FLOWSERVE

Network Advanced Diagnostics Objects

Experience In Motion

CONTENTS

1 Introduction

1.1 Purpose

This manual defines and explains how to read the actuator's advanced diagnostics through its Diagnostics Object Protocol (DOP). This user manual should be used as an addendum to any network protocol, through means of communicating to the actuator remotely, for the purposes of reading advanced diagnostics data. Limitorque actuators were first introduced with its MX and QX series B actuators and contain data on general status, time-stamped and categorized operational logs, graphical data, as well as time-stamped deviation data. This manual will outline how to poll for specific data (objects) and their sequence of reading/writing.

1.2 How to Use this Manual

Each section provides the user with information on the type of data stored within each object, its response, as well as any needed follow-up commands.

This manual does not define the index or registers in order to read this data, as that information can be found in the relevant network IOMs. This manual just defines the objects that can be read by the networks through their means of reading data. An example of this would be the differences between reading indexes with Profibus vs. registers with Modbus; those differences are outlined in their respective IOMs.

Any questions with this IOM, please contact your local distributor or Flowserve at LimitorqueService@flowserve.com or by calling +1-434-528-4400.

1.3 User Knowledge

It is recommended that the user read this manual in its entirety before the implementation of any diagnostics are done at a site.

The user needs to have a fundamental knowledge of electric actuators and industrial network protocols. An understanding of valve actuators and digital control systems is beneficial to the field unit user.

2   Reading of Advanced Diagnostic Data

2.1 Data Definitions

Definition	Model
Command Request Register	11-bit object ID allows ID's
Diagnostic Indicator Status Registers	Used to show active/inactive state of user-configured indicators
Response Status Register	11-bit ID matching request being processed 3-bit status
Command Response Data Count	
Response Data Registers	Array of 512 registers

Reading of the objects is first done by writing the object ID to the Command Request Data register. Upon successful write, the Response Status Register can be read for indication of a completed command. Once status indicates READY, the Command Response Data Count can be read followed by the reading of the response data stored in the Response Data registers.
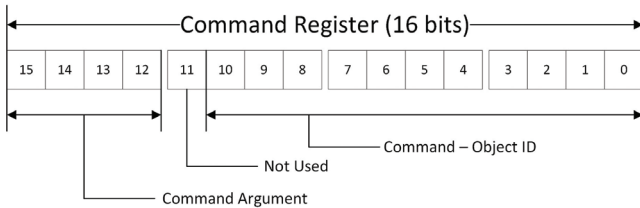
2.1.1   Command Request Data

This register must be written and structured as the above figure for proper writing. The Object ID will be written in the response status register. The command argument will help define ranges or times available per specific object. The command register for each object can be found in each object's corresponding section.

Example from Object ID 1:

0x0001 = 24 Hours

0x1001 = 30 Days

The most significant bit differs from 0 to 1. The zero represents 24Hr, while the 1 indicates 30 Days for the same object ID found in the least significant 10 bits. The object ID is 1, which is for Vibration Level vs. Time Graph.

2.1.2   Diagnostic (User) Indicator Status Data

This 64-bit value provides the status (Active = 1, Not Active = 0) of the various user indicators. The indicators are user-configurable and may be enabled or disabled. If disabled, they will not show as active, even if the configured conditions are present. Each of the configurable indicators have additional configuration elements to set levels.

Active indicators will not clear when the triggering condition is no longer present; they must be acknowledged by the user to clear them. Clearing of indicators can only be done locally at the actuator through the actuator menus.

A high-level, single-bit indication that any user indicator is active will be placed in legacy Modbus Fault Register 10 at bit 7 (replaces defunct inhibit conflict bit). The user can poll this bit and if it goes active, determine which indicator(s) are active by polling this Diagnostic Indicator Status Register.

A user-configurable relay can also be set to trip on User Indicators.
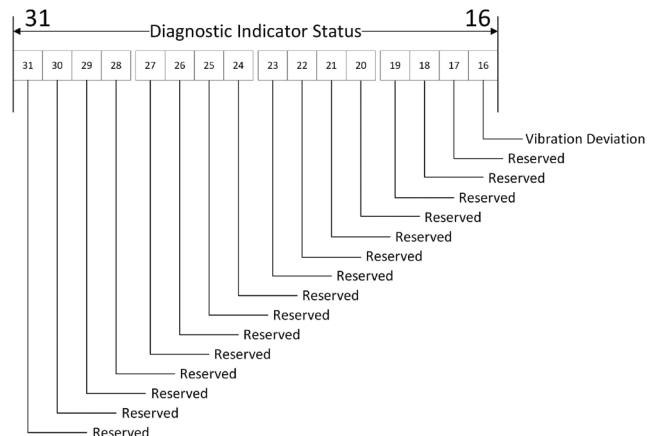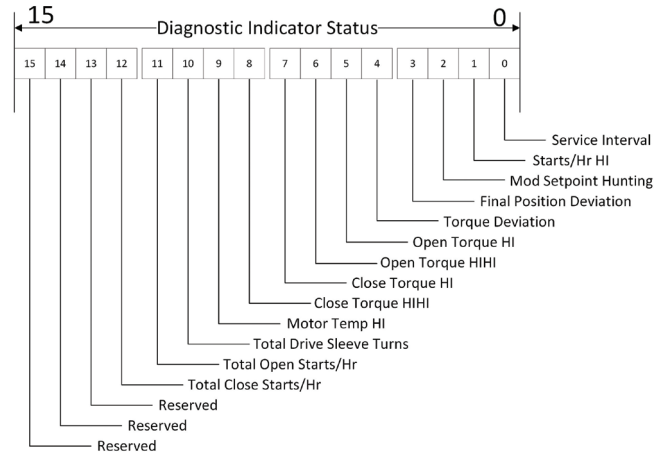
2.1.3 Response Status Data

After issuing a command, this register would be polled on a periodic basis, checking for completion of the command. To match the response to the command, the object ID of the requested command will be returned with the status.
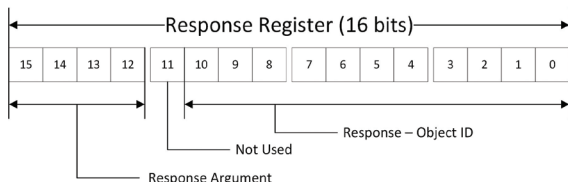
Value	Status	Description
1	Busy	The DOP is busy processing a command.
2	Ready	The last requested command has completed successfully, and any return data is available in the Response Data Registers.
3	Error	An error has occured, and the command was not able to be processed. An error code has been saved to the Respose Data Registers at offset 0.

Error Code: 16 bits

When an error is indicated in the Response Status Register, an error code will be provided in the first register offset of the Response Data Registers as an unsigned-16 value. Additional error information may be stored there but is not intended at this time.

Error Code	Description
0	None
1	Unhandled Command
2	Object Too large
3	Command Option Invalid
4	Command Q Failed
5	Write Unlock Failed
6	Parameter out of Range
7	Fail to Save
8	Fail to Execute
9	Write Not Allowed Now
10	DOP Board Link Busy
11	DOP Board Response Timeout
12	DOP Board Request Error
13	DOP Board Response Invalid
14	Parameter Count Mismatch
15	

2.1.4 Command Response Data Count

This is the number of registers of data returned in the Response Data Register section. The count will depend upon the Object ID of the Command Request being responded to.

2.1.5 Response Data

Array of 512 registers to be used to store whatever data set has been requested. The format of the data will be defined for each object ID. Upon receipt of command, only the sub-set of Response Data Registers required for that command will be cleared. The customer should only expect valid return data in those Response Data Registers defined for each Object ID. In the case of an error, only the first register in the Response Data Register will be valid and it will contain an error code.

2.1.6 Word Ordering

Modbus addresses are defined for 16-bit registers. When accessing different sized variables via Modbus register, the user must take **endianness** into account.

1. 8-bit values will be returned with the 8-bit value and an additional 8 bits. In the document, it will always be explicitly called out as the high byte (H) or the low byte (L) of the register.

2. 16-bit values are returned as a single register with MSB first, and LSB last.

   a. Value = 0x0045
   b. Return = 0045

3. 32-bit values are returned as two registers with LSW first, MSW second.

   a. Value = 0x4501 3492
   b. Return = 3492 4501

4. 64-bit values are returned as four registers with LSDW (LSW first, MSW second) first; MSDW (LSW first, MSW second)

   a. Value = 0x0000 0001 6026 9ECB
   b. Return = 9ECB 6026 0001 0000

5. Array data is placed in registers starting with LSB. Example: Array[0] ->Reg[0].LSB, Array[1]->Reg[0]. MSB, etc.

3　Object Definitions

3.1　Vibration Objects

3.1.1　Object ID 1: Vibration Level vs. Time Graph

Vibration Level vs. Time Graph Command Request Register
0x0001 = 24 Hours
0x1001 = 30 Days
0x2001 = 12 Months
0x3001 = 10 Years

Vibration Level vs. Time Graph

Two sets of graph data are available: Maximum and Average Vibration. Both sets will be returned when this object ID is requested. The data set for both graphs will be returned according to the time scale selected, and the possible number of points will be defined by the time scale. For example, if the user requests 12 months, both the Maximum and Average data will be returned in the 12-month format.
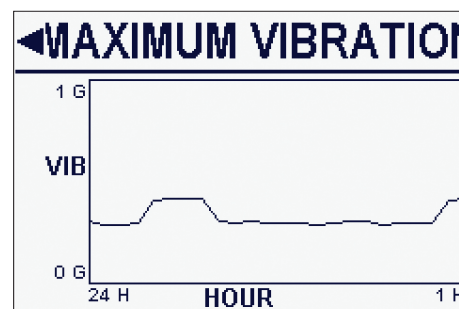
Figure 1: Sample vibration level vs. time graph

Command Request = 0x0001 - 24 Hours			
Response Data Registers			
Offset	Type	Data	Notes
0	U16	No of Max Vib Data Pts	For 24 hrs max, or less
1 to 47	S32	Max Vib Yr Pt No	Newest to oldest (mG units)
49 to 95	S32	Avg Vib Yr Pt No	
97	S64	Start Date/Time	Epoch time units
101	S64	End Date/Time	

Command Request = 0x1001 - 30 Days			
Response Data Registers			
Offset	Type	Data	Notes
0	U16	No of Max Vib Data Pts	For 30 Days Max, or Less
1 to 59	S32	Max Vib Yr Pt No	Newest to Oldest (mG Units)
61 to 119	S32	Avg Vib Yr Pt No	
121	S64	Start Date/Time	Epoch Time Units
125	S64	End Date/Time	

Command Request = 0x2001 - 12 Months			
Response Data Registers			
Offset	Type	Data	Notes
0	U16	No of Max Vib Data Pts	For 12 Months Max, or Less
1 to 23	S32	Max Vib Yr Pt No	Newest to Oldest (mG Units)
25 to 47	S32	Avg Vib Yr Pt No	
49	S64	Start Date/Time	Epoch Time Units
53	S64	End Date/Time	

Command Request = 0x3001 - 10 Years			
Response Data Registers			
Offset	Type	Data	Notes
0	U16	No of Max Vib Data Pts	For 10 Years Max, or Less
1 to 19	S32	Max Vib Yr Pt No	Newest to Oldest (mG Units)
21 to 39	S32	Avg Vib Yr Pt No	
41	S64	Start Date/Time	Epoch Time Units
45	S64	End Date/Time	

3.1.2 Object ID 2: Elapsed Time vs. Vibration Histogram

Elapsed Time vs. Vibration Histogram Command Request Register			
0x0002 = Elapsed Time vs. Vibration Histogram			

Command Request = 0x0002			
Response Data Registers			
Offset	Type	Data	Notes
0	U16	No. of Bins	15 points
1 to 19	S32	Time (s) at Vib (G)	0 to 4G interval, 0.4G increment
21 to 29	S32	Time (s) at Vib (G)	4 to 20G interval, 3.2G increment
31 to 67	S64	TIme (epoch) at Vib (G)	0 to 4G interval, 0.4G increment
71 to 87	S64	Time (epoch) at Vib (G)	4 to 20G interval, 3.2G increment

Elapsed Time vs. Vibration Histogram

Two sets of data are returned when this object ID is requested: the time in seconds spent in each acceleration range as well as the latest time/date when the data was last updated. Date and time are in epoch units.
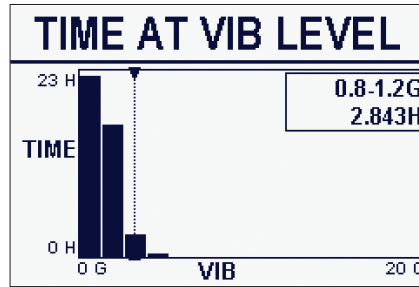
Figure 2: Sample elapsed time vs. vibration histogram

3.1.3 Object ID 3 and 4: Vibration vs. Open or Vibration vs. Close Position Histograms

Vibration vs. Position Histogram Command Request Register	
Open Position	Close Position
0x0003 = Last Run Histograms	0x0004 = Last Run Histograms
0x1003 = Summary Run Histograms	0x1004 = Summary Run Histograms
0x2003 = Saved Reference Histograms	0x2004 = Saved Reference Histograms

Command Request			
Response Data Registers			
Offset	Type	Data	Notes
0 to 18	S32	Max Vib at 0 to 100% Travel	Newest to Oldest (mG Units)
20 to 38	S32	Min Vib at 0 to 100% Travel	
40 to 58	S32	Avg Vib at 0 to 100% Travel	
60 to 96	S64	Time of Max Vib at 0 to 100% Travel	Epoch Time Units

Note: *Vibration vs. open position histograms have the same response data registers as the vibration vs. close position histograms.*

Vibration vs. Open Position Histograms

Vibration vs. Open Position. Three sets of graph data are available: Maximum, Minimum and Average Vibration. All sets will be returned when the object ID is requested. The time frame of the last open stroke can be selected as the last run, a summary of runs, or the saved reference run. (Reference runs must be saved to be viewed.)

Vibration vs. Close Position Histograms

Vibration vs. Close Position. Three sets of graph data are available: Maximum, Minimum and Average Vibration. All sets will be returned when the object ID is requested. The time frame of the last close stroke can be selected as the last run, a summary of runs, or the saved reference run. (Reference runs must be saved to be viewed.)
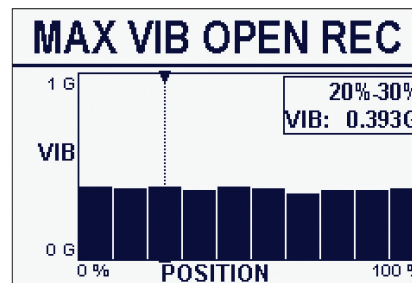
Figure 3: Sample vibration vs open position histogram.

3.1.4 Object ID 5: Present Vibration Runtime Parameters

Command Request = 0x0005			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0 to 2	S16	Acc RMS X, Y, Z Axes	mG Units
3	S32	Acc RMS Vector Value	
5 to 7	S16	Acc Avg X, Y, Z Axes	
8 to 10	U16	FFT Max Hz X, Y, Z Axes	Hz x 10
11 to 13	S16	Acc Peak X, Y, Z Axes	mG Units

Present Vibration Runtime Parameters

Present Vibration Runtime Parameters is a summary of the three vibration axes. It provides the RMS, Average and Peak of all three axes' acceleration values. It also provides the max frequency observed on the axes.

3.1.5 Object ID 6: Historical Maximum Vibration Level

Command Request = 0x0006			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	S64	Rated Vib Occ Timestamp	mG Units
4 to 6	S16	Rated Vib Acc RMS X, Y, Z Axes	
7	S32	Rated Vib Acc RMS Vector Value	
9 to 11	U16	Rated Vib Max Hz X, Y, Z Axes	Hz x 10
12	S32	Rated Vib LTA RMS Vector Value	mG Units
14	S64	Vib HI Occ Timestamp	
18 to 20	S16	Vib HI Acc RMS X, Y, Z Axes	
21	S32	Vib HI Acc RMS Vector Value	
23 to 25	U16	Vib HI Max Hz X, Y, Z Axes	Hz x 10
26	S32	Vib HI LTA RMS Vector Value	mG Units

Historical Maximum Vibration Levels

Historical Maximum Vibration Levels is a summary of the three vibration axes' historical max recordings. Acceleration and frequency are stored based on when the units' rated vibration ratings were last eclipsed as well as the data/time in epoch units. If configured, the tripping of the Vibration HI setpoint can be observed in this data as well. Setting of the Vibration HI can be found in the User Indicators section of the Advanced Diagnostics menu in the actuator.

3.1.6 Object ID 7: Last Vibration Level Exceeded Details

Vibration vs. Position Histogram Command Request Register
Open Position
0x0007 = Last Run Histograms
0x1007 = Summary Run Histograms
0x2007 = Saved Reference Histograms

Command Request = 0x0006			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	S64	Start Time	Epoch Time Units
4	S64	End Time	
8	U32	Occ Count	
10	S32	Max Dev (mG)	
12	U32	Level Setting (mG)	
14	U16	Position	% Open x 10
15	S16	Torque	% Rating x 10
16	S16	Speed	rpm x 100
17	S16	Motor Temp	Hz x 10
18 to 20	S16	Max Peak X, Y, Z Axes	mG Units
21	S32	Max Peak Vector Value	
23 to 25	S16	Max RMS X, Y, Z Axes	
26 to 28	U16	Max Hz X, Y, Z Axes	Hz x 10

Last Vibration Level Exceeded Details

Last Vibration Level Exceeded Details is a summary of the unit's performance during the vibration exceeded event. The summary includes start and end times of the vibration event, position, torque, motor temperature, and speed of the unit at the time, as well as vibration information captured. This summary can be selected for the trip event for the unit's rated vibration, the configured Vibration HI indicator or the Deviation indicator. Setting of the Vibration HI and Deviation indicators can be found in the User Indicators section of the Advanced Diagnostics menu in the actuator.

4 Position Objects

4.1 Object ID 201: Motor On-Time vs. Position

Command Request = 0x000C9			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0 to 18	U32	Open On-Time, 0 to 100% Travel	Bins = 10% Position, Newest to Oldest (S Units)
20 to 38	U32	Close On-Time, 0 to 100% Travel	
40 to 76	S64	Open Time, 0 to 100% Travel	
80 to 116	S64	Close Time, 0 to 100% Travel	

Motor On-Time vs. Position

Two sets of histogram data are available: Open and Close On-Time. The data returned is accumulated time (in seconds) that the actuator has spent running within the 10% wide "time bins." This graph can clarify how much motor runtime the unit has between certain positions.
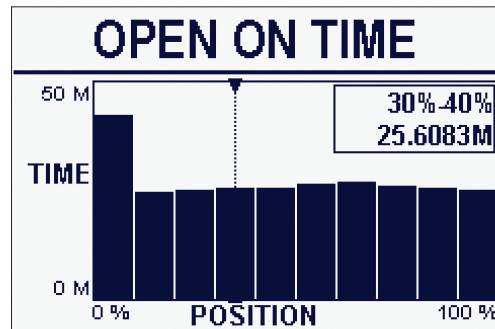
Figure 4: Sample motor on-time vs. position histogram

4.2 Object ID 202: Motor Starts/Hr vs. Position

Command Request = 0x00CA - Current Value			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0 to 9	U16	Open Start/Hr, 0 to 100% Travel	Bins = 10% Pos., (Starts/Hr Units)
10 to 19	U16	Close Start/Hr, 0 to 100% Travel	
20 to 56	S64	Open Time of Entry, 0 to 100% Travel	
60 to 96	S64	Close Time of Entry, 0 to 100% Travel	
Command Request = 0x10CA - Maximum Value			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0 to 9	U16	Open On-Time, 0 to 100% Travel	Bins = 10% Pos., (Starts/Hr Units)
10 to 19	U16	Close Start/Hr, 0 to 100% Travel	
20 to 56	S64	Open Time of Entry, 0 to 100% Travel	
60 to 96	S64	Close Time of Entry, 0 to 100% Travel	

Motor Starts/Hr vs. Position

Two sets of histogram data are available: Open and Close On-Time. The data returned is selectable to be either the current or maximum start/hr rate observed within the 10% wide "time bins." This graph can clarify where the unit currently is spending most of its time starting and stopping.
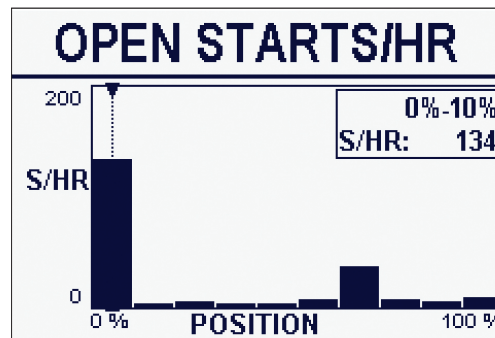

Figure 5: Sample motor starts/hr vs. position histogram

4.3   Object ID 203: Open Final Position Trends

Command Request = 0x00CB			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	No of FPT Data Pts	For 24 Hrs Max, or Less
1 to 47	S32	Max FPT Hr Pt 1 to 24	Newest to Oldest (DST*1,000 Units)
49 to 95	S32	Min FPT Hr Pt 1 to 24	
97 to 143	S32	Avg FPT Hr Pt 1 to 24	
145	S64	Start Date/Time	
149	S64	End Date/Time	
153	U32	Total No of Seats in Time Window	

Command Request = 0x10CB			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	No of FPT Data Pts	For Days Max, or Less
1 to 59	U16	Max FPT Day Pt 1 to 30	Newest to Oldest (DST*1,000 Units)
61 to 119	S64	Min FPT Day Pt 1 to 30	
121 to 179	S64	Avg FPT Day Pt 1 to 30	
181	S64	Start Date/Time	
185	S64	End Date/Time	
189	U32	Total No of Seats in Time Window	

Command Request = 0x20CB			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	No of FPT Data Pts	For 12 Mos Max, or Less
1 to 23	S32	Max FPT Mo Pt 1 to 12	Newest to Oldest (DST*1,000 Units)
25 to 47	S32	Min FPT Mo Pt 1 to 12	
49 to 71	S32	Avg FPT Mo Pt 1 to 12	
73	S64	Start Date/Time	
77	S64	End Date/Time	
81	U32	Total No of Seats in Time Window	

Command Request = 0x30CB			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	No of FPT Data Pts	For 10 Years Max, or Less
1 to 19	S32	Max FPT Yr Pt 1 to 10	Newest to Oldest (DST*1,000 Units)
21 to 39	S32	Min FPT Yr Pt 1 to 10	
41 to 59	S32	Avg FPT Yr Pt 1 to 10	
61	S64	Start Date/Time	
65	S64	End Date/Time	
69	U32	Total No of Seats in Time Window	

Open Final Position Trends

Three sets of graph data are available: Maximum, Minimum and Average Vibration. This graph shows the deviation between end of travel and the preset user configuration reference point. The data set for both graphs will be returned according to the time scale selected, and the possible number of points will be defined by the time scale. For example, if the user requests 12 months, both the Maximum and Average data will be returned in the 12-month format. Setting of the reference point can be found in the User Indicators section of the Advanced Diagnostics menu in the actuator.

Figure 6: Sample open max final position graph

Open Final Position Trends Command Request Register
0x00CB = 24 Hours
0x10CB = 30 Days
0x20CB = 12 Months
0x30CB = 10 Years

4.4   Object ID 204: Close Final Position Trends

Command Request = 0x00CC			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	No of FPT Data Pts	For 24 Hrs Max, or Less
1 to 47	S32	Max FPT Hr Pt 1 to 24	Newest to Oldest (DST*1,000 Units)
49 to 95	S32	Min FPT Hr Pt 1 to 24	
97 to 143	S32	Avg FPT Hr Pt 1 to 24	
145	S64	Start Date/Time	
149	S64	End Date/Time	
153	U32	Total No of Seats in Time Window	
Command Request = 0x10CC			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	No of FPT Data Pts	For 30 Days Max, or Less
1 to 59	S32	Max FPT Day Pt 1 to 30	Newest to Oldest (DST*1,000 Units)
61 to 119	S32	Min FPT Day Pt 1 to 30	
121 to 179	S32	Avg FPT Day Pt 1 to 30	
181	S64	Start Date/Time	
185	S64	End Date/Time	
189	U32	Total No of Seats in Time Window	
Command Request = 0x20CC			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	No of FPT Data Pts	For 12 Mos Max, or Less
1 to 23	S32	Max FPT Mo Pt 1 to 12	Newest to Oldest (DST*1,000 Units)
25 to 47	S32	Min FPT Mo Pt 1 to 12	
49 to 71	S32	Avg FPT Mo Pt 1 to 12	
73	S64	Start Date/Time	
77	S64	End Date/Time	
81	U32	Total No of Seats in Time Window	
Command Request = 0x30CC			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	No of FPT Data Pts	For 10 Years Max, or Less
1 to 19	S32	Max FPT Yr Pt 1 to 10	Newest to Oldest (DST*1,000 Units)
21 to 39	S32	Min FPT Yr Pt 1 to 10	
41 to 59	S32	Avg FPT Yr Pt 1 to 10	
61	S64	Start Date/Time	
65	S64	End Date/Time	
69	U32	Total No of Seats in Time Window	

Close Final Position Trends

Three sets of graph data are available: Maximum, Minimum and Average Vibration. This graph shows the deviation between end of travel and the preset user configuration reference point. The data set for both graphs will be returned according to the time scale selected, and the possible number of points will be defined by the time scale. For example, if the user requests 12 months, both the Maximum and Average data will be returned in the 12-month format. Setting of the reference point can be found in the User Indicators section of the Advanced Diagnostics menu in the actuator.
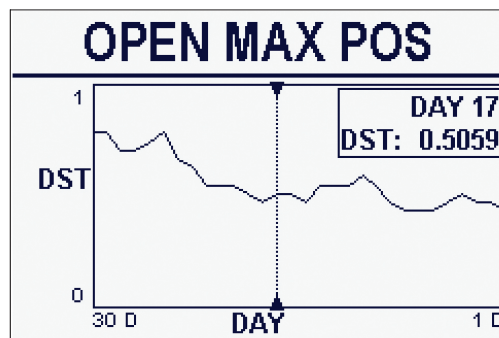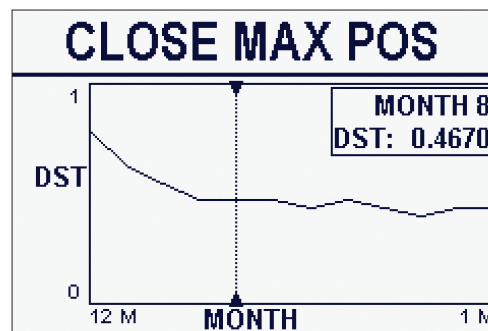

Figure 7: Sample close max final position graph

Open Final Position Trends Command Request Register
0x00CC = 24 Hours
0x10CC = 30 Days
0x20CC = 12 Months
0x30CC = 10 Years

4.5   Object ID 205: Final Position Last Seat Statistics

Offset	Type	Data	Notes
Command Request = 0x00CC			
Response Data Registers			
0	S64	Last Seat Open Date/Time	
4	S32	Last Seat Open Dist From Ref	DST*10,000 Units
6	S32	Last Seat Open Avg Dist From Ref	
8	S16	Last Seat Open RPM at Final Pos	rpm*100 Units
9	U16	Last Seat Open Torque at Final Pos	%*10 Units
10	S16	Last Seat Open Motor Temp at Final Pos	10°C (50°F)*10 Units
11	U16	Last Seat Open Volt at Final Pos	
12	U32	No of Open Seats Since Reset	
14	S32	Open Avg Dis. From Ref Since Reset	
16	S32	Open Max Dist From Ref Since Reset	
18	S32	Open Min Dist From Ref Since Reset	
20	S64	Last Seat Close Date/Time	
24	S32	Last Seat Close Dist From Ref	DST*10,000 Units
26	S32	Last Seat Close Avg Dist From Ref	
28	S16	Last Seat Close rpm at Final Pos	rpm*100 Units
29	U16	Last Seat Close Torque at Final Pos	%*10 Units
30	S16	Last Seat Close Motor Temp at Final Pos	°C (°F)*10 Units
31	U16	Last Seat Close Volt at Final Pos	
32	U32	No of Close Seats Since Reset	
34	S32	Close Avg Dist From Ref Since Reset	
36	S32	Close Max. Dist. From Ref Since Reset	
38	S32	Close Min. Dist. From Ref Since Reset	

Final Position Last Seat Statistics

Final Position Last Seat Statistics is a summary of the last open and close seat unit statistics. The torque, motor temp, voltage and rpm are all tracked during the last seat along with deviation information with relation to the reference saved position. Setting of the reference point can be found in the User Indicators section of the Advanced Diagnostics menu in the actuator.

Open Final Position Trends Command Request Register
0x00CD = 24 Hours
0x10CD = 30 Days
0x20CD = 12 Months
0x30CD = 10 Years

4.6   Object ID 206: Final Position Deviation Indicator Details

Offset	Type	Data	Notes
Command Request = 0x00CC			
Response Data Registers			
0	S64	Open Point Date/Time	Epoch
4	U32	Open Occurrence Count	
6	S32	Open Deviation Value (DST)	DST*10,000 Units
8	S64	Close Point Date/Time	
12	U32	Close Occurrence Count	
14	S32	Close Deviation Value (DST)	DST*10,000 Units

Final Position Deviation Indicator Details

Final Position Deviation Indicator Details responds with the current deviation value, number of occurrences, and time stamp of the last time the unit's seating point was greater than the deviation value of the allowed drive sleeve turns. Setting of the reference point can be found in the User Indicators section of the Advanced Diagnostics menu in the actuator.

4.7   Object ID 207: Starts/Hr Indicators Details

Command Request = 0x00CC			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	S64	Starts/Hr HI Last Occ Date/Time	
4	U32	Starts/Hr HI Last Occ Count	
6	U32	Starts/Hr HI Last Total Time Exceeded	Minutes Units
8	S64	Starts/Hr HI Max Occ Date/Time	
12	U16	Starts/Hr HI Max Exceeded Value	
13	S64	Rated Starts/Hr Last Occ Date/Time	
17	U32	Rated Starts/Hr Last Occ Count	
19	U32	Rated Starts/Hr Last Total Time Exceeded	Minutes Units
21	S64	Rated Starts/Hr Max Occ Date/Time	
25	U16	Rated Starts/Hr Max Exceeded Value	

Starts/Hr Indicators Details

Starts/Hr indicators Details responds with time-stamped related data for user-configurable HI deviations as well as to the units configured starts per hour rating that's set when the actuator was ordered and manufactured. Setting the HI deviation can be found in the User Indicators section of the Advanced Diagnostics menu in the actuator.

4.8   Object ID 208: Service Indicators Details

Command Request = 0x00D0		
Response Data Registers		
Offset	**Type**	**Data**
0	S64	Last Total DST Occ Date/Time
4	U32	Total DST Occ Count
6	S64	Last Total Open Starts/Hr Occ Date/Time
10	U32	Total Open Starts/Hr Occ Count
12	S64	Last Total Close Starts/Hr Occ Date/Time
16	U32	Total Close Starts/Hr Occ Count
18	S64	Last Service Interval Occ Date/Time
22	U16	Service Interval Occ Count
23	U32	Remaining Sec on Service Interval
25	S64	Last Mod Setpoint Hunting Occ Date/Time
29	U32	Mod Setpoint Hunting Occ Count
31	U32	Total Time Hunting (100 ms Ticks)

Service Indicators Details

Service Indicators Details responds with the time-stamped trip data of any of the configurable service indicators. Such indicators are total drive sleeve turns, Starts/Hr rating, Service interval, or modulation hunting. Setting the service indicators can be found in the User Indicators section of the Advanced Diagnostics menu in the actuator.

4.9   Object ID 209: Partial Stroke Test Statistics

Command Request = 0x00D1			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U32	No of Passing Tests Open	
2	S64	Last Passing Test Open Date/Time	
6	U32	No of Failing Tests Open	
8	S64	Last Failing Test Open Date/Time	
12	U16	Last Fail Reason Open	Reason ID No
13	U32	No of Passing Tests Close	
15	S64	Last Passing Test Close Date/Time	
19	U32	No of Failing Tests Close	
21	S64	Last Failing Test Close Date/Time	
25	U16	Last Fail Reason Close	Reason ID No

ID #	Last Fail Reason
0	Undefined
1	System
2	ESD
3	Not in Remote
4	Canceled
5	Remote Open Command Received
6	Remote Close Command Received
7	Remote Stop Command Received
8	NW Open Command Received
9	NW Close Command Received
10	NW Stop Command Received
11	NW Comm Loss and Action = Stop
12	NW Comm Loss and Action = Move to Pos.
13	Valve Jam
14	Open Overtorque
15	Open Torque Switch Timer
16	Close Overtorque
17	Close Torque Switch Timer
18	Open Inhibit Active
19	Close Inhibit Active

ID #	Last Fail Reason
20	PST Runtimer Expired
21	Open Limit
22	Close Limit
23	Wrong State
24	PST Done
25	Unit Not Initialized
26	In Demo Mode
27	Remote Configuration Active
28	Reverse Direction Wait Timer Expired
29	In Setup
30	PST Didn't Reach Min Return Target
31	Open and Close Fault
32	Open Fault
33	Close Fault
34	Error State
35	Trying to Enter Setup Stopped State
36	Trying to Enter Setup Wait for No
37	Trying to Enter Setup Wait for Yes
38	Contactor

Partial Stroke Test Statistics

Partial Stroke Test Statistics are individual historical statistics for the last PST. There are statistics for both the open and close directions. When running a partial stroke test, the device saves the start position, then moves to the desired target. After reaching the target, it then returns to the start position. For each test, there can be data for the travel to target (open or close) and the return to start (close or open). However, if the first direction of travel is open and the test fails, the unit will stop where it fails, so there will be no data/count accumulated for the return direction.

5   Torque Objects

5.1   Object ID 401: Torque Trend Graphs

Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	Max Torque Graph	Array of 100, U16 Torque Samples, Each Pt = 1% Pos Bin, Units = % Unit Rating*10
100	U16	Min Torque Graph	
200	U16	Avg Torque Graph	
300	U16	LTA Torque Graph	
302	S64	Start Date/Time	Epoch Units
306	S64	End Date/Time	
310	U16	Start Position	
311	U16	End Position	

Torque Trend Graphs Command Request Register
0x0191 = Open Recent
0x1191 = Open Reference
0x2191 = Close Recent
0x3191 = Close Reference

Torque Trend Graphs

Four sets of graph data are available: Maximum, Minimum, Average and Long-Term Average Torque. These four graphs are selectable to show open or close stroke as well as whether it was the most recent run or the saved reference run.
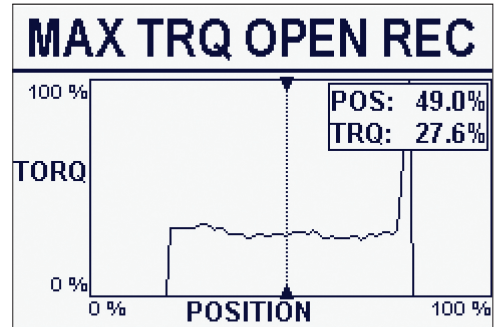

Figure 8: Sample max torque graph

5.2   Object ID 402: Torque Profile

Offset	Type	Data	Notes
Response Data Registers
Offset	Type	Data	Notes
0	S64	Open Recent Start Pt Date/Time	Epoch Units
4	U16	Open Recent Start Pos	% Open*10
5	S16	Open Recent Start Motor Temp	10°C (50°F)*10
6	S64	Open Recent End Pt Date/Time	
10	U16	Open Recent Stop Pos	
11	S16	Open Recent Stop Motor Temp	
12	U32	Open Recent No of Samples	
14	U16	Open Recent Avg Torque	Epoch Units
15	U16	Open Recent Stop Torque	
16	U16	Open Recent Breakout Torque	
17	U16	Open Recent Breakout Pos	
18	U16	Open Recent Peak Run Torque	
19	U16	Open Recent Peak Run Pos	
20	U16	Open Recent Ending Torque	
21	U16	Open Recent Ending Pos	
22	S64	Open Ref Start Pt Date/Time	
26	U16	Open Ref Start Pos	
27	S16	Open Ref Start Motor Temp	
28	S64	Open Ref End Pt Date/Time	
32	U16	Open Ref Stop Pos	
33	S16	Open Ref Stop Motor Temp	
34	U32	Open Ref No of Samples	
36	U16	Open Ref Avg Torque	
37	U16	Open Ref Stop Torque	
38	U16	Open Ref Breakout Torque	
39	U16	Open Ref Breakout Torque	
40	U16	Open Ref Peak Run Torque	
41	U16	Open Ref Peak Run Pos	
42	U16	Open Ref Ending Torque	
43	U16	Open Ref Ending Pos	
44	S64	Close Recent Start Pt Date/Time	
48	U16	Close Recent Start Pos	
49	S16	Close Recent Start Motor Temp	

Offset	Type	Data	Notes
Response Data Registers
Offset	Type	Data	Notes
50	S64	Close Recent End Pt Date/Time	
54	U16	Close Recent Stop Pos	
55	S16	Close Recent Stop Motor Temp	
56	U32	Close Recent No of Samples	
58	U16	Close Recent Avg Torque	
59	U16	Close Recent Stop Torque	
60	U16	Close Recent Breakout Torque	
61	U16	Close Recent Breakout Pos	
62	U16	Close Recent Peak Run Torque	
63	U16	Close Recent Peak Run Pos	
64	U16	Close Recent Ending Torque	
65	U16	Close Recent Ending Pos	
66	S64	Close Ref Start Pt Date/Time	
70	U16	Close Ref Start Pos	
71	S16	Close Ref Start Motor Temp	
72	S64	Close Ref End Pt Date/Time	
76	U16	Close Ref Stop Pos	
77	S16	Close Ref Stop Motor Temp	
78	U32	Close Ref No of Samples	
80	U16	Close Ref Avg Torque	
81	U16	Close Ref Stop Torque	
82	U16	Close Ref Breakout Torque	
83	U16	Close Ref Breakout Pos	
84	U16	Close Ref Peak Run Torque	
85	U16	Close Ref Peak Run Pos	
86	U16	Close Ref Ending Torque	
87	U16	Close Ref Ending Torque	

Torque Profile

Torque Profile returns a summary of both the most recent and saved reference open and close strokes. It provides the time stamp of the strokes as well as the number of samples and peak torque witnessed along with its position mid-stroke.

5.3   Object ID 403: Torque Deviation Indicator Details

Response Data Registers			
Offset	Type	Data	Notes
0	S64	Open Ref Dev Last Occ Date/Time	Epoch
4	U32	Open Ref Dev Occ Count	
6	U16	Open Ref Dev First Fail Pos	% Open*10
7	S16	Open Ref Dev Value	%*10
8	U16	Open Ref Dev Total Fail Pos	
9	S64	Open Avg Dev Last Occ Date/Time	
13	U32	Open Avg Dev Occ Count	
15	U16	Open Avg Dev First Fail Pos	
16	S16	Open Avg Dev Value	
17	U16	Open Avg Dev Total Fail Pos	
18	S64	Close Ref Dev Last Occ Date/Time	
22	U32	Close Ref Dev Occ Count	
24	U16	Close Ref Dev First Fail Pos	
25	S16	Close Ref Dev Value	

Response Data Registers			
Offset	Type	Data	Notes
26	U16	Close Ref Dev Total Fail Pos	
27	S64	Close Avg Dev Last Occ Date/Time	
31	U32	Close Avg Dev Occ Count	
33	U16	Close Avg Dev First Fail Pos	
34	S16	Close Avg Dev Value	
35	U16	Close Avg Dev Total Fail Pos	

Torque Deviation Indicator Details

Torque Deviation Indicator Details returns the time-stamped date of last occurrence, total deviation trip counts, and value and position of the most recent open and close trips. Torque deviations can be helpful to warn the user prior to torque alarms. Setting of the deviations can be found in the User Indicators section of the Advanced Diagnostics menu in the actuator.

5.4   Object ID 404: Torque HI and HI HI Indicator Details

Command Request = 0x00194			
Response Data Registers			
Offset	Type	Data	Notes
0	S64	Open Torque HI Last Occ Date/Time	Epoch
4	U32	Open Torque HI Occ Count	
6	S64	Open Torque HI HI Last Occ Date/Time	
10	U32	Open Torque HI HI Occ Count	
12	S64	Close Torque HI Last Occ Date/Time	
16	U32	Close Torque HI Occ Count	
18	S64	Close Torque HI HI Last Occ Date/Time	
22	U32	Close Torque HI HI Occ Count	

Torque HI and HI HI Indicator Details

Torque HI and HI HI Indicator Details returns the time-stamped date of last occurrence and total occurrence counts. The torque HI and HI HI indicators are two different thresholds that can be configured to warn a user of increased torque output prior to torque alarms. Setting of the HI and HI HI indicators can be found in the User Indicators section of the Advanced Diagnostics menu in the actuator.

5.5   Object ID 405: Torque Statistics Log

Command Request = 0x00195			
Response Data Registers			
Offset	Type	Data	Notes
0	S64	Max Open Torque Last Occ Date/Time	
4	U16	Max Open Torque Value	
5	S64	Max Close Torque Last Occ Date/Time	
9	U16	Max Close Torque Value	

Torque Statistics Log

Torque Statistics Log returns the time-stamped date of last occurrence and the historical maximum witnessed torque. These can be helpful for position-seated valves to identify that the max torque has been observed and how recent it was.

6   Environmental Objects

6.1   Object ID 601: Motor Temperature Statistics

Command Request 0x0259 - 24 Hours			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	# of x Motor Temp Data Pt	For 24 Hrs Max, or Less
1 to 47	S32	Max Motor Temp Hr Pt 1 to 24	Newest to Oldest (°C*10 [°F*10])
49 to 95	S32	Min Motor Temp Hr Pt 1 to 24	
97 to 143	S32	Avg Motor Tempt Hr Pt 1 to 24	
145	S64	State Date/Time	Epoch
149	S64	End Date/Time	
Command Request 0x1259 - 30 days			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	# of x Motor Temp Data Pt	For 30 Days Max, or Less
1 to 59	S32	Max Motor Temp Day Pt 1 to 30	Newest to Oldest (°C*10 [°F*10])
61 to 119	S32	Min Motor Temp Day Pt 1 to 30	
121 to 179	S32	Avg Motor Temp Day Pt 1 to 30	
181	S64	State Date/Time	Epoch
185	S64	End Date/Time	
Command Request 0x2259 - 12 months			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	# of x Motor Temp Data Pt	For 30 Days Max, or Less
1 to 23	S32	Max Motor Temp Day Pt 1 to 12	Newest to Oldest (°C*10 [°F*10])
25 to 47	S32	Min Motor Temp Day Pt 1 to 12	
49 to 71	S32	Avg Motor Temp Day Pt 1 to 12	
73	S64	State Date/Time	Epoch
77	S64	End Date/Time	
Command Request 0x3259 - 10 years			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	# of x Motor Temp Data Pt	For 10 Years Max, or Less
1 to 19	S32	Max Motor Temp Day Pt 1 to 10	Newest to Oldest (°C*10 [°F*10])
21 to 39	S32	Min Motor Temp Day Pt 1 to 10	
41 to 59	S32	Avg Motor Temp Day Pt 1 to 10	
61	S64	State Date/Time	Epoch
65	S64	End Date/Time	

Motor Temperature Statistics

Motor Temperature Statistics returns the time-stamped date of last occurrence and the maximum and minimum recorded motor temps. It also returns the last time-stamped fault, the count, and motor temp HI indicator stats. Setting of the HI indicators can be found in the User Indicators section of the Advanced Diagnostics menu in the actuator.

6.2   Object ID 602: Motor Temperature Trends

Offset	Type	Data	Notes
Command Request 0x0259 - 24 Hours		
Response Data Registers		
0	S16	Avg Temp	°C*10 (°F*10)
1	S64	Max Temp Occ Date/Time	Epoch
5	S16	Max Temp	°C*10 (°F*10)
6	S64	Min Temp Occ Date/Time	Epoch
10	S16	Min Temp	°C*10 (°F*10)
11	S64	Last Overtemp Fault Occ Date/Time	Epoch
15	U32	Overtemp Fault Occ Count	°C*10 (°F*10)
17	S64	Last Motor Temp HI Indicator Occ Date/Time	Epoch
21	U32	Motor Temp HI Indicator Occ Count	°C*10 (°F*10)

Motor Temperature Trends

Three sets of graph data are available: Maximum, Minimum and Average Motor Temp. The data set for all graphs will be returned according to the time scale selected, and the possible number of points will be defined by the time scale. For example, if the user requests 12 months, both the Maximum and Average data will be returned in the 12-month format.
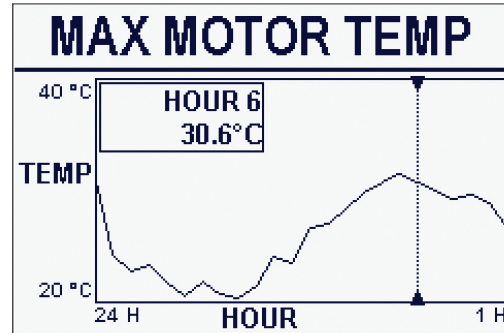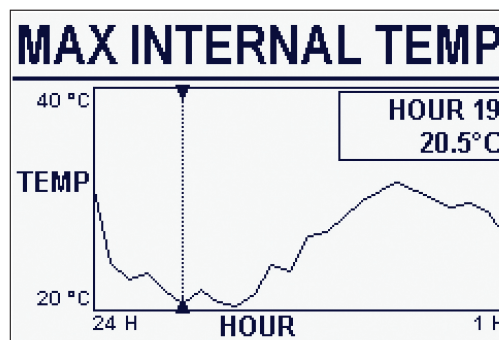

Figure 9: Sample max motor temperature graph

6.3   Object 604: Internal Temperature Trends

Command Request 0x025C - 24 Hours			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	# of Internal Temp Data Pt	For 24 Hrs Max, or Less
1 to 47	S32	Max Internal Temp Hr Pt 1 to 24	Newest to Oldest (°C*10 [°F*10])
49 to 95	S32	Min Internal Temp Hr Pt 1 to 24	
97 to 143	S32	Avg Internal Temp Hr Pt 1 to 24	
145	S64	Start Date/Time	Epoch
149	S64	End Date/Time	
Command Request 0x125C - 30 days			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	# of Internal Temp Data Pt	For 30 Days Max, or Less
1 to 59	S32	Max Internal Temp Hr Pt 1 to 30	Newest to Oldest (°C*10 [°F*10])
61 to 119	S32	Min Internal Temp Hr Pt 1 to 30	
121 to 179	S32	Avg Internal Temp Hr Pt 1 to 30	
181	S64	Start Date/Time	Epoch
185	S64	End Date/Time	
Command Request 0x225C - 12 months			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	# of Internal Temp Data Pt	For 12 Months Max, or Less
1 to 23	S32	Max Internal Temp Hr Pt 1 to 12	Newest to Oldest (°C*10 [°F*10])
25 to 47	S32	Min Internal Temp Hr Pt 1 to 12	
49 to 71	S32	Avg Internal Temp Hr Pt 1 to 12	
73	S64	Start Date/Time	Epoch
77	S64	End Date/Time	
Command Request 0x325C - 10 years			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	# of Internal Temp Data Pt	For 10 Years Max, or Less
1 to 19	S32	Max Internal Temp Hr Pt 1 to 10	Newest to Oldest (°C*10 [°F*10])
21 to 39	S32	Min Internal Temp Hr Pt 1 to 10	
41 to 59	S32	Avg Internal Temp Hr Pt 1 to 10	
61	S64	Start Date/Time	Epoch
65	S64	End Date/Time	

Internal Temperature Trends

Three sets of graph data are available: Maximum, Minimum and Average Internal Temp. The data set for all graphs will be returned according to the time scale selected, and the possible number of points will be defined by the time scale. For example, if the user requests 12 months, both the Maximum and Average data will be returned in the 12-month format.

Figure 10: Sample max internal temperature graph

6.4   Object ID 605: Internal Temperature Statistics

Command Request - 0x025D			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	S64	Max Temp Occ Date/Time	Epoch
4	S16	Max Temp	
5	S64	Min Temp Occ Date/Time	Epoch
9	S16	Min Temp	

Internal Temperature Statistics (Log)

Internal Temperature Statistics returns the time-stamped date of last occurrence and the maximum and minimum rrecorded motor temps.

7   Operational Objects

7.1   Object ID 1003: Power Supply Statistics

Command Request - 0x03EB			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	S64	Max Voltage Last Occ Date/Time	Epoch
4	U16	Max Voltage Occ Value	
5	S64	Min Voltage Last Occ Date/Time	Epoch
9	U16	Min Voltage Occ Value	
10	S64	Max Freq Last Occ Date/Time	Epoch
14	U16	Max Freq Occ Value	*10 for precision
15	S64	Min Freq Last Occ Date/Time	Epoch
19	U16	Min Freq Occ Value	*10 for precision
20	U16	Voltage Value @ Time of Request	
21	U16	Freq Value @ Time of Request	*10 for precision

Power Supply Statistics

Power Supply Statistics returns the time-stamped maximum and minimum measured input voltages and frequencies. It also returns the current voltage and frequency measured at the time of the request. Frequency is only available on MXb three-phase units.

7.2   Object ID 1004: Operation Statistics

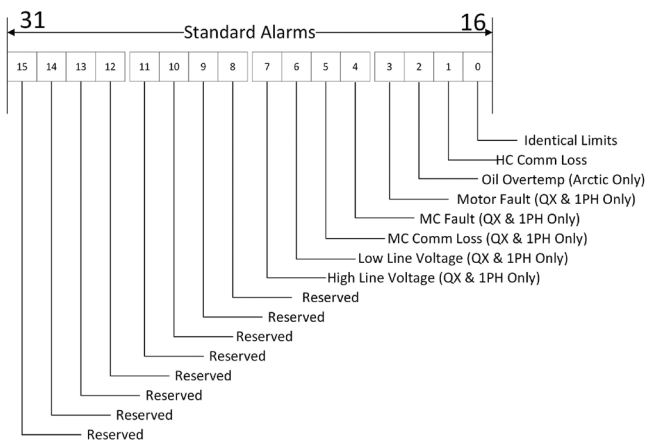| Command Request - 0x03EB			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	Stroke Time	Units in Seconds
1	U32	Turns Total	
3	U32	Open Contactor Counts	
5	U32	Close Contactor Counts	
7	U32	Motor Runtime	Units in Seconds
9	U32	Moved Manually Total Counts	
11	U32	Rated Vib Exceeded Total Counts	
13	U32	User Vib HI Exceeded Total Counts	
15	S64	Last Service Date/Time	UTC
19	U32	Unit on Time	Units in Seconds
21	U32	Reset Cold Count	

Operation Statistics

Operation Statistics returns the current accumulated counts of the unit's operations such as stroke time, turns, contactor ops, vibration HI trips, and the number of times the unit recorded vibration values exceeding unit rating. Setting of the Vibration HI indicator can be found in the User Indicators section of the Advanced Diagnostics menu in the actuator.

7.3   Object ID 1005: Standard Alarms and Warnings

Command Request - 0x03EB			
Response Data Registers			
Offset	Type	Data	Notes
0	U32	Standard Alarms	See Bitmap Below
2	U32	Standard Warnings	

Standard Alarms and Warnings

Standard Alarms and Warnings returns two bitmapped registers with the binary status of the listed alarms and warnings.
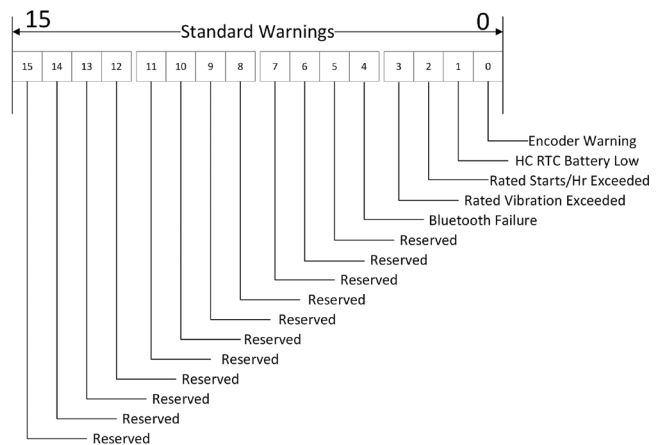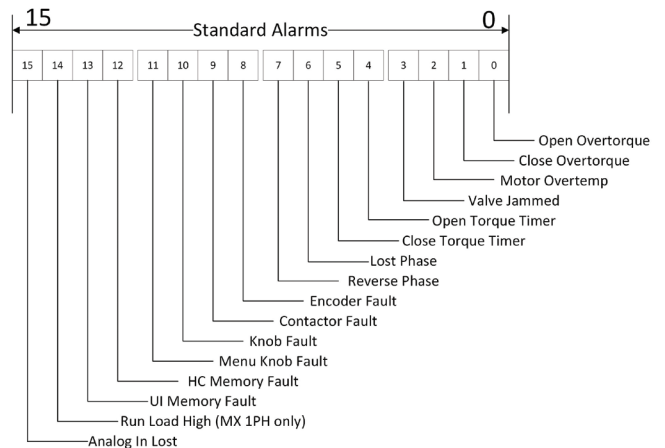
7.4   Object ID 1007: View Real Time Clock Information

Command Request - 0x03EB			
Response Data Registers			
Offset	Type	Data	Notes
0	S64	Current Date/Time	UTC Time Value
4	U16	Battery Level	Volts*1,000 for Precision
5	U16	RTC Indicators	Bit 0 = Battery Low Bit 1 = RTC was set

View Real Time Clock Information

View Real Time Clock Information returns the current date/time as well as battery level and the indicator status of the battery and RTC.

7.5   Object ID 1006: Identification Information

Offset	Type	Data	Notes
— **Command Request - 0x03EB**			
— **Response Data Registers**			
0	U8 ASCII	User Tag	Null Terminated String - Max 18 Bytes
9	U8 ASCII	QA Stamp HC	Null Terminated String - Max 10 Bytes
14	U8 ASCII	QA Time HC	Null Terminated String - Max 12 Bytes
20	U8 ASCII	QA Date HC	Null Terminated String - Max 10 Bytes
25	U8 ASCII	Serial Number	Null Terminated String - Max 10 Bytes
30	U8 ASCII	Order Number	Null Terminated String - Max 12 Bytes
36	U8 ASCII	QA Stamp UI	Null Terminated String - Max 10 Bytes
41	U8 ASCII	HC Boot Firmware Version	Null Terminated String - Max 12 Bytes
47	U8 ASCII	HC App Firmware Version	Null Terminated String - Max 10 Bytes
52	U8 ASCII	UI Boot Firmware Version	Null Terminated String - Max 12 Bytes
58	U8 ASCII	UI App Firmware Version	Null Terminated String - Max 10 Bytes
63	U8 ASCII	Unit Bluetooth Mac ID	Null Terminated String - Max 20 Bytes
73	U8 ASCII	Unit Bluetooth Name	Null Terminated String - Max 34 Bytes
90	U8 ASCII	Unit Bluetooth Firmware Version	Null Terminated String - Max 12 Bytes
96	U8 ASCII	Unit Bluetooth FCC ID	Null Terminated String - Max 16 Bytes
104	U8 ASCII	AO1 Board Firmware Version	Null Terminated String - Max 6 Bytes
107	U8 ASCII	AO2 Board Firmware Version	Null Terminated String - Max 6 Bytes
110	U8 ASCII	R5R8 DO Board Firmware Version	Null Terminated String - Max 6 Bytes
113	U8 ASCII	Network Board Firmware Version	Null Terminated String - Max 14 Bytes
120	U8 ASCII	Motor Controller Firmware Version	Null Terminated String - Max 10 Bytes
125	U8 ASCII	Encoder Firmware Version	Null Terminated String - Max 6 Bytes

Identification Information

Identification Information returns all installed board firmware versions as well as QA info for the Host Controller Assembly board.

8   Record Log Objects

These logs have time-stamped events which can span for years (estimated max is 10 years). There could be a very large number of records. The amount of data returned can be extremely large, so it will be returned in fixed size records (sub-sets) and the customer can request additional records. The maximum number of records returned with each request is based on the fixed record size and the total size (512 registers) size of the Response Data Registers.

The user can request the newest or oldest record first. But typically, a user would request the newest record first to get the most recent entries in the log. Then for subsequent record requests, the user would make the request with the sub-command older/newer. The user can continue to request older/newer records until the request returns a "number of records" equal to zero, which indicates the user has reached the end of the records.

The user can also query if there is a log present (any records at all) but is not required to do so. If there are no records present, a request will return the "number of records" as zero.

An example of reading the newest log data to the oldest can be found in the adjacent flow chart.
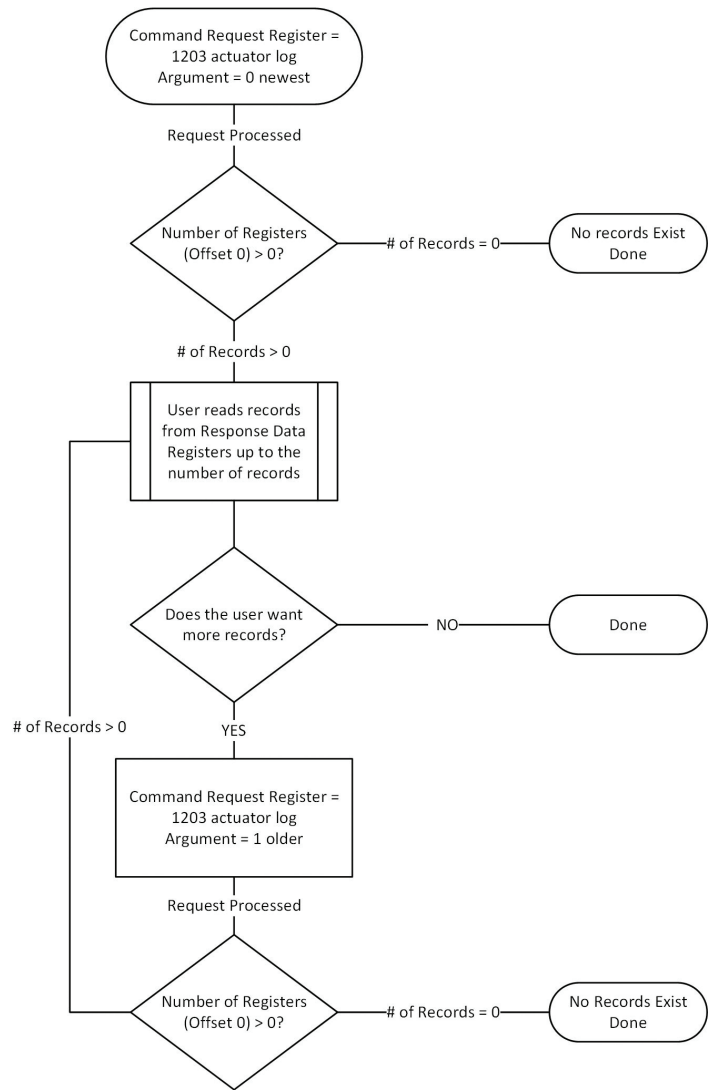
8.1   Object ID 1202: Get Event Log Entries

Command Request = 0x04B2			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	Number of Records	Max = 18 (Based on Record Size)
1	U32	Log Record ID	
3	S64	Event Date/Time	UTC Format
7	U16	NE107 Log Category	Enumeration
8	U8 ASCII	Item Text	NULL Terminated String, Max 40 Characters
28	U32	Log Record ID	
30	S64	Event Date/Time	UTC Format
34	U16	NE107 Log Category	Enumeration
35	U8 ASCII	Item Text	NULL Terminated String, Max 40 Characters
55	U32	Log Record ID	
57	S64	Event Date/Time	UTC Format
61	U16	NE107 Log Category	Enumeration
62	U8 ASCII	Item Text	NULL Terminated String, Max 40 Characters
		Until Last Record in Number of Records	

Get Event Log Entries

Event Log Entries returns the time-stamped NAMUR NE 107 compliant captured events. The event log records include the time stamp, log ID, NE107 category and the event item. Those event items can be configured at the actuator in the Event Log section of the advanced diagnostics.

Numeric Value	Category
0	Maintenance (NE107)
1	Out of Specification (NE107)
2	Check Function (NE107)
3	Failure (NE107)
4	Engineering Info (Only in Engineering Mode)
5	Engineering Warning (Only in Engineering Mode)
6	Engineering Alarm (Only in Engineering Mode)
7	Engineering Test (Only in Engineering Mode)

8.2 Object ID 1203: Get Actuator Movement Log Entries

Command Request = 0x04B3			
Response Data Registers			
Offset	**Type**	**Data**	**Notes**
0	U16	Number of Records	Max = 18 (Based on Record Size)
1	U16	Log Record ID	
2	S64	Event Date/Time	UTC Format
6	U16	Actuator Positions @ Event Occ	% Open
7	S16	Actuator Speed @ Event Occ	rpm
8	U16	Actuator Torque @ Event Occ	%
9	S16	Actuator Motor Temp @ Event Occ	Temp*10 for Precision
10	U16	Actuator Demand @ Event Occ	Demand*10 for Precision
11	U16	Deadband Setting @ Event Occ	*10 for Precision — Only When Modulating (e.g., Analog Input, PST, Move-to, etc.)
12	U16	Proportional Band Setting @ Event Occ	
13	U8 ASCII	Item Text	NULL Terminated String Max 32 Char
29	U16	Log Record ID	
30	S64	Event Date/Time	UTC Format
34	U16	Actuator Positions @ Event Occ	% Open
35	S16	Actuator Speed @ Event Occ	rpm
36	U16	Actuator Torque @ Event Occ	%
37	S16	Actuator Motor Temp @ Event Occ	Temp*10 for Precision
38	U16	Actuator Demand @ Event Occ	Demand*10 for Precision
39	U16	Deadband Setting @ Event Occ	*10 for Precision — Only When Modulating (e.g., Analog Input, PST, Move-to, etc.)
40	U16	Proportional Band Setting @ Event Occ	
41	U8 ASCII	Item Text	NULL Terminated String Max 32 Char
57	U16	Log Record ID	
58	S64	Event Date/Time	UTC Format
62	U16	Actuator Positions @ Event Occ	% Open
63	S16	Actuator Speed @ Event Occ	rpm
64	U16	Actuator Torque @ Event Occ	%
65	S16	Actuator Motor Temp @ Event Occ	Temp*10 for Precision
66	U16	Actuator Demand @ Event Occ	Demand*10 for Precision
67	U16	Deadband Setting @ Event Occ	*10 for Precision — Only When Modulating (e.g., Analog Input, PST, Move-to, etc.)
68	U16	Proportional Band Setting @ Event Occ	
69	U8 ASCII	Item Text	NULL Terminated String Max 32 Char
		Until Last Record in Number of Records	

Get Actuator Movement Log Entries

Actuator Movement Log Entries returns the time-stamped movement command of the actuator. Whether that movement is a command to move or a reason for stopping, the movement log records include the log ID, time stamp, position, torque, temp, speed, movement demand, dead/prop band settings, as well as the description of the movement command. This command will be identified if it is a remote, network, modulating or local command as well as the reason it stopped if due to alarm, command or reaching desired position.

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