FischerPanda

# Fischer Panda GmbH

SAE J1939 Interface Description

# fpCAN

*Customer description - VCS Generators*
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# 1 Revision history

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| 1.36 | 2026-07-23 | - Document created based on customer documentation |
| | | |
| 1.37 | 2026-10-15 | - PGN 65133 "HTR – Heater Information" added |
| | | |

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# 2 Preamble

## 2.1 CAN communication description

The protocol consists of the general ISO 11992 part which is responsible for addressing and arbitration as well as the data flow, the SAE-J1939 portion of usable frames from the automotive and commercial vehicle segment and the special fpCAN containing the part not yet shown in the standards precisely in order to realize until now non-existent features and enhancements.

The fpCAN is ISO / SAE-J1939 / NMEA2000® conform and also uses a bitrate of 250 kbits per second and a 29-bit extended Identifier and can be mixed with NMEA2000®. The orientation of the data is always LSB first unless explicitly defined otherwise.

# 3 ISO functions

The ISOBUS-Standard describes the main functions process control, data exchange and arbitration that are used in *SAE-J1939*, *NMEA2000®* and *fpCAN*. The structure of data is the same in all these standards.

## 3.1 ISO Acknowledgement

**PGN 59392 (0xE800)**
**Specification:** This message is provided by ISO 11783 for a handshake mechanism between transmitting and receiving devices. This message is the possible response to acknowledge the reception of a “normal broadcast” message or the response to a specific command to indicate compliance or failure. The application layer is responsible for determining when this message is desired, outside of network management requirements specified by this standard (e.g. response to ISO Request message). The destination address of this PGN shall always contain a destination specific address.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 6 | 0 | 0 | 232 | 0 | X |
| **hex** | 6 | 0 | 0 | E8 | 00 | X |
| **PGN** | leer | 59392 (E800) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |

**Content:**

| Byte | Data Type | Data Field |
|---|---|---|
| 0 | DD177 | 0x00 = Positive Acknowledgment; |
| | DF52 | 0x01 = Negative Acknowledgment; |
| | | 0x02 = PGN supported but access denied; |
| | | 0x03 to 0xFF = Reserved |
| 1 | DD177 | Group Function of PGN being acknowledged. |
| | DF52 | This field identifies for a device the specific group |
| | | function of a PGN being acknowledged or declined. This |
| | | field is not used if the PGN being acknowledged or |
| | | declined is not a group function PGN. |
| 2 | DD001 | reserved bits, all set to logic 1 |
| | DF52 | |
| 3 | | reserved bits, all set to logic 1 |
| 4 | | reserved bits, all set to logic 1 |
| 5 | DD009 | Parameter Group Number (PGN) expressed in binary, |
| | | LSB first |
| | DF52 | |
| 6 | | PGN |
| 7 | | PGN |
| | Single Frame | |

## 3.2 ISO Request

**PGN 59904 (0xEA00)**
**Specification:** ISO 11783 defines this message to provide a method for *requesting the transmission of a PGN* from a network device or devices. As defined by ISO, this message has a *data length of 3 bytes* with no padding added to complete the single frame. The appropriate response to this message is based on the PGN being requested, and whether the receiver supports the requested PGN. See section 3.4.2 of 11783-3 for the rules governing the response to this PGN.
**Note that the destination address must be entered.**

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 6 | 0 | 0 | 234 | 0 | X |
| **hex** | 6 | 0 | 0 | EA | 00 | X |
| **PGN** | | 59904 (EA00) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | - | - | - | - | - |

**Content:**

| **Byte** | **Data Type** | **Data Field** |
|---|---|---|
| DB0 | DD009 | Parameter Group Number (PGN) expressed |
| | DF52 | in binary, LSB first |
| DB1 | | PGN |
| DB2 | DD001 | PGN |
| | Single Frame | |

## 3.3 ISO Transport Protocol – Data Transfer

**PGN 60160 (0xEB00)**
**Specification:** ISO 11783 defines this PGN as part of the transport protocol method used for transmitting messages that have 9 or more data bytes. This PGN represents a single packet of a multipack message and is used in conjunction with PGN 60416. Once a connection has been established or a broadcast announcement has been made, this message is transmitted using the timing and handshake requirements in section 3.10 of 11783-3 until all the message's packets are transmitted or the transmission is aborted. Although this PGN is addressable, when used with the Broadcast Announce Message (BAM) method, the destination shall be 255.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 6 | 0 | 0 | 235 | 0 | X |
| **hex** | 6 | 0 | 0 | EB | 00 | X |
| **PGN** | | 60160 (EB00) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |

**Content:**

| **Byte** | **Data Type** | **Data Field** |
|---|---|---|
| 0 | DD180 | 0x00 = Positive Acknowledgment; |
| | DF52 | 0x01 = Negative Acknowledgment; |
| | | 0x02 = PGN supported but access denied; |
| | | 0x03 to 0xFF = Reserved |
| 1 | DD181 | Multipack data: |
| | DF52 | 56 bits organized as seven 8-bit bytes, each of the bytes |
| | | is transmitted in the same order as it would in a standard |
| | | (i.e., single frame) message. Unused bytes shall be filled |
| | | with 0xFF. |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| | Single Frame | |

## 3.4 ISO Transport Protocol – Connection Management

**PGN 60416 (0xEC00)**
**Specification:** ISO 11783 defines this group function PGN as part of the transport protocol method used for transmitting messages that have 9 or more data bytes. This PGN's role in the transport process is determined by the group function value found in the first data byte of the PGN.

*RTS* - When the group function is **R**equest **T**o **S**end (RTS), the PGN is asking a specific node on the network for permission to transmit a larger than 8 byte message to the node. This process is referred to as opening a connection.

*CTS* - If the group function is **C**lear **T**o **S**end (CTS), the PGN is notifying the transmitter of a multipack message how many packets the node is ready to receive and which packets have been received successfully. This group function is the proper response to an RTS group function to start the transmission of the multipack data and allows the receiver to control the flow of data throughout the multipack transmission.

*EOM* - When the group function is **E**nd **O**f **M**essage (EOM), the PGN is notifying the transmitter of a multipack message that all packets were received successfully. This group function signals the successful conclusion of a transmission started with the RTS group function thus closing the connection.

*ABORT* - When the group function is Abort, the PGN is notifying the transmitter or receiver of the multipack message that the other partner is terminating the connection without completing the transfer of the message. This group function can also be used to refuse the connection when the RTS group function is initially received.

*BAM* - When the group function is **B**roadcast **A**nnounce **M**essage (BAM), the PGN is notifying all network nodes that a multipack message is about to be transmitted on the network. Because the BAM group function is broadcast, no further handshake is required.

For a complete description of this PGN's usage and timing requirements see section 3.10 of 11783-3.

## 3.5 ISO Transport Protocol – Connection Management, RTS group function

**PGN 60416 (0xEC00)**

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 6 | 0 | 0 | 236 | 0 | X |
| **hex** | 6 | 0 | 0 | EC | 00 | X |
| **PGN** | | 60416 (EC00) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |

**Content:**

| **Byte** | **Data Type** | **Data Field** | **Values** | **Default** |
|---|---|---|---|---|
| 0 | DD179 | 0x10 = Request to Send; | 0x01 | RTS (0x10) |
| | DF52 | 0x11 = Clear to Send; | - | |
| | | 0x13 = End of Message; | 0xFF | |
| | | 0x20 = Broadcast Announce Message; | | |
| | | 0xFF = Abort; | | |
| | | 0x00 to 0xF, 0x12, 0x14 to 0x1F, | | |
| | | 0x21 to 0xFE = Reserved | | |
| 1 | DD007 | Number of routes, waypoint, event, | 9 | |
| | DF54 | mark, etc. | - | |
| | | | 1785 | |
| 2 | | | | |
| 3 | DD180 | Multi-packet frame counter | 0x01 | |
| | DF52 | | - | |
| | | | 0xFF | |
| 4 | DD001 | reserved bits, all set to logic 1 | | |
| | DF52 | | | |
| 5 | DD009 | Parameter Group Number (PGN) expressed | | |
| | DF52 | in binary, LSB first | | |
| 6 | | PGN | | |
| 7 | | PGN | | |
| | Single Frame | | | |

## 3.6 ISO Transport Protocol – Connection Management, CTS group function

**PGN 60416 (0xEC00)**

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 6 | 0 | 0 | 236 | 0 | X |
| **hex** | 6 | 0 | 0 | EC | 00 | X |
| **PGN** | | 60416 (EC00) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |

**Content:**

| **Byte** | **Data Type** | **Data Field** | **Values** | **Default** |
|---|---|---|---|---|
| 0 | DD179 | 0x10 = Request to Send; | 0x01 | CTS (0x11) |
| | DF52 | 0x11 = Clear to Send; | - | |
| | | 0x13 = End of Message; | 0xFF | |
| | | 0x20 = Broadcast Announce Message; | | |
| | | 0xFF = Abort; | | |
| | | 0x00 to 0xF, 0x12, 0x14 to 0x1F, | | |
| | | 0x21 to 0xFE = Reserved | | |
| 1 | DD180 | Number of frames that can be sent | 0x01 | |
| | DF52 | Multi-packet frame counter, valid | - | |
| | | range 0x01 to 0xFF | 0xFF | |
| 2 | DD180 | Number of next frames to be transmitted | 0x01 | |
| | DF52 | Multi-packet frame counter, valid | - | |
| | | range 0x01 to 0xFF | 0xFF | |
| 3 | DD001 | reserved bits, all set to logic 1 | | |
| | DF52 | | | |
| 4 | | reserved bits, all set to logic 1 | | |
| 5 | DD009 | Parameter Group Number (PGN) expressed | | |
| | DF52 | in binary, LSB first | | |
| 6 | | PGN | | |
| 7 | | PGN | | |
| | Single Frame | | | |

## 3.7 ISO Transport Protocol – Connection Management, EOM group function

**PGN 60416 (0xEC00)**

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 6 | 0 | 0 | 236 | 0 | X |
| **hex** | 6 | 0 | 0 | EC | 00 | X |
| **PGN** | | 60416 (EC00) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |

**Content:**

| **Byte** | **Data Type** | **Data Field** | **Values** | **Default** |
|---|---|---|---|---|
| 0 | DD179 | 0x10 = Request to Send; | 0x01 | EOM (0x13) |
| | DF52 | 0x11 = Clear to Send; | - | |
| | | 0x13 = End of Message; | 0xFF | |
| | | 0x20 = Broadcast Announce Message; | | |
| | | 0xFF = Abort; | | |
| | | 0x00 to 0xF, 0x12, 0x14 to 0x1F, | | |
| | | 0x21 to 0xFE = Reserved | | |
| 1 | DD007 | Total message size, bytes | 9 | |
| | DF54 | | - | |
| | | | 1785 | |
| 2 | | | | |
| 3 | DD180 | Total number of frames received | 0x01 | |
| | DF52 | | - | |
| | | | 0xFF | |
| 4 | DD001 | reserved bits, all set to logic 1 | | |
| | DF52 | | | |
| 5 | DD009 | Parameter Group Number (PGN) expressed | | |
| | DF52 | in binary, LSB first | | |
| 6 | | PGN | | |
| 7 | | PGN | | |
| | Single Frame | | | |

## 3.8 ISO Transport Protocol – Connection Management, BAM group function

**PGN 60416 (0xEC00)**

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 6 | 0 | 0 | 236 | 0 | X |
| **hex** | 6 | 0 | 0 | EC | 00 | X |
| **PGN** | | 60416 (EC00) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |

**Content:**

| **Byte** | **Data Type** | **Data Field** | **Values** | **Default** |
|---|---|---|---|---|
| 0 | DD179 | 0x10 = Request to Send; | 0x01 | BAM (0x20) |
| | DF52 | 0x11 = Clear to Send; | - | |
| | | 0x13 = End of Message; | 0xFF | |
| | | 0x20 = Broadcast Announce Message; | | |
| | | 0xFF = Abort; | | |
| | | 0x00 to 0xF, 0x12, 0x14 to 0x1F, | | |
| | | 0x21 to 0xFE = Reserved | | |
| 1 | DD007 | Total message size, bytes | 9 | |
| | DF54 | | - | |
| | | | 1785 | |
| 2 | | | | |
| 3 | DD180 | Total number of frames to be transmitted | 0x01 | |
| | DF52 | | - | |
| | | | 0xFF | |
| 4 | DD001 | reserved bits, all set to logic 1 | | |
| | DF52 | | | |
| 5 | DD009 | Parameter Group Number (PGN) expressed | | |
| | DF52 | in binary, LSB first | | |
| 6 | | PGN | | |
| 7 | | PGN | | |
| | Single Frame | | | |

## 3.9 ISO Transport Protocol – Connection Management, Abort group function

**PGN 60416 (0xEC00)**

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 6 | 0 | 0 | 236 | 0 | X |
| **hex** | 6 | 0 | 0 | EC | 00 | X |
| **PGN** | | 60416 (EC00) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |

**Content:**

| Byte | Data Type | Data Field | Values | Default |
|---|---|---|---|---|
| 0 | DD179 | 0x10 = Request to Send; | 0x01 | Abort (0xFF) |
| | DF52 | 0x11 = Clear to Send; | - | |
| | | 0x13 = End of Message; | 0xFF | |
| | | 0x20 = Broadcast Announce Message; | | |
| | | 0xFF = Abort; | | |
| | | 0x00 to 0xF, 0x12, 0x14 to 0x1F, | | |
| | | 0x21 to 0xFE = Reserved | | |
| 1 | DD001 | reserved bits, all set to logic 1 | | |
| | DF52 | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | DD009 | Parameter Group Number (PGN) expressed | | |
| | DF52 | in binary, LSB first | | |
| 6 | | PGN | | |
| 7 | | PGN | | |
| | Single Frame | | | |

## 3.10 ISO Address Claim

**PGN 60928 (0xEE00)**
**Specification:** This network management message is used to claim network address, reply to devices requesting the claimed address, and to respond with device information (NAME) requested by the ISO Request (PGN 059904) or Complex Request Group Function (PGN 126208).
If a Complex Request Group Function (PGN 126208) requesting this PGN is received, the receiving device shall respond in the following manner:
If no request able fields have been included with the Complex Request, then the response is to return this PGN, just like responding to the ISO Request (PGN 059904) described above.
If the Complex Request (PGN 126208) includes one or more request able fields, then the response shall be filtered by the one or more fields and field values contained within the request.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 6 | 0 | 0 | 238 | 0 | X |
| **hex** | 6 | 0 | 0 | EE | 00 | X |
| **PGN** | | 60928 (EE00) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |

**Content:**

| Bits | Data Type | Data Field | Length | Values | Default |
|---|---|---|---|---|---|
| 0-20 | DD173 | NMEA2000® Unique Number assigned | 21 | | 0 |
| | DF52 | by manufacturer to ensurethat the | | | |
| | | NAME field for each manufactured | | | |
| | | device is unique. | | | |
| 21-31 | DD172 | NMEA2000® Manufacturer Code | 11 | | 0 |
| | DF52 | | | | |
| 32-34 | DD201 | Device Instance Lower | 3 | | |
| | DF52 | (ISO ECU Instance) | | | |
| | | | | | |
| 35-39 | DD174 | Device Instance Upper | 5 | | |
| | DF52 | (ISO Function Instance) | | | |
| | | | | | |
| 40-47 | DD171 | NMEA2000® Function Code | 8 | | |
| | DF52 | | | | |
| 48 | DD175 | Dominant Bits | 1 | | |
| | DF52 | | | | |
| 49-55 | DD170 | NMEA2000® Device Class | 7 | | |
| | DF52 | | | | |
| 56-59 | DD169 | System Instance (ISO Device | 4 | 0 | |
| | DF52 | Class Instance) | | - | |
| | | | | 15 | |
| 60-62 | DD168 | Industry Group | 3 | | 4 |
| | DF52 | | | | Marine |
| 63 | DD001 | reserved bit, all set to logic 1 | 1 | | |
| | DF52 | | | | |
| | Single Frame | | | | |

## 3.11 ISO Commanded Address

**PGN 65240 (0xFED8)**
**Specification:** ISO 11783 defined this message to provide a mechanism for assigning a network address to a node. The NAME information in the data portion of the message must match the name information of the node whose network address is to be set. ISO 11783-5 requires this message to be sent using the BAM Transport Protocol method. The appropriate response to this message is defined in section 5.2.3 of 11783-5.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | X | 0 | 0 | 254 | 216 | X |
| **hex** | X | 0 | 0 | FE | D8 | X |
| **PGN** | | 65240 (FED8) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |

**Content:**

| Bits | Data Type | Data Field | Length | Values | Default |
|---|---|---|---|---|---|
| 0-20 | DD173 | NMEA2000® Unique Number assigned | 21 | | 0 |
| | DF52 | by manufacturer to ensurethat the | | | |
| | | NAME field for each manufactured | | | |
| | | device is unique. | | | |
| 21-31 | DD172 | NMEA2000® Manufacturer Code | 11 | | 0 |
| | DF52 | | | | |
| 32-34 | DD201 | Device Instance Lower | 3 | | |
| | DF52 | (ISO ECU Instance) | | | |
| | | | | | |
| 35-39 | DD174 | Device Instance Upper | 5 | | |
| | DF52 | (ISO Function Instance) | | | |
| | | | | | |
| 40-47 | DD171 | NMEA2000® Function Code | 8 | | |
| | DF52 | | | | |
| 48 | DD175 | Dominant Bits | 1 | | |
| | DF52 | | | | |
| 49-55 | DD170 | NMEA2000® Device Class | 7 | | |
| | DF52 | | | | |
| 56-59 | DD169 | System Instance (ISO Device | 4 | 0 | |
| | DF52 | Class Instance) | | - | |
| | | | | 15 | |
| 60-62 | DD168 | Industry Group | 3 | | 4 |
| | DF52 | | | | Marine |
| 63 | DD001 | reserved bit, all set to logic 1 | 1 | | |
| | DF52 | | | | |
| 64-71 | DD176 | New Source Address: | 8 | | |
| | DF52 | 0x00 to 0xFB (0 to 251)=Claimable | | | |
| | | NMEA 2000 network address space | | | |
| | | 0xFC (252) = Reserved | | | |
| | | 0xFD (253) = Reserved | | | |
| | | 0xFE (254) = Null address | | | |
| | | 0xFF (255) = Global address | | | |
| | BAM | | | | |

# 4 SAE-J1939 functions

## 4.1 J1939 EEC1 – Electronic Engine Controller #1

**PGN 61444 (0xF004)**
**Type:** Broadcast all 100ms
**Description:** Contains the engine load and the engine speed from the engine control unit (e.g. Hatz)

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | X | 0 | 0 | 240 | 4 | X |
| **hex** | X | 0 | 0 | F0 | 04 | X |
| **PGN** | | 61444 (F004) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **Bits** | | | SPN513 | SPN190 | | | | |

**Content:**

| **Byte** | **SPN** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | | 8 | uint8 | not used | X | X |
| 1 | | 8 | uint8 | not used | X | X |
| 2 | 513 | 8 | uint8 | Engine Load (from ECU) | 1 % / -125 | -125 … 125 |
| 3 | 190 | 16 | uint16 | Engine Speed (from ECU) | 1/8 rpm | 0 … 8031.8 |
| 4 | | | | | | |
| 5 | | 8 | uint8 | not used | X | X |
| 6 | | 8 | uint8 | not used | X | X |
| 7 | | 8 | uint8 | not used | X | X |

## 4.2 J1939 A1DOC1 - Aftertreatment 1 Diesel Oxidation Catalyst 1

**PGN 64800 (0xFD20)**
**Type:** Broadcast all 500 ms
**Description:** Handles diagnostic and operational data from the diesel oxidation catalyst.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 6 | 0 | 0 | 253 | 32 | X |
| **hex** | 6 | 0 | 0 | FD | 20 | X |
| **PGN** | | 64800 (FD20) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **Bits** | SPN 4765 | | | | | | | |

**Content:**

| **Byte** | **SPN** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 4765 | 16 | uint16 | Intake Temperature | 0,03125 °C/bit | -273 … 1734,96875 °C |
| 1 | | | | | -273 offset | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |

## 4.3 J1939 DPF C1 – Diesel Particulate Filter Control 1

**PGN 64892 (0xFD7C)**
**Type:** Broadcast cyclic single frame (1000ms)
**Description:** The engine Electronic Control Unit (ECU) uses DPF C1 to broadcast regeneration statuses, filter conditions, and active DPF lamp commands.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | X | 0 | 0 | 253 | 124 | X |
| **hex** | X | 0 | 0 | FD | 7C | X |
| **PGN** | | 64892 (FD7C) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **SPN** | | 3700, 3701 | 3703 | 3708 | 3710 | | 3698 | |

**Content:**

| Byte | SPN | Data Length | Data Type | Parameter | Resolution / Offset | Data Range |
|---|---|---|---|---|---|---|
| 1 | 3700 | Bit 2-3 | | Active Regeneration Status | 0 … 3 | 0 … 3 |
| | | | | 0 = Not Active | | |
| | | | | 1 = Active | | |
| | | | | 2 = Regeneration Needed | | |
| | | | | 3 = Not Available | | |
| 1 | 3701 | Bit 4-6 | | DPF Status | 0 … 7 | 0 … 7 |
| | | | | 0 = Regeneration not needed | | |
| | | | | 1 = Regen. needed, lowest level | | |
| | | | | 2 = Regen. needed, moderate level | | |
| | | | | 3 = Regen. needed, highest level | | |
| | | | | 4-6 = reserved for SAE assignm. | | |
| | | | | 7 = not available | | |
| 2 | 3703 | Bit 2-3 | | DPF Regeneration Inhibited | 0 … 3 | 0 … 3 |
| | | | | due to Inhibit Switch | | |
| | | | | 0 = Not Inhibited | | |
| | | | | 1 = Inhibited | | |
| | | | | 2 = Reserved for SAE assignment | | |
| | | | | 3 = Not Available | | |
| 3 | 3708 | Bit 4-5 | | DPF Regeneration Inhibited | 0 … 3 | 0 … 3 |
| | | | | due to Neutral Gear Switch | | |
| | | | | 0 = Not Inhibited | | |
| | | | | 1 = Inhibited | | |
| | | | | 2 = Reserved for SAE assignment | | |
| | | | | 3 = Not Available | | |
| 4 | 3710 | Bit 0-1 | | DPF Regeneration Inhibited | 0 … 3 | 0 … 3 |
| | | | | due to Parking Brake | | |
| | | | | 0 = Not Inhibited | | |
| | | | | 1 = Inhibited | | |
| | | | | 2 = Reserved for SAE assignment | | |
| | | | | 3 = Not Available | | |
| 6 | 3698 | Bit 2-4 | | Exhaust Gas High Temperature | 0 … 7 | 0 … 7 |
| | | | | 0 = Off | | |
| | | | | 1 = On - solid | | |
| | | | | 2-6 = reserved for SAE assignm. | | |
| | | | | 7 = not available | | |

## 4.4 J1939 GTACPP – Generator Total AC Percent Power

**PGN 64911 (0xFD8F)**
**Type:** Broadcast all 250 ms
**Description:** This PGN contains quantities for the instantaneous AC power from the generator, as percentages of rated power.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 6 | 0 | 0 | 253 | 143 | X |
| **hex** | 6 | 0 | 0 | FD | 8F | X |
| **PGN** | | 64911 (FD8F) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **Bits** | SPN 3590 | | SPN 3591 | | SPN 3592 | | | |

**Content:**

| **Byte** | **SPN** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 3590 | 16 | uint16 | Generator total percent | 0,0078125 %/bit | -251 … 250,99 % |
| 1 | | | | kW (real power) | -251 offset | |
| 2 | 3591 | 16 | uint16 | Generator total percent | 0,0078125 %/bit | -251 … 250,99 % |
| 3 | | | | kVA (apparent power) | -251 offset | |
| 4 | 3592 | 16 | uint16 | Generator total percent | 0,0078125 %/bit | -251 … 250,99 % |
| 5 | | | | kvar (reactive power) | -251 offset | |
| 6 | | | | | | |
| 7 | | | | | | |

## 4.5 J1939 GPCACR – Generator Phase C AC Reactive Power (3-Phase Module)

**PGN 65019 (0xFDFB)**
**Type:** Broadcast cyclic single frame (100ms)
**Description:** Reactive power, power factor and power factor lagging of generator phase C.

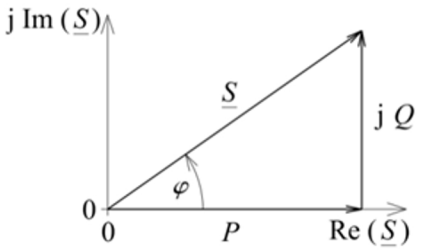



Figure 1: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 3 | 0 | 0 | 253 | 251 | X |
| **hex** | 3 | 0 | 0 | FD | FB | X |
| **PGN** | | 65012 (FDF4) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **Bits** | SPN 2459 | | | | SPN 2467 | | SPN 2521 | |

**Content:**

| **Byte** | **SPN** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 2459 | 32 | uint32 | Generator Phase C | 1 var/bit | -2E9 … 2E9 |
| 1 | | | | Reactive Power | -2E9 var offset | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | 2467 | 16 | uint16 | Generator Phase C | $\frac{1}{16384}$/bit | -1 … +1 |
| | | | | Power factor | | |
| 5 | | | | ($\frac{TruePowerP}{ApparentPowerS}$) | | |
| 6 | 2521 | 16 | uint16 | Generator Phase C | 4 states/2 bit | 00 = Leading |
| | | | | Power factor | 0 offset | 01 = Lagging |
| 7 | | | | lagging | | 10 = Error |
| | | | | | | 11 = Not Available |
| | | | | | | or Not Installed |

## 4.6 J1939 GPCACP – Generator Phase C AC Power (3-Phase Module)

**PGN 65020 (0xFDFC)**
**Type:** Broadcast cyclic single frame (100ms)
**Description:** Real power and apparent power of generator phase C.

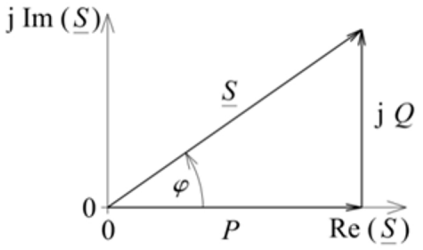



Figure 2: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 3 | 0 | 0 | 253 | 252 | X |
| **hex** | 3 | 0 | 0 | FD | FC | X |
| **PGN** | | 65020 (FDFC) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **Bits** | SPN 2455 | | | | SPN 2463 | | | |

**Content:**

| **Byte** | **SPN** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 2455 | 32 | uint32 | Generator Phase C | 1 W/bit | -2E9 … 2E9 |
| 1 | | | | Real Power | -2E9 W offset | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | 2463 | 32 | uint32 | Generator Phase C | 1 VA/bit | -2E9 … 2E9 |
| 5 | | | | Apparent Power | -2E9 VA offset | |
| 6 | | | | | | |
| 7 | | | | | | |

## 4.7 J1939 GPCAC – Generator Phase C Basic AC Quantities (3-Phase Module)

**PGN 65021 (0xFDFD)**
**Type:** Broadcast cyclic single frame (100ms)
**Description:** Generator Phase C, Line-Line AC RMS voltage, Line-N AC RMS voltage, AC frequency and AC current.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 3 | 0 | 0 | 253 | 253 | X |
| **hex** | 3 | 0 | 0 | FD | FD | X |
| **PGN** | | 65021 (FDFD) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **Bits** | SPN 2443 | | SPN 2447 | | SPN 2439 | | SPN 2451 | |

**Content:**

| **Byte** | **SPN** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 2443 | 16 | uint16 | Generator AC Voltage C | 1 V/bit | 0 … 65535 V |
| 1 | | | | RMS Line to Line | 0 offset | |
| 2 | 2447 | 16 | uint16 | Generator AC Voltage C | 1 V/bit | 0 … 65535 V |
| 3 | | | | RMS Line to Neutral | 0 offset | |
| 4 | 2439 | 16 | uint16 | Generator AC Frequency | $\frac{1}{128}$ Hz/bit | 0 … 501,9921875 Hz |
| 5 | | | | phase C | 0 offset | |
| 6 | 2451 | 16 | uint16 | Generator AC Current | 1 A/bit | 0 … 65535 A |
| 7 | | | | RMS phase C | 0 offset | |

## 4.8 J1939 GPBACRP – Generator Phase B AC Reactive Power (3-Phase Module)

**PGN 65022 (0xFDFE)**
**Type:** Broadcast cyclic single frame (100ms)
**Description:** Reactive power, power factor and power factor lagging of generator phase B.

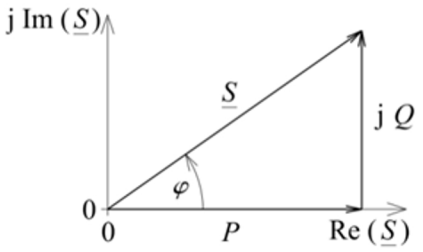



Figure 3: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 3 | 0 | 0 | 253 | 254 | X |
| **hex** | 3 | 0 | 0 | FD | FE | X |
| **PGN** | | 65022 (FDFE) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **Bits** | SPN 2458 | | | | SPN 2466 | | SPN 2520 | |

**Content:**

| **Byte** | **SPN** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 2458 | 32 | uint32 | Generator Phase B | 1 var/bit | -2E9 … 2E9 |
| 1 | | | | Reactive Power | -2E9 var offset | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | 2466 | 16 | uint16 | Generator Phase B | $\frac{1}{16384}$/bit | -1 … +1 |
| | | | | Power factor | | |
| 5 | | | | ($\frac{TruePowerP}{ApparentPowerS}$) | | |
| 6 | 2520 | 16 | uint16 | Generator Phase B | 4 states/2 bit | 00 = Leading |
| | | | | Power factor | 0 offset | 01 = Lagging |
| 7 | | | | lagging | | 10 = Error |
| | | | | | | 11 = Not Available |
| | | | | | | or Not Installed |

## 4.9 J1939 GPBACP – Generator Phase B AC Power (3-Phase Module)

**PGN 65023 (0xFDFF)**
**Type:** Broadcast cyclic single frame (100ms)
**Description:** Real power and apparent power of generator phase B.

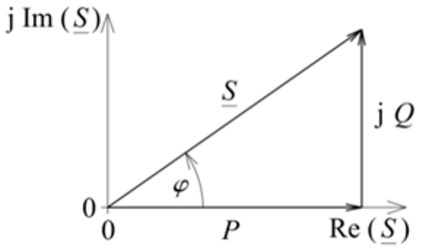



Figure 4: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 3 | 0 | 0 | 253 | 255 | X |
| **hex** | 3 | 0 | 0 | FD | FF | X |
| **PGN** | | 65023 (FDFF) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **Bits** | SPN 2454 | | | | SPN 2462 | | | |

**Content:**

| **Byte** | **SPN** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 2454 | 32 | uint32 | Generator Phase B | 1 W/bit | -2E9 … 2E9 |
| 1 | | | | Real Power | -2E9 W offset | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | 2462 | 32 | uint32 | Generator Phase B | 1 VA/bit | -2E9 … 2E9 |
| 5 | | | | Apparent Power | -2E9 VA offset | |
| 6 | | | | | | |
| 7 | | | | | | |

## 4.10 J1939 GPBAC – Generator Phase B Basic AC Quantities (3-Phase Module)

**PGN 65024 (0xFE00)**
**Type:** Broadcast cyclic single frame (100ms)
**Description:** Generator Phase B, Line-Line AC RMS voltage, Line-N AC RMS voltage, AC frequency and AC current.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 3 | 0 | 0 | 254 | 0 | X |
| **hex** | 3 | 0 | 0 | FE | 00 | X |
| **PGN** | | 65024 (FE00) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **Bits** | SPN 2442 | | SPN 2446 | | SPN 2438 | | SPN 2450 | |

**Content:**

| **Byte** | **SPN** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 2442 | 16 | uint16 | Generator AC Voltage B | 1 V/bit | 0 … 65535 V |
| 1 | | | | RMS Line to Line | 0 offset | |
| 2 | 2446 | 16 | uint16 | Generator AC Voltage B | 1 V/bit | 0 … 65535 V |
| 3 | | | | RMS Line to Neutral | 0 offset | |
| 4 | 2438 | 16 | uint16 | Generator AC Frequency | $\frac{1}{128}$ Hz/bit | 0 … 501,9921875 Hz |
| 5 | | | | phase B | 0 offset | |
| 6 | 2450 | 16 | uint16 | Generator AC Current | 1 A/bit | 0 … 65535 A |
| 7 | | | | RMS phase B | 0 offset | |

## 4.11 J1939 GPAACR – Generator Phase A AC Reactive Power

**PGN 65025 (0xFE01)**
**Type:** Broadcast cyclic single frame (100ms)
**Description:** Reactive power, power factor and power factor lagging of generator phase A.

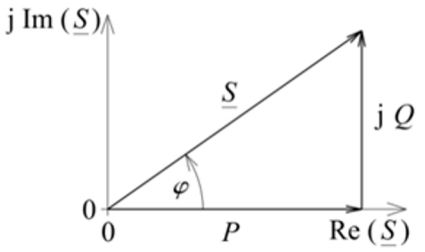



Figure 5: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 3 | 0 | 0 | 254 | 1 | X |
| **hex** | 3 | 0 | 0 | FE | 01 | X |
| **PGN** | | 65025 (FE01) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **Bits** | SPN 2457 | | | | SPN 2465 | | SPN 2519 | |

**Content:**

| **Byte** | **SPN** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 2457 | 32 | uint32 | Generator Phase A | 1 var/bit | -2E9 … 2E9 |
| 1 | | | | Reactive Power | -2E9 var offset | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | 2465 | 16 | uint16 | Generator Phase A | $\frac{1}{16384}$/bit | -1 … +1 |
| | | | | Power factor | | |
| 5 | | | | ($\frac{TruePowerP}{ApparentPowerS}$) | | |
| 6 | 2519 | 16 | uint16 | Generator Phase A | 4 states/2 bit | 00 = Leading |
| | | | | Power factor | 0 offset | 01 = Lagging |
| 7 | | | | lagging | | 10 = Error |
| | | | | | | 11 = Not Available |
| | | | | | | or Not Installed |

## 4.12 J1939 GPAACP – Generator Phase A AC Power

**PGN 65026 (0xFE02)**
**Type:** Broadcast cyclic single frame (100ms)
**Description:** Real power and apparent power of generator phase A.

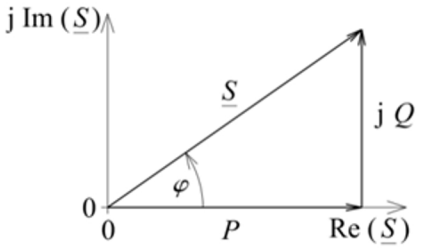



Figure 6: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 3 | 0 | 0 | 254 | 2 | X |
| **hex** | 3 | 0 | 0 | FE | 02 | X |
| **PGN** | | 65026 (FE02) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **Bits** | SPN 2453 | | | | SPN 2461 | | | |

**Content:**

| **Byte** | **SPN** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 2453 | 32 | uint32 | Generator Phase A | 1 W/bit | -2E9 … 2E9 |
| 1 | | | | Real Power | -2E9 W offset | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | 2461 | 32 | uint32 | Generator Phase A | 1 VA/bit | -2E9 … 2E9 |
| 5 | | | | Apparent Power | -2E9 VA offset | |
| 6 | | | | | | |
| 7 | | | | | | |

## 4.13 J1939 GPAAC – Generator Phase A Basic AC Quantities

**PGN 65027 (0xFE03)**
**Type:** Broadcast cyclic single frame (100ms)
**Description:** Generator Phase A, Line-Line AC RMS voltage, Line-N AC RMS voltage, AC frequency and AC current A.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 3 | 0 | 0 | 254 | 3 | X |
| **hex** | 3 | 0 | 0 | FE | 03 | X |
| **PGN** | | 65027 (FE03) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **Bits** | SPN 2441 | | SPN 2445 | | SPN 2437 | | SPN 2449 | |

**Content:**

| **Byte** | **SPN** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 2441 | 16 | uint16 | AC Voltage A | 1 V/bit | 0 … 65535 V |
| 1 | | | | RMS Line to Line | 0 offset | |
| 2 | 2445 | 16 | uint16 | AC Voltage A | 1 V/bit | 0 … 65535 V |
| 3 | | | | RMS Line to Neutral | 0 offset | |
| 4 | 2437 | 16 | uint16 | AC Frequency | $\frac{1}{128}$ Hz/bit | 0 … 501,9921875 Hz |
| 5 | | | | phase A | 0 offset | |
| 6 | 2449 | 16 | uint16 | AC Current | 1 A/bit | 0 … 65535 A |
| 7 | | | | RMS phase A | 0 offset | |

## 4.14 J1939 GAAC – Generator Average Basic AC Quantities

**PGN 65030 (0xFE06)**
**Type:** Broadcast cyclic single frame (100 ms)
**Description:** Generator Average Line-Line AC RMS Voltage, Generator Average Line-Neutral AC RMS Voltage, Generator Average AC Frequency and Generator Average AC RMS Current.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | 3 | 0 | 0 | 254 | 6 | X |
| **hex** | 3 | 0 | 0 | FE | 06 | X |
| **PGN** | | 65030 (FE06) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **SPN** | 2440 | | 2444 | | 2436 | | 2448 | |

**Content:**

| **Byte** | **SPN** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 2440 | 16 | uint16 | Generator Average | 1 V/bit | 0 … 65535 V |
| 1 | | | | Line-Line AC | 0 offset | |
| | | | | RMS Voltage | | |
| 2 | 2444 | 16 | uint16 | Generator Average | 1 V/bit | 0 … 65535 V |
| 3 | | | | Line-Neutral | 0 offset | |
| | | | | AC RMS Voltage | | |
| 4 | 2436 | 16 | uint16 | Generator Average | $\frac{1}{128}$ Hz/bit | 0 … 501,9921875 Hz |
| 5 | | | | AC Frequency | 0 offset | |
| 6 | 2448 | 16 | uint16 | Generator Average | 1 A/bit | 0 … 65535 A |
| 7 | | | | AC RMS Current | 0 offset | |

## 4.15 HTR – Heater Information

**65133 (0xFE6D)**
**Type:** Broadcast cyclic single frame (1000ms).
**Description:** Status and temperature data of vehicle auxiliary or parking heaters.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | X | 0 | 0 | 254 | 109 | X |
| **hex** | X | 0 | 0 | FE | 6D | X |
| **PGN** | | 65133 (FE6D) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **SPN** | | | | 1677 | | | | |

**Content:**

| **Byte** | **SPN** | **Data Length** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | | 8 bits | uint8 | 0xFF | | |
| 1 | | 8 bits | uint8 | 0xFF | | % |
| 2 | | 8 bits | uint8 | 0xFF | | |
| 3 | 1677 | Bit 0-3 | uint8 | Auxiliary Heater Mode | 1 / bit | 0 … 15 |
| | | | | 0x00 = Heater not active | 0 offset | |
| | | | | 0x01 = Off due to ADR | | |
| | | | | 0x02 = Economy mode | | |
| | | | | 0x03 = Normal mode | | |
| | | | | 0x04 = Heater pump up-keep | | |
| | | | | 0x0E = Error | | |
| | | | | 0x0F = Not available | | |
| 4 | | 8 bits | uint8 | 0xFF | | |
| 5 | | 8 bits | uint8 | 0xFF | | |
| 6 | | 8 bits | uint8 | 0xFF | | |
| 7 | | 8 bits | uint8 | 0xFF | | |

## 4.16 J1939 HOURS – Engine Hours

**PGN 65253 (0xFEE5)**
**Type:** Broadcast cyclic single frame (100 ms)
**Description:** Operating hour counter.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | X | 0 | 0 | 254 | 229 | X |
| **hex** | X | 0 | 0 | FE | E5 | X |
| **PGN** | | 65253 (FEE5) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **SPN** | 247 | | | | 249 | | | |

**Content:**

| **Byte** | **SPN** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 247 | 32 | uint32 | Operating Hours | 3 min ($\frac{1}{20}$ h) | 0 … 214748364,75 h |
| 1 | | | | (motor running) | 0 offset | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | 249 | 32 | uint32 | Not used | - | - |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |

## 4.17 J1939 ET1 – Engine Temperatures 1

**PGN 65262 (0xFEEE)**
**Type:** Broadcast cyclic single frame (1000 ms)
**Description:** Generator Temperatures.

**NOTE**
The engine fuel temperature and the engine oil temperature are only available with engines with engine control unit (ECU) and when this ECU is in operation / when the diesel engine is running.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | X | 0 | 0 | 254 | 238 | X |
| **hex** | X | 0 | 0 | FE | EE | X |
| **PGN** | | 65262 (FEEE) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 16 | | 16 | | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **Bits** | SPN 110 | SPN 174 | SPN 175 | | SPN 176 | | SPN 52 | SPN 1134 |

**Content:**

| **Byte** | **SPN** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 110 | 8 | uint8 | Engine coolant temp. | 1 °C/bit | -40 … 213 °C |
| | | | | 0xFE = short circuit | offset -40 | |
| | | | | 0xFF = not available | | |
| 1 | 174 | 8 | uint8 | Engine fuel temp. | 1 °C/bit | -40 … 213 °C |
| | | | | 0xFE = short circuit | offset -40 | |
| | | | | 0xFF = not available | | |
| 2 | 175 | 16 | uint16 | Engine oil temp. | $\frac{1}{32}$ °C/bit | -273 … 1735 °C |
| 3 | | | | 0xFE = short circuit | offset -273 | |
| | | | | 0xFF = not available | | |
| 4 | 176 | 16 | uint16 | Not used | - | - |
| 5 | | | | | | |
| 6 | 52 | 8 | uint8 | Not used | - | - |
| 7 | 1134 | 8 | uint8 | Not used | - | - |

## 4.18 DD1 – Dash Display 1

**65276 (0xFEFC)**
**Type:** Broadcast cyclic single frame (1000ms).
**Description:** Fuel level – ratio of volume of fuel to the total volume of fuel storage container.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | X | 0 | 0 | 254 | 252 | X |
| **hex** | X | 0 | 0 | FE | FC | X |
| **PGN** | | 65276 (FEFC) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **SPN** | | 96 | | | | | | |

**Content:**

| **Byte** | **SPN** | **Data Length** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | | 8 bits | uint8 | 0xFF | | |
| 1 | 96 | 8 bits | uint8 | Fuel Level 1 | 0,4 % / bit gain<br>0 offset | 0 … 100 % |
| 2 | | 8 bits | uint8 | 0XFF | | |
| 3 | | 8 bits | uint8 | 0xFF | | |
| 4 | | 8 bits | uint8 | 0xFF | | |
| 5 | | 8 bits | uint8 | 0xFF | | |
| 6 | | 8 bits | uint8 | 0xFF | | |
| 7 | | 8 bits | uint8 | 0xFF | | |

# 5 Special functions - Proprietary PGNs

## 5.1 PROPA00 – Remote Procedure Request

**PGN 61184 (0xEF00)**
**Type:** Single frame, target oriented, partially routed via »fpControl CAN Interface – SAE J1939« (fpControl CI-SAE J1939) [1]
**Description:** Special function for parameter request and for producing special operation. Using PROPA00 a remote procedure request is sent to a device which acknowledges with a PROPB00 message (PGN 65280) as described in 5.2 as broadcast. The possible requests are displayed in the chapter "RPC-Requests". An RPC-ID and up to 3 parameters (3 x 16 bits) can be transferred. **Unlike most of the standard PGNs the RPC-ID and parameters are big endian encoded.**

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | X | 0 | 0 | 239 | XX | X |
| **hex** | X | 0 | 0 | EF | XX | X |
| **PGN** | | 61184 (EF00) | | | | |

**NOTE: »XX« in field PS must be replaced with the destination address.** Refer to 5.1.1.

**Data Bytes:**

| **Bits** | 16 | 16 | 16 | 16 |
|---|---|---|---|---|
| **Name** | RPD-ID | Param 1 | Param 2 | Param 3 |
| **SPN** | | | | |

**Content:**

| **Byte** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|
| 0 | 16 | uint16 | Request RPC-ID | - | 0…65535 |
| 1 | | | | | |
| 2 | 16 | uint16 | Request Parameter 1 | - | 0…65535 |
| 3 | | | | | |
| 4 | 16 | uint16 | Request Parameter 2 | - | 0…65535 |
| 5 | | | | | |
| 6 | 16 | uint16 | Request Parameter 3 | - | 0…65535 |
| 7 | | | | | |

[1] »fpControl CAN Interface – SAE J1939«: https://knowledgebase.fischerpanda.de/?p=4052

### 5.1.1 The fields within the 29-bit Identifier

| Field | | Meaning | Description | Comment |
|---|---|---|---|---|
| Prio | | Priority | Priority of the message on the CAN bus. Messages of higher importance are sent before those of lower priority. | »0« has the highest priority. |
| Parameter Group Number | EDP DP | Extended Data Page Data Page | With EDP and DP, four different data pages can be selected for J1939 messages (Parameter Group). | EDP = 0 and DP = 0: SAE J1939 Parameter Groups |
| | PF | PDU Format | Protocol Data Unit Format – defines whether the message is intended for a specific device in the CAN bus or for the entire network. | **1 … 239:** A specific device in the CAN bus should be addressed by this CAN message. The PS field contains the destination address.<br><br>**240 … 255:** All devices in the CAN bus should be addressed by this CAN message. The PS field contains a Group Extension. |
| | PS | PDU Specific | Protocol Data Unit Specific – based on the value of the PF field | If the message is intended for a specific device (PF <= 239), PS is the destination address of this device. **»XX« must be replaced with a destination address != 0.**<br><br>If the message is intended for all devices (PF > = 240), PS is the group extension field and enables a higher number of possible broadcast messages. |
| SA | | Source Address | Address of the device sending the current message. | »X« must be replaced with the source address. |

**NOTE:**

The destination address in the PS field must always be a value != 0. The destination address »0« isn´t used by any Fischer Panda device.

## 5.2 PROPB00 – Response for PROPA00 RPC-request

**PGN 65280 (0xFF00)**
**Type:** Broadcast single frame, partially routed via »fpControl CAN Interface – SAE J1939« (fpControl CI-SAE J1939) [2]
**Description:** RPC-Response frame for PROPA00 (refer to 5.1) and for file transfer. In case of an error the RPC-ID and 0xFFFF$_{hex}$ in parameter fields 1-3 will be transferred.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | X | 0 | 0 | 255 | 0 | X |
| **hex** | X | 0 | 0 | FF | 00 | X |
| **PGN** | | 65280 (FF00) | | | | |

**Data Bytes:**

| **Bits** | 16 | 16 | 16 | 16 |
|---|---|---|---|---|
| **Name** | Function | Param 1 | Param 2 | Param 3 |
| **Bits** | | | | |

**Content:**

| **Byte** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|
| 0 | 16 | uint16 | Requested RPC-ID | - | 0…65535 |
| 1 | | | | | |
| 2 | 16 | uint16 | Request Parameter 1 | - | 0…65535 |
| 3 | | | | | |
| 4 | 16 | uint16 | Request Parameter 2 | - | 0…65535 |
| 5 | | | | | |
| 6 | 16 | uint16 | Request Parameter 3 | - | 0…65535 |
| 7 | | | | | |

[2] »fpControl CAN Interface – SAE J1939«: https://knowledgebase.fischerpanda.de/?p=4052

## 5.3 PROPB01 – Generator System Information

**PGN 65281 (0xFF01)**
**Type:** Broadcast cyclic single frame (250 ms)
**Source:** fpControl
**Description:** This frame is sent cyclic from generator controller to the panel. Different states and display messages are contained which can also be evaluated from extern.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | X | 0 | 0 | 255 | 1 | X |
| **hex** | X | 0 | 0 | FF | 01 | X |
| **PGN** | | 65281 (FF01) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **SPN** | 520200 | | 520192 | 520195 | 520193 | 520201 | 520202 | 520203 |

**Content:**

| **Byte** | **SPN** | **Data Length** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 520200 | 16 bits | uint16 | System battery voltage | $\frac{1}{10}$ V / bit | 0…6553,5 |
| 1 | | | | | 0 offset | |
| 2 | 520192 | 8 bits | uint8 | **System state** | 0 – 255 | 0...255 |
| | | | | 0 = Standby (Generator is stopped) | | |
| | | | | 1 = Self-test | | |
| | | | | 2 = Preheat | | |
| | | | | 3 = Starting (Starter on) | | |
| | | | | 4 = Starting | | |
| | | | | 5 = Start-up phase (Starter off) | | |
| | | | | 6 = Override phase | | |
| | | | | (Frequency control) | | |
| | | | | 7 = Warm-up phase | | |
| | | | | (Switching to voltage | | |
| | | | | control with checking | | |
| | | | | oil pressure) | | |
| | | | | 8 = Normal mode | | |
| | | | | (Generator is running) | | |
| | | | | 9 = Stopping phase | | |
| | | | | possibly with turbo lag | | |
| | | | | 10 = Error occurred | | |
| | | | | 11 to 255 are unused | | |

| Byte | SPN | Data Length | Data Type | Parameter | Resolution / Offset | Data Range |
|---|---|---|---|---|---|---|
| 3 | 520195 | 8 bits | uint8 | Error code if in error state | 0 – 255 | 0...255 |
| 4 | 520193 | 8 bits | uint8 | Delay until next state | 0 – 255 | 0...255 |
| 5 | 520201 | 8 bits | uint8 | Cyclic recurring | | |
| | | | | unacknowledged warnings. | 0 – 255 | 0...255 |
| | | | | Warnings are toggled per | | |
| | | | | cycle, that means every | | |
| | | | | 500 ms for example 1, 6, | | |
| | | | | 3, 4, 1, 6, 3, 4… and so on. | | |
| | | | | If a warning has been | | |
| | | | | acknowledged Show Warning=0 | | |
| | | | | until the next warning | | |
| 6 | 520202 | 8 bits | uint8 | Cyclic recurring all active | | |
| | | | | warnings. Warning is active | | |
| | | | | if <> 0. A warning is active | | |
| | | | | if it is acknowledged and no | | |
| | | | | longer displayed but still | | |
| | | | | present. This warning is | | |
| | | | | displayed cyclic. | 0 – 255 | 0...255 |
| 7 | 520203 | 8 bits | uint8 | Special config bits: | 0 – 255 | 0...255 |
| | | Bit 0 | | 1 = automatic start active, | | |
| | | | | 0 = automatic start inactive | | |
| | | Bit 1 | | 1 = automatic start requested, | | |
| | | | | genset will try to start | | |
| | | Bit 2 | | Not used | | |
| | | Bit 3 | | Not used | | |
| | | Bit 4 | | 1 = teach start request | | |
| | | Bit 5 | | 1 = Actuator max position test | | |
| | | Bit 6 | | 1 = Actuator teaching OK | | |
| | | Bit 7 | | 1 = Actuator teaching failed | 0 – 255 | 0...255 |

## 5.4 PROPB03 – Generator System RPM

**PGN 65283 (0xFF03)**
**Type:** Broadcast cyclic single frame (100 ms)
**Source:** fpControl or Inverter
**Description:** Generator RPM. In case of iSeries generators the RPM is sent by the inverter. PROPB03 is required for the "Start without inverter" function.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | X | 0 | 0 | 255 | 3 | X |
| **hex** | X | 0 | 0 | FF | 03 | X |
| **PGN** | | 65283 (FF03) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **SPN** | 520230 | | | | | | | |

**Content:**

| **Byte** | **SPN** | **Data Length (bits)** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 520230 | 16 | uint16 | Engine Speed | 1 rpm / bit | 0 … 65535 |
| 1 | | | | (sent from inverter) | 0 offset | |
| 2 | | 8 | | | - | - |
| 3 | | 8 | | | - | - |
| 4 | | 8 | | | - | - |
| 5 | | 8 | | | - | - |
| 6 | | 8 | | | - | - |
| 7 | | 8 | | | - | - |

## 5.5 PROPB05 – Generator System Temperatures

**PGN 65285 (0xFF05)**
**Type:** Broadcast cyclic single frame (100 ms)
**Source:** fpControl
**Description:** Temperature Information about the system.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | X | 0 | 0 | 255 | 5 | X |
| **hex** | X | 0 | 0 | FF | 05 | X |
| **PGN** | | 65285 (FF05) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **SPN** | 520204 | 520205 | 520206 | | | | | |

**Content:**

| **Byte** | **SPN** | **Data Length** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 520204 | 8 bits | uint8 | Temperature Winding | 1 °C / bit | -40 … 213 °C |
| | | | | 0xFE = short circuit | -40 offset | |
| | | | | 0xFF = not available | | |
| | | | | | | |
| 1 | 520205 | 8 bits | uint8 | Temperature Exhaust | 1 °C / bit | -40 … 213 °C |
| | | | | 0xFE = short circuit | -40 offset | |
| | | | | 0xFF = not available | | |
| | | | | | | |
| 2 | 520206 | 8 bits | uint8 | Temperature MCU | 1 °C / bit | -40 … 213 °C |
| | | | | 0xFE = short circuit | -40 offset | |
| | | | | 0xFF = not available | | |
| | | | | | | |
| 3 | | 8 bits | uint8 | | | |
| 4 | | 8 bits | uint8 | | | |
| 5 | | 8 bits | uint8 | | | |
| 6 | | 8 bits | uint8 | | | |
| 7 | | 8 bits | uint8 | | | |

## 5.6 PROPB0F – Service Hour Counter

**PGN 65295 (0xFF0F)**
**Type:** Broadcast cyclic single frame (100 ms)
**Description:** Service Hour Counter.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | X | 0 | 0 | 255 | 15 | X |
| **hex** | X | 0 | 0 | FF | 0F | X |
| **PGN** | | 65295 (FF0F) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **SPN** | 520223 | | | | | | | |

**Content:**

| **Byte** | **SPN** | **Data Length** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 520223 | 32 bits | uint32 | Service Hour Counter [LSB] | 3 min (1/20 h) | 0 … 214748364,75 h |
| 1 | | | | [second byte] | 0 offset | |
| 2 | | | | [third byte] | | |
| 3 | | | | [MSB] | | |
| | | | | | | |
| 4 | | 8 bits | uint8 | - | - | - |
| 5 | | 8 bits | uint8 | - | - | - |
| 6 | | 8 bits | uint8 | - | - | - |
| 7 | | 8 bits | uint8 | - | - | - |

## 5.7 PROPB25 – fpCAN Device Info

**PGN 65317 (0xFF25)**
**Type:** Broadcast cyclic single frame (1 s).
**Description:**

- Sends Bus ID, Module ID, Software Version and Serial Number of each detected fpCAN device.
- Cycles through the detected fpCAN devices on each transmit.

**Structure of the 29-bit identifier:**

| **Bits** | 3 | 1 | 1 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|
| **Name** | Prio | EDP | DP | PF | PS | SA |
| **dec** | X | 0 | 0 | 255 | 37 | X |
| **hex** | X | 0 | 0 | FF | 25 | X |
| **PGN** | | 65317 (FF25) | | | | |

**Data Bytes:**

| **Bits** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Name** | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 |
| **SPN** | 520243 | 520244 | 520245 | | 520246 | | | |

**Content:**

| **Byte** | **SPN** | **Data Length** | **Data Type** | **Parameter** | **Resolution / Offset** | **Data Range** |
|---|---|---|---|---|---|---|
| 0 | 520243 | 8 bits | uint8 | **Bus ID** | 1 / bit | 0 … 255 |
| | | | | | 0 offset | |
| 1 | 520244 | 8 bits | uint8 | **Module ID** | 1 / bit | 0 … 255 |
| | | | | | 0 offset | |
| 2 | 520245 | 16 bits | uint16 | **Software Version** | 1 / bit | 0 … 65535 |
| 3 | | | | | 0 offset | |
| 4 | 520246 | 32 bits | uint32 | **Serial Number** | 1 / bit | 0 … 4.294.967.296 |
| 5 | | | | | 0 offset | |
| 6 | | | | | | |
| 7 | | | | | | |

**Encoding of »Software Version«**

| **Upper nibble MSB** | **Lower nibble MSB** | **LSB** |
|---|---|---|
| Release Candidate 0-15 | Major Version 0-15 | Minor Version 0-255 |

# 6 Remote Procedure Requests

## 6.1 Introduction to the topic

Although basic runtime information will be made available on the J1939/NMEA2000® bus it is not possible to map all functionality to the standard PGNs. Because of the necessity to make those unmapped parameters/functions accessible the FP-Bus supports a simplified RPC-mechanism.

## 6.2 Functionality

It is possible to request/set specific data and/or request the execution of a function on a FP-Bus device. Therefore, the RPC-mechanism uses the proprietary Fischer Panda Messages PGNs PropA00 (PGN 61184) and PropB00 (PGN 65280). PropA00 is used to send the request and due to its definition as address oriented PGN the request can either be sent to an individual device (unicast) or to all devices (multicast). The device processing the request will check if the requested RPC-ID is known to it. If so, it will acknowledge it with sending the answer on PropB00, if not it will not respond anything. In case of an error while processing a request the parameter fields 1-3 of the corresponding response would be set to $0xFFFF_{hex}$. PropB00 will always be broadcasted, so that every device on the bus is able to process it (if necessary).

## 6.3 Request types

The RPC-ID is a unique identifier for individual functions on FP-Bus devices. The identifier itself is 15 bits wide and is represented by the lower 15 bits of the first word of an RPC-Request/-Response. The MSB (bit 15) categorizes it into *»read- and write-requests«*. The MSB set to 1 indicates a *»write-request«* (e.g. write something into a register, execute a function that changes parameters, conditions etc.), whereas the MSB set to 0 indicates a read-request (e.g. request of a special parameter, condition etc.).

## 6.4 Endianness of the RPC-PGNs

Unlike most of the standard PGNs the content of the RPC-PGNs is **big endian** encoded.

## 6.5 Notice for sending RPC requests

**NOTICE**
**Property damage to the generator control due to cyclic remote procedure requests.**
Most remote procedure requests write to the EEPROM.
Frequent writing to the EEPROM can lead to the rapid destruction of this component.
**Send remote procedure requests only once, never cyclically.**

## 6.6 RPC-ID 0x000d – Clear errors/warnings

**Type:** R / W

**Description:** This RPC clears errors/warnings. If the generator ran into an error - after clearing it resets the generator-status to 0 (standby).
**ATTENTION: If the generator-control is in automatic-start mode and there is still an active start request (e.g. by digital input or RPC-ID 0x809c) the generator will try to start again after clearing an error.**

| Read Request | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | - | - | - |
| | | | |
| **param #1** | - | - | - |
| **param #2** | - | - | - |
| **param #3** | - | - | - |

| Read Response | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | - | - | - |
| | | | |
| **param #1** | - | - | - |
| | | | |
| **param #2** | - | - | - |
| | | | |
| **param #3** | - | - | - |
| | | | |

| Write Request | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x800d | - | - |
| | | | |
| **param #1** | 0xffff: clears all warnings | 1 / bit | 0 … 65535 |
| | 0x0000 – 0x00ff clears | 0 offset | |
| | | | |
| | individual warning | | |
| | | | |
| **param #2** | 0xffff: clears error | 1 / bit | 0 … 65535 |
| | | 0 offset | |
| **param #3** | - | - | - |
| | | | |

| Write Response | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x800d | - | - |
| | | | |
| **param #1** | echoed value of request | 1 / bit | 0 … 65535 |
| | | 0 offset | |
| **param #2** | echoed value of request | 1 / bit | 0 … 65535 |
| | | 0 offset | |
| | | | |
| **param #3** | - | - | - |
| | | | |

## 6.7 RPC-ID 0x0012 – Automatic start mode

**Type:** R / W

**Description:** This RPC informs about the status of the automatic start mode (Read Request) and is used to activate/deactivate the automatic start mode (Write Request).

**NOTE**

At the **iControl2 system** activating the automatic start is only possible using the control panel.

| Read Request | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x0012 | - | - |
| | | | |
| **param #1** | - | - | - |
| **param #2** | - | - | - |
| **param #3** | - | - | - |

| Read Response | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x0012 | - | - |
| | | | |
| **param #1** | 0: automatic start-mode off | 1 / bit | 0 … 1 |
| | 1: automatic start-mode on | 0 offset | |
| | | | |
| **param #2** | minimum value | 1 / bit | 0 … 1 |
| | | 0 offset | |
| **param #3** | maximum value | 1 / bit | 0 … 1 |
| | | 0 offset | |

| Write Request | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x8012 | - | - |
| | | | |
| **param #1** | 0: automatic start-mode off | 1 / bit | 0 … 1 |
| | 1: automatic start-mode on | 0 offset | |
| | | | |
| **param #2** | - | - | - |
| | | | |
| **param #3** | - | - | - |
| | | | |

| Write Response | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x8012 | - | - |
| | | | |
| **param #1** | 0: automatic start-mode off | 1 / bit | 0 … 1 |
| | 1: automatic start-mode on | 0 offset | |
| **param #2** | - | - | - |
| | | | |
| **param #3** | - | - | - |
| | | | |

## 6.8 RPC-ID 0x008b – Service done

**Type:** W

**Description:** Resetting the service interval to the number of operating hours defined for the relevant generator type.

| Write Request | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x808b | - | - |
| **param #1** | 0x0001 = service done | 1 / bit<br>0 offset | 0 … 1 |
| **param #2** | - | - | - |
| **param #3** | - | - | - |

| Write Response | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x808b | - | - |
| **param #1** | 0x0001 = service done | 1 / bit<br>0 offset | 0 … 1 |
| **param #2** | - | - | - |
| **param #3** | - | - | - |

## 6.9 RPC-ID 0x008e – Set CPU in Power-Save-Mode (Sleep controller)

**Type:** W

**Description:** Remote Power Off.
The panel sends this RPC frame with the first payload word set to “1” which turns off the control.

| Write Request | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x808e | - | - |
| **param #1** | 0 = Running<br>1 = Turn off the control | 1 / bit<br>0 offset | 0 … 1 |
| **param #2** | - | - | - |
| **param #3** | - | - | - |

| Write Response | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x808e | - | - |
| **param #1** | echoed value of request | 1 / bit<br>0 offset | 0 … 1 |
| **param #2** | - | - | - |
| **param #3** | - | - | - |

## 6.10 RPC-ID 0x0093 – Read software release

**Type:** R

**Description:** Being requested this RPC delivers the software release of the device.

| Read Request | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x0093 | - | - |
| **param #1** | [MSB] = server address<br>[LSB] = client address | 1 / bit<br>0 offset | 0 … 65535 |
| **param #2** | - | - | - |
| **param #3** | - | - | - |

| Read Response | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x0093 | - | - |
| **param #1** | [MSB] = Bus address<br>[LSB] = Module ID | 1 / bit<br>0 offset | 0 … 65535 |
| **param #2** | Software Release<br>format [xx].[yy] | 1 / bit<br>0 offset | 0 … 65535 |
| **param #3** | - | - | - |

## 6.11 RPC-ID 0x0094 – Read serial number

**Type:** R

**Description:** Being requested this RPC delivers the serial number of the addressed device.

| Read Request | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x0094 | - | - |
| **param #1** | Client address | 1 / bit<br>0 offset | 0 … 65535 |
| **param #2** | - | - | - |
| **param #3** | - | - | - |

| Read Response | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x0094 | - | - |
| **param #1** | [MSB] = Bus address<br>[LSB] = Modul ID | 1 / bit<br>0 offset | 0 … 65535 |
| **param #2** | Serial number, [MSW] | 1 / bit<br>0 offset | 0 … 65535 |
| **param #3** | Serial number, [LSW] | - | - |

**How does an RPC request for the serial number work in practice? Let's dive into it:**
In this example we will request the serial number of two communication interfaces using PROPA00 (PGN 61184) (refer to **??**). A remote procedure request for RPC ID 0x0094 is sent to each device which acknowledges with PROPB00 (PGN 65280) (refer to **??**) as broadcast. Parameter #1 (Payload1) contains the bus address of the subscriber whose serial number is to be requested. In this example it is address »234« (hex. 0xEA). This request must be carried out separately for each bus subscriber whose serial number is required.

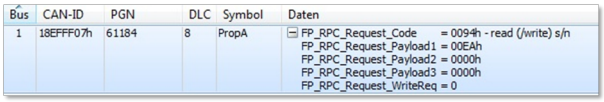



Figure 7: Example for an RPC request for the serial number

In our example, we also request the serial number of the second communication interface with the address »235«. Below you can see the acknowledgements (PROPB00) of both interfaces to our requests.

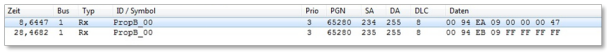



Figure 8: Acknowledgements (PROPB00) of both interfaces to the request for the serial number

The contents of the acknowledgement messages in detail:

| **Read Response** | **Acknowledgement of the first request** | **Acknowledgement of the second request** |
|---|---|---|
| **RPC-ID** | **0x0094** | **0x0094** |
| | | |
| **param #1** | [MSB] = Bus address = **0xEA** = 234 dec, | [MSB] = Bus address = **0xEB** = 235 dec, |
| | [LSB] = Modul ID = **0x09** (Com. Interface) | [LSB] = Modul ID = **0x09** (Com. Interface) |
| | | |
| **param #2** | Serial number, [MSW] = **0x0000** | Serial number, [MSW] = **0xFFFF** = 65535 dec *) |
| | | |
| **param #3** | Serial number, [LSW] = **0x0047** = 71 dec | Serial number, [LSW] = **0xFFFF** = 65535 dec |
| | | |

*) The second interface requested in this example is a development hardware and does not have a valid serial number, therefore 0xFFFF.

## 6.12 RPC-ID 0x009c – Remote start of Generator

**Type:** R / W

**Description:** The functionality of this RPC is based on the remote-start feature using the dedicated digital input on the generator control unit. A switch closing the circuit between this digital input and GND would request a generator remote start-procedure. Analogously sending a write request with payload 1 will do. Sending 0 would be the equivalent of opening the switch again. Thinking of a virtual switch (e.g. in a remote application's GUI) the answer Frames of either 0x809c or 0x009c will contain the position (0/1) of this switch. **So that the generator can be started receiving this message the automatic-start mode must be activated.**

| Read Request | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x009c | - | - |
| **param #1** | - | - | - |
| **param #2** | - | - | - |
| **param #3** | - | - | - |

| Read Response | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x009c | - | - |
| **param #1** | position of remote GUI's switch | 1 / bit<br>0 offset | 0 … 1 |
| **param #2** | - | - | - |
| **param #3** | - | - | - |

| Write Request | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x809c | - | - |
| **param #1** | 1 = start<br>0 = stop | 1 / bit<br>0 offset | 0 … 1 |
| **param #2** | - | - | - |
| **param #3** | - | - | - |

| Write Response | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x809c | - | - |
| | | | |
| **param #1** | position of remote GUI's switch | 1 / bit | 0 … 1 |
| | | 0 offset | |
| | | | |
| **param #2** | - | - | - |
| | | | |
| **param #3** | - | - | - |
| | | | |

## 6.13 RPC-ID 0x009e – Power on via RPC

**Type:** W

**Description:** With this RPC ID, the controller can be switched on via a bus command (remote power on).

| Write Request | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x809e | - | - |
| **param #1** | 0x0001 = remote power on | 1 / bit<br>0 offset | 0 … 1 |
| **param #2** | don't care | - | - |
| **param #3** | don't care | - | - |

| Write Response | Parameter definition | Resolution / Offset | Data Range |
|---|---|---|---|
| **RPC-ID** | 0x809e | - | - |
| **param #1** | echoed value of request | - | - |
| **param #2** | - | - | - |
| **param #3** | - | - | - |

**Note:** The system can be **switched off** again using **RPC-ID 0x008e**.

**Note:** If there are several CAN interfaces in the fpCAN bus (several generator systems) you can "wake up" individual systems instead of all together (destination address DA: FF). In this case, the destination address of the corresponding CAN interface must be selected in the PROPA00 message (PGN 61184).

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