INTEGRATOR'S GUIDE

Bi-Directional Isolator Relay Delay (B.I.R.D.®)

Part number: 00-01136-000

Description:

This document is a guide for system integrators which provides the necessary information for communicating and interfacing with the B.I.R.D.® Included in this document is a description of the devices functionality and full list of supported DGN's regarding the communication and configuration of the B.I.R.D.®

The Bi-Directional Isolator Relay Delay communicates via CANbus utilitizing the RV-C protocol. The device provides two seperate parallel CANbus connections, one which provides source 1 power and the other source 2 power. The physical connectors used for the communicating on the RV-C network are 4-pin MiniFit connectors with the pin definitions listed in the table below:

Pin	Description
1	CAN H
2	CAN L
3	GND
4	PWR SRC1 / PWR SRC2

The RV-C protocol defines the data rate for all transmitters shall be 250 kbits/s with a sample point rate being between the range of 85% to 90%. For more information on the physical layer of an RV-C network please refer to the RV-C specification provided on the RV-C website.

RV-C Product Specifications

The B.I.R.D.® supports dynamic source addressing. As defined in the RV-C specification, the preferred dynamic address ranged is 0x90-0x9F.

Manufacturer Code:	0x69
Default Source Address:	0x8B
Product Definition:	DC Disconnect
DC Disconnect Instance:	3 (Default)

Supported RV-C DGN's

DGN	1FED0h
Name	DC Disconnect Status
Description	Defines the state of the B.I.R.D.®'s isolator relay, current flow through the contacts and direction of the current.

Byte	Bit	Name	Data Type	Value Description
0	-	Instance	Uint8	0 – Invalid 1 – Main House Battery Disconnect 2 – Chassis Battery Disconnect 3 – House/Chassis Bridge 4 – Secondary House Battery 5- Generator Starter Battery 6-250 - Other
1	0 to 1	Circuit Status	bit	00b – Circuit is disconnected. 01b – Circuit is connected.
	2 to 3	Last Command	bit	00b – Disconnect circuit. 01b – Connect circuit.
	4 to 5	Bypass Detect	bit	Not Supported
2 to 3	-	DC Switched Voltage	Uint16	Not Supported
4 to 7	-	DC Switched Current	Uint32	-2,000,000 to 2,221,081.2 Amps

DGN	1FFFDh
Name	DC Disconnect Command
Description	Control message for disconnecting and reconnecting the B.I.R.D.®'s isolator relay.

Byte	Bit	Name	Data Type	Value Description
0	-	Instance	Uint8	0 – Invalid 1 – Main House Battery Disconnect 2 – Chassis Battery Disconnect 3 – House/Chassis Bridge 4 – Secondary House Battery 5- Generator Starter Battery 6-250 - Other
1	0 to 1	Command	bit	00b – Disconnect Circuit. 01b – Connect Circuit.

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DGN	1FECFh			
Name	DC Source Status 1			
Description	Provides the source voltage from both sides of the isolator relay when no other device is transmitting DC Source Status message.			

Byte	Bit	Name	Data Type	Value Description
0	-	Instance	Uint8	0 – Invalid 1 – Main House Battery Disconnect 2 – Chassis Battery Disconnect 3 – House/Chassis Bridge 4-250 - Other
1	-	Device Priority	-	40 – Voltmeter/Ammeter
2 to 3	-	DC Voltage	Uint16	0 to 3212.5 Volts
4 to 7	-	DC Amperage	Uint32	Not Supported

DGN	1FE9Fh			
Name	Generic Alarm Status			
Description	The alarm status indicates when the B.I.R.D® senses a charging source present and has begun the bridging delay process or when charging source is removed and has begun the isolation delay process. This alarm can be monitored to determine how much time remains before the event will occur or just as a condition flag in a logger. The B.I.R.D.® also provides an alarm for over temperature and over current conditions.			

Byte	Bit	Name	Data Type	Value Description
0	-	Instance	Uint8	1 – Impending Disconnect 2 – Impending Reconnect 3 – Impending Over Temp Cutoff 4 – Impending Over Current Cutoff
1	-	DSA	Uint8	139 – DC Disconnect
2	0 to 1	Alarm Triggered	bit	00b – Alarm is not Triggered. 01b – Alarm is Triggered
	2 to 3	Alarm Ready	bit	00b – Alarm condition is not being monitored. 01b – Alarm condition is being monitored.
	4 to 5	Alarm is Acknowledged	bit	00b – Alarm has not been acknowledged. 01b – Alarm has been triggered and acknowledged.
	6 to 7	Auto Reset	bit	Set permanently to 1
3 to 5	-	Elapsed Time	Uint16	Time in minutes since alarm triggered

DGN	1FE9Eh			
Name	Generic Alarm Command			
Description	Generic alarm command allows the user to acknowledge the alarm condition and disable alarm.			

Byte	Bit	Name	Data Type	Value Description
0	-	Instance	Uint8	1 – Impending Disconnect 2 – Impending Reconnect 3 – Impending Over Temp Cutoff 4 – Impending Over Current Cutoff
1	-	DSA	Uint8	139 – DC Disconnect
2	0 to 1	-	-	Always 11b
	2 to 3	Ready Alarm	bit	00b – Stop Monitoring Alarm condition. 01b – Start Monitoring Alarm condition.
	4 to 5	Ack Alarm	bit	00b – No Action 01b – Acknowledge Alarm.
	6 to 7	Auto Reset	bit	Set Permanently to 1

DGN	17F00h			
Name	General Reset			
Description	General reset allows the user to perform a software reset, clear faults or put the B.I.R.D.® back into factory setting.			

Byte	Bit	Name	Data Type	Value Description
0	0 to 1	Reboot	Bit	00b - No action 01b - Reboot
	2 to 3	Clear Faults	Bit	00b - No action 01b - Clear faults
	4 to 5	Reset Default	Bit	00b - No action 01b - Restore settings to default values
	6 to 7	Reset Stats	bit	Not Supported
1	0 to 1	Test Mode	bit	00b – Quit testing node 01b – Initiate testing node
	2 to 3	Restore OEM Settings	bit	Not Supported
	4 to 5	Reboot/Enter Bootloader Mode	bit	Not Supported

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DGN	17FB0h			
Name	Instance Status			
Description	Reports the B.I.R.D.®'s single instance for DC disconnect.			

Byte	Bit	Name	Data Type	Value Description
0	-	Device Type	Uint8	DSA of the target device Instance.
1	-	Base Instance	Uint8	
2	-	Max Instance	Uint8	0xFF = Applies to single instance only.
3 to 4	-	Base Internal Address	Uint16	
5 to 6	-	Max Internal Address	Uint16	0xFFFF = Applies to single instance only
7	-	Reserved	Uint8	

DGN	17C00h	(Lower two bytes of DGN is destination address)		
Name	Instance Assignment			
Description	The Instance Assignment provide a generalized method for configuring the instances used. The Disconnect has a base internal address is 0. After successful instance assignment the device will respond with an Instance Status with the updated instance. If failed instance assignment the device will respond with a NACK message.			

Byte	Bit	Name	Data Type	Value Description
0	-	Device Type	Uint8	DSA of the target device Instance.
1	-	Base Instance	Uint8	0 – Invalid 1 – Main House Battery Disconnect 2 – Chassis Battery Disconnect 3 – House/Chassis Bridge 4 – Secondary House Battery 5- Generator Starter Battery 6-250 - Other 0xFF = Send INSTANCE_STATUS for all Instances of the indicated device type.
2	-	Max Instance	Uint8	0xFF = Applies to single instance only.
3 to 4	-	Base Internal Address	Uint16	
5 to 6	-	Max Internal Address	Uint16	0xFFFF = Applies to single instance only
7	-	Reserved	Uint8	

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DGN	EF00h	(Lower two bytes of DGN is destination address)		
Name	Proprietary Message			
Description	The proprietary messages used by the B.I.R.D.® allows read and write access to configurable parameters within the device, the ability to calibrate the current sensing, read the disconnect/reconnect log and obtain firmware information. Note: More on proprietary messaging described in the proprietary messaging section of this document.			

Byte	Bit	Name	Data Type	Value Description
0	-	MFG Code	Uint8	0x69 – Intellitec Manufacturer Code
1	-	Function	Uint8	0x00 – Read Configuration 0x01 – Write Configuration 0x02 – Calibrate 0x03 – Read Log
2	-	Parameter	Uint8	Configurable parameter being addressed
3 to 4	-	Parameter Value	Uint16	Value of parameter define in Parameter Table
5 to 6	-	Reserved	Uint8	Value of log (upper bytes)
7	-	Reserved	Uint8	0x69 Manufacturer Code

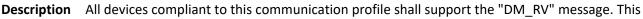|				
DGN	EA00h	(Lower two bytes of DGN is destination address 0xFF for global)		
Name	Request for DGN			
Description	Request for a DGN allows the user to instantly obtain the status messages of the B.I.R.D.® Instead of waiting for the standard message timing, immediate information may be obtained. Supported Request include: DC_DISCONNECT_STATUS DC_SOURCE_STATUS_1 PRODUCT_IDENTIFICATION GENERIC_CONFIG_STATUS			

Byte	Bit	Name	Data Type	Value Description
0 to 2	-	Desired DGN	Uint17	LSB in Byte 0
3	-	Instance	Uint8	0 - 253 - Instance desired, if multi-instanced. 0xFFh if not multi-instanced or reports from all instances is desired.
4	-	Instance Bank or Secondary Instance	Uint8	Not supported
5 to 7	-	Reserved	Uint8	

DGN   1FECAh

Name   Diagnostic Message

Description   All devices compliant to this communication profile shall support the "DM_RV" message. This message allows the communication of diagnostic information and general operating status. If there are no active faults, data bytes 2 to 5 shall be set to FFh. The DM_RV is still broadcast, allowing other nodes to see its operating status.

Byte	Bit	Name	Data Type	Value Description
0	0 to 1	Operating Status	Uint2	0x00 – Disabled / Not operating
	2 to 3	Operating Status	Uint2	0x05 – Normal / On condition
	4 to 5	Yellow Lamp Status	Uint2	Indicates minor fault
	6 to 7	Red Lamp Status	Uint2	Indicates critical fault
1	-	DSA	Uint8	69h – default source address
2	-	SPN-MSB	Uint8	Refer to SPN section of document
3	-	SPN-ISB	Uint8	Refer to SPN section of document
4	5 to 7	SPN-LSB	Uint3	Refer to SPN section of document
	0 to 4	FMI	Uint5	Refer to SPN section of document
5	0 to 6	Occurrence Count	Uint7	0 – 126 counts
	7	Reserved	Bit1	Always 1
6	-	DSA Extension	Uint8	0xFF
7	0 to 3	Bank Select	Uint4	0xF

DGN   17D00h   (Lower two bytes of DGN is destination address, must not be 0xFF)

Name   Download

Description   The Download Message allows the B.I.R.D.® to update its firmware in the field via bootloader. A windows-based application is provided to perform this task. For more information on the bootloader protocol please contact.

DGN	1FECAh
Name	Generic Configuration Status
Description	DGN provide valuable information regarding the firmware revision and date as well as the configuration number and revision.

Byte	Bit	Name	Data Type	Value Description
0		Manufacturer Code	Uint8	Manufacturer Code (LSB)
1	0-2	Manufacturer Code	Uint3	Manufacturer Code (MSB)
	3-7	Function Instance	Uint5	Function Instance
2	-	Function	Uint8	Function Code
3	-	Firmware Revision	Uint8	Firmware Revision
4	-	Configuration Type	Uint8	Configuration Type (LSB)
5	-	Configuration Type	Uint8	Configuration Type
6	-	Configuration Type	Uint8	Configuration Type (MSB)
7	-	Configuration Rev	Uint8	Configuration Revision

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Proprietary Messages

The B.I.R.D.® offers parameters that are configurable via RV-C network. This allows installers or users the ability to make changes to their module as they feel necessary. Byte 1 of the proprietary messages determines what function is being performed. 0x00 and 0x01 allow the reading and writing of these configurable parameters, respectively. The table below shows how to access each of these parameters, what the upper and lower bounds are and a description of how the parameter functions.

Byte[2]	Limits	Default Value	Description
0x00	12.8 >= Val >= 10.5	12.8 Volts	Isolation Threshold is the voltage at which the device determines that the batteries should be isolated when bridged.
0x02	300 >= Val >= 60	60 Seconds	Isolation Delay is the delay the voltage must remain below the threshold before performing an isolation.
0x03	14.2 >= Val > 12.5	13.3 Volts	Bridge Threshold is the voltage at which the device determines charging is occurring and will attempt to bridge the batteries together.
0x04	300 >= Val >= 60	60 Seconds	Bridge Delay is the delay the voltage must remain above the bridge threshold before performing a bridge.
0x09	250 >= Val >= 1	0x01	DC Source Status 1 instance assignment for source 1. In a traditional bridge installation this value is typically Main House Battery.
0x0A	See device priority	0x20	DC Source Status 1 device priority assignment allows integrators the ability to change the priority level when integrating with other devices that transmit DC Source Status 1.
0x0B	250 >= Val >= 1	0x02	DC Source Status 1 instance assignment for source 2. In a traditional bridge installation this value is typically Chassis Battery.
0x0C	See device priority	0x20	DC Source Status 1 device priority assignment allows integrators the ability to change the priority level when integrating with other devices that transmit DC Source Status 1.
0x0D	12.8 >= Val >= 12.4	12.6 Volts	Threshold at which the non-charging battery must be below before bridging. This will prevent the unnecessary bridging of a charged battery and minimize the cycling of the bridge relay.
0x0E	4.0 >= Val >= 0.5	2.0 Amps	This value is used to determine end of Absorption phase of charging a battery. Setting the value higher will isolate the batteries sooner potential prior to the battery being fully charge but also will ensure not to damage the battery by over-charging.
0x0F	13.8 >= Val 13.3	13.5 Volts	Float voltage value. If suing a smart charging source, the charger will automatically reduce the voltage output to prevent over charging. This value is used to determine whether a smart charger exists or the B.I.R.D needs to isolate the second battery to prevent over charging.
0xFA	N/A	N/A	Stores a user defined configuration number and revision. After completing the configuration process. Setting this value last will allow technicians the ability to retrieve these number and reference to configuration parameters. Bytes[3-5] = Configuration Number LSB-MSB Byte[6] = Configuration Rev

Note: Values being address are represented as seconds for timing parameters and 100 of millivolts for voltage parameters (i.e. 12.1V = 121 or 79h).

If a read request is performed the B.I.R.D.® will echo the request but will fill byte[3] and byte[4] with the parameter value. An example of a read sequence of the Isolation Voltage Threshold with a default value of 12.8V is described below.

Request:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x69	0x00	0x00	0xFF	0xFF	0xFF	0xFF	0x69

B.I.R.D.® Response:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x69	0x00	0x00	0x80	0x00	0xFF	0xFF	0x69

On a write request the B.I.R.D.® will respond with an ACK if the value being assigned is valid and successfully save into the EEprom. If either of these cases is not true, the device will respond with a NACK DGN. An example of a write request to change the Isolation Voltage Threshold value of the B.I.R.D.® to 12.1V is described below.

Request:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x69	0x01	0x00	0x79	0x00	0xFF	0xFF	0x69

B.I.R.D.® Response:
ACK DGN

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x00	0x01	0xFF	0xFF	0xFF	0x00	0xEF	0x00

The calibration feature built into the B.I.R.D.® allows the ability to zero out the solenoid's current sensing. The calibration process is straight forward, simply remove the battery from one side of the B.I.R.D.®, ensure the solenoid is in the connected state and send the calibration message via RV-C. This will remove any offset in the positive or negative direction. The message to calibrate is expressed in the below message:

Requestor:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x69	0x02	0xFF	0xFF	0xFF	0xFF	0xFF	0x69

Event Logging

The B.I.R.D.® logs the number of solenoid disconnects and reconnects. To access this information, a read log request must be sent. The log records 2 different events both of which are stored as 32-bit integers allowing for over 1,000,000 records for each event. The device will echo the request from the user and return the 32-bit value in byte[3]-byte[6], where byte[3] is the LSB and byte[6] is the MSB. The event index is listed in the table below:

Index	Event
0	Isolation Event
1	Bridge Event

The sequence for accessing the number of reconnects is described below:

Request:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x69	0x03	0x01	0xFF	0xFF	0xFF	0xFF	0x69

B.I.R.D.® Response:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x69	0x03	0x01	0x40	0x42	0x0F	0x00	0x69

This result returned 1,000,000 reconnect events.

Service Point Number

The B.I.R.D.® provide valuable diagnostic information via the DM_RV DGN. It supports both Red Lamp and Yellow Lamp status. Critical events where the B.I.R.D.® is deemed in operable are indicated by Red Lamp Status and inhibits its operations. Status messages will continue to transmit but control messages will be ignored. These failures include the following:

1. Failed to Disconnect
2. Failed to Reconnect

Both failures are indicated using the same SPN and FMI. Which represents solenoid mechanical failure. To resume operation, the GENERAL RESET DGN must be used to clear the fault.

Non-critical events where the B.I.R.D.® is deemed operable with the fault are indicated by the Yellow Lamp Status. The B.I.R.D.® will operate as normal but will continue to indicate the failure until cleared by the GENERAL RESET DGN or a user reconnect. There is a safety delay built into the device if any of these events occur and the user will not be able to reconnect until the delay has expired. These failures include the following:

1. Disconnect over current
2. Solenoid over temperature

Several SPN's are supported by the B.I.R.D.®. The following table identifies the SPN and FMI values for each of the supported faults:

SPN MSB	SPN ISB	SPN LSB	FMI	Description
1	Instance	0	0x07	Failed to disconnect or reconnect
1	Instance	3	0x00	Solenoid Temperature
1	Instance	4	0x00	Contact Current

Available Product Literature and Guides:

Brochure: 53-01136-000

Product Specification: 53-01136-001

User's Guide: 53-01136-100

Installation and Applications: 53-01136-200

Integrator Guide: 53-01136-300

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