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

Part number: 00-01194-000

Description:

This document is a guide for system integrators that provides the necessary information for communicating and interfacing with the Heavy Duty Bi-Directional Isolator Relay Delay.® 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 HD B.I.R.D.®

The HD B.I.R.D® 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 HD B.I.R.D.® supports dynamic source addressing. As defined in the RV-C specification, the preferred dynamic address range is 0x80-0x8F.

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

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Supported RV-C DGN's

DGN 1FED0h

Name DC Disconnect Status

Description Defines the state of the HD 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

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DGN 1FFFDh

Name DC Disconnect Command

Description Control message for disconnecting and reconnecting the HD 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.

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

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				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 HD 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 HD 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

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	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.

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	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 HD B.I.R.D.® back into the 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 HD 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 provides 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.

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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	

DGN EF00h (Lower two bytes of DGN is destination address)

Name Proprietary Message

Description The proprietary messages used by the HD 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.

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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 HD 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

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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

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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 HD 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

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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

Proprietary Messages

The HD 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 determine 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 Isolation voltage threshold before performing an isolation.
0x03	14.2 >= Val > 12.5	13.3 Volts	Bridge Threshold Source 1 is the voltage at which the device determines charging is occurring on Source 1 and will attempt to bridge the batteries together.
0x04	300 >= Val >= 60	60 Seconds	Bridge Delay Source 1 is the delay the voltage of Source 1 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.

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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 Source 1 must be below when not charging before bridging occurs. This will prevent the unnecessary bridging of a charged battery and minimize the cycling of the bridge relay.
0x0E	15.0 >= Val >= 5.0	10.0 Amps	This value is used to determine the 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 using 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.
0x01	14.2 >= Val > 12.5	13.3 Volts	Bridge Threshold Source 2 is the voltage at which the device determines charging is occurring on Source 2 and will attempt to bridge the batteries together.
0x11	300 >= Val >= 60	60 Seconds	Bridge Delay Source 2 is the delay the voltage of Source 2 must remain above the bridge threshold before performing a bridge.
0x12	12.8 >= Val >= 12.4	12.6 Volts	Threshold at which Source 2 must be below when not charging before bridging occurs. This will prevent the unnecessary bridging of a charged battery and minimize the cycling of the bridge relay.
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).

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If a read request is performed, the HD 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

HD 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 HD 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 HD 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

HD 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 HD 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 HD 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:

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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 HD B.I.R.D.® logs the number of solenoid disconnections and reconnections. 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

HD 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.

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Service Point Number

The HD 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 HD B.I.R.D.® is deemed inoperable 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 HD B.I.R.D.® is deemed operable with the fault are indicated by the Yellow Lamp Status. The HD 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 HD 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

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Available Product Literature and Guides:

Brochure:	53-01194-000
Product Specification:	53-01194-001
User's Guide:	53-01194-100
Installation and Applications:	53-01194-200
Integrator Guide:	53-01194-300

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