DATA PANEL

A Murrelektronik Company

xtremeHB™: CANbus H-Bridge

User Manual

Table of Contents

Document Revision History

A	Initial release, July 2024
B	Updated LED codes, minor J1939 changes, August 2024

Description of Manual

This user manual is a resource to users for correct maintenance and operation of this product. The text, illustrations, diagrams, and examples used in this manual exist solely for the purpose of explaining the operation and usage of the xtremeHB™ DP-43016 H-Bridge module. If you have any further questions regarding the installation and set-up of the equipment described in this manual, please do not hesitate to contact us at dptech@murrinc.com. Data Panel Corporation and Murrelektronik reserve the right to make changes or modifications to this manual without prior notice.

Description of Product

xtremeHB™ is the ultimate mobile H-Bridge solution for both on-highway and off-highway system applications with DC load directional control needs of up to 25 Amps. This H-Bridge module takes advantage of DEUTSCH connections to achieve IP67 ratings, and pin-level LED diagnostics for improved field serviceability. In addition to short circuit and overcurrent protection, a complete set of fault codes is shown via port- and module-level LEDs, and these codes that are broadcasted on the network can enable fault messages on the display so operators can quickly identify possible problems on the machine.

Applicable Data Sheets:

DP-43016-000_ina_a

Applicable Installation Manuals:

DP-43016-000_ina_10

Applicable Software Quickstart Guides

Block Tool
DPLoader
DPNPlayer

Safety Information

TARGET GROUPS

This manual addresses itself exclusively to qualified and trained technicians knowledgeable in the safety standards of automation technology. Only a qualified, trained technician knowledgeable in the safety standards of the mobile industry may perform configuration, installation, set-up, maintenance, and testing of the equipment.

DESIGNATED USE

The H-Bridge modules of the xtremeDB® series are designated for use only in those areas as described in this manual. Strict adherence to the data specified in this manual and other published documentation must be ensured. The products have been developed, manufactured, tested, and documented in compliance with safety codes noted in the data sheets. The equipment poses no danger to operating personnel or material if configuration, assembly, and operation are performed in compliance with the stated handling and safety regulations. Unqualified intervention in the hardware and software of our equipment, disregard of warning labels found on the equipment, or non-observance of the information in this manual can result in injury or serious damage to man and/or material. Any application or usage beyond and above this shall be regarded as non-designated.

REGULATIONS

Current safety and accident prevention laws valid for a specific application must be observed in the configuration, installation, setup, and maintenance and testing of the equipment.

1. The designated function of the module is guaranteed only if the conditions for installation, system extension, operation, and maintenance are complied with and the housing is fully installed. Any modifications to the housing are not allowed.
    i. The module described is installed as a subcomponent in a system. The safety of this system is the responsibility of the creator. The system manufacturer is obliged to carry out a risk assessment, and from this to prepare and enclose documentation in accordance with the legal and normative requirements for the operator and the user of the system. This must contain all necessary information and safety instructions for the operator, user and, if applicable, service personnel authorized by the system manufacturer.
    ii. Read this document before putting the product into operation; keep this document for the duration of product use.
2. Only system accessories and cables that meet the requirements and regulations for safety, electromagnetic compatibility and, where applicable, telecommunications transmission equipment and specifications are allowed. The installation of other accessories may violate these requirements and regulations or damage the equipment. Information concerning the type of authorized system extensions and cables can be obtained from your Murrelektronik distributor or taken from this manual.
3. Welding may damage the integrity of the module. Use good welding practices.
    i. Damage or impairment of electrical safety may occur due to overcurrent, welding spatter, and contamination from welding work.
    ii. Welding work on the chassis frame may only be carried out by qualified personnel.
    iii. Remove and cover the positive and negative terminals of the batteries.
    iv. Disconnect the module with all contacts from the onboard power supply before welding on the vehicle or on the system.
    v. Connect the ground clamp of the welding device directly to the part to be welded.
    vi. Do not touch the module and electrical lines with the welding electrode or the ground terminal of the welding device.
    vii. Protect the module, including all connection plugs and all connection lines, against welding spatter and other contaminants.
4. This product is designed and manufactured to assure protection against damage and hazards if designated usage and proper maintenance are observed.
    i. This product must be suitable without restriction for the applications and environmental conditions concerned. **This product is not a safety component or appropriate for potentially explosive environments.** Only use the product as intended. Failure to observe application instructions or technical specifications may result in damage to property and/or personal injury.

END USER LICENSE

EXCLUSION OF INCIDENTAL, CONSEQUENTIAL, AND CERTAIN OTHER DAMAGES:

To the maximum extent permitted by applicable law, in no event shall Data Panel or Murrelektronik be liable for any special, incidental, indirect, or consequential damages whatsoever (including, but not limited to, damages for loss of profits or confidential or other information, for business interruption, for personal injury, for loss of privacy, for failure to meet any duty including of good faith or of reasonable care, for negligence, and for any other pecuniary or other loss whatsoever) arising out of or in any way related to the use of or inability to use the software product, the provision of or failure to provide support services, or otherwise under or in connection with any provision of this End User License, even in the event of the fault, tort (including negligence), strict liability, breach of contract or breach of warranty of Data Panel or Murrelektronik, or any supplier, and even if Data Panel or Murrelektronik or any supplier has been advised of the possibility of such damages.

EXAMPLE OF SYMBOLS

Use of Attention Signs

Notes containing important information are specially marked. These are illustrated as follows:

Attention text…

Use of Danger Signs

Danger signs are indicated by text and a corresponding symbol inside of a frame:

CAUTION!
Disregard for safety measures may result in damage to equipment and other serious consequences.

Part Number Structure

D	P	—	4	3	0	1	6	—	0	4	—	0	0	0

Data Panel Product Group
Designed and assembled in the USA

xtremeHB Family

Variant
04 - (4) 25A H-Bridge Port Variant

Communication
0 - J1939, Node Only
2 – CANopen (*Coming Soon*)

Special Features
00 = Standard

Example: DP-43016-04-000 is a CAN J1939 4-Port xtremeHB™ H-Bridge Module.

Module Overview

TECHNICAL DATA

(2) x CANbus ports allow for daisy chaining capability

Individual DEUTSCH DTP Connections for 25A H-Bridge

LED Feeback for Module or individual port diagnostics

Output Power and Ground lugs for 100A Output Power

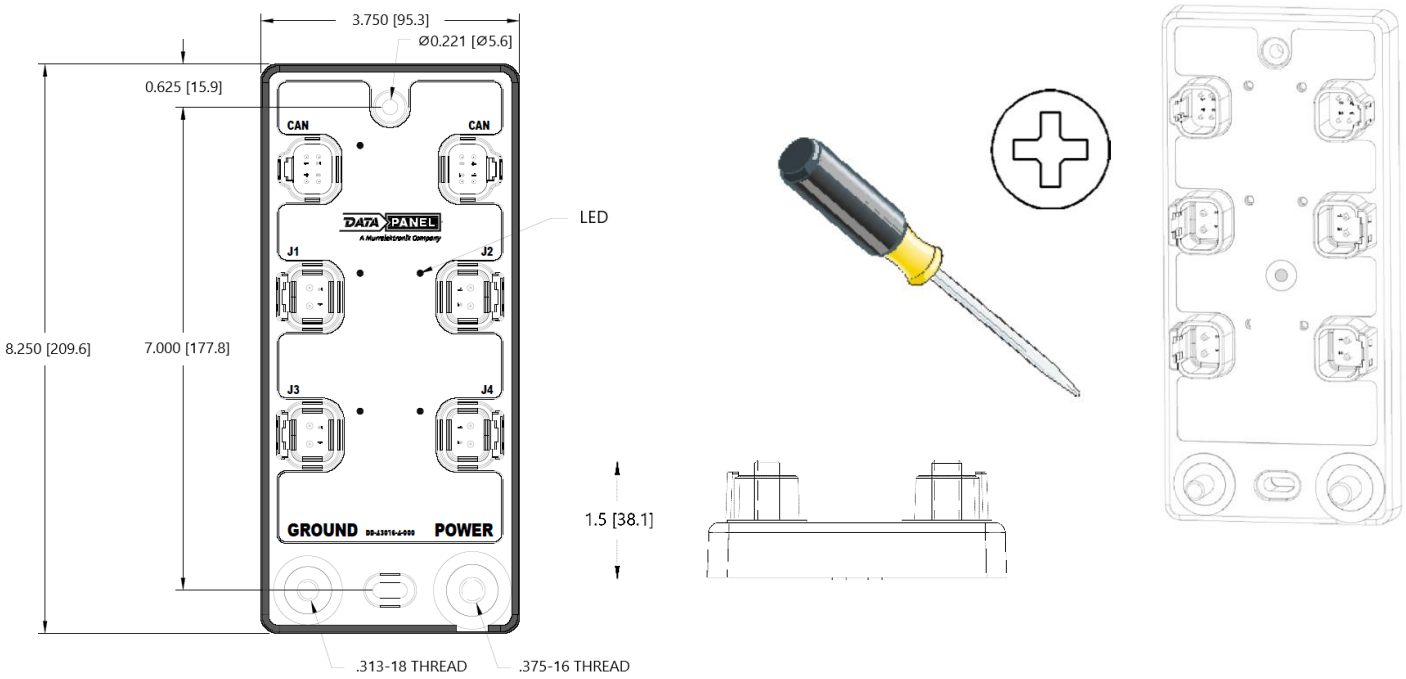
| AT A GLANCE

- Proportional Control (PWM) via CAN Messaging
- (4) x H-Bridge Ports per module
- Current Rating
  - Up to 100A per module
  - Up to 25A per H-bridge port
- Works in 12 and 24V DC systems
- Operating Temperature Range: -40 to 85°C
- Size: 8.2" (L) x 3.7" (W) x 0.7" (D)
- Internal Protection for Inductive Load Switching

See page 5 for J1939 Configuration guide.

Installation	(2) M5 x 1 screws
Communication	2 non-isolated J1939 ports (250kb & 500kb)
Voltage Range	8-32V DC
Current Draw	150mA
Operating Temperature	(-40 to 85°C)
Storage Temperature	(-40 to 85°C)
Protection	IP67 with Murrelektronik MDC cables
Number of Ports	4
Total Number of Channels	4
Total Current per Channel	25 A
Total Module Current	100 A
Output Diagnostics	Short Circuit and Overcurrent

INSTALLATION AND MAINTENANCE NOTES



Installation
The *xtremeHB* blocks can be mounted directly on an installation panel or on a machine. The module features two mounting holes, which each accept M5 screws, for this purpose. The mounting surface must be smooth and flat to prevent mechanical stress in the module housing. Prevent torsional forces or mechanical loads from acting on the housing.

- Logic and Output power connections should be fused externally to the block.
- The module must not exceed or fall below the specified tolerances.
- Select and install connecting cables in such a way that capacitive and inductive interference does not impair the system.
- Avoid contamination before and during installation until the protection rating is ensured by plugs or dummy plugs.
- Secure the module against misuse and accidental use.

See Safety Information for detailed notes on safe application of this product.

Servicing and Cleaning
The module itself is maintenance-free. No inspection and maintenance work are necessary during operation. However, a regular check of your overall system should be included in the maintenance schedule of your machine in order to detect possible defects caused by external influences at an early stage.

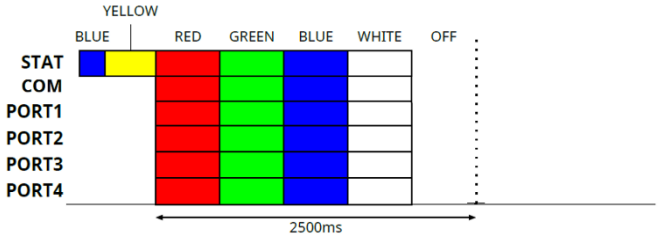
- **Clean soiled contacts only with oil-free compressed air or with alcohol and a lint-free cloth. Do not use contact spray.**
- **When using aggressive mediums near the block, check the application-specific material resistance. This product has good chemical and oil resistance; refer to data sheet for material specifications.**

All unused ports should be plugged. All unused pins should be plugged with a DEUTSCH sealing plug to maintain the IP67 rating.

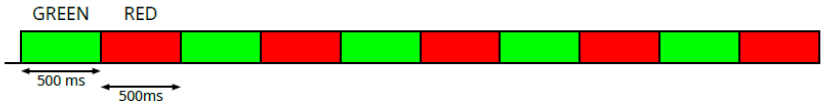
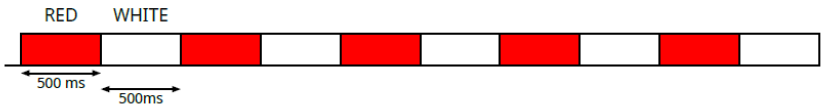
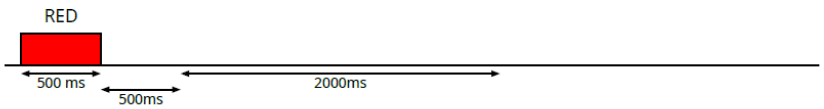
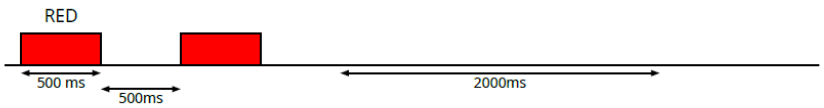
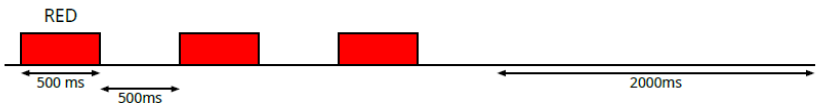
J1939 LED INDICATION

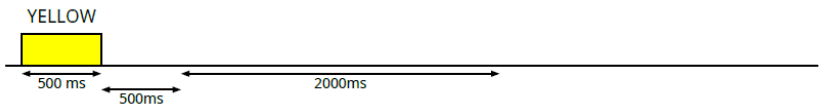
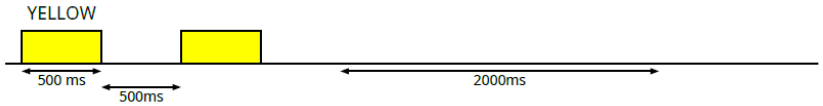
BULB TEST:
Immediately after power on, STAT LED will turn to BLUE to indicate startup.
While the bootloader software checks for updates, the status LED is solid YELLOW.
The bulb test begins when the bootloader exits and the application starts.
All LED indicators will flash RED, GREEN, BLUE, WHITE, and then off. Each step lasts 500ms.

For more information about FAULT CODES, refer to Page 84.

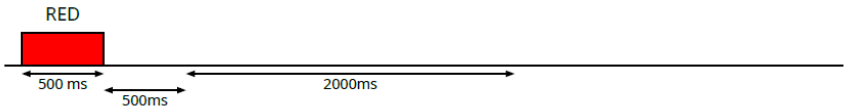
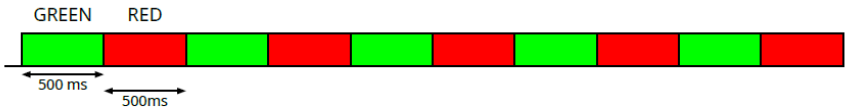
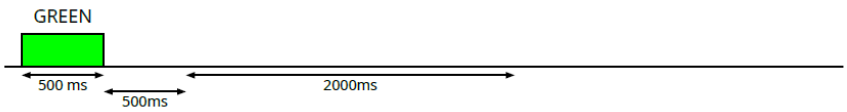
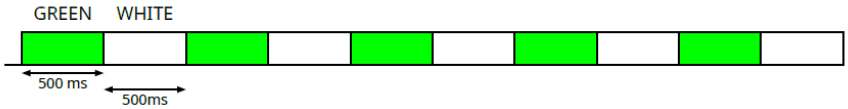


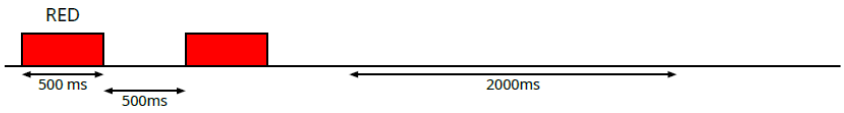
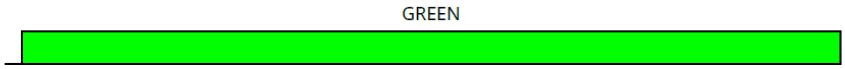
STAT LED:

Hardware fault	 Green/Red Alternating pattern. System or hardware-related faults such as POST failure or invalid configuration. System is inoperable.
Temperature too high	 Red/Yellow alternating pattern. System temperature out of operating range. Outputs disabled.
I/O Port fault	 Red/white alternating pattern. One or more ports has an active fault.
Low-voltage system hold	 Single red blink, 2000 ms gap. System supply voltage is below operating range. Outputs disabled.
System voltage too high	 Two red blinks, 2000ms gap. System supply voltage is beyond operating range.
System over-current	 Three red blinks, 2000 ms gap. The total current supplied by the device is beyond operating limits. Outputs disabled.

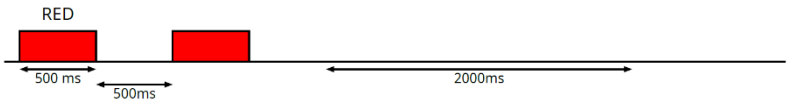
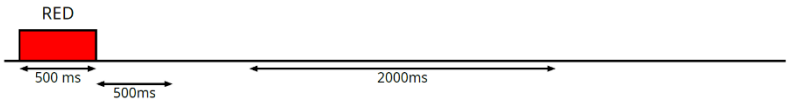
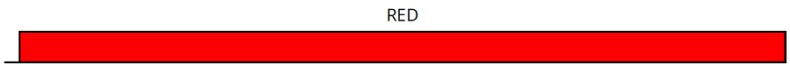
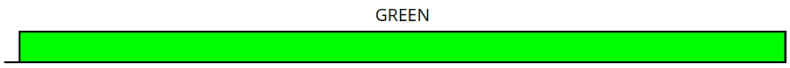
Low voltage warning	 Single yellow blink, 2000 ms gap. System voltage below nominal. Outputs remain operational.
High voltage warning	 Two yellow blinks, 200 ms gap. System voltage above nominal. Outputs remain operational.
Normal operation	 Solid blue with brief cyan flash once per second. System operating normally.

COM LED:

CAN bus fault	 Single red blink, 2000 ms gap. CAN BUSOFF error due to physical layer issue.
Address claim failure	 Green/Red alternating. A J1939 address could not be claimed.
Control failure	 Single green blink, 2000 ms gap. Control-related communication failure, such as a timeout, invalid, or conflicting command received.
DM13 active	 Green/White alternating. Broadcast messages inhibited due to active J1939 DM13 request.

Protocol error	 Two red blinks, 2000 ms gap. A protocol-related error has occurred.
Normal operation	 Solid green. System is operating normally.

PORT LED:

Hardware overcurrent (critical)	 Two red blinks, 2000 ms gap. The hardware has detected an overcurrent condition, possibly indicating a short-circuit. Output disabled.
Software overcurrent (warning)	 Single red blink, 2000 ms gap. The output current exceeds the configured limit. Output disabled.
General failure	 Solid red. An unspecified error has occurred on the port.
Normal operation (active)	 Solid green. The port is enabled and is operating normally.
Normal operation (inactive)	 Off. The port is not active, and there are currently no faults.

I/O Specifications

DP-43016-4-000: 4 Channel H-Bridge Block	
Total Number of Channels	4 H-Bridge Channels
Configurable Ouput	4 Digital or PWM
Total Channel Current	25 A
Total Output Current	100A

MODULE PINOUTS

DP-43016-4-000: 4 Channel H-Bridge Block		
Pin	CAN Ports 1 & 2	
1	LOGIC POWER	 4 PIN DEUTSCH DT06-4S
2	CAN HIGH	
3	GND-EXT	
4	CAN LOW	
Pin	HB Output Ports 1-4	
1	Output HB-B	 2 PIN DEUTSCH DTP10-2P
2	Output HB-A	

J1939 Configuration

	Configuration	Port 1	Port 2	Port 3	Port 4
Parameter ID (HEX)	Output Mode	0x0000C9	0x0000CA	0x0000CB	0x0000CC
	PWM Output Frequency	0x0001C9	0x0001CA	0x0001CB	0x0001CC
	PWM Output Minimum Duty Cycle	0x0006C9	0x0006CA	0x0006CB	0x0006CC
	PWM Output Maximum Duty Cycle	0x0007C9	0x0007CA	0x0007CB	0x0007CC
	Ramp Time Forward	0x0008C9	0x0008CA	0x0008CB	0x0008CC
	Ramp Time Reverse	0x0009C9	0x0009CA	0x0009CB	0x0009CC
	Output Current Soft Limit	0x000AC9	0x000ACA	0x000ACB	0x000ACC
	Output Current Soft Limit Time	0x000BC9	0x000BCA	0x000BCB	0x000BCC
	Output Current Soft Limit Reaction	0x000CC9	0x000CCA	0x000CCB	0x000CCC
	Output Current Soft Limit Max Retries	0x000DC9	0x000DCA	0x000DCB	0x000DCC
	H-Bridge Invert Direction	0x0012C9	0x0012CA	0x0012CB	0x0012CC

* For more information on J1939 Configuration, refer to Page 23.

MODULE CONFIGURATION:

Output Mode:
• Configure individual ports to desired output mode

PWM Output Frequency:
• Configure frequency of PWM output control signal

PWM Output Minimum/Maximum Duty Cycle
• Configure the trim values by setting the minimum and maximum duty cycle

Ramp Time Forward/Reverse:
• Configure the ramp times for forward and reverse directions for individual ports

Output Current Soft Limit
• Configure the user current limit on individual ports to trigger limit reaction

Output Current Soft Limit Time:
• Configure the time limit for inrush that exceeds user current limit

Output Current Soft Limit Reaction
• Configure the module's response when exceeding the user soft limit and inrush time allowance

Output Current Soft Limit Retries:
• Configure the number of retries before requiring a module power cycle

H-Bridge Invert Direction:
• Configure the direction of individual H-Bridge ports

Configuration messages should only be sent until receipt is confirmed, DO NOT send continuously.

NOTES ON MODULE CONFIGURATION

PGN 61184 (0xEF00h) is the base message ID for destination-specific PGNs. This message is sent from the xtremeHB to the controller. This message will not transmit until the receipt of CTRL1 from the controller and the controller SA can be identified. For more information on this PGN, refer to Page 23.

NOTE: A controller cannot use SAs 0x00h or 0xFFh.

Example:
Controller is SA 39d (0x27h) and the module is at SA 208d (0xD0h).
The *xtremeHB* [CTRL1 COMMAND] message sent to the module is 0xEFD027h.
The *xtremeHB* [CTRL STAT] message will go out as 0xEF27D0h to the controller.
PGN 0xEF27 (61223d)

The module can be configured globally or individually. Both configuration types use the same PGN. PGN 61401 is used for multiple messages by use of a different value put into the "Command" and "Parameter ID" bytes of the data packet. This value is used as an index or pointer as to where the information goes in the module. Refer to the Parameters table for more information.

Proprietary A STAT Message (PGN 61184-Base)		
PGN (0xEF00 + CTRL1 SA)	**Dec**	**Hex**
Data Length	8	8
Priority: 6	24	0x18
EDP & DP	0	0
PDU Format	239	0xEF
PDU Specific	CTRL1 PGN 61392 SA	
SA - Response Base	208	0xD0
Transmission Repetition	100 mSec	

• Default operation of the module is PWM control.

Control Message 1 / 0xEFD9h / PGN 61401									
Data Type		**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Byte	**Byte 0**	Command							
	Byte 1	Parameter ID							
	Byte 2								
	Byte 3								
	Byte 4	Value							
	Byte 5								
	Byte 6								
	Byte 7								

NOTE: Data Panel uses little-endian bit ordering

Base Address 208 (0xD0) is not recommended to be used in multiple module systems. Reserve for testing purposes.

PGNs Used

Depending on the selected Node SA, the PGNs and source address will be different for the module. The section below shows which are used for each Node SA.

Source Address and SA-Specific Values

Source Address	237	238	239
SA	D0	D1	D2
Control	9DD0	9DD1	9DD2
Device Configuration	EFD0	EFD1	EFD2

NOTE: Reference provided SA values in the table above when building the PGN messages in the table below

	PGN Value (DEC)	PGN Value (HEX)	Default Transmit Rate	Priority	Type
H-Bridge Control	40192	0x9D(SA*)	100 mSec	-	TX
H-Bridge Status 1	65314	0xFF22	100 mSec	6	RX
H-Bridge Status 2	65315	0xFF23	100 mSec	6	RX
H-Bridge Temperature	65317	0xFF25	200 mSec	6	RX
Device Status	65363	0xFF53	100 mSec	6	RX
CTRL1 COMMAND	61184	0xEF(SA)	100 mSec	-	TX
CTRL1 STAT	61184	0xEF(CSA**)	100 mSec	6	RX

*SA: Module Source Address
**CSA: Controller Source Address
*** Click on the 0xFFXX to jump to the corresponding page.

HBCTRL1: H-Bridge Control #1

Controls H-Bridge output ports 1, 2, 3, and 4.

Output Control Message 1 [HBCTRL1]									
Data Type		**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Byte	**Byte 0**	H-Bridge-1 Duty Cycle Command							
4 bit	**Byte 1**	H-Bridge-1 Direction Command				H-Bridge1 Duty Cycle Command			
Byte	**Byte 2**	H-Bridge-2 Duty Cycle Command							
4 bit	**Byte 3**	H-Bridge-2 Direction Command				H-Bridge-2 Duty Cycle Command			
Byte	**Byte 4**	H-Bridge-3 Duty Cycle Command							
4 bit	**Byte 5**	H-Bridge-3 Direction Command				H-Bridge-3 Duty Cycle Command			
Byte	**Byte 6**	H-Bridge-4 Duty Cycle Command							
4 bit	**Byte 7**	H-Bridge-4 Direction Command				H-Bridge-4 Duty Cycle Command			

NOTE: Data Panel uses little-endian bit ordering

Name	Data Type	Description
H-Bridge-1 Duty Cycle Command	12 bits	Sets the PWM output duty cycle of the corresponding H-bridge: 0-100% (0-1000)
H-Bridge-2 Duty Cycle Command		
H-Bridge-3 Duty Cycle Command		
H-Bridge-4 Duty Cycle Command		
H-Bridge-1 Direction Command	4 bits	Sets the direction of current flow for the h-bridge. 0x0=Coast, 0x1=Forward, 0x2=Reverse, 0x4=Brake, 0xF=Maintain previous state
H-Bridge-2 Direction Command		
H-Bridge-3 Direction Command		
H-Bridge-4 Direction Command		

HBCTRL1: H-Bridge Control #1

PGN: 40192 (0x9D00)
PDU Format: 157 (0x9D)
PDU Specific: Device Source Address
Message length: 8 Bytes
Transmit Rate: 100 ms
Timeout: 400 ms

The contents of this PGN differs from AUXIO6 as defined in SAE J1939

PGN 65314 (0x00FF22): H-Bridge Status 1

Indicates status of the H-Bridge outputs on Port 1 and Port 2.

H-Bridge Status 1 [HBSTAT1]									
Data Type		**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
4 bit	**Byte 0**	H-Bridge 2 Operational Status				H-Bridge 1 Operational Status			
Byte	**Byte 1**	H-Bridge 1 Current							
	Byte 2	H-Bridge 1 Current							
	Byte 3	H-Bridge 2 Current							
	Byte 4	H-Bridge 2 Current							
2 bit	**Byte 5**					H-Bridge 2 Limit Status		H-Bridge 1 Limit Status	
	Byte 6	HB2 LED Status				HB1 LED Status			
	Byte 7								

NOTE: Data Panel uses little-endian bit ordering

Name	Data Type	Description
H-Bridge 1 Operational Status	4 bits	Indicates current state of corresponding output. 0x0=Coast, 0x1=Forward, 0x2=Reverse, 0x3=Brake, 0xE=Fault, 0xF=Not available
H-Bridge 2 Operational Status		
H-Bridge 1 Current	16 bits	Measured current through H-Bridge Channel. **Operational Range= 0…65.535A** (Data Range: 0-65535)
H-Bridge 2 Current		
H-Bridge 1 Limit Status	2 bits	Indicates status of user-set limit switch. 0x0=Limit not reached, 0x01=Limit reached, 0x2=Fault, 0x3=Not available
H-Bridge 2 Limit Status		
HB1 LED Status	4 bits	Indicates state of port LED. 0x0=OFF, 0x1=Red, 0x2=Green, 0x3=Yellow, 0x4=Blue, 0x5=Magenta, 0x6=Cyan, 0x7=White, 0xE=Error, 0xF=Not available
HB2 LED Status		

HBSTAT1: H-Bridge Status 1

PGN: 65314 (0xFF22)
PDU Format: 255 (0xFF)
PDU Specific: 34 (0x22)
Message length: 8 Bytes
Transmit Rate: 100 ms

Current measurement is not available in ‘Brake’ mode.

PGN 65315 (0x00FF23): H-Bridge Status 2

Indicates status of the H-Bridge outputs on Port 3 and Port 4.

H-Bridge Status 2 [HBSTAT2]									
Data Type		**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
4 bit	**Byte 0**	H-Bridge 4 Operational Status				H-Bridge 3 Operational Status			
Byte	**Byte 1**	H-Bridge 3 Current							
	Byte 2	H-Bridge 3 Current							
	Byte 3	H-Bridge 4 Current							
	Byte 4	H-Bridge 4 Current							
2 bit	**Byte 5**					H-Bridge 4 Limit Status		H-Bridge 3 Limit Status	
	Byte 6	HB4 LED Status				HB3 LED Status			
	Byte 7								

NOTE: Data Panel uses little-endian bit ordering

Name	Data Type	Description
H-Bridge 3 Operational Status	4 bits	Indicates current state of corresponding output. 0x0=Coast, 0x1=Forward, 0x2=Reverse, 0x3=Brake, 0xE=Fault, 0xF=Not available
H-Bridge 4 Operational Status		
H-Bridge 3 Current	16 bits	Measured current through H-Bridge Channel. **Operational Range= 0…65.535A** (Data Range: 0-65535)
H-Bridge 4 Current		
H-Bridge 3 Limit Status	2 bits	Indicates status of user-set limit switch. 0x0=Limit not reached, 0x01=Limit reached, 0x2=Fault, 0x3=Not available
H-Bridge 4 Limit Status		
HB3 LED Status	4 bits	Indicates state of port LED. 0x0=OFF, 0x1=Red, 0x2=Green, 0x3=Yellow, 0x4=Blue, 0x5=Magenta, 0x6=Cyan, 0x7=White, 0xE=Error, 0xF=Not available
HB4 LED Status		

HBSTAT2: H-Bridge Status 2

PGN: 65315 (0xFF23)
PDU Format: 255 (0xFF)
PDU Specific: 35 (0x23)
Message length: 8 Bytes
Transmit Rate: 100 ms

Current measurement is not available in ‘Brake’ mode.

PGN 65317 (0x00FF25): H-Bridge Temperature

Reports temperature of H-Bridge output drivers on each individual channel.

H-Bridge Temperature [HBRT1]									
Data Type		**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Byte	**Byte 0**	H-Bridge 1 Temperature							
	Byte 1	H-Bridge 1 Temperature							
	Byte 2	H-Bridge 2 Temperature							
	Byte 3	H-Bridge 2 Temperature							
	Byte 4	H-Bridge 3 Temperature							
	Byte 5	H-Bridge 3 Temperature							
	Byte 6	H-Bridge 4 Temperature							
	Byte 7	H-Bridge 4 Temperature							

NOTE: Data Panel uses little-endian bit ordering

Name	Data Type	Description
H-Bridge 1 Temperature	16 bits	Measured temperature of H-Bridge output channel. **Operational Range = -273 °C ... 239 °C** (Data Range: 0-65535) (0.0078125 °C/bit, Offset: -273 °C)
H-Bridge 2 Temperature		
H-Bridge 3 Temperature		
H-Bridge 4 Temperature		

HBRT1: H-Bridge Temperature 1

PGN: 65317 (0xFF25)
PDU Format: 255 (0xFF)
PDU Specific: 37 (0x25)
Message length: 8 Bytes
Transmit Rate: 200 ms

PGN 65363 (0x00FF53): Device Status

Periodic broadcast of overall device status.

Device Status [DPSTAT]									
Data Type		**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Byte	**Byte 0**	VBAT							
	Byte 1	VBAT							
	Byte 2	TEMP							
	Byte 3	ITOTAL							
	Byte 4	CTRLSA							
2 bit	**Byte 5**	COM LED				STAT LED			
Byte	**Byte 6**	USER FAULT							
	Byte 7	HARDWARE FAULT							

NOTE: Data Panel uses little-endian bit ordering

Name	Data Type	Description
VBAT	16 bits	Reports battery voltage measured at the device. **Operational Range= 0…65.535A** (Data Range: 0-65535)
TEMP	8 bits	Reports temperature of device. **Operational Range = -40°C ... 210 °C** (Data Range: 0-250) (1°C/bit, Offset: -40 °C)
ITOTAL		Total current consumed by all outputs. **Operational Range = 0...255A** (Data Range: 0-255)
CTRLSA		Source address of device providing control commands. The NULL address (254, 0xFE) is transmitted if no device has control.
STAT LED	4 bits	Indicates state of STAT LED. 0x0=OFF, 0x1=Red, 0x2=Green, 0x3=Yellow, 0x4=Blue, 0x5=Magenta, 0x6=Cyan, 0x7=White, 0xE=Error, 0xF=Not available
COM LED		Indicates state of COM LED. 0x0=OFF, 0x1=Red, 0x2=Green, 0x3=Yellow, 0x4=Blue, 0x5=Magenta, 0x6=Cyan, 0x7=White, 0xE=Error, 0xF=Not available
USER FAULT	8 bits	Cause of fault is likely linked to installation/configuration. See User Fault Code Table for fault codes
HARDWARE FAULT		Highest priority active hardware fault. Refer to table below.

DPSTAT: Device Status

PGN: 65363 (0xFF53)
PDU Format: 255 (0xFF)
PDU Specific: 83 (0x53)
Message length: 8 Bytes
Transmit Rate: 100 ms

FAULT CODES

Value	Hex	Description
0_{10}	0x0	No active fault
65_{10}	0x41	POST failed
66_{10}	0x42	Invalid port ID
67_{10}	0x43	Invalid or unsupported configuration
68_{10}	0x44	External voltage supply out of range
69_{10}	0x45	Internal voltage out of range
70_{10}	0x46	CAN bus fault
71_{10}	0x47	Low voltage system hold
72_{10}	0x48	System temperature too high
73_{10}	0x49	Operating system software fault
129_{10}	0x81	Input fault
130_{10}	0x82	Output fault
193_{10}	0xC1	Communication protocol error
194_{10}	0xC2	Could not assign address
195_{10}	0xC3	Control message timeout

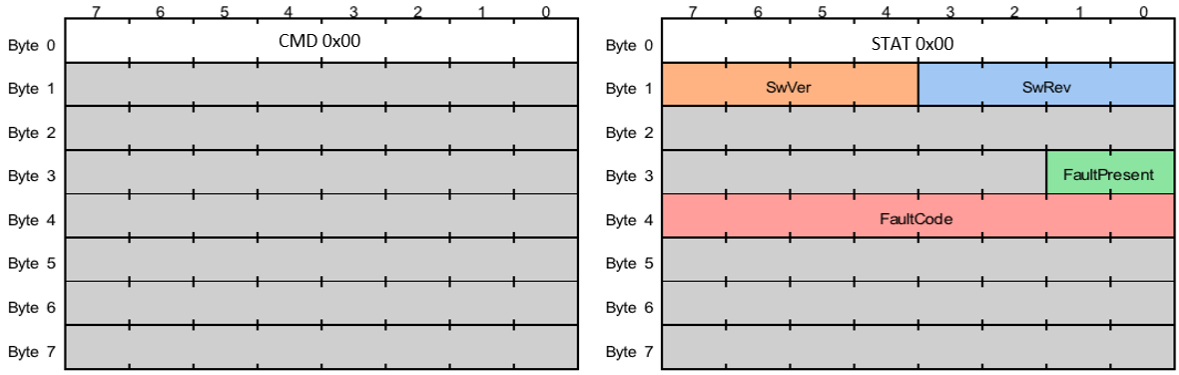
Device Configuration – CTRL 1

This section shows the supported commands for the CTRL1 message. Each command (CMD) is described along with a response message (STAT)..

Command	Name	Description
0x00	NOP	No-operation
0xDC	DCD	Device Configuration

NOP: No-Operation

This command has no effect and can be used to request the status of the device.



SwRev: Software Revision

Indicates software revision level currently running on the device.

Size: 4 bits

Data Range: 0... 15

SwRev: Software Version

Indicates software version level currently running on the device.

Size: 4 bits

Data Range: 0... 15

FaultPresent: Fault active

Indicates if a fault condition currently exists.

Size: 2 bits

Data Range: 0… 3

Value	Value (Bin)	Value (Hex)	Description
0_{10}	00_2	0x0	No fault condition detected.
1_{10}	01_2	0x1	One or more fault conditions exist.
2_{10}	10_2	0x2	Error
3_{10}	11_2	0x3	Not available

FaultCode: Active fault code

FaultCode: Active fault code Indicates a currently active fault condition.

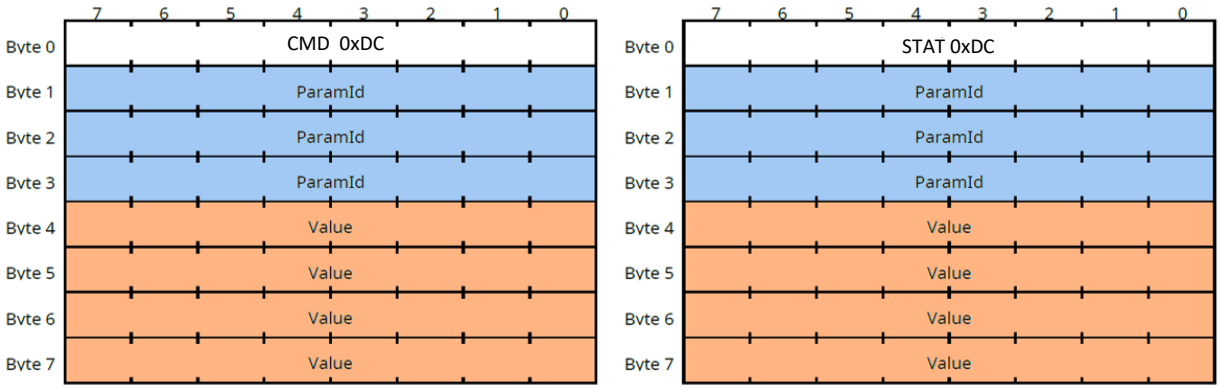
Size: 8 bits

Data Range: 0… 255

Value	Value (Hex)	Description
0_{10}	0x00	No fault condition detected
7_{10}	0x07	EEPROM validation error
8_{10}	0x08	Reference voltage error
9_{10}	0x09	Internal communication error (e.g., I2C)
10_{10}	0x0A	Error reading CNFG pins
11_{10}	0x0B	Mag input switch fault
12_{10}	0x0C	Checksum mismatch
13_{10}	0x0D	Error determining port type
14_{10}	0x0E	Voltage too low
15_{10}	0x0F	Voltage too high
21_{10}	0x15	System voltage too low
22_{10}	0x16	System voltage too high
31_{10}	0x1F	Error claiming or setting communication address
32_{10}	0x20	Communication hardware error (bus fault)
33_{10}	0x21	Communication protocol error
41_{10}	0x29	Low-voltage system hold
51_{10}	0x33	Output overcurrent detected
52_{10}	0x34	Output short circuit detected
53_{10}	0x35	Input voltage out of range
54_{10}	0x36	System temperature too high

DCD: Device Configuration

This command is used to read and write device configuration data.



PGN 61184 (0x00EF(SA)): DCD COMMAND

*SA = Module Source Address

ParamId: Parameter Identifier

Uniquely identifies a configuration parameter.

Size: 24 bits, 3 Bytes

Data Range: 0... 16777215

See the list of supported parameters on Page 24 for more information.

Value: Value to write to configuration parameter

Change a configuration parameter.

Size: 32 bits, 4 Bytes

Data Range: 0... 4294967295

See the list of supported parameters on Page 24 for more information.

To read the value of a parameter without modifying it, set VALUE to (0xFFFFFFFF).
The device will respond with the current value of the parameter.

PGN 61184 (0x00EF(CSA)): DCD STAT

*CSA = Controller Source Address

ParamID: Parameter Identifier

Uniquely identifies a configuration parameter.

Size: 24 bits, 3 Bytes

Data Range: 0... 16777215

Value: Current value of configuration parameter

The present value of the configuration parameter is returned.

Size: 32 bits, 4 Bytes

Data Range: 0... 4294967295

See the list of supported parameters on Page 24 for more information.

A value of all ones (0xFFFFFFFF) indicates that the parameter is not supported.
A value of 0xFFFFFFFE indicates that the value could not be returned due to an error.

Parameters

Parameter ID	Space	Name	Description	Access
0x009800	SPN	SpnBootCount	Boot count	Read-Only
0x00A800		SpnBattV	Battery voltage	Read-Only
0x040900		SpnEcuHrs	ECU Hours	Read-Only
0x047000		SpnEcuTemp	ECU temperature	Read-Only
0x0B1500		SpnNameIdent	J1939 NAME Identity	Read-Only
0x0B1600		SpnNameMfgCode	J1939 NAME Manufacturer Code	Read-Only
0x0B1700		SpnNameFuncInst	J1939 NAME Function Instance	Read-Only
0x0B1800		SpnNameEcuInst	J1939 NAME ECU Instance	Read-Only
0x0B1900		SpnNameFunc	J1939 NAME Function	Read & Write
0x0B1A00		SpnNameVehSys	J1939 NAME Vehicle System	Read & Write
0x0B1B00		SpnNameVehInst	J1939 NAME Vehicle Instance	Read & Write
0x0B1C00		SpnNameSelfConfig	J1939 NAME Self-configurable Address	Read & Write
0x0B1E00		SpnNameIndGroup	J1939 NAME Industry Group	Read & Write
0x0B4700		SpnCfgChangeCount	Configuration change count	Read-Only
0x0B5500		SpnPartNumber	Part number of ECU	Read-Only
0x0B5600		SpnSerNum	Serial number of ECU	Read-Only
0x0B5700		SpnEcuLocation	Location of ECU within vehicle or system	Read-Only
0x0B5800		SpnEcuType	Description of ECU functionality	Read-Only
0x0C7C00		SpnUptime	Uptime since last reset	Read-Only
0x10D000		SpnEcuMfgName	Name of ECU manufacturer	Read-Only
0x1A3A00		SpnEcuHardwareID	Hardware revision level of ECU	Read-Only

Parameter ID	Space	Name	Description	Access
0x000080	Device Information	Cnfg1	CNFG1	Read-Only
0x000180		Cnfg2	CNFG2	Read-Only
0x000280		Cnfg3	CNFG3	Read-Only
0x000380		NumPorts	Number of ports	Read-Only
0x000480		Port1Type	Port 1 Type	Read-Only
0x000580		Port2Type	Port 2 Type	Read-Only
0x000680		Port3Type	Port 3 Type	Read-Only
0x000780		Port4Type	Port 4 Type	Read-Only
0x000880		Port5Type	Port 5 Type	Unavailable
0x000980		Port6Type	Port 6 Type	Unavailable
0x000A80		Port7Type	Port 7 Type	Unavailable
0x000B80		Port8Type	Port 8 Type	Unavailable
0x001880		AppVerString	Application version string	Read-Only
0x001980		RtosVerString	RTOS version string	Read-Only
0x001A80		BootVerString	Bootloader version string	Read-Only
0x001B80		PartNumber	Part Number	Read-Only
0x001C80		SerialNumber	Serial Number	Read-Only
0x000081	Device Configuration	NodeAddress	J1939 CA address	Read & Write
0x000181		CanBitrate	CAN interface bitrate	Read & Write
0x000281		CanProtocolMode	CAN Protocol Mode	Read & Write
0x000381		UnderVHoldThreshold	Undervoltage Hold Threshold	Read & Write
0x000481		UnderVWarnThreshold	Undervoltage Warn Threshold	Read & Write
0x000581		OverVWarnThreshold	Overvoltage Warn Threshold	Read & Write
0x000681		ControllerAddress	J1939 Control Address	Read & Write
0x000781		CfgChangeCount	Configuration change count	Read-Only
0x000881		UnderVHoldExitThreshold	Undervoltage Hold Exit Threshold	Read & Write

Parameter ID	Space	Name	Description	Access
0x000081	Device Configuration	NodeAddress	J1939 CA address	Read & Write
0x000181		CanBitrate	CAN interface bitrate	Read & Write
0x000281		CanProtocolMode	CAN Protocol Mode	Read & Write
0x000381		UnderVHoldThreshold	Undervoltage Hold Threshold	Read & Write
0x000481		UnderVWarnThreshold	Undervoltage Warn Threshold	Read & Write
0x000581		OverVWarnThreshold	Overvoltage Warn Threshold	Read & Write
0x000681		ControllerAddress	J1939 Control Address	Read & Write
0x000781		CfgChangeCount	Configuration change count	Read-Only
0x000881		UnderVHoldExitThreshold	Undervoltage Hold Exit Threshold	Read & Write
0x000082	Fault History	NumActiveFaults	Number of active faults	Read-Only
0x000182		NumHistFaults	Number of historical faults	Read-Only
0x000282		FltClearTimestamp	Last cleared timestamp	Read-Only
0x000382		Fault1	Fault history 1	Read-Only
0x000482		Fault2	Fault history 2	Read-Only
0x000582		Fault3	Fault history 3	Read-Only
0x000682		Fault4	Fault history 4	Read-Only
0x000782		Fault5	Fault history 5	Read-Only
0x000882		Fault6	Fault history 6	Read-Only
0x000982		Fault7	Fault history 7	Read-Only
0x000A82		Fault8	Fault history 8	Read-Only
0x000B82		Fault9	Fault history 9	Read-Only
0x000C82		Fault10	Fault history 10	Read-Only
0x000D82		Fault11	Fault history 11	Read-Only
0x000E82		Fault12	Fault history 12	Read-Only

Parameter ID	Space	Name	Description	Access
0x000F82	Fault History	Fault13	Fault history 13	Read-Only
0x001082		Fault14	Fault history 14	Read-Only
0x001182		Fault15	Fault history 15	Read-Only
0x001282		Fault16	Fault history 16	Read-Only
0x001382		Fault17	Fault history 17	Read-Only
0x001482		Fault18	Fault history 18	Read-Only
0x001582		Fault19	Fault history 19	Read-Only
0x001682		Fault20	Fault history 20	Read-Only
0x001782		Fault21	Fault history 21	Read-Only
0x001882		Fault22	Fault history 22	Read-Only
0x001982		Fault23	Fault history 23	Read-Only
0x001A82		Fault24	Fault history 24	Read-Only
0x001B82		Fault25	Fault history 25	Read-Only
0x001C82		Fault26	Fault history 26	Read-Only
0x001D82		Fault27	Fault history 27	Read-Only
0x001E82		Fault28	Fault history 28	Read-Only
0x001F82		Fault29	Fault history 29	Read-Only
0x002082		Fault30	Fault history 30	Read-Only
0x002182		Fault31	Fault history 31	Read-Only
0x002282		Fault32	Fault history 32	Read-Only
0x0001C9	Port 1 Configuration	Port1PwmFreq	PWM output frequency	Read & Write
0x0006C9		Port1PwmMinDuty	PWM Output minimum duty cycle	Read & Write
0x0007C9		Port1PwmMaxDuty	PWM Output maximum duty cycle	Read & Write
0x0008C9		Port1RampTimeFwd	Ramp time forward	Read & Write
0x0009C9		Port1RampTimeRev	Ramp time reverse	Read & Write
0x000AC9		Port1CurSoftMax	Output current soft limit	Read & Write
0x000BC9		Port1CurSoftLimitTime	Output current soft limit time	Read & Write
0x000CC9		Port1CurLimitReact	Output current soft limit reaction	Read & Write

Parameter ID	Space	Name	Description	Access
0x000DC9	Port 1 Configuration	Port1CurLimitRetries	Output current soft limit max retries	Read & Write
0x0012C9		Port1HBridgeInvertDir	H-bridge invert direction	Read & Write
0x0018C9		Port1DisCurChopping	Disable current chopping	Read & Write
0x0001CA	Port 2 Configuration	Port2PwmFreq	PWM output frequency	Read & Write
0x0006CA		Port2PwmMinDuty	PWM Output minimum duty cycle	Read & Write
0x0007CA		Port2PwmMaxDuty	PWM Output maximum duty cycle	Read & Write
0x0008CA		Port2RampTimeFwd	Ramp time forward	Read & Write
0x0009CA		Port2RampTimeRev	Ramp time reverse	Read & Write
0x000ACA		Port2CurSoftMax	Output current soft limit	Read & Write
0x000BCA		Port2CurSoftLimitTime	Output current soft limit time	Read & Write
0x000CCA		Port2CurLimitReact	Output current soft limit reaction	Read & Write
0x000DCA		Port2CurLimitRetries	Output current soft limit max retries	Read & Write
0x0012CA		Port2HBridgeInvertDir	H-bridge invert direction	Read & Write
0x0018CA		Port2DisCurChopping	Disable current chopping	Read & Write
0x0001CB	Port 3 Configuration	Port3PwmFreq	PWM output frequency	Read & Write
0x0006CB		Port3PwmMinDuty	PWM Output minimum duty cycle	Read & Write
0x0007CB		Port3PwmMaxDuty	PWM Output maximum duty cycle	Read & Write
0x0008CB		Port3RampTimeFwd	Ramp time forward	Read & Write
0x0009CB		Port3RampTimeRev	Ramp time reverse	Read & Write
0x000ACB		Port3CurSoftMax	Output current soft limit	Read & Write
0x000BCB		Port3CurSoftLimitTime	Output current soft limit time	Read & Write
0x000CCB		Port3CurLimitReact	Output current soft limit reaction	Read & Write
0x000DCB		Port3CurLimitRetries	Output current soft limit max retries	Read & Write
0x0012CB		Port3HBridgeInvertDir	H-bridge invert direction	Read & Write
0x0018CB		Port3DisCurChopping	Disable current chopping	Read & Write

Parameter ID		Name	Description	
0x0001CC	Port 4 Configuration	Port4PwmFreq	PWM output frequency	Read & Write
0x0006CC		Port4PwmMinDuty	PWM Output minimum duty cycle	Read & Write
0x0007CC		Port4PwmMaxDuty	PWM Output maximum duty cycle	Read & Write
0x0008CC		Port4RampTimeFwd	Ramp time forward	Read & Write
0x0009CC		Port4RampTimeRev	Ramp time reverse	Read & Write
0x000ACC		Port4CurSoftMax	Output current soft limit	Read & Write
0x000BCC		Port4CurSoftLimitTime	Output current soft limit time	Read & Write
0x000CCC		Port4CurLimitReact	Output current soft limit reaction	Read & Write
0x000DCC		Port4CurLimitRetries	Output current soft limit max retries	Read & Write
0x0012CC		Port4HBridgeInvertDir	H-bridge invert direction	Read & Write
0x0018CC		Port4DisCurChopping	Disable current chopping	Read & Write
0x0000FF	Diagnostic Information	DiagResetReason	Reset Reason	Read-Only
0x0001FF		DiagCanNumRxErr	CAN RX error count	Read-Only
0x0002FF		DiagCanNumTxErr	CAN TX error count	Read-Only
0x0003FF		DiagRtosNumThreads	RTOS thread count	Read-Only
0x0004FF		DiagRtosHeapFree	RTOS heap free	Read-Only
0x0005FF		DiagRtosHeapAlloc	RTOS heap allocated	Read-Only
0x0006FF		DiagRtosHeapAllocMax	RTOS heap allocated max	Read-Only
0x0007FF		DiagCpuUsageCur	Current CPU usage	Read-Only
0x0008FF		DiagCpuUsagePeak	Peak CPU usage	Read-Only
0x0009FF		DiagCpuUsageAvg	Average CPU usage	Read-Only

SPN Parameters

SpnBootCount: 0x009800

Name	SpnBootCount			Parameter ID	0x009800
Summary	Boot count				
Space	0: SPN	Object	152 0x000098	Type	U32
Read access	Uncontrolled	Write access	Engineering/Development	Storage	Persistent
Data range	0 — 4,294,967,295			Default	1
Scaling	Scale	1			
	Offset	0			
	Units	boots			
	Scaled range	0 boots — 4,294,967,295 boots			
	Default	1 boots			
Description					
Number of power-on cycles. Increments with every successful boot.					

Return to Parameters Table.

SpnBattV: 0x00A800

Name	SpnBattV			Parameter ID	0x00A800
Summary	Battery voltage				
Space	0: SPN	Object	168 0x0000A8	Type	U16
Read access	Uncontrolled	Write access	Not supported	Storage	Volatile
Data range	0 — 65,535			Default	
Scaling	Scale	0.001			
	Offset	0			
	Units	v			
	Scaled range	0.0 V — 65.535 V			
	Default				
Description					
Measured input power voltage. Measured at the connector of the device.					

Return to Parameters Table.

SpnEcuHrs: 0x040900

Name	SpnEcuHrs			Parameter ID	0x040900
Summary	ECU Hours				
Space	0: SPN	Object	1033 0x000409	Type	U32
Read access	Uncontrolled	Write access	Engineering/Development	Storage	Persistent
Data range	0 — 4,294,967,295			Default	
Scaling	Scale	0.05			
	Offset	0			
	Units	Hours			
	Scaled range	0.0 Hours — 214,748,364.75 Hours			
	Default				
Description					
Increments while unit is powered					

Return to Parameters Table.

SpnEcuTemp: 0x047000

Name	SpnEcuTemp			Parameter ID	0x047000
Summary	ECU temperature				
Space	0: SPN	Object	1136 0x000470	Type	U16
Read access	Uncontrolled	Write access	Not supported	Storage	Volatile
Data range	0 — 65,535			Default	
Scaling	Scale	0.03125 ($^{1}/_{32}$)			
	Offset	-273			
	Units	°C			
	Scaled range	-273.0 °C — 1,774.96875 °C			
	Default				
Description					
Internal PCB temperature					

Return to Parameters Table.

SpnNameIdent: 0x0B1500

Name	SpnNameIdent			Parameter ID	0x0B1500
Summary	J1939 NAME Identity				
Space	0: SPN	Object	2837 0x000B15	Type	U32
Read access	Uncontrolled	Write access	Not supported	Storage	Persistent
Data range	0 — 2,097,151			Default	
Scaling	Scale				
	Offset				
	Units				
	Scaled range	—			
	Default				
Description					
Identity field used in J1939 NAME data. Default is derived from a hash of a device-specific unique ID.					

Return to Parameters Table.

SpnNameMfgCode: 0x0B1600

Name	SpnNameMfgCode			Parameter ID	0x0B1600
Summary	J1939 NAME Manufacturer Code				
Space	0: SPN	Object	2838 0x000B16	Type	U16
Read access	Uncontrolled	Write access	Not supported	Storage	Persistent
Data range	0 — 2,047			Default	659
Scaling	**659** Data Panel Corporation				
Description					

Return to Parameters Table.

SpnNameFuncInst: 0x0B1700

Name	SpnNameFuncInst			Parameter ID	0x0B1700
Summary	J1939 NAME Function Instance				
Space	0: SPN	Object	2839 0x000B17	Type	U8
Read access	Uncontrolled	Write access	Not supported	Storage	Persistent
Data range	0 — 31			Default	
Scaling	Scale				
	Offset				
	Units				
	Scaled range	—			
	Default				
Description					

Return to Parameters Table.

SpnNameEcuInst: 0x0B1800

Name	SpnNameEcuInst			Parameter ID	0x0B1800
Summary	J1939 NAME ECU Instance				
Space	0: SPN	Object	2840 0x000B18	Type	U8
Read access	Uncontrolled	Write Access	Not Supported	Storage	Persistent
Data range	0 — 7			Default	
Scaling	Scale				
	Offset				
	Units				
	Scaled range	—			
	Default				
Description					

Return to Parameters Table.

SpnNameFunc: 0x0B1900

Name	SpnNameFunc			Parameter ID	0x0B1900
Summary	J1939 NAME Function				
Space	0: SPN	Object	2841 0x000B19	Type	U8
Read access	Uncontrolled	Write access	OEM	Storage	Persistent
Data range	0 — 255			Default	66
Scaling	**28** Off-vehicle gateway **37** Cab Controller **66** I/O controller **67** Electrical System Controller **81** Hydraulic Powertrain **255** Not available				
Description					

Return to Parameters Table.

SpnNameVehSys: 0x0B1A00

Name	SpnNameVehSys			Parameter ID	0x0B1A00
Summary	J1939 NAME Vehicle System				
Space	0: SPN	Object	2842 0x000B1A	Type	U8
Read access	Uncontrolled	Write access	OEM	Storage	Persistent
Data range	0 — 127			Default	
Scaling	Scale				
	Offset				
	Units				
	Scaled range	—			
	Default				
Description					

Return to Parameters Table.

SpnNameVehInst: 0x0B1B00

Name	SpnNameVehInst			Parameter ID	0x0B1B00
Summary	J1939 NAME Vehicle Instance				
Space	0: SPN	Object	2843 0x000B1B	Type	U8
Read access	Uncontrolled	Write access	OEM	Storage	Persistent
Data range	0 — 15			Default	
Scaling	Scale				
	Offset				
	Units				
	Scaled range	--			
	Default				
Description					

Return to Parameters Table.

SpnNameSelfConfig: 0x0B1C00

Name	SpnNameSelfConfig			Parameter ID	0x0B1C00
Summary	J1939 NAME Self-configurable Address				
Space	0: SPN	Object	2844 0x000B1C	Type	U8
Read access	Uncontrolled	Write access	OEM	Storage	Persistent
Data range	0 — 1			Default	
Scaling	**0** Fixed address **1** Self-configurable address				
Description					

Return to Parameters Table.

SpnNameIndGroup: 0x0B1E00

Name	SpnNameIndGroup			Parameter ID	0x0B1E00
Summary	J1939 NAME Industry Group				
Space	0: SPN	Object	2846 0x000B1E	Type	U8
Read access	Uncontrolled	Write access	OEM	Storage	Persistent
Data range	0 — 7			Default	
Scaling	**0** Global **1** On-highway Equipment **2** Agricultural and Forestry Equipment **3** Construction Equipment **4** Marine **5** Industrial-process Control-Stationary (Gen-Sets)				
Description					

Return to Parameters Table.

SpnCfgChangeCount: 0x0B4700

Name	SpnCfgChangeCount			Parameter ID	0x0B4700
Summary	Configuration change count				
Space	0: SPN	Object	2887 0x000B47	Type	U16
Read access	Uncontrolled	Write access	Engineering/Development	Storage	Persistent
Data range	0 — 65,535			Default	
Scaling	Scale	1			
	Offset	0			
	Units	changes			
	Scaled range	0 changes — 65,535 changes			
	Default				
Description					
Number of times a configuration parameter has been changed					

Return to Parameters Table.

SpnPartNumber: 0x0B5500

Name	SpnPartNum			Parameter ID	0x0B5500
Summary					
Space	0: SPN	Object	2901 0x000B55	Type	STRING
Read access	Uncontrolled	Write access	Manufacturer	Storage	Persistent
Data range	0 — 65,535			Default	
Scaling	Scale				
	Offset				
	Units				
	Scaled range				
	Default				
Description					
Part number of ECU					

Return to Parameters Table.

SpnSerNum: 0x0B5600

Name	SpnSerNum			Parameter ID	0x0B5600
Summary	Serial number				
Space	0: SPN	Object	2902 0x000B56	Type	STRING
Read access	Uncontrolled	Write access	Manufacturer	Storage	Persistent
Data range				Default	
Description					
Serial number of module					

Return to Parameters Table.

SpnEcuLocation: 0x0B5700

Name	SpnEcuLocation			Parameter ID	0x0B5700
Summary	Ecu Location				
Space	0: SPN	Object	2903 0x000B57	Type	STRING
Read access	Uncontrolled	Write access	Not supported	Storage	Persistent
Data range	0 — 65,535			Default	
Scaling	Scale				
	Offset				
	Units				
	Scaled range				
	Default				
Description					
Location of the ECU within the vehicle or system					

Return to Parameters Table.

SpnEcuType: 0x0B5800

Name	SpnEcuType			Parameter ID	0x0B5800
Summary	EcuType				
Space	0: SPN	Object	2904 0x000B58	Type	STRING
Read access	Uncontrolled	Write access	Not supported	Storage	Persistent
Data range	0 — 65,535			Default	
Scaling	Scale				
	Offset				
	Units				
	Scaled range				
	Default				
Description					
Description of ECU functionality					

Return to Parameters Table.

SpnUptime: 0x0C7C00

Name	SpnUptime			Parameter ID	0x0C7C00
Summary	Uptime since last reset				
Space	0: SPN	Object	3196 0x000C7C	Type	U32
Read access	Uncontrolled	Write access	Not supported	Storage	Volatile
Data range	0 — 4,294,967,295			Default	
Scaling	Scale	1			
	Offset	0			
	Units	s			
	Scaled range	0 s — 4,294,967,295 s			
	Default				
Description					
Seconds since device was powered on					

Return to Parameters Table.

SpnEcuMfgName: 0x10D000

Name	SpnEcuMfgName			Parameter ID	0x10D000
Summary	EcuMfgName				
Space	0: SPN	Object	4304 0x0010D0	Type	STRING
Read access	Uncontrolled	Write access	Not supported	Storage	Persistent
Data range	0 — 65,535			Default	
Scaling	Scale				
	Offset				
	Units				
	Scaled range				
	Default				
Description					
Name of ECU manufacturer					

Return to Parameters Table.

SpnEcuHardwareId: 0x1A3A00

Name	SpnEcuHardwareId			**Parameter ID**	0x1A3A00
Summary	EcuHardwareId				
Space	0: SPN	**Object**	6714 0x001A3A	**Type**	STRING
Read access	Uncontrolled	**Write access**	Not supported	**Storage**	Persistent
Data range	0 — 65,535			**Default**	
Scaling	**Scale**				
	Offset				
	Units				
	Scaled range				
	Default				
Description					
Hardware revision level of ECU					

Return to Parameters Table.

Device Information Parameters

Cnfg1: 0x000080

Name	Cnfg1			**Parameter ID**	0x000080
Summary	CNFG1				
Space	128: Device information	**Object**	0 0x000000	**Type**	U8
Read access	Uncontrolled	**Write access**	Not supported	**Storage**	Volatile
Data range	0 — 255			**Default**	
Scaling	**Scale**	1			
	Offset	0			
	Units				
	Scaled range	0 — 255			
	Default				
Description					
Device-specific configuration strapping					

Return to Parameters Table.

Cnfg2: 0x000180

Name	Cnfg2			**Parameter ID**	0x000180
Summary	CNFG2				
Space	128: Device information	**Object**	1 0x000001	**Type**	U8
Read access	Uncontrolled	**Write access**	Not supported	**Storage**	Volatile
Data range	0 — 255			**Default**	
Scaling	**Scale**	1			
	Offset	0			
	Units				
	Scaled range	0 — 255			
	Default				
Description					
Device-specific configuration strapping					

Return to Parameters Table.

Cnfg3: 0x000280

Name	Cnfg3			Parameter ID	0x000280
Summary	CNFG3				
Space	128: Device information	Object	2 0x000002	Type	U8
Read access	Uncontrolled	Write access	Not supported	Storage	Volatile
Data range	0 — 255			Default	
Scaling	Scale	1			
	Offset	0			
	Units				
	Scaled range	0 — 255			
	Default				
Description					
Device-specific configuration strapping					

Return to Parameters Table.

NumPorts: 0x000380

Name	NumPorts			Parameter ID	0x000380
Summary	Number of ports				
Space	128: Device information	Object	3 0x000003	Type	U8
Read access	Uncontrolled	Write access	Not supported	Storage	Volatile
Data range	0 — 255			Default	
Scaling	Scale	1			
	Offset	0			
	Units	ports			
	Scaled range	0 ports — 255 ports			
	Default				
Description					

Return to Parameters Table.

Port1Type: 0x000480

Name	Port1Type			Parameter ID	0x000480
Summary	Port 1 Type				
Space	128: Device information	Object	4 0x000004	Type	U8
Read access	Uncontrolled	Write access	Not supported	Storage	Volatile
Data range	0 — 255			Default	
Scaling	**0** Invalid **1** Port Type 1 **2** Port Type 2 **3** Port Type 3 **4** Port Type 4 **5** Port Type 5 **6** Port Type 6 **7** Port Type 7 **8** Port Type 8		**9** Port Type 9 **10** Port Type 10 **11** Port Type 11 **12** Port Type 12 **13** Port Type 13 **14** Port Type 14 **15** Port Type 15 **255** Port not populated		
Description					
Describes I/O capabilities of corresponding port.					

Return to Parameters Table.

Port2Type: 0x000580

Name	Port2Type			Parameter ID	0x000580
Summary	Port 2 Type				
Space	128: Device information	Object	5 0x000005	Type	U8
Read access	Uncontrolled	Write access	Not supported	Storage	Volatile
Data range	0 — 255			Default	
Scaling	**0** Invalid **1** Port Type 1 **2** Port Type 2 **3** Port Type 3 **4** Port Type 4 **5** Port Type 5 **6** Port Type 6 **7** Port Type 7 **8** Port Type 8		**9** Port Type 9 **10** Port Type 10 **11** Port Type 11 **12** Port Type 12 **13** Port Type 13 **14** Port Type 14 **15** Port Type 15 **255** Port not populated		
Description					
Describes I/O capabilities of corresponding port.					

Return to Parameters Table.

Port3Type: 0x000680

Name	Port3Type			Parameter ID	0x000680
Summary	Port 3 Type				
Space	128: Device information	Object	6 0x000006	Type	U8
Read access	Uncontrolled	Write access	Not supported	Storage	Volatile
Data range	0 — 255			Default	
Scaling	**0** Invalid **1** Port Type 1 **2** Port Type 2 **3** Port Type 3 **4** Port Type 4 **5** Port Type 5 **6** Port Type 6 **7** Port Type 7 **8** Port Type 8			**9** Port Type 9 **10** Port Type 10 **11** Port Type 11 **12** Port Type 12 **13** Port Type 13 **14** Port Type 14 **15** Port Type 15 **255** Port not populated	
Description					
Describes I/O capabilities of corresponding port.					

Return to Parameters Table.

Port4Type: 0x000780

Name	Port4Type			Parameter ID	0x000780
Summary	Port 4 Type				
Space	128: Device information	Object	7 0x000007	Type	U8
Read access	Uncontrolled	Write access	Not supported	Storage	Volatile
Data range	0 — 255			Default	
Scaling	**0** Invalid **1** Port Type 1 **2** Port Type 2 **3** Port Type 3 **4** Port Type 4 **5** Port Type 5 **6** Port Type 6 **7** Port Type 7 **8** Port Type 8			**9** Port Type 9 **10** Port Type 10 **11** Port Type 11 **12** Port Type 12 **13** Port Type 13 **14** Port Type 14 **15** Port Type 15 **255** Port not populated	
Description					
Describes I/O capabilities of corresponding port.					

Return to Parameters Table.

AppVerString: 0x001880

Name	AppVerString			Parameter ID	0x001880
Summary	Application version string				
Space	128: Device information	Object	24 0x000018	Type	STRING
Read access	Uncontrolled	Write access	Not supported	Storage	Volatile
Data range				Default	
Description					
Software application version as a string					

Return to Parameters Table.

RtosVerString: 0x001980

Name	RtosVerString			Parameter ID	0x001980
Summary	RTOS version string				
Space	128: Device information	Object	25 0x000019	Type	STRING
Read access	Uncontrolled	Write access	Not supported	Storage	Volatile
Data range				Default	
Description					
RTOS version as a string					

Return to Parameters Table.

BootVerString: 0x001A80

Name	BootVerString			Parameter ID	0x001A80
Summary	Bootloader version string				
Space	128: Device information	Object	26 0x00001A	Type	STRING
Read access	Uncontrolled	Write access	Not supported	Storage	Volatile
Data range				Default	
Description					
Bootloader version as a string					

Return to Parameters Table.

PartNumber: 0x001B80

Name	PartNumber			Parameter ID	0x001B80
Summary	Part Number				
Space	128: Device information	Object	27 0x00001B	Type	STRING
Read access	Uncontrolled	Write access	Manufacturer	Storage	Persistent
Data range				Default	
Description					
Top-level assembly part number					

Return to Parameters Table.

SerialNumber: 0x001C80

Name	SerialNumber			Parameter ID	0x001C80
Summary	Serial Number				
Space	128: Device information	Object	28 0x00001C	Type	STRING
Read access	Uncontrolled	Write access	Manufacturer	Storage	Persistent
Data range				Default	
Description					
Device serial number					

Return to Parameters Table.

Device Configuration Parameters

NodeAddress: 0x000081

Name	NodeAddress			Parameter ID	0x000081
Summary	J1939 CA address				
Space	129: Device configuration	Object	0 0x000000	Type	U8
Read access	Uncontrolled	Write access	OEM	Storage	Persistent
Data range	0 — 250			Default	208
Scaling	Scale	1			
	Offset	0			
	Units				
	Scaled range	0 — 250			
	Default	208			
Description					
J1939 CA address to use					

Return to Parameters Table.

CanBitrate: 0x000181

Name	CanBitrate			Parameter ID	0x000181
Summary	CAN interface bitrate				
Space	129: Device configuration	Object	1 0x000001	Type	U16
Read access	Uncontrolled	Write access	OEM	Storage	Persistent
Data range	0 — 65,535			Default	250
Scaling	**100** 100 kbps **125** 125 kbps **250** 250 kbps **500** 500 kbps **1000** 1 Mbps				
Description					
CAN bitrate to use					

Return to Parameters Table.

UnderVHoldThreshold: 0x000381

Name	UnderVHoldThreshold			**Parameter ID**	0x000381
Summary	Undervoltage Hold Threshold				
Space	129: Device configuration	**Object**	3 0x000003	**Type**	U16
Read access	Uncontrolled	**Write access**	OEM	**Storage**	Persistent
Data range	0 — 65,535			**Default**	8000
Scaling	**Scale**	0.001			
	Offset	0			
	Units	V			
	Scaled range	0.0 V — 65.535 V			
	Default	8.0 V			
Description					

Return to Parameters Table.

UnderVWarnThreshold: 0x000481

Name	UnderVWarnThreshold			**Parameter ID**	0x000481
Summary	Undervoltage Warn Threshold				
Space	129: Device configuration	**Object**	4 0x000004	**Type**	U16
Read access	Uncontrolled	**Write access**	OEM	**Storage**	Persistent
Data range	0 — 65,535			**Default**	10000
Scaling	**Scale**	0.001			
	Offset	0			
	Units	V			
	Scaled range	0.0 V — 65.535 V			
	Default	10.0 V			
Description					

Return to Parameters Table.

OverVWarnThreshold: 0x000581

Name	OverVWarnThreshold			Parameter ID	0x000581
Summary	Overvoltage Warn Threshold				
Space	129: Device configuration	Object	5 0x000005	Type	U16
Read access	Uncontrolled	Write access	OEM	Storage	Persistent
Data range	0 — 65,535			Default	32000
Scaling	Scale	0.001			
	Offset	0			
	Units	V			
	Scaled range	0.0 V — 65.535 V			
	Default	32.0 V			
Description					

Return to Parameters Table.

ControllerAddress: 0x000681

Name	ControllerAddress			Parameter ID	0x000681
Summary	J1939 Control Address				
Space	129: Device configuration	Object	6 0x000006	Type	U8
Read access	Uncontrolled	Write access	OEM	Storage	Persistent
Data range	0 — 255			Default	255
Scaling	Scale	1			
	Offset	0			
	Units				
	Scaled range	0 — 255			
	Default	255			
Description					
Filters control messages to a specific address.					

Return to Parameters Table.

CfgChangeCount: 0x000781

Name	CfgChangeCount			**Parameter ID**	0x000781
Summary	Configuration change count				
Space	129: Device configuration	**Object**	7 0x000007	**Type**	U16
Read access	Uncontrolled	**Write access**	Engineering/Development	**Storage**	Persistent
Data range	0 — 4,294,967,295			**Default**	
Scaling	**Scale**	1			
	Offset	0			
	Units				
	Scaled range	0 — 4,294,967,295			
	Default				
Description					
Number of times a configuration parameter has been changed					

Return to Parameters Table.

UnderVHoldExitThreshold: 0x000881

Name	UnderVHoldExitThreshold			**Parameter ID**	0x000881
Summary	Undervoltage Hold Exit Threshold				
Space	129: Device configuration	**Object**	8 0x000008	**Type**	U16
Read access	Uncontrolled	**Write access**	OEM	**Storage**	Persistent
Data range	0 — 65,535			**Default**	10600
Scaling	**Scale**	0.001			
	Offset	0			
	Units	V			
	Scaled range	0.0 V — 65.535 V			
	Default	10.6 V			
Description					
Threshold for exiting undervoltage hold					

Return to Parameters Table.

OverVCriticalThreshold: 0x000981

Name	OverVCriticalThreshold			**Parameter ID**	0x000981
Summary	Overvoltage Critical Threshold				
Space	129: Device configuration	**Object**	9 0x000009	**Type**	U16
Read access	Uncontrolled	**Write access**	OEM	**Storage**	Persistent
Data range	0 — 65,535			**Default**	36000
Scaling	**Scale**	0.001			
	Offset	0			
	Units	V			
	Scaled range	0.0 V — 65.535 V			
	Default	36.0 V			
Description					
Threshold for creating a critically high voltage fault					

Return to Parameters Table.

Fault History Parameters

NumActiveFaults: 0x000082

Name	NumActiveFaults			Parameter ID	0x000082
Summary	Number of active faults				
Space	130: Fault history	Object	0 0x000000	Type	U8
Read access	Uncontrolled	Write access	Not supported	Storage	Volatile
Data range	0 — 255			Default	
Scaling	Scale	1			
	Offset	0			
	Units	faults			
	Scaled range	0 faults — 255 faults			
	Default				
Description					
Count of currently active faults					

Return to Parameters Table.

NumHistFaults: 0x000182

Name	NumHistFaults			Parameter ID	0x000182
Summary	Number of historical faults				
Space	130: Fault history	Object	1 0x000001	Type	U32
Read access	Uncontrolled	Write access	Not supported	Storage	Persistent
Data range	0 — 4,294,967,295			Default	
Scaling	Scale	1			
	Offset	0			
	Units	faults			
	Scaled range	0 faults — 4,294,967,295 faults			
	Default				
Description					
Total number of faults recorded in non-volatile memory					

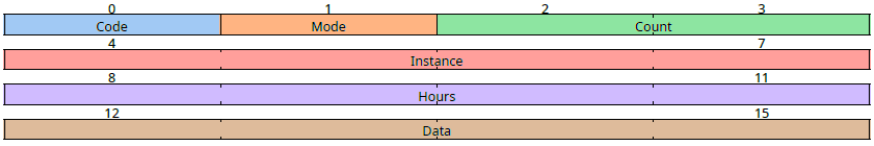
Return to Parameters Table.

FltClearTimestamp: 0x000282

Name	FltClearTimestamp			**Parameter ID**	0x000282
Summary	Last cleared timestamp				
Space	130: Fault history	**Object**	2 0x000002	**Type**	U32
Read access	Uncontrolled	**Write access**	Manufacturer	**Storage**	Persistent
Data range	0 — 4,294,967,295			**Default**	
Scaling	**Scale**	0.000277778 ($1/3600$)			
	Offset	0			
	Units	hours			
	Scaled range	0.0 hours — 1,193,046.4708333344 hours			
	Default				
Description					
ECU hour meter when faults were last cleared					

Return to Parameters Table.

Fault1-32: 0x000382 - 0x002282

Name	Fault1-32			**Parameter ID**	*Refer to table on Page 23
Summary	Fault history 1-32				
Space	130: Fault history	**Object**	*Refer to table on Page 23	**Type**	FAULT
Read access	Uncontrolled	**Write access**	Not supported	**Storage**	Persistent
Data range				**Default**	
Scaling					
	Code Fault code **Mode** Failure mode identification **Count** Number of times failure has been observed for this Code/Mode/Instance **Instance** Fault-code specific identifier (e.g., port number) **Hours** Hour meter at time of most-recent fault ($1/3600$ hr/bit) **Data** Fault-specific data gathered at time of fault				
Description					
Recorded fault data – Refer to FAULT CODES table					

Return to Parameters Table.

Port 1 Configuration Parameters

Port1PwmFreq: 0x0001C9

Name	Port1PwmFreq			Parameter ID	0x0001C9
Summary	PWM output frequency				
Space	201: Port 1 configuration	Object	1 0x000001	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	50 — 5,000			Default	500
Scaling	Scale	1			
	Offset	0			
	Units	Hz			
	Scaled range	50 Hz — 5,000 Hz			
	Default	500 Hz			
Description					
Frequency of PWM output control signal.					

Return to Parameters Table.

Port1PwmMinDuty: 0x0006C9

Name	Port1PwmMinDuty			Parameter ID	0x0006C9
Summary	PWM Output minimum duty cycle				
Space	201: Port 1 configuration	Object	6 0x000006	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 10,000			Default	
Scaling	Scale	0.01			
	Offset	0			
	Units	%			
	Scaled range	0.0 % — 100.0 %			
	Default				
Description					

Return to Parameters Table.

Port1PwmMaxDuty: 0x0007C9

Name	Port1PwmMaxDuty			Parameter ID	0x0007C9
Summary	PWM Output maximum duty cycle				
Space	201: Port 1 configuration	Object	7 0x000007	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 10,000			Default	10000
Scaling	Scale	0.01			
	Offset	0			
	Units	%			
	Scaled range	0.0 % — 100.0 %			
	Default	100.0 %			
Description					

Return to Parameters Table.

Port1RampTimeFwd: 0x0008C9

Name	Port1RampTimeFwd			Parameter ID	0x0008C9
Summary	Ramp time forward				
Space	201: Port 1 configuration	Object	8 0x000008	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 10,000			Default	2500
Scaling	Scale	1			
	Offset	0			
	Units	ms			
	Scaled range	0 ms — 10,000 ms			
	Default	2,500 ms			
Description					
0: disabled (no ramp), 1-5000: time in ms					

Return to Parameters Table.

Port1RampTimeRev: 0x0009C9

Name	Port1RampTimeRev			**Parameter ID**	0x0009C9
Summary	Ramp time reverse				
Space	201: Port 1 configuration	**Object**	9 0x000009	**Type**	U16
Read access	Uncontrolled	**Write access**	Uncontrolled	**Storage**	Persistent
Data range	0 — 10,000			**Default**	2500
Scaling	**Scale**	1			
	Offset	0			
	Units	ms			
	Scaled range	0 ms — 10,000 ms			
	Default	2,500 ms			
Description					
0: disabled (no ramp), 1-5000: time in ms					

Return to Parameters Table.

Port1CurSoftMax: 0x000AC9

Name	Port1CurSoftMax			**Parameter ID**	0x000AC9
Summary	Output current soft limit				
Space	201: Port 1 configuration	**Object**	10 0x00000A	**Type**	U16
Read access	Uncontrolled	**Write access**	Uncontrolled	**Storage**	Persistent
Data range	0 — 30,000			**Default**	25000
Scaling	**Scale**	0.001			
	Offset	0			
	Units	A			
	Scaled range	0.0 A — 30.0 A			
	Default	25.0 A			
Description					

Return to Parameters Table.

Port1CurSoftLimitTime: 0x000BC9

Name	Port1CurSoftLimitTime			Parameter ID	0x000BC9
Summary	Output current soft limit time				
Space	201: Port 1 configuration	Object	11 0x00000B	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 5,000			Default	500
Scaling	Scale	1			
	Offset	0			
	Units	ms			
	Scaled range	0 ms — 5,000 ms			
	Default	500 ms			
Description					

Return to Parameters Table.

Port1CurLimitReact: 0x000CC9

Name	Port1CurLimitReact			Parameter ID	0x000CC9
Summary	Output current soft limit reaction				
Space	201: Port 1 configuration	Object	12 0x00000C	Type	U8
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 3			Default	
Scaling	**0** Disable output, record fault **1** Disable output **2** Ignore				
Description					

Return to Parameters Table.

Port1CurLimitRetries: 0x000DC9

Name	Port1CurLimitRetries			**Parameter ID**	0x000DC9
Summary	Output current soft limit max retries				
Space	201: Port 1 configuration	**Object**	13 0x00000D	**Type**	U8
Read access	Uncontrolled	**Write access**	Uncontrolled	**Storage**	Persistent
Data range	0 — 255			**Default**	5
Scaling	**Scale**	1			
	Offset	0			
	Units				
	Scaled range	0 — 255			
	Default	5			
Description					

Return to Parameters Table.

Port1HBridgeInvertDir: 0x0012C9

Name	Port1HBridgeInvertDir			**Parameter ID**	0x0012C9
Summary	H-bridge invert direction				
Space	201: Port 1 configuration	**Object**	18 0x000012	**Type**	U8
Read access	Uncontrolled	**Write access**	Uncontrolled	**Storage**	Persistent
Data range	0 — 3			**Default**	
Scaling	**0** Normal; forward is current flow from A to B **1** Inverted; forward is current flow from B to A				
Description					

Return to Parameters Table.

Port1DisCurChopping: 0x0018C9

Name	Port1DisCurChopping			Parameter ID	0x0018C9
Summary	Disable current chopping				
Space	201: Port 1 configuration	Object	24 0x000018	Type	BOOL
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range				Default	
Scaling	Scale				
	Offset				
	Units				
	Scaled range				
	Default				
Description					
When set, hardware inrush current limiting is disabled					

Return to Parameters Table.

Port 2 Configuration Parameters

Port2PwmFreq: 0x0001CA

Name	Port2PwmFreq			Parameter ID	0x0001CA
Summary	PWM output frequency				
Space	202: Port 2 configuration	Object	1 0x000001	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	50 — 5,000			Default	500
Scaling	Scale	1			
	Offset	0			
	Units	Hz			
	Scaled range	50 Hz — 5,000 Hz			
	Default	500 Hz			
Description					
Frequency of PWM output control signal.					

Return to Parameters Table.

Port2PwmMinDuty: 0x0006CA

Name	Port2PwmMinDuty			Parameter ID	0x0006CA
Summary	PWM Output minimum duty cycle				
Space	202: Port 2 configuration	Object	6 0x000006	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 10,000			Default	
Scaling	Scale	0.01			
	Offset	0			
	Units	%			
	Scaled range	0.0 % — 100.0 %			
	Default				
Description					

Return to Parameters Table.

Port2PwmMaxDuty: 0x0007CA

Name	Port2PwmMaxDuty			Parameter ID	0x0007CA
Summary	PWM Output maximum duty cycle				
Space	202: Port 2 configuration	Object	7 0x000007	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 10,000			Default	10000
Scaling	Scale	0.01			
	Offset	0			
	Units	%			
	Scaled range	0.0 % — 100.0 %			
	Default	100.0 %			
Description					

Return to Parameters Table.

Port2RampTimeFwd: 0x0008CA

Name	Port2RampTimeFwd			Parameter ID	0x0008CA
Summary	Ramp time forward				
Space	202: Port 2 configuration	Object	8 0x000008	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 10,000			Default	2500
Scaling	Scale	1			
	Offset	0			
	Units	ms			
	Scaled range	0 ms — 10,000 ms			
	Default	2,500 ms			
Description					
0: disabled (no ramp), 1-5000: time in ms					

Return to Parameters Table.

Port2RampTimeRev: 0x0009CA

Name	Port2RampTimeRev			Parameter ID	0x0009CA
Summary	Ramp time reverse				
Space	202: Port 2 configuration	Object	9 0x000009	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 10,000			Default	2500
Scaling	Scale	1			
	Offset	0			
	Units	ms			
	Scaled range	0 ms — 10,000 ms			
	Default	2,500 ms			
Description					
0: disabled (no ramp), 1-5000: time in ms					

Return to Parameters Table.

Port2CurSoftMax: 0x000ACA

Name	Port2CurSoftMax			Parameter ID	0x000ACA
Summary	Output current soft limit				
Space	202: Port 2 configuration	Object	10 0x00000A	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 30,000			Default	25000
Scaling	Scale	0.001			
	Offset	0			
	Units	A			
	Scaled range	0.0 A — 30.0 A			
	Default	25.0 A			
Description					

Return to Parameters Table.

Port2CurSoftLimitTime: 0x000BCA

Name	Port2CurSoftLimitTime			Parameter ID	0x000BCA
Summary	Output current soft limit time				
Space	202: Port 2 configuration	Object	11 0x00000B	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 5,000			Default	500
Scaling	Scale	1			
	Offset	0			
	Units	ms			
	Scaled range	0 ms — 5,000 ms			
	Default	500 ms			
Description					

Return to Parameters Table.

Port2CurLimitReact: 0x000CCA

Name	Port2CurLimitReact			Parameter ID	0x000CCA
Summary	Output current soft limit reaction				
Space	202: Port 2 configuration	Object	12 0x00000C	Type	U8
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 3			Default	
Scaling	**0** Disable output, record fault **1** Disable output **2** Ignore				
Description					

Return to Parameters Table.

Port2CurLimitRetries: 0x000DCA

Name	Port2CurLimitRetries			Parameter ID	0x000DCA
Summary	Output current soft limit max retries				
Space	202: Port 2 configuration	Object	13 0x00000D	Type	U8
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 255			Default	5
Scaling	Scale	1			
	Offset	0			
	Units				
	Scaled range	0 — 255			
	Default	5			
Description					

Return to Parameters Table.

Port2HBridgeInvertDir: 0x0012CA

Name	Port2HBridgeInvertDir			Parameter ID	0x0012CA
Summary	H-bridge invert direction				
Space	202: Port 2 configuration	Object	18 0x000012	Type	U8
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 3			Default	
Scaling	**0** Normal; forward is current flow from A to B **1** Inverted; forward is current flow from B to A				
Description					

Return to Parameters Table.

Port2DisCurChopping: 0x0018CA

Name	Port2DisCurChopping			Parameter ID	0x0018CA
Summary	Disable current chopping				
Space	202: Port 2 configuration	Object	24 0x000018	Type	BOOL
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range				Default	
Scaling	Scale				
	Offset				
	Units				
	Scaled range				
	Default				
Description					
When set, hardware inrush current limiting is disabled					

Return to Parameters Table.

Port 3 Configuration Parameters

Port3PwmFreq: 0x0001CB

Name	Port3PwmFreq			Parameter ID	0x0001CB
Summary	PWM output frequency				
Space	203: Port 3 configuration	Object	1 0x000001	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	50 — 5,000			Default	500
Scaling	Scale	1			
	Offset	0			
	Units	Hz			
	Scaled range	50 Hz — 5,000 Hz			
	Default	500 Hz			
Description					
Frequency of PWM output control signal.					

Return to Parameters Table.

Port3PwmMinDuty: 0x0006CB

Name	Port3PwmMinDuty			Parameter ID	0x0006CB
Summary	PWM Output minimum duty cycle				
Space	203: Port 3 configuration	Object	6 0x000006	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 10,000			Default	
Scaling	Scale	0.01			
	Offset	0			
	Units	%			
	Scaled range	0.0 % — 100.0 %			
	Default				
Description					

Return to Parameters Table.

Port3PwmMaxDuty: 0x0007CB

Name	Port3PwmMaxDuty			Parameter ID	0x0007CB
Summary	PWM Output maximum duty cycle				
Space	203: Port 3 configuration	Object	7 0x000007	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 10,000			Default	10000
Scaling	Scale	0.01			
	Offset	0			
	Units	%			
	Scaled range	0.0 % — 100.0 %			
	Default	100.0 %			
Description					

Return to Parameters Table.

Port3RampTimeFwd: 0x0008CB

Name	Port3RampTimeFwd			Parameter ID	0x0008CB
Summary	Ramp time forward				
Space	203: Port 3 configuration	Object	8 0x000008	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 10,000			Default	2500
Scaling	Scale	1			
	Offset	0			
	Units	ms			
	Scaled range	0 ms — 10,000 ms			
	Default	2,500 ms			
Description					
0: disabled (no ramp), 1-5000: time in ms					

Return to Parameters Table.

Port3RampTimeRev: 0x0009CB

Name	Port3RampTimeRev			Parameter ID	0x0009CB
Summary	Ramp time reverse				
Space	203: Port 3 configuration	Object	9 0x000009	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 10,000			Default	2500
Scaling	Scale	1			
	Offset	0			
	Units	ms			
	Scaled range	0 ms — 10,000 ms			
	Default	2,500 ms			
Description					
0: disabled (no ramp), 1-5000: time in ms					

Return to Parameters Table.

Port3CurSoftMax: 0x000ACB

Name	Port3CurSoftMax			Parameter ID	0x000ACB
Summary	Output current soft limit				
Space	203: Port 3 configuration	Object	10 0x00000A	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 30,000			Default	25000
Scaling	Scale	0.001			
	Offset	0			
	Units	A			
	Scaled range	0.0 A — 30.0 A			
	Default	25.0 A			
Description					

Return to Parameters Table.

Port3CurSoftLimitTime: 0x000BCB

Name	Port3CurSoftLimitTime			Parameter ID	0x000BCB
Summary	Output current soft limit time				
Space	203: Port 3 configuration	Object	11 0x00000B	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 5,000			Default	500
Scaling	Scale	1			
	Offset	0			
	Units	ms			
	Scaled range	0 ms — 5,000 ms			
	Default	500 ms			
Description					

Return to Parameters Table.

Port3CurLimitReact: 0x000CCB

Name	Port3CurLimitReact			Parameter ID	0x000CCB
Summary	Output current soft limit reaction				
Space	203: Port 3 configuration	Object	12 0x00000C	Type	U8
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 3			Default	
Scaling	**0** Disable output, record fault **1** Disable output **2** Ignore				
Description					

Return to Parameters Table.

Port3CurLimitRetries: 0x000DCB

Name	Port3CurLimitRetries			**Parameter ID**	0x000DCB
Summary	Output current soft limit max retries				
Space	203: Port 3 configuration	**Object**	13 0x00000D	**Type**	U8
Read access	Uncontrolled	**Write access**	Uncontrolled	**Storage**	Persistent
Data range	0 — 255			**Default**	5
Scaling	**Scale**	1			
	Offset	0			
	Units				
	Scaled range	0 — 255			
	Default	5			
Description					

Return to Parameters Table.

Port3HBridgeInvertDir: 0x0012CB

Name	Port3HBridgeInvertDir			**Parameter ID**	0x0012CB
Summary	H-bridge invert direction				
Space	201: Port 1 configuration	**Object**	18 0x000012	**Type**	U8
Read access	Uncontrolled	**Write access**	Uncontrolled	**Storage**	Persistent
Data range	0 — 3			**Default**	
Scaling	**0** Normal; forward is current flow from A to B **1** Inverted; forward is current flow from B to A				
Description					

Return to Parameters Table.

Port3DisCurChopping: 0x0018CB

Name	Port3DisCurChopping			Parameter ID	0x0018CB
Summary	Disable current chopping				
Space	203: Port 3 configuration	Object	24 0x000018	Type	BOOL
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range				Default	
Scaling	Scale				
	Offset				
	Units				
	Scaled range				
	Default				
Description					
When set, hardware inrush current limiting is disabled					

Return to Parameters Table.

Port 4 Configuration Parameters

Port4PwmFreq: 0x0001CC

Name	Port4PwmFreq			Parameter ID	0x0001CC
Summary	PWM output frequency				
Space	204: Port 4 configuration	Object	1 0x000001	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	50 — 5,000			Default	500
Scaling	Scale	1			
	Offset	0			
	Units	Hz			
	Scaled range	50 Hz — 5,000 Hz			
	Default	500 Hz			
Description					
Frequency of PWM output control signal.					

Return to Parameters Table.

Port4PwmMinDuty: 0x0006CC

Name	Port4PwmMinDuty			**Parameter ID**	0x0006CC
Summary	PWM Output minimum duty cycle				
Space	204: Port 4 configuration	**Object**	6 0x000006	**Type**	U16
Read access	Uncontrolled	**Write access**	Uncontrolled	**Storage**	Persistent
Data range	0 — 10,000			**Default**	
Scaling	**Scale**	0.01			
	Offset	0			
	Units	%			
	Scaled range	0.0 % — 100.0 %			
	Default				
Description					

Return to Parameters Table.

Port4PwmMaxDuty: 0x0007CC

Name	Port4PwmMaxDuty			**Parameter ID**	0x0007CC
Summary	PWM Output maximum duty cycle				
Space	204: Port 4 configuration	**Object**	7 0x000007	**Type**	U16
Read access	Uncontrolled	**Write access**	Uncontrolled	**Storage**	Persistent
Data range	0 — 10,000			**Default**	10000
Scaling	**Scale**	0.01			
	Offset	0			
	Units	%			
	Scaled range	0.0 % — 100.0 %			
	Default	100.0 %			
Description					

Return to Parameters Table.

Port4RampTimeFwd: 0x0008CC

Name	Port4RampTimeFwd			Parameter ID	0x0008CC
Summary	Ramp time forward				
Space	204: Port 4 configuration	Object	8 0x000008	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 10,000			Default	2500
Scaling	Scale	1			
	Offset	0			
	Units	ms			
	Scaled range	0 ms — 10,000 ms			
	Default	2,500 ms			
Description					
0: disabled (no ramp), 1-5000: time in ms					

Return to Parameters Table.

Port4RampTimeRev: 0x0009CC

Name	Port4RampTimeRev			Parameter ID	0x0009CC
Summary	Ramp time reverse				
Space	204: Port 4 configuration	Object	9 0x000009	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 10,000			Default	2500
Scaling	Scale	1			
	Offset	0			
	Units	ms			
	Scaled range	0 ms — 10,000 ms			
	Default	2,500 ms			
Description					
0: disabled (no ramp), 1-5000: time in ms					

Return to Parameters Table.

Port4CurSoftMax: 0x000ACC

Name	Port4CurSoftMax			Parameter ID	0x000ACC
Summary	Output current soft limit				
Space	204: Port 4 configuration	Object	10 0x00000A	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 30,000			Default	25000
Scaling	Scale	0.001			
	Offset	0			
	Units	A			
	Scaled range	0.0 A — 30.0 A			
	Default	25.0 A			
Description					

Return to Parameters Table.

Port4CurSoftLimitTime: 0x000BCC

Name	Port4CurSoftLimitTime			Parameter ID	0x000BCC
Summary	Output current soft limit time				
Space	204: Port 4 configuration	Object	11 0x00000B	Type	U16
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 5,000			Default	500
Scaling	Scale	1			
	Offset	0			
	Units	ms			
	Scaled range	0 ms — 5,000 ms			
	Default	500 ms			
Description					

Return to Parameters Table.

Port4CurLimitReact: 0x000CCC

Name	Port4CurLimitReact			Parameter ID	0x000CCC
Summary	Output current soft limit reaction				
Space	204: Port 4 configuration	Object	12 0x00000C	Type	U8
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 3			Default	
Scaling	**0** Disable output, record fault **1** Disable output **2** Ignore				
Description					

Return to Parameters Table.

Port4CurLimitRetries: 0x000DCC

Name	Port4CurLimitRetries			Parameter ID	0x000DCC
Summary	Output current soft limit max retries				
Space	204: Port 4 configuration	Object	13 0x00000D	Type	U8
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 255			Default	5
Scaling	Scale	1			
	Offset	0			
	Units				
	Scaled range	0 — 255			
	Default	5			
Description					

Return to Parameters Table.

Port4HBridgeInvertDir: 0x0012CC

Name	Port4HBridgeInvertDir			Parameter ID	0x0012CC
Summary	H-bridge invert direction				
Space	204: Port 4 configuration	Object	18 0x000012	Type	U8
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range	0 — 3			Default	
Scaling	**0** Normal; forward is current flow from A to B **1** Inverted; forward is current flow from B to A				
Description					

Return to Parameters Table.

Port4DisCurChopping: 0x0018CC

Name	Port4DisCurChopping			Parameter ID	0x0018CC
Summary	Disable current chopping				
Space	204: Port 4 configuration	Object	24 0x000018	Type	BOOL
Read access	Uncontrolled	Write access	Uncontrolled	Storage	Persistent
Data range				Default	
Scaling	Scale				
	Offset				
	Units				
	Scaled range				
	Default				
Description					
When set, hardware inrush current limiting is disabled					

Return to Parameters Table.

Diagnostic Information Parameters

DiagResetReason: 0x0000FF

Name	DiagResetReason			Parameter ID	0x0000FF
Summary	Reset Reason				
Space	255: Diagnostic information	Object	0 0x000000	Type	U8
Read access	Uncontrolled	Write access	Not supported	Storage	Volatile
Data range	0 — 7			Default	
Scaling	**0** Unknown **1** Power **2** Brownout **3** Trap **4** External **5** Software **6** Watchdog **7** Other				
Description					
Cause of last reset					

Return to Parameters Table.

DiagCanNumRxErr: 0x0001FF

Name	DiagCanNumRxErr			Parameter ID	0x0001FF
Summary	CAN RX error count				
Space	255: Diagnostic information	Object	1 0x000001	Type	U8
Read access	Uncontrolled	Write access	Not supported	Storage	Volatile
Data range	0 — 255			Default	
Scaling	Scale	1			
	Offset	0			
	Units	errors			
	Scaled range	0 errors — 255 errors			
	Default				
Description					

Return to Parameters Table.

DiagCanNumTxErr: 0x0002FF

Name	DiagCanNumTxErr			**Parameter ID**	0x0002FF
Summary	CAN TX error count				
Space	255: Diagnostic information	**Object**	2 0x000002	**Type**	U8
Read access	Uncontrolled	**Write access**	Not supported	**Storage**	Volatile
Data range	0 — 255			**Default**	
Scaling	**Scale**	1			
	Offset	0			
	Units	errors			
	Scaled range	0 errors — 255 errors			
	Default				
Description					

Return to Parameters Table.

DiagRtosNumThreads: 0x0003FF

Name	DiagRtosNumThreads			**Parameter ID**	0x0003FF
Summary	RTOS thread count				
Space	255: Diagnostic information	**Object**	3 0x000003	**Type**	U8
Read access	Uncontrolled	**Write access**	Not supported	**Storage**	Volatile
Data range	0 — 255			**Default**	
Scaling	**Scale**	1			
	Offset	0			
	Units	threads			
	Scaled range	0 threads — 255 threads			
	Default				
Description					
Number of currently executing threads.					

Return to Parameters Table.

DiagRtosHeapFree: 0x0004FF

Name	DiagRtosHeapFree			**Parameter ID**	0x0004FF
Summary	RTOS heap free				
Space	255: Diagnostic information	**Object**	4 0x000004	**Type**	U32
Read access	Uncontrolled	**Write access**	Not supported	**Storage**	Volatile
Data range	0 — 4,294,967,295			**Default**	
Scaling	**Scale**	1			
	Offset	0			
	Units	bytes			
	Scaled range	0 bytes — 4,294,967,295 bytes			
	Default				
Description					
Memory available for dynamic allocation. Includes kernel heap, user space heap, and any other heaps.					

Return to Parameters Table.

DiagRtosHeapAlloc: 0x0005FF

Name	DiagRtosHeapAlloc			**Parameter ID**	0x0005FF
Summary	RTOS heap allocated				
Space	255: Diagnostic information	**Object**	5 0x000005	**Type**	U32
Read access	Uncontrolled	**Write access**	Not supported	**Storage**	Volatile
Data range	0 — 4,294,967,295			**Default**	
Scaling	**Scale**	1			
	Offset	0			
	Units	bytes			
	Scaled range	0 bytes — 4,294,967,295 bytes			
	Default				
Description					
Memory allocated from heap. Includes kernel heap and userspace heap.					

Return to Parameters Table.

DiagRtosHeapAllocMax: 0x0006FF

Name	DiagRtosHeapAllocMax			**Parameter ID**	0x0006FF
Summary	RTOS heap allocated max				
Space	255: Diagnostic information	**Object**	6 0x000006	**Type**	U32
Read access	Uncontrolled	**Write access**	Not supported	**Storage**	Volatile
Data range	0 — 4,294,967,295			**Default**	
Scaling	**Scale**	1			
	Offset	0			
	Units	bytes			
	Scaled range	0 bytes — 4,294,967,295 bytes			
	Default				
Description					
High-water mark of dynamically allocated memory					

Return to Parameters Table.

DiagCpuUsageCur: 0x0007FF

Name	DiagCpuUsageCur			**Parameter ID**	0x0007FF
Summary	Current CPU usage				
Space	255: Diagnostic information	**Object**	7 0x000007	**Type**	U8
Read access	Uncontrolled	**Write access**	Not supported	**Storage**	Volatile
Data range	0 — 250			**Default**	
Scaling	**Scale**	0.4			
	Offset	0			
	Units	%			
	Scaled range	0.0 % — 100.0 %			
	Default				
Description					
Percent of time CPU is non-idle					

Return to Parameters Table.

DiagCpuUsagePeak: 0x0008FF

Name	DiagCpuUsagePeak			**Parameter ID**	0x0008FF
Summary	Peak CPU usage				
Space	255: Diagnostic information	**Object**	8 0x000008	**Type**	U8
Read access	Uncontrolled	**Write access**	Not supported	**Storage**	Volatile
Data range	0 — 250			**Default**	
Scaling	**Scale**	0.4			
	Offset	0			
	Units	%			
	Scaled range	0.0 % — 100.0 %			
	Default				
Description					
Percent of time CPU is non-idle, max observed					

Return to Parameters Table.

DiagCpuUsageAvg: 0x0009FF

Name	DiagCpuUsageAvg			**Parameter ID**	0x0009FF
Summary	Average CPU usage				
Space	255: Diagnostic information	**Object**	9 0x000009	**Type**	U8
Read access	Uncontrolled	**Write access**	Not supported	**Storage**	Volatile
Data range	0 — 250			**Default**	
Scaling	**Scale**	0.4			
	Offset	0			
	Units	%			
	Scaled range	0.0 % — 100.0 %			
	Default				
Description					
Percent of time CPU is non-idle, average					

Return to Parameters Table.

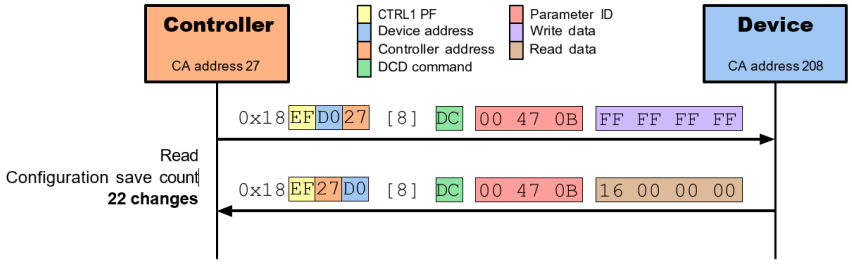
Example Configuration Messages

Given a device has source address 208 (0xD0) and a controller has source address 39 (0x27).

Example 1: Read configuration change counter (Read Only)

Read the value of the Configuration change counter.

From the Parameter table, Configuration change count is Parameter ID 0x0B4700. Send a CTRL1 message with the DCD command. Use a value of (0xFFFFFFFF) to read the value without modifying it.



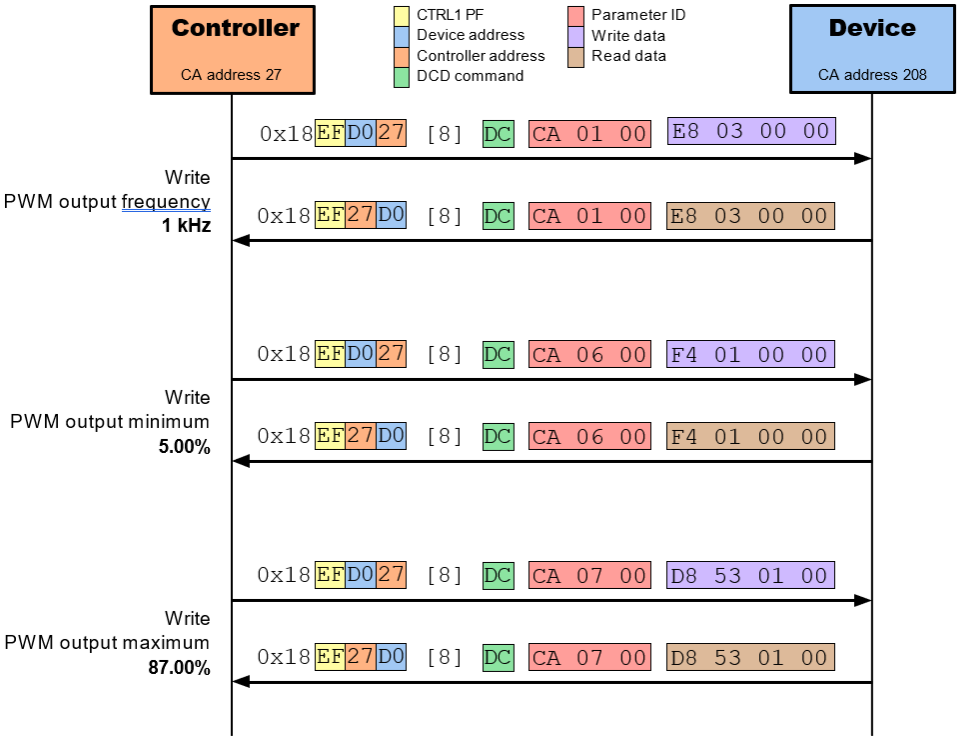
In this example, the configuration change counter is **22 (0x16) changes**.

Example 2: Configure PWM for Port 2 (Read & Write)

Set and verify the value of the Port 2 PWM Output Frequency, Port 2 PWM output minimum, and Port 2 PWM output maximum.

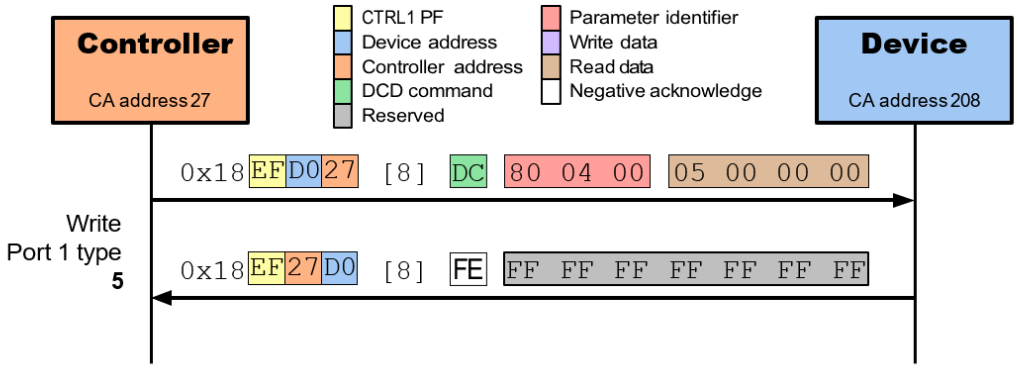
From the Parameter table, we find the following:

Parameter ID	Name	Desired Value	Written Value
0x0001CA	PWM output frequency	1 kHz	1000 0x000003E8
0x0006CA	PWM output minimum	5.00% duty cycle	500 0x000001F4
0x0007CA	PWM output maximum	87.00% duty cycle	87000 0x000153D8



Example 3: Attempt to Write to a Read-Only Parameter

This example depicts a failed write attempt. The controller tries to write to Port 1 Type, or Parameter ID 0x000480. The Device responds with a negative acknowledge.



Programming/Firmware Notes

xtremeHB modules are capable of in-the-field firmware updates with the use of the xtremeDB Programming Kit (DP-34005-12) or the PEAK-System Technik PCAN-USB Adapter.

- DP Dash is the software used to configure xtremeHB blocks. Please reference the DP Dash Quickstart Guide for instruction.
- DPLoader is the software used to download the firmware to xtremeHB blocks. Please reference the DPLoader Quickstart Guide for instructions.
- DPNPlayer is the software used to parse DPN and SPN into readable numbers and display messages from a CANBUS network. Please reference the DPNPlayer Quickstart Guide for instructions.

Accepted Accessories

Parts and equipment from other manufacturers can cause functional impairments and product damage. See below for the recommended accessories.

4 Pin Port Dummy Plug
DP-34042-401
Seals any unused ports.

4 Pin CAN Terminating Plug
DP-34042-402
120 Ohm terminating resistor on pin 2 and pin 4.

ADDITIONAL FAULT CODES

Code	Name	Instance	Data	Description
NO FAULTS (FC_NONE)				
0	FM_NONE	N/A	N/A	No fault indicated
COMMUNICATION ADDRESSING (FC_COMM_ADDR)				
1	FM_EXISTS	Bus (0)	Internal error code	Initialization failed
23	FM_COMM_EXTERNAL	Bus (0)	N/A	Address arbitration failed
COMMUNICATION CONTROL (FC_COMM_CONTROL)				
7	FM_DATA_INVALID	Port	Direction [31:16], Duty cycle [15:0]	Invalid direction or duty cycle command received
22	FM_COMM_INTERNAL	Port	Internal error code	Valid command received, but output could not be set due to internal error
23	FM_COMM_EXTERNAL	Bus (0)	CA address of sender	Conflicting commands received from multiple controllers
SYSTEM CANBUS (FC_SYS_CAN)				
23	FM_COMM_EXTERNAL	Bus (0)	Transmit error counter	CAN BUSOFF error or problem with physical interface
8	FM_DATA_INTEGRITY	Bus (0)	N/A	Excessive checksum errors
SYSTEM TEMPERATURE (FC_SYS_TEMP)				
17	FM_TEMPERATURE_WARN_HIGH	0 (CPU die temp)	Temperature, in °C	System temperature approaching operational limits
19	FM_TEMPERATURE_CRITICAL_HIGH	0 (CPU die temp)	Temperature, in °C	System temperature exceeds operational limits
SYSTEM HOLD (FC_SYS_HOLD)				
12	FM_VOLTAGE_CRITICAL_LOW	Power bus index (0)	Measured voltage, in mV	Power supply voltage too low to continue operation
10	FM_VOLTAGE_WARN_LOW	Power bus index (0)	Measured voltage, in mV	Power supply voltage abnormally low
9	FM_VOLTAGE_WARN_HIGH	Power bus index (0)	Measured voltage, in mV	Power supply voltage abnormally high
12	FM_VOLTAGE_CRITICAL_LOW	1 (3.3V rail)	Measured voltage, in mV	MCU power supply voltage out of range
10	FM_VOLTAGE_WARN_LOW	1 (3.3V rail)	Measured voltage, in mV	MCU power supply voltage out of range
9	FM_VOLTAGE_WARN_HIGH	1 (3.3V rail)	Measured voltage, in mV	MCU power supply voltage out of range
11	FM_VOLTAGE_CRITICAL_HIGH	1 (3.3V rail)	Measured voltage, in mV	MCU power supply voltage out of range
SYSTEM POST FAILED (FC_SYS_POST_FAILED)				
22	FM_COMM_INTERNAL	0	Internal error code	One or more required internal hardware components did not respond
27	FM_WATCHDOG	0	N/A	Watchdog reset detected
SYSTEM CONFIGURATION (FC_SYS_CONFIG)				
7	FM_DATA_INVALID	0	CNFG1[7:0], CNFG2[15:8], CNFG3[23:16]	Invalid strapping resistor configuration
8	FM_DATA_INTEGRITY	0	N/A	Invalid saved configuration data; Using defaults
SYSTEM HARDWARE FAULT (FC_SYS_HW_FAULT)				
15	FM_CURRENT_CRITICAL_HIGH	0	Total current, A	Output current exceeds operational limits
SYSTEM OS FAULT (FC_SYS_OS_FAULT)				
255	FM_UNKNOWN	0	Internal error code	Unexpected internal software error
3	FM_DATA_WARN_LOW	0	Available heap memory, in bytes	Running out of dynamic memory
2	FM_DATA_WARN_HIGH	0	CPU usage percent	Elevated CPU usage
OUTPUT FAULT (FC_IO_OUTPUT_FAULT)				
13	FM_CURRENT_WARN_HIGH	Port	Measured let-through (I^2t)	Soft current limit exceeded
15	FM_CURRENT_CRITICAL_HIGH	Port	Port-specific fault flags	Hard current limit exceeded
17	FM_TEMPERATURE_WARN_HIGH	Port	Temperature (0.001°C)	Output current approaching operating limits
19	FM_TEMPERATURE_CRITICAL_HIGH	Port	Temperature (0.001°C)	Output current exceeded operating limits
27	FM_WATCHDOG	Port	Unused	Device-specific watchdog error
1	FM_EXISTS	Port	Device-specific	Other hardware fault, e.g., gate driver fault

Warranty and Liability Claims

Data Panel Corporation warrants the original purchaser of its products that the products are free of defects in materials and workmanship, when operated under normal conditions and in accordance with accepted industry recommended practices. The standard warranty period is 12 months from the date the product is first put into service but not to exceed 18 months from the date of shipment.

Products must be returned, freight prepaid, to Data Panel for inspection. A Return Material Authorization (RMA) number must be obtained from that location before shipment is made, and clearly indicated on the shipping package. Product must be received within 3 months of the claim as per the requirements of the Returned Goods Process, which is considered to be part of the warranty. Data Panel reserves the right to repair or replace any product found to be under warranty. This warranty policy does not provide for a refund or credit for defective material.

This warranty is null and void if in the judgment of Data Panel, the part had been used in the wrong application, damaged, improperly maintained or repaired, subjected to inappropriate environmental and operating conditions, repaired by a non-approved party without prior authorization, not used in accordance with the operational and service recommendations, or repaired with other then approved parts.

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To the maximum extent permitted by applicable law, in no event shall Data Panel, Corp. or Murrelektronik, Inc. be liable for any special, incidental, indirect, or consequential damages whatsoever (including, but not limited to, damages for loss of profits or confidential or other information, for business interruption, for personal injury, for loss of privacy, for failure to meet any duty including of good faith or of reasonable care, for negligence, and for any other pecuniary or other loss whatsoever) arising out of or in any way related to the use of or inability to use the software product, the provision of or failure to provide support services, or otherwise under or in connection with any provision of this End User License, even in the event of the fault, tort (including negligence), strict liability, breach of contract or breach of warranty of Data Panel, Corp or Murrelektronik, Inc. or any supplier, and even if Data Panel, Corp. or Murrelektronik, Inc. or any supplier has been advised of the possibility of such damages.

Message Locations Within This Document

Protocol	PGN Value (DEC)	PGN Value (HEX)	Message Function	Page(s)
J1939	Command Messages			
	40192	0x9D(SA)	H-Bridge Control	15
	61184	0xEF(SA)	CTRL1 Command	20
	PGN Status Messages			
	65314	0xFF22	H-Bridge Status 1	16
	65315	0xFF23	H-Bridge Status 2	17
	65317	0xFF25	H-Bridge Temperature	18
	65363	0xFF53	Device Status	19
	61184	0xEF(CSA)	CTRL1 STAT	20

*SA: Module Source Address
**CSA: Controller Source Address

Glossary

Term	Definition
Baud	Abbreviation: Bd = Unit of measurement for speed in data transmission
BUS	Serial data transmission of several participants on the same line
Byte	Term from IEC 61158, corresponds to 1 byte or 8 bits
CA	Controller application; J1939 term for a network endpoint, comprising both hardware and software. A single device may provide multiple CAs
CAN	Controller Area Network
CANopen	CANopen is a standard of the CiA (CAN in Automation)
DC	Direct Current
Digital Output	A positive voltage output, binary ON or OFF
EMCY	Emergency messages in CANopen
Enable 24V DC	Enables the low and over voltage fault limits for 24V DC system, otherwise feeding 24V DC to 12V DC system would cause system over voltage error. This is also used for the output overcurrent and short circuit detection.
FREQ1	Sets the global configuration of the frequency for all channels. Value in decimal (40 - 1100 Hz). Example: 0xC8h = 200d = 200 Hz. Outputs will assume the default value if no other value is provided.
H-Bridge	A simple circuit used for bidirectional c DC loads, usually motors
ID1	This is used to give a reference number to the node that will be transmitted back in Status Message 1-User ID. Default as 0, please note this User ID is not “the” node ID (node address), please see “Configuring the Node ID” for setting node address.
ISO	International Standards Organization
LED	Light Emitting Diode
Node	Participant in the network
Node ID	Address of CANopen devices in the CAN network
Node SA	Source Address of a J1939 device for identification purposes
PDU	Protocol Data Unit; A properly formatted valid message that may consist of multiple frames
PGN	Parameter Group Number; J1939 term that identifies the structure and interpretation of a PDU
PLC	Programmable Logic Controller
Process	Set of interrelated means and activities that transform inputs into outputs
PWM	Pulse Width Modulation
Ramp Up/Down	Gradually increasing or decreasing the motor speed over a specified period
Ratiometric	I/O data presented as a percentage of battery voltage
SA	Source Address: J1939 term for the 8-bit node identifier that is transmitted with each PDU
SAE	Society of Automotive Engineers; Trade organization that publishes the J1939 standard for on and off- highway digital data networks
SLOT	Scaling, Limit, Offset, and Transfer function; J1939-defined signal transformations that relate the data transmitted on the wire with the corresponding engineering units

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