

BridgeWay

Application Note

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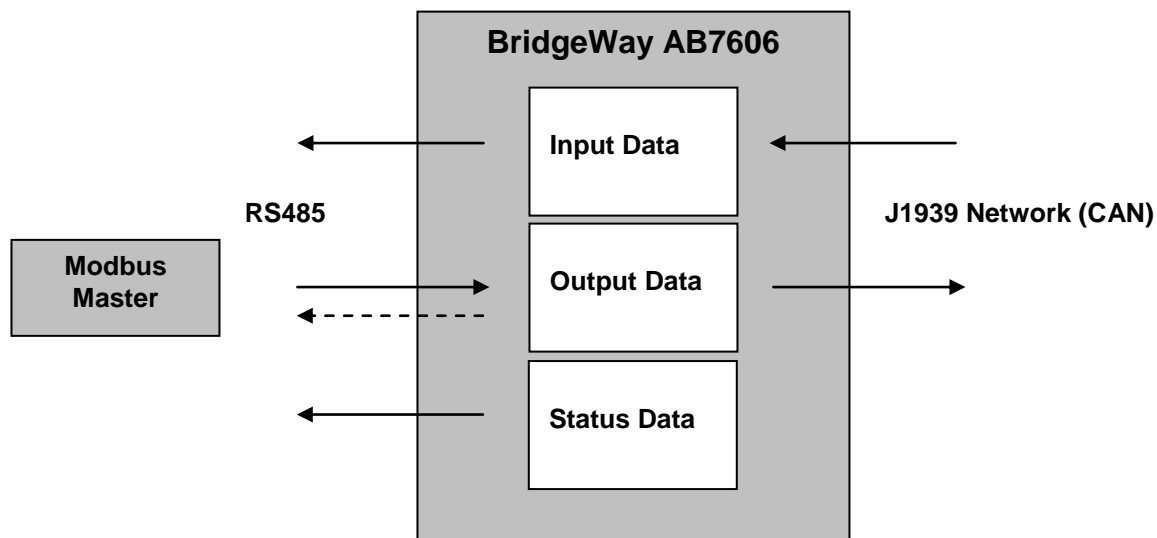
AB7606 Modbus Register Mapping Overview

Important! Please ensure that you have the latest version of BWConfig software. You can download BWConfig for the AB7606 here:

<http://support.pyramidsolutions.com/support-nc-bridgeway-products-j1939-to-modbus-interface-ab7606.html>

The addressing of Modbus registers for access to the AB7606 Input, Output and Status tables is explained beginning on page 5-7 of the User Manual.

AB7606 Functional Diagram



The diagram above provides a high level view of the following:

- 1) The Input, Output and Status data within the AB7606 is accessible by the Modbus Master via Modbus Commands (e.g. Read Input Register or Read / Write Holding Register)
- 2) The AB7606 takes inbound J1939 message data and places it in the Input Data Table (based on the Byte Swapping selection)
- 3) The AB7606 takes output data written to the Output Data Table by the Modbus Master and sends it onto the J1939 Network (i.e. if J1939 out going messages have been configured)
- 4) The AB7606 provides module status information made available through the Status Data Table and readable by the Modbus Master. This data is used for diagnostics and can be used by the Modbus Master logic.

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AB7606 Modbus Register Mapping Overview (continued)

The AB7606 configuration and data handling is governed by the following limits:

Max Data Size

2048 bytes in the Input Data Table (data that can be read from Modbus)

2048 bytes in the Output Data Table (data that can be written by Modbus)

Max Configured I/O Points

200 total I/O data points in the configuration – any combination of input or output (a data point is a single configured entry in the Input or Output Data Table)

Max Configured J1939 PGN messages

50 PGN's monitored for input data points

50 PGN's transmitted by output data points

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AB7606 Output Data

AB7606 output data starts at Output Table offset 0 (Modbus offset 1).

The Modbus registers corresponding to the AB7606 (Modbus Slave) output data are as follows:

AB7606 Output Data Table Modbus Holding Register

Start of J1939 Output Data 40001

The Output Data Table for the AB7606 is written by the Modbus Master via Modbus messages. This includes J1939 output data (if any) that will be sent by the AB7606 to the J1939 network, based on the AB7606 configuration downloaded by the BWConfig software.

Important! You must download any changes you make in BWConfig in order for them to be active in the AB7606.

Outgoing Message Configuration Example

The screenshot shows the J1939 Configuration software interface. At the top, there are status indicators: Status: Online, Error: No Error, Network Address: 0, and Device NAME: B00200010000007B. There are checkboxes for "Swap I/O Bytes" (checked) and "Enable Bus-Off CAN Reset" (unchecked). A "Network Address List" section shows an address of 0 with "Add" and "Remove" buttons. Below this are two tables: "J1939 Input I/O Table" and "J1939 Output I/O Table".

Table Offset	Data Length	PGN	Target Address	Update Rate	Message Offset
0 (0,0)	8 (1,0)	61444	6	10	0 (0,0)
16 (2,0)	8 (1,0)	61444	6	10	8 (1,0)
32 (4,0)	8 (1,0)	61444	6	10	16 (2,0)
48 (6,0)	16 (2,0)	61444	6	10	24 (3,0)
64 (8,0)	8 (1,0)	61444	6	10	40 (5,0)
80 (10,0)	16 (2,0)	61444	6	10	48 (6,0)

The example configuration shown above will have the AB7606 send PGN 61444 at a 10 millisecond rate at priority 6 to target address 6. Note that PGN 61444 has been placed in the output table in a manner to allow individual elements of the PGN (byte & word data) to be separated in the Output Data Table by the Modbus Master, starting at Holding Register 40001 (Output Table offset 0).

In this case, you MUST have the "Swap I/O Bytes" option selected (checked) in order to enable the AB7606 to automatically swap the bytes sent to the Output Table for putting them in the correct J1939 Little Endian byte order.

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Alternatively, the same PGN can be configured as follows if the Modbus Master copies the data (all 8 bytes packed in the correct J1939 Little Endian byte order) into the Output Table:

The screenshot shows the BridgeWay configuration interface. At the top is the 'J1939 Configuration' panel with the following settings: Status: Online, Error: No Error, Network Address: 0, Device NAME: B00200010000007B, Swap I/O Bytes: unchecked, and Enable Bus-Off CAN Reset: unchecked. A 'Network Address List' panel on the right shows an 'Address' field with '0' and 'Add'/'Remove' buttons. Below are two tables: 'J1939 Input I/O Table' (empty) and 'J1939 Output I/O Table' (containing one entry).

Table Offset	Data Length	PGN	Target Address	Update Rate	Message Offset	
0 (0,0)	64 (8,0)	61444	6	6	10	0 (0,0)

In this case, you MUST have the “Swap I/O Bytes” option deselected (unchecked) in order to prevent the AB7606 from automatically swapping the bytes sent to the Output Table.

Since the “Swap I/O Bytes” function is applied to input as well as output data, your BridgeWay configuration needs to take into account, whether or not you are just receiving or just sending J1939 messages or if you receiving and sending J1939 messages, since your host controller will be required to (or not to) manipulate received and sent data accordingly.

Important! The output PGN data length must match the size of the PGN in the J1939 Specification (i.e. in the PGN has 4 bytes of data and 4 bytes of fill, you must send the same).

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AB7606 Input Data

AB7606 input data starts at Input Table offset 0 (Modbus offset 1).

The Modbus register corresponding to the AB7606 (Modbus Slave) input data is as follows:

AB7606 Input Data Area Modbus Input Register

Start of J1939 Input Message Data 30001

Important! All J1939 data is Little Endian format or least significant byte first. Modbus assumes data is Big Endian or most significant byte first.

An example of the way data is stored based on its “endianess” is as follows:

Value in Decimal: **25421** Value in Hex: **634D**
Big Endian Byte Storage Order: **634D** Little Endian Byte Storage Order: **4D63**

Selecting the Swap Bytes option in the J1939 configuration will swap the Endian byte orientation of **every** 16 bit word for input and output data.

Incoming Message Configuration Example

The screenshot shows the J1939 Configuration window. The top section includes status (Online, No Error), network address (0), and device name (B00200010000007B). The 'Swap I/O Bytes' checkbox is checked. The 'Network Address List' shows a single entry with address 6. Below are two tables: 'J1939 Input I/O Table' and 'J1939 Output I/O Table'.

Table Offset	Data Length	PGN	Target Address	Update Rate	Message Offset
0 (0,0)	16 (2,0)	61444	0	0	24 (3,0)

Table Offset	Data Length	PGN	Priority	Target Address	Update Rate	Message Offset
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The above configuration will input PGN 61444 (“Engine Speed” bytes only). The 16 bit value pulled from the received 61444 PGN will be placed into the AB7606 input table at the first data location, which will be accessible from a Modbus Master through a “Read Input Register” command at 30001.

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The data will be presented in “Big Endian” format as expected by the Modbus Master since the “Swap I/O Bytes” option was selected. With the Update Rate set to ‘0’, the AB7606 assumes that the PGN is broadcast and will map the received PGN data into the Input Data Table each time the PGN is received. Setting the Update Rate to a non-zero value indicates to the AB7606 that it needs to request the PGN on the bus at the specified rate if it does not appear on the bus within the specified amount of time.

Important! Although you can input a portion of a PGN into the input table, you must send the entire PGN when sending from the output table (see the output example).

Alternatively, the same PGN can be configured as follows to have the entire 8 data bytes contained in the PGN transferred to the Input Table:

J1939 Configuration

Status: Online Swap I/O Bytes Enable Bus-Off CAN Reset
Error: No Error
Network Address: 0 Device NAME: B00200010000007B Edit
Network Address List: Address: [Add] [6] [Remove]

J1939 Input I/O Table

Table Offset	Data Length	PGN	Target Address	Update Rate	Message Offset
0 (0,0)	64 (8,0)	61444	0	0	0 (0,0)

J1939 Output I/O Table

Table Offset	Data Length	PGN	Target Address	Update Rate	Message Offset

In this case, you MUST have the “Swap I/O Bytes” option deselected (unchecked) in order to prevent the AB7606 from automatically swapping the bytes received into the Input Table.

Since the “Swap I/O Bytes” function is applied to input as well as output data, your BridgeWay configuration needs to take into account, whether or not you are just receiving or just sending J1939 messages or if you receiving and sending J1939 messages, since your host controller will be required to (or not to) manipulate received and sent data accordingly.

Using this method of configuration, your host controller will be required to extract data from the received data since it is presented in Little Endian format and will be required to manipulate the received data in order to put it into Modbus (Big Endian) format.

For example, since the non-swapped input data is received as follows in Little Endian Format:

Byte2, Byte1, Byte4, Byte3, Byte6, Byte5, Byte8, Byte7 (or 22,11,44,33,66,55,88,77)

Based on the input PGN, you will have to extract the bytes from the correct offset in the table and then pair and manipulate received word and dword data.

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Diagnostics & Troubleshooting

AB7606 Status Data

AB7606 status data can be used to determine the status of the J1939 interface. AB7606 Status Data starts at register offset 256. This is Input Register 32001 in Modbus terminology.

The 16 bit Modbus registers corresponding to the AB7606 (Modbus Slave) status data are as follows:

AB7606 Status Data Area	Modbus Input Register
Modbus diagnostic register	32001
Modbus bus message counter	32002
Modbus communication error counter	32003
Modbus exception response counter	32004
Modbus slave message counter	32005
Modbus no response counter	32006
Modbus receive overrun counter	32007
J1939 status register	32008
J1939 fault register	32009
J1939 CAN error counter	32010
J1939 CAN bus-off counter	32011
J1939 CAN receive overrun counter	32012

Note: See the AB7606 User Manual for a definition of the status data

Clearing AB7606 Diagnostic Registers, Counters & Module Faults

To clear AB7606 counters & faults, use Modbus write commands 6 or 16 to Holding Register 42001. This will clear the condition (J1939 Status LED blinking green then red), and will set the J1939 Status LED to solid green (if no additional faults are generated).

AB7606 Files & Documentation

AB7606 documentation and other related files are being updated periodically. Check our web site AB7606 support page at:

<http://support.pyramidsolutions.com/support-nc-bridgeway-products-j1939-to-modbus-interface-ab7606.html>

or Contact Pyramid Solutions at 248-549-1200 ext. 231 for updates.