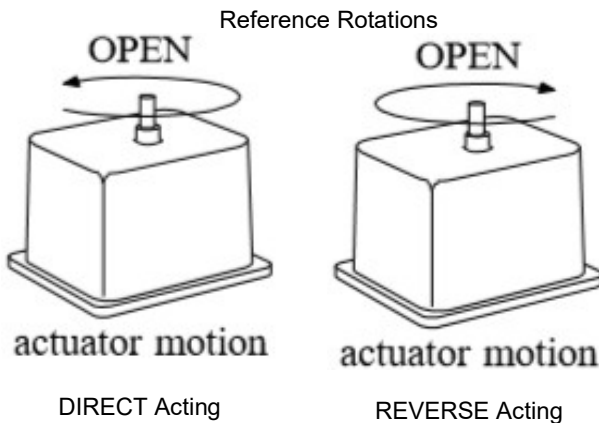
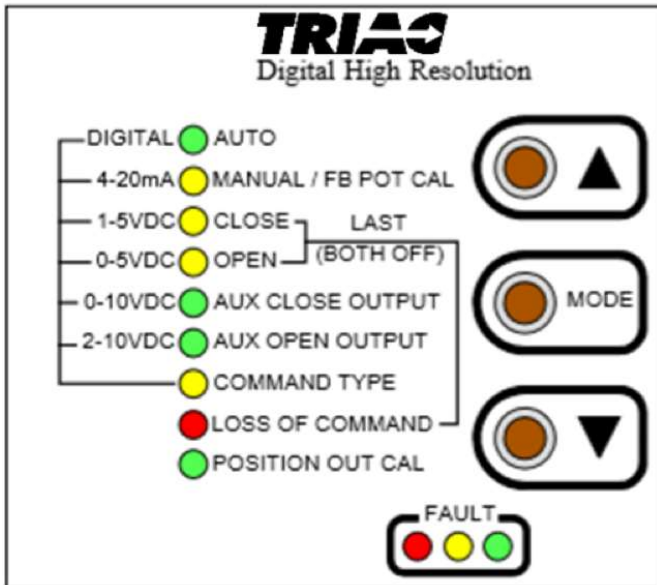


GENERAL

The MODE button selects a particular function, or mode, and the indicator for the selected mode turns on solid. 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 the current mode. For more details regarding calibration and features refer to the manual.



Quick Calibration Procedure

- Before applying power, ensure that the unit is properly mounted and properly wired to the actuator. Refer to the pertinent MKT Data Sheet specified for the actuator. Ensure potentiometer gears are tight and properly meshed.
- 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.
- 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.
- Use the adjust buttons (▲ and ▼) to move the actuator and verify that the limit switches are set past the desired open and closed positions, but not so far as to interfere with the mechanical end stops, if the actuator has this feature. Then move the actuator to mid stroke.
- If LED is solid, proceed to Step 7.
- If LED is flashing, loosen the gear on the actuator shaft and rotate the potentiometer 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 as a slower rate the farther away from the mid position it gets. Once the LED is on solid tighten the actuator shaft gear and ensure that the gear engagement is tight and properly meshed.
- Push the MODE button until the "CLOSE" LED is lit solid. Use the adjust buttons (▲ and ▼) to drive the actuator toward the desired closed position until the associated limit switch trips. Then tap the other adjust button to move the actuator just off the limit switch to the desired valve closed position. This position corresponds to a minimum input signal.
- Push the MODE button until the "OPEN" LED is lit solid. Use the adjust buttons (▲ and ▼) to drive the actuator toward the desired open position until the associated limit switch trips. Then tap the other adjust button to move the actuator just off the limit switch to the desired valve open position. This position corresponds to a maximum input signal.
- If an OTR-101 option module is installed, follow **Auxiliary Open/Close Setup** (see below); otherwise continue to the next step.
- Push the MODE button until the "COMMAND TYPE" LED is lit solid. Use the adjust buttons (▲ and ▼) to select the 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.
- Push the MODE button until the "LOSS OF COMMAND" LED is lit solid; 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).
- If an OTR-101 or OTX-101 option module is installed, follow **Position Output Mode Setup** (see below); otherwise continue to the next step.
- Push the MODE button until the "AUTO" LED is lit solid. Your calibration is not **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.

Auxiliary Open/Close Setup

(for units with an OTR-101 option module only)

1. Push the MODE button until the "AUX CLOSE OUTPUT" LED is lit solid. 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 lit solid. Use the adjust buttons (▲ and ▼) to drive the actuator to the desired auxiliary open position.
3. Continue with Step 10 in the **Quick Calibration Procedure** (see above).

Position Output Mode Setup

(for units with an OTR-101 or OTX-101 option module only)

1. Push the MODE button until the green "POSITION OUT CAL" LED is lit solid **while** the "CLOSE" LED flashes.
2. Use the adjust buttons (▲ and ▼) to set the desired output voltage (VDC) or current (mA) on the option module output for the closed position.
3. Push the MODE button so the "POSITION OUT CAL" LED remains solid **while** the "OPEN" LED flashes. Use the adjust buttons (▲ and ▼) to set the desired output voltage (VDC) or current (mA) on the option module output for the open position.
4. Continue with Step 13 in the **Quick Calibration Procedure** (see above).

FAULT INDICATORS

The TDC-400 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 for 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.

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	flash	OFF	Motor 1 No Motion
ON	OFF	flash	Motor 2 No Motion
ON	flash	flash	Double No Motion
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

Low Battery Voltage - When the TDC-400 detects that the battery/power supply voltage connected to BAT POS (J2-1) and BAT NEG (J2-2) drops below 10V, the motor outputs are turned off and the TDC-400 suspends all other operations until the voltage returns to 10V or more. However, the Low Battery Voltage fault indication will maintain for 3 seconds after voltage returns. Since DC motors present a large load (from in-rush currents) when turned on, a weak battery or insufficient power supply may experience a short voltage drop below 10V until the motor begins to move. Therefore, the Low Battery Voltage indication provides warning of batteries in need of recharge or power supplies that have insufficient current for the application.

Motor 1 Stall - A *stall* condition is detected when no actuator motion is detected while the Motor 1 output is turned on and drawing more than 0.5A of motor current. The fault condition will disable the Motor 1 output only, and the fault is cleared when the TDC-400 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 Stall - A *stall* is detected when no actuator motion is detected while the Motor 2 output is turned on and drawing more than 0.5A of motor current. The fault can be cleared in the same manner as previously described for a Motor 1 Stall.

Double Stall - If the TDC-400 detects a *stall* condition in both directions, 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 TDC-400 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.

Motor 1 Current Trip - A *current trip* fault is detected when the motor current exceeds the current trip setting (see TRIP SETTING) while the Motor 1 output is turned on. The fault can be cleared in the same manner as previously described for a Motor 1 Stall. NOTE: Successive attempts with manual operation using the adjust buttons can exceed the torque limit set by the Trip Setting.

Motor 2 Current Trip - A *current trip* fault is detected when the motor current exceeds the current trip setting (see TRIP SETTING) while the Motor 2 output is turned on. The fault can be cleared in the same manner as previously described for a Motor 1 Current Trip.

Double Current Trip - If the TDC-400 detects a *current trip* fault in both directions, both motor outputs will be disabled. The fault can be cleared in the same manner as previously described for a Double Stall.

Motor 1 No Motion - A *no motion* fault is detected when no actuator motion is detected while the Motor 1 output is turned on and drawing less than 0.5A of motor current. The fault can be cleared in the same manner as previously described for a Motor 1 Stall. A *stall* usually indicates a heavy mechanical load or stall, while a *no motion* fault usually indicates a broken motor wire or disengaged feedback pot. Note that a *stall* cannot be detected in applications using very small motors (locked rotor currents less than 0.5A); only a *no motion* fault can be detected.

Motor 2 No Motion - A *no motion* fault is detected when no actuator motion is detected while the Motor 2 output is turned on and drawing less than 0.5A of motor current. The fault can be cleared in the same manner as previously described for a Motor 1 Stall. A *no motion* fault differs from a *stall* as previously describe for a Motor 1 No Motion fault.

Double No Motion - If the TDC-400 detects a *no motion* fault in both directions, both motor outputs will be disabled. The fault can be cleared in the same manner as previously described for a Double Stall.

Feedback Alarm - A fault condition is detected whenever the feedback signal is out of range (that is, less than 5% of the 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

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSES	REMEDIES
No response from unit (All lights are off)	No power. Excessive voltage applied to unit. Blown or missing fuse.	Check power source. Replace unit. Replace with appropriate fuse; see "Specifications in manual.
No response from unit, and no response from adjust (▲ and ▼) or MODE buttons. (MANUAL/FB POT CAL light is lit solid)	Jumper wire on J7 terminal block is missing. Auto/Manual station is improperly wired.	Install jumper wire on J7 terminal block. Check wiring on Auto/Manual station; see "Override Mode" in manual.
Actuator rotates valve backwards	Actuator or valve is mounted incorrectly on coupling. Actuator needs to be reverse acting.	Remount actuator as necessary. Refer to "Close" and "Open" modes in manual.
Actuator does not respond to input signal (all FAULT indicators off).	Closed and open positions are set to the same position.	Set close and open settings; refer to "Close" and "Open" modes in manual.
Motor 1 or 2 No Motion (Stall) FAULT indicators flash after actuator reaches fully closed or open position.	Closed or open limit switches set inside the operating range. Torque switches trip due to mechanical end stops set inside the operating range.	Adjust limit switch cams; refer to "Close" and "Open" modes in manual. Adjust mechanical end stops; refer to "Close" and "Open" modes in manual.
AUX CLOSE OUTPUT or AUX OPEN OUTPUT indicators flash. If an OTR-101 option module is not installed, no remedy is required.	Actuator position is near close or open.	If and OTR-101 option module is installed, set Aux Close and Aux Open positions; refer to "Aux Close Output" and "Aux Open Output" modes in manual.

<p>Actuator hunts for position.</p>	<p>Sloppy gear tooth engagement.</p> <p>No motor brake or brake slipping.</p> <p>Unstable command input signal from PID control loop.</p>	<p>Adjust feedback potentiometer gears for tight engagement.</p> <p>Install or repair motor brake.</p> <p>Adjust PID parameters for stable command signal.</p>
<p>Triac output failure (Motor buzzes and overheats).</p> <p>Perform appropriate remedy, <u>then</u> replace the unit.</p>	<p>Exposure to water from conduit entrance.</p> <p>Exposure to water from unsealed actuator housing.</p> <p>Exposure to moisture from condensate.</p> <p>Corrosion from exposure to salts or acids.</p> <p>External power applied to motor connections as J1-1 or J1-3.</p> <p>Lightning or power surge.</p>	<p>Install drip loop at conduit entrance.</p> <p>Inspect and/or replace actuator housing gasket; use actuator with proper sealing.</p> <p>Use heater and thermostat and/or desiccant packets.</p> <p>Use corrosion inhibitors and desiccant packets.</p> <p>Remove connector J1 prior to applying external power.</p> <p>Replace unit.</p>

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