FLOWSERVE

USER INSTRUCTIONS

MASTER STATION IV: EEP-SN4001

Installation
Operation
Maintenance

FCD LMENIM5010-00-AQ - 03/19

Experience In Motion

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1 Introduction

1.1 Overview

The next generation master station is designed by Flowserve Limitorque specifically for use with the Limitorque line of electric actuators equipped with Modbus DDC. The Master Station IV (MSIV) acts as a single-source controller for up to 250 actuators.

The MSIV is a plug-and-play solution that provides complete control, monitoring, and diagnostics of Limitorque electric actuators through a simple touch-panel display serving as a Human Machine Interface (HMI).

1.2 User Role Overview

The MSIV requires users to login. Four user role levels are configurable for each user: 1) View, 2) Control, 3) Configure, and 4) Administrator. Each role includes the rights of the lesser roles (i.e. Control includes View's rights, and Configure includes Control's rights and View's rights).

VIEW: the user can view the network status and the activity log. No control or configuration functionality is available.

CONTROL: in addition to the View rights, the user has the ability to control MOVs.

CONFIGURE: in addition to the Control rights, the user has the ability to configure the Master Station and the Network.

ADMINISTRATOR: in addition to Configure rights, the user has the ability to add or delete users, as well as modify user settings.

These roles can be changed by an Administrator user. See section the User Administration section for details.

1.3 Login

When the MSIV completes the boot process, it loads the introduction screen (Figure 1.1).

Figure 1.1 - Introduction

Touching any part of the screen will load the Enter User name screen (Figure 1.2).

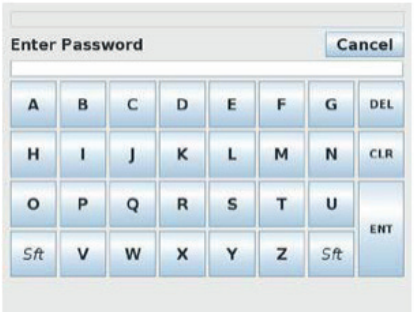
NOTE: If the screen is blank and the green power LED is illuminated, the MSIV is in screen saver mode. Touch the display to exit the screen saver mode.

Figure 1.2 - Enter User Name

Once the user name has been entered, the Enter Password screen will be displayed (Figure 1.3).

NOTE: Each user name must have a unique password.

Figure 1.3 - Login



Passwords and user names are set via the User Administration menu, under System Configuration.

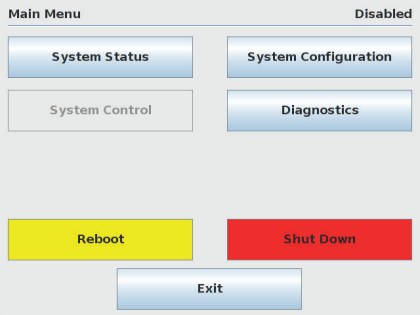
The correct password entry for the respective user name will advance the screen to the Main Menu (Figure 1.4).

If passwords are lost or forgotten, please contact your Limitorque service coordinator at 1-434-528-4400.

1.4 Main Menu

Once logged in, the user will see the Main Menu (Figure 1.4).

Figure 1.4 - Main Menu



From here, the menu options are displayed based on the current user role. Each button represents a separate logical section of the Master Station.:

SYSTEM STATUS (ALL USERS): View information related to the network status, status of the Master Station, and MOV status.

S**YSTEM CONTROL (CONTROL, CONFIGURE, AND ADMINISTRATOR):** Access to MOV control and emergency shutdown functions.

DIAGNOSTICS (CONFIGURE AND ADMINISTRATOR): Activate event logging, communication data analysis, or polling statistics.

REBOOT: Restart the MSIV

SHUT DOWN: Shut down the MSIV

EXIT: Log out of the MSIV user mode.

1.5 System Technical Data

1. Power supply

1.1. Nominal: 24VDC to 48VDC (+/- 10%).
1.2. Absolute minimum: 21.6VDC.
1.3. Absolute maximum: 52.8VDC.
1.4. Maximum current draw is 2.0 amps.

2. Operating environment

2.1. It is recommended to install and operate the MSIV in an indoor, climate-controlled environment, ideally in temperature range of 10 Celsius to 30 Celsius.
2.2. Absolute minimum operating ambient temperature: 0 degrees Celsius
2.3. Absolute maximum operating ambient temperature: 40 degrees Celsius
2.4. Humidity: maximum 85% RH non-condensing

3. Storage

3.1. Store the MSIV in a cool, dry area, out of direct sunlight.
3.2. Minimum storage temperature: -20 degrees Celsius
3.3. Maximum storage temperature: 60 degrees Celsius
3.4. Humidity: maximum 95% RH non-condensing

4. Human machine interface

4.1. 6.5” diagonal touch panel LCD
4.2. 640x480 resolution
4.3. Multiple language support: English, Spanish, and Chinese

5. Communication Protocols

5.1. MSIV to Field Units
  5.1.1. Modbus RTU
    5.1.1.1. EIA-485 (RS-485) physical layer
    5.1.1.2. Bi-directional redundant loop or multi-drop network topologies
    5.1.1.3. Maximum communication rate of 38.4 Kbaud
5.2. MSIV to DCS
  5.2.1. Modbus RTU
    5.2.1.1. TIA-232 (RS-232) physical layer
    5.2.1.2. If RS-485 or RS-422 physical layers are required, an external converter can be specified.
    5.2.1.3. Maximum communication rate of 115.2 Kbaud
  5.2.2. Modbus TCP/IP
    5.2.2.1. 10/100Mbit ethernet physical layer

6. System Redundancy

6.1. A completely modular, redundant system can be setup using two EEP-SN4001 modules.
6.2. Wire the modules in parallel to the same Modbus RTU actuator network and configure one module as Active and one as Standby.
6.3. The Standby module will monitor network communications and if the Active module fails, the Standby module will become active and take over the actuator network communications.

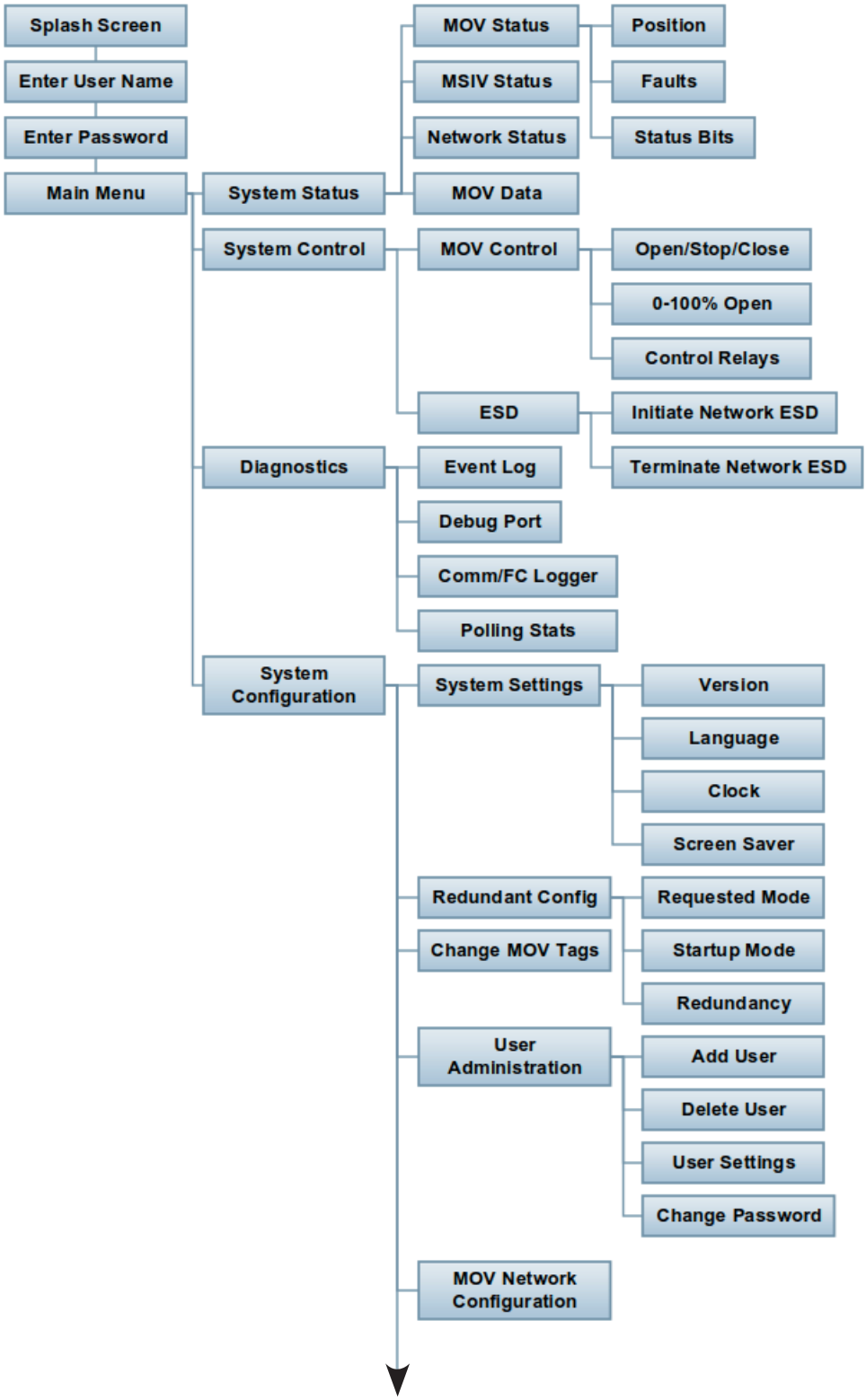
7. Electromagnetic Compatibility (EMC) Compliance

7.1. EN 61326-1:2013
7.2. EN 55011:2009+A1(2010) Class A
7.3. EN 61000-4-2:2009
7.4. EN 61000-4-3:2006+A1(2008)+A2(2010)
7.5. EN 61000-4-4:2004+A1(2010)
7.6. EN 61000-4-5:2006
7.7. EN 61000-4-6:2009
7.8. EN 61000-4-8:2010
7.9. EN 61000-4-11:2004

2 Function Flowchart

The following flowchart graphics illustrate the main functional categories of the MSIV.

Figure 2.1 – MSIV Functional Flowchart



System Configuration branch continued on next page…

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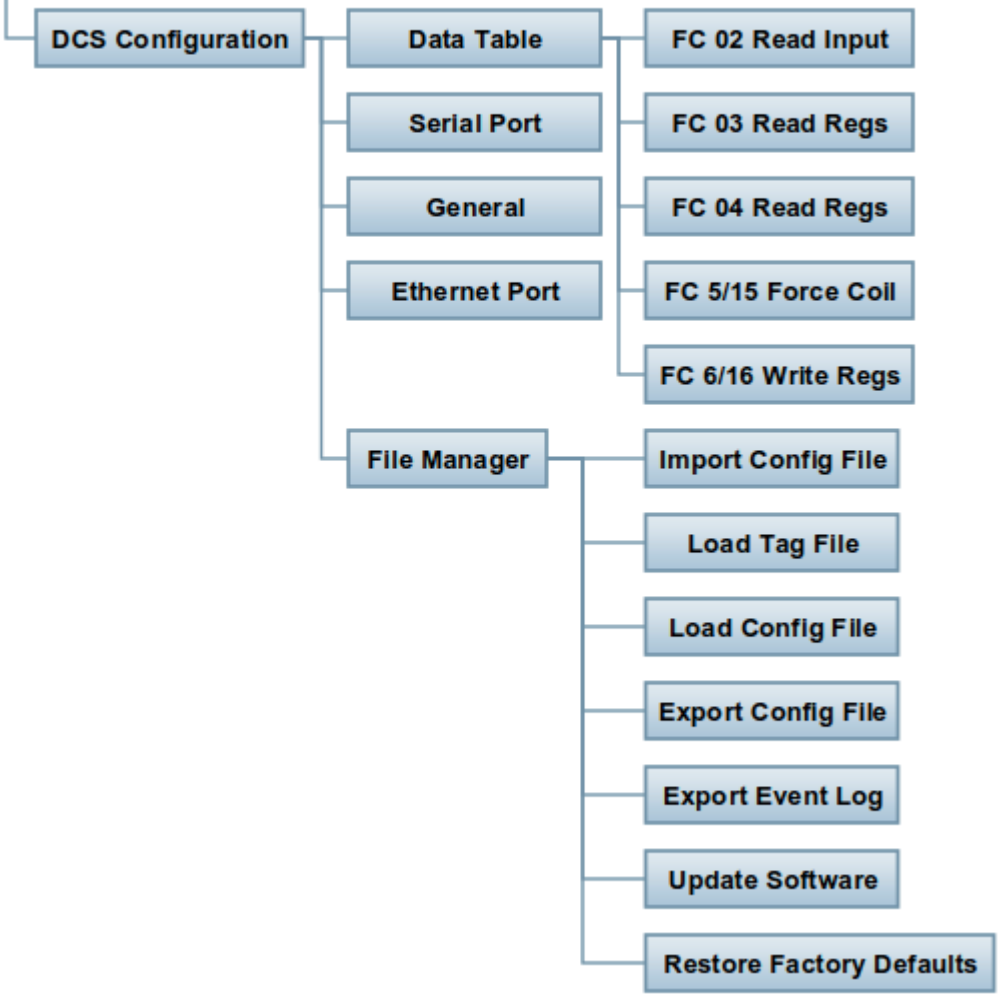


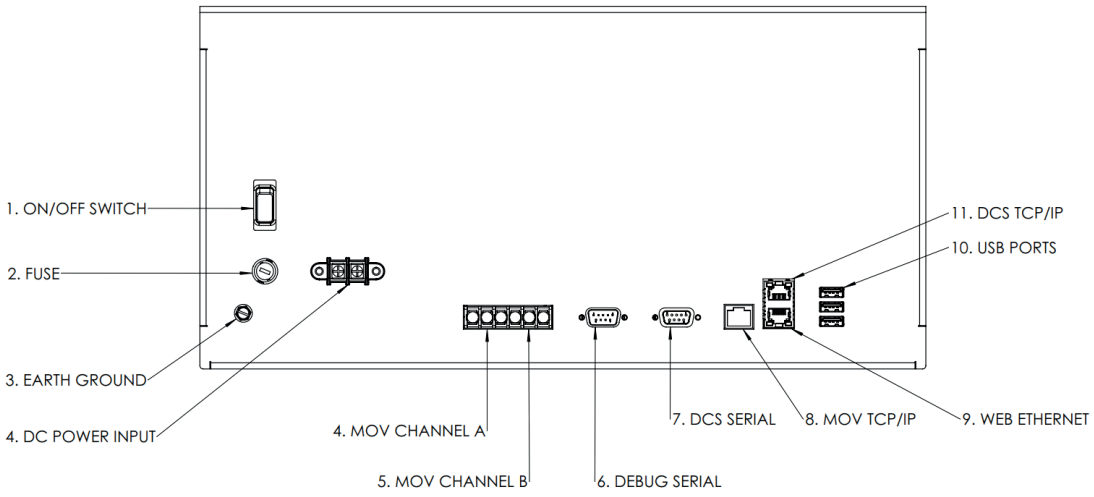
3 Quick Startup

1. Connect earth ground (#18AWG minimum) wiring, MOV network cables (Belden #3074F/#9841/#3107), and DC power cabling.
2. Apply power to the MSIV and turn the power switch to the ON position.
3. Wait for the MSIV to display the start-up screen.
4. Touch the screen once and wait for the login prompt.
5. Enter default username “FLOW”. Press Enter.
6. Enter default password. Press Enter. Contact Limitorque for the default password.
7. Select “System Configuration” then “Redundant Configuration”.
8. Set the requested mode to “Disabled”, startup mode to “Active”, and redundancy mode to desired setting.
9. Press the “Back” button and in the “System Configuration” page select “User Administration”.
10. Set up user accounts.
11. Select “MOV Network Config” and set up the MOV network.
12. Select “DCS Configuration” and set up the DCS communications.
    a. For remote DCS control, the three primary registers of interest are:
        i. 46001: Register for HS Status (Ready Only): 0=idle, 1=standby, 2=hot
        ii. 46002: Register for Host System to toggle (Write Only): 3=toggle state
        iii. 46191: Register for Internal Program Execution Heartbeat (Read Only): Updates every scan, 8-bit integer.
13. Tap the “Back” button to return to the “System Configuration” screen.
14. Select “Redundant Config” and change the requested mode to “Active”.

4 Electrical Connections

4.1 MSIV Rear Panel Connections

Figure 4.1 – MSIV Rear Panel Electrical Connections



The following list defines the connections shown in Figure 4.1 above.

1. **ON/OFF SWITCH:** Used to switch the MSIV DC power supply ON or OFF.
2. **FUSE:** Housing of the fuse used to protect the DC power input. Use a 5x20mm, 2.5 amp, 250V fuse.
3. **EARTH GROUND:** Chassis ground using a #10-32 grounding screw. The Master Station MUST be attached to a good quality electrostatic local earth ground. An effective, low-impedance (less than 5 ohms) connection is required.
4. **MOV CHANNEL A:** Connections for channel A of the MOV network using #6-32 terminal screws. See table 4.1 for connection details.

Table 4.1 – Network Channel A Connection

Connector	MX/QX	UEC-3-DDC
DATA-A1(+)	13	TB4 D-S
DATA-A1*(-)	14	TB4 D-S*
Shield	N/C	

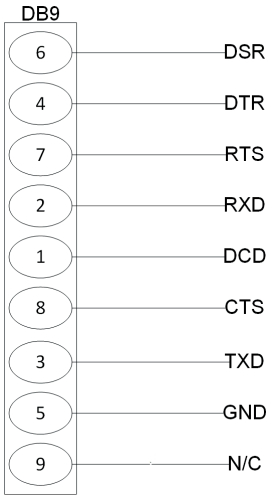
5. MOV CHANNEL B: Connections for channel B of the MOV network using #6-32 terminal screws. See table below for connection details.

Table 4.2 – Network Channel B Connection

Connector	MX/QX	UEC-3-DDC
DATA-A2(+)	5	TB3 D-M
DATA-A2*(-)	4	TB3 D-M*
Shield	3	

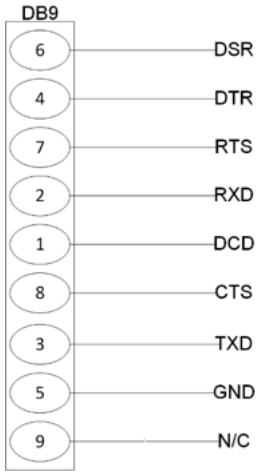
6. DEBUG SERIAL: RS-232 serial port. Used for MSIV diagnostics. See figure 4.2 below for RS-232 connection information. The Debug serial port is configured as a DTE, DB9 Male connector.

Figure 4.2 – Debug Port Connection: DB9 Male



7. **DCS SERIAL PORT:** RS-232 serial port. If RS-422 or RS-485 is needed, an external converter should be used. The DCS serial port is configured as a DTE, DB9 female connector (depending on the DCS system, a null modem DB9 cable may need to be used for communicating with this port).

Figure 4.3 – DCS Serial Port Connection: DB9 Female



8. **MOV TCP/IP:** Ethernet connector for future development (not currently placed). Intended for use with actuators that are equipped with Modbus TCP/IP add-on adapter.

9. **WEB ETHERNET:** Ethernet port for future development.

10. **USB PORTS:** Can be used for updating MSIV software. Note: the rear panel has 3 USB ports physically installed, but only the top 2 ports are available for the user.

11. **DCS TCP/IP:** Ethernet port for DCS communications. RJ45 connector. Supports Modbus TCP/IP protocol as specified by the Modbus Organization's "MODBUS MESSAGING ON TCP/IP IMPLEMENTATION GUIDE V1.0b" publication.

4.2 Master Station Wiring Requirements

Regarding the network cable which connects the field units to the Master Station, a shielded, twisted-pair cable must be used. In particular, Belden 3074F, 3105A or 9841 cable should be used. The use of other cables may result in a reduction of internodal distances or increased error rate, and is the user's responsibility.

BELDEN 3074F SPECIFICATIONS

- Total cable length between repeaters or nodes with repeaters: up to 19.2 kbps: 4000' (1.2km)

For loop mode, this is the total length between operating field units. If a field unit loses power, the relays internal to the field unit connect the A1 Channel to the A2 Channel, which effectively doubles the length of the cable (assuming a single field unit fails). To ensure operation within specifications in the event of power failure to field units, this consideration must be added. Example: to ensure operation within specification when any two consecutive field units lose power, the maximum length of cable up to 19.2 kbps should not exceed 4000' (1.2 km) per every four field units.

Key Specifications

- Resistance/1000 ft = 18 AWG (7 x 26) 6.92 ohms each conductor (13.84 ohms for the pair)
- Capacitance/ft = 14 pF (conductor-to-conductor)
- Capacitance/ft = 14 pF (conductor-to-shield)

BELDEN 3105A SPECIFICATIONS

- Total cable length between repeaters or nodes with repeaters: up to 19.2 kbps: 4000' (1.2 km)

For loop mode, this is the total length between operating field units. If a field unit loses power, the relays internal to the field unit connect the A1 Channel to the A2 Channel, which effectively doubles the length of the cable (assuming a single field unit fails). To ensure operation within specifications in the event of power failure to field units, this consideration must be added. Example: to ensure operation within specification when any two consecutive field units lose power, the maximum length of cable up to 19.2 kbps should not exceed 4000' (1.2 km) per every four field units.

Key Specifications

- Resistance/1000 ft = 22 AWG (7 x 30) 14.7 ohms each conductor (29.4 ohms for the pair)
- Capacitance/ft = 11.0 pF (conductor-to-conductor)
- Capacitance/ft = 20.0 pF (conductor-to-shield)

BELDEN 9841 SPECIFICATIONS

- Total cable length between repeaters or nodes with repeaters: up to 19.2 kbps: 3500' (1 km)

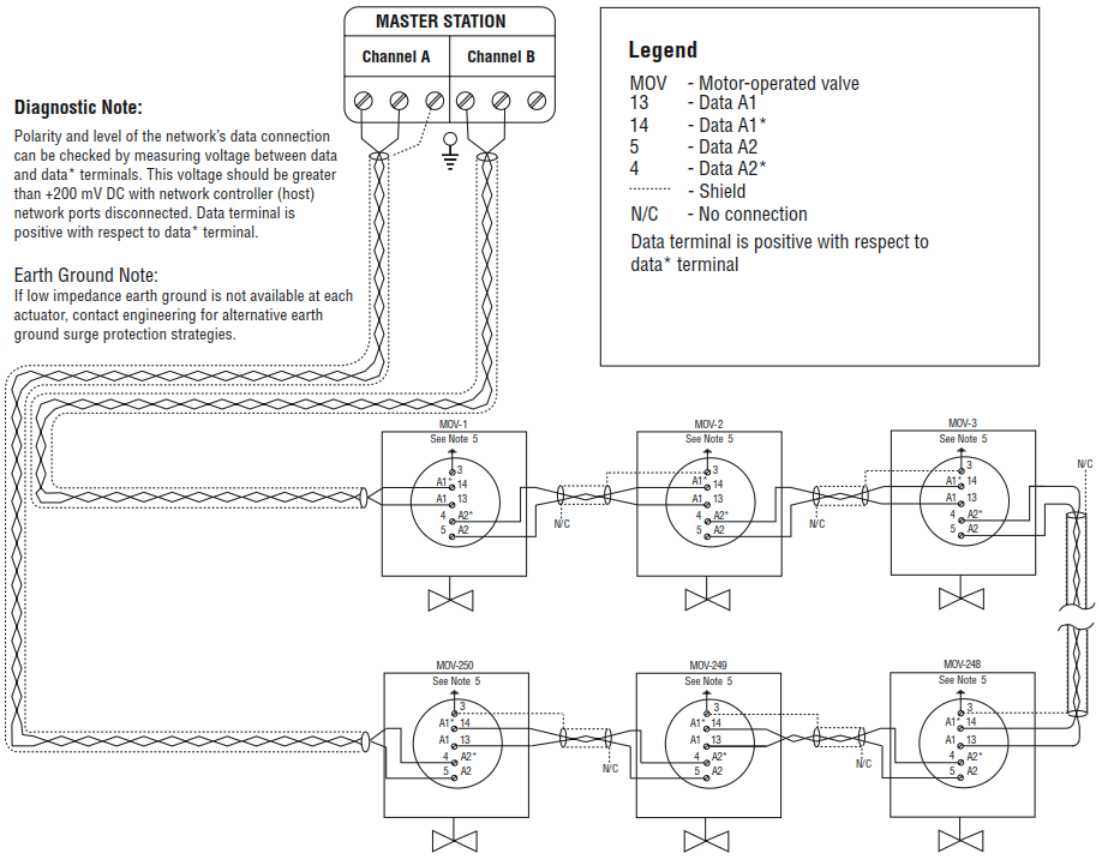
For loop mode, this is the total length between operating field units. If a field unit loses power, the relays internal to the field unit connect the A1 Channel to the A2 Channel, which effectively doubles the length of the cable (assuming a single field unit fails). To ensure operation within specifications in the event of power failure to field units, this consideration must be added. Example: to ensure operation within specification when any two consecutive field units lose power, the maximum length of cable up to 19.2 kbps should not exceed 3500' (1 km) per every four field units.

Key Specifications

- Resistance/1000 ft = 24 AWG (7 x 32) 24 ohms each conductor (48 ohms for the pair)
- Capacitance/ft = 12.8 pF (conductor-to-conductor)
- Capacitance/ft = 23 pF (conductor-to-shield)

4.3 Master Station Network Topologies

Figure 4.4 – Modbus Redundant Loop Topology



Notes:

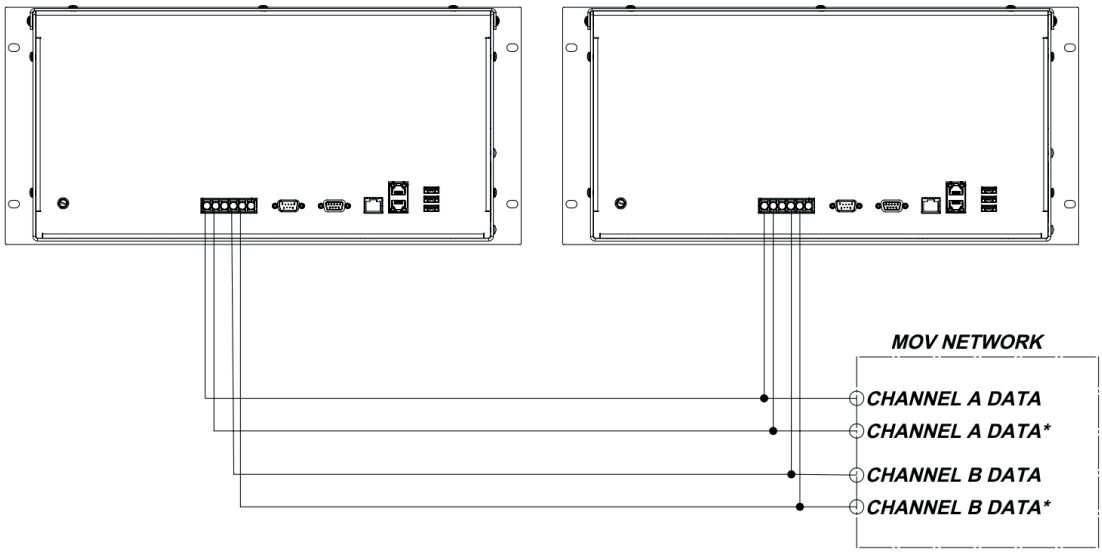
1) Belden 3074F, 3105A, or 9841 shielded cable is recommended.
2) Correct polarity for field unit and network controller connection is necessary for proper operation.
3) Connections shown are typical. The number of MOVs shown may not indicate true system size.
4) Earth ground: ground rod
5) Earth ground: ground rod or lug in actuator if actuator is grounded.

Additionally, a redundant system can be setup using by using 2 modules. Wire the modules in parallel to the same MOV RS-485 network as shown below. The redundant modules can be located at any position in the network, but Configure one module as Active and one as Standby as explained in section 7.2.2 Redundant configuration. The 2 redundant modules should be connected to the same electrical node of the RS-485 network, and the wiring should adhere to the Belden wiring specifications regarding max distance between network nodes and repeaters.

Table 4.3 – Hot-Standby Wiring Connections for Redundant Modules

MSIV Module	Connector	MX/QX Network	UEC-3-DDC Network
Hot Active	Channel A Data (+)	13	TB4 D-S
	Channel A Data*(-)	14	TB4 D-S*
	Shield (GND)	N/C	
Standby	Channel B Data(+)	5	TB3 D-M
	Channel B Data*(-)	4	TB3 D-M*
	Shield (GND)	3	

Figure 4.5 – Hot Standby Redundant Wiring Diagram. Refer to Figure 4.4 for cable shield wiring (applies to both Active and Standby Modules)

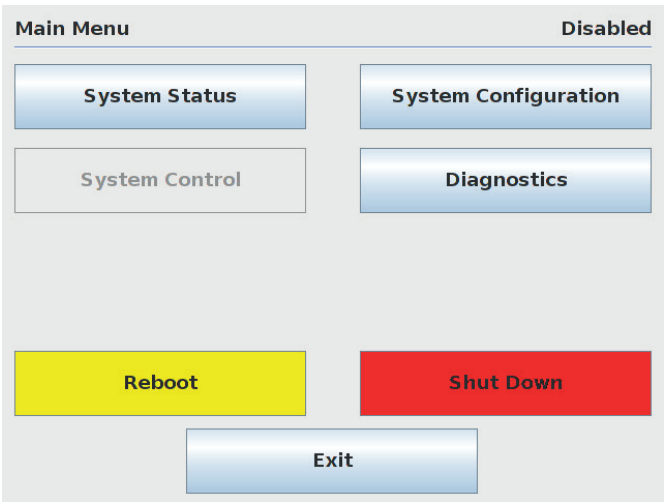


5 System Status

5.1 Main Menu

Upon successful login as a user assigned to any role level, the System Status button on the Main Menu screen will be present. Simply touching the System Status button will advance the HMI display to the System Status screen. Be selecting Exit, the user will end the session and log out.

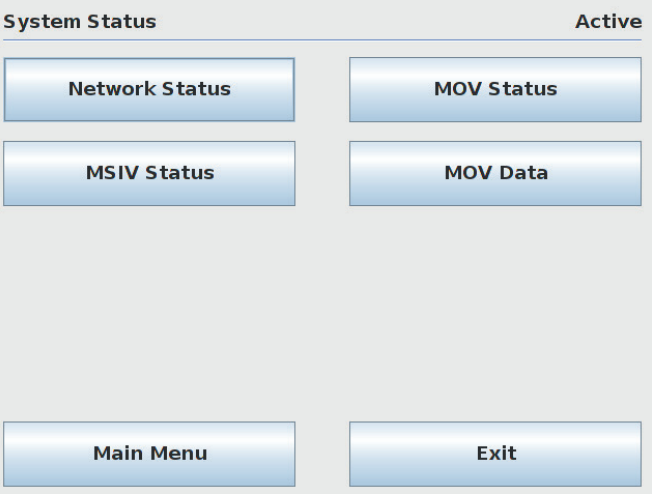
Figure 5.1 – The Main Menu Screen



5.2 System Status

The System Status main screen allows the user to view the overall status of the MOV network and Master Station.

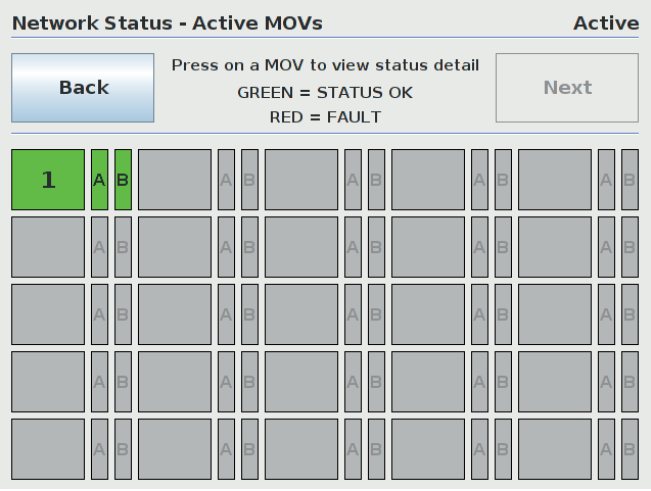
Figure 5.2 – System Status



5.2.1 Network Status

The Network Status screen presents an overview of the entire field unit network, up to 25 activated MOVs per page. Only those MOVs that have been activated will be displayed. See MOV Network Config in System Configuration to activate desired MOVs.

Figure 5.3 – Network Status

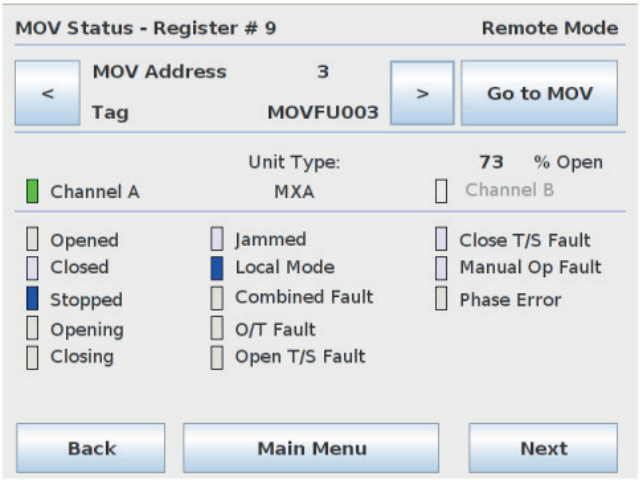


The numeric buttons represent addressed MOVs, while the A and B bars represent MOV communication channels A & B. The MOVs and their respective communication channels are constantly being monitored and will display green if OK and red if faulted. The user can advance to the MOV status screen by either touching an addressed MOV or touching the Back button to return to System Status screen, and then selecting MOV Status.

5.2.2 MOV Status

The MOV Status screen reveals the actual MOV network address, tag name, unit type, and position. In addition, it shows the status of the MOV communication channels and the Modbus holding registers that have been selected to be mapped to the PLC/DCS data table.

Figure 5.4 – MOV Status Screen

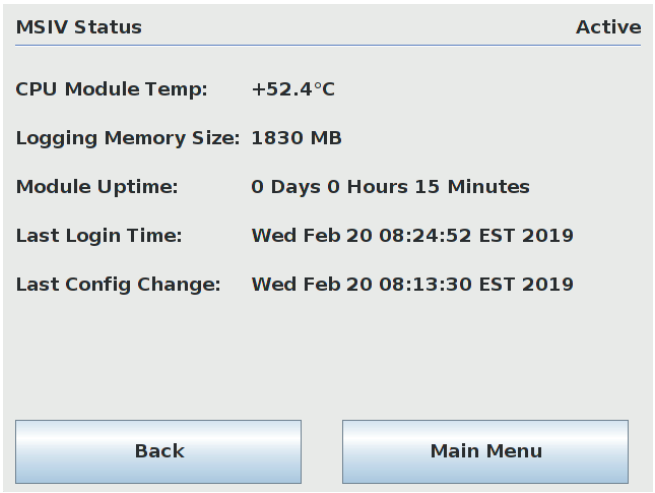


5.2.3 MSIV Status

The MSIV Status screen provides the following Master Station status information:

1. CPU Module temperature
2. Available memory for logging
3. CPU Module up-time
4. Time of last login
5. Time of last configuration change

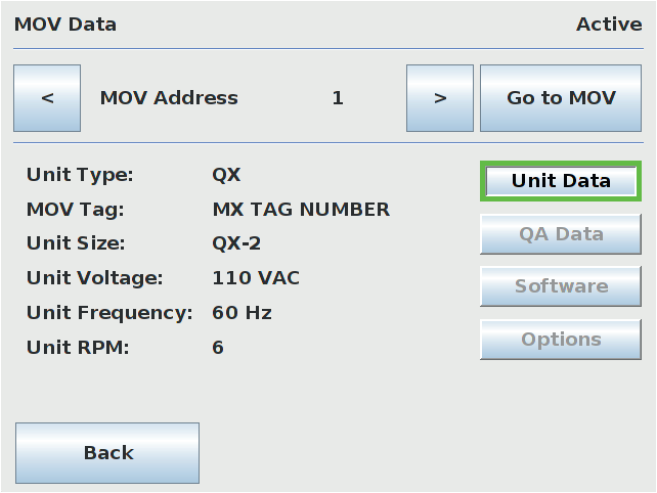
Figure 5.5 – MSIV Module Status



5.2.4 MOV Data

The MOV Data menu displays detailed unit information of network MOVs including: Unit Data, QA Data, Software, and Options the unit has installed.

Figure 5.6 – MOV Data



6 System Control

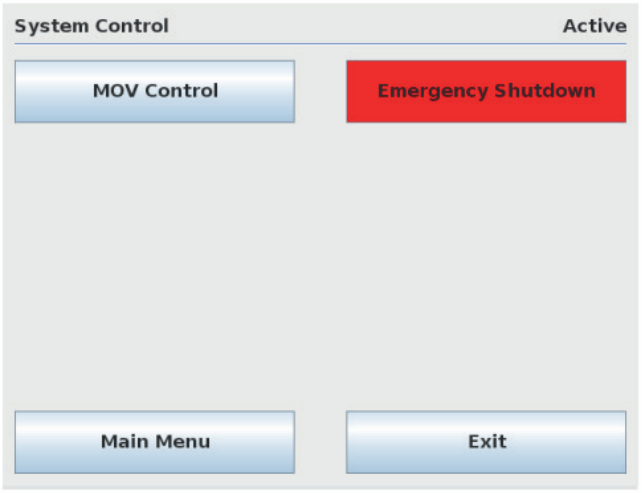
6.1 Main Menu

Upon successful login as a user assigned to a Control, Configure, or Administrator role, the System Control button on the Main Menu will be selectable if the MSIV is in Active mode. Pressing the System Control button will advance the user to the System Control menu.

6.2 System Control

The System Control screen allows for the selection of either MOV Control or Emergency Shutdown, over the network.

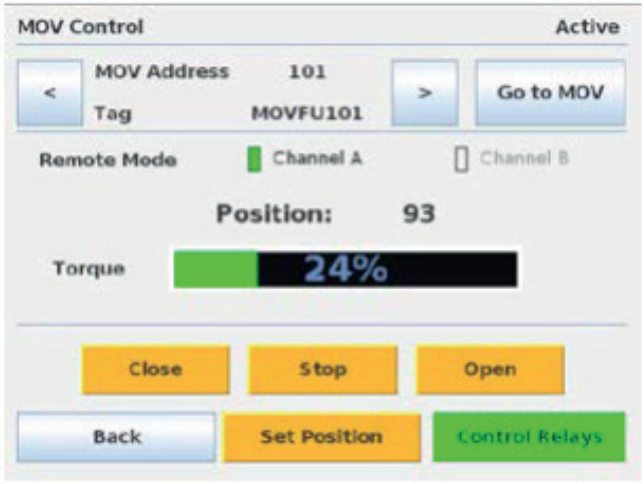
Figure 6.1 – System Control Menu



6.2.1 MOV Control

The MOV Control screen allows for a selected MOV to be opened, stopped, closed, or moved to a set position (such as 38% open). If the torque register is selected, the MOV control screen displays the torque reading during MOV operation for the latest generation smart actuators. MOV control relays can also be energized from this screen if the relays are configured for network control within the MSIV.

Figure 6.2 – MOV Control Menu



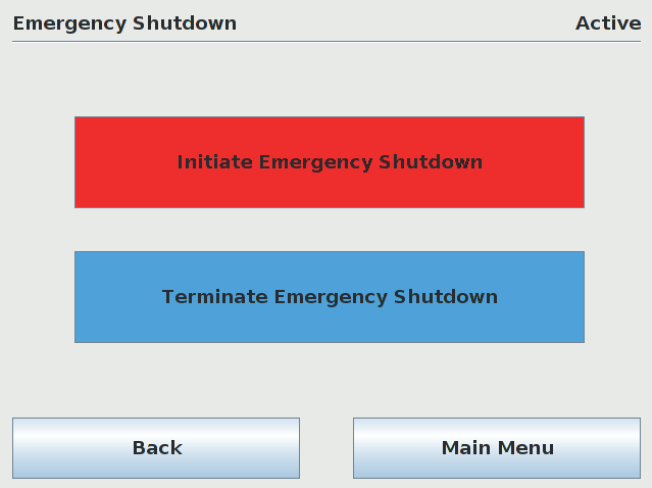
The Control Relays screen allows for a selected MOV's relay to be toggled on and off. To do this, the DCS function code 05/15 coils must be enabled. Additionally, the relays must be configured for network control within the specific MOV. Toggle a coil by tapping on the desired coil text box.

Figure 6.3 – Control Relays

6.2.2 Emergency Shutdown

An Emergency Shutdown of the networked MOVs can be initiated from the Emergency Shutdown menu.

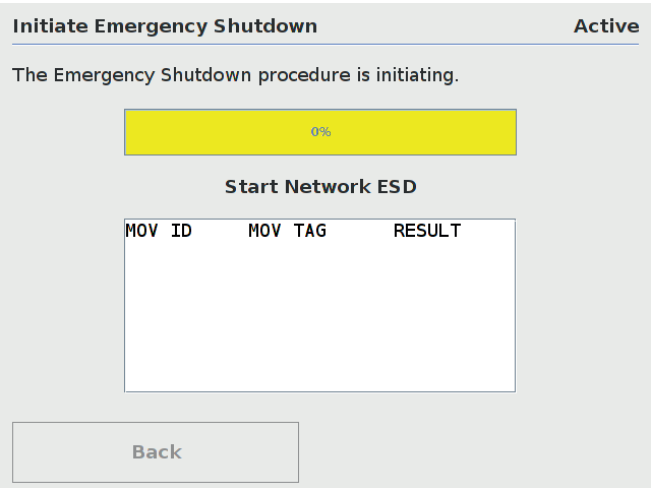
Figure 6.4 – Emergency Shutdown



As shown in figure 6.4, two options are available: Initiate Emergency Shutdown and Terminate Emergency Shutdown. Once an emergency shutdown has completed and is no longer needed, the emergency shutdown state can be cleared by pressing the Clear Emergency Shutdown button.

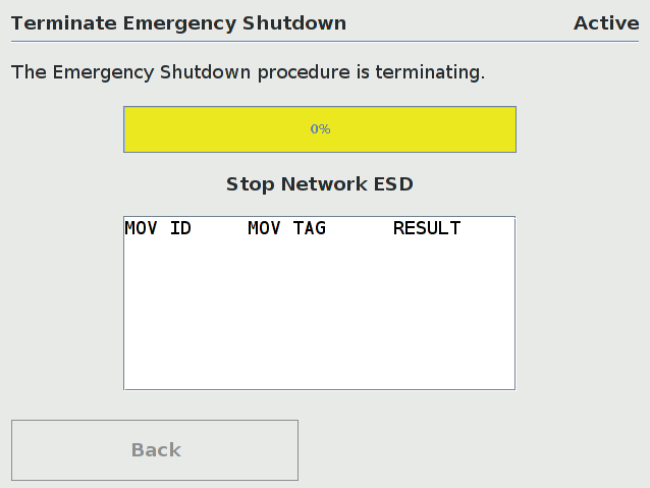
When an emergency shutdown is initiated, the Emergency Shutdown in Progress screen will be displayed.

Figure 6.5 – Emergency Shutdown in Progress



When an emergency shutdown is terminated, the Emergency Shutdown Termination in Progress screen will be displayed until the procedure is complete.

Figure 6.6 – Emergency Shutdown Termination



7 System Configuration

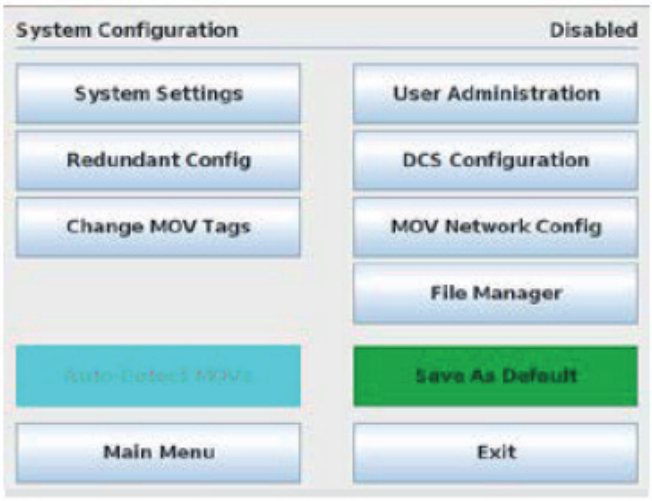
7.1 Main Menu

Upon successful login as a user assigned to a Configure or Administrator role, the System Configuration button on the Main Menu will be accessible. Pressing the System Configuration button will advance the user to the System Configuration menu.

7.2 System Configuration

The System Configuration menu allows the user to view/configure the main settings within the Master Station.

Figure 7.1 – System Configuration Menu



System Settings: provides software version information and access to Language, Clock, and Screen Saver settings.

Redundant Config: provides access to setting the unit's current operating mode, startup mode, and redundancy mode.

Change MOV Tags: allows for customizing MOV tag names for each network MOV.

User Administration: accessible when logged in as Administrator and permits the addition/deletion of users and their respective roles.

DCS Configuration: provides access to communication settings for the Host System/Device.

MOV Network Config: provides access to settings for the MOV field network.

File Manager: allows user to load, save, or restore system configurations, import unit tags, update software, and export event logs.

Auto-Detect MOVs: scans the network for connected MOVs and adds them to the network configuration. The Master Station must be configured as Active to execute the scan. The field MOVs must have consistent communication settings for the Auto-Detect scan to be successful. For example: if one MOV is configured for 9600 baud rate but another MOV is configured for 18200 baud rate, it is impossible for the Auto-Detect feature to add both MOVs to the network configuration.

Save As Default: saves the current network configuration as default. This default is saved as a file and is loaded automatically whenever the Master Station is turned on or rebooted.

7.2.1 System Settings

The System Settings menu allows the user to view software Version information, Language settings, Clock settings, and Screen Saver settings.

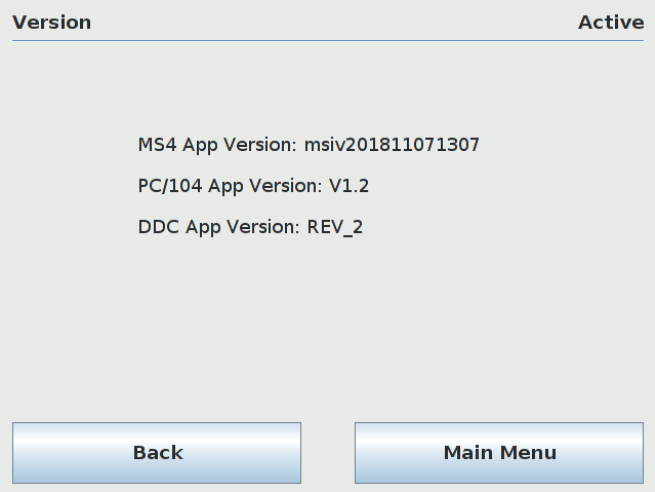
Note: Changing the System Settings is disabled when the MSIV is in “Active” mode. The only option available to view while in “Active” mode is the software version. To turn off “Active” mode and make changes to the System Settings, go to the System Configuration menu and select the “Redundant Config” button. Under Requested Mode, select the “Disabled” button. This will allow the System Settings to be accessible.

F*igure 7.2 – System Settings Menu*

7.2.1.1 Version

The Version screen displays the Master Station's current software version information.

Figure 7.3 – Software Version Information



7.2.1.2 Language

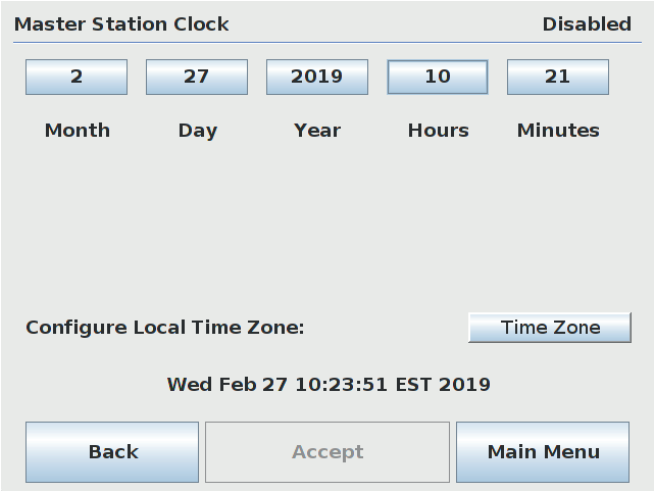
The language menu allows the user to set the unit's display language by selecting the desired language button.

Figure 7.4 – Language Selection Menu

7.2.1.3 Clock

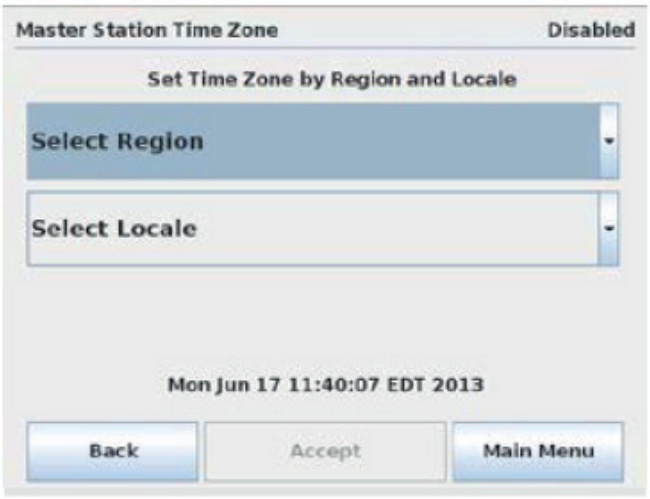
The Clock menu allows the user to set the unit's clock parameters including the current time.

Figure 7.5 – System Clock Settings



Additionally, the MSIV clock can be set to a specific time zone by selecting the Time Zone button in the Clock Setting Menu. The time zone is configured by selecting the region and locale in which the MSIV is located.

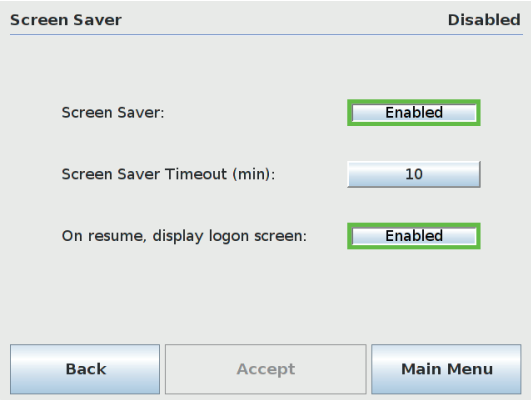
Figure 7.6 – Time Zone Settings



7.2.1.4 Screen Saver Settings

The Screen Saver menu allows the user to configure the MSIV's screen saver settings. The screen saver can be set to activate after 1 to 15 minutes after the last screen use. Alternatively, the screen saver can be disabled entirely. When the screen saver has been activated, the MSIV will display a blank, black screen. Disable the screen saver by firmly tapping the screen once (just like clicking a PC's mouse to disable a PC's screen saver).

Figure 7.7 – Screen Saver Settings

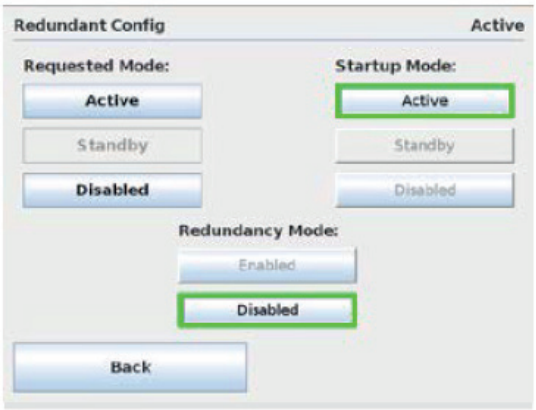


If the "On resume, display login screen:" button is Enabled, the MSIV will return directly to the login screen after the screen saver has been enabled. This is the most secure option because it prevents unauthorized users from resuming an authorized user's session. If this setting is Disabled, the MSIV will return directly to the menu and session which were active prior to the screen saver being activated. This is the least secure option as it will automatically resume a session without requiring the user to login again.

7.2.2 Redundant Configuration

The Redundant Configuration menu allows the user to configure the MSIV's operating modes. The requested mode and startup mode can be set to Active, Standby, or Disabled. Changes to the system configuration settings are only allowed when the MSIV is operating in Disabled mode in order to prevent adverse network problems. Most system configuration menus are disabled when the unit is operating in Active mode. Additionally, the Redundancy Mode can be enabled if two MSIV modules are to be used to form a redundant pair. If Redundancy Mode is disabled, Standby is not a valid option for Requested or Startup Modes.

Figure 7.8 – Redundant Configuration Menu



When the Redundant Configuration is enabled and changes are saved in the Active unit, the two redundant units will perform a configuration file transfer. During the configuration file sync, all user operation is disabled until the synchronization is finished, as shown below. Once the Active unit is finished transferring the configuration files, operation is restored. The Standby unit operation is restored shortly after.

Figure 7.9 – Configuration Transfer Lockout

7.2.3 Change MOV Tags

This menu allows the user to set or modify MOV tag names. Simply select the desired MOV tag box and a keypad will appear. Use the keypad to assign a unique tag for the MOV (max length of 8 characters). Note: changing the MOV tags is disabled when the MSIV is in Active mode. To turn off “Active” mode, go to the System Configuration menu and select the “Redundant Config” button. Under Requested Mode, select the “Disabled” button.

Figure 7.10 – MOV Tag List

7.2.4 User Administration

The User Administration menu is accessible to users logged in as Administrators. This menu permits addition or deletion of users as well as the assignment of user passwords and roles within the Master Station. Note: User Administration is disabled when the MSIV is in Active mode. To turn off "Active" mode, go to the System Configuration menu and select the "Redundant Config" button. Under Requested Mode, select the "Disabled" button.

Figure 7.11 – User Administration Menu

7.2.4.1 Add New User

To add a new user to access the MSIV, tap the "Add User" button on the user Administration menu. The MSIV will step through a form of entering a username, password, confirming the password, and confirming the add user action. All new users default to "Viewer" privileges which can be changed later from the User Administration menu. When the new user account has been created, the MSIV will return to the User Administration screen.

7.2.4.2 Delete User

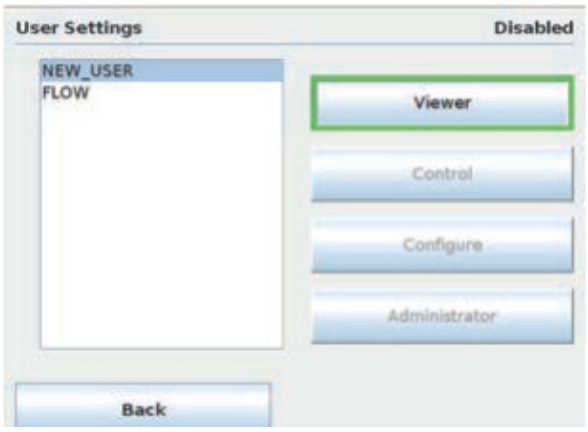
To remove a user account from accessing the MSIV, press the "Delete User" button on the User Administration screen. A listing of all user accounts on the MSIV are displayed as shown below. Select a user account by pressing the desired account and press "Delete User". A confirmation box will appear, confirming the action. This action cannot be undone. When the user account has been deleted, the MSIV returns to the User Administration menu.

Figure 7.12 – Delete User Menu

7.2.4.3 User Settings

To modify user privileges, press the “User Settings” button on the User Administration menu. A listing of all user accounts is displayed. Select a user account by pressing the desired account listing and select the account access level for the user. A confirmation box will appear confirming the change. Once the user privilege has been changed, the MSIV will return to the User Administration menu.

Figure 7.13 – User Settings Menu



7.2.4.4 Change Password

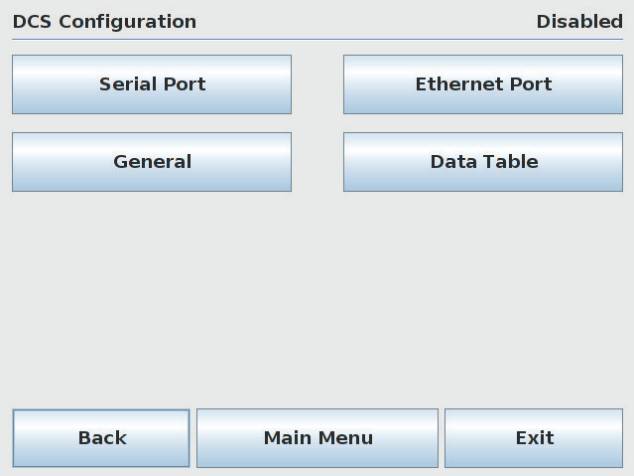
To change a password for a user account, press the “Change Password” button on the User Administration menu. A listing of all user accounts is displayed. Select a user account and press “Change Password”. A password entry form will open. Enter the accounts current password to be authenticated to make the change. When the current password has been correctly entered, the MSIV will prompt for the new password. Enter a new password for the user. Confirm the password and the password change action. When successful, the MSIV will return to the User Administration menu.

Figure 7.14 – Change Password Menu

7.2.5 DCS Configuration

The DCS Configuration menu allows the user to configure communication port parameters to successfully link the MSIV to a control system's host device (DCS, PLC, etc). This menu includes a Serial Port configuration, Ethernet Port configuration, Data Table registry mapping, and general settings.

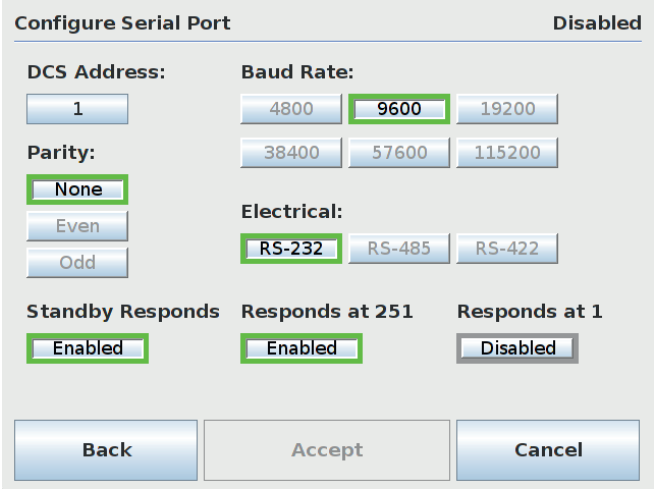
Figure 7.15 – DCS Configuration Menu



7.2.5.1 Serial Port

The DCS serial port is configured via the Serial Port screen. Select the appropriate settings, press Accept, navigate to the main menu and save settings as default when prompted.

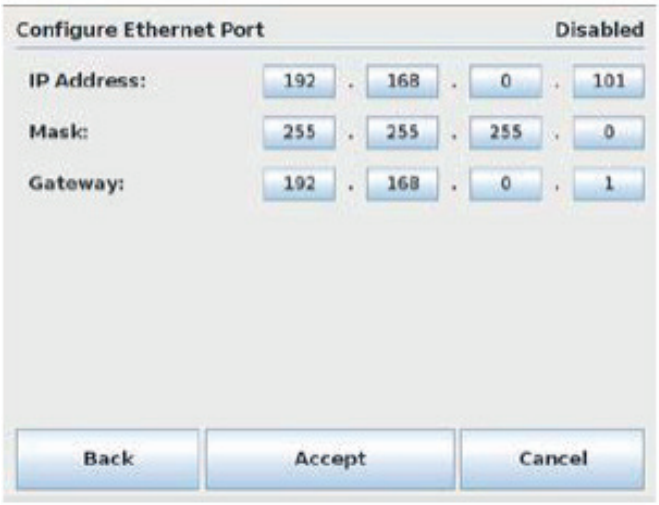
Figure 7.16 – Configure DCS Serial Port



7.2.5.2 Ethernet Port

The Ethernet port assigned to the control system's Host device is configured via the Configure Ethernet Port menu to communicate via Modbus TCP/IP. Set the desired IP address, subnet mask, and gateway, then Accept and save the settings. Note that if 2 redundant modules are used, each module must be configured with a unique IP address. Note: use port 502 for Modbus TCP/IP communications.

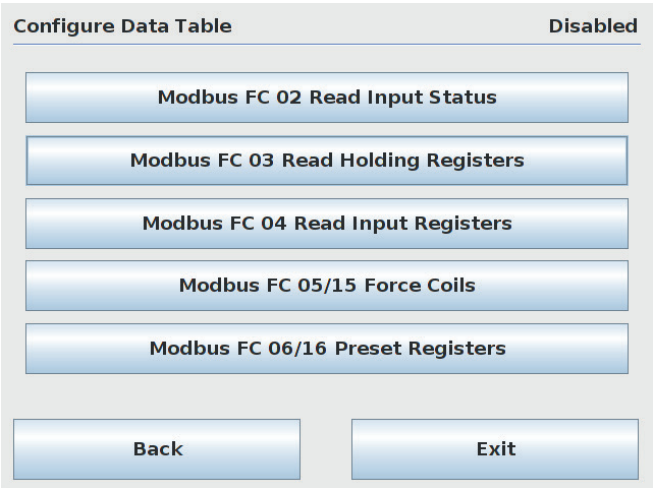
Figure 7.17 – Configure DCS Ethernet Port



7.2.5.3 Configure Data Table

The MSIV data table is configurable for the Modbus Function codes 02, 03, 05/15, and 06/16. The Modbus function code 01 has a fixed data table and does not permit user alteration. The data tables are edited by using the Configure Data Table menu shown below.

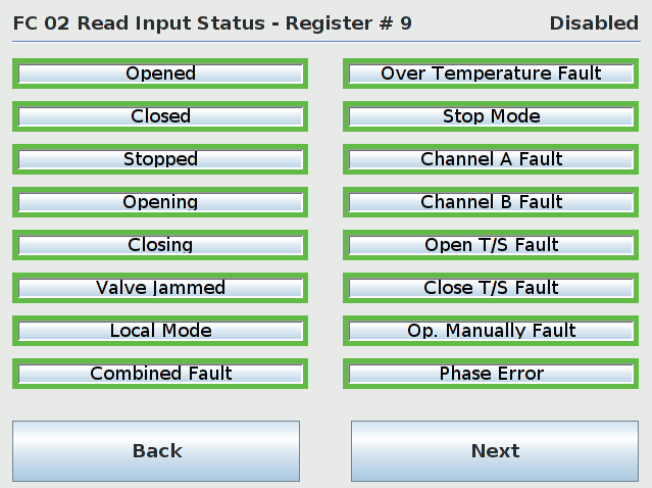
Figure 7.18 – Configure DCS Data Table Menu



7.2.5.3.1 Modbus FC 02 Read Input Status

Pressing the "Modbus FC 02 Read Input Status" button will take the user to the FC 02 Read Input Status menu for selection of desired input status bits from field unit holding registers 9-13. There are two ways of mapping these status bits: Standard and A/B Style. Standard style is a static mapping of register bits as shown in Table 7.1. A/B Style is a dynamic mapping of register status bits as selected using the register tables based on Table 8.1. Choose the mapping style as explained in section 7.2.5.4 General Settings. Selecting the "Next" button will advance the screen from registers 9 through 13.

Figure 7.19 – FC 02 Read Input Status



In standard mapping mode, the Function Code 02 mapping is a static mapping of the total input table as shown in Table 8.1 per MOV. A total of 80 bits represent an individual MOV. The use of this function code will provide the user with the input status bits that are used to develop holding registers 9 through 13. Only the enabled bits will be returned as valid data (otherwise, zeros). Address affect is accounted for in the MSIV decoding process (i.e. 10,000). The A/B mapping style operates similarly but with the exception that only enabled bits return data. So where the Standard Style returns all bits, valid or not, A/B Style returns only the bits that are selected.

Table 7.1 – Status Bit Definitions

Bit Number	Modbus Bit Address	MX/DDC
129	128	Opened
130	129	Closed
131	130	Stopped in mid-travel
132	131	Opening
133	132	Closing
134	133	Valve jammed
135	134	Not in remote
136	135	Combined fault
137	136	Over-temperature fault
138	137	Actuator in Stop Mode

Bit Number	Modbus Bit Address	MX/DDC
139	138	Channel A fault
140	139	Channel B fault
141	140	Open torque switch fault
142	141	Close torque switch fault
143	142	Valve operated manually fault
144	143	Phase error
145	144	Open inhibit active
146	145	Close inhibit active
147	146	Not used
148	147	Not used
149	148	One or more phases is missing
150	149	Reverse phase sequence is occurring
151	150	ESD conflict
152	151	Inhibit conflict
153	152	Use in local/stop (input must be set for CSE and enabled)
154	153	Not used
155	154	Network emergency shutdown (ESD) is active
156	155	Local emergency shutdown is active
157	156	Field unit microprocessor has reset since the last poll
158	157	MX in stop mode
159	158	Opening in local mode
160	159	Closing in local mode
161	160	Close contactor (interlocked)
162	161	Open contactor (interlocked)
163	162	S1 or R1 (opt)
164	163	S2 or R2 (opt)
165	164	R3 (opt)
166	165	R4 (opt)
167	166	R5 (opt)
168	167	R6 (opt)
169	168	R7 (opt)
170	169	Network relay
171	170	R8 (opt)
172	171	Not used
173-176	172-175	MOV series (0-1, A=9)
177	176	Remote switch
178	177	Thermal overload
179	178	Open torque switch
180	179	Open limit switch
181	180	Close torque switch
182	181	Close limit switch
183	182	Not used
184	183	Not used
185	184	User Input 0
186	185	User Input 1
187	186	user Input 2

Bit Number	Modbus Bit Address	MX/DDC
188	187	Remote stop input
189	188	Remote open input
190	189	Remote close input
191	190	Not used
192	191	Not used
193	192	Analog board 1 present
194	193	Analog board 2 present
195	194	Analog Input #1 lost
196	195	Analog Input #2 lost
197	196	Network Channels A/B timed out
198	197	Relay board R5-R8 present
199	198	DDC board present
200	199	Relay board R1-R4 and RM present
201	200	FF board present
202	201	PB PA board present
203	202	CLE assigned for input 2
204	203	DNET board present
205	204	Lost Phase Input
206	205	Phase Reverse Input
207	206	Not used
208	207	PB DP board present

From the DCS, the user must address the MSIV and poll according to the FC 02 data table. See the following example of a request/response exchange between the DCS and MSIV using the standard mapping scheme.

Example of read inputs command

Poll MSIV for 16 inputs starting at input 81 (i.e. field unit #2)

Query: 01020050001079D7

Response: 0102020408BABE

Table 7.2 – Function Code 02 Example Message Breakdown

Query		Response	
01	MSIV Unit Address	01	MSIV Unit Address
02	Function	02	Function
00	Starting Address Hi	02	Byte Count
50	Starting Address Lo	04[1]	Data (Inputs 10088-10081; MOV2)
00	No. of Points Hi	08[2]	Data (Inputs 10096-10089; MOV2)
10	No. of Points Lo	BABE	Error Check (CRC)
79D7	Error Check (CRC)		

Note 1: 04h equals 0000 0100 (actuator stopped in mid-travel input bit is ON)

Note 2: 08h equals 0000 1000 (actuator Channel B fault input bit is ON)

7.2.5.3.2 Modbus FC 03 Read Holding Registers

Pressing the "Modbus FC 03 Read Holding Registers" button will take the user to the Modbus Holding Registers menu for selection of desired field unit holding registers 3-15. Note that register 9 (status) is always required in the data table. Selecting the "Next" button will advance the screen to a sample data table.

Figure 7.20 – FC 03 Read Holding Registers Menu

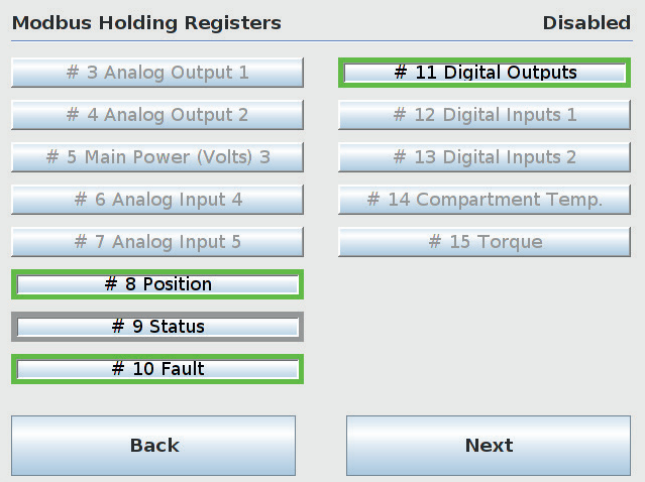
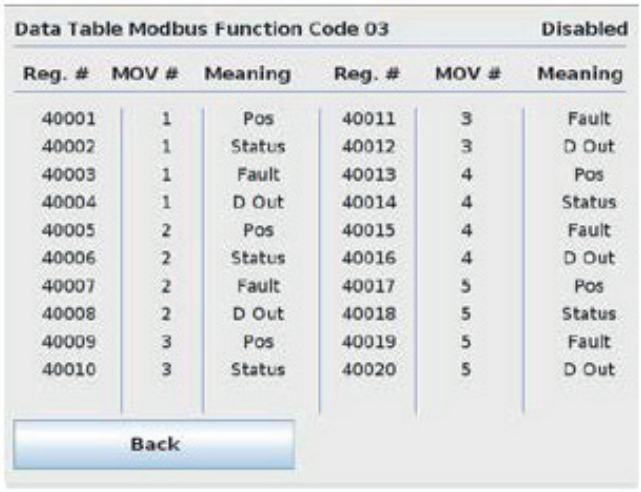


Figure 7.21 – FC 03 Example Data Table



Reg. #	MOV #	Meaning	Reg. #	MOV #	Meaning
40001	1	Pos	40011	3	Fault
40002	1	Status	40012	3	D Out
40003	1	Fault	40013	4	Pos
40004	1	D Out	40014	4	Status
40005	2	Pos	40015	4	Fault
40006	2	Status	40016	4	D Out
40007	2	Fault	40017	5	Pos
40008	2	D Out	40018	5	Status
40009	3	Pos	40019	5	Fault
40010	3	Status	40020	5	D Out

Note: Data table shown with registers 8, 9, 10, and 11 selected (position, status, fault, digital outputs).

The 03 function code is used to read the binary contents of holding registers. This function code is typically used during the network polling cycle. A network poll must consist of field unit register 9 (status) at minimum. See the following tables for an example FC 03 message and a complete list of holding registers, respectively.

Example of read multiple registers command
Poll MSIV for 2 registers starting at register 27 (i.e. field unit #14)
Query: 0103001A0002E5CC
Response: 010304003200445BCF

Table 7.3 – Function Code 03 Example Message Breakdown

Query		Response	
01	MSIV Unit Address	01	MSIV Unit Address
03	Function	03	Function
00	Starting Address Hi	04	Byte Count
1A	Starting Address Lo	00	Data Hi (Register 40027; MOV14)
00	No. of Points Hi	32[1]	Data Lo (Register 40028; MOV14)
02	No. of Points Lo	00	Error Check (CRC)
E5CC	Error Check (CRC)	44[2]	Data Lo Register 40028; MOV14)
		5BCF	Error Check (CRC

Note 1: 0032h equals 50 decimal (actuator position in percent format)

Note 2: 0044h equals 68 decimal or 0000 0000 0100 0100 (actuator stopped between limits in local mode)

Table 7.4 – Function Code 03 Holding Registers

Register #	Description	Meaning
10	Fault Register	16 Bits of field status
		Bit 0 Open inhibit active
		Bit 1 Close inhibit active
		Bit 2 Not used
		Bit 3 Not used
		Bit 4 One or more phases are missing
		Bit 5 Reverse phase sequence is occurring
		Bit 6 ESD conflict
		Bit 7 Inhibit conflict
		Bit 8 CSE in local/stop (input must be set for CSE and enabled)
		Bit 9 Not used
		Bit 10 Network emergency shutdown is active
		Bit 11 Local PB emergency shutdown is active
		Bit 12 Field unit microprocessor has reset since the last poll
		Bit 13 MX in stop mode
		Bit 14 Opening in local mode
		Bit 15 Closing in local mode
11	Digital Outputs	Value of 16 Digital Outputs
		Bit 0 Close contactor (Interlocked)
		Bit 1 Open contactor (Interlocked)
		Bit 2 S1 or R1 (Opt)
		Bit 3 S2 or R2 (Opt)
		Bit 4 R3 (Opt)

		Bit 5 R4 (Opt)
		Bit 6 R5 (Opt)
		Bit 7 R6 (Opt)
		Bit 8 R7 (Opt)
		Bit 9 Network Relay
		Bit 10 R8 (Opt)
		Bit 11 Not Used
		Bit 12-15 MOV Series (MX=1, MXa=9, QX=6, UEC-3=0, UEX=10)
12	Digital Inputs 1	Value of 16 Digital Inputs
		Bit 0 Remote Switch
		Bit 1 Thermal Overload
		Bit 2 Open Torque Switch
		Bit 3 Open Limit Switch
		Bit 4 Close Torque Switch
		Bit 5 Close Limit Switch
		Bit 6 Not Used
		Bit 7 Not Used
		Bit 8 User Input 0 (Default=ESD), Terminal 30
		Bit 9 User Input 1 (Default=Open Inhibit), Terminal 34
		Bit 10 User Input 2 (Default=Close Inhibit), Terminal 35
		Bit 11 Remote Stop Input, Terminal 26
		Bit 12 Remote Open Input, Terminal 25
		Bit 13 Remote Close Input, Terminal 27
		Bits 14-15 Not Used
13	Digital Inputs 2	Value of 16 Digital Inputs
		Bit 0 Analog board 1 present
		Bit 1 Analog board 2 present
		Bit 2 Analog Input 1 lost
		Bit 3 Analog Input 2 lost
		Bit 4 Network Channels A/B timed out
		Bit 5 Relay board R5-R8 present
		Bit 6 DDC board present
		Bit 7 Relay board R1-R4 and RM present
		Bit 8 Foundation Fieldbus board present
		Bit 9 Profibus PA board present
		Bit 10 CSE chosen for input 2
		Bit 11 DeviceNet board present
		Bit 12 Phase lost
		Bit 13 Phase reverse
		Bit 14 Not Used
		Bit 15 Profibus DP board present

14	Compartment Temp	Internal compartment temperature[1]
15	Torque	Torque Value (0-100% unit rating)
16	Current State	Bits 0-15 Not Used
17	Field Unit Holding Register	Special Applications Only
18	Field Unit Holding Register	Special Applications Only
19	Field Unit Holding Register	Special Applications Only
20	Field Unit Holding Register	Special Applications Only
21	Field Unit Holding Register	Special Applications Only
22	Field Unit Holding Register	Special Applications Only
23	Field Unit Holding Register	Special Applications Only
24-44	Reserved	Special Applications Only
45-47	Not Named	Special Applications Only
48	TP_START_POSITION	Special Applications Only
49	TP_STOP_POSITION	Special Applications Only
50	TP_SAMPLE	Special Applications Only
51	TP_MID_T_HIGH	Special Torque Applications Only
52	TP_MID_T_POS	Special Applications Only
53	TP_MID_T_AV_VAL	Special Torque Applications Only
54	TP_STOP_VAL	Special Applications Only
55	TP_BEFORE_MID_T_HIGH	Special Torque Applications Only
56	TP_AFTER_MID_T_HIGH	Special Torque Applications Only

Note 1: Range is +90 degrees Celsius to -55 degrees Celsius. High byte 00 indicates positive (+) and 01 indicates negative (-). Low byte indicates temperature value.

7.2.5.3.3 Modbus FC 05/15 Force Coils

Pressing the “Modbus FC 05/15 Force Coils” button will take the user to the Modbus Coils menu for selection of desired field unit coils. Note that the Close and Open contactor coils are always included in the data table. Pressing the “Next” button will advance the screen to the sample data table.

Figure 7.22- Modbus FC 05/15 Coils

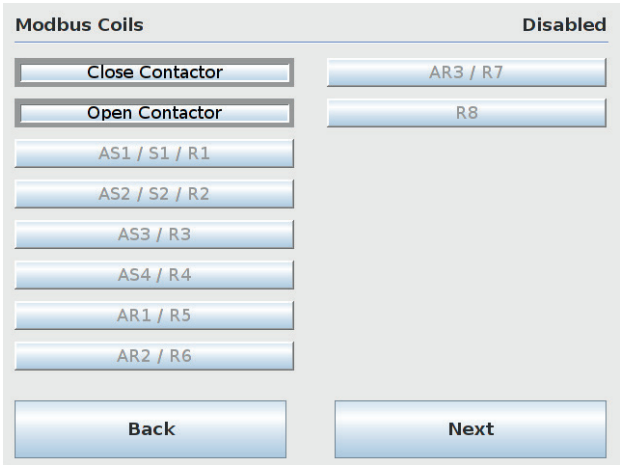
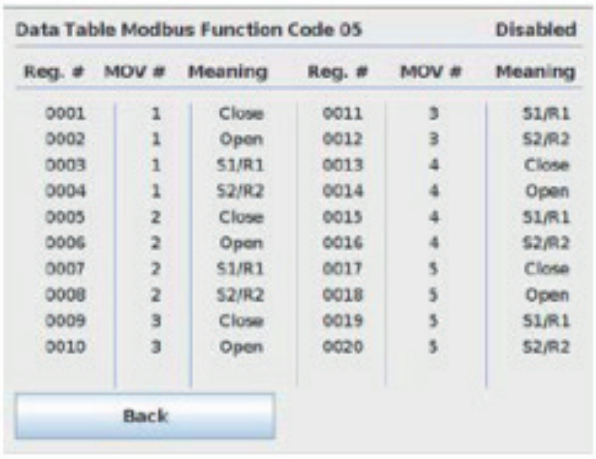


Figure 7.23 – FC 05/15 Sample Data Table



Data Table Modbus Function Code 05 — Disabled

Reg. #	MOV #	Meaning	Reg. #	MOV #	Meaning
0001	1	Close	0011	3	S1/R1
0002	1	Open	0012	3	S2/R2
0003	1	S1/R1	0013	4	Close
0004	1	S2/R2	0014	4	Open
0005	2	Close	0015	4	S1/R1
0006	2	Open	0016	4	S2/R2
0007	2	S1/R1	0017	5	Close
0008	2	S2/R2	0018	5	Open
0009	3	Close	0019	5	S1/R1
0010	3	Open	0020	5	S2/R2

Back

Note: Table shown with Open and Close Contactors, S1/R1 and S2/R2 coils selected.

Function code 05 is used to force a single coil. Forcing the individual coil either ON (1) or OFF (0) will energize or de-energize a coil (digital output). Coil 1 in the field unit closes the actuator and Coils 2 opens the actuator. If the actuator is opening or closing, changing the status of coils 1 or 2 from a value of 1 to 0 will stop the actuator (the coil will automatically be set to zero when the actuator reaches the full open or full close position).

For function code 15, note that the coils are operated from the lowest coil number to the highest. Forcing coil 1 or 2 OFF (0) is considered a stop command, sending a 15 command to force two coils starting with coil 1, with coil 1 ON and coil 2 OFF would result in the unit stopping, since coil 2 is forced OFF after coil 1 is forced ON. To prevent inadvertent stop commands from being issued, it is recommended to force one coil at a time.

Available digital outputs are listed in the table below. Force-coil commands should be issued only once for the desired field unit control. Repeated issuance of an acknowledged command will degrade network performance.

Note: See LMENIM2329, Installation, Operation, and Maintenance Manual for MX/DDC-100 Field Unit to configure AS and AR relays for DDC control.

Table 7.5 – DDC coil assignments, Modbus 05 command usage for Digital Outputs

Coil Number	Bit Number	Function
1	00	Close/Stop
2	01	Open/Stop
3	02	S1 or R1 (Opt) Latched
4	03	S2 or R2 (Opt) Latched
5	04	R3 (Opt) Latched
6	05	R4 (Opt) Latched
7	06	R5 (Opt) Latched
8	07	R6 (Opt) Latched
9	08	R7 (Opt) Latched
10	09	R8 (Opt) Latched

Note: the normal response to the (05) command is an echo of the command.

From the DCS, the user must address the MSIV and poll according to the data table example given in the FC 05 configuration. See following example of a request/response exchange between the DCS and MSIV.

Example of force coil command

Force coil 17 of MSIV ON(this will close the valve controlled by field unit 5)

Query: 01050010FF008DFF

Response: 01050010FF008DFF

Table 7.6 – Function Code 05 Example Message Breakdown

Query		Response	
01	MSIV Unit Address	01	MSIV Unit Address
05	Function	05	Function
00	Coil Address Hi	00	Coil Address Hi (Coil 17; MOV5)
10[1]	Coil Address Lo	10	Coil Address Lo (Coil 17; MOV5)
FF	Force Data Hi	FF	Force Data Hi
00[2]	Force Data Lo	00	Force Data Lo
8DFF	Error Check (CRC)	8DFF	Error Check (CRC)

Note 1: 0010h equals coil address 0001 0001b (field unit 5, coil 1)

Note 2: FF00h requests the coil to be ON (0000h requests the coil to be OFF)

Example of force multiple coils command

Force coil 2 of field unit 23 ON. This will CLOSE the valve controlled by field unit 23.
Additionally, force coil 1 of field unit 24 ON. This will OPEN the valve controlled by field unit 24.

Query: 010F002D000201033290

Response: 010F002D00024403

Table 7.7 – Function Code 15 Example Message Breakdown

Query		Response	
01	MSIV Unit Address	01	MSIV Unit Address
0F	Function	0F	Function
00	Coil Address Hi	00	Coil Address Hi (Coil 46; MOV23)
2D	Coil Address Lo	2D	Coil Address Lo (Coil 46; MOV23)
00	Quantity of Coils Hi	00	Quantity of Coils Hi
02	Quantity of Coils Lo	02	Quantity of Coils Lo
01	Byte Count	4403	Error Check (CRC)
03	Force Data Lo		
3290	Error Check (CRC)		

Note: 002D00020103h equals coil addresses 00101101b (field unit 23, coil 2) and 00101110b (field unit 24, coil 1)

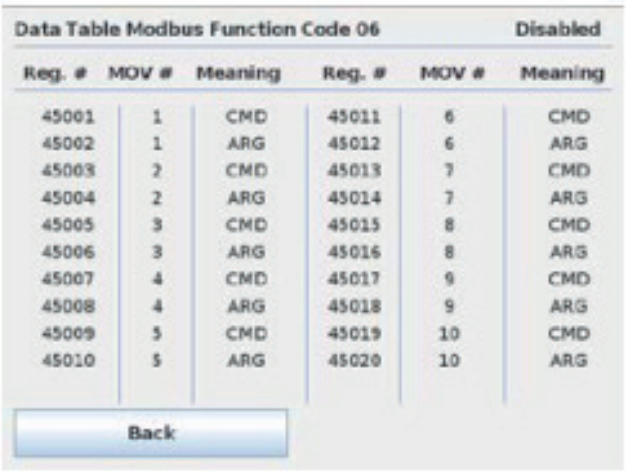
7.2.5.3.4 Modbus FC 06/16 Preset Registers

Pressing the "Modbus FC 06/16 Preset Registers" button will take the user to the Modbus Holding Registers screen for configuration of desired number of holding registers to be written per MOV. The 06 command presets a value into a single-holding register, while the 16 command presets a value into a block of multiple holding registers. The data table for these function codes permit either one or two write registers per field unit.

Figure 7.24 – Modbus holding registers – one per MOV shown

Selecting the "Next" button will advance the screen to a sample data table screen as shown below. Please note that a unique table is created starting at register 45001. Specific field unit registry convention is as follows: DCS Command Write Register = [(MOV address -1) * (selected number of registers per MOV)] + 45001. Address affect is accounted for in the MSIV decoding process (i.e. 40,000).

Figure 7.25 – FC 06 sample data table with "Two Per Mov" selected



These function codes are typically used to command Limitorque Modbus field units by writing values directly into command/argument registers. A predetermined value may be used to open/stop/close the actuator, move the actuator to a preset position, activate/deactivate network ESD, reset the field unit, etc. See the following example of a request/response exchange between the DCS and MSIV. Write register commands should be issued only once for the desired field unit control. Repeated issuance of an acknowledged command will degrade network performance.

Example of a single register write command

Field Unit Command. Start a network ESD operation to field unit number 101. This corresponds to writing the value 1280 to register 45201.

Query: 0106145005008F7B

Response: 0106145005008F7B

Table 7.8 – Function Code 06 First command message breakdown

Query		Response	
01	MSIV Unit Address	01	MSIV Unit Address
06	Function	06	Function
14	Register Address Hi	14	Register Address Hi
50[1]	Register Address Lo	50	Register Address Lo (Register 45201; MOV101)
05	Force Data Hi	05	Force Data Hi
00[2]	Force Data Lo	00	Force Data Lo
8F7B	Error Check (CRC)	8F7B	Error Check (CRC)

Note 1: 1450h equals register address 45201 (field unit 101 command register)

Note 2: 0500h requests the register to be preset with 1280d (Start Network ESD)

Example of a two-command write to a single register

"Move-To" command. Move an actuator at addr4ess 45 to 42% open by first writing the value of 42 to register 45090. After receiving a response, write the value of 6656 to register 45089. The actuator will then move to a position of 42% open. First Command:

Query: 010613E2002AACA7

Response: 010613E2002AACA7

Table 7.9 – Function code 06 message breakdown

Query		Response	
01	MSIV Unit Address	01	MSIV Unit Address
06	Function	06	Function
13	Register Address Hi	13	Register Address Hi (Register 45090; MOV45)
E2[1]	Register Address Lo	E2	Register Address Lo (Register 45090; MOV45)
00	Force Data Hi	00	Force Data Hi
2A[2]	Force Data Lo	2A	Force Data Lo
ACA7	Error Check (CRC)	ACA7	Error Check (CRC)

Note 1: 13E2h equals register address 45090 (field unit 45 argument register)

Note 2: 002Ah equals 42d

Second Command:

Query: 010613E11A00D618

Response: 010613E11A00D618

Table 7.10 – Function code 06 message breakdown

Query		Response	
01	MSIV Unit Address	01	MSIV Unit Address
06	Function	06	Function
13	Register Address Hi	13	Register Address Hi (Register 45089; MOV45)
E1[1]	Register Address Lo	E1	Register Address Lo (Register 45089; MOV45)
1A	Force Data Hi	1A	Force Data Hi
00[2]	Force Data Lo	00	Force Data Lo
D618	Error Check (CRC)	D618	Error Check (CRC)

Note 1: 13E1h equals register address 45089 (field unit 45 command register)

Note 2: 1A00h equals 6656d

Example of multiple register write command

Write the command to close an actuator to field units 50, 51, and 52. This corresponds to writing the value 768 into command registers 45050, 45051, and 45052.

Query: 011013B900030603000300030006ABB

Response: 011003B900035569

Table 7.11 – Function code 16 message breakdown

Query		Response	
01	MSIV Unit Address	01	MSIV Unit Address
10	Function	10	Function
13	Starting Address Hi	13	Starting Address Hi
B9[1]	Starting Address Lo	B9	Starting Address Lo
00	Number of registers Hi	00	Number of registers Hi
03	Number of registers Lo	03	Number of registers Lo
06	Byte count	5569	Error Check (CRC)
03	Preset Data Hi (MOV 50)		
00[2]	Preset Data Lo (MOV 50)		
03	Preset Data Hi (MOV 51)		
00	Preset Data Lo (MOV 51)		
03	Preset Data Hi (MOV 52)		
00	Preset Data Lo (MOV 52)		
6ABB	Error Check (CRC)		

Note 1: 13B9h equals register address 45050 (field unit 50 command register)

Note 2: 0300h requests the register to be preset with 768d (field unit close)

See the following tables for valid register operations. For further reference, see DDC (Modbus) Field Unit Installation, Operation, and Maintenance manual LMENIM2329.

Table 7.12 – Valid Command Register Operations

Host Commands to Field Unit Register 1	Value (Decimal)	Function
Null Command	0	No action
Open	256	Open actuator
Stop	512	Stop actuator
Close	768	Close actuator
Reset Field Unit	1024	Reset processor
Start Network ESD	1280	ESD initiate
Stop Network ESD	1536	ESD terminate
Engage Relay #1	2304	S1 or R1 (opt)
Engage Relay #2	2560	S2 or R2 (opt)
Engage Relay #3	2816	R3 (opt)
Engage Relay #4	3072	R4 (opt)
Engage Relay #5	3328	R5 (opt)
Engage Relay #6	3584	R6 (opt)
Engage Relay #7	3840	R7 (opt)
Disengage Relay #1	4352	S1 or R1 (opt)
Disengage Relay #2	4608	S2 or R2 (opt)
Disengage Relay #3	4864	R3 (opt)
Disengage Relay #4	5120	R4 (opt)
Disengage Relay #5	5376	R5 (opt)
Disengage Relay #6	5632	R6 (opt)
Disengage Relay #7	5888	R7 (opt)
Move-To (Enable)[1]	6656	Initiates Move-To
Engage Relay #8	6912	R8 (opt)
Disengage Relay #8	7168	R8 (opt)

Note 1: This is a two-step command. A valid value must be written to Register 2 before issuing this command.

Other registers may also be preset to control or change other functions but care must always be taken to properly change these values. An improper value written to a register can cause undesirable MOV behavior.

Note: Null command – the field unit takes no action when this command is received. This command is typically used by a Host to reset the Host output register when required.

From the DCS, the user must address the MSIV and poll according to the data example given in the FC 06/16 configuration. This command allows a Host to issue the "move-to" command using the function code 06. Register 1 will be used to complete this command.

Rules for using this command:

1. The Field unit scaling must be configured for 0-100.
2. To use the hexadecimal method of determining a single write "move-to" command, 0x4B is always placed into the Hi Byte of Register 1. The desired position value is always placed into the Lo Byte of Register 1.
3. to move the actuator to a position of 50%, place the value 0x4B in the high byte and the value of 0x32 (50 decimal) into the low byte.

Example: Hex format: 0x4B32

To use the decimal method of determining a single write "move-to" command, add the desired position value to 19200.

Example: Desired position = 50%.

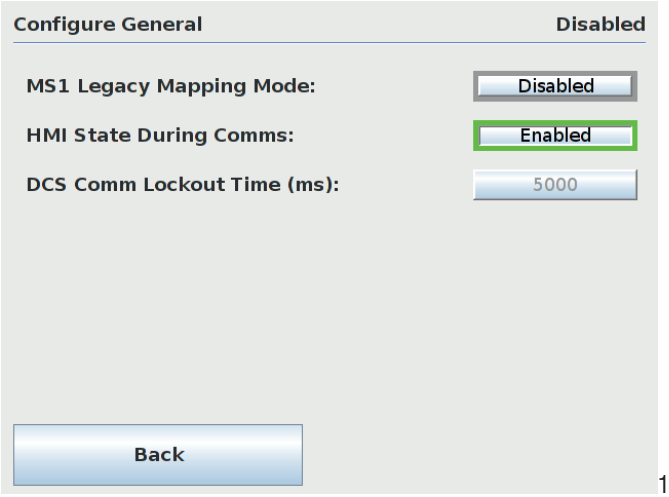
19200 + 50 = 19250

"19200 + Value" (Position Value for units capable of commands accepting 1 write "Move-to"). Valid values for position for this operation are 0 through 100 (decimal).

7.2.5.4 General Settings

General DCS settings can be accessed by pressing the “General” button in the DCs Configuration menu. It is recommended to keep these settings at their default values unless specifically needed for the application.

Figure 7.26 – General DCS Settings (defaults shown)



1.

1. The MS1 Legacy Mapping Mode setting can be Enabled/Disabled for use of the A/B style mapping as explained in section 7.2.5.3.1 FC 02 Read Input Status.
2. The HMI State During Comms setting allows the user to enable or disable use of the local (touchscreen) display when DCS communication is active.
3. The DCS Comm Lockout Time setting defines the duration of the touchscreen lockout period during DCS communications. Valid range in milli-seconds is 1-10,000.

7.2.6 MOV Network Configuration

The MOV Network Config menu provides access to communication parameters used for connecting the MSIV to field unit MOVs. Selecting the "Next" button will advance the display to the Active MOVs display which allows the user to add additional field units to the network configuration. The Poll Priority button allows the user to set the poll cycle interval for each activated MOV. After changing configurations, press "Accept" to save the settings.

Note: MOV Network Configuration is disabled when the unit is in Active mode. To turn off "Active" mode, go to the System Configuration menu and select the "Redundant Config" button. Under Requested Mode, select the "Disabled" button.

Note: The timeout and prop delay settings may need to be adjusted based on actuator series, size of network, baud rate, and cable type/length.

Figure 7.27 – MOV Network Configuration

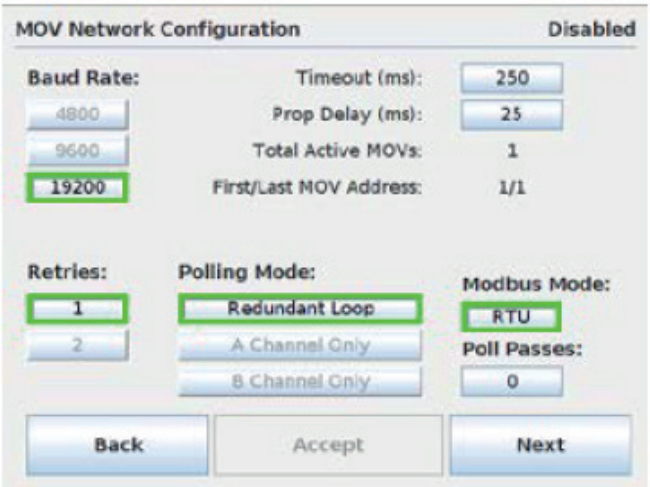


Figure 7.28 – Active MOVs

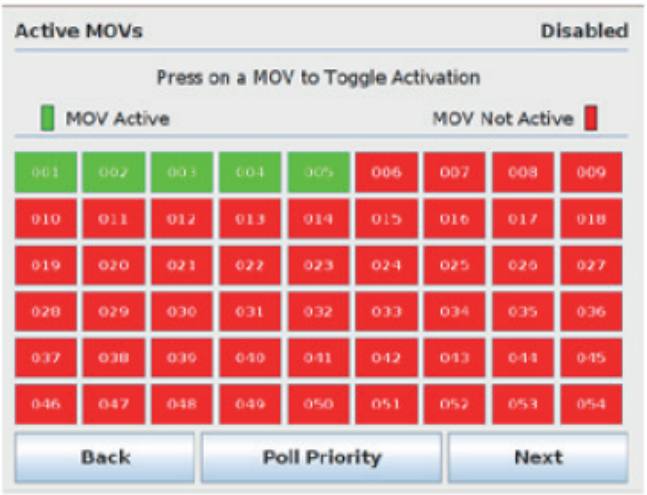
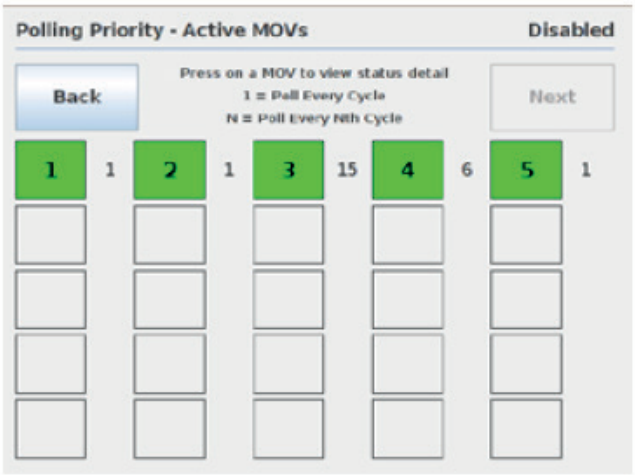


Figure 7.29 – Polling Priority, Active MOVs

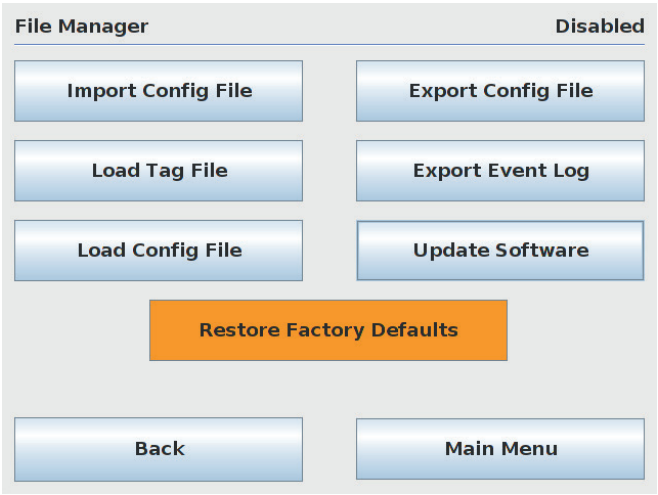


Note: to optimize the network efficiency, lower priority MOVs can be set to be polled at a user defined cycle.

7.2.7 File Manager

The File Manager menu allows the user to import/load/export MSIV configuration files, load tag files, export event logs, update the system software, and restore to factory defaults. Note: The File Manager is disabled when the unit is in Active mode. To turn off "Active" mode, go to the System Configuration menu and select the "Redundant Config" button. Under Requested Mode, select the "Disabled" button.

Figure 7.30 – File Manager Menu



Import Config File: enables the user to import an existing system configuration file from a connected USB flash drive.

Import Tag File: enables user to import a spreadsheet to the MSIV's tag configuration settings.

Load Config File: enables the user to import a saved system configuration file from system memory

Export Config File: enables the user to save the configuration file to a connected USB flash drive

Export Event Log: enables the user to save the MSIV event log to a connected USB flash drive

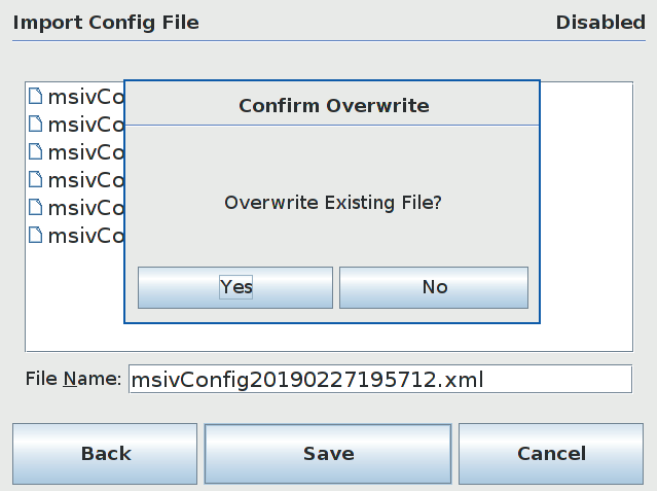
Update Software: enables the user to update the system software through a connected USB flash drive with a software update file

Restore Factory Defaults: enables the user to revert all system changes back to the original factory settings

7.2.7.1 Import Config File

The Import Config File screen allows the user to access the file chooser and select a configuration file to be copied from a connected USB flash drive to the default directory for the config file archives. The MSIV's existing configuration file is overwritten with the new, imported file.

Figure 7.31 – Import Configuration File



7.2.7.2 Load Tag File

The Load Tag File menu allows the user to access the file chooser and select an MOV tag name file from a connected USB flash drive to be loaded into the MSIV MOV tag configuration. The MSIV supports .csv files with MOV numbers in the first column and corresponding tag names in the second column. MOV tag names should be 8 characters or less in order to display properly.

7.2.7.3 Load Config File

When the system configuration file is changed, the MSIV keeps a copy of the old configuration and saves it to system memory. The Load Config File menu allows the user to load the configuration from an existing file that was saved in memory.

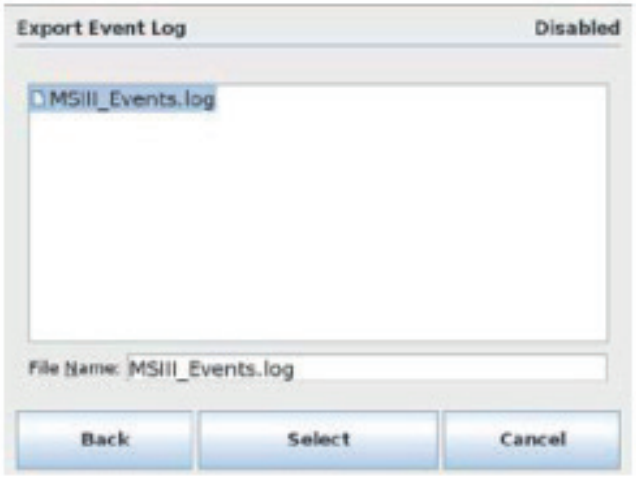
7.2.7.4 Export Config File

The Export Config File menu allows the user to access the file chooser and save a selected configuration file to a connected USB flash drive.

7.2.7.5 Export Event Log

The Export Event Log menu allows the user to save a diagnostics event log. Each event is related to changes in log-in information, configuration events, network status, or MOV status polling activity. In addition, all captured events are defined, numbered, and time-stamped in order to maintain the logged data.

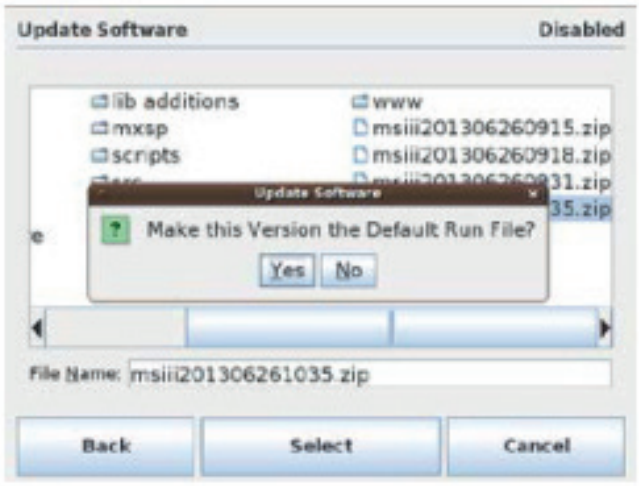
Figure 7.32 – Export Event Log



7.2.7.6 Update Software

The Update Software menu allows the user to access the file chooser and select a software update file to be copied to the default directory for the MSIV software file archives.

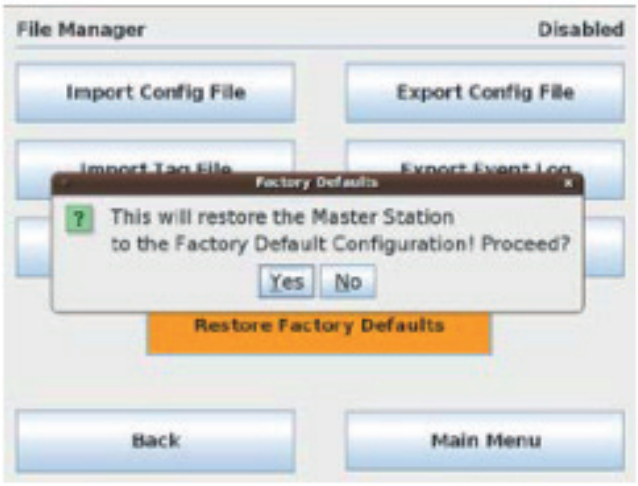
Figure 7.33 – Update Software Menu



7.2.7.7 Restore Factory Defaults

To return the MSIV configuration settings to factory defaults, press the “Restore Factory Defaults” button at the bottom of the File Manager menu. A confirmation box will appear to confirm the restoration. This action cannot be undone.

Figure 7.34 – Restore Factory Defaults

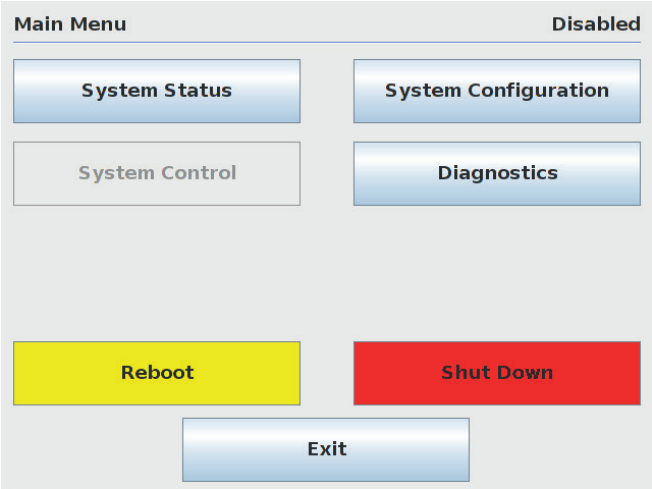


8 Diagnostics

8.1 Main Menu

Upon successful login as a user assigned to either Configure or Administrator role level, the Diagnostics button on the Main Menu screen will be present. Press the Diagnostics button to advance to the Diagnostics menu.

Figure 8.1 – Main Menu



8.2 Diagnostics

The Diagnostics menu allows the user to access four diagnostics utilities: Event logging, Debug serial port, Comm/FC Analyzer, and Polling Stats.

Figure 8.2 – Diagnostics Menu

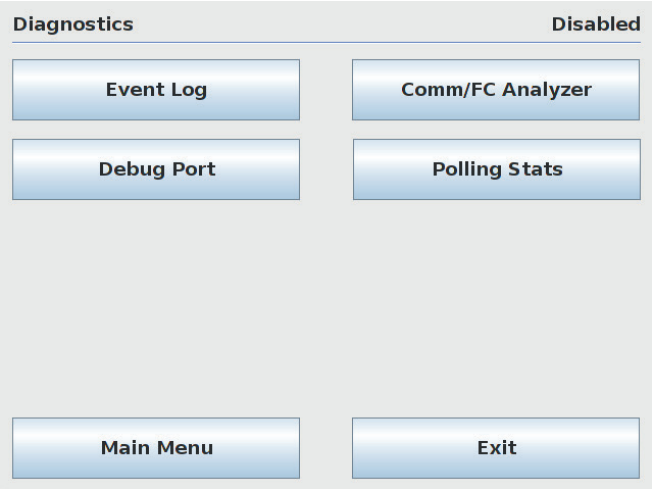
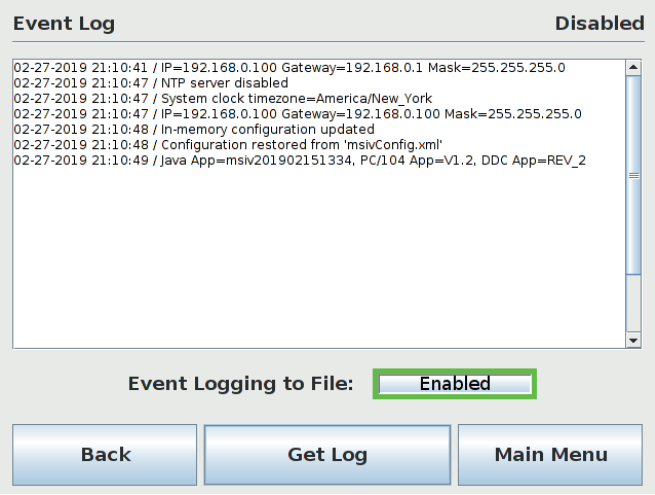
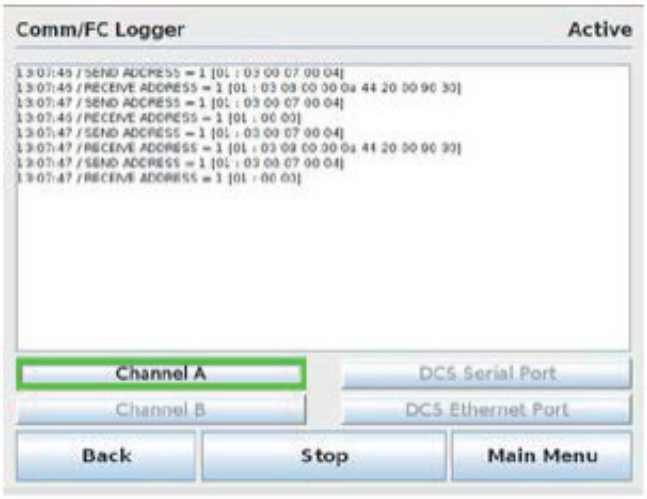


Figure 8.3 – Event Log



The Event Logger allows the user to display the last 20 events that were recorded. Every entry is defined, numbered, and time-stamped in order to maintain the logged data. Press the “Event Logging to File” button to Enable/Disable event logging. If event logging is Disabled, the MSIV performance may improve slightly, but Flowserve recommends enabling the event logging.

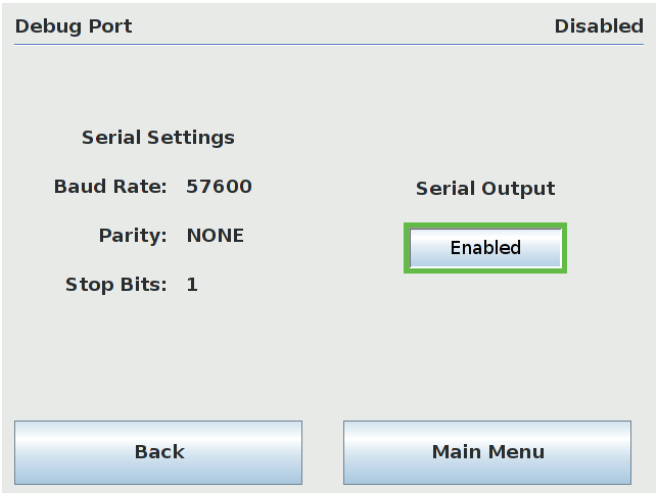
Figure 8.4 – Comm/FC Logger



The Comm/FC logger captures Modbus requests and responses to/from the DCS and MOVs (channel A & B). The different communication channels can be enabled/disabled by pressing the corresponding buttons. Press “Start” to begin displaying communication activity on the screen. Press “Stop” to stop displaying communication activity on the screen.

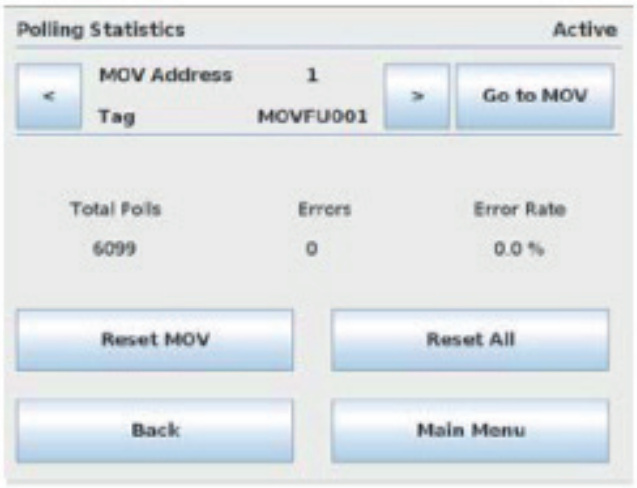
Note: the Comm/FC logger is designed for local diagnostic purposes only. While the logger is active, the MSIV will experience reduced communication performance. When not needed for diagnostics, the logger channels should be disabled.

Figure 8.5 – Debug Serial Port



The Debug Serial port menu allows the user to enable/disable the serial debug port activity. When enabled, the debug serial port will transmit ASCII debug statements which can be monitored/logged via an external serial terminal. Static RS-232 serial settings are: Baud Rate = 57600, Parity = None, Stop Bits = 1. This port is configured as a standard RS-2323 DTE device. See section 4 Electrical Connections for serial port pinout details.

Figure 8.6 – Polling Statistics



The polling statistics menu allows the user to view the polling history of each activated MOV on the network. This menu displays the total number of polls, number of errors, and error rate (%). Press “Reset MOV” to clear the polling stats for the currently selected MOV and restart the accruing of polling stats. Press “Reset All” to clear the polling stats for all active MOVs and restart the accruing of polling stats.

9 Troubleshooting Guide

9.1 Front Panel Indicators

There several LED indicators on the front panel of the MSIV that provide a visual reference for system status and functionality.

PWR: A green LED that the unit has power.

NET FAULT: A red LED indicates a field network communication fault.

MOV FAULT: A red LED indicates an MOV device alarm is present

A: A flashing red LED indicates Channel A activity. Blinks when there is activity. If the LED is off, there is no activity on Channel A.

B: A flashing red LED indicates Channel B activity. Blinks when there is activity. If the LED is off, there is no activity on Channel B.

RX: LED indicating DCS Serial port receiver activity. Blinks when there is activity. If the LED is off, there is not receiver activity.

TX: LED indicating DCS Serial port transmitter activity. Blinks when there is activity. If the LED is off, there is not transmitter activity.

WEB LINK: LED indicating the status of the WEB ethernet port LINK. ON = port connected to a 10/100 network. OFF = port is not connected to a 10/100 network.

WEB ACT: LED indicating the status of the WEB ethernet port ACTIVITY. ON = link is active. BLINK = network activity. OFF = link is inactive.

DCS LINK: LED indicating the status of the DCS ethernet port LINK. ON = port connected to a 10/100 network. OFF = port is not connected to a 10/100 network.

DCS ACT: LED indicating the status of the DCS ethernet port ACTIVITY. ON = link is active. BLINK = network activity. OFF = link is inactive.

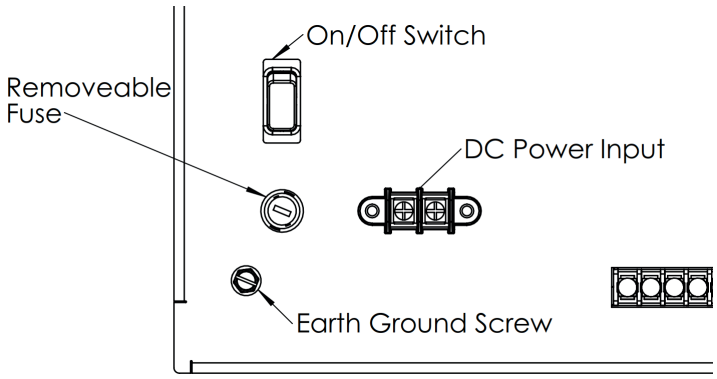
9.2 Network Status Screen

The Network Status screen provides a visual reference of the overall health of the MOV field network. See section 5 for instructions for viewing the MOV and communication channel status. MOV faults can be examined by clicking on the desired unit. Communication channel faults can be examined by reviewing log files. Communication channel faults can be corrected by verifying correct configuration parameters (see section 7) and verifying wiring connections and proper cabling.

9.3 Blank Display

A blank display is usually the result of an activated screen saver. If screen saver setting adjustments are needed, refer to section 7. Also, lack of power will also cause a blank screen – check for green PWR LED and/or measure power input terminals for proper power supply voltage. If the PWR LED is not green and power is supplied to the input terminals, check the removable fuse for continuity.

Figure 9.1 – Rear Panel On/Off Switch, Fuse, and Power Input Terminals



9.4 Network Communications

Problem: Unable to establish communications with DCS serial port.

1. Confirm null modem cable connection
2. Verify DCS address setting
3. Verify baud rate and parity settings.
4. Check host system settings
5. Test communication cable(s)

Problem: Unable to establish communications with DCS Modbus TCP/IP port

1. Confirm IP address settings (a ping command from some point on the network can confirm the MSIV's IP settings and connectivity).
2. Verify ethernet path from host to the MSIV
3. Verify that the hosts' communication settings are compatible with Modbus TCP/IP. The MSIV complies with the Modbus TCP/IP messaging implementation guide V1.0b published by the Modbus Organization.

Problem: Unable to establish communications with field MOVs.

1. Confirm proper cable connections on the first MOV in the loop and the MSIV. RS-485 is polarity sensitive.
2. Confirm RS-485 baud rate, parity, and stop bits settings match the MOV's settings.
3. Confirm the MSIV is configured for Modbus RTU mode.
4. Confirm the timing settings (timeout, prop delay).
5. Confirm that the MOV field unit is activated (number turned green in "Active MOVs" screen).

Notes

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Flowserve Corporation
Flow Control

United States
Flowserve Limitorque
5114 Woodall Road,
P.O. Box 11318
Lynchburg, VA 24506-1318
Phone: 434-528-4400
Facsimile: 434-845-9736

England
Flowserve Limitorque
Euro House
Abex Road
Newbury
Berkshire, RG14 5EY
United Kingdom
Phone: 44-1-635-46999
Facsimile: 44-1-635-36034

Japan
Limitorque – Nippon Gear Co., Ltd.
Asahi-Seimei Bldg. 4th Floor
1-11-11 Kita-Saiwai, Nishi-Ku
Yokohama-Shi, (220-0004)
Japan
Phone: 81-45-326-2065
Facsimile: 81-45-320-5962

Canada
Flowserve Limitorque
120 Vinyl Court
Woodbridge, Ontario L4L 4A3
Canada
Phone 905-856-4565
Fax 905-856-7905

Singapore
Limitorque Asia, Pte., Ltd.
12, Tuas Avenue 20
Singapore 638824
Phone: 65-6868-4628
Facsimile: 65-6862-4940

China
Limitorque Beijing, Pte., Ltd.
RM A1/A2
22/F, East Area, Hanwei Plaza
No. 7 Guanghua Road, Chaoyang District
Beijing 100004, Peoples Republic of China
Phone: 86-10-5921-0606
Facsimile: 86-10-6561-2702

India
Flowserve Limitorque
No.10-12, THE OVAL, Third floor
Venkatnarayana Road
T. Nagar, Chennai 600 017
Phone: 91-44-2432-8755
& 91-44-2432-4801
Facsimile: 91-44-2432-8754