Quarter Master
Series 94 Actuator

Installation, Operation and Maintenance Manual

ASAHI/AMERICA®

Table of Contents

Series 94 Electric Actuator Introduction

Description

Series 94 On/Off & Modulating electric actuators feature a reversing,capacitor run motor (Failsafe/Battery Back Up units feature a brushed DC Motor), with a permanently lubricated gear train. Series 94 electric actuators are equipped with independently adjustable limit switches, integral thermal overload protection (AC models) with automatic reset, declutchable manual override, visual position indicator, Zytel FR50 enclosure with stainless steel trim, ISO mounting configuration, and 2 (two) ½" NPT conduit entries.

On/Off models are offered in 120 VAC, feature a NEMA Type 4X enclosure, and provide up to 300 in-lbs. of output torque.

Modulating models are offered in 120 VAC, feature a NEMA Type 4X enclosure, field selectable command signal and fail mode (upon loss of command).

Failsafe units are offered in 120VAC, feature a NEMA Type 4X enclosure, battery back up system, dry contacts for alarm, and a low battery indicator.

Various options are available for all models such as operating voltages, feedback transmitter for modulating units, etc.

All units are provided as tested and calibrated, so no internal adjustments should be required for opweration.

Units that can be Certified to UL Standard 508 for General Locations are as follows:

- 120vac On/Off Models with or without the RHM Card
- 220vac On/Off Models with or without the RHM Card
- 12vdc or 24vdc Models with or without the RHM Card

These are the most common units requiring certification. Please contact the factory if your requirements differ from the above actuation packages

Actuator size/model is denoted by output torque;
A94 – 150 in/lbs
B94 – 300 in/lbs

Electrical Requirement

WARNING: Do not open actuator cover while circuits are energized.

CAUTION: Proper voltage must be supplied or actuator will become damaged.

CAUTION: In pulse power applications, the Series 94RHM will only power the Heater and Thermostat at the end of travel.

CAUTION: If 120vac & 220vac models are PLC driven, output contacts of PLC should be rated at a minimum of 1.5 times required input voltage of actuator.

This is typical for any capacitor driven electric actuator.

NOTE: To conform to various electrical codes, a **green grounding screw** has been provided (on the baseplate) inside of actuator.

Terminal Strip Wiring: 75° C Copper Supply Wires up to #14 AWG, wired as per the attached diagrams or the wiring diagram affixed inside of actuator cover.
Control Wiring shall be insulated with conductors rated 105° C, 300 V minimum.
Torque Terminal Strip Wiring to 5 in-lbs.

On/Off & Modulating Engineering Data

Model		120 Vac		220 Vac		12 Vdc		24 Vdc		12 Vac		24 Vac		Cycle Time per 90 Degrees (Seconds)	Weight (lbs)
	Torque (in/lbs)	Amp Draw	Duty Cycle	Amp Draw	Duty Cycle	Amp Draw	Duty Cycle	Amp Draw	Duty Cycle	Amp Draw	Duty Cycle	Amp Draw	Duty Cycle		
A94	150	0.5	100%	0.4	100%	2.0	75%	4.0	75%	2.0	75%	4.0	75%	5	3.5
B94	300	0.8	75%	0.6	75%	2.0	75%	4.0	75%	2.0	75%	4.0	75%	5	3.5

NOTE: Amp rating is considered locked rotor.
Duty cycles are for ambient temperature (73°F)

Failsafe Engineering Data (Battery Back Up)

Size	120 VAC		220 VAC		24 VAC		12 VAC		24 VDC		12 VDC		Cycle Time 90°
	Amp Draw	Duty Cycle	Amp Draw	Duty Cycle	Amp Draw	Duty Cycle	Amp Draw	Duty Cycle	Amp Draw	Duty Cycle	Amp Draw	Duty Cycle	(Sec)
A94	0.4	75%	0.2	75%	4.0	75%	2.0	75%	3.3	75%	2.0	75%	5
B94	0.4	75%	0.2	75%	4.0	75%	2.0	75%	3.3	75%	2.0	75%	5

NOTE: Amp rating is considered locked rotor.
Duty cycles are for ambient temperature (73°F)

Installation

Electrical

Reference Drawing #279QM on the following page.

1. To gain access to terminal strip (Part #8 & 9) it is necessary to remove manual override handle (Part #34) by loosening slotted setscrew (Part #35). Remove 8 cover screws and lift off cover (torque cover/base screws to 120 in-lbs when finished wiring up unit). **Note:** Failure to properly tighten cover/base flange fasteners to 120 in/lbs may compromise the certified safety factors of the actuator.

2. Make electrical connections to terminal strip as shown on wiring schematic located inside the cover (per various electrical codes there is a green screw on the actuator base plate for grounding purposes). Terminals are suitable for up to #14 AWG wire. All units are completely calibrated prior to shipment, and no internal adjustments should be required.

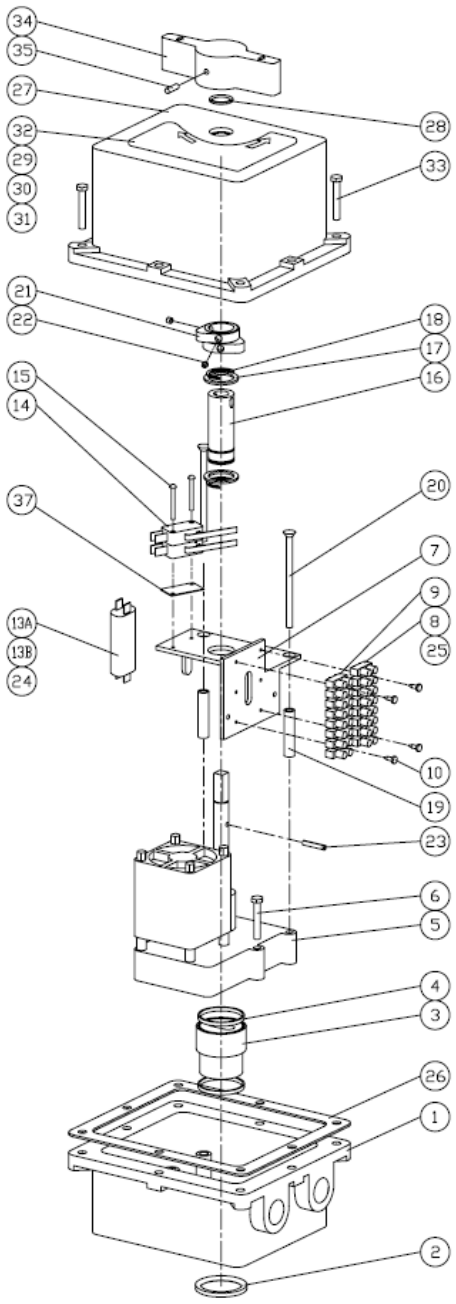
3. Install 1/2" NPT conduit fitting(s) to actuator base.

NOTE: Proper conduit fitting must be used to maintain enclosure rating and not compromise the certified safety factors of the actuator

NOTE: We recommend sealing conduit openings on units installed outdoors or exposed to large temperature swings (15ºF or more).
We also recommend the Heater and Thermostat option in these applications.

4. Replace actuator cover, and install 8 cap screws supplied and torque to 120 in/lbs. ***For outdoor or wet locations it is recommended prior to replacing the cover that the top shaft seal be cleaned and coated with silicone grease. Also clean shaft and lightly coat seal area of shaft with silicone grease***. Unit is now ready for operation.

CAUTION: If mounted unit is installed other than straight up, the actuator should be supported independently to prevent side loading and loosening up of fasteners.



ITEM	PART NO	QTY	DESCRIPTION
1	7403002	1	BASE
2	7403000	1	BASE SEAL
3	7403017	1	OUTPUT COUPLING
4	7403005	2	COUPLING GASKET
5	7403004	1	MOTOR
6	ACTMSC	2	MOTOR SCREW
7	7403011	1	BASE PLATE
8	7401420	1	TERMINAL BLOCK 1-8
9	7401425	1	TERMINAL BLOCK 9-16
10	ACTMSC	4	TERMINAL BLOCK SCREW
13A	7401948	1	4.2 MFD CAPACITOR - A94
13B	7402004	1	6.7 MFD CAPACITOR - B94
14	7401460	2	MICRO SWITCH (V7-6C13D8-132)
15	ACTMSC	2	LIMIT SWITCH SCREW
16	7403016	1	OUTER SHAFT
17	7403006	2	OUTER SHAFT GASKET
18	ACTMSC	2	RETAINING RING
19	ACTMSC	2	STANDOFF
20	ACTMSC	2	BASE PLATE SCREW
21	7401480	2	CAM
22	ACTMSC	4	CAM SCREW
23	ACTMSC	1	PIN
24	7403023	1	2 PC HARNESS
25	7403015	1	4 PC HARNESS
26	7403007	1	BASE GASKET
27	7403001	1	COVER
28	7403020	1	COVER SEAL
29	7403019	1	WIRE DIAGRAM LABEL
30	7403025	1	OPTION LABEL
31	7403030	1	QM II LABEL
32	7403040	1	OVERRIDE LABEL
33	ACTMSC	8	COVER SCREW
34	7403003	1	HANDLE
35	ACTMSC	1	HANDLE SCREW
36	7403021	1	QM II BOX
37	7403240	1	NOMEX INSULATOR PLATE (220VAC ONLY)

NOTE:
1. LOCATE ITEM 29 & 30 ON INSIDE SURFACES OF COVER (ITEM 27).
2. LOCATE ITEM 31 ON OUTSIDE BACK SURFACE OF COVER (ITEM 27).

	NAME	DATE
DR	J.GLASSFORD	6/18/07
APPD	D.HURLEY	6/18/07
PROD	L.LESTER	6/19/07
WO#/SO#		
FILE	ACAD11/QM	

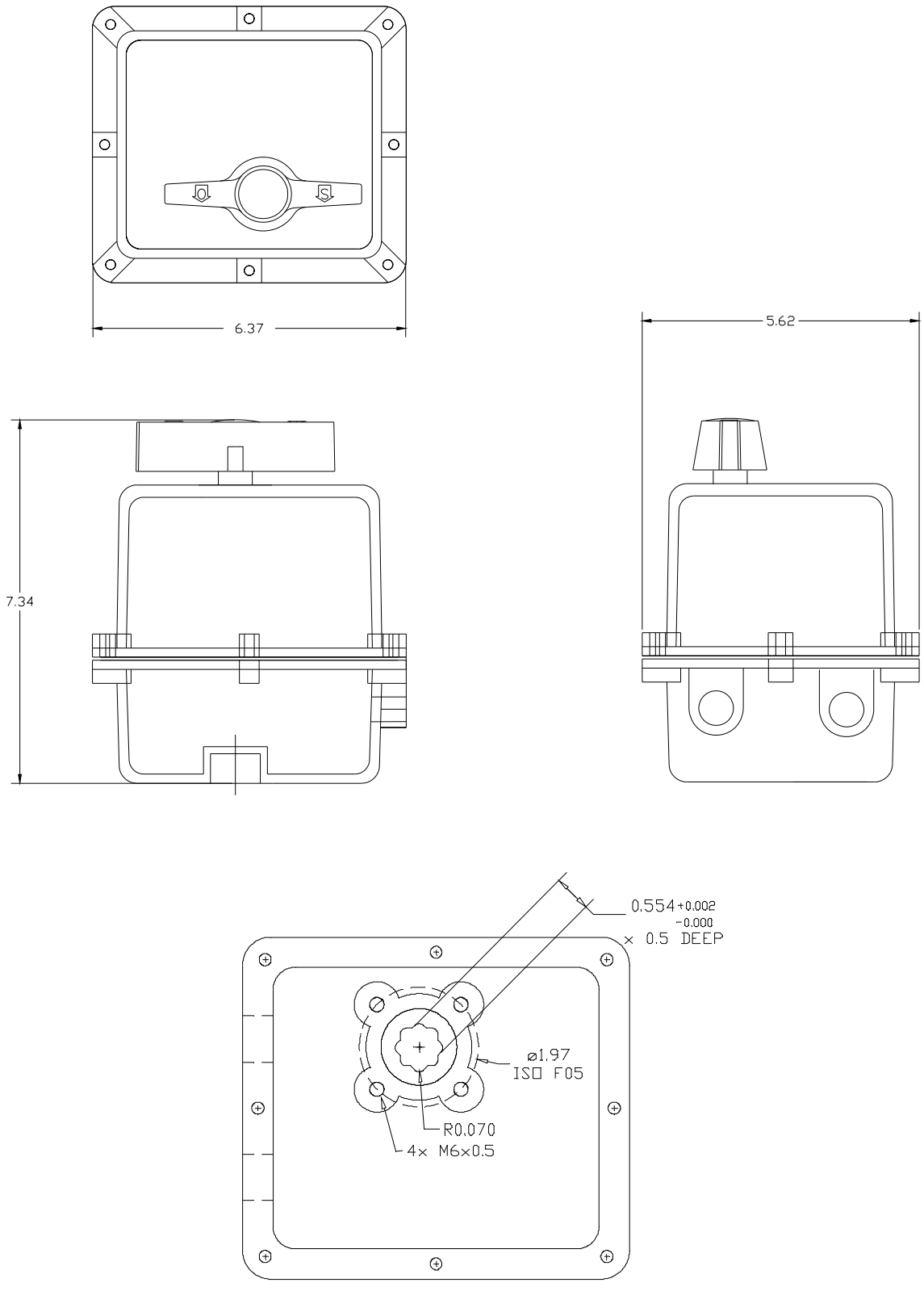
ASAHI/AMERICA
ISO 9001 CERTIFIED
35 GREEN STREET, P.O. BOX 653, MALDEN, MA.

SERIES 94
EXPLODED VIEW

SIZE	DWG. NO.	REV
A	279QM	D

SCALE NTS SHEET 1 OF 1

Actuator Mounting Dimensions



Manual Override Operation
Reference Drawing #279QM

Push down on handle (Part #34) and rotate within labeled limits.
To re-engage simply rotate actuator handle in opposite direction until it moves up and re-engages.

CAUTION: The manual override should only be used when there is no power applied to actuator. When power is restored the actuator will automatically resume normal operation.

Series 94 Options Codes for Serial # Tags

M2	2 extra limit switches
HT	Heater & thermostat
RHM	RHM Module
P	Feedback potentiometer
C1	4-20 mA Positioner
C3	4-20mA Output Transmitter
BR	Mechanical brake
CO	Center off
CL	Cycle length control
2W	2-wire control
FS	Failsafe Battery Pak
W	General Location

Example 1: A94**RHM**W

A94, RHM Module, NEMA Type 4X enclosure

Example 2: A94**BR**W

A94, mechanical brake, NEMA Type 4X enclosure

Maintenance

Disconnect power!

WARNING: Do not open actuator cover while circuits are energized.

CAUTION: It is imperative for reducing the chance of electrical shock that you
Disconnect power
before any maintenance or repairs are performed.

Series 94 actuators are virtually maintenance free. We do however, recommend that periodic checks* are made to ensure that all fasteners are tight and properly torqued to extend the life of the actuator and valve.

*Periodic checks for a Failsafe Battery Back up unit include:

- Check that battery voltage is no less than 12.2 volts
- Check that battery charge voltage is between 12.5 and 12.8 volts
- Battery should be replaced once per year

If battery charge voltage is within the specified parameters, and the battery is below 12.2 volts, then the battery should be replaced regardless of age.

Series 94 Actuators are manufactured with factory lubricated grease in the gear case and gearbox. This lubricant never has to be replenished.

For outdoor or wet locations keep top and bottom seals coated with a silicone based grease.

Spare Parts
Reference Drawing #289S92

On/Off Units

We recommend that the following be kept on hand as spare parts.

1 --- Limit Switch (Item #14,)
1 --- Capacitor (Part #13A or #13B) for 120vac & 220vac units

Modulating Units

1 --- Feedback Potentiometer
1 --- Capacitor (Part #13A or #13B) for 120vac & 220vac units

Failsafe Units (Battery Back Up)

1 --- Battery Pack (3-year shelf life when stored at room temperature)
1 --- Fuse (F1) 2AG FAST-ACTING
2.0A for 120 or 220vac actuator
3.0A for 12vac or 12vdc actuator
4.0A for 24vac or 24vdc actuator

NOTE: When ordering replacement motor parts and/or options specify model #, Serial #, and voltage.

Setting Switches

Disconnect power!

Setting On/Off Travel Switches

SW2
SW1

Open Travel Limit Switch (SW2):
Using declutchable manual override, move the valve into a full open position. Then loosen set screws on top cam (Part #21) and rotate cam (CCW) into limit switch arm until a click is heard, this designates the switch circuit has opened and defines a full open position. Tighten 2 set screws (Part #22) on cam.

Close Travel Limit Switch (SW1):
Using declutchable manual override, move the valve to a full closed position, loosen set screws on bottom cam (Part #21) and rotate cam (CW) into limit switch arm until a click is heard, this designates the switch circuit has opened and defines a full closed position. Tighten 2 set screws (Part #22) on cam.

Manually position valve to midstroke. Reapply power to actuator and drive to open or closed position. Actuator motor will run. The shaft will not turn until drive pins reseat in drive gear. This could take up to 10 seconds.

Modulating Switches (DHC Card)

SW2
SW1

The only switch adjustment for a modulating unit is to ensure that they are calibrated a few degrees beyond the minimum and maximum control signal limits (4-20mA, 0-10vdc, etc.). The switches are there as a back up in case of a positioner card malfunction, and will initiate a fault alarm if tripped. Assuming that the control signal is calibrated to 0 & 90 degrees, the switches should be calibrated to -3 degrees and 93 degrees for proper operation.

Failsafe Switches (Battery Back Up)

SW3	
SW2	
SW1	Bottom of Failsafe Card

Open Travel Limit Switch (SW2):
Using declutchable manual override, move the valve into a full open position. Then loosen set screws on cam and rotate cam (CCW) into limit switch arm until a click is heard, this designates the switch circuit has opened and defines a full open position. Tighten 2 set screws on cam.

Close Travel Limit Switch (SW1):
Using declutchable manual override, move the valve to a full closed position, loosen set screws on cam and rotate cam (CW) into limit switch arm until a click is heard, this designates the switch circuit has opened and defines a full closed position. Tighten 2 set screws on cam. Fine tuning of the failsafe alarm limit switch should be performed at this time.

Failsafe Alarm Limit Switch (SW3):
This switch is factory calibrated with the fail position (closed), and should be calibrated to trip just before the closed travel limit switch. Using declutchable manual override, move the valve to a full closed position, loosen set screws on cam and rotate cam (CW) into limit switch arm until a click is heard, then rotate a few degrees more. This designates the switch circuit has opened and defines a full closed position. Tighten 2 set screws on cam.

Manually position valve to midstroke. Reapply power to actuator and drive to open or closed position. Actuator motor will run. The shaft will not turn until drive pins reseat in drive gear. This could take up to 10 seconds. It is imperative to cycle the unit back and forth a few times to ensure dry contact switches trip ahead of travel switches.

On/Off Calibration/Operation

RHM

Reference Appropriate Drawing Number:
M00EL9903 - x94RHM 12vac & 24vac
M00EL9904 - x94RHM 12vdc & 24vdc
M00EL9905 - x94RHM 120vac & 220vac

The RHM is a combination heater and thermostat, and 2-SPDT dry contact relays for the open and closed positions. Its best feature is to provide a means of powering the heater and thermostat without the need of additional wiring. When the actuator reaches end of travel, the NO contact on the travel switch is tripped, and provides power for optional light indication. At the same time, the appropriate relay on the RHM Card is triggered providing dry contact position indication as well as powering the heater and thermostat. The heater and thermostat are not powered during travel, only at the end of travel. Since this is electrically driven, calibration of the RHM Card is not required.

Mechanical Brake Installation

Loosen two (2) motor screws diagonally from each other and install bracket with tabs facing upward. Tighten screws

Install hexagonal adapter over armature shaft and tighten set screws.
NOTE: The adapter should be resting on the step of the armature shaft.

Install brake assembly onto hexagonal adapter making sure that the brake assembly is sitting flush on the bracket. Tighten with supplied screws.
Remove motor leads “A” & “B” from capacitor and install “piggy back connectors” to capacitor, the re-install motor leads to their original locations.
Connect brake leads to piggy back connectors on capacitor (orientation does not matter)
Wire tie loose wiring and check operation before installing cover.

Feedback Potentiometer Installation

Install potentiometer and bracket on to base plate, with potentiometer gear facing output shaft. Install drive gear face up over output shaft.

Wiring for potentiometer as follows:

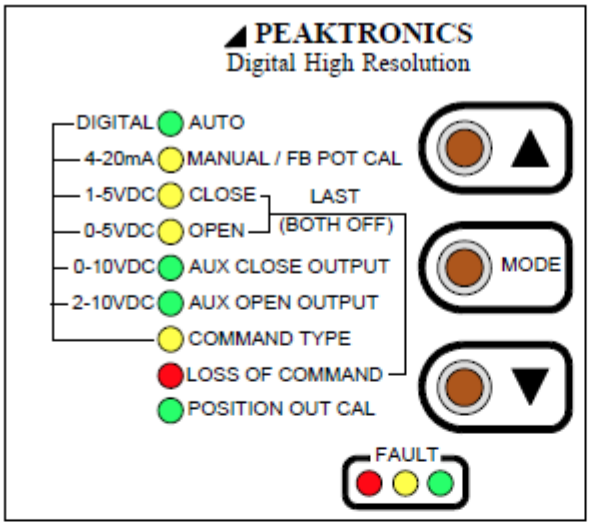
#1 on potentiometer (black)	#14 on terminal strip.
#2 on potentiometer (white)	#15 on terminal strip.
#3 on potentiometer (red)	#16 on terminal strip.

Using multimeter set at 2k ohms, calibrate potentiometer with leads from meter connected to terminals #15 and #16. With actuator in closed position multimeter should read between 95 and 100 ohms. Rotate actuator 90 degrees (open position). Connect leads from multimeter to terminal #14 and #15; multimeter should read 95 to 100 ohms.

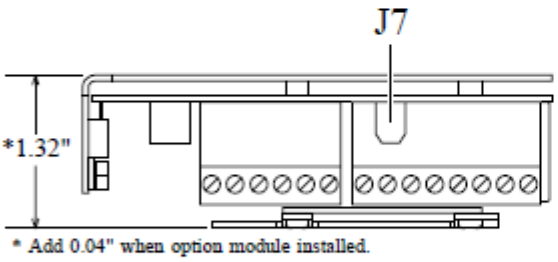
If necessary adjust open limit switch cam so that multimeter will read 95-100 ohms.

Modulating Calibration/Operation

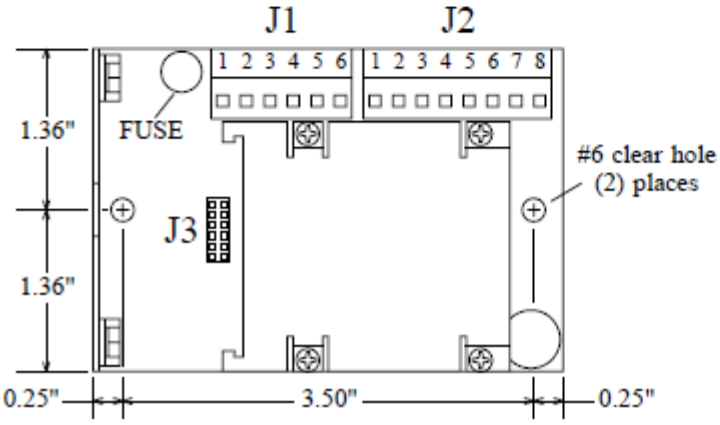
Modulating Outline Diagram



FRONT PANEL



* Add 0.04" when option module installed.



ELECTRICAL CONNECTIONS

J1

to Motor		
MOTOR 1 OUTPUT	1	⊘
NEUTRAL	2	⊘
MOTOR 2 OUTPUT	3	⊘
GND	4	⊘
WIPER	5	⊘
+2.5V	6	⊘
to Feedback Pot		

J2

to AC Power		
L2 NEUTRAL	1	⊘
L1 LINE	2	⊘
EARTH GND	3	⊘
SIGNAL GND (–)	4	⊘
4-20mA CMD (+)	5	⊘
VOLTAGE CMD (+)	6	⊘
+5V OUT	7	⊘
+15V OUT	8	⊘
to Signal		

J3

OPTION MODULE CONNECTOR

J7

to Auto/Manual Station		
GND	1	⊘
OVERRIDE INPUT	2	⊘

QuickCal Procedure

The following is a quick calibration procedure. For more details regarding the calibration and features of your DHC-Positioner, please see the pages following this procedure.

General

The MODE button selects a particular function, or mode, and the indicator for the selected mode turns on steady. Pushing the MODE button saves any new setting of the current mode before switching to the next mode. The adjust up (▲) and adjust down (▼) buttons are used to make adjustments to current mode.

1. Apply power to the actuator on Connector J2: terminal #1 (neutral), terminal #2 (line), and terminal #3 (earth). There is no need for a signal connection during calibration.

2. Push the MODE button until the yellow “MANUAL/FB POT CAL” LED is illuminated. The LED may be flashing (at different speeds) through the next several steps. This is expected and will be explained.

3. Use the adjust buttons (▲ and ▼) to move the actuator and verify that the limit switches are set past the desired open and closed positions; then move the actuator to mid stroke.

4. If LED is solid, proceed to step 7.

5. If LED is flashing, loosen the gear on the actuator shaft and rotate the potentiometer gear until the LED is no longer flashing, but on solid - this indicates the center of the potentiometer’s travel. Note that the LED will flash at a slower rate the farther away from the mid position it gets. Once the LED is on solid tighten all gears.

6. Push the MODE button until the “CLOSE” LED is illuminated. Use the adjust buttons (▲ and ▼) to drive the actuator to the desired closed position. Ensure that the close limit switch does not engage.

7. Push the MODE button until the “OPEN” LED is illuminated. Use the adjust buttons (▲ and ▼) to drive the actuator to the desired open position. Ensure that the open limit switch does not engage.

8. Please skip to **Aux Open/Close Setup** if optional Transmitter with Relays is installed; otherwise continue to the next step.

9. Push the MODE button until the “COMMAND TYPE” LED is illuminated. Use the adjust buttons (▲ and ▼) to select appropriate input signal (4-20mA, 1-5VDC, 0-5VDC, 0-10VDC, 2-10VDC or Digital). If 0-5VDC or 0-10VDC is

selected, the LOSS OF COMMAND feature is not available, so proceed to step 12.

10. Push the MODE button until the “LOSS OF COMMAND” LED is illuminated; this sets the actuator to a predetermined position upon loss of command. Use the adjust buttons (▲ and ▼) to select appropriate position (OPEN, CLOSE, or LAST POSITION).

11. Please skip to **Aux Position Setup** if optional Transmitter, or optional Transmitter with Switches is installed, otherwise continue to the next step.

12. Push the MODE button until the “AUTO” LED is illuminated. Your calibration is now **COMPLETE**. Connect the command signal wires to connector J2: terminal #4 (signal ground) and terminal #5 (mA input) **OR** terminal #6 (voltage input), depending on the application. If a signal input was already connected, the actuator should have moved to that position.

Aux Open/Close Option Setup

1. Push the MODE button until the “AUX CLOSE OUTPUT” LED is illuminated. Use the adjust buttons (▲ and ▼) to drive the actuator to the desired auxiliary close position.

2. Push the MODE button until the “AUX OPEN OUTPUT” LED is on. Use the adjust buttons (▲ and ▼) to drive the actuator to the desired auxiliary open position.

3. Continue with Step 9 in the **Quick Calibration Procedure** (see above).

Aux Position Option Setup

1. Push the MODE button until the green “AUX POSITION OUT CAL” LED illuminates **while** the “CLOSE” LED flashes.

2. Use the adjust buttons (▲ and ▼) to set the desired output voltage or current (mA) on the option module output for the closed position.

3. Push the MODE button so the “AUX POSITION OUT CAL” LED remains steady **while** the “OPEN” LED flashes. Use the adjust buttons (▲ and ▼) to set the desired output voltage or current (mA) on the option module output for the open position.

4. Continue with Step 12 in the **Quick Calibration Procedure** (see above).

Please read the following pages to ensure that ALL of the selectable features are understood and selected if required.

Power / Signal (J2)

Power is connected to pins 1, 2, & 3 as shown in the wiring schematic. The fuse installed on the unit is rated for maximum output current that can be safely delivered by the AC outputs. Replacement fuses must not exceed the maximum rating to prevent damage to the unit. Smaller fuse sizes can be used with smaller motors – consult the factory for appropriate fuse size and type.

An appropriate command signal, either 0-5V, 0-10V, 1-5V, 2-10V or 4-20mA, should be connected to pin 5 or 6 (as shown in the Block Diagram) while using pin 4 as the return *signal ground*. The DHC-Positioner must be configured for the type of command signal that is to be used (see COMMAND TYPE).

Pin 7 of J2 provides an auxiliary +5V output which can be used to connect a command potentiometer. By connecting one end of a potentiometer to pin 7, the other end to pin 4, and the wiper to pin 6, a local control knob can be implemented. Pin 8 provides an auxiliary +15VDC output which can be used to power an input or output 4-20mA transmitter.

Actuator (J1)

The actuator motor and feedback potentiometer are connected to J1 as shown in the wiring schematic. The motor neutral wire must be connected to pin 2, while one motor winding is connected to pin 1 and the other winding is connected to pin 3. The feedback potentiometer wiper must be connected to pin 5, while one end is connected to pin 4 and the other end is connected to pin 6. The **Polarity Detection** feature of the DHC-Positioner automatically determines which motor winding to control based on where the *open* and *closed* positions are set; this feature also eliminates the need to rewire the unit for direct or reverse acting applications.

When the ▲ and ▼ buttons are used to control the actuator, the ▲ button will turn on the motor winding connected to pin 1, while the ▼ button will turn on the motor winding connected to pin 3. See MANUAL/FB POT CAL for more details.

Override (J7)

J7 provides a simple 2-wire connection that can override the DHC-Positioner to perform a variety of external control functions. Using an appropriate interface module, commonly used auto/manual station switches are easily implemented with low voltage/low current switches. The factory-installed jumper between pins

1 and 2 enables normal operation of the DHC-Positioner and must be installed if the external override functions are not used.

Mode

The MODE button is used to select the desired function of operation. When the MODE button is pressed, the unit will switch to the next function and the appropriate LED indicator will turn on to let the user know which function is selected. Except for the MANUAL/FB POT CAL mode, the associated mode indicator will be steady on; for some of the modes other indicators will flash to indicate specific settings associated with the mode. Each of the modes are described in more detail in the following sections.

If a 0-5V or 0-10V command signal is used, the LOSS OF COMMAND function cannot be used. The MODE button will skip over the LOSS OF COMMAND mode when the unit is configured for a 0-5V or 0-10V command signal (see COMMAND TYPE). When the OVERRIDE mode is enabled (see OVERRIDE MODE), the MODE button is disabled and the Manual/Pot Cal indicator will turn on steady.

Adjust up and Adjust down

The adjust up ▲ and adjust down ▼ buttons are used to adjust the setting of any given function. When a function is selected by the MODE button, the adjust buttons will affect that function only. Note, that the AUTO mode does not have any adjustable settings, and therefore, the adjust up and adjust down buttons have no effect. Also, the adjust buttons are disabled in the OVERRIDE mode.

Override Mode

The OVERRIDE mode is not selected by the MODE button and can be enabled at anytime by connecting a resistance greater than 250 ohms to the Override Input (J7 pin 1 and pin 2). While the OVERRIDE mode is enabled, the MODE button and adjust buttons are disabled, and the Manual/Pot Cal indicator will turn on steady to indicate that the unit is being controlled by the Override Input. Shorting J7 pin 1 to pin 2 returns the unit to normal operation and the previously selected mode.

Controlling the DHC-Positioner from the Override Input is accomplished by connecting a specific resistance to select a specific operation. The table below defines the operations and their associated resistance.

RESISTANCE		OPERATION
> 4.3K ohms		OFF
3.3K ohms	±5%	LATCH
2K ohms	±5%	OPEN
1.2K ohms	±5%	CLOSE
510 ohms	±5%	STOP

The OPEN function will operate the motor in the *open* direction as set by the OPEN mode, while the CLOSE function operates the motor in the *closed* direction as set by the CLOSE mode. The LATCH function will maintain the previously selected function; this allows momentary switches to be used for the OPEN and CLOSE functions. The OFF and STOP functions turn the motor off, which also unlatches the OPEN or CLOSE functions.

Note that the OPEN and CLOSE functions may work in reverse until the *open* and *closed* positions are set by the OPEN and CLOSE modes. The DHC-Positioner will automatically turn the motor off when the *open* or *closed* positions are reached. However, if a feedback fault occurs (see FAULT INDICATOR), the motor will be turned on for a period of 15 minutes in the selected direction. For this reason, limit switches should be used when using the OVERRIDE mode, and should be set to a position acceptable for the application. The 15 minute period can also be terminated using the OFF or STOP function.

The motor is also turned off if the DHC-Positioner detects a stall (see STALL DETECTION). An OPEN or CLOSE operation can be attempted again after switching to the OFF, LATCH, or STOP functions first.

Auto

The AUTO function is the normal mode of operation for the DHC-Positioner; all the other functions are used to set up the unit. While in AUTO, the unit can be controlled by various external signals, some of which can be selected by the COMMAND INPUT function. When the unit is not in the AUTO mode, all external controls described below will be disabled.

Once the *open* and *closed* positions have been set, the AUTO mode will control the position of the actuator according to the command input signal. For an input signal of 0V (for 0-5V or 0-10V input), 1V (for 1-5V input), 2V (for 2-10V input), 4.0 mA (for 4-20mA input), or 0% (for a digital input), the DHC-Positioner will position the actuator to the *closed* position as set by the user. Conversely, an input of 5V, 10V, 20mA, or 100% will position the actuator to the defined *open* position.

When the DHC-Positioner is configured to use a 0-5V, 0-10V, 1-5V, 2-10V, or 4-20mA command, the command signal should be connected to the appropriate pin on J2. When the DHC-Positioner is configured for a Digital command type, an appropriate communications option module must be installed. A communications

module may be installed when using one of the analog command types and can be used to override the analog command. The AUTO indicator will flash whenever the unit is being controlled by the communications module.

Manual/FB Pot Cal

The MANUAL/FB POT CAL function allows manual operation of the actuator by using the adjust buttons (▲ and ▼) without affecting any other settings within the DHC-100. Whether the actuator moves toward the *open* or *closed* position depends on which motor wire is connected to J1-1 and J1-3.

The FB POT CAL feature provides an indication of the feedback potentiometer's setting. When the MANUAL/POT CAL function is selected, the Manual/Pot Cal indicator will turn on - it may flash or be on steady, depending on the actuator position. The indicator will be on steady whenever the DHC-Positioner detects that the feedback potentiometer is at midrange of its rotation. As the actuator moves, causing the feedback potentiometer to move away from midrange, the indicator will begin to flash, and the indicator will flash at a decreasingly slower rate as the actuator moves further away from midrange.

By using the adjust buttons to position the actuator to midstroke (half way point between the desired *open* and *closed* positions), the feedback potentiometer can then be adjusted until a steady light occurs. This insures that the feedback potentiometer has maximum range to reach the *open* and *closed* positions.

Close

The CLOSE function is used to set the desired *closed* position; however, prior to doing this, the feedback potentiometer should be checked for optimum position (see MANUAL/POT CAL), and the limit switches should be set outside of the operating range (see STALL DETECTION FEATURE). In the CLOSE function, the adjust buttons are used to set the actuator to any desired position, and upon pressing the MODE button (to select the next function, OPEN), the DHC-Positioner will retain the setting as the defined *closed* position.

Upon selecting the CLOSE function, the DHC-Positioner will begin moving the actuator to the previously set *closed* position; it is not necessary to make an adjustment if the unit has been previously set to the desired position. A command signal input of 0V, 1V, 2V, 4mA, or 0% automatically corresponds to the defined *closed* position.

Open

The OPEN function works the same way as the CLOSE function with the exception that the adjust buttons are used to set the desired *open* position. As with the CLOSE function, upon selecting the OPEN function, the actuator will

move to the previously set *open* position. Once the desired position is set, the DHC-Positioner will automatically associate a command signal input of 5V, 10V, 20mA, or 100% to the *open* position.

Auxiliary Close Output

The AUX CLOSE OUTPUT function is used to set an optional output setting that is associated with the *closed* position - an appropriate relay option module is required to use this output. The adjust buttons are used to set the actuator to a desired position. Whenever the actuator position falls between the defined *closed* position and the Aux Close position, the Aux Close Output indicator will flash. Additionally, the DHC-Positioner will turn on a relay output on the optional relay module - the output can be used to drive an alarm or merely act as an auxiliary limit switch. Relay is rated for 1 amp @ 24VDC or .5 amp @ 115VAC.

Upon selecting the AUX CLOSE OUTPUT function, the DHC-Positioner will begin moving the actuator to the previously set position. It is not necessary to make an adjustment if the unit has been previously set to the desired position.

Auxiliary Open Output

The AUX OPEN OUTPUT function is used to set an optional output setting that is associated with the *open* position - an appropriate relay option module is required to use this output. The adjust buttons are used to set the actuator to a desired position. Whenever the actuator position falls between the defined *open* position and the Aux Open position, the Aux Open Output indicator will flash. Additionally, the DHC-Positioner will turn on a relay output on the optional relay module - the output can be used to drive an alarm or merely act as an auxiliary limit switch. Relay is rated for 1 amp @ 24VDC or .5 amp @ 115VAC.

Upon selecting the AUX OPEN OUTPUT function, the DHC-Positioner will begin moving the actuator to the previously set position. It is not necessary to make an adjustment if the unit has been previously set to the desired position.

Command Type

The COMMAND TYPE function is used to configure the command signal input for either 4-20mA, 1-5V, 0-5V, 0-10V, 2-10V, or Digital so as to match the type of command signal being used. Upon selecting the COMMAND TYPE function, the Command Input indicator will turn on steady, while the indicator for the selected type will flash. Use the adjust buttons (▲ and ▼) to select the desired input type. The selection will be saved when the MODE button is pressed, which will also advance the unit to the LOSS OF COMMAND function.

Loss of Command

When using 1-5V, 2-10V, 4-20mA, or a Digital input type for the command signal, the DHC-100 will detect when the command signal is lost or out of range. A loss of command condition is detected whenever the input is disconnected, the input becomes less than 0.75V (for 1-5Vinput), 1.5V (for 2-10V input), or 3mA, or if the input is connected backwards. An out of range condition is detected whenever the input becomes greater than 5.25V (for 1-5V input), 10.5V (for 2-10V input), or 21mA. If the DHC-Positioner detects a loss of command , a fault will be indicated (see FAULT INDICATORS), and the actuator will be moved to one of three preset positions: the *open* position, the *closed* position, or the position last attained prior to losing the command signal. The LOSS OF COMMAND function is used to set the desired default position.
When the LOSS OF COMMAND function is selected, the adjust buttons ▲ and ▼ are used to set the default position. The DHC-Positioner indicates the selected default setting by flashing the Open function indicator for the *open* default position, or it will flash the Close function indicator for the *closed* default position. When neither indicator is on, then the "last position" default is selected.

When a 0-5V or 0-10V command signal is used, a loss of command signal cannot be detected. Therefore, if the unit is configured for a 0-5V or 0-10V command signal (see COMMAND TYPE), the MODE button will not select the LOSS OF COMMAND function. However, the DHC-Positioner can detect when a 0-5V or 0-10V command signal is out of range (i.e., greater than 5.25V or greater than 10.5V), or connected backwards. When an out of range condition is detected for a 0-5V or 0-10V input, the motor is turned off (leaving the actuator is its “last position”) and a fault will be indicated (see FAULT INDICATORS).

Position Out Cal

The POSITION OUT CAL function is used to calibrate an optional feedback transmitter output. An appropriate transmitter option module is required to use this feature. When the POSITION OUT CAL function is first selected (by pressing the MODE button while in the LOSS OF COMMAND function), the CLOSE indicator will flash, and the voltage or current associated with the *closed* position will appear at the option module output. If desired, the output can be adjusted (using the adjust buttons ▲ and ▼) to any value from 0-10V (for a voltage output) or 4 to 20mA (for a current output). The new setting is then saved when the MODE button is pressed.

Pressing the MODE button again will leave the unit in the POSITION OUT CAL function except that the OPEN indicator will flash, and the output voltage or current associated with the *open* position will appear at the option module output. Like the *closed* setting, the output can be adjusted to any voltage (from 0-10V) or current (from 4-20mA), and the new setting is then associated with the *open* position.

Fault Indicators

The DHC-100 detects various fault conditions that prohibit the unit from controlling the actuator. A combination of the three Fault indicators (red, yellow, and green) will turn on or flash to indicate a specific detected fault. If an appropriate relay option module is installed, the Fault relay output on the option module will turn off (indicating a fault) when any of the Fault indicators turn on or flash. A communications option module can also read the specific conditions causing a fault. Note that a fault condition DOES NOT disable the motor outputs when manually controlling the actuator with the adjust buttons; while useful in troubleshooting, care should be exercised when operating the motor under a fault condition. The OVERRIDE mode can also operate the motor when a fault condition exists – see OVERRIDE MODE for details.

Note that the indicators may not indicate ALL the fault conditions that may exist. This means that when the indicated fault is corrected, the unit may display another fault that has not been corrected. The table below provides a summary of the Fault indications which is followed by a description of each fault.

DHC-100 Faults (120vac, 220vac, 24vac)

RED	YEL	GRN	FAULT
ON	flash	OFF	Motor 1 No Motion (stall)
ON	OFF	flash	Motor 2 No Motion (stall)
On	flash	flash	Double No Motion (stall)
OFF	OFF	flash	Feedback Alarm
OFF	flash	OFF	Loss of Command
OFF	ON	OFF	Command out of Range
OFF	flash	flash	Feedback Alarm and Loss of Command
OFF	ON	flash	Feedback Alarm and Command out of Range

DHC-400 Faults (12vdc & 24vdc)

RED	YEL	GRN	FAULT
flash	OFF	OFF	Low Battery Voltage
flash	flash	OFF	Motor 1 Stall
flash	OFF	flash	Motor 2 Stall
flash	flash	flash	Double Stall
flash	ON	OFF	Motor 1 Current Trip
flash	OFF	ON	Motor 2 Current Trip
flash	ON	ON	Double Current Trip
ON	OFF	OFF	Battery Over Voltage
ON	flash	OFF	Motor 1 No Motion (stall)
ON	OFF	flash	Motor 2 No Motion (stall)

On	flash	flash	Double No Motion (stall)
OFF	OFF	flash	Feedback Alarm
OFF	flash	OFF	Loss of Command
OFF	ON	OFF	Command out of Range
OFF	flash	flash	Feedback Alarm and Loss of Command
OFF	ON	flash	Feedback Alarm and Command out of Range

Motor 1 No Motion (stall)

A fault condition is detected when no actuator motion is detected while the Motor 1 output is turned on. The fault condition will disable the Motor 1 output only, and the fault is cleared when the DHC-Positioner detects a motion greater than 1.5° in either direction. The fault can be cleared if 1) the command signal commands a Motor 2 operation, 2) manual operation with the adjust buttons results in a motion greater than 1.5°, or 3) a mechanical manual override forces the 1.5° motion, provided the mechanical motion is monitored by the feedback pot.

Motor 2 No Motion (stall)

A fault is detected when no actuator motion is detected while the Motor 2 output is turned on. The fault can be cleared in the same manner as a Motor 1 Stall (see above).

Double No Motion (stall)

If the DHC-Positioner detects no actuator motion in either direction, both motor outputs will be disabled. The command signal cannot clear this condition; only manual operation or a mechanical override can clear the fault. Alternatively, the DHC-Positioner can be powered off and then on to temporarily clear the fault; however, this practice should be avoided without permanently correcting the cause of such a fault.

Feedback Alarm

A fault condition is detected whenever the feedback signal is out of range (that is, less than 5% of potentiometer value or more than 95% of the potentiometer value), or when any of the potentiometer connections are broken. Normal operation resumes when the potentiometer is reconnected or back in range.

Loss of Command

If the command signal is disconnected, the fault indication will remain on until the signal is reconnected. See LOSS OF COMMAND for details.

Command Out of Range

If the command signal goes out of range, the fault indication will remain on until the signal is back in range. See LOSS OF COMMAND for details.

Stall Detection Feature

The **Stall Detection** feature of the DHC-Positioner (see FAULT INDICATORS) essentially performs a similar function as commonly used torque switches; however, the differences should be considered before eliminating torque switches. The DHC-Positioner feature does not measure torque, but rather motion; if the load is sensitive to excessive torque, the torque switches may be desirable. Since common torque switches are mechanical devices, they can provide a fail safe feature in the event of electrical failures (such as shorted wires or damage to the DHC-Positioner).

The **Stall Detection** feature is useful for detecting when any of the motor wires become disconnected. However, limit switches employed in actuators essentially disconnect one of the motor windings. The DHC-Positioner will detect this as a motor stall. To avoid this condition, the limit switches must be set outside of the operating range set by the CLOSE and OPEN functions.

Electronic Brake Feature

The **Electronic Brake** feature of the DHC-Positioner provides highly reliable and accurate braking of the motor, and it is a key element in achieving high resolution. A mechanical brake can still be implemented without interfering with the DHC-Positioner operation. A mechanical brake can still be implemented without interfering with the DHC-Positioner operation. Mechanical brakes can be useful for providing a holding brake in the event power to the actuator is lost.

Since the **Electronic Brake** feature provides the primary braking of the motor, the life of a mechanical brake is dramatically extended. Additionally, the **Adaptive Control** feature of the DHC-Positioner automatically compensates for changes in the mechanical brake's performance due to temperature or age.

Note that the actuators limit switches should be set outside of the operating range set by CLOSE and OPEN functions. The **Electronic Brake** feature degrades in performance if a limit switch is engaged. Limit switches exhibit wide variations, and the DHC-Positioner can position the actuator more precisely at *closed* and *open* than the limit switches. A limit switch serves better as a fail safe device to protect against electrical failures in the actuator.

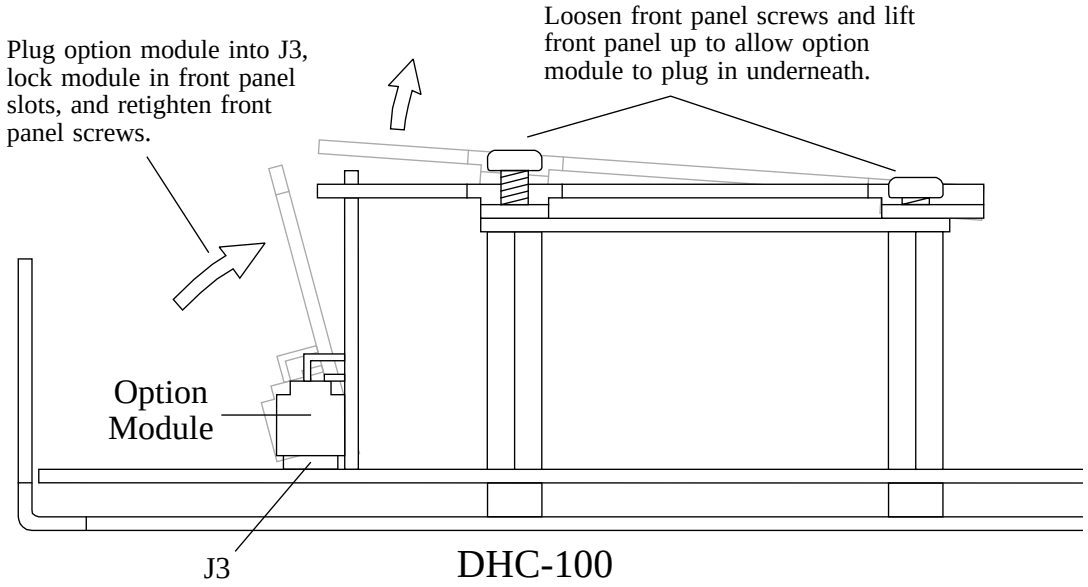
Duty Cycle Control

The **Duty Cycle Control** feature of the DHC-Positioner allows actuators rated at 25% duty or more to be safely used in automated valve applications. The DHC-Positioner accurately monitors the relative heating of the motor and automatically duty cycles the unit at a safe level when a process becomes unstable, or if a control loop is not properly set. While the thermal switch in the motor protects the motor from overheating, thermal switches can shut down the actuator for ten minutes or more. Further, typical thermal switches do not activate until temperatures inside the actuator become too high for other components in the actuator.

The **Duty Cycle Control** feature allows continuous operation of the motor until it detects an excess heat buildup in the motor (usually well below the limit of the thermal switch). At that time, duty cycle operation is automatically enabled and continues until the motor cools enough to resume continuous operation. The duty cycle period is approximately 2 seconds with an on time that automatically various depending on the heating of the motor. While this operation slows down the actuator's operation, it does not impact the resolution performance of the DHC-Positioner, and it prevents disruption of a process due to a thermal switch shutdown.

Option Modules for Modulating Actuators

Various option modules can be plugged into the DHC-Positioner option module connector, J3. Option modules provide additional features such as position feedback signals, auxiliary switch outputs, or digital communications. Contact the factory for the latest available modules. Refer to the diagram below for instructions on installing an option module.



Specifications

DHC-100 Specs

POWER REQUIREMENTS

DHC-100: 117VAC ±10%, 50/60 Hz
DHC-100A: 234VAC ±10%, 50/60 Hz
DHC-100B: 24VAC ±10%, 50/60 Hz
12 VA typical (not including output load)
Fuse Type: 6.3A TR5 Time delay (replaceable)

COMMAND SIGNAL INPUT

Input Impedance
20K ohms (VOLTAGE COMMAND (+) Input)
251 ohms ±1% (4-20 mA CMD (+) Input)
Loss of Command threshold
< 0.75V (1-5 VDC input)
< 1.5V (2-10VDC input)
< 3mA (4-20mA input)
Command Out of Range Threshold
>5.24V (0-5VDC, 1-5VDC input)
>10.5V (0-10VDC, 2-10VDC input)
>21mA (4-20mA input)

FEEDBACK SIGNAL INPUT

Input Voltage: 0 to 2.5 VDC
External Feedback Potentiometer: 1K ohm

POWER SUPPLY OUTPUTS

+15V OUT (J2-8): 100mA maximum (not including option module)
+5V OUT (J2-7): 20mA maximum
NOTE: *Do not* connect these outputs to other power supplies.

AC MOTOR OUTPUTS

Off-state Leakage Current: <15mA
Maximum Load Current @ 150°F: 5A

ENVIRONMENTAL

Operating Temperature Range: 32 °F to 150 °F
Storage Temperature Range: -40 °F to 185 °F
Relative Humidity Range: 0 to 90 % (noncondensing)

DHC-400 Specs

POWER REQUIREMENTS

Operating Voltage: 0-30VDC

Operating Current, typical: 10mA (not including option module)

Fuse Type: 10A TR5 Time Lag 374 (replaceable)

COMMAND SIGNAL INPUT

Common Mode Voltage (both inputs): -9 to +30vdc

Input Impedance

10.25K ohms (1-5 VDC, 0-5 VDC, 0-10 VDC Input)

250 ohms ±1% (4-20 mA Input)

Loss of Command threshold

< 0.75V (1-5 VDC input)

<1.5V (2-10VDC input)

< 3mA or > 22mA (4-20mA input)

Command out of Range threshold

>5.25V (0-5 VDC,1-5 VDC INPUT)

10.5v (0-10 VDC, 2-10 VDC input)

21mA (4-20mA input)

FEEDBACK SIGNAL INPUT

Input Voltage: 0 to 2.5 VDC

External Feedback Potentiometer: 1K ohm

Command Potentiometer Power Output (J2-6)

+5V OUT: 5mA maximum

NOTE: *Do not* connect these outputs to other power supplies.

DC MOTOR OUTPUTS

Maximum Running Current: 10A

Motor Current Trip: 0-12A (adjustable)

Motor Current Measurement Resolution: 85mA typical

ENVIRONMENTAL

Operating Temperature Range: 32 °F to 140 °F

Storage Temperature Range: -40 °F to 185 °F

Relative Humidity Range: 0 to 90 % (noncondensing)

Series 94 Specs

MOTOR

Brushless Capacitor Run, CE Compliant AC Motors

Brushed DC Motor (Low Voltage Models)

GEAR TRAIN

Permanently Lubricated

Alloy Steel

MOUNTING CONFIGURATION
ISO Bolt circle (F05)
ISO Output Drive: 14mm

MANUAL OVERRIDE
Fully De-clutchable

ENCLOSURE
NEMA Type 4X
Stainless Steel Trim
2 (Two) ½" FNPT Conduit Entries

POSITION INDICATION
Visual Position Indicator

TEMPERATURE
150° F maximum Ambient Temperature

Failsafe (Protek Battery Back up)

******IMPORTANT******
BATTERY MUST BE DISCONNECTED DURING SHIPMENT. BE SURE TO RECONNECT BATTERY WHEN COMPLETING INSTALLATION

Description

Series 94 electric actuators feature a reversing, brushed DC Motor, with a permanently lubricated gear train. Series 94 electric actuators are equipped with a declutchable manual override, visual position indication, Zytel FR50 enclosure with stainless steel trim, ISO mounting configuration, and a ½" NPT conduit entry.

The Series 94 Failsafe reversing electric actuators feature a fail-safe rechargeable battery pack that provides 12vdc to drive the actuator to a predetermined position upon the loss of supply power.

Also included is a low voltage indicator light on the housing exterior and a "Local/Remote" switch to facilitate calibration during start-up and/or maintenance.

Series 94 models feature a NEMA Type 4X enclosure, and, provide up to 300 in-lbs. of output torque.

All units are provided as tested and calibrated, so no internal adjustments should be required for opweration.

The Series 94 Failsafe electric actuators can not be Certified to UL Standards at this current time.

WARNING: Do not open actuator cover while circuits are energized.

CAUTION: Proper voltage must be supplied or actuator will become damaged.

CAUTION: The Series 94 Failsafe actuator will not operate in pulse power applications

NOTE: To conform to various electrical codes, a **green grounding screw** has been provided (on the baseplate) inside of actuator.

Terminal Strip Wiring: 75° C Copper Supply Wires up to #14 AWG, wired as per the attached diagrams or the wiring diagram affixed inside of actuator cover. Control Wiring shall be insulated with conductors rated 105° C, 300 V minimum. Torque Terminal Strip Wiring to 5 in-lbs.

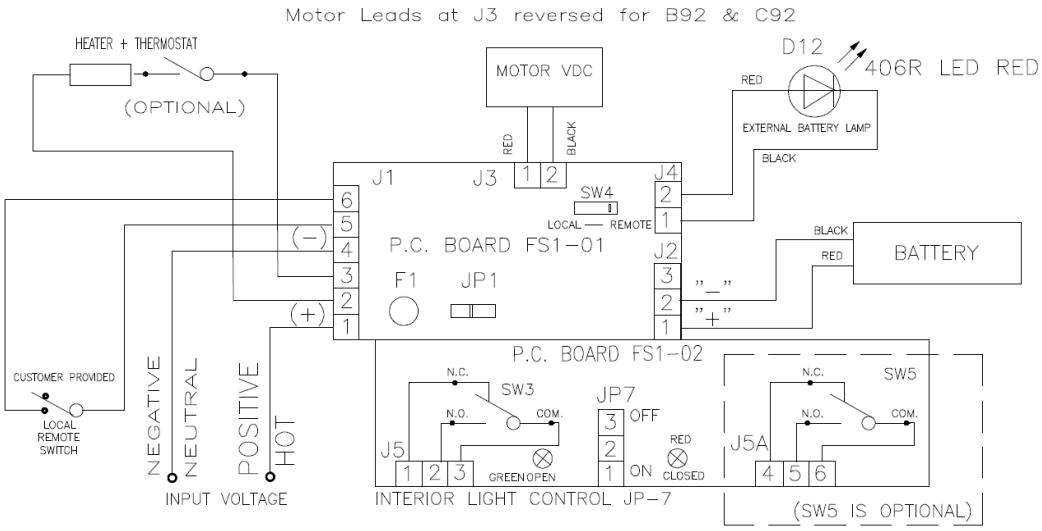
Failsafe Calibration/Operation

The fail-safe option uses a high energy, rechargeable NIMH battery to provide power to the actuator upon loss of primary power.
As long as power is available from the primary power source, the fail-safe relay directs that power through the control relay to the actuator motor and limit switches. Upon loss of power the fail-safe relay will de-energize interrupting the normal power circuits and connect the battery pack to a circuit which bypasses the control relay and powers the actuator to the fail position.

Once the condition that initiated the fail-safe action no longer exists, the circuit board's detection and controls circuits will automatically reset. Immediately upon reset and dependent upon the input to the control circuit, the actuator may drive to the non-fail-safe position

AC SUPPLY: Per drawing No. 0029FS, connect incoming AC power to Terminal Block J1; Hot to Contact #1 and Neutral to Contact #4.

DC SUPPLY: Per drawing No. 0029FS (Shown Below), connect incoming DC power to Terminal Block J1; Positive to Contact #1 and Negative to Contact #4.



The internal LED's on the failsafe PCB can be turned off or on. This is accomplished by setting the jumper at located at JP7. With the jumper installed at terminals 2 & 3, the internal LED's will be ON. With the jumper installed at terminals 1 & 2, the internal LED's will be OFF.

Wiring Techniques
Reference Drawing Above

Failsafe electric actuators can be wired for operation in one of two ways.

1. **Actuated valve in one position indefinitely, and fails to a predetermined position upon loss of power:**

With a customer provided jumper installed in Terminal #'s 5 & 6 at J1, provide constant power to Terminal #'s 1 & 4. This will hold the actuator in the open position as long as power is present, and also provide a trickle charge to the battery pack. When the power is interrupted, the charged battery pack will close the actuator.
NOTE: This wiring configuration is ONLY for a valve that is not cycled.

2. **Actuated valve cycles from open to close via supply power, and fails to a predetermined position upon loss of power:**

With a customer provided dry contact switch installed in Terminal #'s 5 & 6 at J1, provide constant power to Terminal #'s 1 & 4. When the dry contact switch is made, the valve will open. When the dry contact switch is not made, the valve will close. This task is completed via the supply power and does not affect the battery pack. When the supply power is interrupted, the valve will travel via battery pack power to its predetermined position.

The power MUST remain constant to hold the unit into the open position (for a Fail Close Unit) AND to maintain a trickle charge to the battery. Cycling is

achieved via the dry contact switch, and the unit will be driven to its Fail position upon the loss of supply power.

To ensure reliable operation, the battery pack should be replaced every year.

To ensure maximum battery capability, the battery charging voltage must be precisely adjusted to 12.5 - 12.8 volts with no load.

The proper adjustment is made during final test at the factory, but it should be checked upon actuator installation.

Checking/Calibrating the Battery Charging Voltage

Disconnect power!

WARNING: Do not open actuator cover while circuits are energized.

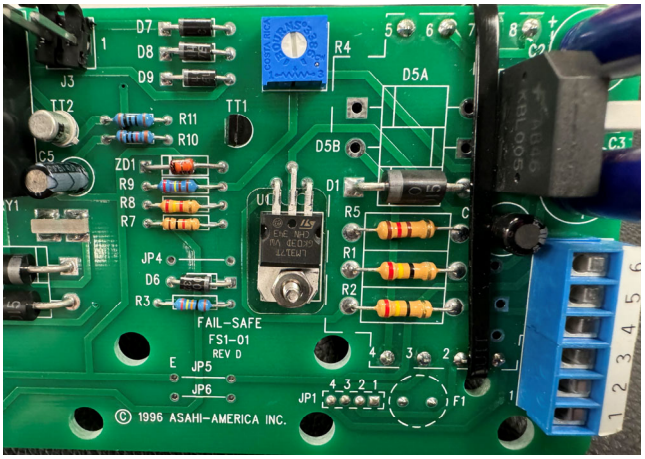
NOTE: Use a digital voltmeter or digital multimeter with ±1.2% accuracy.

1. After disconnecting power, remove manual override handle by loosing slotted setscrew. Loosen cover screws and remove cover.

2. Unplug the battery cable from the circuit board. Check the battery volts at the battery terminal block; the middle contact is negative, and either side terminal is positive. If the voltage measured is not 12.2 volts then it is necessary to charge the battery.

Reference Drawing Number 0029FS (Previous Page)

3. Reconnect power with battery unplugged from circuit board, and measure the voltage at Terminal Block J2; the middle contact is negative, and either side terminal is positive. If the voltage measured is not 12.5 - 12.8, adjust potentiometer R4 until a voltage reading of 12.5 – 12.8 is achieved.



4. Reconnect the battery cable. If battery is fully charged, the low voltage indicator light will be flashing. If the battery is low on charge--battery voltage below 11.5 volts--the low voltage indicator light should be easily visible (almost steady illumination).

Local/Remote Selector Switch (SW4)

The Local/Remote switch allows the user to cycle the valve utilizing only the supply power for commissioning, or calibrating the switches, without the need for assistance from the Contrioller/PLC.

NOTE: All comments below are based on a Fail Close actuator.

When the Local/Remote Selector switch in the Remote positon, the actuator will travel to the closed position, and RED LED indicator will be illuminated.

When the Local/Remote Selector switch in the Local positon, the actuator will travel to the opened position, and GREEN LED indicator will be illuminated.

If you have re-calibrated the travel (micro) switches, this would be the time to cycle the actuator to confirm the switch settings.

When commissioning and/or calibration is complete, slide the Local/Remote Selector switch back to the Remote position for proper interface and operation with the controller/PLC.

Troubleshooting

On/Off Troubleshooting

WARNING: Do not open actuator cover while circuits are energized.

Q: *What if there is no output, but the motor runs?*
A: Manual override possibly engaged.
When the manual override is engaged, the motor will run, but no output will be observed until the manual override re-engages with the output shaft.
A: Valve stem broken. When the valve stem is broken, there will not be a change in fluid movement, making it seem as if the actuator has no output..

Q: *What if valve does not cycle?*
A: No power source to actuator. Check for power.
A: Power source disconnected. Check for broken wire, loose connection or no connection as per appropriate wiring diagram.
A: Low or wrong power source. Check for proper voltage.

A: Mechanical Brake jammed or misaligned. Check alignment of brake assembly.
This could occur during installation when someone would rest their hand on the Mechanical Brake to steady themselves.

***Q:** What if there is water and/or moisture inside of the unit?*
A: Conduit fitting installed improperly. Re-install correctly.
A: Cover and/or base seal damaged. Replace damaged seal(s).
A: Base gasket damaged or installed improperly. Check gasket and replace if necessary.
A: Temperature swings of more than 15 degrees F. Install heater and thermostat to eliminate condensation.
When these temperature swings occur, the unit will “sweat” on the inside causing internal corrosion unless the actuator is equipped with a heater and thermostat to keep a constant temperature inside of the housing.
A: Unit has been submerged. Raise unit above liquid level.
An actuator that is to be submerged MUST meet NEMA Type 6 for the proper protection of the actuator and the elimination of a potential hazard. We do not recommend submerging the Series 92 Actuator as the electrical rating does not meet NEMA 6.

***Q:** What if unit is oscillating?*
A: Valve torque exceeds output torque of actuator. Check for chemical compatibility of valve, and flange torque.

***Q:** What if thermal overload frequently cuts out motor?*
A: Frequency of operation exceeds duty cycle rating. Check cycling period.
A: Unit is oscillating. Refer to above.

***Q:** What if motor hums and no output is observed?*
A: Foreign material caught in valve. Remove material and inspect valve for damaged and/or worn parts. Replace parts as necessary.
A: Unit wired incorrectly (simultaneously powering open and closed). Check wiring as per appropriate wiring diagram.
A: Capacitor worn. Replace.

***Q:** What if actuator “over-shoots” limit switches without stopping?*
A: Actuator wired in parallel to each other. Please note that each actuator requires it’s own set of switch contacts.

Modulating Troubleshooting

WARNING: Do not open actuator cover while circuits are energized.

***Q:** Why is there no response and Manual/FB POT CAL light is lit solid?*
A: J-7 jumper is missing. Replace.
A: Auto/Manual Staion is improperly wired. Wire properly.

***Q:** Why does actuator not respond to input signal (all faults are off)?*
A: Close and Open positions are set to the same position. See Quick Cal Procedure to recalibrate positioner.

***Q:** What if Motor 1 or 2 No Motion (Stall) Fault indicators flash after the actuator reaches full open or full close?*
A: Closed or Open switch is set inside of the operating range. See Quick Cal Procedure to properly adjust switch(es).

***Q:** Why are the AUX Open Output or Aux Close Output indicators flashing?*
A: This is normal if the OTX Option module is NOT installed.
A: OTX Option module needs calibration. See Quick Cal Procedure

***Q:** Why does my actuator hunt for position?*
A: Potentiometer gears not fully meshed.
A: Potentiometer not properly calibrated. See Quick Cal Procedure to calibrate potentiometer.
A: Unstable command from PID control loop. Adjust PID parameters for stable command.

Failsafe Troubleshooting

WARNING: Do not open actuator cover while circuits are energized.

***Q:** What if there is no output, but the motor runs?*
A: Manual override possibly engaged.
When the manual override is engaged, the motor will run, but no output will be observed until the manual override re-engages with the output shaft.
A: Valve stem broken. When the valve stem is broken, there will not be a change in fluid movement, making it seem as if the actuator has no output..

***Q:** What if valve does not cycle?*
A: Possible blown fuse (F1). Check fuse and replace of required.
A: No power source to actuator. Check for power.
A: Power source disconnected. Check for broken wire, loose connection or no connection as per appropriate wiring diagram.
A: Low or wrong power source. Check for proper voltage.

***Q:** What if there is water and/or moisture inside of the unit?*
A: Conduit fitting installed improperly. Re-install correctly.
A: Cover and/or base seal damaged. Replace damaged seal(s).
A: Base gasket damaged or installed improperly. Check gasket and replace if necessary.
A: Temperature swings of more than 15 degrees F. Install heater and thermostat to eliminate condensation.

When these temperature swings occur, the unit will “sweat” on the inside causing internal corrosion unless the actuator is equipped with a heater and thermostat to keep a constant temperature inside of the housing.
A: Unit has been submerged. Raise unit above liquid level.
An actuator that is to be submerged MUST meet NEMA 6 for the proper protection of the actuator and the elimination of a potential hazard. We do not recommend submerging the Series 92 Actuator as the electrical rating does not meet NEMA 6.

Q: *What if unit is oscillating?*
A: Valve torque exceeds output torque of actuator. Check for chemical compatibility of valve, and flange torque.

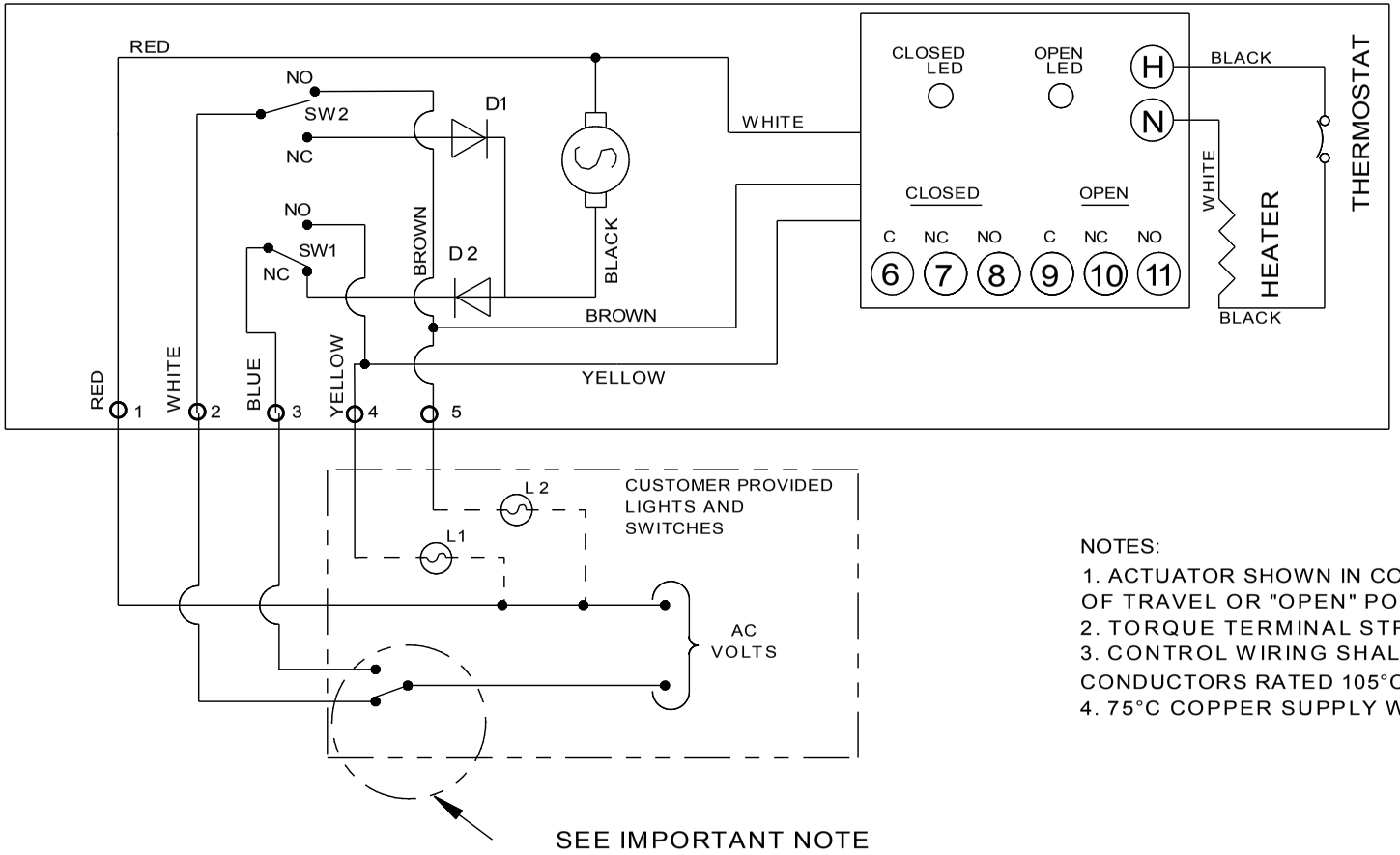
Q: *What if motor hums and no output is observed?*
A: Foreign material caught in valve. Remove material and inspect valve for damaged and/or worn parts. Replace parts as necessary.
A: Unit wired incorrectly. Check wiring as per appropriate wiring diagram.

Wiring Schematics

Schematics Attached to this Manual:
M00EL9903 – Series 92 On/Off with RHM 12/24vac
M00EL9904 – Series 92 On/Off with RHM 12/24vdc
M00EL9905 – Series 92 On/Off with RHM 120/220vac
279S92 – Series 94 Exploded View
M00EL382 – Series 94 Modulating with DHC-100 24vac
M00EL381 – Series 94 Modulating with DCH-100 120/220vac
M00EL7854 – Series 94 Modulating with DHC-400 12/24vdc
0029FS – Series 92 Failsafe 12/24vac, 12/24vdc, 120/220vac

REV	DATE	DESCRIPTION	BY	FROM
A	6/22/17	FIRST ISSUE	JH	KB

AC WIRING DIAGRAM



NOTES:

1. ACTUATOR SHOWN IN COUNTER CLOCKWISE EXTREME OF TRAVEL OR "OPEN" POSITION.
2. TORQUE TERMINAL STRIP WIRING TO 5 IN-LBS.
3. CONTROL WIRING SHALL BE INSULATED WITH CONDUCTORS RATED 105°C, 300V MINIMUM.
4. 75°C COPPER SUPPLY WIRES ONLY.

UNLESS OTHERWISE SPECIFIED		
DIMENSIONS ARE IN INCHES		
MACHINING TOLERANCES:	2 PL DECIMALS	± .01
	3 PL DECIMALS	± .005
	ANGULAR	± 1/2°
	FRACTIONAL	± 1/64
FABRICATION TOLERANCES:	1/2" - 8"	± 1/4
	10" AND UP	± 1/2
	ANGULAR	± 1.0°
WELD TYPE:	N/A	
MATERIAL:	AS NOTED	
FINISH:	125µ"	

	NAME	DATE
DR	J. Hughes	06/22/17
REV		
APPR	K. Blystone	06/22/17

PRODUCT: VALVE & ACT

WO#/SO#

ASAHI/AMERICA
ISO 9001 CERTIFIED
655 ANDOVER STREET, LAWRENCE, MA

SERIES 94 WITH RHM WIRING DIAGRAM 12/24 VAC

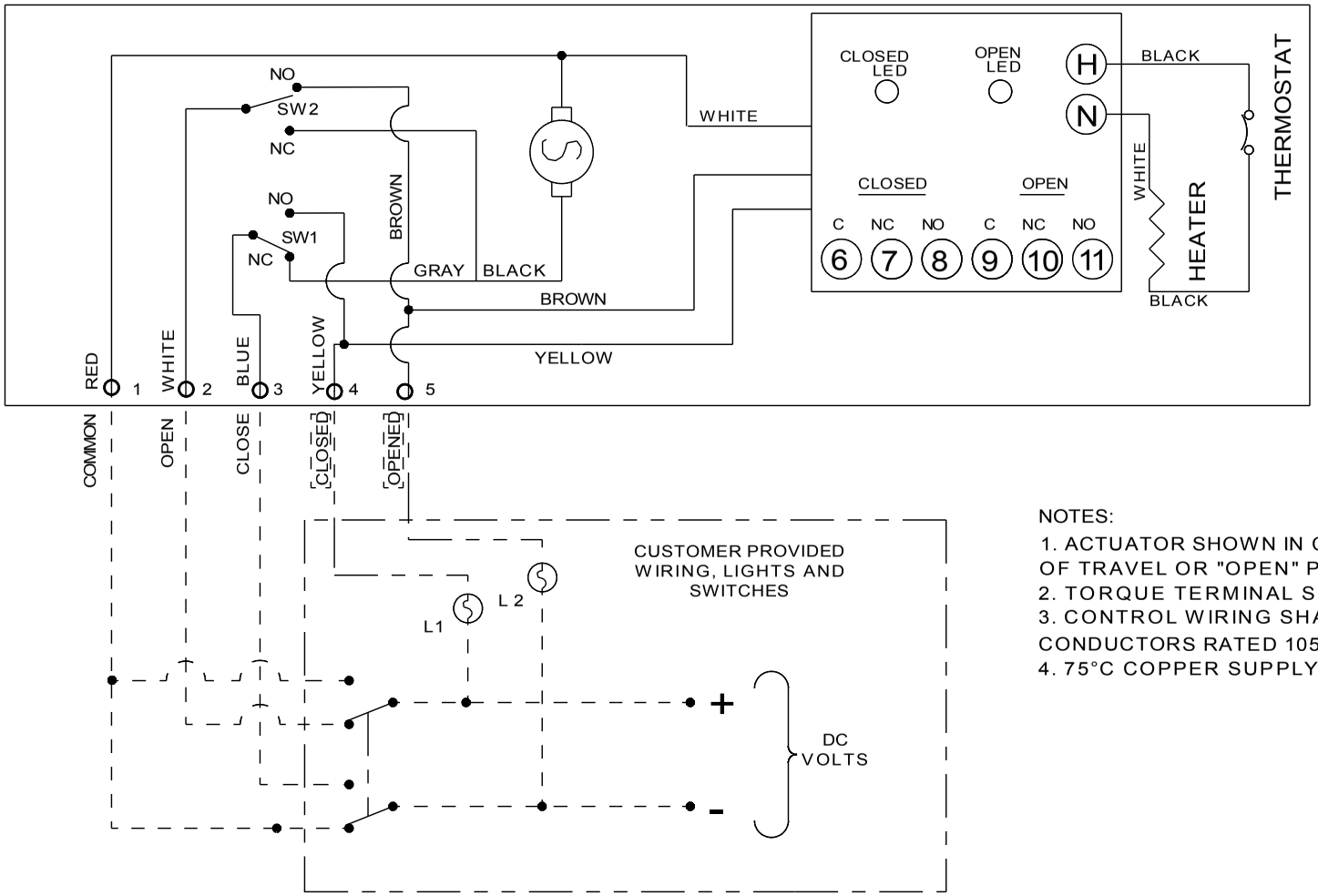
JDE PART # M00EL9903

SIZE A | DWG # **M00EL9903** | REVISION A

SCALE N/A | SHEET 1 OF 1

REV	DATE	DESCRIPTION	BY	FROM
A	6/22/17	FIRST ISSUE	JH	KB

DC WIRING DIAGRAM



NOTES:

1. ACTUATOR SHOWN IN COUNTER CLOCKWISE EXTREME OF TRAVEL OR "OPEN" POSITION.
2. TORQUE TERMINAL STRIP WIRING TO 5 IN-LBS.
3. CONTROL WIRING SHALL BE INSULATED WITH CONDUCTORS RATED 105°C, 300V MINIMUM.
4. 75°C COPPER SUPPLY WIRES ONLY.

UNLESS OTHERWISE SPECIFIED		
DIMENSIONS ARE IN INCHES		
MACHINING TOLERANCES:	2 PL DECIMALS	± .01
	3 PL DECIMALS	± .005
	ANGULAR	± 1/2°
	FRACTIONAL	± 1/64
FABRICATION TOLERANCES:	1/2" - 8"	± 1/4
	10" AND UP	± 1/2
	ANGULAR	± 1.0°
WELD TYPE:	N/A	
MATERIAL:	AS NOTED	
FINISH:	125µ"	

	NAME	DATE
DR	J. Hughes	06/22/17
REV		
APPR	K. Blystone	06/22/17

PRODUCT: VALVE & ACT

WO#/SO#

ASAHI/AMERICA
ISO 9001 CERTIFIED
655 ANDOVER STREET, LAWRENCE, MA

SERIES 94 WITH RHM WIRING DIAGRAM 12/24 VDC

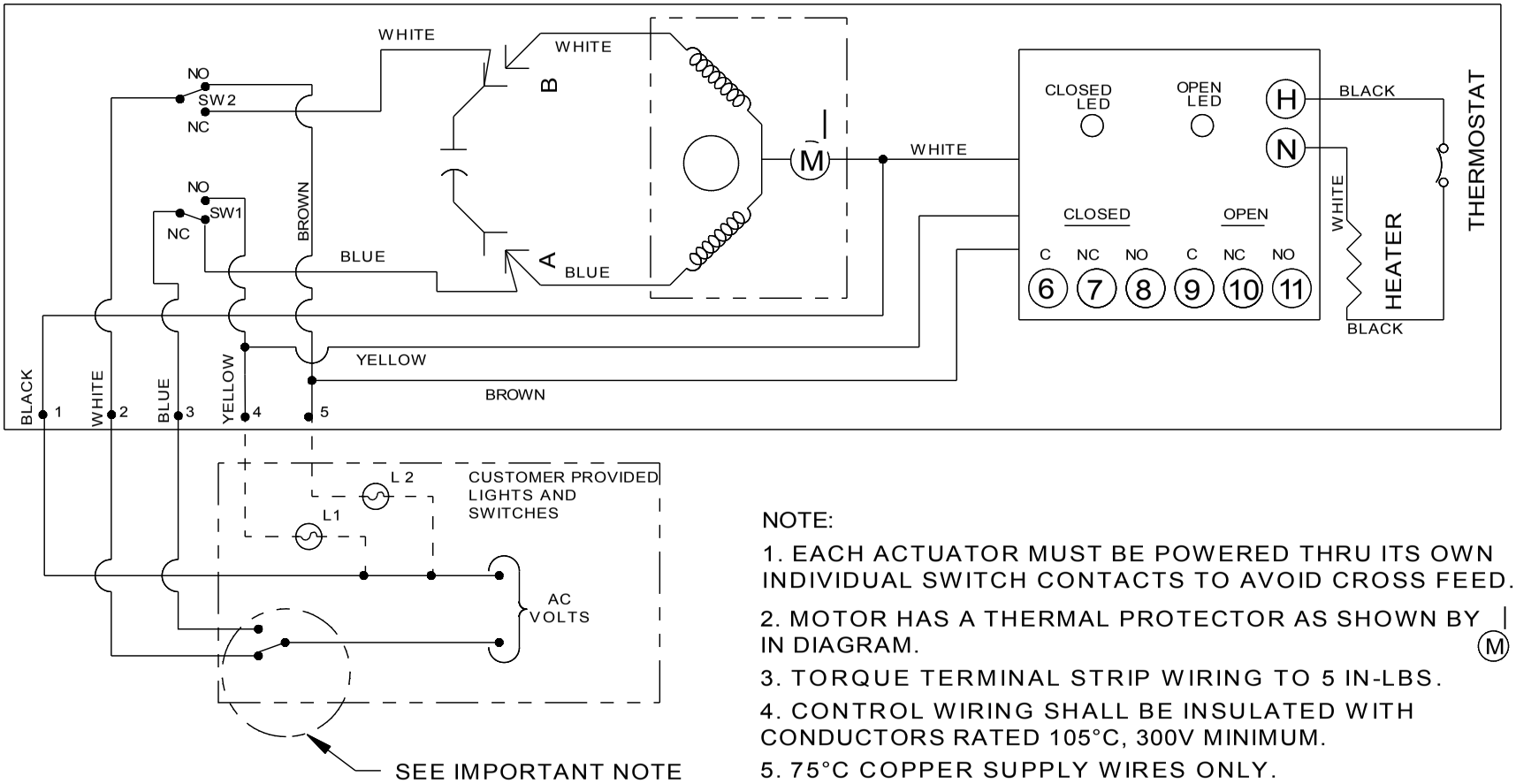
JDE PART # M00EL9904

SIZE A | DWG # **M00EL9904** | REVISION A

SCALE N/A | SHEET 1 OF 1

REV	DATE	DESCRIPTION	BY	FROM
A	6/22/17	FIRST ISSUE	JH	KB

WIRING DIAGRAM FOR 120 VAC AND 220 VAC ONLY
ACTUATOR SHOWN IN COUNTER-CLOCKWISE EXTREME OF TRAVEL, OR "OPEN" POSITION



NOTE:

1. EACH ACTUATOR MUST BE POWERED THRU ITS OWN INDIVIDUAL SWITCH CONTACTS TO AVOID CROSS FEED.
2. MOTOR HAS A THERMAL PROTECTOR AS SHOWN BY | (M) IN DIAGRAM.
3. TORQUE TERMINAL STRIP WIRING TO 5 IN-LBS.
4. CONTROL WIRING SHALL BE INSULATED WITH CONDUCTORS RATED 105°C, 300V MINIMUM.
5. 75°C COPPER SUPPLY WIRES ONLY.

UNLESS OTHERWISE SPECIFIED		
DIMENSIONS ARE IN INCHES		
MACHINING TOLERANCES:	2 PL DECIMALS	± .01
	3 PL DECIMALS	± .005
	ANGULAR	± 1/2°
	FRACTIONAL	± 1/64
FABRICATION TOLERANCES:	1/2" - 8"	± 1/4
	10" AND UP	± 1/2
	ANGULAR	± 1.0°
WELD TYPE:	N/A	
MATERIAL:	AS NOTED	
FINISH:	125µ"	

	NAME	DATE
DR	J. Hughes	06/22/17
REV		
APPR	K. Blystone	06/22/17

PRODUCT: VALVE & ACT
WO#/SO#

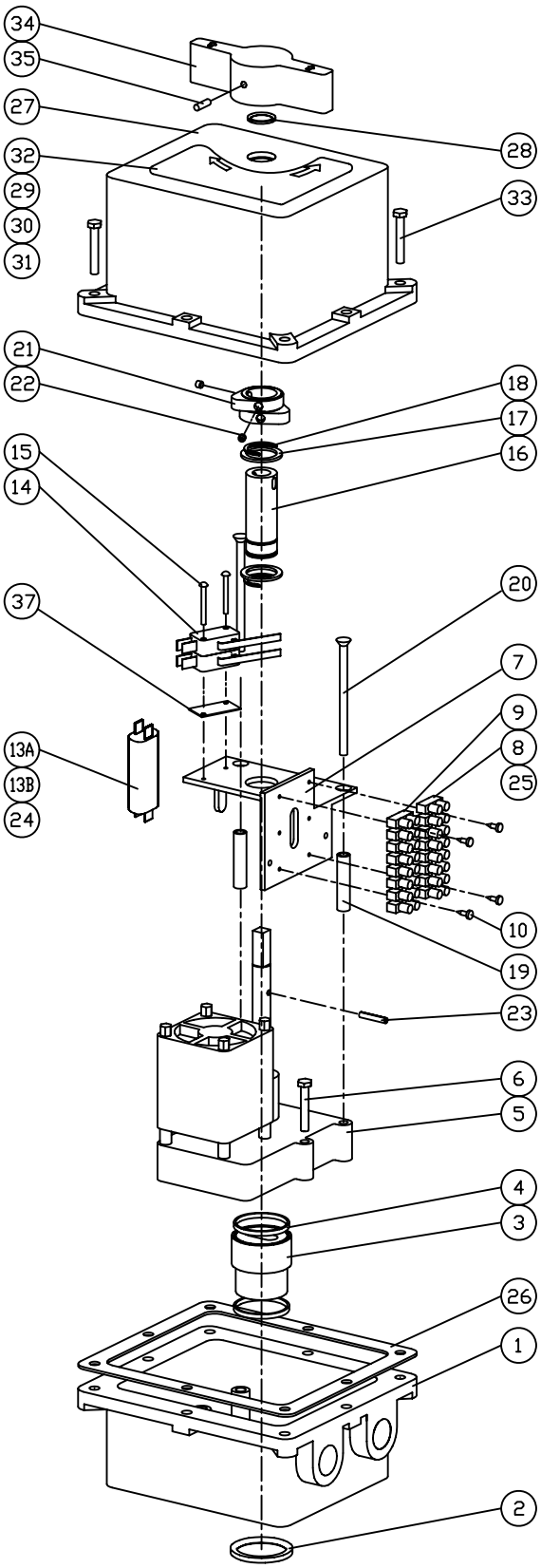
ASAHI/AMERICA
ISO 9001 CERTIFIED
655 ANDOVER STREET, LAWRENCE, MA

SERIES 94 WITH RHM WIRING DIAGRAM 120/220 VAC

JDE PART # M00EL9905

SIZE A | DWG # **M00EL9905** | REVISION A

SCALE N/A | SHEET 1 OF 1



ITEM	PART NO	QTY	DESCRIPTION
1	7403002	1	BASE
2	7403000	1	BASE SEAL
3	7403017	1	OUTPUT COUPLING
4	7403005	2	COUPLING GASKET
5	7403004	1	MOTOR
6	ACTMSC	2	MOTOR SCREW
7	7403011	1	BASE PLATE
8	7401420	1	TERMINAL BLOCK 1-8
9	7401425	1	TERMINAL BLOCK 9-16
10	ACTMSC	4	TERMINAL BLOCK SCREW
13A	7401948	1	4.2 MFD CAPACITOR - A94
13B	7402004	1	6.7 MFD CAPACITOR - B94
14	7401460	2	MICRO SWITCH (V7-6C13D8-132)
15	ACTMSC	2	LIMIT SWITCH SCREW
16	7403016	1	OUTER SHAFT
17	7403006	2	OUTER SHAFT GASKET
18	ACTMSC	2	RETAINING RING
19	ACTMSC	2	STANDOFF
20	ACTMSC	2	BASE PLATE SCREW
21	7401480	2	CAM
22	ACTMSC	4	CAM SCREW
23	ACTMSC	1	PIN
24	7403023	1	2 PC HARNESS
25	7403015	1	4 PC HARNESS
26	7403007	1	BASE GASKET
27	7403001	1	COVER
28	7403020	1	COVER SEAL
29	7403019	1	WIRE DIAGRAM LABEL
30	7403025	1	OPTION LABEL
31	7403030	1	QM II LABEL
32	7403040	1	OVERRIDE LABEL
33	ACTMSC	8	COVER SCREW
34	7403003	1	HANDLE
35	ACTMSC	1	HANDLE SCREW
36	7403021	1	QM II BOX
37	7403240	1	NOMEX INSULATOR PLATE (220VAC ONLY)

NOTE:
1. LOCATE ITEM 29 & 30 ON INSIDE SURFACES OF COVER (ITEM 27).
2. LOCATE ITEM 31 ON OUTSIDE BACK SURFACE OF COVER (ITEM 27).

	NAME	DATE
DR	J.GLASSFORD	6/18/07
APPD	D.HURLEY	6/18/07
PROD	L.LESTER	6/19/07
WO#/SO#		
FILE	ACAD11/QM	

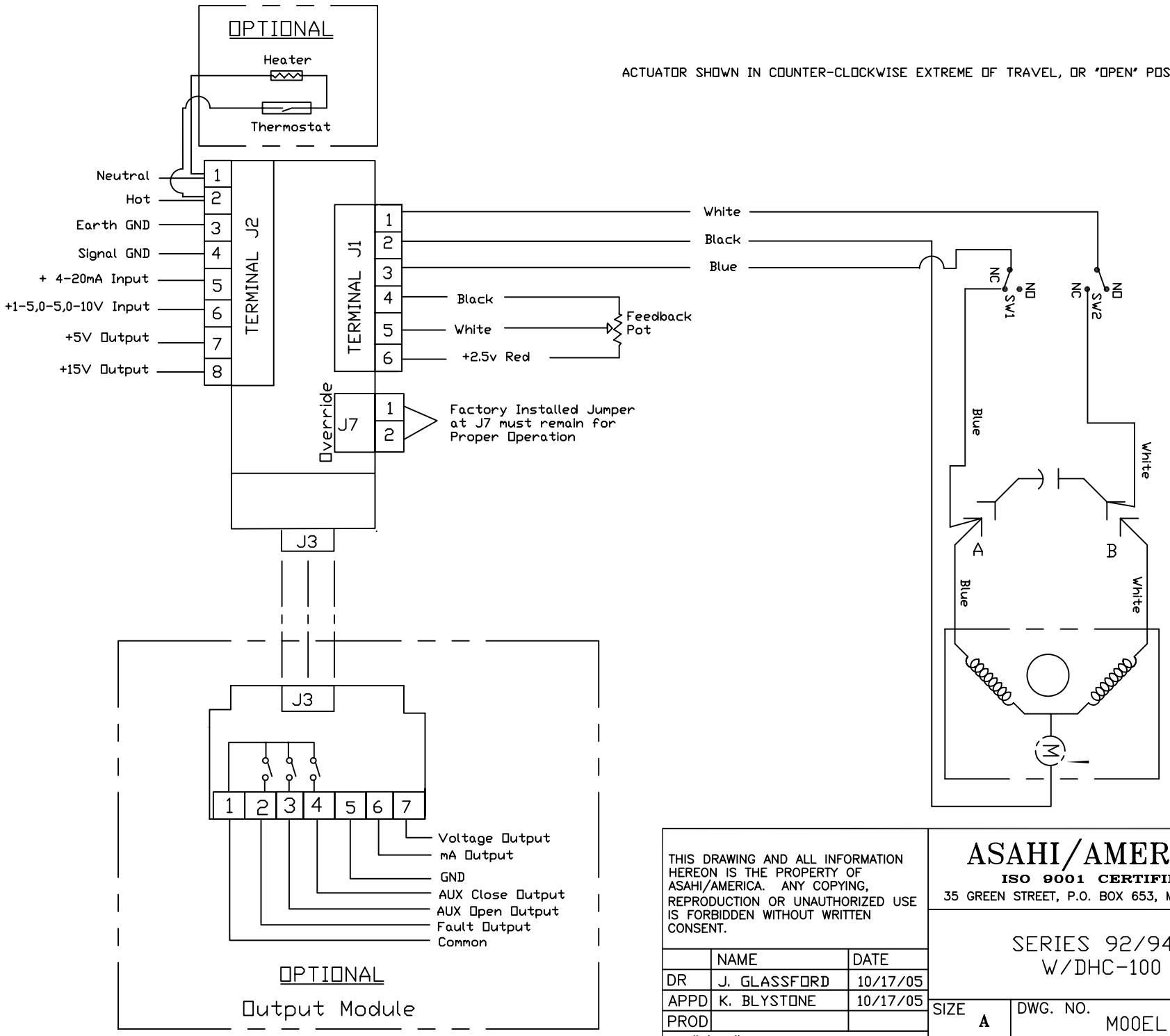
ASAHI/AMERICA
ISO 9001 CERTIFIED
35 GREEN STREET, P.O. BOX 653, MALDEN, MA.

SERIES 94 EXPLODED VIEW

SIZE	DWG. NO.	REV
A	279QM	D

SCALE NTS

SHEET 1 OF 1

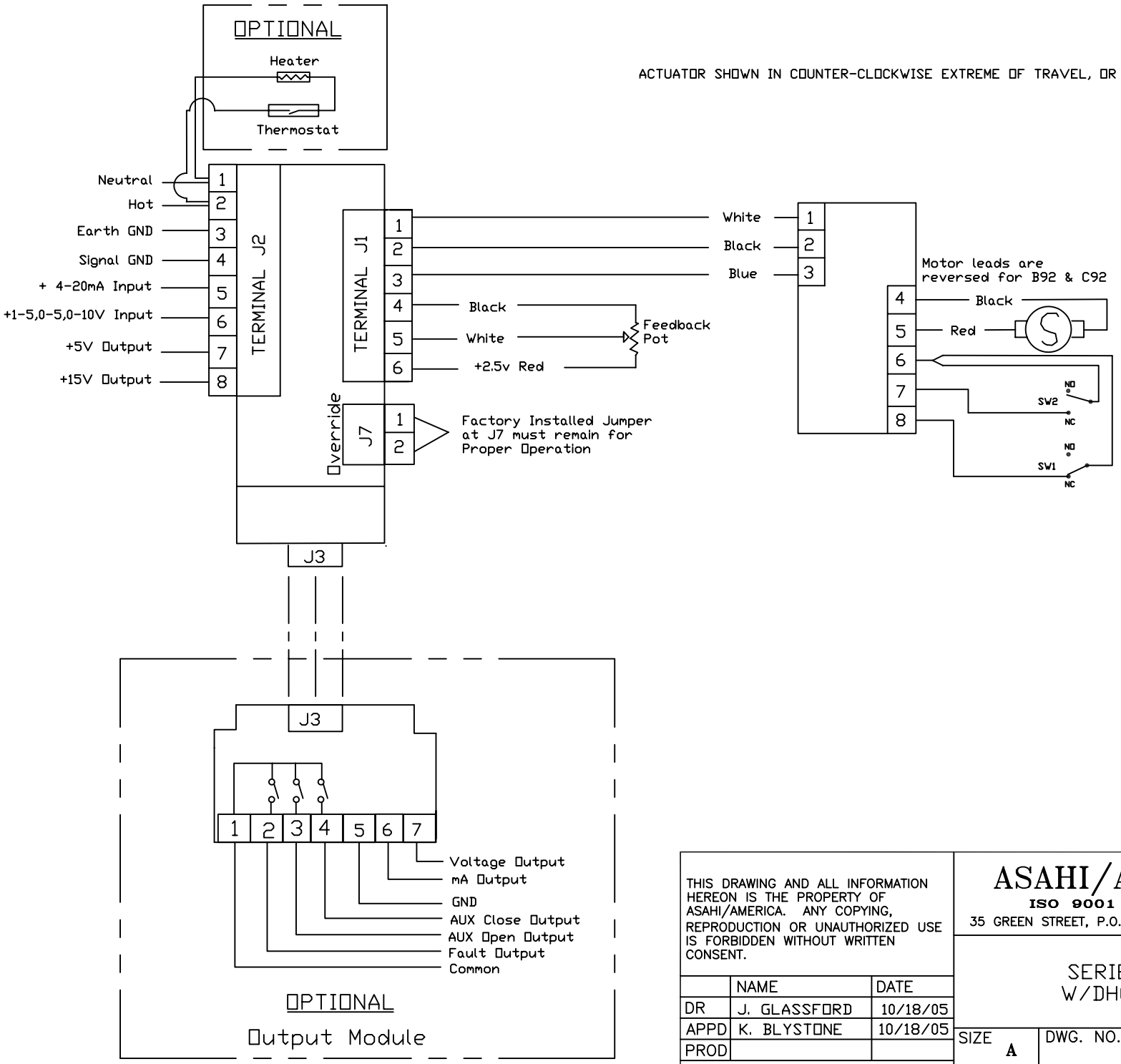


	NAME	DATE
DR	J. GLASSFORD	10/17/05
APPD	K. BLYSTONE	10/17/05
PROD		
WO#/SO#		
FILE		

ASAHI/AMERICA
ISO 9001 CERTIFIED
35 GREEN STREET, P.O. BOX 653, MALDEN, MA.

SERIES 92/94 115/230 VAC W/DHC-100 POSITIONER

SIZE	DWG. NO.	REV
A	M00EL381	A
SCALE NTS		SHEET 1 OF 1



	NAME	DATE
DR	J. GLASSFORD	10/18/05
APPD	K. BLYSTONE	10/18/05
PROD		
WO#/SO#		
FILE		

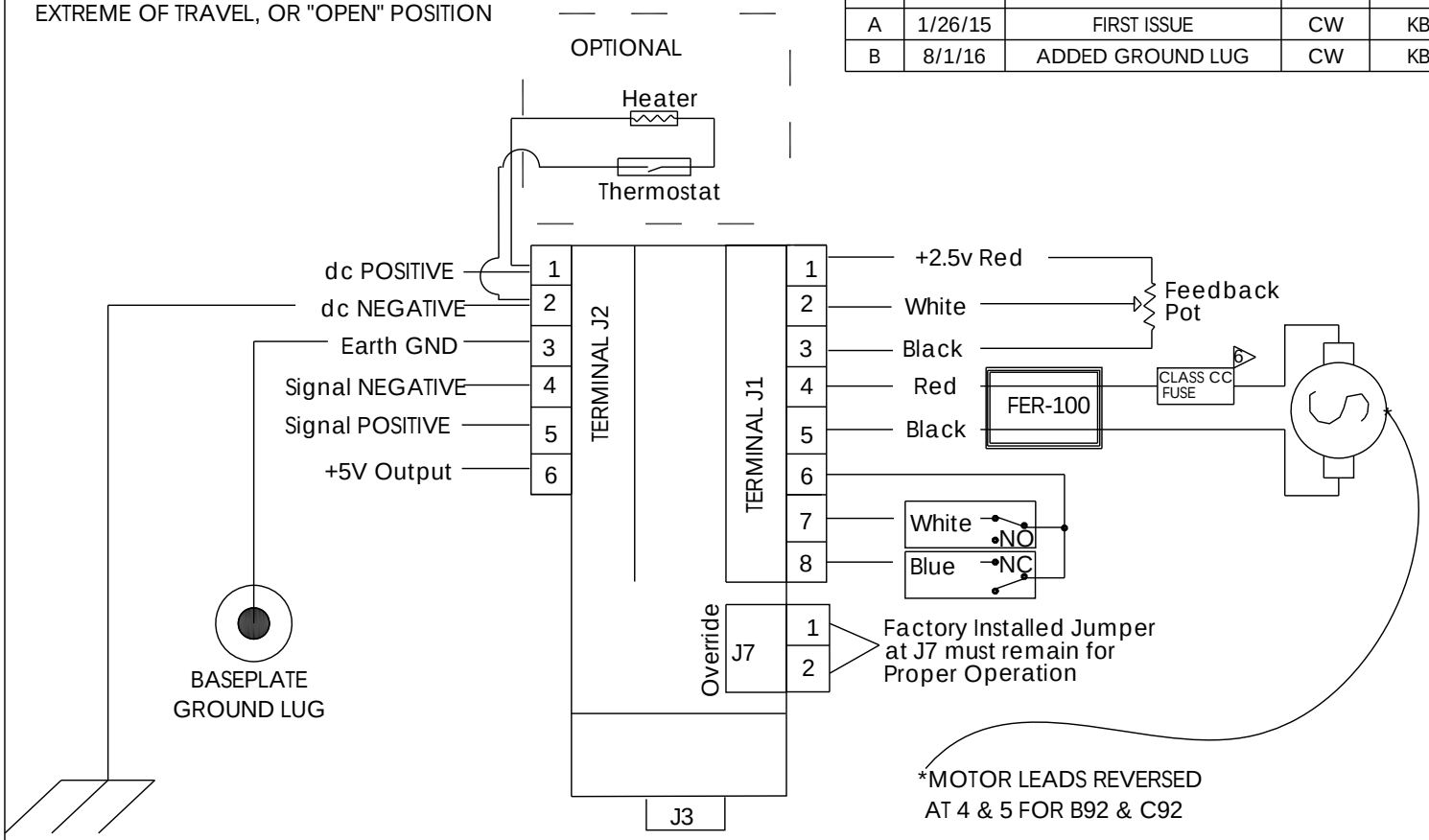
ASAHI/AMERICA
ISO 9001 CERTIFIED
35 GREEN STREET, P.O. BOX 653, MALDEN, MA.

SERIES 92/94 24VAC W/DHC-100 POSITIONER

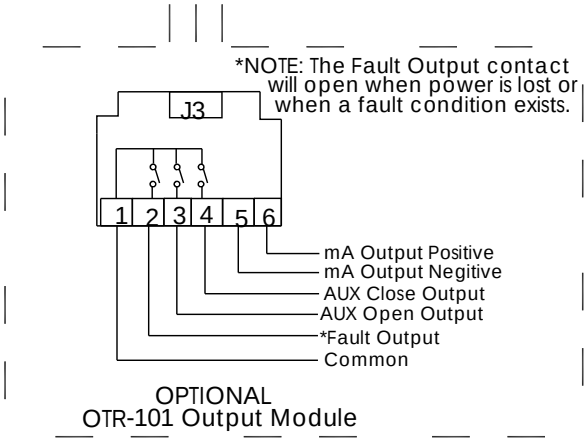
SIZE	DWG. NO.	REV
A	M00EL382	A
SCALE NTS		SHEET 1 OF 1

REV	DATE	DESCRIPTION	BY	FROM
A	1/26/15	FIRST ISSUE	CW	KB
B	8/1/16	ADDED GROUND LUG	CW	KB

ACTUATOR SHOWN IN COUNTER-CLOCKWISE EXTREME OF TRAVEL, OR "OPEN" POSITION



DC NEGITIVE MUST BE CONNECTED TO EARTH GROUND AT POWER SOURCE



1. TORQUE TERMINAL STRIP WIRING TO 5 IN-LBS
2. CONTROL WIRING SHALL BE INSULATED WITH CONDUCTORS RATED AT 105°C, 300V MINIMUM
3. 75°C COPPER SUPPLY WIRES ONLY
4. UL UNITS REQUIRE LITTLEFUSE L60030C1C FUSE HOLDER WITH LITTLEFUSE CCMR004.TXP 4A FUSE FOR 24VDC POWER SUPPLY, OR LITTLEFUSE CCMR002.TXP 2A FUSE FOR 12VDC POWER SUPPLY

UNLESS OTHERWISE SPECIFIED		
DIMENSIONS ARE IN INCHES		
MACHINING TOLERANCES:	2 PL DECIMALS	± .01
	3 PL DECIMALS	± .005
	ANGULAR	± 1/2°
	FRACTIONAL	± 1/64
FABRICATION TOLERANCES:	1/2" - 8"	± 1/4
	10" AND UP	± 1/2
	ANGULAR	± 1.0°
WELD TYPE: N/A		
MATERIAL: N/A		
FINISH: N/A		

	NAME	DATE
DR	C. Williams	01/26/15
REV		
APPR	K. Blystone	08/01/16

PRODUCT: VALVE & ACT

WO#/CO#

ASAHI/AMERICA
ISO 9001 CERTIFIED
655 ANDOVER STREET, LAWRENCE, MA

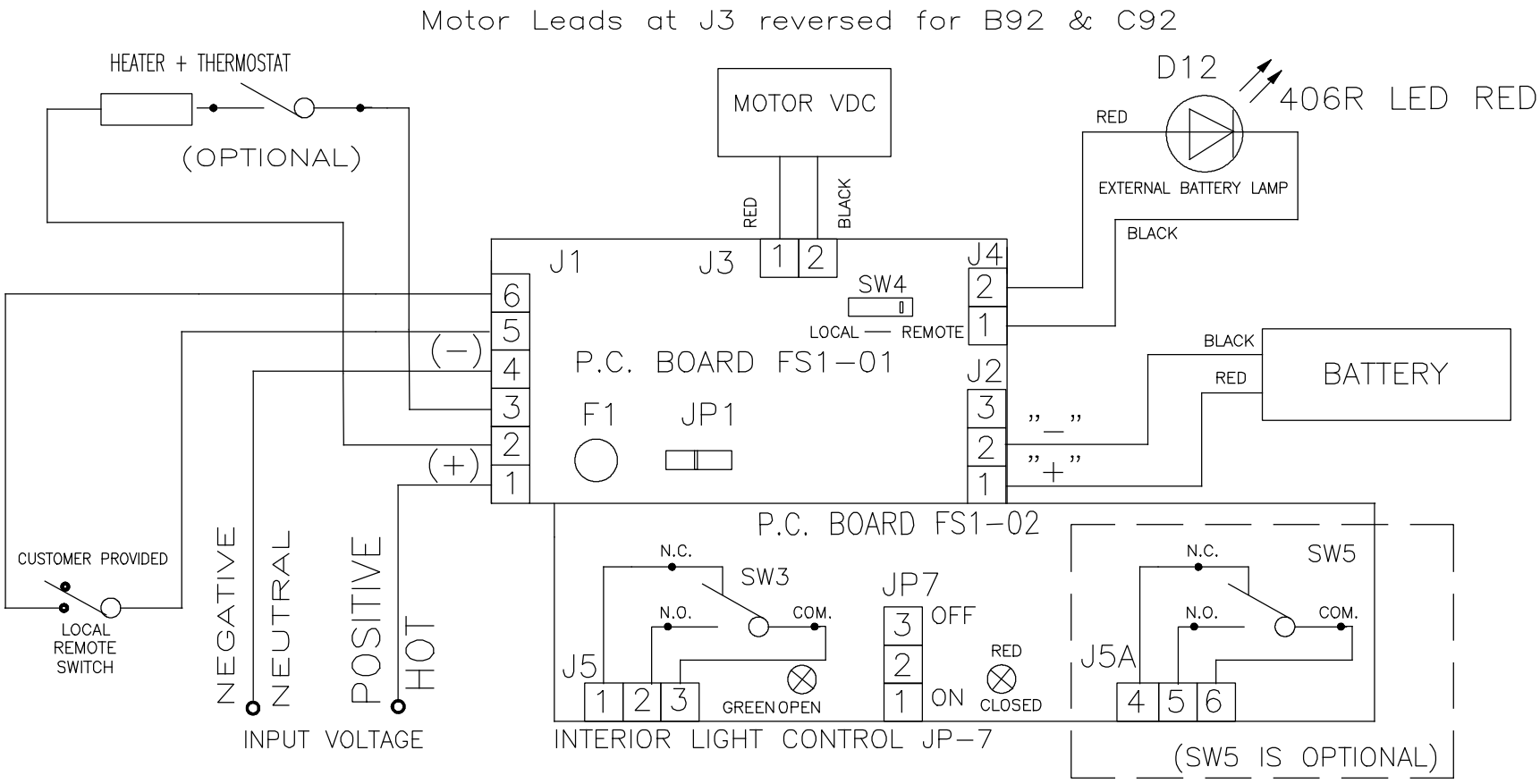
SERIES 92/94 12/24 VDC
W/DHC-400 & OTR-101 POSITIONER

JDE PART #

SIZE A | DWG # M00EL7854 | REVISION B

SCALE N/A | SHEET 1 OF 1

SERIES 92 + 94 WITH PROTEK FAILSAFE BATTERY PACK



NOTES 1:

F1 - FUSE TR5 # 19373 FAST−ACTING

FOR 120VAC/220VAC − 2.0A

12VAC/12VDC − 3.0A

24VAC/24VDC − 4.0A

	NAME	DATE
DR	KENICHI MIYAZAKI	1/8/02
APPD	DAVE HURLEY	1/8/02
PROD	LEO LESTER	1/8/02
WO#/CO#		
FILE		

ASAHI/AMERICA
ISO 9001 CERTIFIED
35 GREEN STREET, P.O. BOX 653, MALDEN, MA.

FSI WIRING DIAGRAM
FAIL - SAFE

SIZE	DWG. NO.	REV
A	0029FS	B

SCALE NTS

SHEET 1 OF 1