

Limitorque[®] MX

Advanced Diagnostics

AI10M000289



Limitorque® MX Advanced Diagnostics

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|--|----|
| Abbreviations..... | 3 |
| 1. Advanced Diagnostics..... | 4 |
| 2. Status Information..... | 4 |
| 3. Analytics..... | 4 |
| 3.1 Torque Trends..... | 4 |
| 3.1.1 Torque Profile..... | 4 |
| 3.1.2 Save Reference..... | 5 |
| 3.1.3 Torque Graph..... | 5 |
| 3.2 Position Trends..... | 5 |
| 3.2.1 Motor on Time..... | 5 |
| 3.2.2 Starts/HR..... | 6 |
| 3.2.3 Final Position..... | 6 |
| 3.3 Vibration Trends..... | 6 |
| 3.3.1 Vibration vs Time..... | 6 |
| 3.3.2 Vibration vs Position..... | 6 |
| 3.3.3 Elapsed Time vs Vibration..... | 7 |
| 3.4 Motor Temp..... | 7 |
| 3.5 Internal Temp..... | 7 |
| 4. Logs..... | 8 |
| 4.1 Event Log..... | 8 |
| 4.2 Actuator Log..... | 8 |
| 4.3 Service Log..... | 9 |
| 4.4 Partial Stroke Test Log..... | 9 |
| 5. User Indicators..... | 9 |
| 5.1 Set Levels – Customize Indicator Criteria..... | 10 |
| 5.1.2 Open and Close Torque..... | 10 |
| 5.1.3 Open and Close Final Position..... | 10 |
| 5.1.4 Vibration..... | 11 |
| 5.1.5 Service Indicators..... | 11 |
| 5.2 Enable Indicators..... | 12 |
| 5.3 View Indicators..... | 12 |
| 5.4 Clear User Indicators..... | 14 |
| Appendix A – Menu Tree..... | 15 |
| Appendix B – Diagnostic Descriptions..... | 16 |

Abbreviations

| | |
|-------|---|
| ANLG | Analog |
| APT | Analog Position Transmitter |
| ATT | Analog Torque Transmitter |
| AVG | Average |
| BRD | Board |
| CL | Close |
| CMD | Command |
| CNCL | Cancel |
| CNT | Count |
| COMM | Communication |
| CONT | Continuous |
| DEV | Deviation |
| DS | Drive Sleeve |
| ESD | Emergency Shutdown |
| EXC | Exceeded |
| HC | Host Controller |
| HH:MM | Two Digit Hour: Two Digit Minute (Time represented in 24 hour increments) |
| HI | High |
| HR | Hour |
| ID | Identification |
| LTA | Long Term Average |
| MAC | Media Access Control |
| MAX | Maximum |
| MID | Mid-travel |
| MIN | Minimum |
| MM | Two Digit Month |
| MOD | Modulating |
| OLIM | Open Limit |
| OPS | Operation |
| POS | Position |
| PREV | Previous |
| PS | Partial Stroke |
| PST | Partial Stroke Test |
| PWRON | Power On |
| QA | Quality Assurance |
| REC | Recent (Last Run) |
| REF | Reference |
| RMT | Remote |
| RTC | Real Time Clock |
| SEC | Seconds |
| TEMP | Temperature |
| TRQ | Torque |
| UI | User Interface |
| VIB | Vibration |
| YYYY | Four Digit Year |

1. Advanced Diagnostics

To access the advanced diagnostics menus, rotate the red selector knob to the stop position. Then rotate the black control knob in the following sequence: Open – Close – Open. Use the menu knob to navigate through menu options.

NOTE: Some advanced diagnostic charts, graphs, live data and event log information can also be viewed from the Quick Access menu. To access the Quick Access menu, ensure the red selector knob is rotated to the remote or stop position. Then rotate the menu knob in the appropriate direction to access the menu.

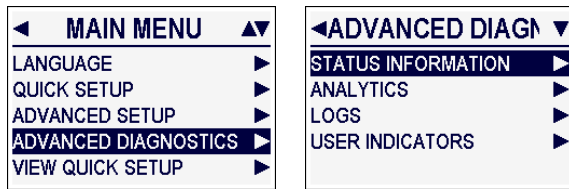


Figure 1: Access to the advanced diagnostics menus

2. Status Information

The advanced diagnostics status information displays the status of a series of standard alarms, warnings and unit functions. Status information appears as a combination of live process readings and static input criteria. Live status information is also available for review by accessing Quick Access > Live Data. Status information menus are read only.

Status information submenus contain detailed information about the following actuator functions:

- Standard Alarms
- Standard Warnings
- Rated Vib Exc Details
- Actuation
- Open Final Position
- Close Final Position
- Operational
- Digital Inputs
- Digital Outputs
- Partial Stroke Test
- Real Time Clock
- Hardware
- Motor Status
- Power Supply
- Bluetooth
- Identification
- QA Data

Additional information about the status information submenus is available in Appendix B – Diagnostic Descriptions.

NOTE: Warnings notify the user of potential unit damage and/or failure. Warnings will not prevent actuator movement, however, if left unresolved, warnings may escalate to activation of alarms. Activated alarms notify the user of immediate issues and failures. Alarms will prevent movement of the actuator.

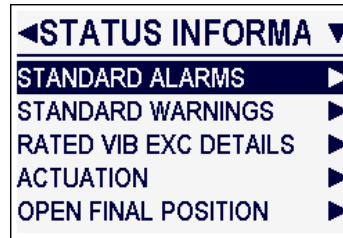


Figure 2: Status information menus

3. Analytics

The advanced diagnostics analytics displays functional information and visual graphics and charts of function and trend data. Analytics appears as a combination of live process readings and saved historical references. Analytics information can provide an indication of a change in the process conditions, which over time could lead to loss of function or unit failure. Analytics information is primarily read only, with the exception of saving graphed data for future reference.

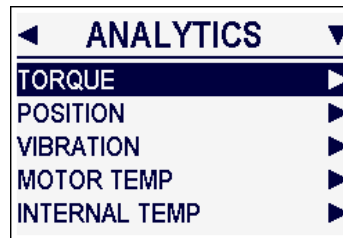


Figure 3: Analytics menus

Analytics submenus contain graphical information about the following actuator functions:

- Torque
- Position
- Vibration
- Motor Temp
- Internal Temp

NOTE: Specific graphical values can be viewed by activating the graph highlight function. To activate this function, rotate the black control knob to Open/Select, then use the rotary menu knob to view various values on the graph. To exit the function, rotate the black control knob to Close/Back twice.

3.1 Torque Trends

The torque trends menu provides access to information about the open and close torque profiles, the open and close torque profile references, and the corresponding torque graphs.

NOTE: A torque profile is a numerical summary of a torque graph.

3.1.1 Torque Profile

The open and close torque profile screens display the date, time and position when the torque value is collected. The motor

Limitorque® MX Advanced Diagnostics

temperature is also displayed for the torque start and end points. The torque is collected at the start point, end point, breakout, peak run and ending positions. A sample #, last run torque average and last stop torque are also displayed.

The breakout portion of the actuator stroke represents the first 10% of the full stroke travel. The ending portion of the actuator stroke represents the last 10% of the full travel stroke.

NOTE: Torque values noted with % units indicate a percent of that particular unit's max torque capabilities.

The open and close torque profile reference menus display information about the saved reference profile. The information displayed is the same as the information displayed in the torque profile menus.

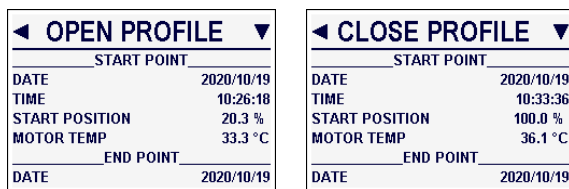


Figure 4: Open and close torque profile menus

3.1.2 Save Reference

The torque trends menu also allows the user to save the last torque profile and graph as the reference. The save open and save close reference functions will save the appropriate torque profile and corresponding torque graph simultaneously. The save reference functions can be valuable for saving a profile and graph as a reference after commissioning has been performed on the actuator unit.

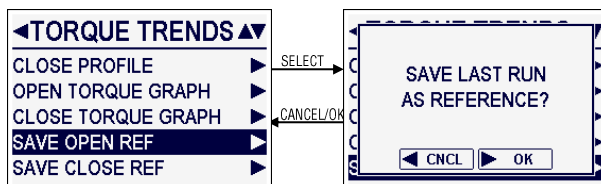


Figure 5: Save torque profile and graph as reference

3.1.3 Torque Graph

The open and close torque graph menus provide access to the most recent and reference torque graphs. Max, min, average and long term average recent and reference torque graphs are available for review.

| Graph Type | Description |
|------------|--|
| Max Trq | Displays the maximum torque recorded within each percentage of travel |
| Min Trq | Displays the minimum torque recorded within each percentage of travel |
| Avg Trq | Displays the average torque recorded within each percentage of travel |
| Lta Trq | Displays a reevaluation of the long term average with the inclusion of the most current average run. |

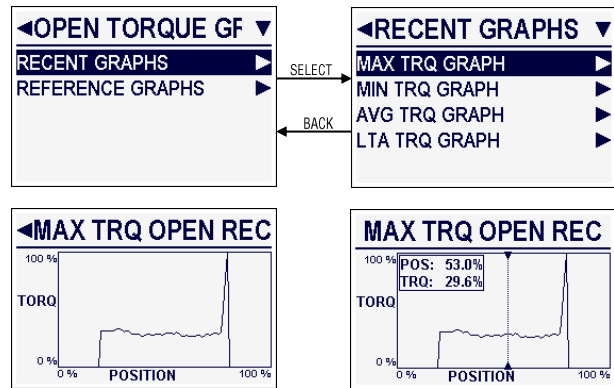


Figure 6: Accessing recent open max torque graph and highlighting a specific graphical value. Note: the max torque open graphs shown above illustrate actuator travel that has started and ended mid-stroke. These graphs do not represent full stroke actuator movement.

Refer to the note in section 3 Analytics for information about how to highlight a specific graphical value.

3.2 Position Trends

The position trends menu provides access to the open and close motor on time histogram charts, the open and close starts/HR histogram charts and the open and close final position graphs.

Note: Each histogram marker bin represents 10% of the stroke. Several motor time readings are measured per bin. These readings are then averaged to obtain the displayed value.



Figure 7: Position trends menu

3.2.1 Motor on Time

The open and close motor on time screens display the amount of time the motor is running versus the actuator position.

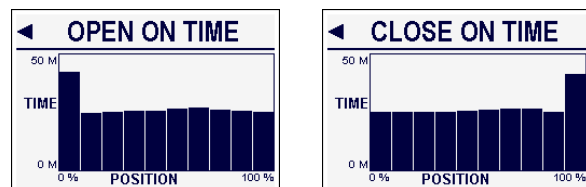


Figure 8: Open and close motor on time histograms

To view a bin time value, rotate the black control knob to Open/Select, then use the rotary menu knob to view the time values for different positions.

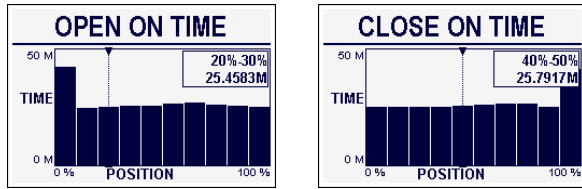


Figure 9: Displayed open and close motor on time highlighted value

3.2.2 Starts/HR

The open and close starts/hr screens display the number of motor starts per hour versus the actuator position.

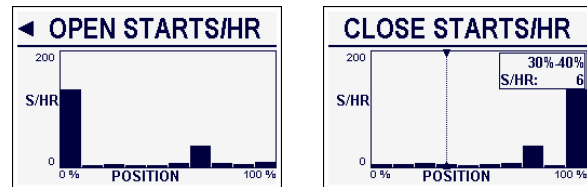


Figure 10: Open and close starts/hr histograms. Close starts/hr histogram displays optional bin s/hr and position values.

3.2.3 Final Position

The open and close final position screen provides access to the max, min and average final position graphs, in the open and close direction with respect to the saved position reference user input. The user must save the reference final position to use this data. The final position graphs display the deviation of the final position of the actuator drive sleeve (in number of drive sleeve turns) over a user defined time scale.

The time scale options are 24 hours, 30 days, 12 months or 10 years.

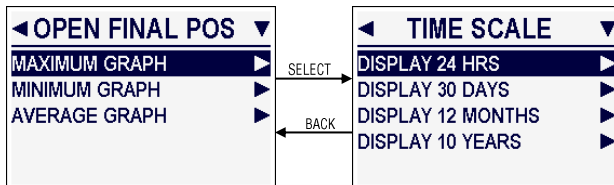


Figure 11: Position trends access menus

To highlight a specific time or motor position, rotate the knob to Open/Select then use the rotary menu knob to view the time values for different positions

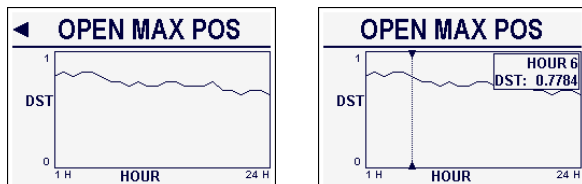


Figure 12: Open max position graph. The image on the right displays the highlighted final position deviation and time details.

3.3 Vibration Trends

The vibration trends menu provides access to graphs of vibration vs time, vibration vs position and the amount of time a

vibration level is detected. The vibration data displayed in the graphs is always of the vibration level detected (RMS G's).

Note: For histogram type graphs involving position, each histogram marker bin represents 10% of the actuator stroke. Several vibration readings are measured per bin. These readings are then averaged to obtain the displayed value.



Figure 13: Vibration trends menu

3.3.1 Vibration vs Time

The vibration vs time screen provides access to the max and average vibration vs time graphs. The time scale is user defined and is available as 24 hours, 30 days, 12 months or 10 years.

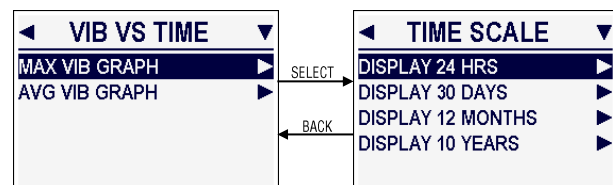


Figure 14: Vibration trend access menus

To highlight a specific time or vibration, rotate the knob to Open/Select then use the rotary menu knob to view the time values for different positions

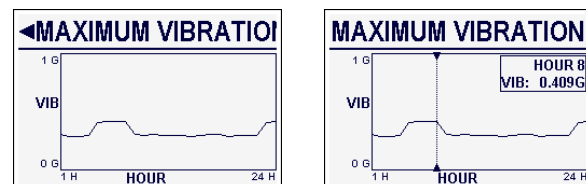


Figure 15: Max vibration vs time. The image on the right displays the highlighted vibration and time details.

3.3.2 Vibration vs Position

The vibration vs open or close position screens provide access to the max, min and average last run graphs or to the summary run graphs. Summary run graphs are the max, min and average graphs from all runs since the actuator was powered or rebooted.

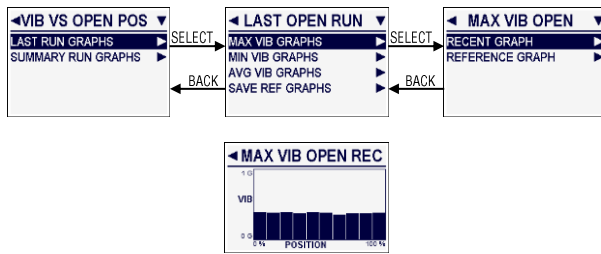


Figure 16: Vibration vs open position graphs

The vibration vs position menus also allow the user to save the last run and summary run graphs as a reference. The save reference functions can be valuable for saving a vibration vs position graph as a reference after commissioning has been performed on the actuator unit. The references are also used as the reference data for the deviation indicators.

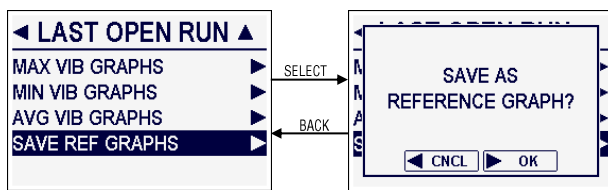


Figure 17: Save vibration vs position graphs as reference

3.3.3 Elapsed Time vs Vibration

The elapsed time vs vibration screen displays a histogram of the amount of time various vibration levels are detected.

To highlight a specific time or vibration increment, rotate the knob to Open/Select then use the rotary menu knob to view the time values for different positions.

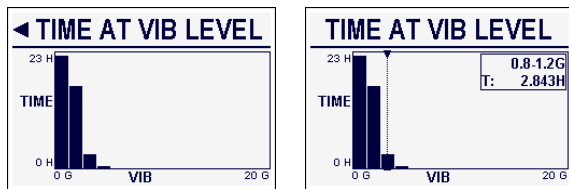


Figure 18: Time vs vibration level. The image on the right displays the highlighted vibration and time details.

Note: The vibration histogram marker bin represents vibrational increments of 0.4 G up to the vibrational value of 4.0 G. After 4.0 G the scale increment increases to 3.2 G. Refer to Figure 19 for a visual clarification.

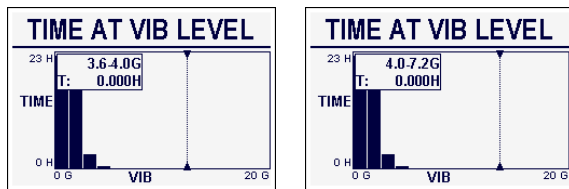


Figure 19: Vibrational scale increment change from 0.4 G to 3.2 G

3.4 Motor Temp

The motor temperature menu provides access to the max, min and average motor temperature versus time graphs. The time scale is user defined and is available as 24 hours, 30 days, 12 months or 10 years.

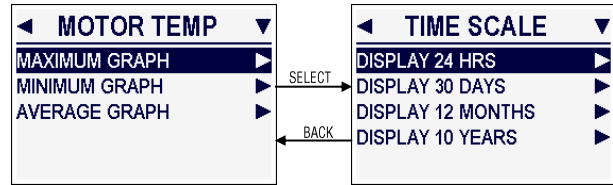


Figure 20: Motor temperature graph access menus

To highlight a specific time or motor temperature, rotate the knob to Open/Select then use the rotary menu knob to view the time values for different positions.

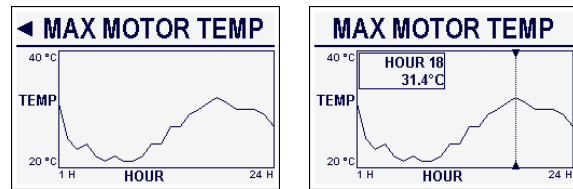


Figure 21: Max motor temperature vs time. The image on the right displays the highlighted motor temperature and hour details.

3.5 Internal Temp

The internal temperature menu provides access to the max, min and average internal temperature versus time graphs. The time scale is user defined and is available as 24 hours, 30 days, 12 months or 10 years.

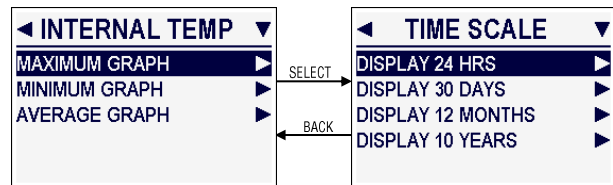


Figure 22: Internal temperature graph access menus.

To highlight a specific time or motor temperature, rotate the knob to Open/Select then use the rotary menu knob to view the time values for different positions.

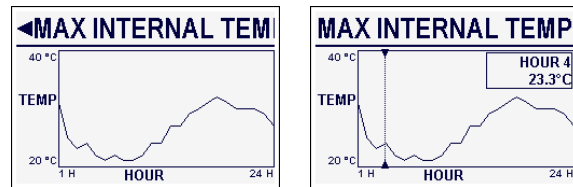


Figure 23: Max internal temperature vs time. The image on the right displays the highlighted internal temperature and hour details.

4. Logs

The advanced diagnostics logs display captured information with a date and time stamp, and statistics for a series of unit functions. Logs information appears as static recorded data.

Logged events can be scrolled through by using the menu rotary knob. Logs can be scrolled through in the list or details format.

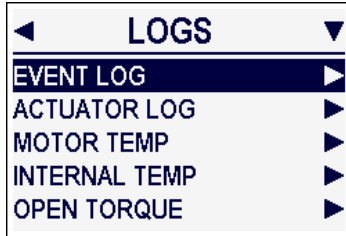


Figure 24: Logs menus

Logs submenus contain captured information about the following actuator functions:

- Event Log
- Actuator Log
- Motor Temp
- Internal Temp
- Open Torque
- Close Torque
- Max Starts/HR
- Operation
- Trips
- Power Supply
- Service Log
- Bluetooth Log
- PST Log
- Reset Counters
- Seat Real Time Clock

4.1 Event Log

The event log menu provides access to the displayed event logs and the configurable event categories.

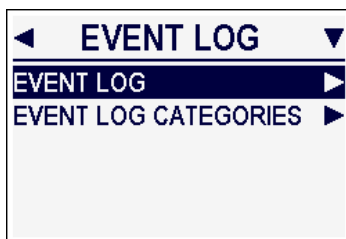


Figure 25: Event log menu

Event Log

The event log submenu displays a list of date and time stamped events. A detailed event log screen also displays the logged event ID, date, time, event category and event name.

NOTE: Up to 14,000 events can be logged. Once the allowable number of logs has been exceeded, new events will override the oldest logs.

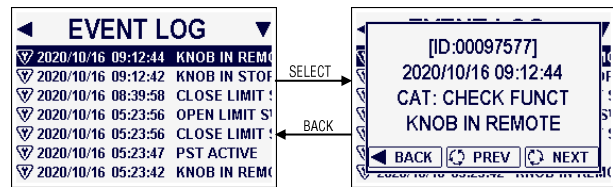


Figure 26: Event log list and event log details screen

Event Log Categories

The event log categories menu allows the user to select which events will be logged. Events are separated into the four Namur NE 107 compliant categories:

- Maintenance
- Out of Specification
- Check Function
- Failure

To configure the event log, select the desired event category, then select the event to log. A check marked event will display in the log. To remove an event from the log, highlight the event, then select the event to remove the check mark status.

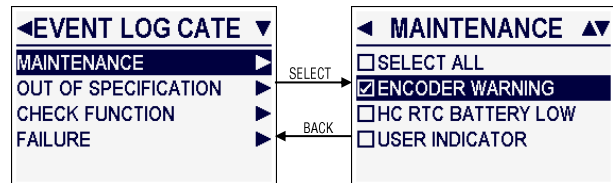


Figure 27: Event log categories and maintenance event log category menu

4.2 Actuator Log

The actuator log menu displays a list of date and time logged actuator movement commands, such as mode of command and the reason for stop. The mode of command details how the actuator was commanded to move, e.g. local control, remote network, analog or discrete command. The reason for stop details what caused the actuator to stop moving, e.g. reaching an end limit, position demand reached, command to stop, or trigger of an alarm that caused the actuator to stop prematurely.

A detailed actuator log screen also displays the date, time, mode of command or reason for actuator stop and the actuator command with the % position.

NOTE: Up to 14,000 actuator commands can be logged. Once the allowable number of logs has been exceeded, new commands will override the oldest logs.

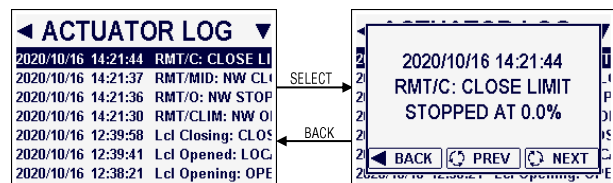


Figure 28: Actuator log list and actuator log details screen

4.3 Service Log

The service log menu provides access to the last service date screen and the set last service date function.

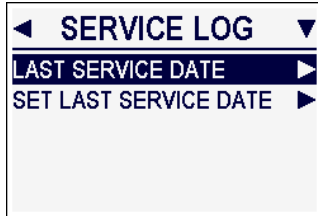


Figure 29: Service log menu

Last Service Date

The last service date screen displays the user defined date and time the unit last received service. It is good practice to log the date and time service was conducted to assist with unit performance tracking and to ensure service is performed routinely.

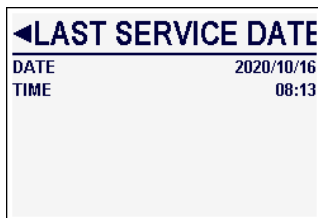


Figure 30: Last service date screen

Set Last Service Date

The set last service date menu allows the user to configure the year, month, day and time that service was last performed on the actuator unit.

To set the last service date and time, use the menu rotary knob to scroll to the applicable year, month and day, and the open and close to transfer between the year, month and day. Once the date is set, set the time service was conducted. Confirm and save the last service date and time.



Figure 31: Set and save the service date and time menus

4.4 Partial Stroke Test Log

The PST log menu provides access to the displayed PST results log and the last PST torque graphs.

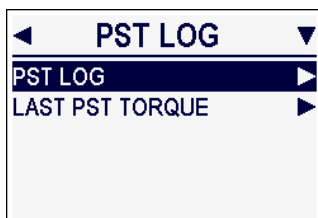


Figure 32: PST log menu

PST Log

The PST log submenu displays a list of date and time logged PST results. A detailed PST log screen also displays the logged date, time, and pass or fail result.

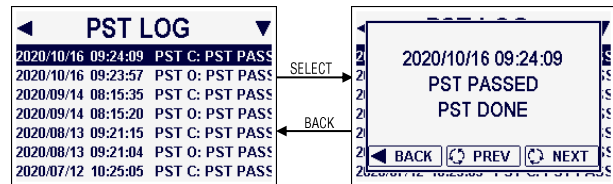


Figure 33: PST log list and PST log details screen

Last PST Torque

The last PST torque menu provides access to graphs of the torque measured during the PST vs position of the partial stroke. Max, min, average and long term average torque graphs are available in the actuator open and close direction.

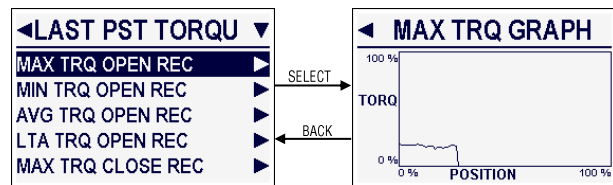


Figure 34: Last PST torque menu and max torque graph screen. Note: the max torque open graph shown above illustrates the partial stroke test actuator travel. This graph does not represent full stroke actuator movement.

To highlight a specific torque or position, rotate the knob to Open/Select then use the rotary menu knob to view the torque values for different positions.

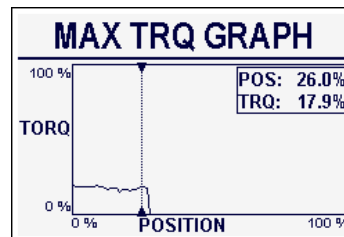


Figure 35: Max open torque graph with highlighted torque and position details.

5. User Indicators

The User Indicators menus allow the user to enable, view, clear and customize the conditions of the unit indicators. User indicators add greater insight into the specific use application and provide process performance monitoring by warning the operator of potential future failures before they occur. The following indicator types are available for modification:

- Torque
- Vibration
- Final Position
- Service Indicators

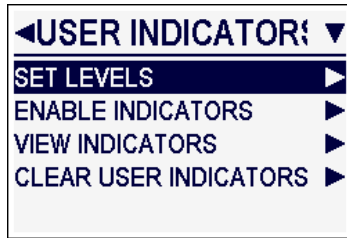


Figure 36: User indicators

NOTE: Indicator notifications will remain active until cleared by the user, even if the indicator condition has been resolved. Triggered user indicators must be cleared locally from the actuator. This feature promotes proper diagnoses of the system in the event of a deviation.

NOTE: User indicator notifications will not prevent movement of the actuator.

NOTE: A discrete output (DO) option is available for configuration of the user indicator warning. This DO option can be set to trip in the event any user indicator becomes active.

A status message will display when an enabled and activated indicator is present. The status of the indicators can also be viewed by accessing User Indicators > View Indicators.

5.1 Set Levels – Customize Indicator Criteria

The Set Levels menu allows the user to customize the indicator criteria.

To set or modify the indicator levels, access User Indicators > Set Levels. Then use the black control knob to select the indicator to customize.

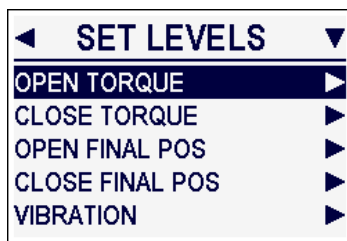


Figure 37: Set levels

5.1.2 Open and Close Torque

The open and close torque indicators provide notification when the torque deviates from the running long term average or saved reference torque graphs, or the torque is greater than a configurable value.

To configure the open and close torque indicators, select the desired parameters and use the menu knob to select the indicator value; use the black control knob to select OK to set the value.

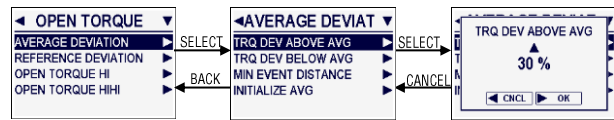


Figure 38: Open torque indicator menus

NOTE: The torque deviation % above or below the average is an additive value on top of the current torque percentage at that particular point in the stroke.

Min Event Distance

The min event distance is the minimum travel distance in units of 1% of span necessary to trigger a user indicator.

Initialize Average

The initialize average option allows the user to set a new average reference based on the last run, the saved reference or the next run. This function is valuable when the average torque may have changed over an extended period of time.

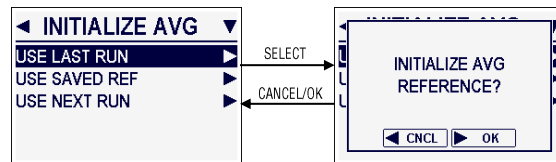


Figure 39: Initialize average

Reference Deviation

The reference deviation is allowable amount of deviation above the saved reference graph.

Torque Hi/HiHi

The torque Hi and HiHi are configurable torque values that must be surpassed to trigger the high torque indicators. One or both can be used for greater protection.

5.1.3 Open and Close Final Position

The open and close final position indicators provide notification when the final seated position deviates from the saved reference position. The position deviation unit of measure is number of drive sleeve turns.

To configure the open and close final position indicators, select the desired parameters and use the menu knob to select the indicator value; use the black control knob to select OK to set the value.

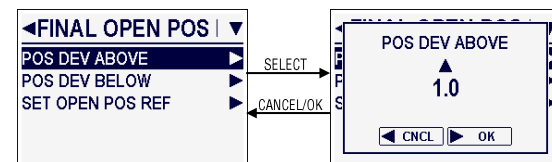


Figure 40: Open final position indicator menu

Set Position Reference

The set position reference allows the user to define the final position reference. Note, the position reference is independent of setting position limits, and must be set through the advanced

Limitorque® MX Advanced Diagnostics

diagnostics to utilize the position deviation indicator and create position deviation graphs.

To set the final position, move the actuator to the desired position and select set position reference. A popup window will ask the user to verify that the actuator is in the final position.

Once the position is verified, select OK to save the current actuator position as the indicator reference.

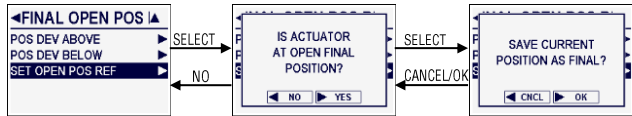


Figure 41: Set final position reference

5.1.4 Vibration

The vibration indicators provide notification when the vibration deviates from the user configured value. Vibration indicators can be set for vibration that exceeds a set value, vibration that is above the max reference or vibration that is below the min reference. The vibration unit of measure is mG RMS; the vibration deviation unit of measure is %.

NOTE: The vibration deviation % above or below the reference is the percent deviation from the current vibration reference value.

To configure the vibration indicator, select the desired parameters and use the menu knob to select the indicator value; use the black control knob to select OK to set the value.

Inactive Settle Time

The inactive settle time is the amount of time that the vibration must remain within the vibration deviation levels to clear the vibration indicator.

Active Settle Time

The active settle time is the amount of time that the vibration must remain outside the vibration deviation levels to trigger the vibration indicator.

Vibration Hi

The vibration hi is the vibrational value that must be surpassed to trigger the vibration high indicator.

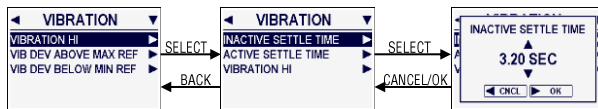


Figure 42: Vibration indicator menus

5.1.5 Service Indicators

The service indicators provide notifications when the actuator function deviates from user defined criteria. The service indicators submenus allow the user to configure the following attributes:

- Motor Temp Hi
- Starts/Hr Hi
- Total DS Turns
- Total Starts Open
- Total Starts Close
- Service Interval
- Mod Setpoint Hunting

Motor Temp High

The motor temperature high indicator notifies the user when the motor temperature reading is higher than a configured temperature value. The temperature unit of measure is °C.

To configure the motor temperature high indicator, select the Motor Temp Hi service indicator option. Then use the menu knob to configure the indicator trigger temperature value; use the black control knob to select OK to set the value.

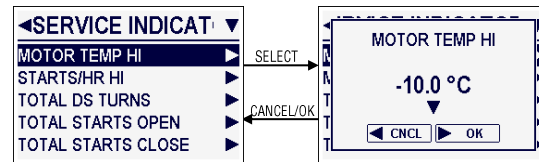


Figure 43: Motor temperature high indicator menu

Starts/Hr High

The starts per hour high exceeded indicator notifies the user when the actuator has started more times per hour than a configured value. The maximum allowable configuration value is five starts/hr below the unit configured rating.

To configure the starts per hour indicator, select the Starts/HR Hi service indicator option. Then use the menu knob to configure the indicator trigger value; select OK to set or cancel to return to the previous menu.

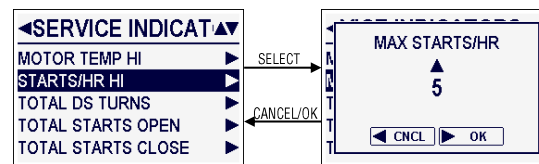


Figure 44: Max starts per hour indicator menu

Total Drive Sleeve Turns

The total drive sleeve turns indicator notifies the user when the drive sleeve has exceeded a configured number of turns.

To configure the allowable drive sleeve turns indicator, select the Total DS Turns service indicator option. Then use the menu knob to configure the indicator trigger value; select OK to set or cancel to return to the previous menu.

Limitorque® MX Advanced Diagnostics

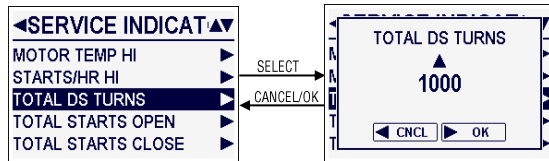


Figure 45: Total drive sleeve turns indicator menu

Total Starts Open and Close

The total starts count exceeded indicator notifies the user when the total number of starts has exceeded a configured number of starts in the open or close direction.

To configure the total starts indicator in the open or close direction, select the Total Starts Open or Total Starts Close service indicator option. Then use the menu knob to configure the indicator trigger value; select OK to set or cancel to return to the previous menu.

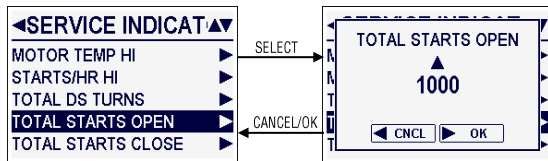


Figure 46: Total starts open indicator menu

Service Interval

The service interval indicator notifies the user when a configured number of hours has passed.

NOTE: Service interval hours are based on active motor on time.

To configure the service interval indicator, select the Service Interval indicator option. Then use the menu knob to configure the indicator trigger value; select OK to set or cancel to return to the previous menu.

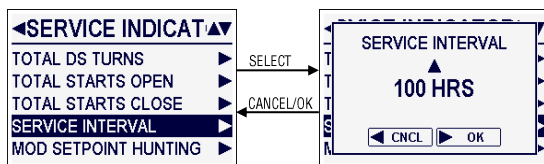


Figure 47: Service interval indicator menu

Modulating Setpoint Hunting

The modulating setpoint hunting indicator notifies the user when the actuator is unable to achieve a commanded position within a configured number of movement attempts.

To configure the modulating setpoint hunting indicator, select the Mod Setpoint Hunting indicator option. Then use the menu knob to configure the indicator trigger value; select OK to set or cancel to return to the previous menu.

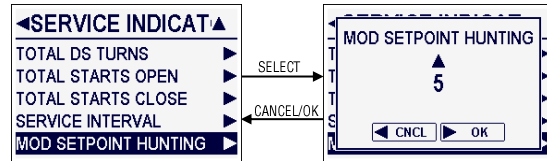


Figure 48: Modulating setpoint hunting indicator menu

Enable Indicators

The Enable Indicators menu allows the user to customize which indicators are enabled and disabled.

To enable an indicator, select the box next to the indicator name. A check will appear in the box next to enabled indicators.

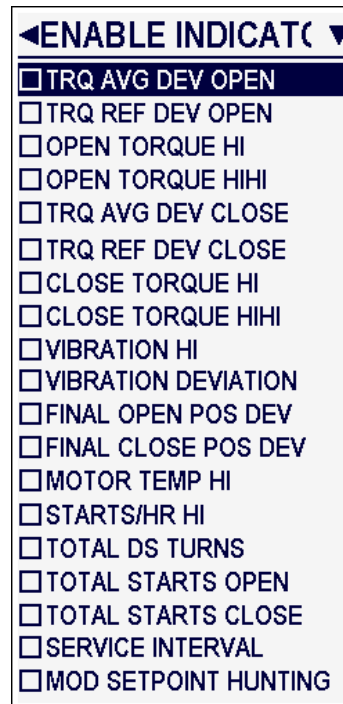


Figure 49: Enable indicators menu

5.2 View Indicators

The View Indicators menu allows the user to view the status of all set indicators concurrently or to view the details of individual groups of indicators.

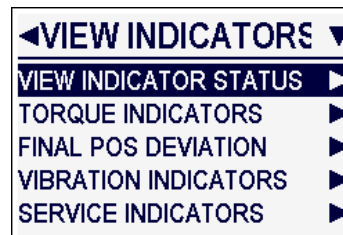


Figure 50: View indicators menu

View Indicator Status

The view indicators status menu allows the user to view the status all set indicators concurrently.

| ◀VIEW INDICATOR ! ▼ | |
|----------------------|------------|
| TORQUE DEVIATION | NOT ACTIVE |
| OPEN TORQUE HI | NOT ACTIVE |
| OPEN TORQUE HIHI | NOT ACTIVE |
| CLOSE TORQUE HI | NOT ACTIVE |
| CLOSE TORQUE HIHI | NOT ACTIVE |
| VIBRATION HI | NOT ACTIVE |
| VIBRATION DEVIATION | NOT ACTIVE |
| FINAL POS DEVIATION | NOT ACTIVE |
| MOTOR TEMP HI | NOT ACTIVE |
| MAX STARTS/HR | NOT ACTIVE |
| TOTAL DS TURNS | NOT ACTIVE |
| TOTAL STARTS OPEN | NOT ACTIVE |
| TOTAL STARTS CLOSE | NOT ACTIVE |
| SERVICE INTERVAL | NOT ACTIVE |
| MOD SETPOINT HUNTING | NOT ACTIVE |

Figure 51: View indicator status menu

Torque Indicators

The torque indicators menu provides access to the torque indicator details and the torque deviation details menus.

Torque Indicator Details

The indicator details menu displays the number of times an indicator has occurred, and the date and time the indicator was activated.

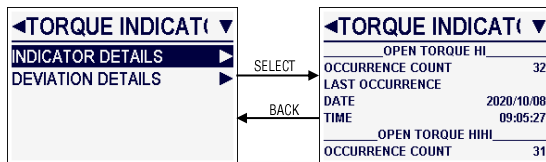


Figure 52: Torque indicator details menu

Torque Deviation Details

The deviation details menu provides access to the open and close torque deviation details relative to the reference value or the long term average torque. The torque deviation details menus display the number of times a deviation occurred, the date and time the deviation occurred, the position at which the deviation occurred, the deviation percent value and a total fail position range.

NOTE: The torque deviation value will appear as a positive percent value if the deviation is above the reference or long term average value and it will appear as a negative percent value if the deviation is below the reference or long term average value.

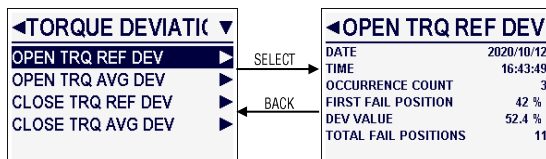


Figure 53: Torque deviation from reference details menu

View Final Position Deviation Details

The final position deviation details menu provides access to the open and close final position deviation details. The final position deviation details menu displays the date and time the deviation

occurred, the number of times the deviation occurred and the amount of deviation, displayed in drive sleeve turns.

NOTE: The final position deviation value will appear as a positive value if the deviation is above the set final position value and it will appear as a negative value if the deviation is below the set final position value.

| ◀DEVIATION DETAI ▼ | |
|----------------------|------------|
| OPEN FINAL POSITION | |
| DATE | 2020/08/26 |
| TIME | 11:37:32 |
| OCCURRENCE COUNT | 15 |
| DEV VALUE | 3.8210 |
| CLOSE FINAL POSITION | |
| DATE | 2020/08/26 |

Figure 54: Final position deviation details menu

View Vibration Indicators

The vibration indicators menu provides the user access to the vibration hi details and the vibration deviation details. The vibration details menus display the date and time when the detected vibration exceeded the allowable range, the date and time when the vibration returned to the allowable range, the number of times the vibration indicator has been triggered, the vibration value recorded when the indicator was triggered and the vibration max allowable setting.

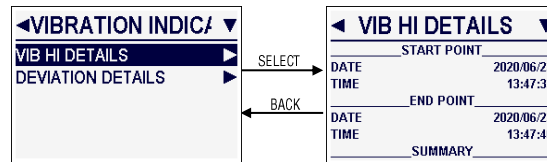


Figure 55: Vibration hi details menu

Limitorque® MX Advanced Diagnostics

View Service Indicators

The view service indicators menu displays the date and time a service indicator was triggered and the number of times an indicator occurred.

| ◀SERVICE INDICAT▶ | |
|----------------------|------------|
| MOTOR TEMP HI | |
| OCCURRENCE COUNT | 7 |
| LAST OCCURRENCE | |
| DATE | 2020/09/02 |
| TIME | 09:14:42 |
| STARTS/HR HI | |
| OCCURRENCE COUNT | 15 |
| LAST OCCURRENCE | |
| DATE | 2020/08/14 |
| TIME | 08:31:01 |
| TOTAL DS TURNS | |
| OCCURRENCE COUNT | 7 |
| LAST OCCURRENCE | |
| DATE | 2020/09/04 |
| TIME | 08:20:13 |
| TOTAL STARTS OPEN | |
| OCCURRENCE COUNT | 3 |
| LAST OCCURRENCE | |
| DATE | 2020/09/04 |
| TIME | 08:26:35 |
| TOTAL STARTS CLOSE | |
| OCCURRENCE COUNT | 4 |
| LAST OCCURRENCE | |
| DATE | 2020/09/04 |
| TIME | 08:26:24 |
| SERVICE INTERVAL | |
| OCCURRENCE COUNT | 3 |
| LAST OCCURRENCE | |
| DATE | 2020/09/04 |
| TIME | 08:02:50 |
| MOD SETPOINT HUNTING | |
| OCCURRENCE COUNT | 3 |
| LAST OCCURRENCE | |
| DATE | 2020/10/14 |
| TIME | 11:31:14 |
| TOTAL TIME | 0:00:13 |

Figure 56: Service Indicators details menu

5.3 Clear User Indicators

The clear user indicators function allows the user to clear all of the recorded indicators.

To clear the user indicators, access the User Indicators > Clear User Indicators. Select OK to clear the indicators or cancel to return to the main menu.

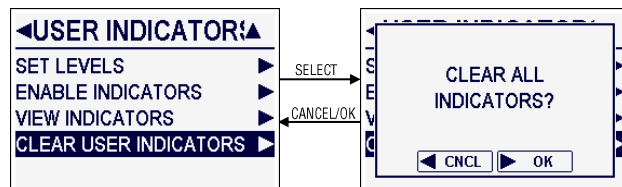
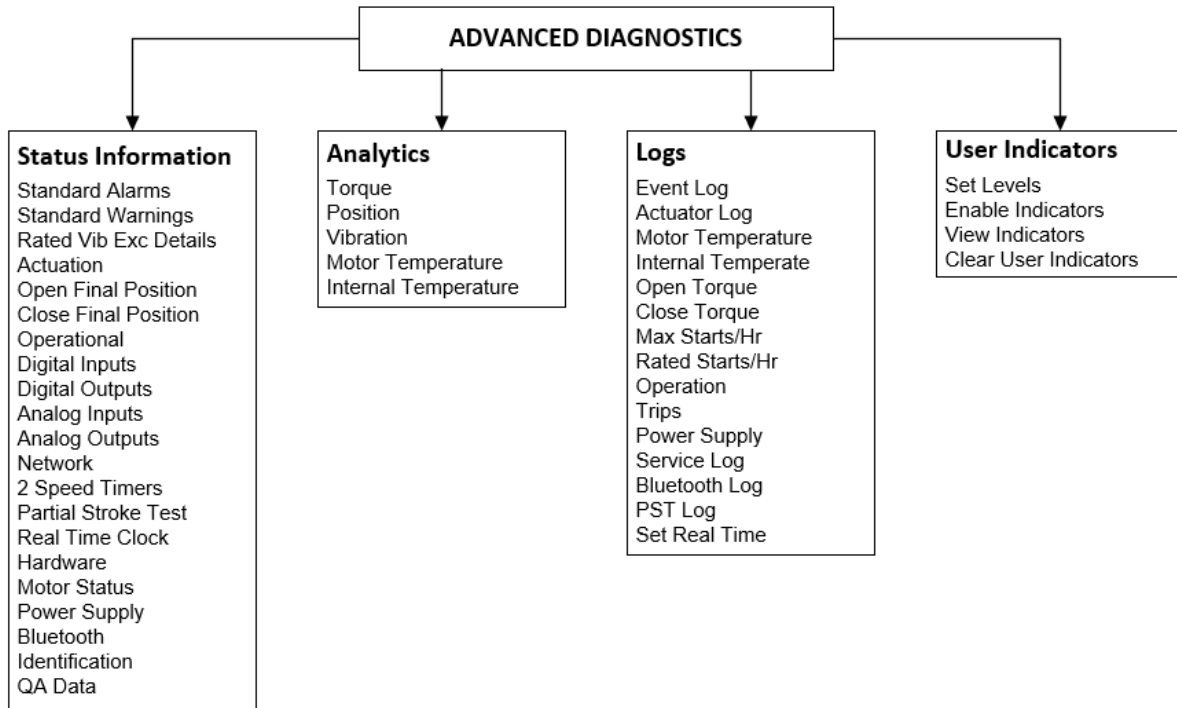


Figure 57: Clear user indicators function

Appendix A – Menu Tree



Appendix B – Diagnostic Descriptions

| Menu Feature | Description |
|--|---|
| STATUS INFORMATION | |
| The Status Information displays the configuration and status of a series of standard alarms, warnings and unit functions | |
| Standard Alarms | The Standard Alarms menu displays the status of alarms standard to the function of the actuator. The menu is live and not configurable. Standard alarms prohibit movement of the actuator if left unresolved. |
| Open Overtorque | The Open Overtorque alarm status indicates if the unit has detected an output torque greater than the configured torque setting while running open in mid-travel. |
| Close Overtorque | The Close Overtorque alarm status indicates if the unit has detected an output torque greater than the configured torque setting while running close in mid-travel. |
| Motor Overtemp | The Motor Overtemp alarm status indicates the measured motor thermistor temperature has exceeded the safe operating temperature and rating of the motor. |
| Valve Jammed | The Valve Jammed alarm status indicates the actuator has not detected any movement of the valve during its last movement command. |
| Open Torque Timer | The Open Torque Timer alarm status indicates the unit has exceeded its configured allowable time to torque seat in the open position. |
| Close Torque Timer | The Close Torque Timer alarm status indicates the unit has exceeded its configured allowable time to torque seat in the close position. |
| Lost Phase Fault | The Lost Phase Fault alarm status indicates if one of three motor phases has been detected. |
| Phase Reverse | The Phase Reverse alarm status indicates if one of the three motor phases has been reversed. |
| Encoder Fault | The Encoder Fault alarm status indicates if the encoder has failed. |
| Contactor Fault | The Contactor Fault alarm status indicates if there is a contactor failure. |
| Knob Fault | The Knob Fault alarm status indicates there is a failure with the black control knob and/or the red selector knob. Activation of the knob fault alarm will prohibit actuator movement. |
| Menu Knob Fault | The Menu Knob Fault alarm status indicates the center, rotary menu control knob has failed. Activation of the menu knob fault alarm will not prevent actuator movement. |
| HC Memory Fault | The HC Memory Fault alarm status indicates the host controller memory has failed. |
| UI Memory Fault | The UI Memory Fault alarm status indicates the user interface memory has failed. |
| Analog In 0 Lost | The Analog IN 0 Lost alarm status indicates if a 4-20 mA signal is not detected. |
| Identical Limits | The Identical Limits alarm indicates if the position limits are set adjacent to each other. The actuator will not move until the alarm error is corrected. |
| HC Comm Loss | The HC Comm Loss alarm indicates the user interface board has lost communication with the host controller board. |

| Menu Feature | Description |
|-----------------------------------|--|
| Standard Warnings | The Standard Warnings menu displays standard unit warnings. The Standard Warnings is a live menu, displaying actively updated information. Standard warnings will not prevent movement of the actuator unit if left unresolved. However, warnings left unresolved may lead to component failure and unit alarms, which will prevent movement of the actuator unit. |
| Encoder Warning | The Encoder Warning notifies the user the encoder has experienced a glitch. If the glitch persists, it could lead to encoder failure. |
| HC RTC Battery Low | The HC RTC Battery Low warning notifies the user of a low real time clock battery. |
| RTC Not Set | The RTC Not Set warning notifies the user that the real time clock has not been set. |
| Rated Starts/HR Exceeded | The Rated Starts/HR Exceeded warning notifies the user that the motor has exceeded the number of acceptable starts per hour. The Rated Starts/HR is set per the actuator requirements at the factory but may be reconfigured. Contact Limitorque Customer Service for assistance. |
| Rated Vibration Exceeded | The Rated Vibration Exceeded warning notifies the user that the unit has experienced vibrations above the actuator rated level. (3g over 3 seconds) |
| Bluetooth Failed | The Bluetooth Failed warning notifies the user that the Bluetooth module has failed. |
| Rated Vib Exceeded Details | The Rated VIB Exceeded Details provides the user with information about vibrations above the accepted actuator rated level (3g over 3 seconds). The details include information about the date, time, start and end point, occurrence count, deviation value and the max. acceptance level. |
| Actuation | The Actuation screen provides the user with live status information about the actuator. The detailed information includes position, analog in 0 status, demand status, percent torque and the internal and motor temperatures. |
| Open Final Position | The Open Final Position status information page displays the last open seat date, time and deviation from the defined seat reference. |
| Close Final Position | The Close Final Position status information page displays the last close seat date, time and deviation from the defined seat reference. |
| Operational | The Operational menu displays general operational status information. The status will appear as either active or not active. |
| Opened | The Opened status indicates if the actuator is open. |
| Closed | The Closed status indicates if the actuator is closed. |
| Stopped Midtravel | The Stopped Midtravel status indicates if the actuator has stopped midtravel. |
| Manual Operation | The Manual Operation status indicates if the actuator detects movement by the handwheel. This event is cleared through a local or remote movement command. |
| Open Limit Switch | The Open Limit Switch status indicates if the open limit switch has been activated. |
| Close Limit Switch | The Close Limit Switch status indicates if the close limit switch has been activated. |
| Open Torque Switch | The Open Torque Switch status indicates if the open torque switch has been activated. |
| Close Torque Switch | The Close Torque Switch status indicates if the close torque switch has been activated. |

| Menu Feature | Description |
|------------------------|--|
| Network ESD | The Network ESD status indicates if the actuator has received a network emergency shutdown command and has entered a shutdown state. |
| Local ESD | The Local ESD status indicates if the actuator has received a local emergency shutdown command and has entered a shutdown state. |
| Open Inhibit | The Open Inhibit status indicates if a digital input, open inhibit signal is active. |
| Close Inhibit | The Close Inhibit status indicates if a digital input, close inhibit signal is active. |
| Knob Lockout | The Knob Lockout status indicates if the knob lockout function has been activated and the knobs are inaccessible. Note: The Knob Lockout option is a custom input option and only available if purchased. |
| Digital Inputs | The Digital Inputs menu displays the user defined digital input functions and the live status of the functions as active or not active. The functions of each input can be standard open/stop/close with |
| Digital Outputs | The Digital Outputs menu displays the user defined digital output functions and the live status of the functions as active or not active. Four status (S) contacts and four optional alarm contacts (R) |
| Analog Input | The Analog Input menu displays live and static data about the status of the 4-20 mA current controlled analog input functions. |
| Analog In 0 | The Analog In 0 displays the status of the analog input board as enabled or disabled. |
| Demand | Demand displays the percent demand as observed and calculated by the analog input circuitry. |
| Position | The Position displays the current percent position of the actuator. |
| Hunting Indicator | The Hunting Indicator is a user configurable alarm that notifies the user when the actuator is hunting and unable to reach a commanded position. |
| Proportional Band | Proportional Band displays the user configured percent range where the actuator will being to pulse or slow towards it's demand position. Proportional Band is set by default to 5.0% Refer to Limitorque MX Series B Electronic Actuator user instructions for more information about configuring the actuator proportional band. |
| Deadband | Deadband displays the user configured deadband setting. Deadband is set by default to 2.0% Refer to Limitorque MX Series B Electronic Actuator user instructions for more information about configuring the actuator deadband. |
| Analog Outputs | The Analog Output menu displays live and static data about the status of the analog output function options APT polarity and/or ATT polarity. Refer to Limitorque MX Series B Electronic Actuator user instructions for more information about configuring the actuator analog outputs. |
| ANLG# IO BRD | ANLG# IO BRD notifies the user if an analog output board is present and enabled or disabled. |
| AO# Function | AO# Function displays the function assigned by the user to analog output #. The user can assign the analog output APT polarity and provide a 4-20 mA feedback signal proportional to the valve position. Or the user can assign the analog output ATT polarity and provide a 4-20 mA proportional to the actuator output torque. |
| Analog Out# | Analog Out # displays the live data associated with the user assigned function displayed in AO# Function. |

Limitorque® MX Advanced Diagnostics

| Menu Feature | Description |
|----------------------------|--|
| AO Loss | AO# Loss notifies the user the analog output board driver chip is reporting a fault, resulting in a loss of analog output signal. This fault forces an analog board reset on a continuous cyclic basis until the fault is cleared. |
| Network | The Network menu displays status information about the applicable communication network such as configuration, board status, and communications status. Note: The Network menu is only visible if the user has purchased a network card. |
| Two Speed Timers | The Two Speed Timers menu displays live and static information about the two-speed timer option. Refer to Limitorque MX Series B Electronic Actuator user instructions for more information about the Two-speed timer functionality. |
| Position | The Position displays the live actuator percent open position. |
| Close Timer | The Close Timer displays if the user has enabled the two-speed timer to function in the close direction. |
| Inside Close Band | The Inside Close Band displays if the unit is within the configured close position band. |
| Start Position | The Start Position displays the user defined setpoint position at which the actuator motor will begin pulsing. The default close start position is 10%. Refer to Limitorque MX Series B Electronic Actuator user instructions for more information about setting the close start position. |
| Stop Position | The Stop Position displays the user setpoint position at which the actuator motor will stop pulsing. The default close stop position is 0%. Refer to Limitorque MX Series B Electronic Actuator user instructions for more information about setting the close stop position. |
| Pulse On Time | The Pulse On Time displays the user set pulse on duration during actuator closing. The default close pulse on time is 2.0 seconds. Refer to Limitorque MX Series B Electronic Actuator user instructions for more information about setting the close pulse on time duration. |
| Pulse Off Time | The Pulse Off Time displays the user set pulse off duration during actuator closing. The default close pulse off time is 1.0 seconds. Refer to Limitorque MX Series B Electronic Actuator user instructions for more information about setting the close pulse off time duration. |
| Open Timer | The Open Timer displays if the user has enabled the two-speed timer to function in the open direction. |
| Inside Open Band | The Inside Open Band displays if the unit is within the configured open position band. |
| Start Position | The Start Position displays the user defined setpoint position at which the actuator motor will begin pulsing. The default open start position is 90%. Refer to Limitorque MX Series B Electronic Actuator user instructions for more information about setting the open start position. |
| Stop Position | The Stop Position displays the user setpoint position at which the actuator motor will stop pulsing. The default open stop position is 100%. Refer to Limitorque MX Series B Electronic Actuator user instructions for more information about setting the open stop position. |
| Pulse On Time | The Pulse On Time displays the user set pulse on duration during actuator opening. The default open pulse on time is 2.0 seconds. Refer to Limitorque MX Series B Electronic Actuator user instructions for more information about setting the open pulse on time duration. |
| Pulse Off Time | The Pulse Off Time displays the user set pulse off duration during actuator opening. The default open pulse off time is 1.0 seconds. Refer to Limitorque MX Series B Electronic Actuator user instructions for more information about setting the open pulse off time duration. |
| Partial Stroke Test | The Partial Stroke Test (PST) menu displays the results of a stroke test. |

| Menu Feature | Description |
|------------------------|---|
| PST | PST displays the state of the stroke test. |
| PST Results | PST Results displays the pass or fail result of the last PST. |
| Failure Reason | Failure Reason displays the cause of the PST failure. |
| PST Target | PST Target displays the percent open target the actuator needed to meet to pass the PST. |
| Position | Position displays the current actuator percent open position. |
| PST Start Position | PST Start Position displays the user defined test start position. |
| Deadband | Deadband displays the user defined deadband percent value. The default deadband is 2.0%. Refer to Limitorque MX Series B Electronic Actuator user instructions for information about adjusting the deadband percent value. |
| Proportional Band | Proportional Band displays the user configured percent range where the actuator will being to pulse or slow towards it's demand position. The default proportional band value is 5.0% The proportional band can be modified by accessing the Digital Inputs menu, the Modutronic menu, of the Network menu. Refer to Limitorque MX Series B Electronic Actuator user instructions for additional information about adjusting the proportional band percent value. |
| Real Time Clock | The Real Time Clock (RTC) menu displays live date, time and battery level information. It also displays time zone offset, the active/deactive low battery alarm status and if the RTC has been set. |
| Hardware | The Hardware menu displays the live OK/Fault status of various components and software boards. Components will not display if they have not been incorporated into the unit. |
| Motor Status | The Motor Status menu displays the live phase rotation status and motor temperature. |
| Power Supply | The Power Supply menu displays the live minimum and maximum recorded voltage, the current power supply voltage and the power supply frequency. |
| Bluetooth | The Bluetooth screen displays details about the Bluetooth connection. |
| Identification | The Identification menu display information about the actuator unit, firmware and software. Displayed information will be dependent on unit type. |
| QA Data | The QA Data menu displays the quality assurance test date, time and stamp. information |
| ANALYTICS | |
| Torque | The Torque Trends menu provides access to the actuator open and close torque profile information and open and close torque graphs. Trend graphs are useful for tracking changes in operating conditions. |
| Open Profile | The Open and Close Profile screens display the most recent and saved reference information about the actuator torque profile, such as breakout torque, ending torque and peak running torque. The torque profile is helpful for tracking changes in the process conditions. |
| Close Profile | |
| Open Torque Graph | The Open and Close Torque Graph screens displays the most recent and saved reference torque graphs, as well as the option to save a graph as a reference. Available torque graphs for view include max torque vs position, min torque vs position, average torque vs position and LTA torque vs position. |
| Close Torque Graph | |

| Menu Feature | Description |
|----------------------|---|
| Save Open Ref | The Save Open and Close Ref options allows the user to save the latest torque profile and graph as the reference. A newly saved reference will replace an existing reference. |
| Save Close Ref | |
| Position | The Position Trend menu provides access to the actuator open and close motor and position information and graphs. Trend graphs are useful for tracking changes in operating conditions. Note: The position reference must be saved in-order to accurately use this data. |
| Open Motor On Time | The Open and Close Motor On Time screens display cumulative data of the motor on time vs position as a histogram chart. Each histogram X axis point equals 10% of stroke. |
| Close Motor On Time | |
| Open Starts/Hour | The Open and Close Starts/Hour screens display cumulative data of the number of motor starts per hour vs position as a histogram chart. Each histogram X axis point equals 10% of stroke. |
| Close Starts/Hour | |
| Open Final Position | The Open and Close Final Position screens display the average, maximum or minimum final position vs time, over a user defined range of time. Optional time scales include 24 hours, 30 days, 12 months or 10 years. |
| Close Final Position | |
| Vibration | The Vibration Trend menu provides access to vibration data graphs. Trend graphs are useful for tracking changes in operating conditions. |
| Vibration vs Time | The Vibration vs Time menu provides access to the max vibration vs time and average vibration vs time graphs. Vibration vs time graphs may be viewed with a time scale of 24 hours, 30 days, 12 months or 10 years. |
| Vib vs Open Pos | The Vib vs Pos menu provides access to the vibration vs position last run and summary run graphs. The last run graphs consist of the max, min and average vibration vs opening position with a time scale of the last run of stroke. The summary run graphs consists of the max, min and average vibration vs position with a time scale from last system reboot to present. The Vib vs pos menu also provides the ability to save last run and summary graphs as reference graphs. Note, the save reference graph function will save the max, min and average graph for reference. |
| Vib vs Close Pos | |
| Elapsed Time vs Vib | The Elapsed Time vs Vib screen displays cumulative data of the high or low vibration range over time as a histogram chart. The high range vibration data will display as five histogram X axis points at 3200mG each. The low range vibration data will display as ten histogram X axis points at 400mG each. |
| Motor Temp | The Motor Temp screen displays a graph of motor temperature over time. The motor temp vs time graph may be viewed with a time scale of 24 hours, 30 days, 12 months or 10 years. Trend graphs are useful for tracking changes in operating conditions. |
| Internal Temp | The Internal Temp screen displays a graph of internal temperature over time. The internal temp vs time graph may be viewed with a time scale of 24 hours, 30 days, 12 months or 10 years. Trend graphs are useful for tracking changes in operating conditions. |
| LOGS | |
| Event Log | The Event Log displays time and date stamped details about maintenance, out of spec, check function and failure events. The events displayed in the log can be configured though the Event Log Categories screen. |
| Actuator Log | The Actuator Log displays time and date stamped details about actuator commands, position and movement. |

| Menu Feature | Description |
|---|---|
| Motor Temp | The Motor Temp displays time and date stamped details about the average, max and min motor temperature. |
| Internal Temp | The Internal Temp displays time and date stamped details about the average, max and min internal temperature. |
| Open Torque | The Open Torque displays time and date stamped details about the average, max and high torque indicators experienced while the actuator was opening. |
| Close Torque | The Close Torque displays time and date stamped details about the average, max and high torque indicators experienced while the actuator was closing. |
| Starts/Hr HI | The Starts/Hr HI displays time and date stamped details about the number of times the actuator has exceeded the configured motor starts/hr hi setting. |
| Rated Starts/Hr | The Rated Starts/Hr displays time and date stamped details about the number of times the actuator has exceeded the starts/hr unit rating. |
| Operation | The Operation displays details about the motor and drive sleeve operation, stroke time and vibration experienced by the unit. |
| Trips | The Trips displays time and date stamped information about the actuator seating in the open and closed direction and the torque to seat. |
| Power Supply | The Power Supply displays time and date stamped information about the max and min voltage and frequency of the power supply. |
| Service Log | <p>The Service Log displays the last date and time the actuator was serviced. It also provides the user the ability to set the last service date.</p> <p>Note: The last service date and time must be set by the user. It is highly recommended to set the last service date for tracking trends and for reference.</p> |
| Bluetooth Log | The Bluetooth Log displays the time and date a Bluetooth compatible device was connected or disconnected from the actuator. |
| PST Log | The PST Log displays time and date stamped information about preformed partial stroke tests. It also provides access to the graphed max, min, average and long term average torque recorded during the PST. |
| Set Real Time Clock | The Set Real Time Clock allows the user to view and set the real time clock details. |
| USER INDICATORS | |
| Set Levels | The Set Levels menu allows the user to define indicator notification conditions for open and close torque, open and close final position, open and close speed, vibration and the service indicators. |
| Open Torque Close Torque | The Open and Close Torque indicator menus allow the user to customize alarms to notify when the torque to open or close the actuator has exceeded an allowed deviation above or below a defined torque value. |
| Open Final Pos Close Final Pos | The Open and Close Final Position indicator menus allow the user to customize alarms to notify when the final seat position has deviated from the saved final seat position. Position deviation values are shown in units of drive sleeve turns. The final seat position must also be saved from the open and close final position menus. |

| Menu Feature | Description |
|------------------------------|---|
| Vibration | The Vibration Indicator menus allow the user to customize alarms to notify when a vibration experienced by the actuator has deviated from an accepted value, or when a vibration experienced by the actuator has exceeded an accepted settle time. |
| Service Indicators | The Service Indicators menus allow the user to customize alarms to notify when the motor temperature, starts/hr, drive sleeve turns, motor starts in the open and close direction, service interval and modulating setpoint hunting has exceeded an accepted value. |
| Enable Indicators | The Enable Indicators menu allows the user to select which indicators are active. |
| View Indicators | The View Indicators menus allow the user to view time and date stamped details about the active indicators. |
| Clear User Indicators | The Clear User Indicators option allows the user to clear all unit recorded indicators. Note: This must be done locally each time there is a user indicator trip in order to ensure the failed condition is properly analyzed and acknowledged. |



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