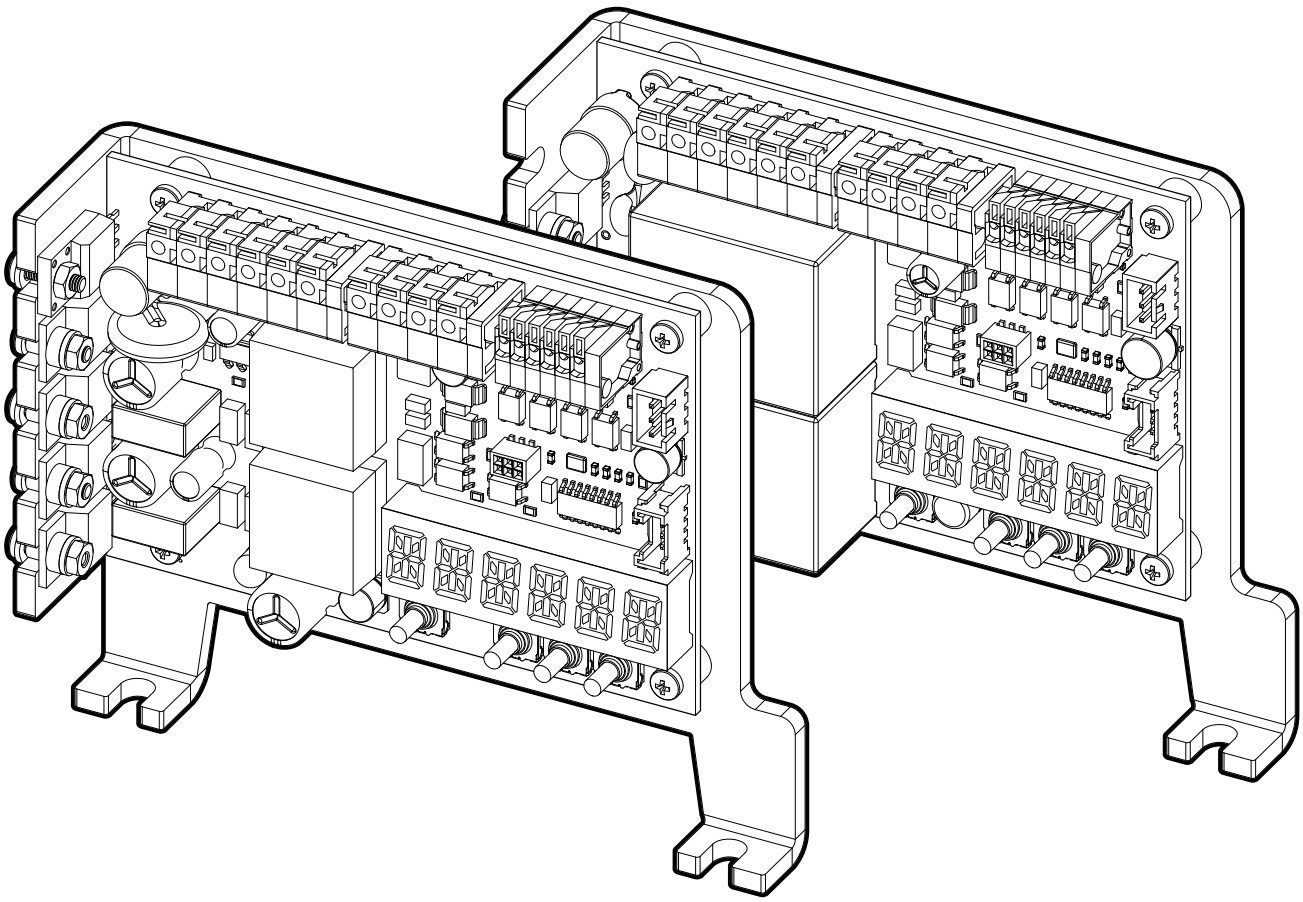
SERIES 76

MODULATING CONTROL CARD

Installation, Operation, and Maintenance Manual



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READ AND FOLLOW THESE INSTRUCTIONS CAREFULLY.
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1.0 DEFINITION OF TERMS

All information within this manual is relevant to the safe operation and proper care of your Bray valve. Please understand the following examples of information used throughout this manual.

1.1 Safety Statements

The terms DANGER, WARNING, CAUTION, and NOTICE are used in this document to prevent unwanted consequences. Standard symbols and classifications are:

DANGER
Indicates an immediate hazardous situation which, if not avoided, **will** result in death or serious injury and/or property damage.

WARNING
Indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury and/or property damage.

CAUTION
Indicates a potentially hazardous situation which, if not avoided, **may** result in minor or moderate injury and/or property damage.

NOTICE
Indicates and provides additional technical information which may not be obvious, even to qualified personnel. The term is not used for personal injury hazards or warnings, but can be used to indicate possible equipment or property damage.

NOTE: Provides important information related to a procedure.

Compliance with other notes — regarding transport, assembly, operation & maintenance, and about technical documentation (e.g., in the operating instructions, product documentation, or on the product itself) — is essential, to avoid faults which can directly or indirectly cause severe personal injury or property damage.

2.0 HAZARD FREE USE

This device left the factory in proper condition to be safely installed and operated in a hazard-free manner. The notes and warnings in this document must be observed by the user to ensure hazard-free operation of this device.

All necessary precautions need to be taken to prevent damage due to rough handling, impact, or improper storage. Do not use abrasive compounds to clean the device, or scrape it surface with any objects.

Configuration and setup procedures for this device are described in this manual. Proper configuration and setup are required for the safe operation of this device.

The control system in which this device is installed must have proper safeguards to prevent injury to personnel, or damage to equipment, should a failure of system components occur.

WARNING
Equipment controlled by this device can generate large mechanical forces during normal operation.

3.0 QUALIFIED PERSONNEL

WARNING
The device must only be installed, commissioned, operated and repaired by qualified personnel.

Installation, commissioning, operation and maintenance must be performed under strict observation of all applicable codes, standards and safety regulations.

A **qualified person** in terms of this document is one who is familiar with the installation, commissioning, and operation of the device and who has appropriate qualifications, such as:

> Is trained in the operation and maintenance of electrical and mechanical equipment and systems in accordance with established safety practices.

> Is trained or authorized to energize, de-energize, ground, tag, and lock electrical circuits and equipment in accordance with established safety practices.

> Is trained in the proper use and care of personal protective equipment (PPE) in accordance with established safety practices.

> In cases where the device is installed in a potentially explosive (hazardous) location – is trained in the commissioning, operation, and maintenance of equipment in hazardous locations.

WARNING
Reference is specifically made here to observe all applicable safety regulations for actuators installed in potentially explosion (hazardous) locations.

4.0 INTRODUCTION

The Bray Series 76 Modulating Control Card (MCC) provides complete modulating control and monitoring of the Bray Series 76 Electric Actuator.

4.1 Principal of Operation

The basic function of the MCC is to position the Series 76 in response to a command signal from a process controller. The process controller contains a desired process set point entered by the user and continually monitors the process variable (such as flow rate, tank level, etc.) through some type of sensor. Varying the command signal to the MCC will cause the actuator to change position, which will move the associated control valve to modify the process variable. The process controller continually calculate and transmits the appropriate command signal to the MCC to maintain the process at the desired set point.

NOTICE
The Bray Series 76 MCC is used when the application does not require a Local Control Station.

4.2 Electrical Operation

The command signal to the MCC can be various DC voltage ranges (0-5V, 0-10V, 1-5V, 2-10V) or various current source ranges (0-20mA, 4-20mA). The MCC simultaneously provides a feedback output signal, representing the current actuator position. The retransmission output signal reported by the MCC can also be various DC voltage or current source ranges. These settings, along with specific operating modes, are enabled by a simple-to-use configuration menu using push buttons to control a 6-character alpha-numeric display.

5.0 HARDWARE DESCRIPTION

The Bray S76 MCC has two voltage options:
110VAC/ 220VAC-240VAC (**Figure 01**) and 24Vdc. (**Figure 02**).

Figure 1: Hardware Description - 110VAC/ 220VAC-240VAC

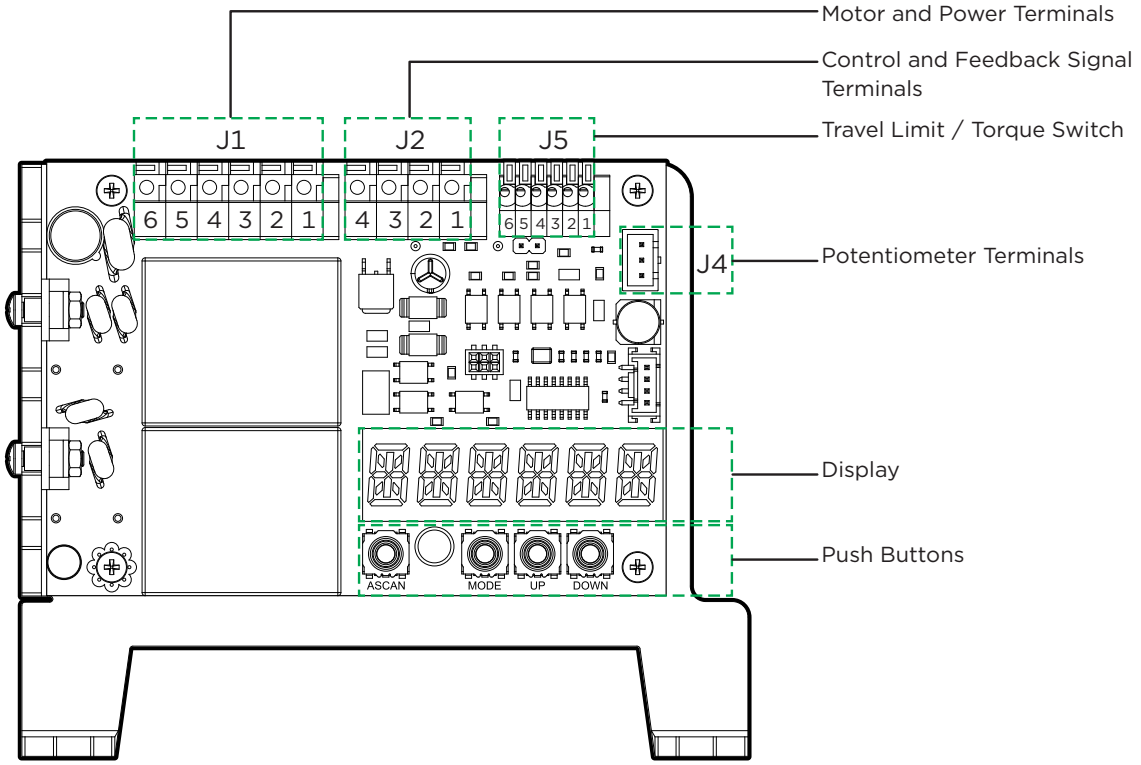
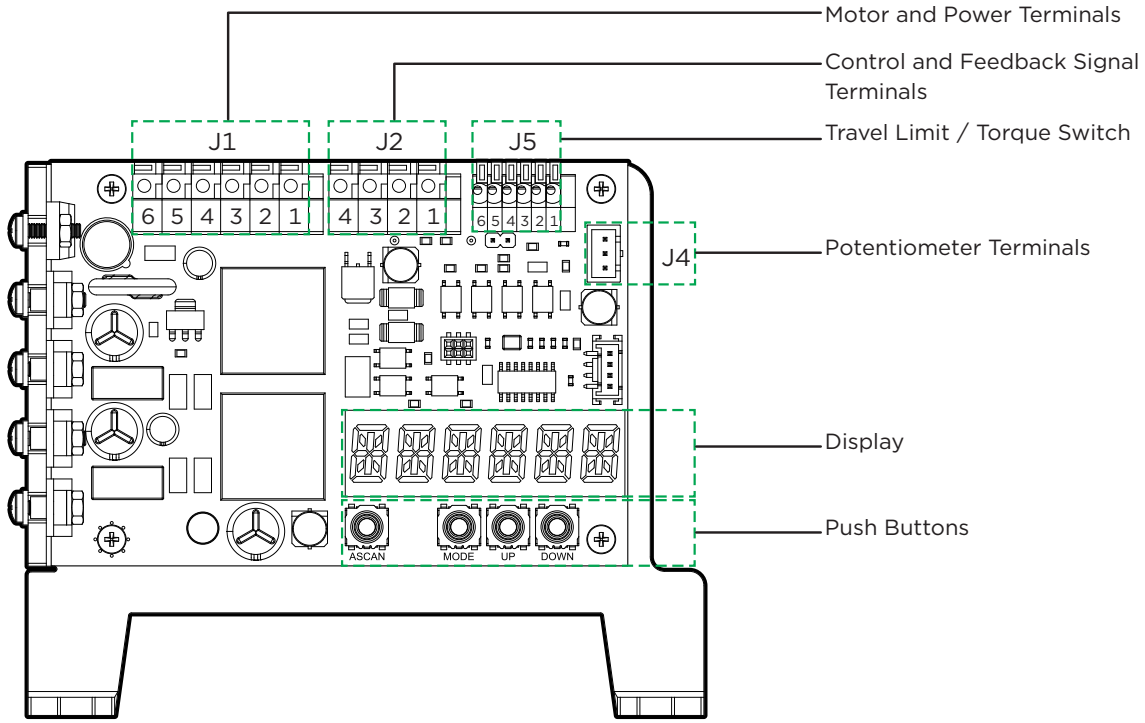


Figure 2: Hardware Description - 24 VDC



5.1 Product Default Settings

The product settings determine how the MCC will respond to commands from the process controller. These must be defined and verified before beginning operation.

All units ship with default settings (**Table 1**) from the factory. These settings can be adjusted within setup mode (Section 7.5)

TABLE 1: Default Settings

Display	Description	Default Value
SET-FS	Fail-Safe	Fail Stop
SET-AF	Auto Full Action	2%
SET-IR	Reverse Input	Normal
SET-OR	Reverse Output	Normal
SET-SP	Command Signal	4-20mA
SET-FB	Feedback Signal	4-20mA
SET-LB	Closed Limit Switch Bypass	None (Deactivated)
SET-DB	Deadband	+-1.0%
SET-DT	Deadtime	1.0s
INZERO	Command Signal - Zero	4mA
INSPAN	Command Signal - Span	20mA
Ot 4mA	Feedback Signal - Zero	--
Ot20mA	Feedback Signal - Span	--
INIT	Initialization	--
SET-3P	Operation Voltage Phase	Single Phase
SET-DC	Operation Speed	100%

6.0 TERMINAL CONNECTIONS AND USER INTERFACE

Terminals are provided on the unit for the landing of stripped wires, connecting the MCC to the external sources and signals needed for it to successfully operate.

For modulating control, either a 110VAC/220-240VAC (**Figure 01**) or a 24DC (**Figure 02**) card is used, depending on the unit's power input.

NOTICE
Actuator connections are generally made at the factory and should not require any customer adjustment. All connections required for proper operation are bolded below.

6.1 Connections Required for Proper Operation

Motor Connections
Motor settings, connection pins 1 to 3 on terminal J1 (**Figure 03**).

Power Connections
Power, connection pins 4 to 6 on terminal J1 (**Figure 03**), energizes the MCC and powers the actuator under control. The voltage supplied should be based on the actuator nameplate voltage and the voltage listed on the MCC label. The MCC has an onboard protective fuse in line with the input power connection. This protective fuse is rated 5A, the maximum allowable current draw for the MCC. Therefore, the power supply connected to the input power connection should be rated to provide at least this much current to each MCC.

Note: Terminal 6 is connected to Chassis GND internally. No field wiring required. Factory use only.

Figure 3: Terminal Strips (J1) - Motor and Power

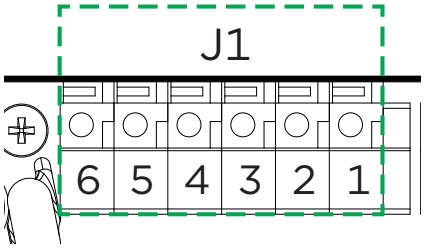


TABLE 2: Motor and Power Terminal Connections

		Term. No.	Description AC			Term. No.	Description DC
110/220V AC	Motor	1	Motor CW	24V DC	Motor	1	Motor+
		2	Motor CCW			2	Motor-
		3	Motor COM			3	--
	Power	4	Power Neutral		Power	4	Power-
		5	Power Line			5	Power+
		6	Chassis GND			6	Chassis GND

6.1 Connections Required for Proper Operation (cont.)

Feedback Connection

The feedback signal, connected to pins 1 and 2 on terminal J2 (Figure 04), reports the valve position using an analog signal. The signal type, which defaults to 4-20mA, can be adjusted through the feedback signal settings (section 7.6.6). The feedback signal is polarized, so incorrect wiring may result in unexpected behavior.

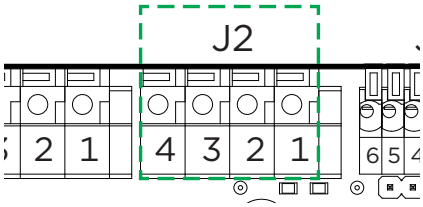
Command Connection

The command signal, connected to pins 3 and 4 on terminal J2 (Figure 04), positions the valve based on the command signal value. The signal type, which defaults to 4-20mA, can be adjusted through the command signal settings (section 7.6.5). The command signal is polarized, so incorrect wiring may result in unexpected behavior.

TABLE 3: Command and Feedback Signal Terminal Connections

Term. No.	Description
1	Feedback Signal-
2	Feedback Signal+
3	Command Signal–
4	Command Signal+

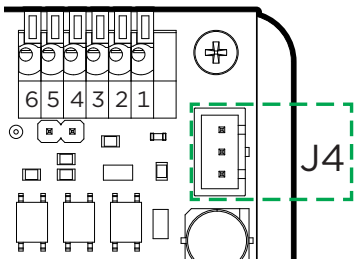
Figure 4: Terminal Strips (J2) - Command and Feedback Signals



Potentiometer Connection

The feedback potentiometer, connected at terminal J4 (Figure 05), allows the controller to determine the valve position. The MCC supplies a logic-level voltage across the potentiometer and monitors the voltage returned on the wiper terminal. As the cam shaft rotates, the wiper voltage changes. During auto calibration, the MCC records this voltage range and uses it to position the actuator accurately and precisely. The header is keyed and will only fit in the correct orientation. Align carefully before insertion.

Figure 5: Header (J4) - Potentiometer



6.1 Connections Required for Proper Operation (cont.)

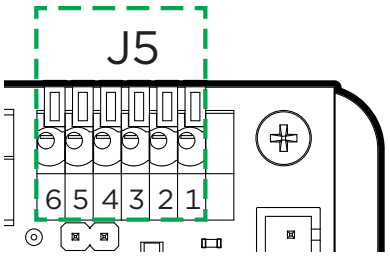
Travel Limit Switch Connections
The travel limit switches, connected to pins 1 through 3 on terminal J5 (Figure 06), signal to the MCC when an end-of-travel setpoint has been reached. The MCC supplies a logic-level voltage at the Open and Close terminals of this connection. When a travel limit switch is engaged, it pulls the corresponding pin to 0 V, signaling the MCC to stop movement. For proper operation, both travel limit switches must not be engaged simultaneously, as this would prevent the MCC from operating the actuator and result in a fault condition.

Torque Switch (Optional Connection)
If a torque switch assembly is installed, connected to pins 4 through 6 on terminal J5 (Figure 06), it alerts the MCC when excessive torque is applied to the actuator. The MCC supplies a logic-level voltage at the Open and Close terminals of this connection. If the actuator torque exceeds its rated limit, the corresponding switch pulls the pin to 0V, signaling the MCC to respond accordingly.

TABLE 4: Travel and Torque Limit Switch Terminal Connections

Term. No.	Description
1	Closed limit switch
2	Open limit switch
3	Limit switch common
4	Closed torque switch
5	Open torque switch
6	Torque switch common

Figure 6: Terminal Strips(J5) - Travel and Torque Limit Switches

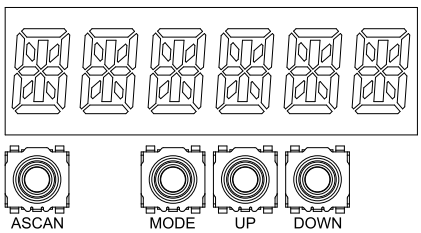


6.2 User Interface

The MCC features a 6-character, 14-segment, alpha-numeric menu that displays both configurable settings and operational status.

Modes and settings can be changed locally by utilizing the push buttons on the MCC. The push buttons are located below the display menu with button labels located below each on the circuit board.

Figure 7: User Interface



7.0 OPERATING MODES

The Series 76 MCC has five distinct operating modes: remote mode, error mode, manual mode, auto calibration mode, and setup mode These modes provide status indication and can be manipulated using the user interface.

7.1 Remote Mode

By default, the operating mode of the MCC is Remote Mode where the actuator positions the valve based on analog input command signals. Exiting another mode of operation generally results in the MCC returning to the Remote Mode.

Without any user interaction, the MCC will display the actuator position, direction of travel, limit switch activation, and torque switch activation. Fault status will be displayed automatically if an error occurs.

TABLE 5: Remote Control Mode Display Messages

Display	Description
	Actuator is operating in the open direction
	Actuator is operating in the closed direction
	Actuator is at the desired position and stopped
	The open limit switch is activated
	The closed limit switch is activated
	The open torque switch is activated. **Note:** Available in sizes 2–7; not applicable to size 1.
	The closed torque switch is activated. **Note:** Available in sizes 2–7; not applicable to size 1.

7.2 Error Mode

The error mode activates automatically when an error occurs and automatically deactivates once the error is resolved. While in error mode, users have access to Setup mode, Manual mode, and Auto calibration mode, excluding Motor Reverse, Limit Fault, or Torque Trip. Consult the table below for different error messages and their respective solutions.

TABLE 6: Error Mode Display Messages

Display	Display	Description
	EEPROM	Settings are not stored/read correctly
	NOTINS	Command signal initialization failure
	NOTASC	Auto setting initialization failure
	LOSESP	No command signal detected
	MOTREV	Motor reversed
	Err.SIG	Command signal selection failure
	Err.POT	Potentiometer failure
	OPNERR	Open failure
	CLSERR	Close failure
	Err.LMT	Limit switch failure
	TOTRIP	Torque trip

Please refer to Appendix B – MCC Troubleshooting for the appropriate corrective actions.

7.3 Manual Mode

Manual mode allows the user to control the actuator's position using the **UP** and **DOWN** buttons located on the MCC.

> Press and hold the **UP** and **DOWN** buttons simultaneously for more than 1 second.

> The display will alternate between the actuator's state and the current mode [MANUAL].

> Press and hold the **UP** button to operate the actuator to the open limit.

> Press and hold the **DOWN** button to operate the actuator to the closed limit.

> Press the **MODE** or **ASCAN** button once to leave Manual mode.

NOTE
If the actuator is not operated for more than 10 seconds, the MCC will automatically return to the remote mode.

7.4 Auto Calibration Mode

The MCC uses an automated calibration sequence to determine the operating points for the application in which it is installed. These operating points allow the MCC to calculate the correct feedback position of the product, making auto calibration an important step during commissioning.

1. Ensure the actuator is correctly mounted to the valve with accurate Command Signal, input power, and wiring.
2. Press the **ASCAN** button once to initiate auto calibration mode, regardless of the actuator's current position.
3. The display will alternately show the actuator's state.
4. The actuator will undergo the following operations:
   > Move to the closed the closed limit switch is activated.
   > Move to the open limit until the open limit switch is activated.
   > Return to the closed limit until the closed limit switch is activated.

NOTE
Pressing **UP**, **DOWN**, or **MODE** button once will exit auto calibration mode, and Proportional Control mode will be activated. Additionally, any error, such as motor reverse, limit fault, or torque trip, will also terminate auto calibration mode, transitioning to remote mode.

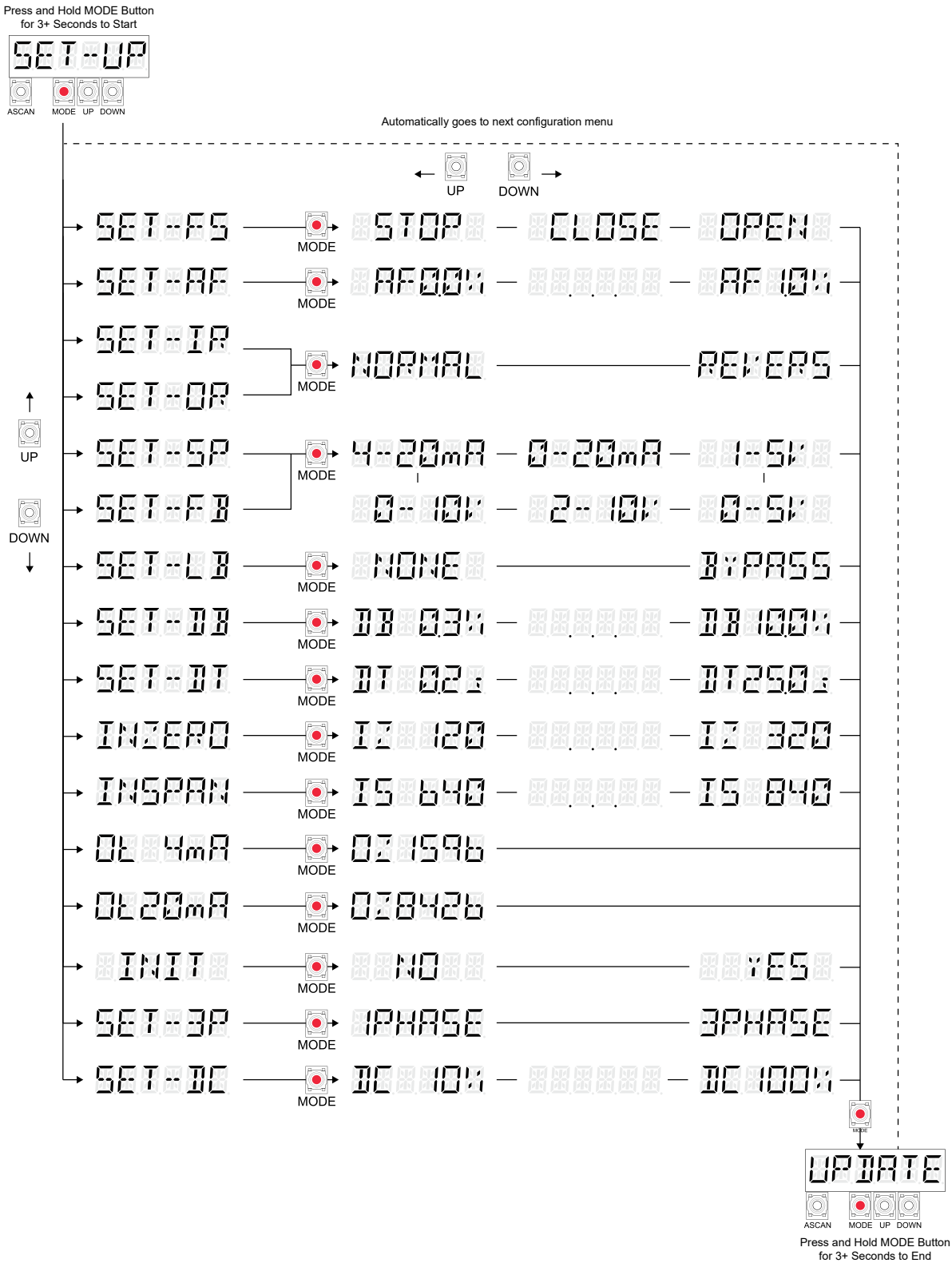
7.5 Setup Mode

Settings can be changed locally by utilizing the push buttons on the MCC. The push buttons are located below the display menu. Button labels are located below each button on the circuit board

CAUTION
It is recommended to stop operating the actuator before entering the setup mode. After entering Setup mode, the MCC will stop operation and ignore process commands. The MCC will re-implement process control after the user leaves Setup Mode and re-enters Remote Mode.

1. Press and hold the **MODE** button for 3 or more seconds to leave Remote Mode and enter Setup Mode.
   > The alpha-numeric display will show [SET-UP] for a short time.
   > Afterwards, the first setting in the menu, [SET-FS], will be automatically displayed.
2. Press the **UP** or **DOWN** buttons to navigate through the settings menu.
3. Press the **MODE** button once to configure the setting displayed on the menu. The display will automatically show the current setting's value.
4. Press the **UP** or **DOWN** button to select a desired setting value.
5. Press the **MODE** button once to save the setting. If a change has been made to the setting, the menu will display the new setting for a short time before returning to the settings menu.
6. Press and hold the **MODE** button for 3 or more seconds to leave the Setup Mode.

Figure 8: Configuration Flowchart



7.6 Description of Settings

7.6.1 Fail-Safe [SET-FS]

The Failure Position determines how the MCC positions the valve on the loss of command input signal. Loss of signal occurs when the Command Signal is outside the valid range of the selected Command Signal type. For the minimum valid command input, refer to Table 12.

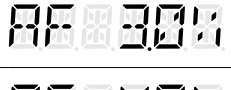
TABLE 7: Fail Safe Mode Display Messages

Setting Value	Display	Description
Fail stop (Default)		Actuator remains in its current position
Fail close		Actuator operates to the close limit
Fail open		Actuator operates to the open limit

7.6.2 Range Adjust [SET-AF] Setting

To compensate for unwanted noise, the command signals for fully opening or closing the actuator can be adjusted. This helps ensure the MCC drives the valve completely open or fully closed, even when the input signal is unstable. These adjustments are set as a percentage of the full input range.

TABLE 8: Range Adjust (Example For 4-20mA Input Mode)

Setting Value	Display	Description	
0%		Zero: 4.00mA	Span: 20.00mA
1%		Zero: 4.16mA	Span: 19.84mA
2% (Default)		Zero: 4.32mA	Span: 19.68mA
3%		Zero: 4.48mA	Span: 19.52mA
4%		Zero: 4.64mA	Span: 19.36mA
5%		Zero: 4.80mA	Span: 19.20mA
6%		Zero: 4.96mA	Span: 19.04mA
7%		Zero: 5.12mA	Span: 18.88mA
8%		Zero: 5.28mA	Span: 18.72mA
9%		Zero: 5.44mA	Span: 18.56mA
10%		Zero: 5.60mA	Span: 18.40mA

7.6.3 Reverse Acting Input [SET-IR] Setting

Reverse acting input mode determines how the MCC responds to the command input signal. When the mode is reversed, the MCC will treat the maximum command input signal value as the close command and the minimum command signal as the open command. This setting does not affect the feedback.

TABLE 9: Reverse Acting Input Mode Display Messages

Setting Value	Display	Description
Normal (Default)		Fully closed at zero (4mA) and fully open at span (20mA).
Reverse		Fully closed at span (20mA) and fully open at (4mA)

7.6.4 Reverse Acting Output [SET-OR] Setting

Reverse acting output mode determines how the MCC defines the polarity of the feedback signal. When the output mode is in [REVERS], the MCC will invert the feedback signal, treating the maximum output signal value as the fully closed position and the minimum output signal value as the fully open signal. This setting does not affect the Command Signal.

TABLE 10: Reverse Acting Output Mode Display Messages

Setting Value	Display	Description
Normal (Default)		Minimum value corresponds to the closed position, and maximum value to the open position.
Reverse		Maximum value corresponds to the closed position, and minimum value to the open position.

7.6.5 Command Signal Type [SET-SP]

Command signal type defines the type of command signal used for valve control and works together with the [SET-IR] parameter to determine whether the minimum or maximum signal corresponds to the closed position. For example, in [NORMAL] operation, the minimum signal value drives the valve fully closed, while the maximum signal drives it fully open.

TABLE 11: Command Signal Display Messages

Setting Value	Display
4-20mA (Default)	
0-20mA	
1-5V	
0-5V	
2-10V	
0-10V	

TABLE 12: Minimum Valid Command Signal

	Minimum Valid Value
0-20mA	0mA
4-20mA	2mA
0-5V	0V
1-5V	0.5V
0-10V	N/A
2-10V	1V

7.6.6 Feedback Signal Type [SET-FB]

The feedback signal type setting defines the type of feedback signal used to indicate the current position of the controlled valve and works together with the [SET-OR] parameter to determine whether the minimum or maximum signal corresponds to the closed position. For example, in [NORMAL] operation, the minimum signal value represents the fully closed position, while the maximum value represents fully open. Only one type of feedback signal can be active at a time.

Table 13: Feedback Signal Display Messages

Setting Value	Display
4-20mA (Default)	
0-20mA	
1-5V	
0-5V	
2-10V	
0-10V	

7.6.7 Closed Limit Bypass Setting [SET-LB]

WARNING
Closed Limit Bypass Mode value will default to None. Bypass mode is not recommended. May cause damage to the actuator

Table 14: Closed Limit Bypass Mode Display Messages

Setting Value	Display	Description
None (Default)		Actuator stops when close limit switch is ON (fully closed)
Bypass		Must not be used. Actuator disregards close limit switch and stops when closed torque limit switch is ON

7.6.8 Set Dead Band [SET-DB]

The Dead Band setting determines a range or interval in a system where no action or response occurs, even if there are small changes in input. A deadband is used to prevent actuator moves back and forth near set point (hunting). This value is a percentage of the full input range and creates an inactive area centered around the desired set point. For example, for a 0-10V input command, a 1% Dead Band Control setting allows the actuator position to be offset from the desired set point by up to 0.1V in either direction, creating a dead band with a span of 0.2V. (Default +-1%)

Table 15: Dead Band Display Messages

Setting Value	Display
+-0.3%	
0.1% Increments	
+-10.0%	

NOTE
Holding the UP or DOWN buttons will continuously increment the setting.

CAUTION
The mechanical dynamics of a system may allow for over travel past the dead band settings. Hunting is defined as continuous over-travel past the dead band range. Persistent hunting can cause damage and/or excessive wear to actuator components such as the motor, gearing, and potentiometer. Increasing the dead band setting will alleviate hunting.

7.6.9 Set Dead Time [SET-DT]

The Dead Time setting determines the minimum delay in which the MCC responds to a change in the command signal. Increasing the Dead Time may alleviate issues with continuous repositioning due to noise on the command signal. (Default 1.0s)

Table 16: Dead Time Range Display Messages

Setting Value	Display
0.2s	
0.1s increments	
25.0s	

NOTE
Holding the UP or DOWN buttons will continuously increment the setting.

7.6.10 Input Signal Zero Adjust [INZERO]

The input signal zero adjust is a manual process to specify the command signal value in which the MCC will send the actuator to the fully closed position.

1. Apply the desired command signal.
2. Once you enter the parameters, the saved value will be temporarily displayed.
3. The controller will then read the current command signal and convert it into the IZ value.

NOTE: To quit the process without saving, press either the **UP** or **DOWN** buttons once.

4. Press the **MODE** button once to save a new value based on the desired command signal.
5. The new value will temporarily be shown on the display before going back to the Setup Menu.

NOTE: The zero point of the input signal can be configured from 120 to 320. Attempting to set a value outside this range will result in an “ERR.RNG” error. Available for 2-10V and 4-20mA.

Table 17: Input Signal Zero Adjust Range Display

Setting Value	Display	4-20mA	2-10V
	IZ 120	3mA	1.5V
Automatic detection and not being intended for manual adjustment			
	IZ 320	8mA	4V

7.6.11 Input Signal Span Adjustment [INSPAN]

The input signal span adjustment is a manual process to specify the command signal value in which the MCC will send the actuator to the fully open position.

1. Apply the desired command signal.
2. Once you enter the parameters, the saved value will be temporarily displayed.
3. The controller will then read the current command signal and convert it into the IZ value.

NOTE: To quit the process without saving, press either the **UP** or **DOWN** buttons once.

4. Press the **MODE** button once to save a new value based on the desired command signal.
5. The new value will temporarily be shown on the display before going back to the Setup Menu.

NOTE: The span point of the input signal can be configured from 640 to 840. Attempting to set a value outside this range will result in an "ERR.RNG" error. Available for 0-10V, 2-10V, 0-20mA and 4-20mA.

Table 18: Input Signal Span Adjustment Range Display

Setting Value	Display	4-20mA	2-10V
	IS 640	16mA	8V
Automatic detection and not being intended for manual adjustment			
	IS 840	21mA	10.5V

7.6.12 Output Signal Zero Adjustment (Ot 4mA)

The Output Signal Zero Adjustment is a manual process to calibrate the fully closed feedback signal.

1. Connect a digital multimeter to the feedback terminals.
2. Highlight the adjustment process in the menu [Ot 4mA].
3. Scroll down to the [Ot 4mA]
4. Press the **MODE** button to show the current value.

NOTE: To quit the process without saving, press either the **UP** or **DOWN** buttons once.

5. Press either the **UP** or **DOWN** buttons to adjust the feedback signal.
6. Monitor the digital multimeter until it reaches the desired value.
7. Press the **MODE** button once to save the new value.
8. The new value will temporarily be shown on the display before going back to the Setup Menu.

7.6.13 Output Signal Span Adjustment (Ot20mA)

The Output Signal Span Adjustment is a manual process to calibrate the fully open feedback signal.

1. Connect a digital multimeter to the feedback terminals.
2. Press the **MODE** button to show the current value.

NOTE: To quit the process without saving, press either the **UP** or **DOWN** buttons once.

3. Press either the **UP** or **DOWN** buttons to adjust the feedback signal.
4. Monitor the digital multimeter until it reaches the desired value.

5. Press the **MODE** button once to save the new value.
6. The new value will temporarily be shown on the display before going back to the Setup Menu.

7.6.14 Initialize Settings (INIT)

Initialization setting is utilized to restore the system to its default configuration, ensuring all parameters return to their original, predefined states

Table 19: INIT Display Messages

Setting Value	Display	Description
NO (Default)		No Changes
YES		Restore to the default configuration

7.6.15 Motor Phase Settting (SET-3P)

Motor phase setting changes the control function based on the type of motor.

Table 20: Set-3P Display Messages

Setting Value	Display	Description
1 PHASE (Default)		Set operation for single phase motors.
3 PHASE		Must not be used - not applicable for this product line.Set operation for three phase motors.

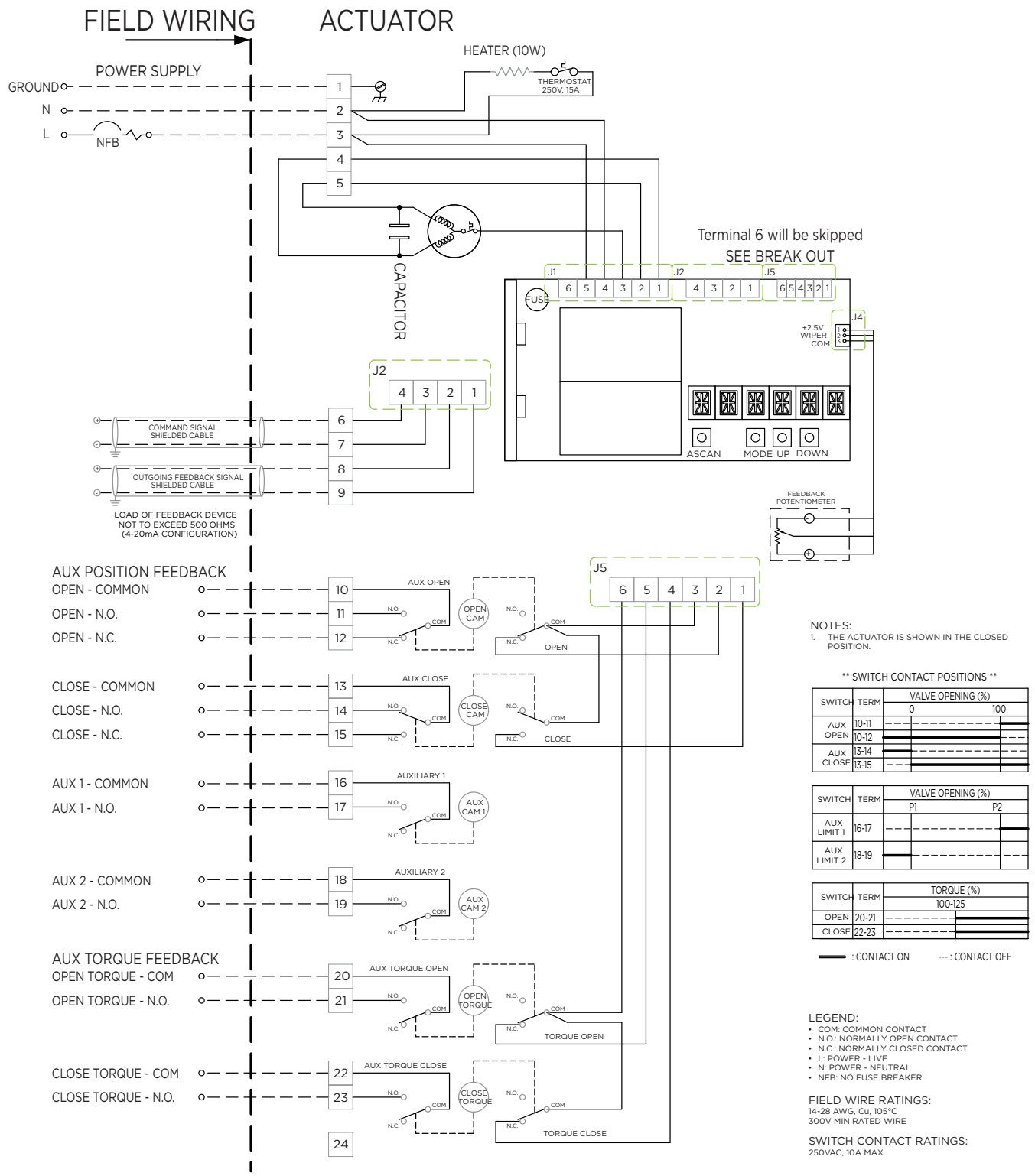
7.6.16 Speed/Duty Control (SET-DC)

Speed/duty control setting adjusts the actuator's operational speed during output. It is precisely configured to align with the duty cycle of the actuator, ensuring accurate performance. The adjustable range spans from 10% to 100%. During a fail-safe or manual operation, the actuator will operate at full speed and disregard the speed setting.

Table 21: Set-DC Display Messages

Setting Value	Display	Description
DC 10%		Extend the speed to 10x default
DC 100% (Default)		Default Speed

8.0 FIELD WIRING DIAGRAMS



NOTES:
1. THE ACTUATOR IS SHOWN IN THE CLOSED POSITION.

** SWITCH CONTACT POSITIONS **

SWITCH	TERM	VALVE OPENING (%) 0 — 100
AUX OPEN	10-11	
	10-12	
AUX CLOSE	13-14	
	13-15	

SWITCH	TERM	VALVE OPENING (%) P1 — P2
AUX LIMIT 1	16-17	
AUX LIMIT 2	18-19	

SWITCH	TERM	TORQUE (%) 100-125
OPEN	20-21	
CLOSE	22-23	

: CONTACT ON --- : CONTACT OFF

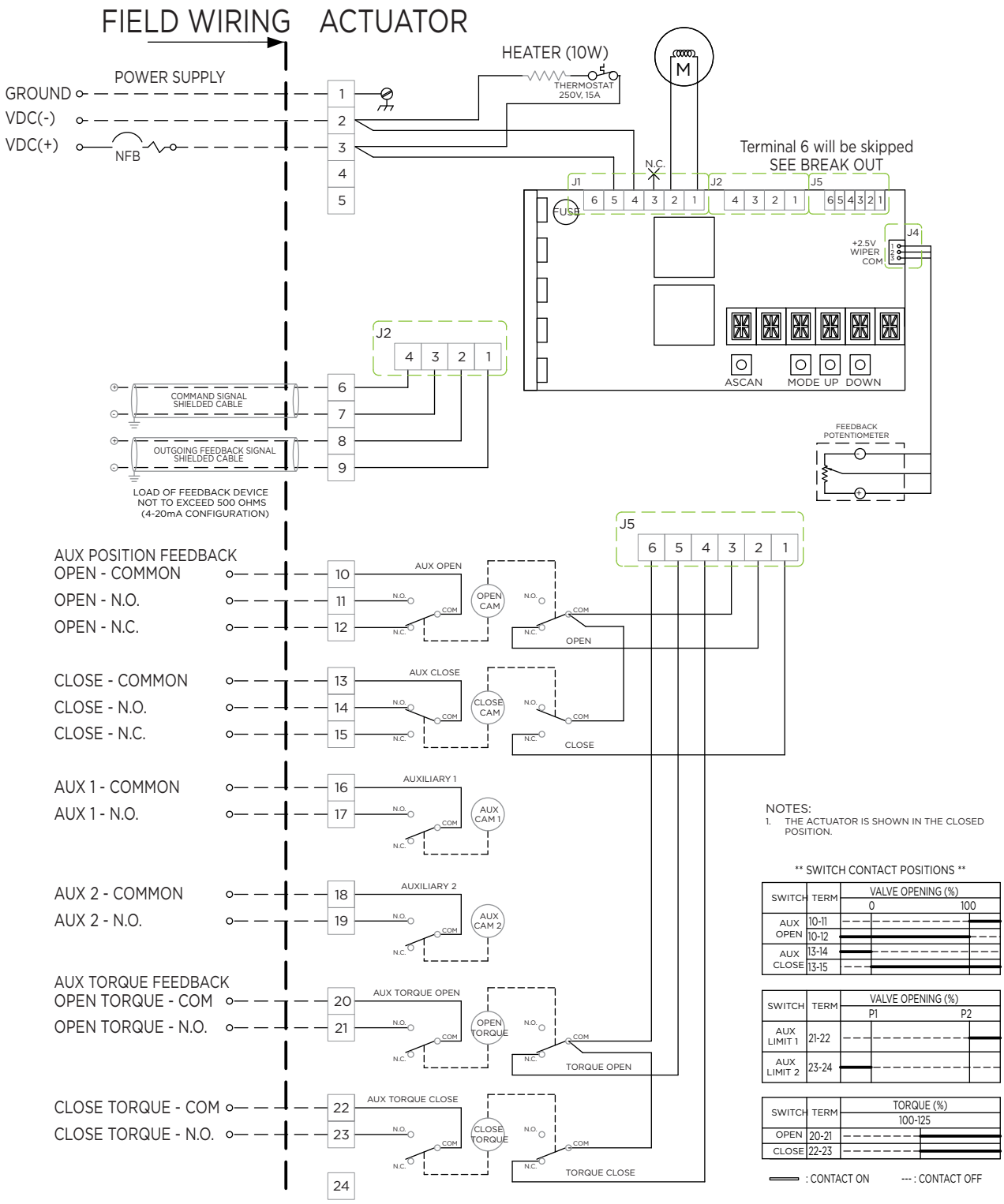
LEGEND:
- COM: COMMON CONTACT
- N.O.: NORMALLY OPEN CONTACT
- N.C.: NORMALLY CLOSED CONTACT
- L: POWER - LIVE
- N: POWER - NEUTRAL
- NFB: NO FUSE BREAKER

FIELD WIRE RATINGS:
14-28 AWG, Cu, 105°C
300V MIN RATED WIRE

SWITCH CONTACT RATINGS:
250VAC, 10A MAX

WD-000677

NOTE: Refer to the wiring diagram provided or contact Bray for support.



NOTES:
1. THE ACTUATOR IS SHOWN IN THE CLOSED POSITION.

** SWITCH CONTACT POSITIONS **

SWITCH	TERM	VALVE OPENING (%) 0	100
AUX OPEN	10-11		
	10-12		
AUX CLOSE	13-14		
	13-15		

SWITCH	TERM	VALVE OPENING (%) P1	P2
AUX LIMIT 1	21-22		
AUX LIMIT 2	23-24		

SWITCH	TERM	TORQUE (%) 100-125
OPEN	20-21	
CLOSE	22-23	

——— : CONTACT ON - - - : CONTACT OFF

LEGEND:
- COM: COMMON CONTACT
- N.O.: NORMALLY OPEN CONTACT
- N.C.: NORMALLY CLOSED CONTACT
- L: POWER - LIVE
- N: POWER - NEUTRAL
- NFB: NO FUSE BREAKER

FIELD WIRE RATINGS:
14-28 AWG, Cu, 105°C
300V MIN RATED WIRE

SWITCH CONTACT RATINGS:
250VAC, 10A MAX

WD-000670

NOTE: Refer to the wiring diagram provided or contact Bray for support.

9.0 COMMISSIONING

9.1 Inspection Checklist

Before using the actuator:

1. Check that the actuator nameplate and wiring diagram match the application requirements (model number, power, control, options, etc.).
2. Check that the actuator and the valve are assembled securely.
3. Check the status of the limit switches, travel stop bolts, and indicator are set properly.
4. Check the electrical wiring matches the wiring diagram.
5. If the position of the limit switches or the potentiometer have been adjusted, perform the auto calibration routine.

WARNING
Do not modify or alter the wiring of the actuator. Do not disassemble, assemble, or modify the actuator without technical support or specific instructions from the factory. Please contact the factory in the case of any problems.

9.2 Potentiometer Adjustment

NOTICE
On/Off models have the option to include the same potentiometer that is available in modulating models for position feedback.

The potentiometer is rated 1kΩ ± 5% and is calibrated at the factory to the standard cam positions. If the 'closed' cam position is modified, then the following procedure must be performed when a potentiometer is installed.

WARNING
Ensure that electrical power is removed from the potentiometer before performing this procedure.

1. Manually operate the actuator clockwise until the valve reaches the 'closed' position and the 'closed' limit switch activates.
2. Loosen the set screw on the gear mounted to the indicator shaft.
3. Adjust the potentiometer.
   > Measure the resistance between the common terminal (P1) and the wiper terminal (P2) with a multimeter.
   > Gently rotate the potentiometer gear until the multimeter measures 100Ω ± 20Ω.
4. Gently tighten the set screw on the indicator shaft gear.
5. Verify the potentiometer measurement before completely tightening the set screw.

NOTICE
The potentiometer assemblies installed in size 5 units travel 270 degrees due to the installation of the 3:1 gearbox. Size 5 potentiometer assemblies use different gearing to account for the larger range of travel and cannot be used in other sized series 76 actuators.

Figure 11: Potentiometer for Sizes 1 - 4.

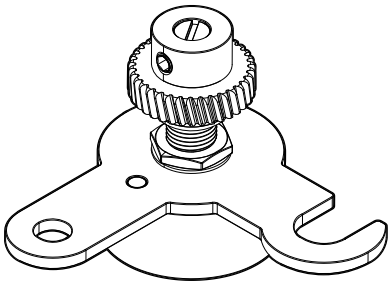


Figure 12: Potentiometer for Size 5.

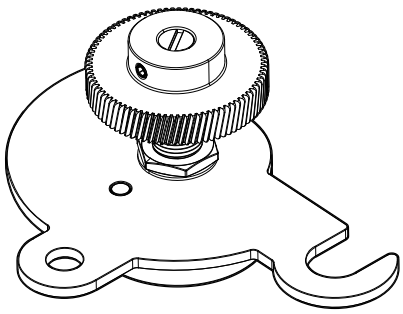
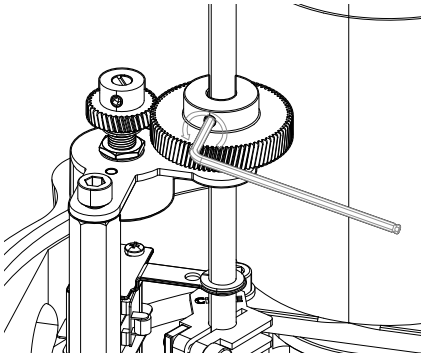


Figure 13:
Potentiometer Adjustment**.**



10.0 APPENDIX A - BASIC TOOLS

Common To All Units	
Terminal Connections	Flathead screwdriver up to 3mm
Cam Adjustment Bolts	4mm hex
Ground Screw	4mm hex
Handwheel Spinner	5mm hex
Conduit Blanks	18mm wrench

11.0 APPENDIX B - TROUBLESHOOTING CHART

Display	Display	Description	Solution
	EEPROM	Settings are not stored/read correctly.	> Perform Auto Calibration (Section 7.4). > Contact the factory.
	NOTINS	Command signal initialization failure	> Inspect the input signal and span of the input. > Perform Input Signal Zero Adjust (nZERO) (Section 7.6.10). > Perform Input Span Signal Adjust (InSPAN) (Section 7.6.11).
	NOTASC	Auto setting initialization failure	> Check that a command signal is present. > Inspect signal wiring and connections. > Perform another Auto Calibration (Section 7.4).
	LOSESP	No Command Signal Detected	> Check that a command signal is present. > Inspect signal wiring and connections.
	MOTREV	Motor reversed	> Confirm correct rotation direction. > Check motor wiring. > Check potentiometer wiring.
	Err.SIG	Command signal selection failure	> Inspect input signal wiring. > Check the command signal type (Set-SP). > Ensure signal settings are configured properly.
	Err.POT	Potentiometer failure	> Check potentiometer wiring. > Inspect for physical damage. > Re-perform Auto Calibration (Section 7.4).
	OPNERR	Open failure	> Inspect motor wiring. > Check potentiometer wiring. > Confirm valve is not obstructed.
	CLSERR	Close failure	> Inspect motor wiring. > Check potentiometer wiring. > Confirm valve is not obstructed.
	Err.LMT	Limit switch failure	> Check limit switch wiring. > Inspect switches for damage or incorrect installation.
	TOTRIP	Torque trip	> Check for valve blockage or mechanical binding. > Inspect and reset the torque switch. > Confirm actuator torque setting is sufficient.

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