

Technical Bulletin, OMNI Flow Computer Modbus Database: Overview



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NOTE: User Manual Reference - This Technical Bulletin complements the information contained in Volume 4 "Modbus Database Address and Index Numbers", applicable to all firmware revisions. Modbus Database – Modbus function codes are shown in hexadecimal notation. The 4th digit (from the right) of the data point address defines that data type.

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Scope

All firmware revisions of OMNI 6000/OMNI 3000 Flow Computers are characterized by a Modbus database structured as described in this Technical Bulletin.

Abstract

The following are the data types within the database:

- Digital Flag Bits:** Also known as Boolean bits, status bits and command bits. All data points of this type can be read via Modbus function code 01 and written to using function codes 05 and 0F. Function codes 01 and 0F transfer byte packed data that is sent in the byte order they are prepared (not word order). Points are packed eight (8) to a byte, packing from least significant to most significant. Unused bit positions within a byte are cleared on transmission from the OMNI and ignored by the OMNI when receiving.
- Writing to status points is allowed but normally is pointless as the status point will be refreshed by the OMNI every 500 ms.
- Valid addresses for this type of data are: 1XXX i.e. 1101, 1705, 1921 etc.
- 16-bit Integer Registers:** All data points of this type can be read via Modbus function code 03 and written to using function codes 06 and 10.
- Byte order transmitted is: MS byte then LS byte.
- Valid addresses for this type of data are: X3XXX i.e. 3121, 13133 etc.
- 8-character ASCII Strings:** All data points of this type can be read via Modbus function code 03 and written to using function code 10 (note that function code 06 is not available on this data type).
- Byte order transmitted is as you would type it.
- Valid addresses for this type of data are: 4XXX i.e. 4101, 4502 etc.
- 32-bit Integer Registers:** Formatted as two's complement. All data points of this type can be read via Modbus function 03 and written to using function codes 06 and 10.
- Byte order transmitted is: MS byte of MS word, LS byte of MS word, MS byte of LS word then LS byte of LS word.
- Valid addresses for this data type are: X5XXX i.e. 5101, 15205 etc.
- 32-bit IEEE Floating Point:** All data points of this type can be read via Modbus function 03 and written to using function codes 06 and 10.
- Byte order transmitted is: Mantissa Sign bit/Exponent byte, LS Exponent bit/MS mantissa byte, middle significant mantissa byte then LS mantissa byte.
- Valid addresses for this data type are: X7XXX i.e. 7210, 17006 etc.
- 16-character ASCII Strings:** All data points of this type can be read via Modbus function code 03 and written to using function code 10 (note that function code 06 is not available for this data type).
- Byte order transmitted is as you would type it.
- Valid addresses for this type of data are: 14XXX i.e. 14001, 14022 etc.

OMNI Flow Computer Modbus® Database Extents

Data within the OMNI Flow Computer data base is organized in logical groups. Certain data written to the OMNI requires special processing to occur in the OMNI before it is stored in the data base. Other data is grouped together because it is related in function i.e. a collection of real-time data for a specific process.

Table 1 shows the extent of each table or set of data points within the data base. Because the sets of data are not connected, data from adjacent sets cannot be read or written in the same poll.

Table 1. OMNI Flow Computer Modbus® Database Extents

DATA POINT ADDRESS	DATA TYPE	APPLICABLE MODBUS FUNCTION CODES (HEX) USED TO Read/Write	COMMENTS
001	Mixed	03 03 (06) (10)	User-defined read only packet - OMNI native mode. User-defined array - Modicon compatible.
201	Mixed	03 03 (06) (10)	User-defined read only packet - OMNI native mode. User defined array - Modicon compatible.
401	Mixed	03 03 (06) (10)	User-defined read only packet - OMNI native mode. User defined array - Modicon compatible.
701	Mixed	03	#1 User defined data archive record - Firmware Revisions 70+.
702	Mixed	03	#2 User defined data archive record - Firmware Revisions 70+.
703	Mixed	03	#3 User defined data archive record - Firmware Revisions 70+.
704	Mixed	03	#4 User defined data archive record - Firmware Revisions 70+.
705	Mixed	03	#5 User defined data archive record - Firmware Revisions 70+.
706	Mixed	03	#6 User defined data archive record - Firmware Revisions 70+.
707	Mixed	03	#7 User defined data archive record - Firmware Revisions 70+.
708	Mixed	03	#8 User defined data archive record - Firmware Revisions 70+.
709	Mixed	03	#9 User defined data archive record - Firmware Revisions 70+.
710	Mixed	03	#10 User defined data archive record - Firmware Revisions 70+.
711	Mixed	03	Alarm/Event Log archive record - Firmware Revisions 70+.
712	Mixed	03	Audit Log archive record - Firmware Revision Versions 70+.
1001 to 1099	Status & Command	01, (05), (0F)	
1101 to 1199	Status	01	

DATA POINT ADDRESS	DATA TYPE	APPLICABLE MODBUS FUNCTION CODES (HEX) USED TO Read/Write	COMMENTS
1201 to 1299	Status	01	
1301 to 1399	Status	01	
1401 to 1499	Status	01	
1501 to 1649	Status & Command	01, (05), (0F)	Scratchpad variables (Point 1600 is a dummy point included to concatenate tables 15XX and 16XX).
1650 to 1699	Status & Command	01, (05), (0F)	Scratchpad one-shot (2 sec)
1701 to 1799	Status & Command	01, (05), (0F)	
1801 to 1899	Status	01	
1901 to 1999	Status	01	
2001 to 2099	Status	01	Reserved for Future Expansion - currently will return error exception 02 (illegal data address).
2101 to 2199	Status	01	
2201 to 2299	Status	01	
2301 to 2399	Status	01	
2401 to 2499	Status	01	
2501 to 2699	Status	01	Reserved for Future Expansion - currently will return error exception 02 (illegal data address).

DATA POINT ADDRESS	DATA TYPE	APPLICABLE MODBUS FUNCTION CODES (HEX) USED TO Read/Write	COMMENTS
2701 to 2799	Status & Command	01, (05), (0F)	
2801 to 2899	Status	01	
2901 to 2999	Status	01	Reserved for Future Expansion - currently will return error exception 02 (illegal data address).
3001 to 3099	16-bit Integer Register	03, (06), (10)	
3101 to 3199	16-bit Integer Register	03, (06), (10)	
3201 to 3299	16-bit Integer Register	03, (06), (10)	
3301 to 3399	16-bit Integer Register	03, (06), (10)	
3401 to 3499	16-bit Integer Register	03, (06), (10)	
3501 to 3599	16-bit Integer Register	03, (06), (10)	Scratchpad variables
3601 to 3699	16-bit Integer Register	03, (06), (10)	
3701 to 3799	16-bit Integer Register	03, (06), (10)	
3801 to 3899	16-bit Integer Register	03, (06), (10)	
3901 to 3999	16-bit Integer Register	03, (06), (10)	
4001 to 4099	8-character ASCII String	03, (10)	Reserved for Future Expansion - currently will return error exception 02 (illegal data address).

DATA POINT ADDRESS	DATA TYPE	APPLICABLE MODBUS FUNCTION CODES (HEX) USED TO Read/Write	COMMENTS
4101 to 4199	8-character ASCII String	03, (10)	
4201 to 4299	8-character ASCII String	03, (10)	
4301 to 4399	8-character ASCII String	03, (10)	
4401 to 4499	8-character ASCII String	03, (10)	
4501 to 4599	8-character ASCII String	03, (10)	Scratchpad variables
4601 to 4699	8-character ASCII String	03, (10)	
4701 to 4799	8-character ASCII String	03, (10)	
4801 to 4899	8-character ASCII String	03, (10)	
4901 to 4999	8-character ASCII String	03, (10)	
5001 to 5099	32-bit Integer 2s Complement	03, (06), (10)	Reserved for Future Expansion - currently will return error exception 02 (illegal data address).
5101 to 5199	32-bit Integer 2s Complement	03, (06), (10)	
5201 to 5299	32-bit Integer 2s Complement	03, (06), (10)	
5301 to 5399	32-bit Integer 2s Complement	03, (06), (10)	

DATA POINT ADDRESS	DATA TYPE	APPLICABLE MODBUS FUNCTION CODES (HEX) USED TO Read/Write	COMMENTS
5401 to 5499	32-bit Integer 2s Complement	03, (06), (10)	
5501 to 5599	32-bit Integer 2s Complement	03, (06), (10)	Scratchpad variables
5601 to 5699	32-bit Integer 2s Complement	03, (06), (10)	Reserved for Future Expansion - currently will return error exception 02 (illegal data address).
5701 to 5799	32-bit Integer 2s Complement	03, (06), (10)	Reserved for Future Expansion - currently will return error exception 02 (illegal data address).
5801 to 5899	32-bit Integer 2s Complement	03, (06), (10)	
5901 to 5999	32-bit Integer 2s Complement	03, (06), (10)	
6001 to 6099	32-bit IEEE Floating Point	03, (06), (10)	Applicable to Firmware Revisions 22/26.71+.
6101 to 6199	32-bit IEEE Floating Point	03, (06), (10)	32-bit, 2s Complement (Applicable to Firmware Revisions 22/26.71+, 23.70+)
6201 to 6299	32-bit IEEE Floating Point	03, (06), (10)	32-bit, 2s Complement (Applicable to Firmware Revisions 22/26.71+, 23.70+).
6301 to 6399	32-bit IEEE Floating Point	03, (06), (10)	32-bit, 2s Complement (Applicable to Firmware Revisions 22/26.71+, 23.70+).
6401 to 6499	32-bit IEEE Floating Point	03, (06), (10)	32-bit, 2s Complement (Applicable to Firmware Revisions 22/26.71+, 23.70+).
6501 to 6799	32-bit IEEE Floating Point	03, (06), (10)	Applicable to Firmware Revisions 22/26.71+

DATA POINT ADDRESS	DATA TYPE	APPLICABLE MODBUS FUNCTION CODES (HEX) USED TO Read/Write	COMMENTS
6801 to 6899	32-bit IEEE Floating Point	03, (06), (10)	32-bit, 2s Complement (Applicable to Firmware Revisions 22/26.71+, 23.70+).
6901 to 6999	32-bit IEEE Floating Point	03, (06), (10)	Reserved for Future Expansion - currently will return error exception 02 (illegal data address).
7001 to 7099	32-bit IEEE Floating Point	03, (06), (10)	
7101 to 7199	32-bit IEEE Floating Point	03, (06), (10)	
7201 to 7299	32-bit IEEE Floating Point	03, (06), (10)	
7301 to 7399	32-bit IEEE Floating Point	03, (06), (10)	
7401 to 7499	32-bit IEEE Floating Point	03, (06), (10)	
7501 to 7599	32-bit IEEE Floating Point	03, (06), (10)	Scratchpad variables
7601 to 7699	32-bit IEEE Floating Point	03, (06), (10)	
7701 to 7799	32-bit IEEE Floating Point	03, (06), (10)	
7801 to 7899	32-bit IEEE Floating Point	03, (06), (10)	
7901 to 8499	32-bit IEEE Floating Point	03, (06), (10)	
8501 to 8599	32-bit IEEE Floating Point	03, (06), (10)	
8601 to 8699	32-bit IEEE Floating Point	03, (06), (10)	

DATA POINT ADDRESS	DATA TYPE	APPLICABLE MODBUS FUNCTION CODES (HEX) USED TO Read/Write	COMMENTS
8701 to 8799	32-bit IEEE Floating Point	03, (06), (10)	
8801 to 8899	32-bit IEEE Floating Point	03, (06), (10)	
8901 to 8999	32-bit IEEE Floating Point	03, (06), (10)	
9001 to 9499	ASCII Text Buffers	41, (42)	Maximum of sixty-four 128-byte buffers per data point.
9500 to 9899	ASCII Text Buffers	41, (42)	Maximum of sixty-four 128-byte buffers per data point.
9901 to 9999	ASCII Text Buffers	41, (42)	Maximum of sixty-four 128-byte buffers per data point.
10000 to 13000	Reserved for Future Expansion - currently will return error exception 02 (illegal data address).		
13001 to 13299	16-bit Integer Registers	03, (06), (10)	
13301 to 13399	16-bit Integer Registers	03, (06), (10)	
13401 to 13499	16-bit Integer Registers	03, (06), (10)	
13501 to 13599	16-bit Integer Registers	03, (06), (10)	
13601 to 13699	16-bit Integer Registers	03, (06), (10)	
13701 to 13799	16-bit Integer Registers	03, (06), (10)	
13801 to 13899	16-bit Integer Registers	03, (06), (10)	

DATA POINT ADDRESS	DATA TYPE	APPLICABLE MODBUS FUNCTION CODES (HEX) USED TO Read/Write	COMMENTS
13901 to 13999	16-bit Integer Registers	03, (06), (10)	
14001 to 14099	16-character ASCII String	03, (10)	
14101 to 14199	16-character ASCII String	03, (10)	
14201 to 14299	16-character ASCII String	03, (10)	
14301 to 14399	16-character ASCII String	03, (10)	
14400 to 15000	Reserved for Future Expansion - currently will return error exception 02 (illegal data address).		
15001 to 15299	32-bit Integer 2s Complement	03, (06), (10)	
15301 to 15499	32-bit Integer 2s Complement	03, (06), (10)	
15501 to 15599	32-bit Integer 2s Complement	03, (06), (10)	
15601 to 15699	32-bit Integer 2s Complement	03, (06), (10)	
15701 to 15799	32-bit Integer 2s Complement	03, (06), (10)	
15801 to 15899	32-bit Integer 2s Complement	03, (06), (10)	
15901 to 15999	32-bit Integer 2s Complement	03, (06), (10)	
16000 to 17000	Reserved for Future Expansion - currently will return error exception 02 (illegal data address).		

DATA POINT ADDRESS	DATA TYPE	APPLICABLE MODBUS FUNCTION CODES (HEX) USED TO Read/Write	COMMENTS
17001 to 17399	32-bit IEEE Floating Point	03, (06), (10)	
17401 to 17499	32-bit IEEE Floating Point	03, (06), (10)	
17501 to 17899	32-bit IEEE Floating Point	03, (06), (10)	
17901 to 17999	32-bit IEEE Floating Point	03, (06), (10)	
18001 to 18099	32-bit IEEE Floating Point	03, (06), (10)	Reserved for Future Expansion - currently will return error exception 02 (illegal data address).
18101 to 18199	32-bit IEEE Floating Point	03, (06), (10)	
18201 to 18299	32-bit IEEE Floating Point	03, (06), (10)	
18301 to 18399	32-bit IEEE Floating Point	03, (06), (10)	
18401 to 18499	32-bit IEEE Floating Point	03, (06), (10)	
18501 to 18599	32-bit IEEE Floating Point	03, (06), (10)	
18601 to 18699	32-bit IEEE Floating Point	03, (06), (10)	
18701 to 18799	32-bit IEEE Floating Point	03, (06), (10)	
18801 to 18899	32-bit IEEE Floating Point	03, (06), (10)	
18901 to 18999	32-bit IEEE Floating Point	03, (06), (10)	

DATA POINT ADDRESS	DATA TYPE	APPLICABLE MODBUS FUNCTION CODES (HEX) USED TO Read/Write	COMMENTS
19001 to 19099	Reserved for Future Expansion - currently will return error exception 02 (illegal data address).		
19101 to 19199	32-bit IEEE Floating Point	03, (06), (10)	
19201 to 19299	32-bit IEEE Floating Point	03, (06), (10)	
19301 to 19399	32-bit IEEE Floating Point	03, (06), (10)	
19401 to 19499	32-bit IEEE Floating Point	03, (06), (10)	
19500 to 49999	Reserved for Future Expansion - currently will return error exception 02 (illegal data address).		

I/O Driver Concerns When Interfacing to OMNI Equipment

Most but not all of the data is grouped in blocks of 100 or so data points. These blocks in many cases are not connected.

Limit requests for contiguous data across different blocks by examining the third digit from the right of the data point start and end addresses. If the digit is different break up the poll request.

For Example

An application requires data from points 7188, 7201 and 7210 to be read and displayed on screen. An intelligent I/O driver may determine that it is more efficient to read twenty-three (23) data points starting with point 7188 and discard the unused data. In this particular example the OMNI will transmit the data for points 7188 through 7199 and blank data will be returned for data points 7200 through 7210 because the data requested is in two (2) different blocks within the OMNI. To obtain the data correctly the I/O driver should determine that point 7188 and point 7201 are in different data blocks (because the third digit from the right changed from a 1 to a 2) and send out two (2) data requests; one (1) request for point 7188 and another for points 7201 through 7210.

Write Single Variable - Modbus Function 06

OMNI software revisions 20.44 and greater implement this function on all 16-bit and 32-bit data points. Revisions prior to 20.44 implement function 06 on 16-bit integers only. To maintain compatibility with early OMNI software revisions it may be advisable to use function ten (10) to write to single data points as well as multiple data points.

Address Ranges - Future Expansion

Some of the address ranges specified in this document encompass more data than may be available on all applications at this time, OMNI advises that for future compatibility any software driver developed should be able to support these address ranges.

DOCUMENT REVISION HISTORY

DOCUMENT INITIAL RELEASE DATE.....15-May-2003

<u>REVISION</u>	<u>DATE</u>	<u>PURPOSE / CHANGE REQUEST</u>
A	15-May-2003	Maintained on the web - Initial release
B	06-March-2009	DCR 090076