75-MX250-00

Replacement for the GE Zenith MX150, MX200, and MX250 Controllers
Operation Manual Version 1.0.0.1
Automatic Transfer Switch Operation

WARNING!

ATS controls can have dangerous, and possibly lethal voltages present. The controller should only be serviced by a qualified technician.

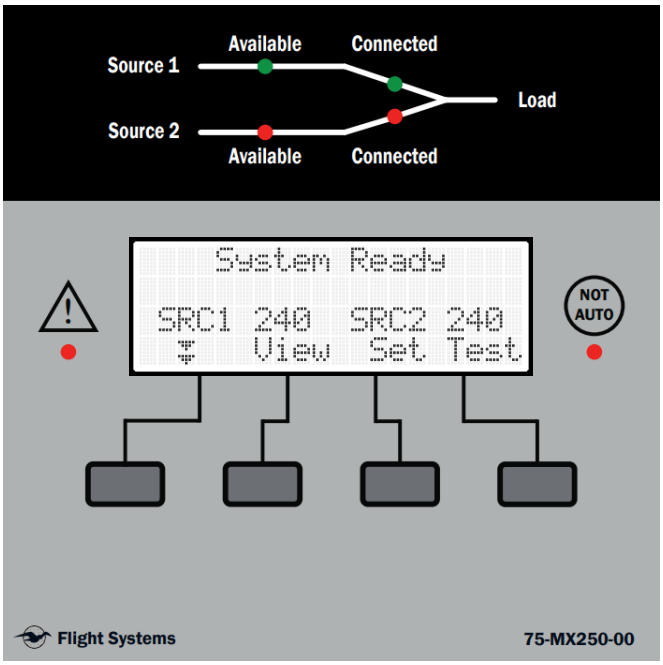
Table Of Contents

Overview

The 75-MX250 is a drop-in replacement for the Zenith MX150/200/250 controllers. The firmware has been designed to make a transition from the OEM controller to the Flight Systems Replacement as transparent as possible. The human machine interface (HMI) has been completely redesigned from the OEM and uses a modified version of the Flight Systems ATS1500 firmware.

Features

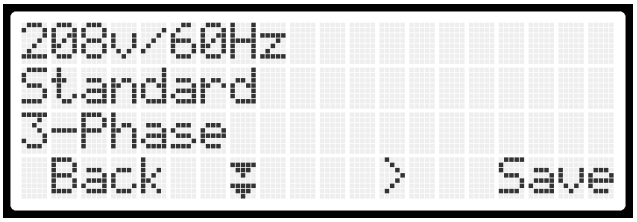
- Voltage ranges from 120VAC to 600VAC; 50 or 60Hz operation
- Voltage and frequency settings compatible with the MX150, MX200, and MX250
- In-phase and phase rotation monitoring
- Standard, programmed, and closed transition operation modes
- On-board Modbus communications without ZNET interface card
- Mini-USB connector for firmware updates during field service
- Source 1 and Source 2 time delays compatible with the MX150, MX200, and MX250
- 16 programmable exercise cycles
- Programmable inputs and outputs
- Setup Assist menu for expedited setup
- Added “Fault” and “Not In Auto” indicators
- Utility to generator operation



Device Setup

It is suggested to use the Setup Assist menu to do the initial setup of the replacement control. Since the OEM controllers were mainly pre-configured at the time of ordering, this section will go over how to derive setup parameters based on the catalog number of the transfer switch assembly. It is possible to manually configure the controller, however, it is not recommended.

Setup Assist (REQUIRED)
From the main menu, press SET, enter the default password '0000' and select **Next**. Use the navigation keys to select Setup Assist and press **Next**. Once in the Setup Assist menu, press **Next** to modify the parameters. Use the down button to select the parameter and the right arrow to modify the value. Press **Save** to commit these settings to memory. Below is an example of a Zenith ATS catalog number and its configuration.



Example Zenith Transfer Switch Catalog Number
ZTG000A00040F-ZEC01ZVC40MSTD

ZTG000: *Transition Type (Standard/Open Transition)*
A0: *Logic Control Panel (MX150)*
0: *Application (Utility-Generator)*
040: *Ampere Size (400 amps)*
F: *Number of Poles (4 poles, 3-phase)*
ZEC01: *Enclosure Type (Type 1 Enclosed)*
ZVC40: *Voltage and Frequency (120/208V, 60Hz)*
MSTD: *Accessories (Standard)*
See the Zenith ATS Catalog Number Table on the next page for the part number nomenclature.

Setup Assist is a required step to obtain the proper voltage sensing configuration. After Setup Assist is performed, refer to the **Calibration** menu to make the readings more accurate and exact.

In the example part number above, the "40" in ZVC40 is in reference to a 208V, 4 pole, 3-phase system. See the Voltage and Frequency code chart on page 6 to verify your voltage, phase, and frequency settings.

Zenith ATS Catalog Number Table

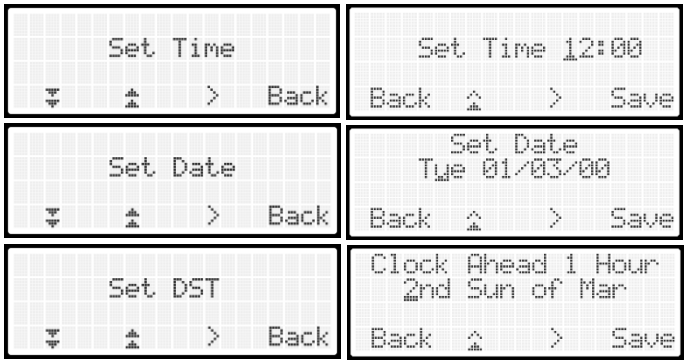
Type	*Logic*	*Application*	*Amperes (XXX)*	*Switched Poles*	*Enclosure*	*Voltage and Frequency*
ZTG Series	A0: MX150	0: **Util-Gen**	**004 - 300**	B: Two-Pole	4X: NEMA 4X	***See Table On Page 6***
ZTG000: Standard (Open Transition)		U: **Util-Util**	**004 - 300**	E: Three-Pole	12: NEMA 12	
ZTGD00: Delayed Transition		M: **Manual**		F: Four-Pole	00: Open	
ZTGSE0: Bypass Isolation (Open Transition)					01: NEMA 1	
ZTGDSE: Bypass Isolation (Delayed Transition)					3R: NEMA 3R	
					40: NEMA 4	
ZTS/ZBTS Series	B0: MX250	0: **Util-Gen**	**004 - 300**	B: Two-Pole		
ZTS000: Standard (Open Transition)		U: **Util-Util**		E: Three-Pole		
ZTSD00: Delayed Transition		M: **Manual**		F: Four-Pole		
ZTSCT0: Closed Transition		G: **Gen-Gen**				
ZBTS00: Bypass Isolation (Open Transition)						
ZBTSD0: Bypass Isolation (Delayed Transition)						
ZBTSCT: Bypass Isolation (Closed Transition)						

Note: Gray-colored columns are parameters that will affect normal operation and must be correct for the controller to function properly. It may be helpful to highlight/mark the parameters in the table to match the transfer switch data sticker.

Code	Voltage	Phase	Configuration	Frequency (Hz)
1 0	120V	1	2-wire	60
2 0	120/240V	1	3-wire	60
2 1	120/208V	1	3-wire	60
3 0	240V	3	3-wire	60
3 1	208V	3	3-wire	60
3 2	220V	3	3-wire	50
3 3	120/240V	3	4-wire	50
3 4	110/220V	3	4-wire	60
3 5	139/240V	3	4-wire	60
3 8	120/240V	3	4-wire	60
4 0	120/208V	3	4-wire	60
4 1	127/220V	3	4-wire	60
4 2	127/220V	3	4-wire	50
5 0	480V	3	3-wire	60
5 1	440V	3	3-wire	60
5 2	440V	3	3-wire	50
5 5	460V	1	3-wire	50
5 7	480V	1	2-wire	60
5 8	254/440V	3	4-wire	60
6 0	575V	3	3-wire	60
6 1	347/600V	3	4-wire	60
7 0	277/480V	3	4-wire	60
7 1	277V	1	2-wire	60
7 4	266/460V	3	4-wire	60
7 5	460V	3	3-wire	60
8 0	120/240V	2	4/5-wire	60
8 2	380V	1	2-wire	50
9 0	240/416V	3	4-wire	60
9 1	220/380V	3	4-wire	60
9 2	220/380V	3	4-wire	50
9 3	240/416V	3	4-wire	50
9 7	380V	3	3-wire	60

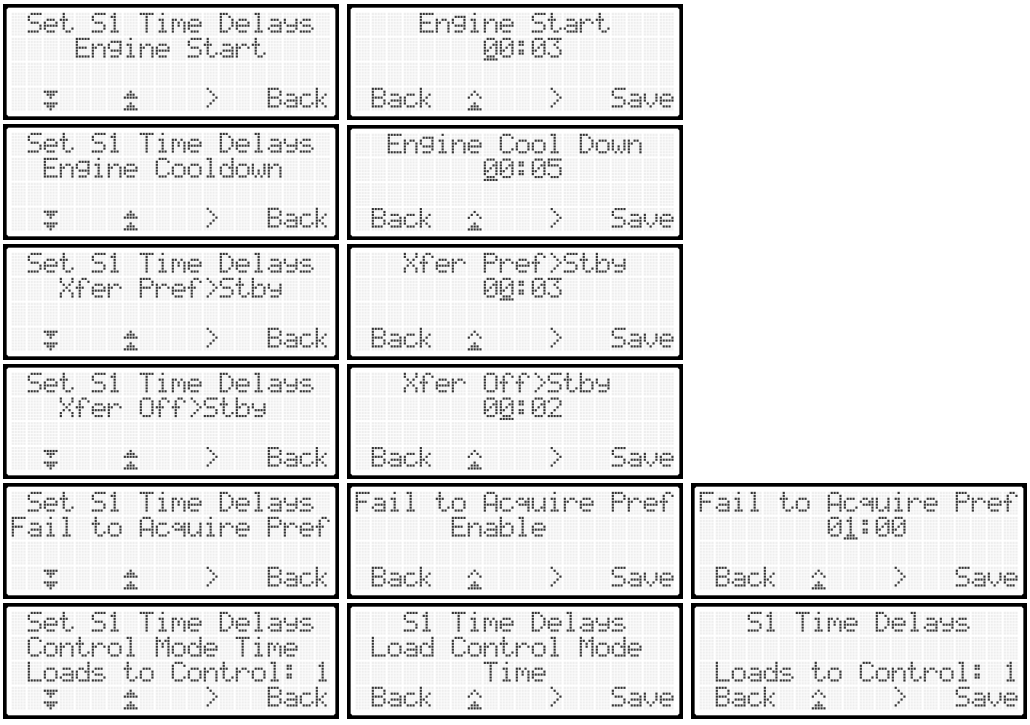
Set Menu Navigation

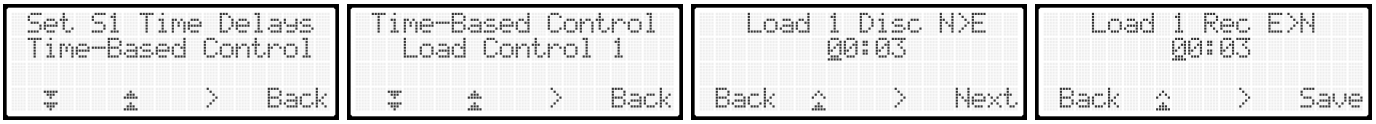
Set Time/Date



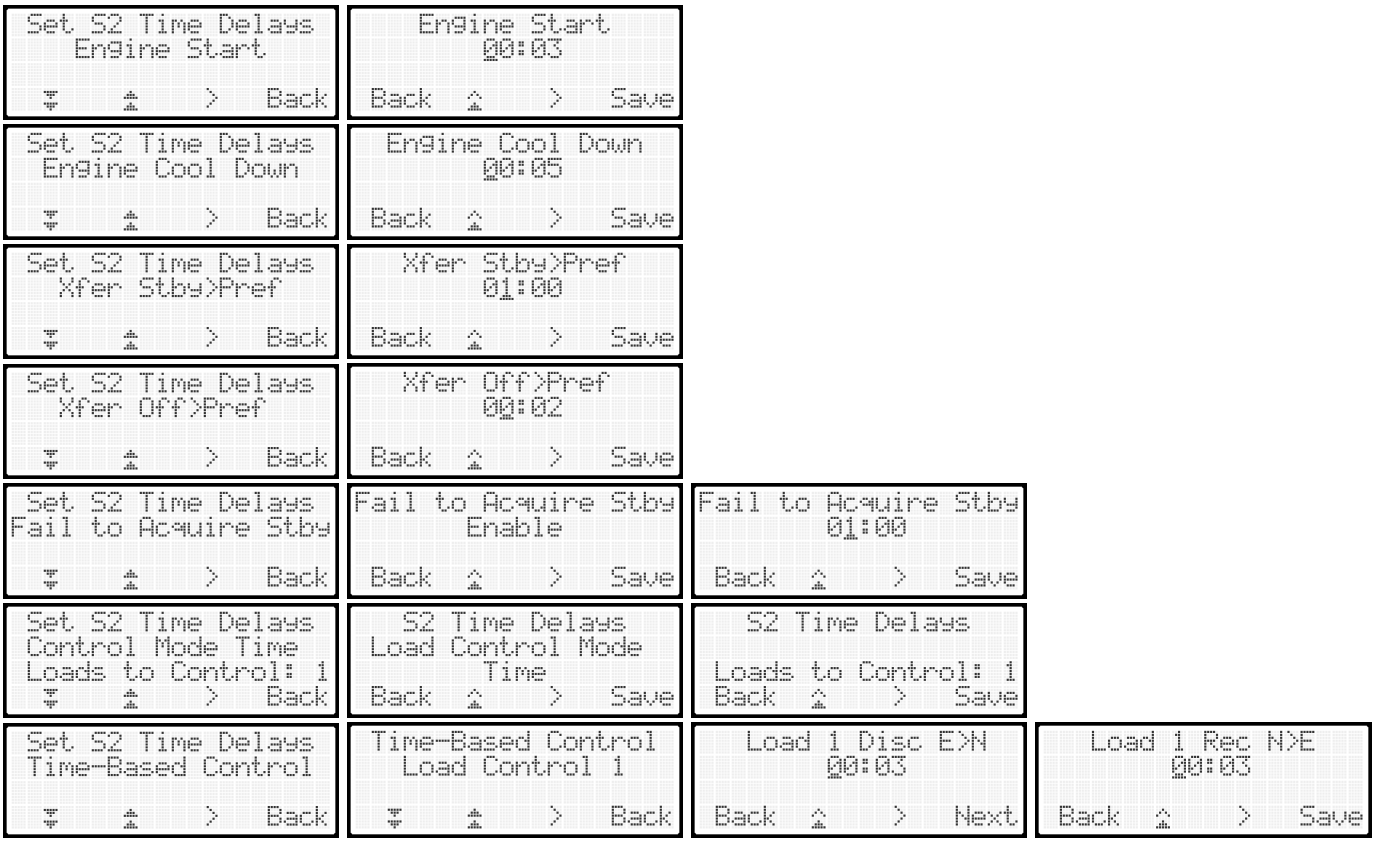
Set Exerciser

Set S1 Time Delays

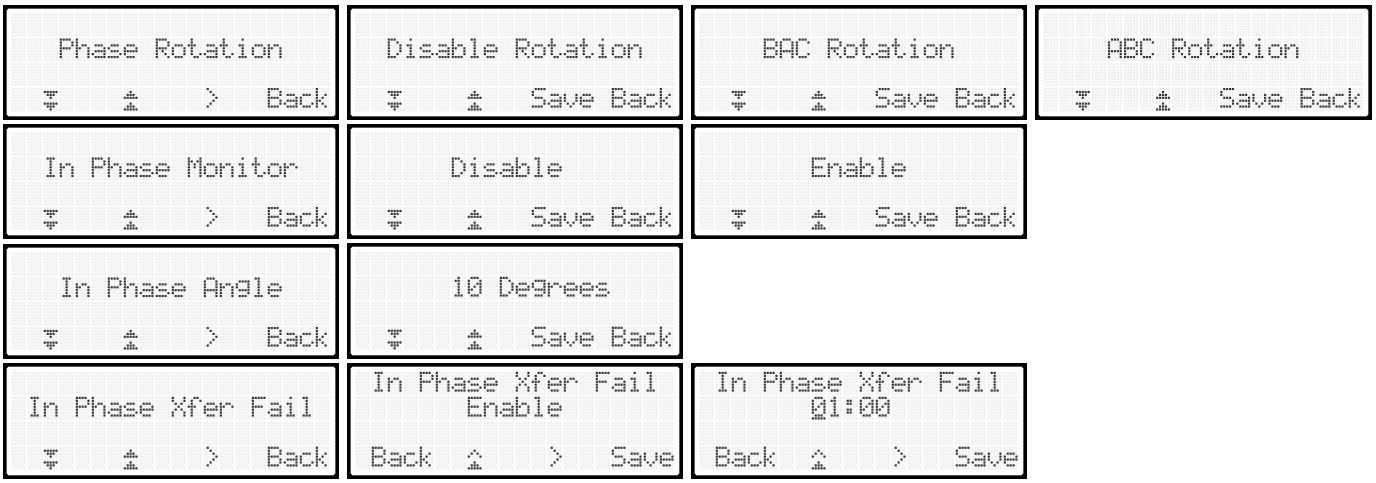




Set S2 Time Delays

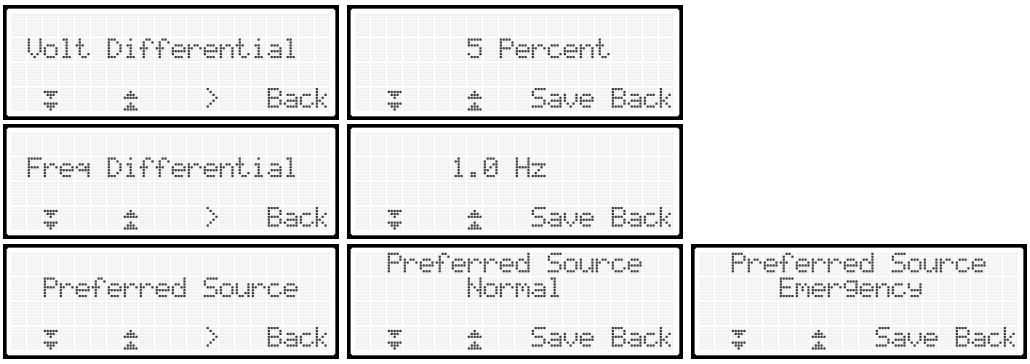


Set Sources

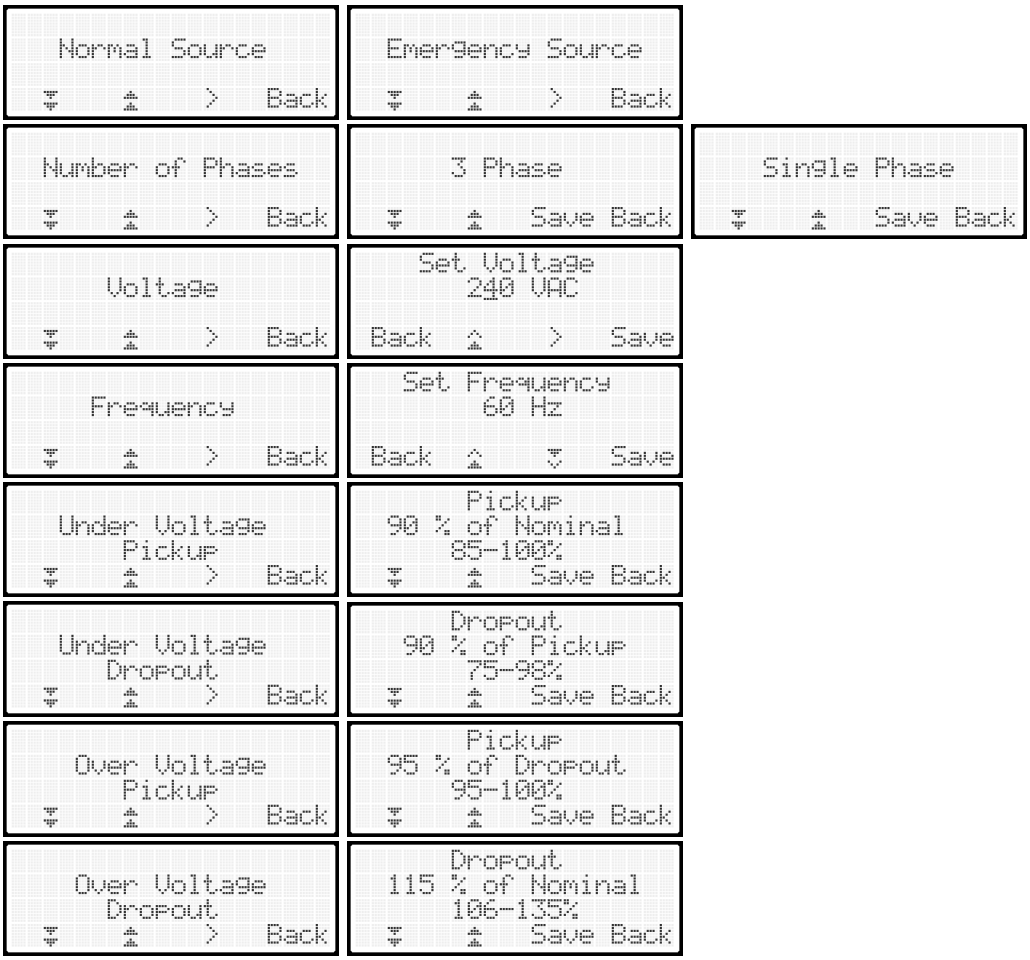


Set Menu Navigation (cont.)

Set Sources (cont.)



Applicable for both Normal and Emergency Source



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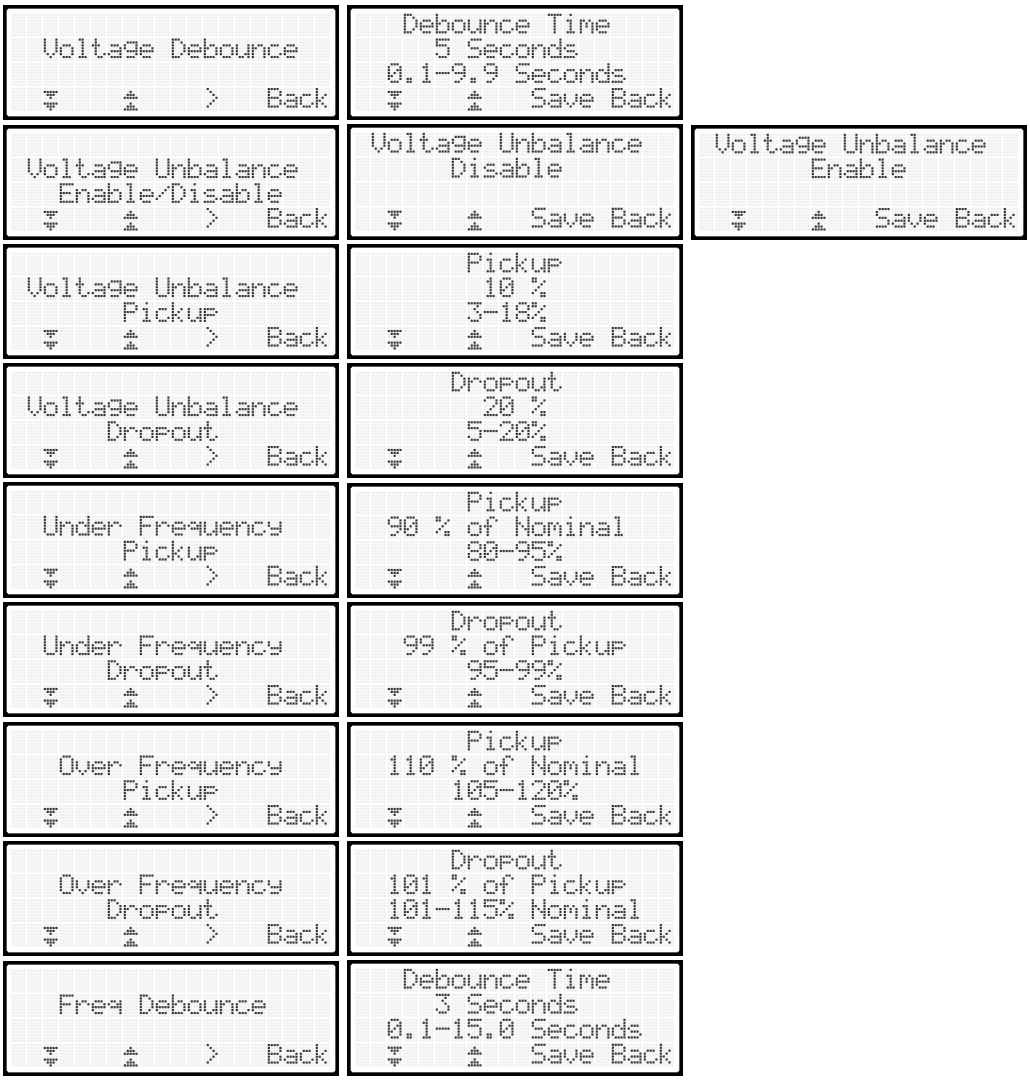
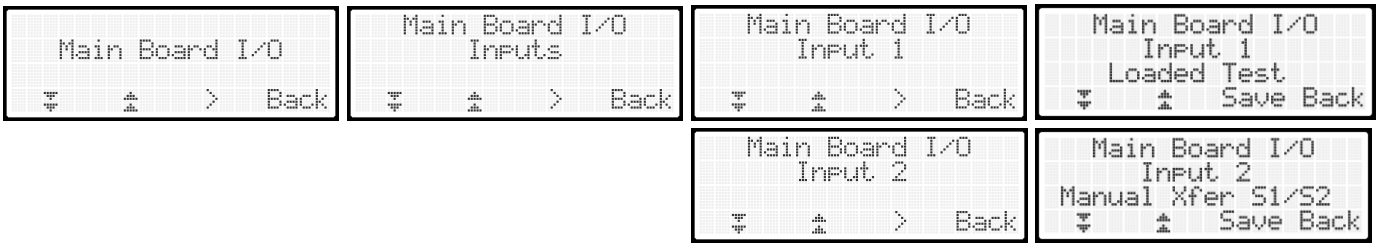
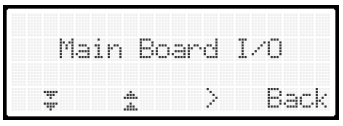


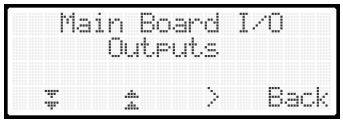
Set Inputs/Outputs

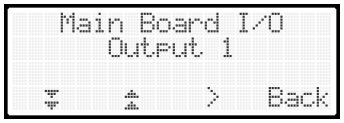


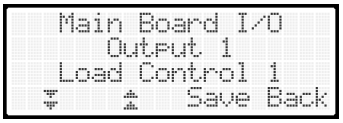
Set Menu Navigation (cont.)

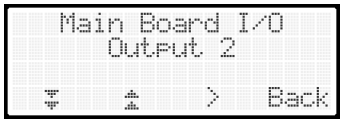
Set Inputs/Outputs (cont.)

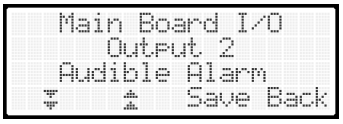




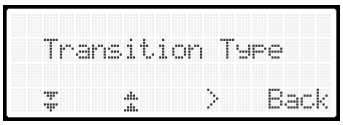


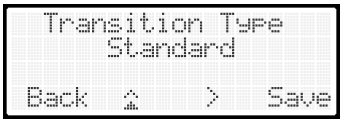


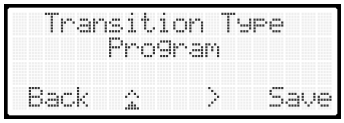




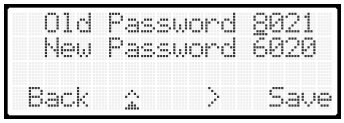
Set System

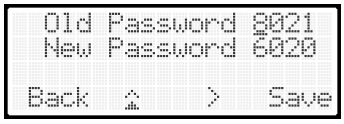




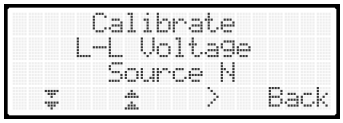


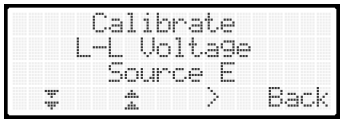
Set Passwords

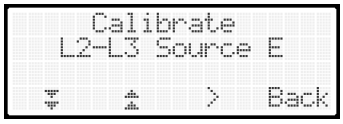




Calibration

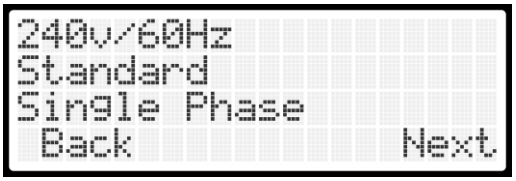


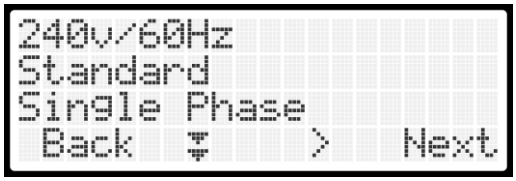




Setup Assist

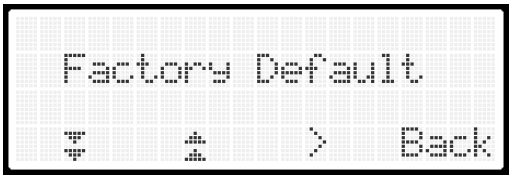
The Setup Assist menu enables the operator to quickly and easily modify critical transfer switch parameters on a single menu screen. Press **Next**, then use the down arrow to change the parameter and the right arrow to change the value.





Factory Default

Press the right arrow button to apply factory default settings



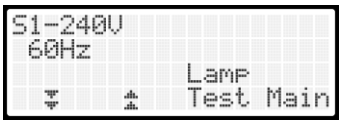
Display Settings

Main Menu

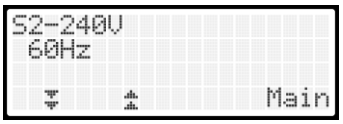
Use the left 2 buttons to navigate through the main menu. The main display will cycle through 6 screens to display various parameters and alternate functions.

Down Button

Displays current status, active time delay, and faults



Displays Normal L-L



Displays Emergency L-L

Displays date and time

Displays source settings

Displays system settings

View Button

Displays exercise setup

Displays S1 delays

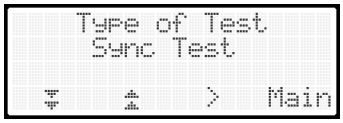
Displays S2 delays

Displays source setup

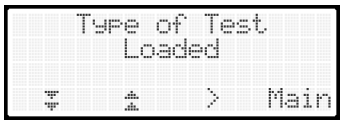
Displays I/O setup

Displays system setup

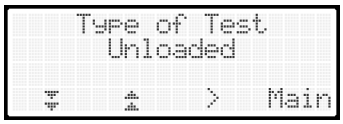
Test Button



Initiates a Sync Test



Initiates a Loaded Test



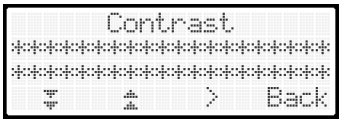
Initiates an Unloaded Test

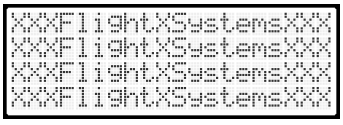
Lamp Test

Press the down arrow to access main display screen 2. Press button 3, LAMP TEST to temporarily illuminate all LEDs and characters on the display.

Contrast Adjustment

Press and hold VIEW for 2 seconds until all the keypad indicators illuminate.



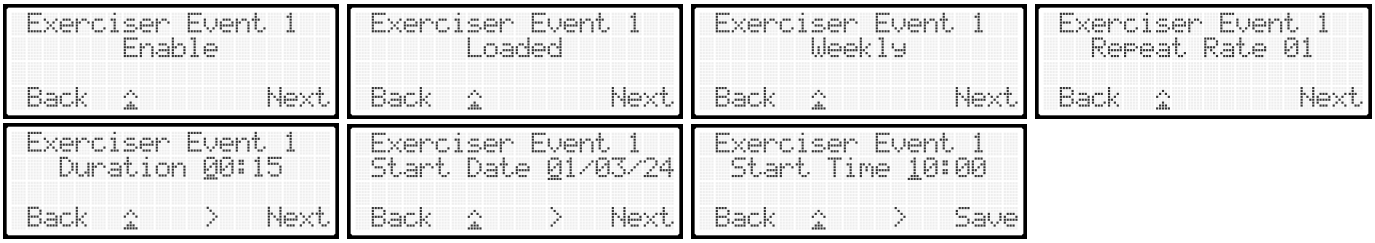


Use the 2 left buttons to adjust the screen contrast. Press Back to exit the contrast adjustment.

Exercise Settings

The 75-MX250-00 supports up to 16 exercise cycles. Each exercise cycle is entered as an event. When the control board is initially powered on it first searches all saved events to determine if they have already passed. All expired events are automatically updated to their next valid cycle and saved in EEPROM. Each exercise event has several parameters that must be set correctly to function properly. Even if an event is disabled and left to expire it will be updated to its next valid exercise time upon enabling the cycle.

Example Exercise Setup:



The above exercise cycle would begin Wednesday January 3, 2024 @ 10:00. It would run a loaded exercise cycle for 15 minutes before transferring to normal, executing all transition delays in addition to the 15-minute exercise cycle. With a repeat rate of one it would wait 1 week before exercising again on Wednesday January 10, 2024. If the repeat rate was set to 2, it would wait 2 weeks.

If the unit was powered down due to a malfunction or removed from service, then put back into service on March 18, 2024 it would immediately update the exercise event to March 20, 2024. Providing the exercise event was set to enabled.

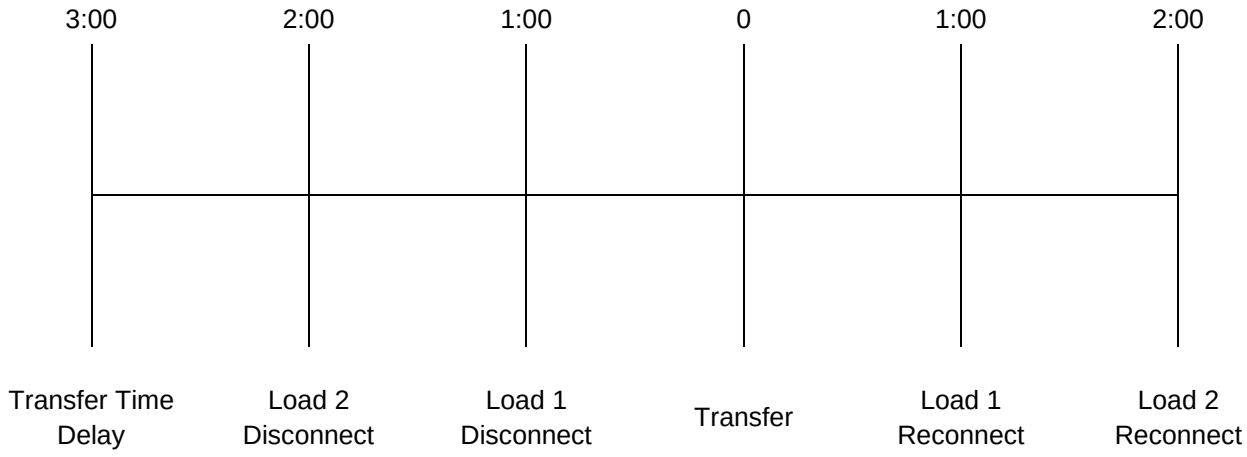
If the exercise interval was set for Monthly with a repeat rate of 1, the exercise event would cycle once per month. With the interval set for daily and the repeat rate at 4, it would exercise every 4 days.

Load Control

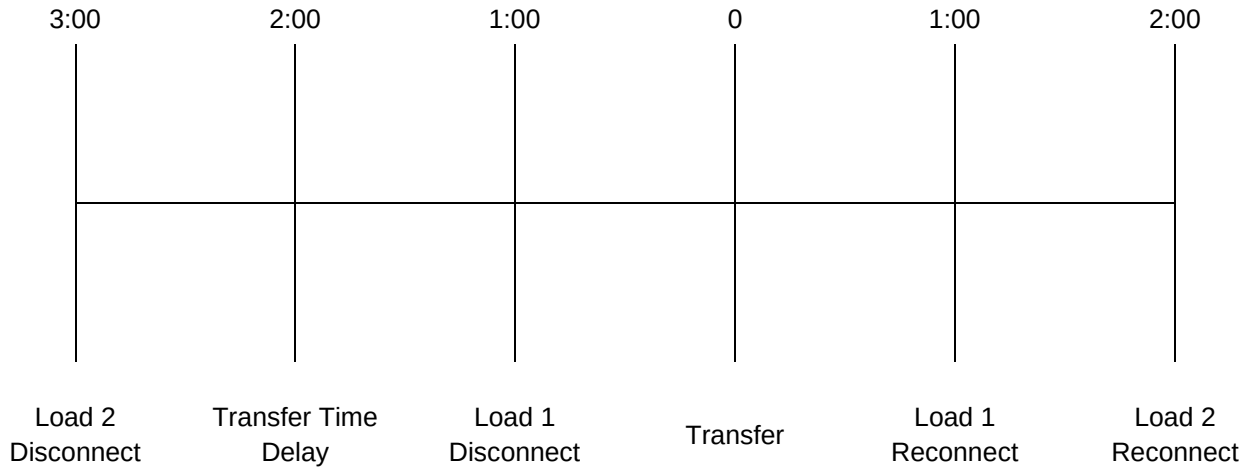
The 75-MX250-00 control supports up to 2 different load control outputs. Each load control output has a programmable disconnect and reconnect time for both source 1 and source 2 independently. The factory default configuration assigns Output 1 to Load Control 1, however, this output is fully configurable for different functions; See I/O page.

If the load control disconnect delay is set longer than the transfer delay, the controller will respect whichever delay is longer. It is good practice to keep the longest pre-transfer delay shorter than the transfer delay.

Transfer time delay is set longer than the load control delays.



One or more load control delays are set longer than the transfer time delay.



Sequence of Operation for Standard Transition

1. Preferred source fails.
2. Engine start delay expires and remote start contacts close.
3. Standby power is available.
4. Preferred to standby time delay expires.
5. K2 relay energizes. Contactor transfers to standby position.
6. Load control reconnect timers expire and load control contacts close.
7. Preferred source returns.
8. Standby to preferred time delay expires.
9. Load control disconnects.
10. In-phase monitor is activated, if enabled.
11. K1 relay energizes. Contactor transfers to preferred position.
12. Load control reconnect timers expire and load control contacts close.
13. Cool down timer expires and the generator shuts down.

Sequence of Operation for Closed Transition

1. Preferred source fails.
2. Engine start delay expires and remote start contacts close.
3. Standby power is available.
4. Preferred to standby time delay expires.
5. K4 relay energizes. Contactor transfers to neutral position.
6. Off to standby time delay expires.
7. K2 relay energizes. Contactor transfers to standby position.
8. Load control reconnect timers expire and load control contacts close.
9. Preferred source returns.
10. Standby to preferred time delay expires.
11. Load control disconnects.
12. In-phase monitor is activated.
13. K1 relay energizes. Contactor transfers to preferred position. Sources will be paralleled for no longer than 100ms.
14. K3 relay energizes. Contactor transfers to off position.
15. Load control reconnect timers expire and load control contacts close.
16. Cool down timer expires and the generator shuts down.

Switch Types (cont.)

Sequence of Operation for Programmed Transition

1. Preferred source fails.
2. Engine start delay expires and remote start contacts close.
3. Standby power is available.
4. Preferred to standby time delay expires.
5. K4 relay energizes. Contactor transfers to neutral position.
6. Off to standby time delay expires.
7. K2 relay energizes. Contactor transfers to standby position.
8. Load control reconnect timers expire and load control contacts close.
9. Preferred source returns.
10. Standby to off time delay expires.
11. Load control disconnects.
12. K3 relay energizes. Contactor transfers to off position.
13. Off to preferred time delay expires.
14. K1 relay energizes. Contactor transfers to preferred position.
15. Load control reconnect timers expire and load control contacts close.
16. Cool down timer expires and the generator shuts down.

Relay Functions per Switch Type

	Standard/Open Transition	Closed Transition	Programmed Transition
K1 Relay	Close Source 1	Close Source 1	Close Source 1
K2 Relay	Close Source 2	Close Source 2	Close Source 2
K3 Relay	N/A	Open Source 2	Open Source 2
K4 Relay	N/A	Open Source 1	Open Source 1

I/O Options: Programmable Inputs and Outputs

While the 75-MX250-00 does come factory configured with I/O identical to the OEM controller, they can be reconfigured to better suit any application. There are 11 inputs and 12 outputs that can be reconfigured on the controller. See below for I/O factory defaults and additional I/O functionality.

Factory Default Inputs

- Input 1 – Loaded Test
- Input 2 – Manual Xfer S1/S2
- Input 3 – Manual Xfer S1
- Input 4 – Disabled
- Input 5 – Closed Transition
- Input 6 – Inhibit to SRC1
- Input 7 – Inhibit to SRC2
- Input 8 – Load Shed
- Input 9 – T-Timer
- Input 10 – W-Timer
- Input 11 – Unloaded Test

Factory Default Outputs

- Output 1 – Pref Source Available
- Output 2 – Load Control 1
- Output 3 – Load Control 2
- Output 4 – Contactor in Standby
- Output 5 – Contactor in Pref
- Output 6 – Standby Source Available
- Output 7 – Disabled
- Output 8 – Shunt Trip Active
- Output 9 – Audible Alarm
- Output 10 – Not in Auto
- Output 11 – Load Shed Active
- Output 12 – Disabled

Input Functions

- Bypass Contactor Disabled
- Forced to OFF
- Inhibit Transfer
- Low Battery Voltage
- W-Timer
- T-Timer
- Unloaded Test
- Loaded Test
- Remote Common Alarm
- Inhibit to SRC1
- Inhibit to SRC2
- Service Disconnect
- Closed Transition
- Manual Xfer to S1
- Manual Xfer S1/S2
- Load Shed

Output Functions

- Audible Alarm
- 3-Src System Disable
- Alarm Silenced
- Aux Switch Fault
- Aux Switch Open
- Common Alarm 1-2
- Contactor in Off
- Contactor in Preferred
- Contactor in Source E
- Contactor in Source N
- Contactor in Standby
- Exerciser Active
- Fail to Acquire Preferred
- Fail to Acquire Standby
- Fail to Transfer
- Fail to Open Source 1
- Fail to Close Source 1
- Fail to Open Source 2
- Fail to Close Source 2
- I/O Module Lost Comm
- IPM Syncing
- Load Control Active
- External Battery Low

Output Functions (cont.)

- MBUS Control RDO 1-4
- Shunt Trip Active
- Load Shed Active
- Load Bank Control Active
- Load Control 1-9
- Non-Emergency Transfer
- Not in Auto Mode
- Peak Shave Active
- Preferred Source Available
- Service Disconnect Gen
- Emergency Rotation Error
- Emergency Loss of Phase
- Emergency Over Frequency
- Emergency Over Voltage
- Emergency Start
- Emergency Under Frequency
- Emergency Under Voltage
- Emergency Unbalanced
- Normal Rotation Error
- Normal Loss of Phase
- Normal Over Frequency
- Normal Over Voltage
- Normal Start
- Normal Under Frequency
- Normal Under Voltage
- Normal Unbalanced
- Normal Standby Available
- Test Mode Active

Calibration

Should the controller require calibration, the calibration function can be accessed from the main menu **> SET > CALIBRATION**. Proper calibration will require taking a physical measurement from line to line. See page 10 for the calibration menu screens.

The current reading is displayed on top and the adjusted reading can be entered below. Enter the corrected reading for each of the relevant measurements. Press **SAVE** and return to the main menu.

Factory Default Settings

Factory defaults can be set by navigating to the Set Factory Defaults entry in the **SET** menu. Applying factory defaults will overwrite all previous parameters and clear all exercise cycles, load control configurations for source 1 and source 2, revert I/O settings, and calibration settings returned to default.

Preferred Source – Normal
Transition Type – Standard
In-Phase – Disabled
S1 / S2 Control Mode – Time
S1 / S2 Loads to Control – 1
Sync Differential Voltage – 5%
Sync Differential Frequency – 2Hz
Sync Angle – 10 degrees
S1 / S2 Nominal Voltage – 240
S1 / S2 Nominal Frequency – 60
S1 / S2 Phases – Single Phase
Set Password – 0000
Test Password – 0000
S1 / S2 Engine Start – 3 Seconds
S1 / S2 Engine Cool Down – 5 Seconds
Standby to Preferred – 60 Seconds
Preferred to Standby – 3 Seconds
Off to Preferred – 2 Seconds
Off to Standby – 2 Seconds
Over Voltage Dropout – 115% of Nominal
Over Voltage Pickup – 95% of Dropout
Under Voltage Pickup – 90% of Nominal
Under Voltage Dropout – 90% of Pickup
Over Frequency Dropout – 101% of Pickup
Over Frequency Pickup – 110% of Nominal
Under Frequency Dropout – 99% of Pickup
Under Frequency Pickup – 90% of Nominal
S1 / S2 Unbalance – Disabled
S1 / S2 Unbalance Dropout – 20%
S1 / S2 Unbalance Pickup – 10%
Rotation Expected – Disabled
S1 / S2 Fail to Acquire – Disabled (60 Seconds)
Fail to Sync – 60 Seconds
Fail to Sync Fallback – Enabled

Modbus Communications

Supported Registers v1.0.0.0
Registers with strikethrough are not supported on the 75-MX250-00 Hardware.

40001	System Overview	RO	40063	Normal Cool Down Delay	RW
40002	~~Source N Line-Neutral L1-L0~~	RO	40064	Emergency Cool Down Delay	RW
40003	~~Source N Line-Neutral L2-L0~~	RO	40065	Standby to Preferred Delay	RW
40004	~~Source N Line-Neutral L3-L0~~	RO	40066	Preferred to Standby Delay	RW
40005	~~Source E Line-Neutral L1-L0~~	RO	40067	Off to Standby Delay	RW
40006	~~Source E Line-Neutral L2-L0~~	RO	40068	Off to Preferred Delay	RW
40007	~~Source E Line-Neutral L3-L0~~	RO	40069	Fail to Acquire Preferred	RW
40008	Source N Line-Line L1-L2	RO	40070	Fail to Acquire Standby	RW
40009	Source N Line-Line L2-L3	RO	40071	Fail to Synchronize	RW
40010	Source N Line-Line L3-L1	RO	40072	Fail to Sync Enabled	RW
40011	Source E Line-Line L1-L2	RO	40073	RESERVED	
40012	Source E Line-Line L2-L3	RO	40074	RESERVED	
40013	Source E Line-Line L3-L1	RO	40075	Active Time Delay	RO
40014	Source N Frequency	RO	40076	Active Time Delay Remaining	RO
40015	Source E Frequency	RO	40077	Active Time Delay Preset	RO
40016	~~Current L1~~	RO	40078	Normal Over Voltage Dropout	RW
40017	~~Current L2~~	RO	40079	Normal Over Voltage Pickup	RW
40018	~~Current L3~~	RO	40080	Normal Under Voltage Pickup	RW
40019	Closed Transition In-Phase Delta	RO	40081	Normal Under Voltage Dropout	RW
40020-40038	RESERVED		40082	Normal Unbalance Enabled	RW
40039	Closed-Programmed Transition Override Mode	RW	40083	Normal Unbalance Voltage Dropout	RW
40040	Password	WO	40084	Normal Unbalance Voltage Pickup	RW
40041	Synchronous Voltage Phase Angle	RO	40085	Normal Voltage Debounce	RW
40042	Synchronous Voltage Differential	RW	40086	Emergency Over Voltage Dropout	RW
40043	Synchronous Frequency Differential	RW	40087	Emergency Over Voltage Pickup	RW
40044	Service Entrance Type	RW	40088	Emergency Under Voltage Pickup	RW
40045	Phase Rotation Actual	RO	40089	Emergency Under Voltage Dropout	RW
40046	Phase Rotation Expected	RW	40090	Emergency Unbalance Enabled	RW
40047	Nominal Normal Voltage	RW	40091	Emergency Unbalance Voltage Dropout	RW
40048	Nominal Emergency Voltage	RW	40092	Emergency Unbalance Voltage Pickup	RW
40049	Nominal Normal Frequency	RW	40093	Emergency Voltage Debounce	RW
40050	Nominal Emergency Frequency	RW	40094	Normal Over Frequency Dropout	RW
40051	Normal Number of Phases	RW	40095	Normal Over Frequency Pickup	RW
40052	Emergency Number of Phases	RW	40096	Normal Under Frequency Dropout	RW
40053	~~Rated Amps~~	RW	40097	Normal Under Frequency Pickup	RW
40054-40056	RESERVED		40098	Normal Frequency Dropout Time	RW
40057	Transition Mode Mode of Operation Auto/Manual	RW	40099	Emergency Over Frequency Dropout	RW
40058	Password	WO	40100	Emergency Over Frequency Pickup	RW
40059	Normal Engine Start Delay	RW	40101	Emergency Under Frequency Dropout	RW
40060	Emergency Engine Start Delay	RW	40102	Emergency Under Frequency Pickup	RW
40061	Normal Ext Start Delay	RW	40103	Emergency Frequency Dropout Time	RW
40062	Emergency Ext Start Delay	RW			

Firmware Revisions

Version 1.0.0.1

Initial Release

To update a controller that is currently in service, please visit our website www.flightsystems.com and download our firmware update utility from the 75-MX250-00 product page. This update utility will always have the most recent firmware version. Updating a controller will require a mini-USB cable and a laptop to connect to.