Communication guide

Doc.No. MDG-01Rev1.0

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This document covers the standard Modbus protocol communication using RS-485 two wire link and data formating used with "**Mash Electric**" bldc drivers only.

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Communication specifications :

(1) Communication standard : RS-485 half duplex ,serial & asynchonous.
(2) Communication mode : Modbus RTU.
(3) Character system : 8-bit data (hexadecimal format), No parity, 1 stop bit
(4) Communication speed : 9600 bps.
(5) Error checking : 16-bit CRC starts with 0xFFFF.

Description:

This communication uses query and response mechanism between master & slave supporting only two function codes for drive parameter access and manipulations.
(1) multiple register read : “0x03 “ (Used for single register read only).
(2) single register write : “0x06”.

Driver requires its identity number or address that is “Slave ID” in the range of 1 to 250.The slave ID “00” is reserved for broadcasting message to all drivers connecting on same RS-485 link and address ranging from 251-255 can't used by users.

The register address starting from 4001 to 4999. Detailed allocation of address to the driver parameters are given in below table with their default values and data ranges.

Driver parameter list:

No.	Address	Parameter name	Range	Default value	Unit
1	4000	Station address	1 - 250	1	
2	4001	Motor current	Factory set	Factory set	A
3	4002	Motor Speed	1 - 25000	3000	rpm
4	4003	Motor poles	2 – 98	8	
5	4004	Acceleration time	0.5 - 60	3	Sec
6	4005	Deceleration time	0.0 - 60	0.5	Sec
7	4006	Speed Ref. By Communication	0 - 25000	0	rpm
8	4007	Control Mode	0 – 1	0	
9	4008	PID proportional gain	0.1 - 100	0.5	

No.	Address	Parameter name	Range	Default value	Unit
10	4009	PID integral gain	0.1 - 100	0.5	
11	400A	PID derivative gain	0.1 - 100	0	
12	400B	PID ouptput upper limit	0 - 100	100	%
13	400C	PID output lower limit	0 - 100	0	%
14	400D	Minimum Reference	0 -100	0	%
15	400E	Maximum Reference	1 -100	100	%
16	400F	Control bit			
17	4010	Fault status			
18	4011	Real time speed			rpm

Control bit description:

The control bit have following settings.

Bit 0 - 0 : Enable, forward/reverse and brake by local terminals.
1 : Control via communication.
Bit 1 - 0 : Speed control via analog refference.
1 : Speed control via communication.
Bit 2 - 0 : Enable inactive
1 : Enable active.
Bit 3 - 0 : Forward command
1 : Reverse command
Bit 4 - 0 : Brake inactive
1 : Brake active.

Fault status:

The fault status bits have following fault indications.

Bit 0 - Motor stalled.
Bit 1 - Motor over current.
Bit 2 - Supply under voltage
Bit 3 - Supply over voltage
Bit 4 - Hall sensor fault.
Bit 5 - Fatal error.

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Note: All parametes having one decimal point accuracy like acceleration and deceleration, up time and down times , proportional gain and integral gain and motor current are send over communication by multiplying 10 only. Means if required to send 0.1 than send 0.1 x 10 = 1 and vice versa if receiving 1 than divide by 10 .

Normal read query/response example:

Query: 01 03 40 01 00 01 91 CA

0x01 : station address
0x03 : function code
0x40 : register address high byte
0x01 : register address low byte
0x00 : Number of points to be read high
0x01 : Number of points to be read low (parameter number 1)
0x91 : CRC Low
0xCA: CRC High

Response: 01 03 02 00 54 79 84

0x01 : station address
0x03 : function code
0x02 : Data byte count
0x00 : Data High
0x54 : Data Low
0x79 : CRC Low
0x84 : CRC High

Normal write query/response example:

Query: 01 06 40 0A 00 00 BC 08

0x01 : station address
0x06 : function code
0x40 : register address high byte
0x0A : register address low byte (parameter number 10)
0x00 : Data high
0x00 : Data low
0xBC : CRC Low
0x08: CRC High

Response: 01 06 40 0A 00 00 BC 08

0x01 : station address
0x06 : function code
0x40 : register address high byte
0x0A : register address low byte (parameter number 10)
0x00 : Data high
0x00 : Data low
0xBC : CRC Low
0x08: CRC High

Communication excepitons:

(1) Illegal function code : 0x01
(2) Illegal register address code : 0x02
(3) Illegal number of points to read : 0x03.

Example : If read query have illegal function code than drive send function ored with 0x80 and exception code 0x01 in their respective bytes.

Response : 0x01 station address
0x83 read register with error of function code (ored with 0x80)
0x01 exception code for function code error.
CRCLo
CRCHi

Also if it has CRC error or parameter write error drive will not responding and the master has to initiate time out process and resend the query again.