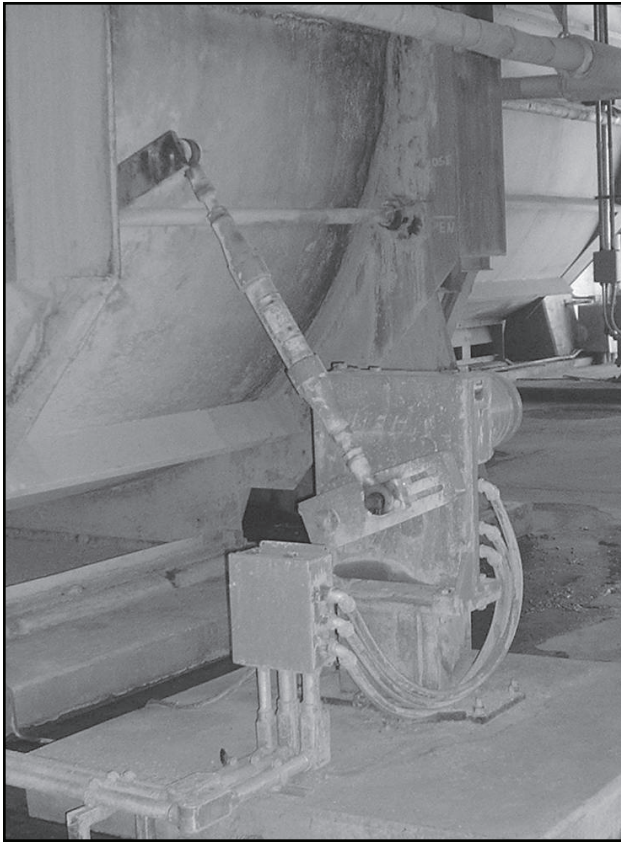


**MODELS 22-309
22-409
22-809**

BECK[®]

Group 22 - Quick Reference



PAGES 2-7 -- WIRING CONNECTIONS

PAGES 8-11 -- ELECTRONICS

PAGES 12-13 - MAINTENANCE KITS

**PAGES 14-17 -- TROUBLESHOOTING
AND TESTPOINTS**

PAGES 18-19 -- HART MENU

**This reference supports
Group 22 actuators
using DCM-2 part numbers:**

12-8224-41

12-8224-45

12-8224-51

12-8224-55



ELECTRIC ACTUATORS FOR INDUSTRIAL PROCESS CONTROL

INSTALLATION - ELECTRICAL

POWER QUALITY

Power quality disturbances such as power outages, transient voltages, harmonic distortions, and electrical noise should be accounted for during installation of your drive. Protecting your drive from these conditions can reduce downtime and promote a longer lifetime for the equipment. Following the recommendations below will maximize the protection.

- ✦ Select wiring materials according to the correct ampacity ratings dictated by national and local regulations.
- ✦ Shielded, twisted pair cables can be used for signal connections to avoid being affected by electrical noise. These signal wires, based on Noise Susceptibility Level (NSL) per IEEE-518, fall into the level 1 classification. A braided shield will be more effective than a wrapped foil shield. Signal wire shields should be connected to the drive casting grounding screw. If grounding at the signal source is required, then the shield should not be grounded at the drive.
- ✦ Raceways such as conduits and trays have to be grounded at both ends to properly meet immunity requirements.
- ✦ An AC power ground connection should be made between the power source and the Beck drive. Grounding connections including wire and metal conduit are permitted, except the drive-grounding conductor may not be connected to a structured metal frame of a building.
- ✦ Surge suppression equipment that meets Underwriters Laboratory (UL) Standard 1449 may be used to protect against transient voltage conditions.
- ✦ Power Conditioners may be used to regulate the supply voltage and maintain a constant voltage level. They are helpful in protection against voltage sags and swells, as well as some measure of electrical noise protection.
- ✦ Harmonic filters may be used to minimize the effects of supply voltage waveform distortions and are used in applications that incur a large amount of high-frequency electronic noise.

ELECTRICAL INSTALLATION

Three 1" N.P.T. conduit connections are provided for power and signal wiring to the drive. One conduit is provided for signal wiring connections, and the other conduits are provided for power and auxiliary switch connections. Use of a sealant on the threaded conduit connections is recommended to keep moisture out. Routing the conduits from below the drives will help to prevent water and other contaminants from entering the drive.

Power and signal wires should be routed to the drive separately. Shielded cables are recommended, otherwise the wires should be installed in conductive conduit and/or cable trays.

Large, clearly labeled terminal blocks are enclosed in a gasketed compartment. Terminals will accommodate up to 12 AWG (3.31 mm²) wires.

Refer to the wiring diagram furnished with your Beck drive (fastened to the inside of the terminal block cover) for proper AC power and signal connections. It is advisable to provide normal short circuit protection on the AC power line.

For maximum safety, the Beck drive body should be grounded. Separate ground terminals are provided in the wiring compartment for power and signal wiring. Wire size 12 AWG (3.31 mm²) is recommended for this purpose.

TERMINAL CONNECTIONS

The Group 22 terminal block assemblies have screw-down clamp terminals with separation barriers and nylon paper electrical shields (shields not shown on terminal connection diagrams). The terminals can accept a variety of lug types or a bare wire. The maximum wire size capacity is #12 AWG (3.31 mm²).

TERMINAL SCREW TORQUES

Regardless of wire termination type, each terminal screw should be torqued to the proper specification upon landing your wire.

All input power terminal screws (terminals 1 to 3) on the model 22-309 and 22-409 should be tightened to 10 lb-in. The input power terminal screws on the model 22-809 and the optional transformer enclosure for 22-309 and 22-409 drives should be tightened to 20 lb-in. All signal wiring terminal screws (terminals 4 to 21) on all Group 22 models should be tightened to 9 lb-in. Both the power and signal ground screws should be tightened to 20 lb-in.

SUPPLY POWER TERMINALS 1, 2, AND 3

Standard supply power for the model 22-309 is single-phase 120 VAC (refer to the drive nameplate for specific rating). Input power connects line to terminal 1, neutral to terminal 2, and ground to the enclosure power ground screw. Terminal 3 is unused for 120 VAC operation.

Standard supply power for the model 22-409 is three-phase 208 VAC. Standard supply power for the model 22-809 is three-phase 480 VAC. Lines 1, 2, and 3 connect to terminals 1, 2, and 3 respectively on each of these drives. The ground wire should be connected to the enclosure power ground screw.

Alternate voltage options include single-phase 240 VAC for the model 22-309 and three-phase 208, 240, 380, 416, 480, & 575 VAC for all Group 22 models. The model 22-309 and 22-409 require an optional transformer enclosure to accommodate any non-standard voltage configuration.

Group 22 drives are equipped with a transient protector assembly installed across each, or a combination of terminals 1, 2, and 3 (dependent upon your drive model and configuration). Note: The transient protector assembly should not be removed.

AUXILIARY LIMIT SWITCHES TERMINALS 4 THROUGH 9

Group 22 drives include two single pole double throw (SPDT) auxiliary limit switches rated for 1 Amp at 250 VAC. These switches may be useful for discrete position indication. The limit switches are actuated by adjustable cams on the control shaft (located with the position sensing device). Details on standard factory switch settings can be found in the configuration section of this manual.

AUTO MODE INDICATION TERMINALS 10 AND 11

A dry contact is available at terminals 10 and 11 to indicate when the handswitch is in the AUTO position. The switch contact is Form A; when the handswitch is not in the AUTO position, the contact is open and when the handswitch is in the AUTO position, the contact is closed. The contact is rated for 1 Amp at 250 VAC.

CAUTION

Always close covers immediately after installation or service to prevent moisture or other foreign matter from entering the drive.

SYSTEM ALARM TERMINALS 12 AND 13

Indication of the system alarm is available as a dry contact at terminals 12 and 13. The factory standard is a form B contact configuration (open on alarm). It is configurable to a form A configuration (closed on alarm). Reference the configuration section of the manual for additional details on how to change this functionality. The contact is rated for a maximum of 80 milliamps at 120 VAC/VDC.

DEMAND SIGNAL TERMINALS 14 AND 15

The DCM monitors an analog 4-20 milliamp input signal at terminals 14 (-) and 15 (+), and positions the output shaft position to match in response. The standard response is to follow the demand signal linearly.

FEEDBACK SIGNAL TERMINALS 16 AND 17

When feedback sourcing is enabled, the DCM-2 transmits a 4-20 milliamp position feedback signal on terminals 16 (-) and 17 (+) that is proportional to the drive output shaft position.

CONTROL OVERRIDE INPUTS TERMINALS 18 THROUGH 21

Analog signal operation may be overridden by using discrete input signals on the control override input terminals. CW (19), CCW (20), and STOP (21) terminals require connection to a common (COM) terminal (18) to perform the override as shown in the table below.

Terminal Connections	Output Shaft Action
19 to 18	Clockwise Rotation
20 to 18	Counter-Clockwise Rotation
21 to 18	Stop in Current Position

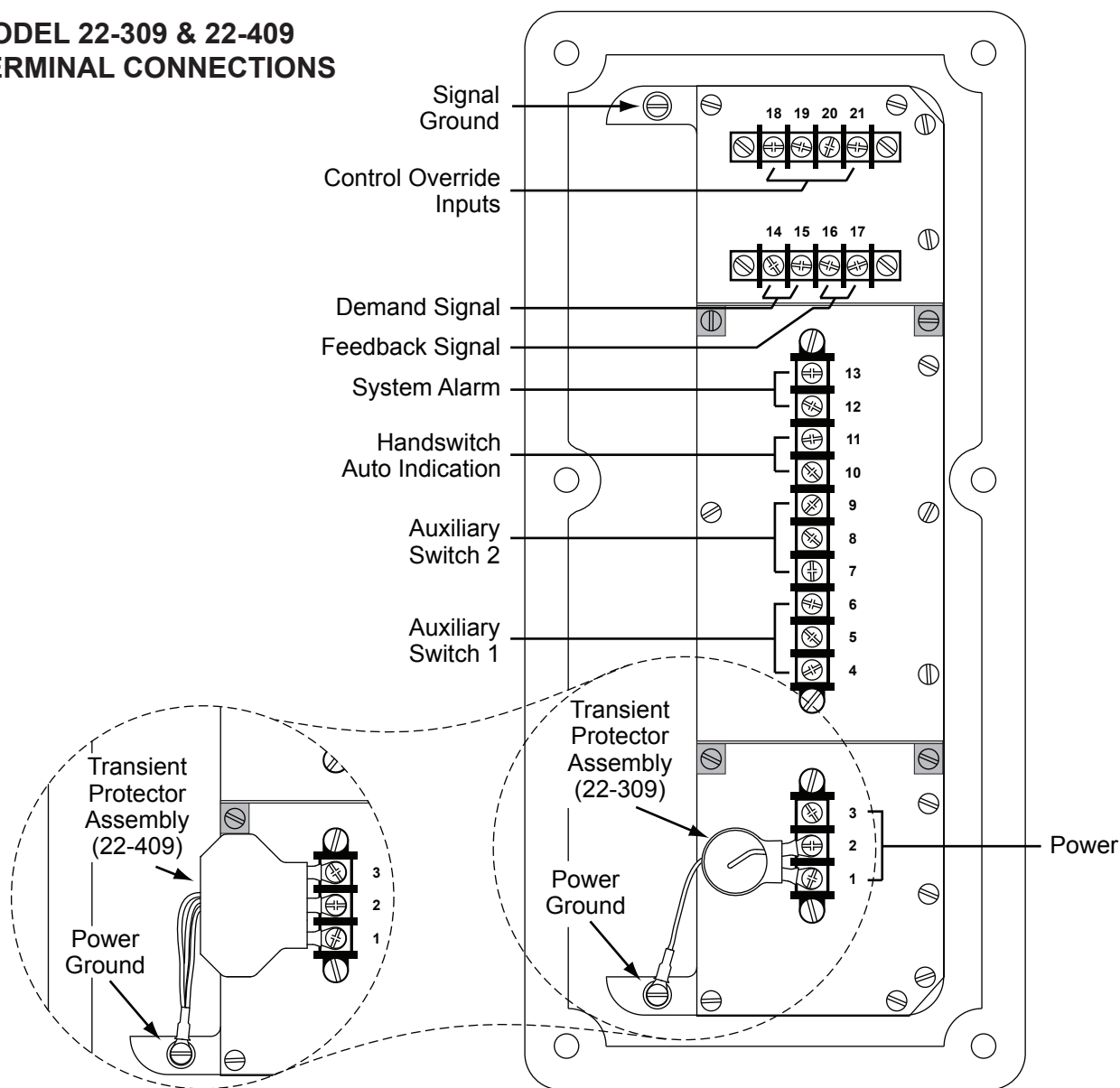
The connection to terminal 18 is designed to be made through relay contacts or through a solid state switch capable of sinking at least 5 milliamps DC. When the circuit is open, terminals 19, 20, and 21 should measure +12 VDC with respect to terminal 18.

CAUTION

Do not connect an external voltage source to override terminals 18–21; an external voltage source may damage the DCM circuitry.

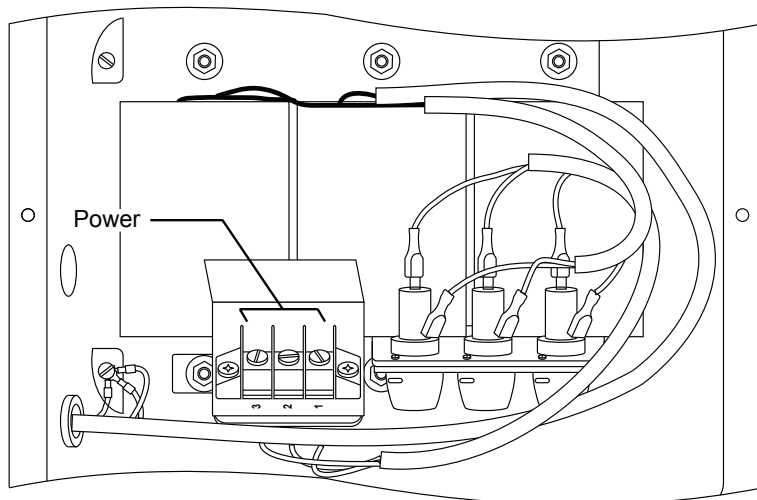
INSTALLATION - WIRING

MODEL 22-309 & 22-409 TERMINAL CONNECTIONS



OPTIONAL TRANSFORMER ENCLOSURE POWER CONNECTIONS FOR MODELS 22-309 / 22-409

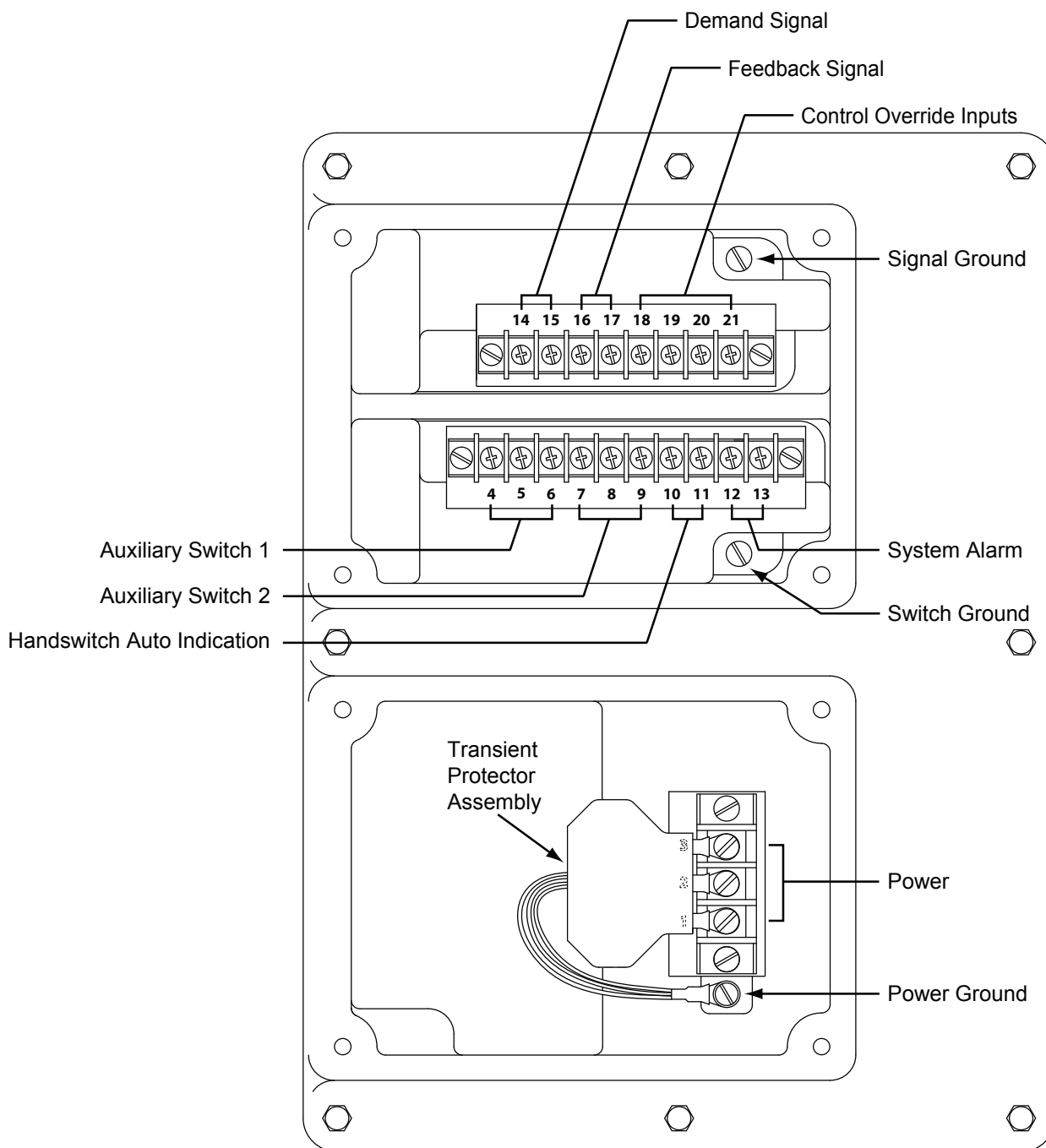
(Refer to page 41 for replacement
fuse part numbers)



OPTIONAL ENCLOSURE

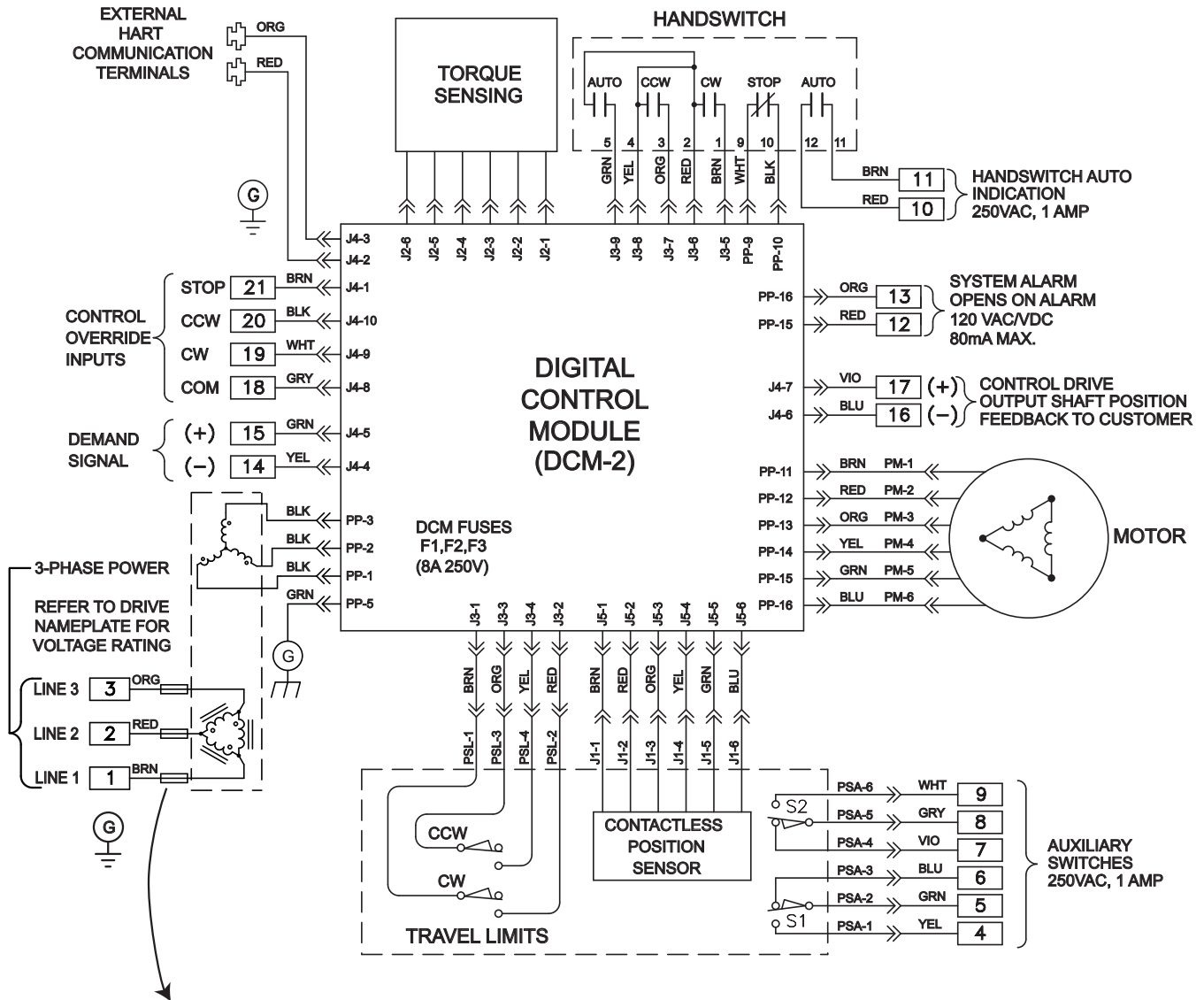
INSTALLATION - WIRING

MODEL 22-809 TERMINAL CONNECTIONS



MODEL 22-809 TYPICAL WIRING SCHEMATIC

(a wiring schematic specific to each drive is located under the wiring terminal cover)



Three-Phase Voltage Rating	Fuse Rating	Fuse Kit Part Number*
208	10 Amps, 600 Volts	12-8061-51
240	10 Amps, 600 Volts	12-8061-51
380	4 Amps, 600 Volts	12-8061-52
416	4 Amps, 600 Volts	12-8061-52
480	4 Amps, 600 Volts	12-8061-52
575	4 Amps, 600 Volts	12-8061-52

* Kits also include (3) 8 Amp, 250 Volt DCM fuses.

INPUT / FEEDBACK SIGNALS:
ISA TYPE 4, CLASS U, POWER ISOLATED

— # — CUSTOMER TERMINAL BLOCK

ELECTRONICS

DIGITAL CONTROL MODULE (DCM-2)

The DCM-2 is a micro-processor based circuit board assembly that serves as the actuator's control center. The DCM-2 chassis assembly is comprised of a Control circuit board, a Driver circuit board (inverter circuit), additional circuit components like capacitors and transformers, and an aluminum chassis to which both the boards and the components are fastened. The whole assembly is mounted in the actuator's DCM compartment (see photo).

The main function of the DCM-2 chassis assembly is to be the actuator's positioner. The control board compares the Demand input signal to the actuator shaft position feedback signal from the Contactless Position Sensor (CPS-4) located in the control end compartment (see photo).

See the troubleshooting section of this manual for details regarding the fuse locations, the test point locations, and expected test point voltage levels.

INTERFACES

The DCM-2 has three configuration interfaces: a local pushbutton interface, a HART interface, and a serial port interface.

PUSHBUTTONS

The local pushbutton interface is integral to the DCM-2 assembly. It requires no additional equipment to perform calibration procedures, but is limited in functionality. This interface also has LEDs for diagnostic information.

HART

The HART interface may be accessed by a HART handheld communicator* or a HART equipped control system. All electronic calibration, configuration, and diagnostics can be accomplished through HART communications.

SERIAL PORT

The serial port interface is accessible by connecting a computer to the DCM-2 using a Beck serial cable**. All electronic calibration and configuration can be accomplished through the serial port interface.

* See the HART appendix for details on connecting via HART communicators.

** See the serial port appendix for details on connecting via the serial port.

DCM
COMPARTMENT



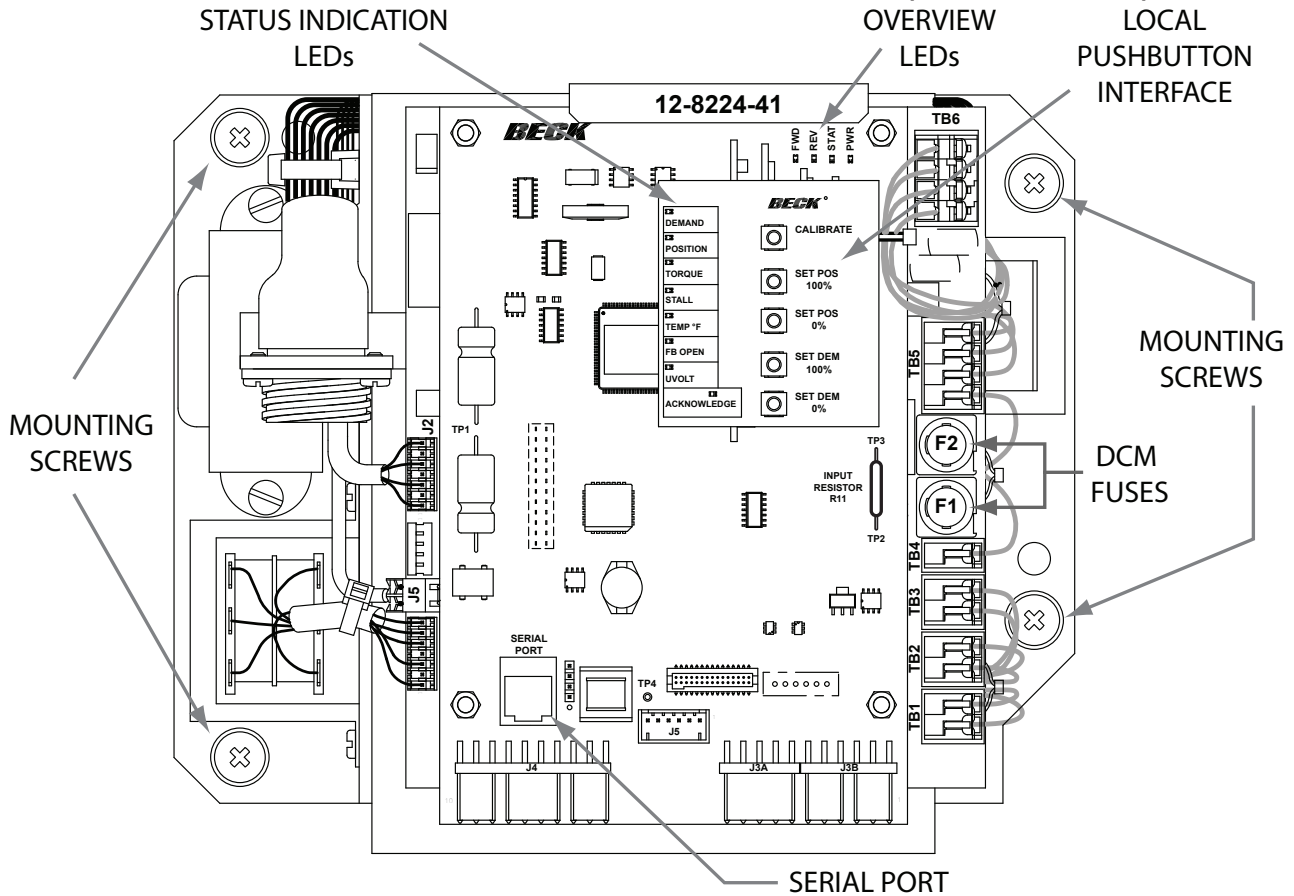
CONTROL END
COMPARTMENT

The DCM-2 chassis assembly is mounted in a dedicated compartment (see photo) and normally does not need to be removed.

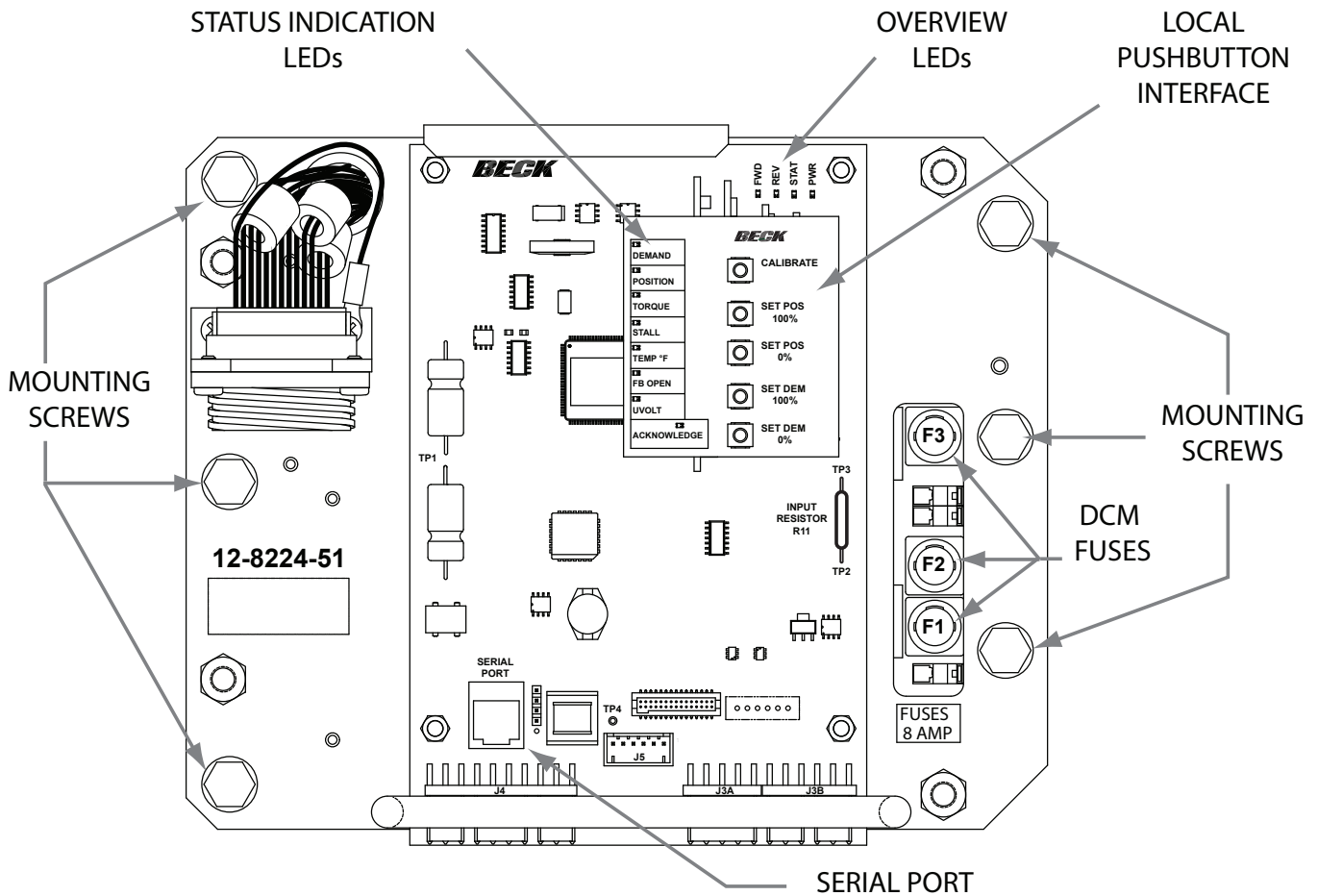
Accessing the DCM-2 assembly may be required for configuration or diagnostic purposes using either the pushbutton or serial port interfaces.

If the DCM-2 needs to be repaired for any reason, the whole chassis should be removed and replaced as an assembly. See the Maintenance section of this manual for complete details on chassis removal and installation.

MODEL 22-309 DIGITAL CONTROL MODULE (P/N 12-8224-41)



MODEL 22-409 & 22-809 DIGITAL CONTROL MODULE (P/N 12-8224-51)



ELECTRONICS

OVERVIEW LEDs

There are four LEDs in the upper right corner of the DCM-2 circuit board. These provide an overview of DCM-2 status.

PWR

This LED is lit when power is applied to the drive. After initial power up, this LED pulses from bright to dim indicating the micro-processor is operating.

STAT

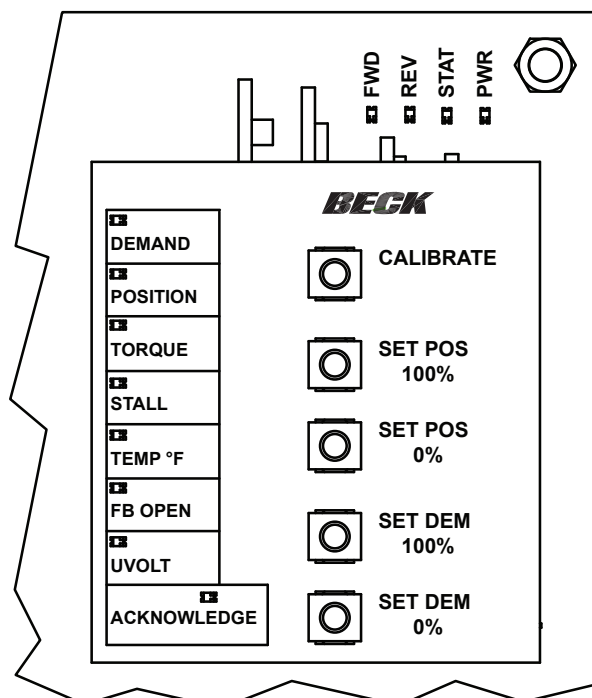
This LED is lit when a system alarm occurs. When the STAT LED is lit, typically a status indication LED will be illuminate to further explain the status.

REV

This LED is lit when the drive is instructed to move in the reverse direction. The instructions may come from a demand signal, a control override input, the handswitch, HART, or serial commands.

FWD

This LED is lit when the drive is instructed to move in the forward direction. The instructions may come from a demand signal, a control override input, the handswitch, HART, or serial commands.



**LOCAL PUSHBUTTON
INTERFACE / LEDs**

STATUS INDICATION LEDs

The status indication LEDs are located on the left side of the local pushbutton interface.

The applicable status indication LED(s) will illuminate when the "STAT" LED is lit, to reveal the condition(s) as described below. When more than one status LED is required at one time, the illuminated LEDs will cycle rather than illuminate all at once.

Refer to the troubleshooting section of this manual for corrective actions that will eliminate system alarms, status indication LEDs from being lit, and the STAT LED from being lit.

DEMAND

The demand signal is outside of the acceptable range of values.
(Standard current range is 3.2 - 21.0 mA DC)

POSITION

The internal position signal from the CPS-4 is outside of the acceptable range of values.
(Standard voltage is 1.3 - 3.7 volts DC)

TORQUE

The torque sensed at the output shaft of the actuator exceeds the torque alarm threshold.
(Standard torque alarm threshold is 105%)

STALL

The drive is in a stall condition and stall protection has been activated.

TEMP °F

The temperature sensed at the DCM-2 is outside of the acceptable range.
(Acceptable range is -40°F to 185°F (-40°C to 85°C))

FB OPEN

The feedback current loop is disconnected, open, or does not sense a load.

UVOLT

The operating voltage is below the rated voltage tolerance (under voltage condition). This LED could also be lit if an individual phase of a three-phase operating voltage is lost.

ACKNOWLEDGE

Temporarily lit when a pushbutton configuration operation is performed to confirm that the pushbutton configuration operation has been completed.

When a status LED is lit the system alarm contact will change state. Indication of the system alarm is available as a dry contact at terminals 12 and 13. The standard factory setting is for the contact to be closed in the normal state and open in an alarm state.

LOCAL PUSHBUTTON INTERFACE

The five pushbuttons located on the local pushbutton interface are used for simple calibration features. To utilize the pushbuttons, the user must press and hold the calibrate button, then press and hold the button for the desired function. Pressure should be maintained until the “ACKNOWLEDGE” LED lights; this confirms receipt of the pushbutton command.

See the calibration section of this manual for further explanation of the calibration procedures.

CAUTION

Pressing the following buttons may change calibration and cause the drive to reposition.

CALIBRATE

As a safety feature, this button must be pressed and held simultaneously with another pushbutton to perform a calibration.

SET POS 100%

Calibrates the DCM-2 to recognize the current output shaft position as the 100% position.

SET POS 0%

Calibrates the DCM-2 to recognize the current output shaft position as the 0% position.

SET DEM 100%

Calibrates the DCM-2 to recognize the currently applied demand signal as the 100% demand signal.

SET DEM 0%

Calibrates the DCM-2 to recognize the currently applied demand signal as the 0% demand signal.

CONTROL END

The control end assembly is comprised of the contactless position sensor (CPS-4), limit switches, and limit switch cams. The control end assembly is located in the actuator's control end compartment under the cylinder shaped cover.

The assembly is installed on the control shaft which is geared into the main output shaft of the actuator. As the output shaft turns it moves the control shaft, the limit switch cams, and the contactless position sensor ferrite core.

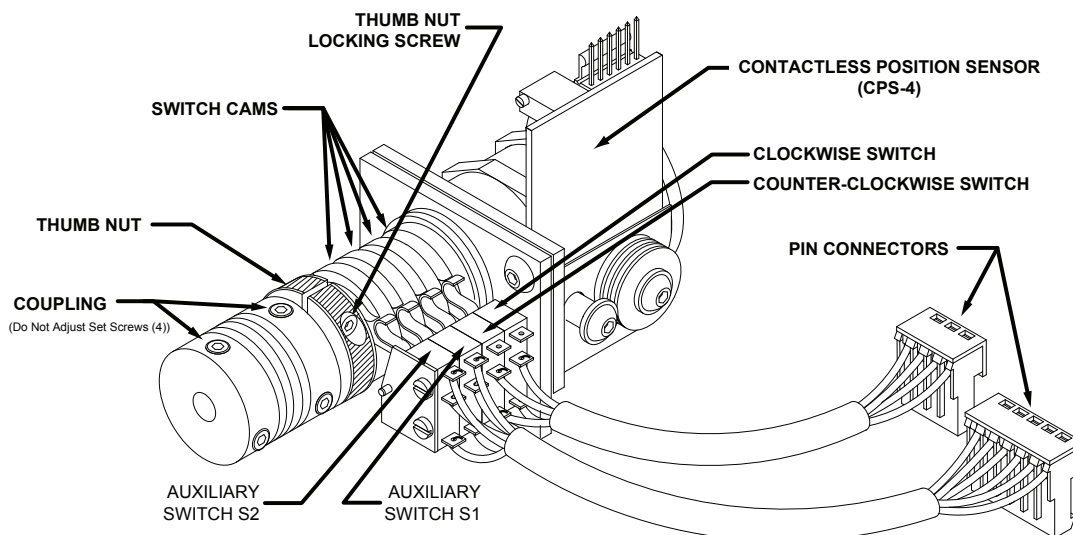
The control end includes two SPDT auxiliary limit switches (labeled S1 and S2) for customer connection and two over-travel limit switches (labeled CW and CCW). The cams can be adjusted to actuate the auxiliary switches anywhere in the actuator's range of travel.

CONTACTLESS POSITION SENSOR (CPS-4)

The contactless position sensor (CPS-4) is a circuit board and sensor assembly that is part of the control end assembly. The CPS-4 provides the DCM-2 with a continuous position signal proportional to the position of the actuator's output shaft. The CPS-4 is located in the actuator's control end compartment under the cylinder shaped cover.

The position sensing function of the CPS-4 is provided by a ferrite magnetic sensing element. An electronic circuit translates the voltage from the ferrite magnetic sensor into a position signal. The position signal is used by the DCM-2 to determine the actuator's output shaft position for control and to generate an analog 4-20 milliamp position feedback signal for external use.

CONTROL END / CONTACTLESS POSITION SENSOR



MAINTENANCE

COMPONENT REPLACEMENT

The Group 22 was designed modularly for ease of maintenance and parts replacement. The individual components of the actuator are available in replacement parts kits as detailed in the replacement parts kits tables in this section. Each replacement parts kit includes the component(s), necessary hardware, and detailed instructions for installation of the parts.

HOW TO ORDER SPARE PARTS

Any customer replacement kit may be purchased for spare parts, however several kits have been selected by the factory as recommended spares. Contact your Beck Sales Engineer for questions regarding recommended replacement parts particular to your application. Parts may be ordered by mail, telephone, fax or e-mail, with the confirming order sent to the factory.

ROUTINE MAINTENANCE

Beck drives require only a minimum of routine maintenance. At regular plant maintenance intervals, a visual inspection is recommended to verify that the connection to the final control element is intact and operating normally. If vibration is present, check the electrical terminal connections and other hardware for tightness. Check the conduit seals for any moisture penetration and reseal if necessary.

LUBRICATION

The Group 22 control drive has a grease filled gear housing, so periodic lubrication is not required. However, to extend the life of the linkage, rod ends should be lubricated periodically.

GASKETS

During routine service, inspect the cover gaskets for wear or damage. In order to protect internal components, worn or damaged gaskets and O-rings should be replaced.

To remove, scrape all of the old adhesive and gasket material from the body housing and cover. Cement the new gasket to the drive body using a gasket cement such as 3M #847 Rubber and Gasket Adhesive, or equivalent.

MOTOR

The motor assembly is not field-repairable and is intended to last for the lifetime of the actuator. Disassembly of the motor will result in a loss of torque that can only be restored by returning the motor to the factory for re-magnetizing.

If you suspect a motor problem, contact the factory for assistance.

CAUTION

Before removing the control motor, block the control drive crank arm to prevent the crank arm and the gear train from moving when the motor is removed. Failure to do so can cause damage to equipment and serious injury or death.

RECOMMENDED REPLACEMENT PARTS KITS

Replacement Kit	Applicable Model			KIT P/N
	22-309	22-409	22-809	
Control End Assembly	X	X	X	12-8061-05
DCM Replacement (1-phase)	X			12-8061-75 (DCM-2 p/n 12-8224-41)
DCM Replacement (1-phase) CE rating	X			12-8061-78 (DCM-2 p/n 12-8224-45)
DCM Replacement (3-phase)		X	X	12-8061-85 (DCM-2 p/n 12-8224-51)
DCM Replacement (3-phase) CE rating		X	X	12-8061-88 (DCM-2 p/n 12-8224-55)
Gasket Set	X	X		12-8061-09
Gasket Set			X	12-8061-29
Fuse Kit - 8 Amps 22-309 (120 VAC 1-phase) & 22-409 (208 VAC 3-phase)	X	X		12-8061-53
*Fuse Kit - 8 Amps DCM & 4 Amps - input 380, 416, 480, 575 VAC (3-phase)			X	12-8061-52
*Fuse Kit - 8 Amps DCM & 10 Amps - input 208, 240 VAC (3-phase)			X	12-8061-51

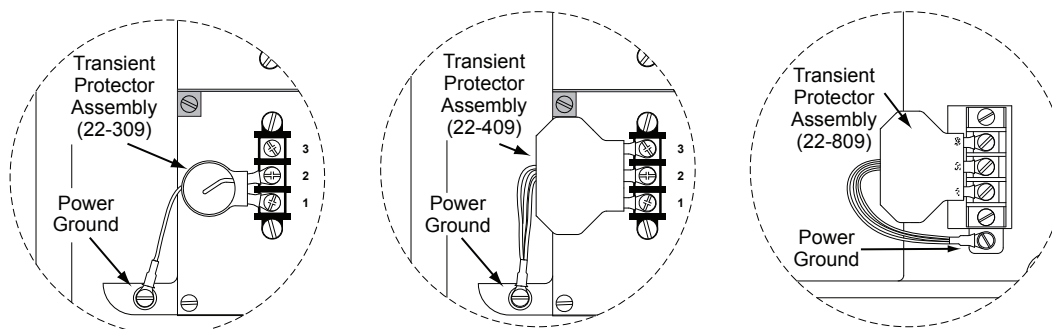
* Select the proper Fuse Kit based on your actuator operating voltage.

OTHER AVAILABLE REPLACEMENT PARTS KITS

Replacement Kit	Applicable Model			KIT P/N
	22-309	22-409	22-809	
CPS-4 Switch Assembly	X	X	X	12-8061-06
CPS-4 P.C. Board	X	X	X	12-8061-07
CPS-4 Coupling	X	X	X	12-8061-08
Mounting Shim Set	X	X	X	12-8061-11
Handswitch Assembly	X	X	X	12-8061-12
Capacitor	X			12-8061-14
Motor	X	X		12-8061-01
Handwheel / Dampener	X	X		12-8061-02
Self Locking Mechanism Rebuild	X	X		12-8061-69
Motor w/ Hand crank Assembly Replacement			X	12-8061-20
Handwheel / Dampener			X	12-8061-22
Self Locking Mechanism Rebuild			X	12-8061-23
Hand crank Assembly			X	12-8061-27
Service Screw Set	X	X		12-8061-10
Service Screw Set			X	12-8061-30
*Fuse Kit - 8 Amps-DCM, & 4 Amps - input 240 VAC (1-phase)	X			12-8061-50
Optional Transformer fuse (9 A - 208 VAC) (3 required)	X	X		11-1372-10
Optional Transformer fuse (8 A - 240 VAC) (3 required)	X	X		11-1372-09
Optional Transformer fuse (4 A - 380 VAC) (3 required)	X	X		11-1372-06
Optional Transformer fuse (4 A - 416 VAC) (3 required)	X	X		11-1372-06
Optional Transformer fuse (4 A - 480 VAC) (3 required)	X	X		11-1372-06
Optional Transformer fuse (3.5 A - 575 VAC) (3 required)	X	X		11-1372-08
**Transient Protector (120 VAC, 1-phase)	X			12-8061-44
**Transient Protector (240 VAC, 1-phase)	X			12-8061-42
**Transient Protector (208 VAC, 3-phase)		X		12-8061-43
**Transient Protector (208 VAC, 3-phase)			X	12-8061-45
**Transient Protector (240 VAC, 3-phase)			X	12-8061-46
**Transient Protector (380 VAC, 3-phase)			X	12-8061-54
**Transient Protector (416 VAC, 3-phase)			X	12-8061-55
**Transient Protector (480 VAC, 3-phase)			X	12-8061-47
**Transient Protector (575 VAC, 3-phase)			X	12-8061-48

** Select the proper Transient Protector Kit based on your actuator operating voltage.

GROUP 22 TRANSIENT PROTECTION



TROUBLESHOOTING

WHERE DO I START?

The Group 22 actuator was designed so the user can quickly diagnose any actuator status conditions causing an interruption in operation. By removing the DCM compartment cover to access the DCM-2, you can view the overview and status indication LEDs. These LEDs provide an efficient means of determining the actuator problem, in many cases without the need for metering equipment.

The following matrix lists some of the potential conditions that a user may experience when troubleshooting.

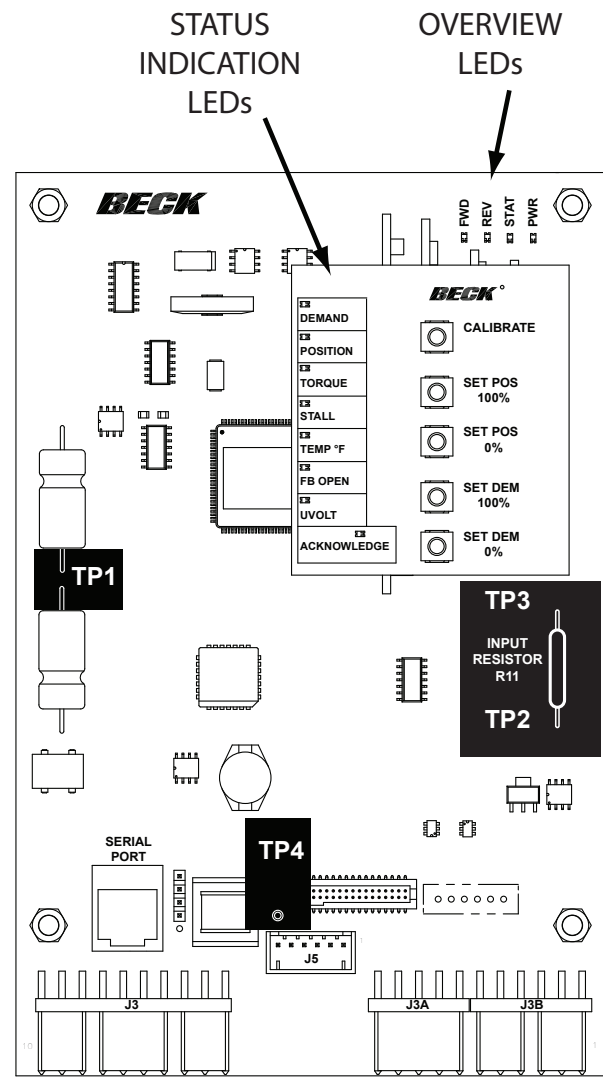
DCM-2

The DCM-2 board is the control center of the drive. Drive configuration and calibration are accessed and set through the DCM-2 board. The DCM-2 has the overview and status indication LEDs that indicate status and alarm conditions. More advanced troubleshooting features may be accessed via HART or serial connection (see respective appendixes in this manual). Reference Menu 8, Diagnostics menu, for troubleshooting with HART and for serial port troubleshooting use the diagnostic commands featured in the serial port appendix.

The DCM-2 performs an error based positioning function. It accepts a demand signal, compares it to an internal position feedback voltage provided by the CPS-4, and controls the motor to correct for a difference. The DCM-2 includes four test points for measuring the demand and internal position signal voltages at the DCM-2. The demand signal should measure 1-5 volts DC across test points TP3 (-) and TP2 (+), proportional to the 4-20 mA demand input signal. The raw position signal should measure approximately 1.3 to 3.7 volts DC across test points TP4 (+) and TP1 (-), proportional to the output shaft's 0-100 degree position (shaft position can be determined by viewing the mechanical index).

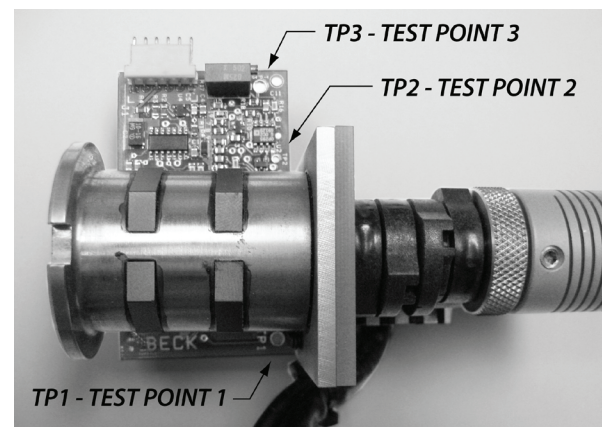
CPS-4

The output voltage of the CPS-4 ranges from 1.3 to 3.7 volts DC for 100° drive shaft rotation. This can be measured across CPS-4 test points TP3(+) and TP1(-). If the position signal is outside the anticipated range, the "STAT" and "POSITION" LEDs will light, and contacts at terminals 12 & 13 will open if the PositionLOS alarm mask bit is ON (default state). When the Position signal is corrected, the drive will automatically resume normal operation. The 5 volts DC CPS-4 power supply can be measured across test points TP2(+) and TP1(-).



DCM-2 TESTPOINTS

CPS-4 TESTPOINTS



CONDITIONS	POSSIBLE CAUSES	CORRECTIONS
1. No DCM-2 LEDs are illuminated.	<ul style="list-style-type: none"> a. No power is applied to the actuator. b. Incorrect power is applied to the actuator. c. Main power fuse/breaker is blown. d. DCM-2 malfunction. 	<ul style="list-style-type: none"> a. Apply operating voltage to the operating voltage terminals. b. Verify correct voltage on actuator nameplate and ensure that it is applied at the operating voltage terminals. c. Verify fuse/breaker integrity. Replace/reset if blown. Find cause of the short circuit. d. Replace DCM-2.
2. STAT LED is illuminated.	<ul style="list-style-type: none"> a. A status alarm is active. 	<ul style="list-style-type: none"> a. Check the status indication LEDs on the local pushbutton interface of the DCM-2. Continue troubleshooting based on the LEDs that are illuminated.
3. DEMAND LED is illuminated.	<ul style="list-style-type: none"> a. No demand signal. b. Applied demand signal is outside of configured range. c. Polarity of applied signal wires is reversed. 	<ul style="list-style-type: none"> a. Apply a demand signal to terminals 14 (-) & 15 (+). b. Confirm demand signal value via HART or by measuring DC voltage across DCM-2 test points TP3(+) & TP2(-). Should see 1-5 volts for 4-20 mA applied signal. c. Correct the polarity of the applied control signal wires on terminals 14 (-) & 15 (+).
4. POSITION LED is illuminated.	<ul style="list-style-type: none"> a. Position signal voltage generated by CPS-4 read by the DCM-2 is outside of the configured range. b. CPS-4 malfunction. c. DCM-2 malfunction. 	<ul style="list-style-type: none"> a. Using HART communicator check the Position Sensor Setup menu to verify the Present CPS voltage falls within the configured CPS Zero% and Span (typical range 1.3 to 3.7 volts). OR measure DC volts between DCM-2 test points TP4 (+) and TP1 (-) to verify present CPS voltage. If the voltage is outside of the configured range, replace control end. b. Replace control end. c. Replace DCM-2.
5. TORQUE LED is illuminated.	<ul style="list-style-type: none"> a. Torque exceeding configured limit (typically over 105% of rated torque) is being applied to the output shaft. b. Torque Null and Torque Constant values are not set correctly. c. Torque cable is not connected to DCM-2. 	<ul style="list-style-type: none"> a. Eliminate cause of excessive torque (i.e. binding damper, improper linkage, etc.) b. Locate torque null and constant values inside DCM compartment and set via HART or serial port. c. Reconnect torque cable to DCM-2.
6. STALL LED is illuminated.	<ul style="list-style-type: none"> a. Actuator has been energizing either the FWD or REV motor winding longer than the configured stall timer due to a physical obstruction. b. The configured stall time is less than the configured Max Travel Time. 	<ul style="list-style-type: none"> a. Eliminate the obstruction and reset the stall by reversing direction on your demand signal, cycling the power, or issuing the stall reset from HART or serial command. b. Configure the stall time to exceed the Max Travel Time via HART or serial command.
7. TEMP F LED is illuminated.	<ul style="list-style-type: none"> a. The measured temperature at the DCM-2 is outside of the normal operating range of -40° to 185° Fahrenheit. 	<ul style="list-style-type: none"> a. Protect the actuator from the extreme temperatures below or above the operating range to eliminate the alarm.

TROUBLESHOOTING

CONDITIONS	POSSIBLE CAUSES	CORRECTIONS
8. FB OPEN LED is illuminated.	<ul style="list-style-type: none"> a. The position feedback circuit current loop is not complete. b. The position feedback is enabled, but not in use. 	<ul style="list-style-type: none"> a. Ensure the device measuring the 4-20 mA feedback is properly terminated on terminals 16 (-) and 17 (+) and is applying a 0 - 800 ohm load resistance. b. Disable feedback via HART or serial command. OR terminate the feedback loop by applying a 0 - 800 ohm load resistance across terminals 16 and 17.
9. UVOLT LED is illuminated.	<ul style="list-style-type: none"> a. The applied operating voltage is outside of the tolerance (+10%/-15%) of the nameplate operating voltage. b. A DCM-2 fuse is open. (or primary transformer fuse on 22-809 is open) c. A component failure has occurred on the DCM-2. 	<ul style="list-style-type: none"> a. Apply the correct operating voltage to the actuator per the voltage stamped on the nameplate. b. Replace the open fuse with the appropriate fuse kit; check page 17 or 19 to identify the appropriate kit for your drive. c. Replace the DCM-2.
10. All LEDs are illuminated or flashing.	<ul style="list-style-type: none"> a. A component failure has occurred on the DCM-2. 	<ul style="list-style-type: none"> a. Replace the DCM-2.
11. The actuator will only move at a very slow speed when using the handswitch or override terminals.	<ul style="list-style-type: none"> a. The DCM-2 does not detect a valid position signal from the CPS-4. b. The drive max travel time is set to a high value (maximum allowable time is 300 seconds). 	<ul style="list-style-type: none"> a. Verify CPS-4 cable connections, check CPS-4 raw position voltage test points TP3 and TP1 for 1.3 - 3.7 volts DC, check CPS-4 power supply test points TP2 and TP1 for 5 volts DC, and replace control end if necessary. b. Adjust max travel time via HART or serial closer to the minimum (30 seconds for 22-309 and 15 seconds for 22-409/22-809).
12. FWD or REV LED illuminated, drive is not moving, and there are no other status alarms.	<ul style="list-style-type: none"> a. Handswitch is in the STOP position. b. CW or CCW limit switch is open. 	<ul style="list-style-type: none"> a. Place the handswitch in the AUTO position. b. Verify if the limit switch is set outside of the electrically calibrated limits, readjust if necessary or replace.
13. Drive runs uncontrolled to one end of travel.	<ul style="list-style-type: none"> a. The CPS-4 is malfunctioning. b. The DCM-2 is malfunctioning. 	<ul style="list-style-type: none"> a. Verify CPS-4 cable connections, check CPS-4 raw position voltage test points TP3 and TP1 for 1.3 - 3.7 volts DC, check CPS-4 power supply test points TP2 and TP1 for 5 volts DC, and replace control end if necessary. b. Verify the raw position signal seen by the DCM-2 at test points TP4 and TP1 for 1.3 - 3.7 volts DC. If valid signal is measured, replace DCM-2.
14. Drive will not hold position with handswitch in STOP.	<ul style="list-style-type: none"> a. Self Locking Mechanism (SLM) is damaged. 	<ul style="list-style-type: none"> a. Rebuild the SLM assembly.

CONDITIONS	POSSIBLE CAUSES	CORRECTIONS
15. Actuator has a flashing PWR LED on, but does not respond to demand signal, handswitch, or override terminals.	<ul style="list-style-type: none"> a. The emergency override STOP terminal (21) is connected to the common terminal (18). b. The safety shutoff circuit is damaged c. The handswitch is damaged. 	<ul style="list-style-type: none"> a. Remove the connection from terminal 21 to terminal 18. b. Contact the factory. c. Replace the handswitch.
16. HART communications cannot be established with the DCM-2.	<ul style="list-style-type: none"> a. The device description (DD) file is not installed. b. The HART communicator is not compatible with Beck equipment. c. The HART communications circuit on the DCM-2 is damaged. 	<ul style="list-style-type: none"> a. Install the Beck MK-2 DD on your HART device. b. Utilize a compatible HART communicator or configure the actuator through the serial port. c. Replace the DCM-2.
17. Present CPS voltage appears to be within the configured range, but the position feedback signal at terminals 16 and 17 remains constant or is erratic.	<ul style="list-style-type: none"> a. The position feedback circuit on the DCM-2 is damaged. 	<ul style="list-style-type: none"> a. Replace the DCM-2.
18. Power LED is pulsing bright to dim.	<ul style="list-style-type: none"> a. This is a normal condition indicating that the processor is functioning. 	<ul style="list-style-type: none"> a. No action required.
19. Actuator output shaft rotates opposite of the desired direction when applying a 4-20 mA demand signal.	<ul style="list-style-type: none"> a. The rotation direction is incorrectly configured. 	<ul style="list-style-type: none"> a. Configure the rotation direction using pushbutton, HART, or serial method. (page 30)

APPENDIX - HART

HART DEVICE DESCRIPTION (DD) MENU STRUCTURE

MENU 1 - ONLINE		
1	Functions	LINK TO MENU 2
2	Position	0.0%–100.0%
3	Demand	0.0%–100.0%
4	Loop(Dem)	4.00–20.00 mA
5	Trq/Thrust	Percentage
6	Temp	*F. or *C.
7	Feedback	4.00–20.00 mA

FROM MENU 1

MENU 2 - FUNCTIONS		
1	Setup Checklist	LINK TO MENU 3
2	Device Information	LINK TO MENU 4
3	Configuration	LINK TO MENU 5
4	Statistics	LINK TO MENU 6
5	Manual Operation	LINK TO MENU 7
6	Diagnostics	LINK TO MENU 8
7	Calibration Trim	LINK TO MENU 9

FROM MENU 2

MENU 3 - SETUP CHECKLIST		
The setup checklist gathers some of the more commonly accessed parameters and settings in one location for ease of access. All items in this menu are accessible through the categorized menus that follow.		

FROM MENU 2

MENU 4 - DEVICE INFORMATION		
1	Tag*	Alphanumeric
2	Descriptor*	Alphanumeric
3	Message*	Alphanumeric
4	Model#	Actuator model no.
5	Drive S/N*	Number
6	InstId*	Date-DD/MM/YYYY
7	Setup*	Date-DD/MM/YYYY
8	CalibrId*	Date-DD/MM/YYYY
9	Review	LINK TO MENU 15
10	Poll Addr*	Integer

FROM MENU 4

MENU 15 - REVIEW		
The review menu allows the user to view many parameters in a read-only format.		

FROM MENU 2

MENU 6 - STATISTICS		
1	Starts	Integer
2	Reversals	Integer
3	Stalls	Integer
4	OverTorques	Integer
5	Pk Torque	Percentage
6	TotRunTm	Seconds
7	High Temp	Degrees
8	Low Temp	Degrees

FROM MENU 2

MENU 7 - MANUAL OPERATION		
1	Op Mode*	Follow, Hold, Stay, Stop
2	Demand*	Percentage
3	Reset Stall»	Action

FROM MENU 2

MENU 9 - CALIBRATION TRIM		
1	PresCPS V*	Voltage
2	Loop(Dem)*	4.00 mA, 20.00 mA
3	Feedback*	mA
4	Trq/Thrust*	Percentage

FROM MENU 2

MENU 5 - CONFIGURATION		
1	General Setup	LINK TO MENU 5A
2	PositionSensrSetup	LINK TO MENU 5B
3	Demand Setup	LINK TO MENU 5C
4	Feedback Setup	LINK TO MENU 5D
5	Torque Setup	LINK TO MENU 5E
6	Restore to Factory»	Action
7	Use Default Setup»	Action

FROM MENU 5

MENU 5A - GENERAL SETUP		
1	Drive Dir*	CW Incr or CCW Incr
2	Max Travel*	Degrees
3	Travel*	Degrees
4	StepSize*	0.100%–2.500%
5	Stall Time*	30–300 (seconds)
6	StallProt*	Enabled or Disabled
7	LimitSwitch*	Accept or Alert
8	PositionUnit*	Degrees
9	Temperature Unit*	degF or degC
10	Max Freq*	Hertz
11	MaxTravelTm*	Seconds
12	Power*	1-phase / 3-phase

FROM MENU 5

MENU 5B - POSITION SENSOR SETUP		
1	Set Pos 0%»	Action
2	Set Pos 100%»	Action
3	PresCPS V	Voltage
4	CPS Zero%*	1.000–5.000 v
5	CPS Span	Voltage
6	CPS RngLwr	Voltage
7	CPS RngUp	Voltage
8	Pos S/N*	Number
9	Snsr Dir	CW Incr or CCW Incr

FROM MENU 5

MENU 5C - DEMAND SETUP		
1	DemRngLwr*	4.00–16.00 mA
2	DemRngUp*	8.00–20.00 mA
3	Dem Curve*	Linear, Square, Square Root, Special
4	Dem Curve Spcl	LINK TO MENU 14
5	LOS Mode*	Stay or Go-to-Pos
6	LOS Pos*	-5.00%–105.00%
7	DemLimLwr*	0.00–12.00 mA
8	DemLimUp*	mA

FROM MENU 5C

MENU 14 - DEM CURVE SPECIAL		
1	DemNode1X*	Percentage
2	DemNode1Y*	Percentage
3	DemNode 2X*	Percentage
4	DemNode 2Y*	Percentage
	...	
41	DemNode21X*	Percentage
42	DemNode21Y*	Percentage

FROM MENU 5

MENU 5D - FEEDBACK SETUP		
1	FB RngLwr*	3.00–16.00 mA
2	FB RngUp*	7.00–21.00 mA
3	Feedback*	Enabled or Disabled
4	FB Curve*	Linear or InvDem

FROM MENU 5

MENU 5E - TORQUE SETUP		
1	Trq/Thrust*	Enabled or Disabled
2	Ovt Prot*	Enabled or Disabled
3	AlarmLevel*	Percentage
4	ShutDwnTrq*	Percentage
5	Trq Null*	Integer
6	Trq Const*	Integer

FROM MENU 2

MENU 8 - DIAGNOSTICS		
1	Status	LINK TO MENU 8A
2	Tests	LINK TO MENU 10
3	CW Torque	LINK TO MENU 11
4	CCW Torque	LINK TO MENU 11
5	Alarm Setup	LINK TO MENU 12
6	RealTimeClock	LINK TO MENU 13

FROM MENU 8

MENU 8A - STATUS		
1	LED Status	LINK TO MENU 8B
2	Operating Status	LINK TO MENU 8C
3	Switch Status	LINK TO MENU 8D
4	Local Cntrl Status	LINK TO MENU 8E
5	Line Freq	Hertz
6	CW Inhibitors (1)	LINK TO MENU 8F
7	CCW Inhibitors (1)	LINK TO MENU 8F
8	CW Inhibitors (2)	LINK TO MENU 8G
9	CCW Inhibitors (2)	LINK TO MENU 8G
10	DC Volts	Bus Voltage
11	PresFreq	Motor Frequency

FROM MENU 8A

MENU 8B - LED STATUS		
1	Status	ON or OFF
2	Reverse	ON or OFF
3	Forward	ON or OFF
4	Demand	ON or OFF
5	Position	ON or OFF
6	Trq/Thrust	ON or OFF
7	Stall	ON or OFF
8	Temperature	ON or OFF
9	FB Open	ON or OFF
10	Uvolt	ON or OFF
11	Acknowledge	ON or OFF

FROM MENU 8A

MENU 8C - OPERATING STATUS		
1	Dem <> Limits	ON or OFF
2	Pos <> Limits	ON or OFF
3	Temp <> Limits	ON or OFF
4	Torq <> Limits	ON or OFF
5	Over-Torq Stop	ON or OFF
6	Stalled	ON or OFF
7	Feedback Open	ON or OFF
8	Low Volts AC	ON or OFF

FROM MENU 8A

MENU 8D - SWITCH STATUS		
1	Limit CCW	ON or OFF
2	Limit CW	ON or OFF
3	OvrRd CCW	ON or OFF
4	OvrRd CW	ON or OFF
5	OvrRd STOP	ON or OFF
6	HndSw CCW	ON or OFF
7	HndSw CW	ON or OFF
8	HndSw AUTO	ON or OFF

FROM MENU 8A

MENU 8E - LOCAL CONTROL STATUS		
1	Calibrate	ON or OFF
2	Set Pos 100%	ON or OFF
3	Set Pos 0%	ON or OFF
4	Set Dem 100%	ON or OFF
5	Set Dem 0%	ON or OFF

FROM MENU 8A

MENU 8F - CW & CCW INHIBITOR (1)		
1	Balance	ON or OFF
2	Supervisory	ON or OFF
3	Stall	ON or OFF
4	OverTrq/Thr	ON or OFF
5	Switch Block	ON or OFF
6	Bad Pos Sig	ON or OFF
7	Bad Dem Sig	ON or OFF
8	Local Cal	ON or OFF

FROM MENU 8A

MENU 8G - CW & CCW INHIBITOR (2)		
1	Inh 1	ON or OFF
2	Ovrd	ON or OFF
3	LimSw	ON or OFF
4	HndSw	ON or OFF

FROM MENU 8

MENU 10 - TESTS		
1	FB Out Test»	Action
2	Board Self-Test»	Action
3	Identify Device»	Action
4	Board Reset»	Action

FROM MENU 8

MENU 11 - CW TORQUE / CCW TORQUE		
1	Segment 1	Percentage
2	Segment 2	Percentage
...
10	Segment 10	Percentage

FROM MENU 8

MENU 12 - ALARM SETUP		
1	AlarmPol*	Drops Out or Pulls In
2	Alarm Mask	LINK TO MENU 12A

FROM MENU 12

MENU 12A - ALARM MASK		
1	DemandLOS*	ON or OFF
2	Trq/Thrust High*	ON or OFF
3	Stall*	ON or OFF
4	Trq/Thrust Stop*	ON or OFF
5	Stop/Limit*	ON or OFF
6	FeedbackLOS*	ON or OFF
7	Temperature*	ON or OFF
8	PositionLOS*	ON or OFF
9	RTC Fail*	ON or OFF
10	Torq/Thrust/MeasFail*	ON or OFF
11	PositionA/D Error*	ON or OFF
12	Demand/MeasFail*	ON or OFF
13	Reserved 1*	ON or OFF
14	PositionLOS*	ON or OFF
15	TemperatureMeasFail*	ON or OFF
16	MemoryFail*	ON or OFF
17	InvalButtonPress*	ON or OFF
18	DemandTooHigh*	ON or OFF
19	DemUnderHART/FF Cti*	ON or OFF
20	DemUnderPAT Cti*	ON or OFF

FROM MENU 8

MENU 13 - REAL TIME CLOCK		
1	RTC Day*	Integer
2	RTC Month*	Integer
3	RTC Year*	Integer
4	Hour (24)*	Integer
5	Minute*	Integer

SAMPLE MENU BLOCK FORMAT

Previous Menu

MENU # - MENU DESCRIPTION		
1	Parameter	Range / Units / Info.

* Parameter names marked with an asterisk indicate that the value may be edited.

» Parameter names marked with a double arrow indicate that the menu item performs a function.

... Indicates that the menu is longer than shown