

Bray *SERIES 73* **ELECTRIC ACTUATOR**

OPERATION AND MAINTENANCE MANUAL

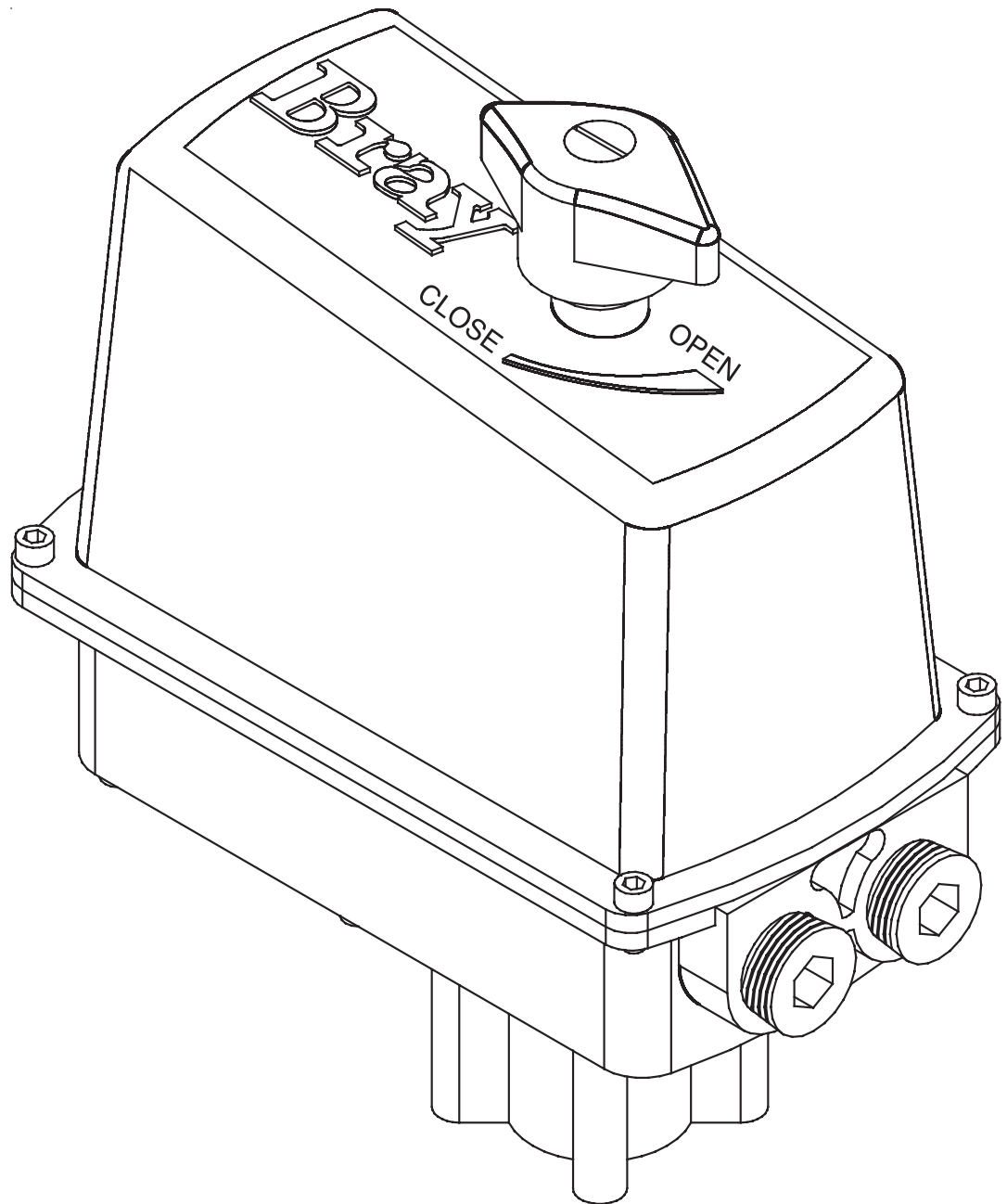


TABLE OF CONTENTS:

	PAGE
SAFETY INSTRUCTIONS: DEFINITIONS OF TERMS	2
INTRODUCTION	
PRINCIPLE OF OPERATION	3
ELECTRICAL OPERATION	3
MECHANICAL OPERATION	3
INSTALLATION	
PRE-INSTALLATION STORAGE	3
MOUNTING TO VALVE	4
MANUAL OVERRIDE OPERATION	4
ELECTRICAL INSTALLATION	5
MULTIPLE ACTUATOR WIRING	6/7
TRAVEL LIMIT SWITCH ADJUSTMENT	8
FIELD OR FACTORY INSTALLABLE OPTIONS	
HEATER	8
AUXILIARY SWITCHES	9
TYPICAL SINGLE PHASE & DC WIRING DIAGRAMS	10
APPENDIX A	
BASIC TOOLS	11
APPENDIX B	
ACTUATOR TROUBLESHOOTING CHART	12

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1.0 SAFETY INFORMATION - DEFINITION OF TERMS



WARNING

indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury.



CAUTION

indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

used without the safety alert symbol indicates a potential situation which, if not avoided, may result in an undesirable result or state, including property damage.

1.1 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 if this safe condition is to be maintained and hazard-free operation of the device assured.

Take all necessary precautions to prevent damage to the actuator due to rough handling, impact, or improper storage. Do not use abrasive compounds to clean the actuator, or scrape metal surfaces with any objects.

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

1.2 QUALIFIED PERSONEL

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 electric 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
- Is trained in first aid
- In cases where the device is installed in a potentially explosive (hazardous) location – is trained in the operation, commissioning, operation and maintenance of equipment in hazardous locations



WARNING

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

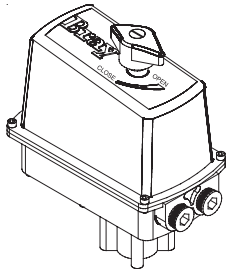
The device generates large mechanical force during normal operation.

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

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

BRAY Series 73 Electric Actuator Operation and Maintenance Manual

PART NUMBERING SYSTEM REFERENCE CHART



PART NUMBER	TORQUE (In.Lbs)	SPEED, 1/4 TURN (Seconds)	SUPPLY (Volts AC)	SUPPLY (Volts DC)
73-010Y-113ZV-536	100	2/5/10	120/240	NA
73-030Y-113ZV-536	300	5/10/15	120/240	12/24
73-060Y-113ZV-536	600	5/10/15/30/60	120/240	12/24

Y - DESIGNATES THE SPEED S
Y = 0 1 2 3 4 5
SEC = 2 5 10 15 30 60

Z - DESIGNATES DRIVE TYPE
Z= D S
TYPE= DOUBLE D STAR

V - DESIGNATES VOLTAGE
V= 3 4 5 6
VOLTAGE 12VDC 24VDC 120VAC 220VAC

Use this chart as a guide to interpret the S73 electric actuator part number.

INTRODUCTION

The Bray Series 73 is a quarter turn electric actuator with manual override for use on any quarter turn valve requiring up to 600 Lb-In of torque. Operating speeds vary between 2 to 60 seconds. Adjusting two cams sets the open and close travel limit switches. These cams can be adjusted to allow rotational travel anywhere from 45° to 300°. Standard Factory setting allows for 90° reversible rotation.

PRINCIPLE OF OPERATION

The Series 73 actuator is basically divided into two internal sections; the power center below the switchplate, and the control center above the switchplate. Below the switchplate the spur geartrain drives an output coupling. The override mechanism for manual operation is also located here. Above the switchplate are components requiring customer adjustment. The indicator shaft assembly, limit switches, terminal strips, heater, capacitor and motor are all placed here for easy access. External to the unit are a highly visible valve position indicator, the unique manual override shaft and two 1/2" NPT conduit entry ports. The external finish is a high quality polyester powder coating, which has exceptional UV as well as chemical resistance.

ELECTRICAL OPERATION

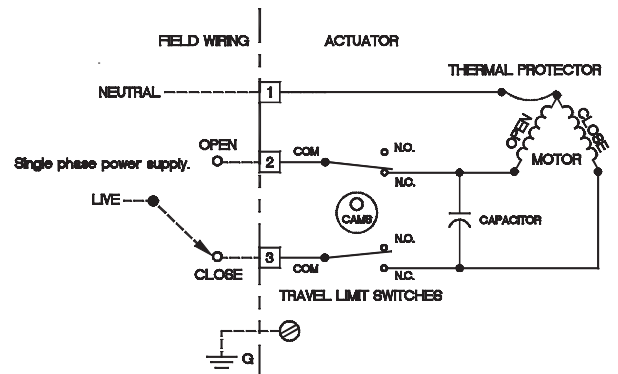
The motor used in the **Bray** Series 73 is a permanent induction split capacitor design (single phase AC power). Travel limit switches are mechanical form C (SPDT) are rated at 10 amp (0.8 PF), 1/2 HP 125 VAC and 3/4 HP 250 VAC. In situations where the torque capacity of the unit is exceeded to the point where the motor stalls and overheats, a thermal protector switch built into the motor windings will automatically disconnect the motor power. Once the motor cools sufficiently the thermal switch will

reset. The motor has a spring loaded brake that activates when power is removed from the unit. The brake prevents the spur gears from being back driven.

General Electrical Schematic

(Note: the schematic below is for reference only. The actual wiring diagram for each specific unit is placed inside the actuator cover).

MECHANICAL OPERATION



Mechanically, the ratio of the gearmotor determines the speed of the unit. The gearmotor utilizes high efficiency spur gears with various ratios for the actuation speeds. Positioning is determined by an indicator-camshaft linked to the output coupling.

PRE-INSTALLATION STORAGE

Units are shipped with two metal conduit entry plugs to prevent foreign matter from entering the unit.

NOTICE

To prevent condensation from forming inside these units, maintain a near constant external temperature and supply power to the optional heater internal to the unit.

BRAY Series 73 Electric Actuator Operation and Maintenance Manual



WARNING Turn off all power and lock out service panel before installing or modifying any electrical wiring.

INSTALLATION

MOUNTING TO A VALVE

All Bray Series 73 electric actuators mount directly to Bray butterfly valves. With proper mounting hardware, the S73 actuator can be installed onto other quarter-turn valves or devices. For horizontal installation, the standard mounting position aligns the actuator parallel and upright to the pipeline. If the actuator is to be mounted on a vertical pipe, it is recommended that the unit be positioned with the conduit entries on the bottom to prevent condensation from entering the actuator through the conduit. In all cases, the conduit should be positioned to prevent drainage into the actuator.

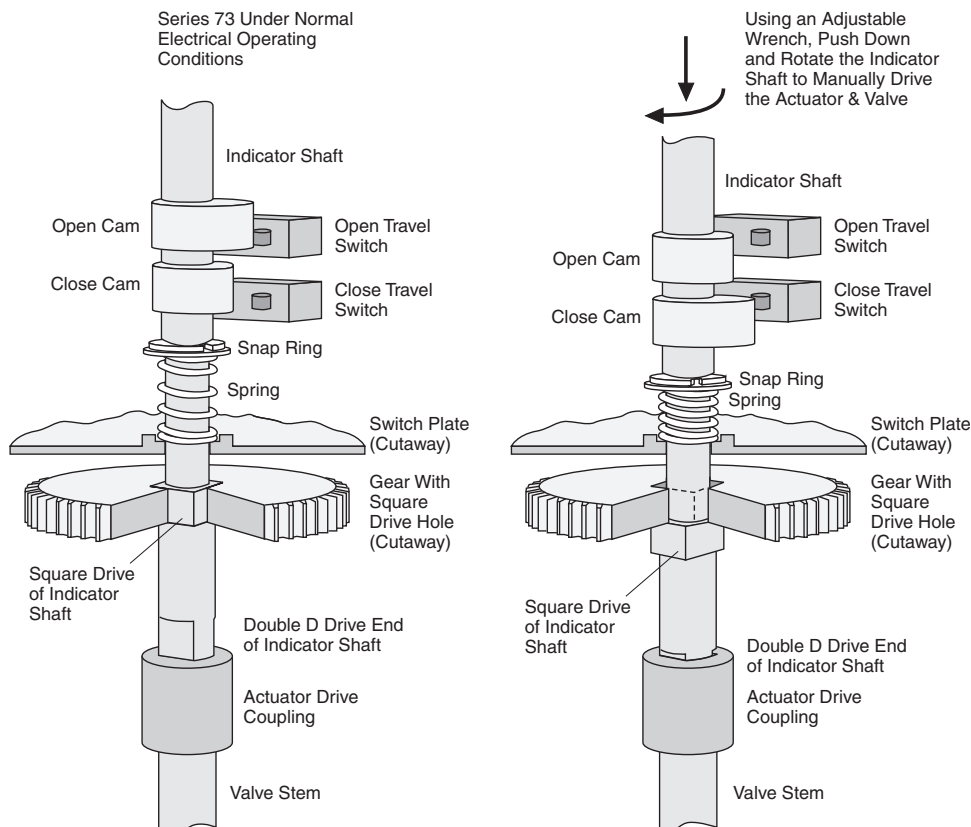
The actuator should be mounted to the valve as follows:

1. Manually operate the actuator until the output shaft of the actuator is in line with the valve stem. If possible, use an intermediate position (i.e. valve disc/stem and actuator half open).
2. Place the proper adapter, if required, onto the valve stem. It is recommended that a small amount of grease be applied to the adapter to ease assembly.
3. Mount the actuator onto the valve stem. It may be necessary to manually override the actuator to align the bolt patterns.
4. Install the furnished mounting studs by threading them all the way into the actuator base.
5. Fasten in place with the furnished hex nuts and lock washers.

MANUAL OVERRIDE OPERATION

1. Ensure that electrical power to the unit is off.
2. Press valve position indicator down, then release a few times to ensure ease of movement.
3. Remove the valve position indicator pointer.
4. Using an adjustable wrench, 6" or 12" depending on actuator size, push down on indicator shaft to disengage it from output gear, then turn shaft to required position. Open and Close lettering and a

- direction of travel arrow are molded into the housing for easy reference and permanent position indication. The double D flats on the indicator shaft are in alignment with the valve disc position.
5. Return to electrical operation by turning power on to the unit. The shaft will re-engage the output gear when electrical power is applied to the actuator.
6. Replace the valve position indicator pointer.



ELECTRICAL INSTALLATION

1. Check the actuator's nametag for confirmation of: Torque Rating, Quarter Turn Time, Duty Rating and Power Supply. Example 'A' below is shown for S73 PN: 73-0102-113D5-536
2. Suitably rated wire should be used for actuator voltage and current rating. 18AWG, 300V minimum, insulated wire is recommended for all sizes.
3. Field control scheme (supplied by others) should be compatible with the operation of actuator motor (AC or DC).

NOTE: Do not parallel wire multiple actuators - refer to explanation on parallel wiring.



CAUTION

Do not reverse motor instantaneously when it is still running - Reversing direction to actuator motor when it is running can cause damage to motor, switches and gearing. Directional control switching can be done by PLC in 20ms or by a small relay in 45ms. Therefore time delay of 1s has to be incorporated into the control scheme to avoid damage.

NOTICE

18 AWG minimum wire is recommended for all field wiring

4. Actuator must have its field wiring terminated as shown in the supplied wiring diagram (diagram attached to inside of cover). Wiring diagrams (AC or DC) show remote (customer supplied) typical control switching devices. Refer to customers/field wiring for details of the specific control devices.

NOTICE

The conduit connections must be properly sealed to maintain the weatherproof integrity of the actuator enclosure.

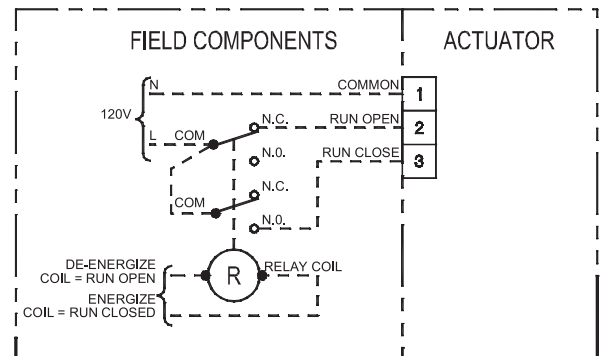


CAUTION

Do not reverse motor instantaneously when it is still running - Reversing direction to actuator motor when it is running can cause damage to motor, switches and gearing. Directional control switching can be done by PLC in 20ms or by a small relay in 45ms. Therefore time delay of 1s has to be incorporated into the control scheme to avoid damage.

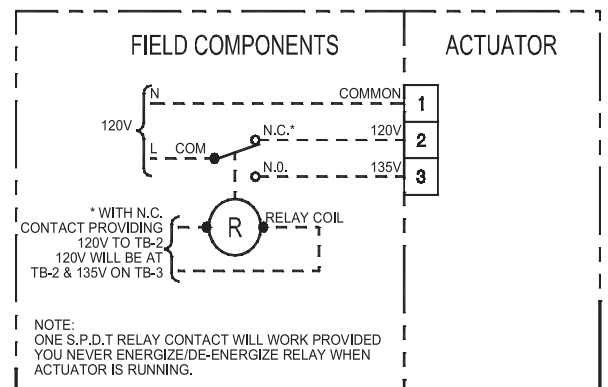
Figure A
Correct

DIAGRAM 1: RECOMMENDED (D.P.D.T RELAY)



Incorrect

DIAGRAM 2: ALTERNATE (S.P.D.T RELAY)



Example A:

	Bray CONTROLS <small>A Division of BRAY INTERNATIONAL, Inc.</small>																				
SERIES 73	<table style="width: 100%; border: none;"> <tr> <td>TORQUE</td> <td>[N m]</td> <td>SPEED</td> <td>sec.</td> <td>TAG</td> </tr> <tr> <td>100</td> <td>In. lbs.</td> <td>10</td> <td>1 / 4</td> <td>XXX</td> </tr> <tr> <td>VOLTAGE</td> <td>F.L.C.</td> <td>DUTY</td> <td></td> <td></td> </tr> <tr> <td>120VAC</td> <td>0.4 Amps</td> <td>INT.</td> <td></td> <td></td> </tr> </table>	TORQUE	[N m]	SPEED	sec.	TAG	100	In. lbs.	10	1 / 4	XXX	VOLTAGE	F.L.C.	DUTY			120VAC	0.4 Amps	INT.		
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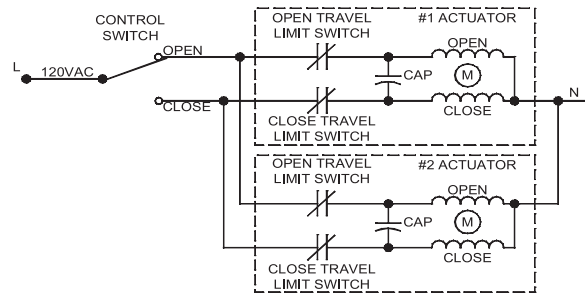
BRAY Series 73 Electric Actuator Operation and Maintenance Manual

Multiple Actuator (Parallel) Wiring

A voltage is present on both motor windings, these voltages are out of phase and different in magnitude. If these windings are connected to one another as shown in the INCORRECT diagrams, this will interfere with the motor performance. Use a multiple pole switch as shown in the CORRECT diagram.

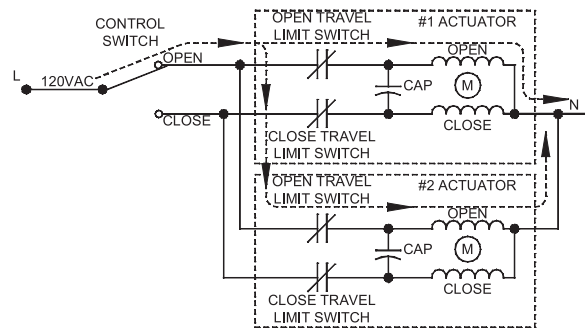
INCORRECT CONNECTIONS

- A. No supply on terminal L.
- B. Control switch in "Open Run Position"
- C. Both actuators in a mid-travel position. i.e. Their open & close travel switches are closed, allowing them to operate in an open or close travel direction.

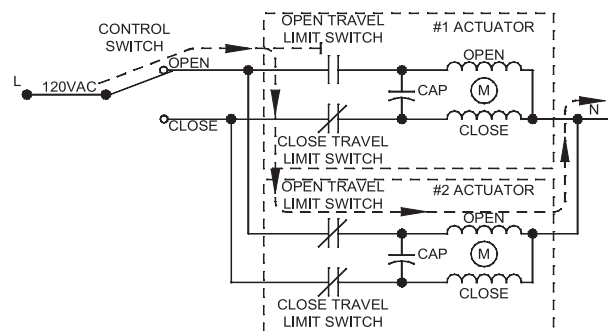


*The following three diagrams show progressive result of parallel wiring.

- D. 120VAC source applied, both motors start to run "open". (Shows current flow)

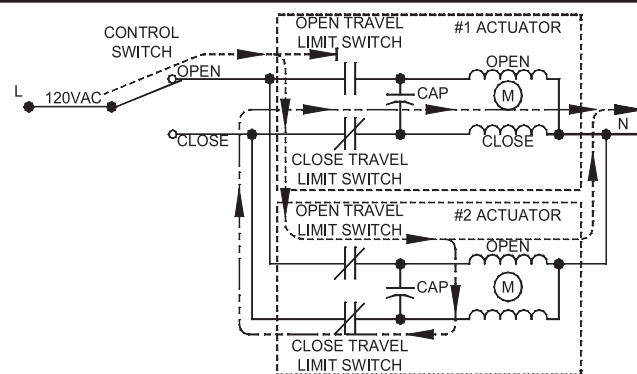


- E. #1 actuator runs fully open and its travel limit switch opens circuit. This actuator stops (perhaps only for a short time!). #2 actuator continues to run open. (Shows current flow)



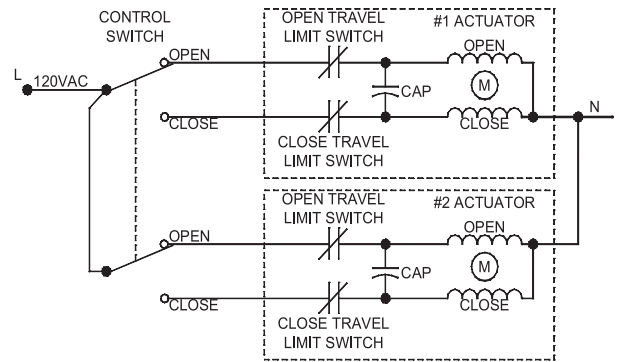
- F. The other "Back Feeding" current path existing between the actuators is shown.
- G. Though actuator #1 had come to rest (full open), it can and does get current flowing through its close travel leg via this "Back Feeding" current from #2 actuator.

This causes actuator #1 to run a couple of degrees in the closed direction, #2 actuator will then reach its fully open position. If left running for a "good" period, both actuators end up driving each other OPEN-CLOSED at strange positions. (Shows current flow)
(Shows other "Back Feeding" current flow)

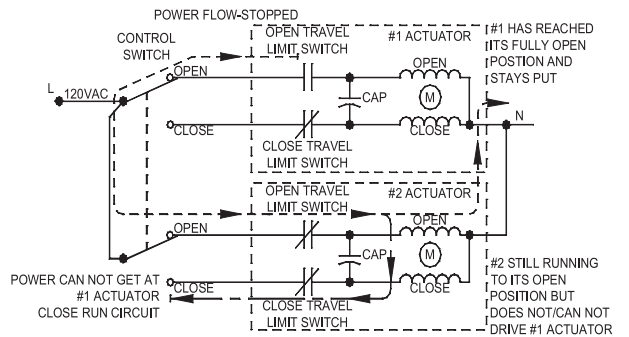


CORRECT CONNECTIONS

To eliminate this “BACK FEEDING PARALLEL” driving, we suggest separate contacts for each actuator.



If we redraw the diagram for the #1 actuator having reached its fully open travel position and having tripped its open travel limit switch. You can see that the #2 actuator would still run on, until it reached its fully open position. The #2 actuator when running open can not “BACK FEED”, the first actuator’s closed travel motor winding (as it did in G). on the previous page). (Shows current flow)



BRAY Series 73 Electric Actuator Operation and Maintenance Manual

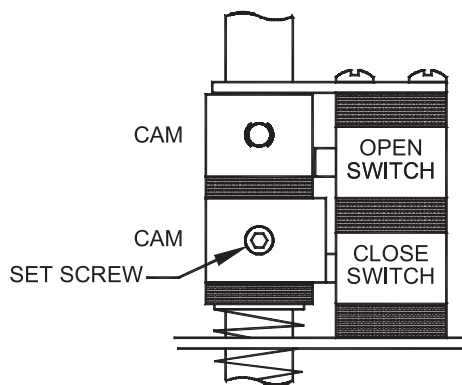
TRAVEL LIMIT SWITCH CAM ADJUSTMENT

Each cam has two tapped holes with one setscrew that may be placed at either location for easy access.

Cams are infinitely adjustable by using a 5/64" hex key. Standard factory setting allows for 90 degrees reversible rotation between open and close positions.

The bottom of the cam must be aligned with the bottom of the travel limit switch button to allow the switch to function properly during manual override.

Correct positioning of cam & switch are shown in the illustration below, when in motor/automatic drive condition.



HEATER

To prevent condensation from forming inside the actuator, Bray offers an optional heater. The heater is a PTC (Positive Temperature Coefficient) type, which has a unique temperature - resistance characteristic. The heater self-regulates by increasing its electrical resistance relative to its temperature. The heater does not require external thermostats or switches to control its heat output. It is constructed of a polycrystalline ceramic, sandwiched between two conductors, and wrapped inside a thermally conductive electrical insulator.

Connect the heater wires to the terminal strip as indicated on the wiring diagram.



WARNING

The heater surface can reach temperatures in excess of 200 degrees Celsius.

HEATER KIT CONSISTS OF:

1. Heater with flying leads
2. Heater Mounting Bracket
3. #10 pan head screw, phillips drive

TOOLS REQUIRED:

- For terminal wiring Screwdriver, 3/16" tip flat blade
- For heater mounting screw Screwdriver, No.1 phillips

INSTALLATION PROCEDURE:

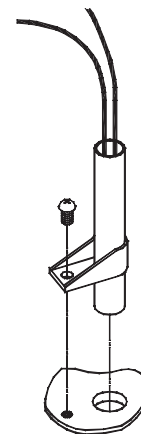


WARNING

Turn off all power and lock out service panel before installing or modifying any electrical wiring.

The heater is mounted through a hole provided in the switchplate.

1. Place the heater snugly into its mounting bracket until approx. 1/2" is below the bracket as shown in the illustration below.
2. Slip the heater into its mounting hole
3. Align the fastening hole in the bracket with the threaded screw hole in the plate. Fasten the heater to the switchplate.
4. Connect the heater wires to the terminal strip as indicated on the wiring diagram.



FIELD INSTALL. OF AUXILIARY SWITCH (ES)

The maximum allowable auxiliary switch configuration is shown in the illustrations below for each size of actuator.

AUXILIARY SWITCH KIT CONSISTS OF:

1. Switch with flying leads
2. Switch spacers
3. Cam with set screw
4. Cam spacers
5. Pan head screw, phillips drive

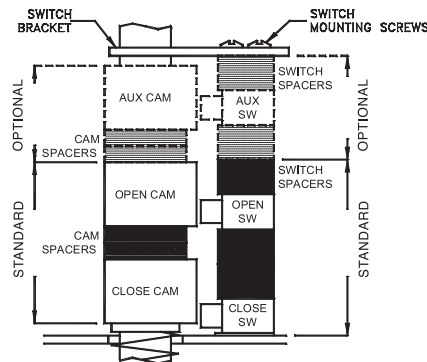
TOOLS REQUIRED

For terminal wiring Screwdriver, 3/16" flat tip blade

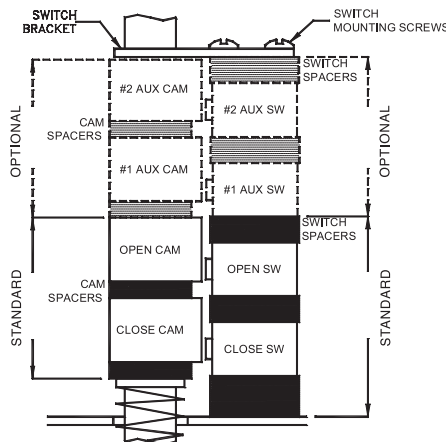
INSTALLATION PROCEDURE:

For switch mounting Screwdriver, No. 1 phillips

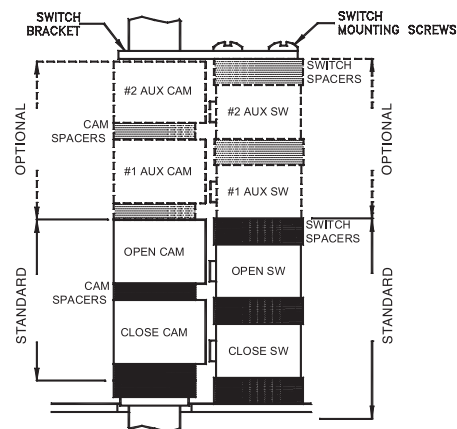
1. Remove switch mounting screws & discard
2. Remove switch bracket & retain for use later
3. Install auxiliary cam(s) and spacers as shown
4. Install auxiliary switch(es) and spacers as shown
5. Reinstall switch bracket
6. Install longer switch mounting screws from kit
7. Connect switch wiring to terminal strip per wiring diagram
8. Adjust cams as required



SIZE 100 IN-LB
(1 AUXILIARY SWITCH MAX)

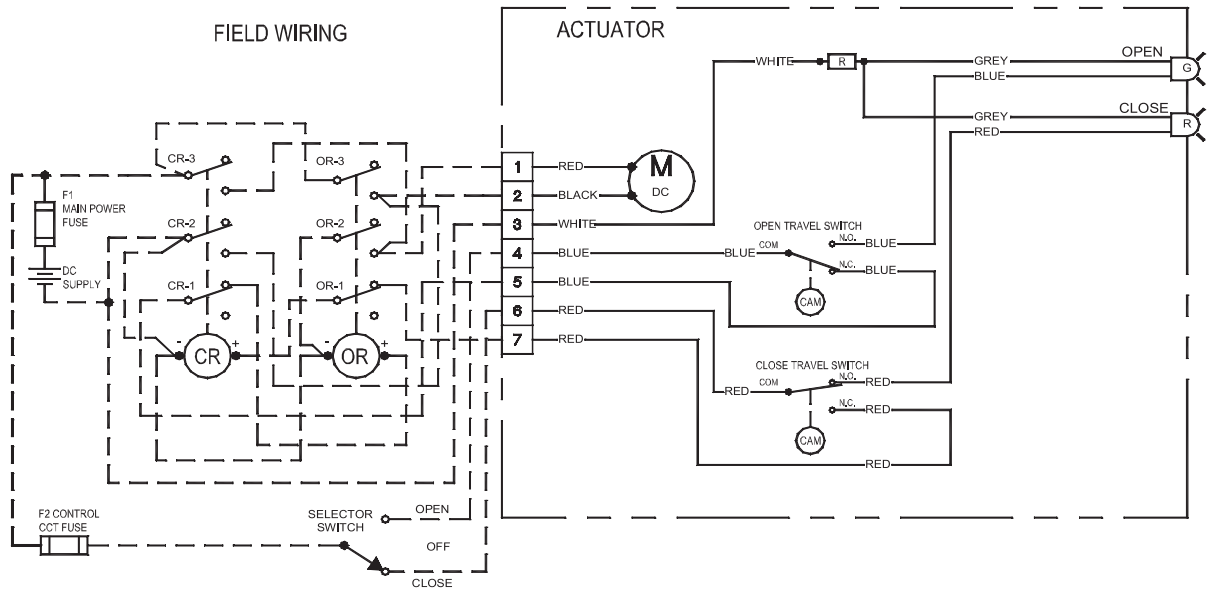
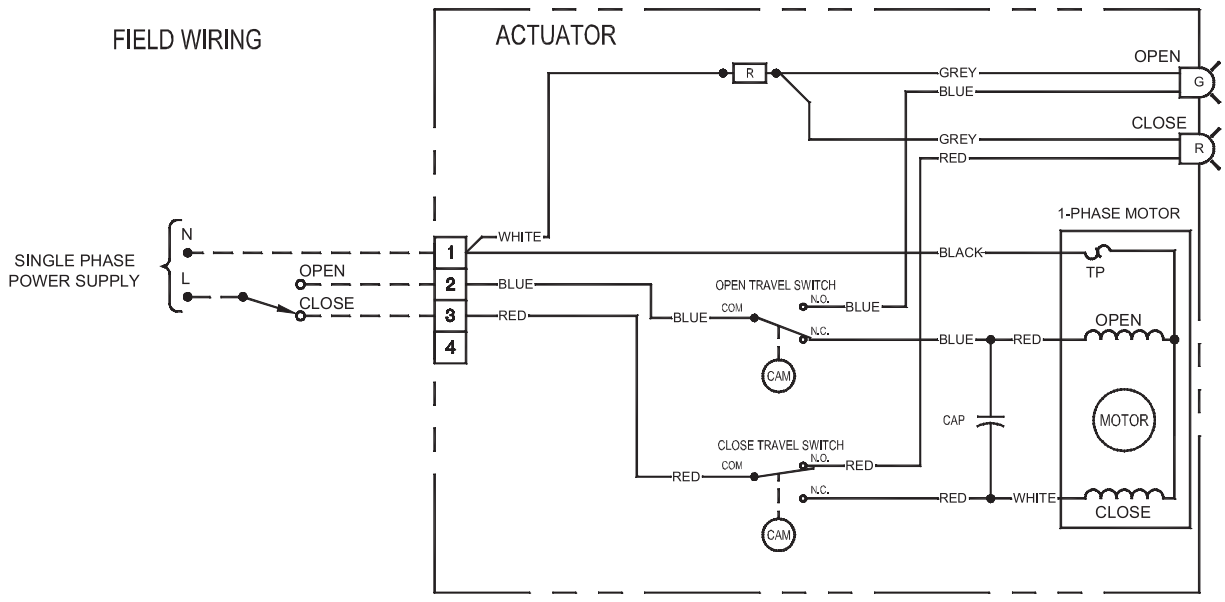


SIZE 300 IN-LB
(2 AUXILIARY SWITCHES MAX)



SIZE 600 IN-LB
(2 AUXILIARY SWITCHES MAX)

BRAY Series 73 Electric Actuator Operation and Maintenance Manual



Typical actuator wiring diagrams shown for single phase A.C. and D.C. motorized units. Diagrams show actuators in their fully closed positions.

APPENDIX A

BASIC TOOLS REQUIRED FOR INSTALLATION

COMMON TO ALL UNITS

Position Indicator Knob	Screwdriver, 3/4" tip flat
All switches, heater kit	Screwdriver, No.1 phillips
Terminal strip wiring	Screwdriver, 3/16" flat tip
Cam adjustment	Hex key, 5/64"
Cover socket head cap screws	Hex key, 9/64"

100-300 LB-IN UNITS

Switchplate socket head cap screws	Hex key, 9/64"
Valve mounting nuts (small bolt circle)	Wrench, 3/8"
Valve mounting nuts (large bolt circle)	Wrench, 7/16"

600 LB-IN UNITS

Switchplate socket head cap screws	Hex key, 7/64"
Valve mounting nuts (small bolt circle)	Wrench, 7/16"
Valve mounting nuts (large bolt circle)	Wrench, 1/2"

APPENDIX B

ACTUATOR TROUBLESHOOTING CHART

Problem	Possible cause	Solutions
Actuator does not operate	Cams are depressing travel switch	Adjust cams to their correct positions
	Override is engaged/shaft depressed	Apply electricity to cancel manual mode
	Wiring is incorrect	Check wiring and power supply
	Actuator has reached its thermal shutdown temperature	Allow time to cool
Actuator operates in reverse directions	Field wiring is reversed	Rewire field wiring
Actuator does not fully close valve (or open valve)	Limit switches are tripping	Readjust travel limit switches
	Valve torque requirement is higher than actuator output	Manually override out of seat, try angle seating or fit larger actuator
	Voltage power supply is low	Check power source
Motor hums but does not run	Motor brake engaged	Check that brake is not obstructed
Corrosion inside unit	Condensation forming	Test heater wiring, should have constant power supply
	Water leaking into the unit	Check all seals and possible water entry through conduit

NOTES



Bray CONTROLS

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