



## MX/QX Advanced Field Troubleshooting

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### Prerequisite: MX/QX Basic course

It is assumed that students taking this course are mechanically inclined, have a working knowledge of the mechanical aspects of Limitorque MX, MX(a) & QX actuators and can perform the following basic tasks:

- a. Enter the Setup Menu and change the operating parameters of the actuator
- b. Set position limits both electrically and manually
- c. Be able to set the actuator for all (2-wire, 3-wire and 4-wire) modes
- d. Be able to configure the status and alarm contacts
- e. Be able to configure the 2-speed timer
- f. Be able to configure the User Inputs
- g. Be able to configure and calibrate the analog output (APT and ATT) option
- h. Be able to configure and calibrate the Modutronic option
- i. Be able to read and interpret wiring diagrams and schematics
- j. Be able to determine the current firmware loaded

\*If students are not proficient in the preceding tasks, please review tasks, prior to class, in the various user Installation, Operation, Maintenance and Spare parts manuals. Links to the necessary manuals are provided at the end of this document.

### Outline:

- a. MX/MXa/QX Similarities and Differences
  - i. Standard Control Features
  - ii. Protection Features
  - iii. Optional Features
- b. Flowserve Modtest Utility
  - i. Message formats
  - ii. Queries and responses
  - iii. Modbus Function Codes
  - iv. Reading and understanding register data
  - v. Controlling the actuator
  - vi. Downloading state machine data



## MX/QX Advanced Field Troubleshooting

- c. Flowserve Dashboard Utility
  - i. Operating modes
  - ii. Configuration options
  - iii. Diagnostic functions
- d. Firmware Downloading
- e. MX, MX(a) & QX preventative maintenance
- f. QX Motor controller

### Hardware requirements:

- a. Portable flash drive – 2GB min. This flash drive will be used to transfer and store utility software, electronic documents and other presentations pertaining to the course.
- b. Laptop PC with Windows XP or 7 operating system.
  - i. User must have administrative rights in order to load utility software. The utility software will be provided during the course.
  - ii. User must have basic computer skills
    1. Transfer, download and save files
    2. Configure communications ports via the Control Panel and Device Manager
- c. Computer should have a functioning serial port, if not then a functioning USB port and a USB-to-serial converter
  - i. Recommend the Sealevel 2105 USB to RS-232 DB9 Serial Interface Adapter <http://www.sealevel.com/store/2105r-usb-to-1-port-rs-232-db9-serial-interface-adapter.html>
- d. IR computer communications link
  - ii. Recommend Actisys IR Computer Link ACT-IR220LN19 <http://www.actisys.com/ac200-220.html>



## MX/QX Advanced Field Troubleshooting

### Other:

Students should be able to use the following test equipment

- a. Digital multimeter
- b. Loop Process meter (example Fluke 789 ProcessMeter or equivalent)
- c. Loop calibrator (example Altek Model 334 or equivalent)

Students should be familiar with the following test equipment

- a. Oscilloscope
- b. Network Protocol Analyzer

Students should have a working knowledge of the following

- a. Digital electronics
- b. Binary number systems
- c. Hexadecimal number systems
- d. Be able to convert between decimal, binary and hexadecimal number systems

The students learning experience will be enhanced with a prior review of the following documents:

Current firmware and instructions

<http://www.flowserve.com/Support/Software-Downloads#Limatorque>

MX Quick mounting instructions

<http://www.flowserve.com/files/Files/Literature/ProductLiterature/FlowControl/Limatorque/LMAIM1312-00.pdf>

MX(a) User instructions

<http://www.flowserve.com/files/Files/Literature/ProductLiterature/FlowControl/Limatorque/LMENI M2306-02.pdf>

MX(a)/QX Dashboard instructions

<http://www.flowserve.com/files/Files/Literature/ProductLiterature/FlowControl/Limatorque/LMENI M2338.pdf>

Maintenance and Spare parts manual

<http://www.flowserve.com/files/Files/Literature/ProductLiterature/FlowControl/Limatorque/LMENI M2314-00.pdf>



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### MX User instructions

<http://www.flowserve.com/files/Files/Literature/ProductLiterature/FlowControl/Limitorque/LMENIM1306-02.pdf>

### MX(a) quick set-up guide

<http://www.flowserve.com/files/Files/Literature/ProductLiterature/FlowControl/Limitorque/LMENIM2310-00.pdf>

### QX User instructions manual

<http://www.flowserve.com/files/Files/Literature/ProductLiterature/FlowControl/Limitorque/LMENIM3306-03.pdf>

### QX Quick mount and start up guide

<http://www.flowserve.com/files/Files/Literature/ProductLiterature/FlowControl/Limitorque/LMENIM3313-001.pdf>

### Protection, Control and Monitoring features

<http://www.flowserve.com/files/Files/Literature/ProductLiterature/FlowControl/Limitorque/LMENTB2300-02.pdf>

### Verifying the Firmware Version on the MX/MX(a)/QX

[http://www.flowserve.com/files/Files/Sites/Blue Ribbon/Verifying the Firmware Version on the MX, MXa and QX.ppt](http://www.flowserve.com/files/Files/Sites/BlueRibbon/Verifying%20the%20Firmware%20Version%20on%20the%20MX,%20MXa%20and%20QX.ppt)

### Other documents sent separately

*Decimal, Binary and Hexadecimal Number Systems (ppt)*

*RS485 Specs (pdf)*

*MX(a) wire routing combinations – Rev2 (pdf)*

*Port Management using the USB to Serial converter (pdf)*