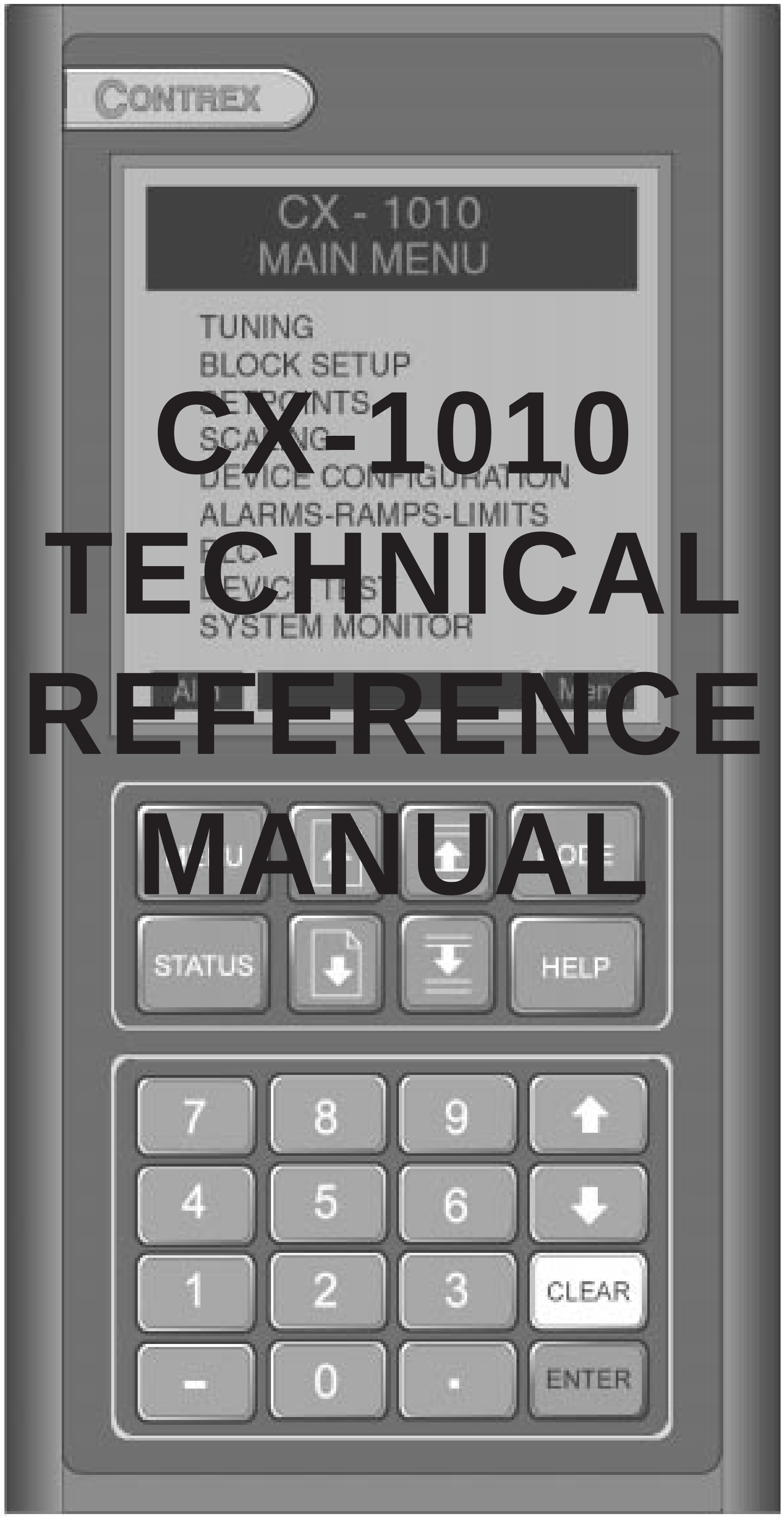
CX-1010 TECHNICAL REFERENCE MANUAL



CONTREX®

0001-0131 Rev A

Technical Assistance

If you have comments or questions concerning the operation of the CX–1010, a member of our Technical Support Staff will be happy to assist you. Ask for Technical Support:
(763) 424-7800 or (800) 342-4411

Contrex®

8900 Zachary Lane North
Maple Grove, Minnesota 55369

DANGER

Improper installation can cause severe injury, death or damage to your system.

Integrate this motion control unit into your system with caution.

Comply with the National Electrical Code and all applicable local and national codes.

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Introduction

INTRODUCING THE CX–1010

The CX–1010 is a quantum leap in user friendly motion control. Its menu-driven screens allow quick and easy access to multiple Control and Monitor Parameters. In addition, all of the screens and parameters can access individual “help” screens, that define the functions and display additional options. For those of you who are familiar with the M-Series, and the single parameter entry, these revolutionary screens will be a paradigm shift in the way you view motion control.

The CX–1010 is a highly accurate, digital, motion controller. Its advanced internal software is capable of solving a great variety of speed control tasks. It operates as either a stand alone control of a single motor (Master mode) or as a part of a complex multi-drive system (Follower mode). It also operates a multi-functional mode that can be custom tailored to your specific system's requirements (Custom Mode). The CX–1010 can also operate with inverse or offset variations.

The CX–1010 is ideal for motor control applications where your open loop or rudimentary closed loop operations are inaccurate or where there is inadequate load regulation. The CX–1010 is also ideal for mixing, blending, extruder or conveyor control applications or any application that requires an accurate ratio following a lead.

The CX–1010 adds accurate digital control to virtually any AC, DC, Servo Flux Vector or Clutch drives. The CX–1010 is at the forefront in user friendly, digitally accurate Follower applications. See figure 1-1 through figure 1-3 for examples of CX-1010 applications.

The CX–1010 preprogrammed internal software integrates with your system with little effort from you. The CX–1010's user friendly screens will also allow you to enter data that is unique to your system's specific needs (e.g., maximum RPM, setpoints, acceleration/deceleration ramp rates). Using Code Parameters (CP), this data is entered through either the CX–1010's screens or through a host computer via the RS485 Serial Communications port. In addition to the Control Parameters that allow you to customize for your systems specific needs, the CX–1010's Monitor Parameters (MP) allow you to monitor your system's performance.

The CX–1010 has multiple scaling formats that allow you to enter the setpoints and monitor speed in the Engineering Units (e.g., RPM, gallons per hour, feet per minute) that are unique to your system. The CX-1010 features timer/counter and batching functions. Integrating the CX-1010's applied intelligence with your system puts closed loop speed regulation with zero accumulative error at your fingertips, quickly, easily and cost effectively. The CX-1010 is perfect for applications that need to accommodate a wide range of changing configurations.

EXAMPLES OF CX–1010 APPLICATIONS

Figure 1-1 is an example of a the Continuous Process Fluid Mixing application. The continuous process fluid mixing application depends on the ability of the followers to maintain their feedback as a constant percentage of the total flow rate. As the Lead pump speed changes, the Follower pump's speed change proportionately The introduction of the CX–1010 to the continuous process fluid mixing process increases control, efficiency and saves time.

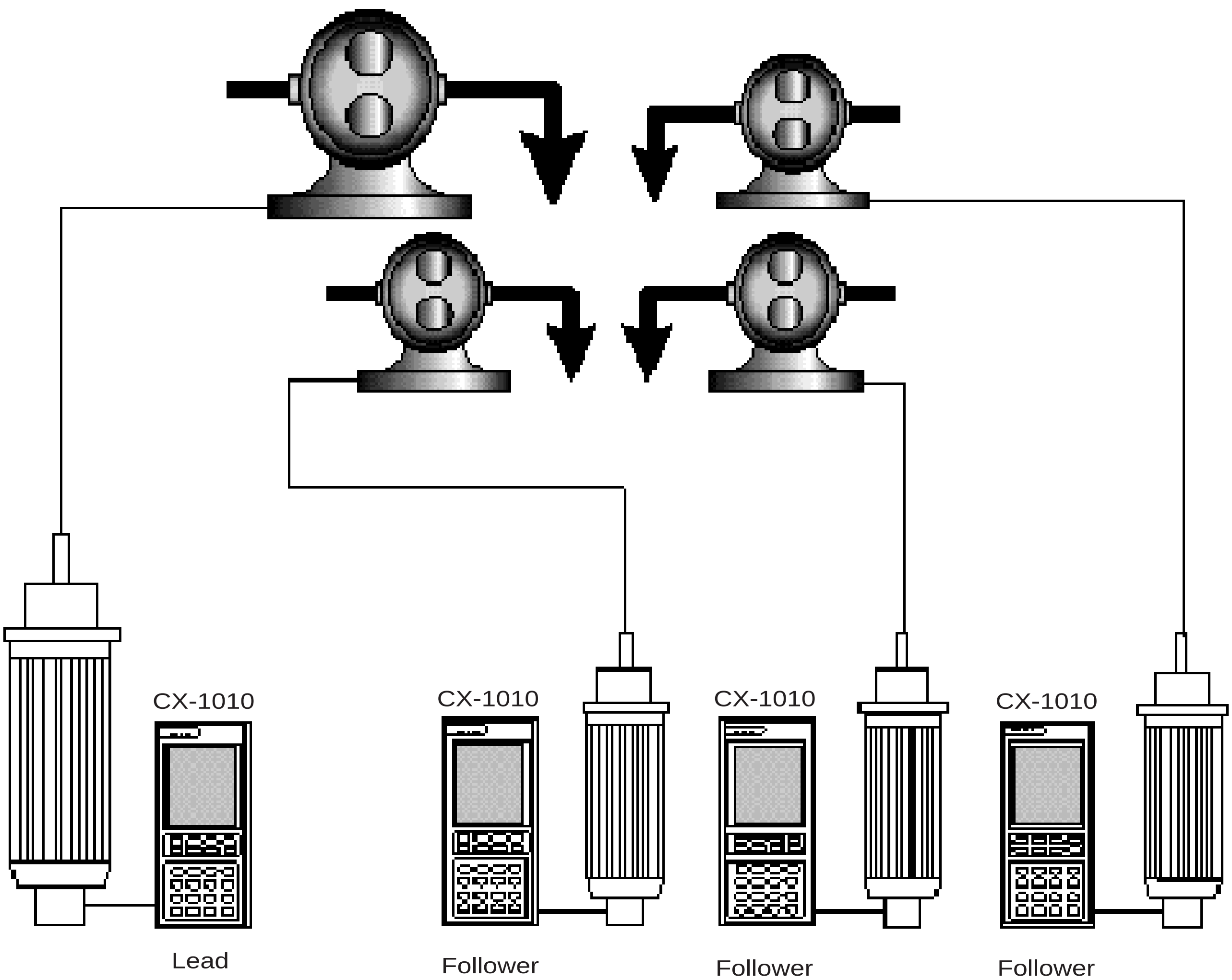


Figure 1-1 CX–1010 Continuous Process Fluid Mixing Application

Figure 1-2 is an example of a the Constant Speed Windup application. As the windup role rotates, its diameter increases. The advanced capability of the CX–1010 senses even the slightest increase in speed and the CX-1010 reduces output to the drive accordingly. In response, the windup role slows down and an exact surface speed is maintained. The CX–1010 allows a nearly infinite range of settings, no pinch points and a significant reduction in mechanical backlash.

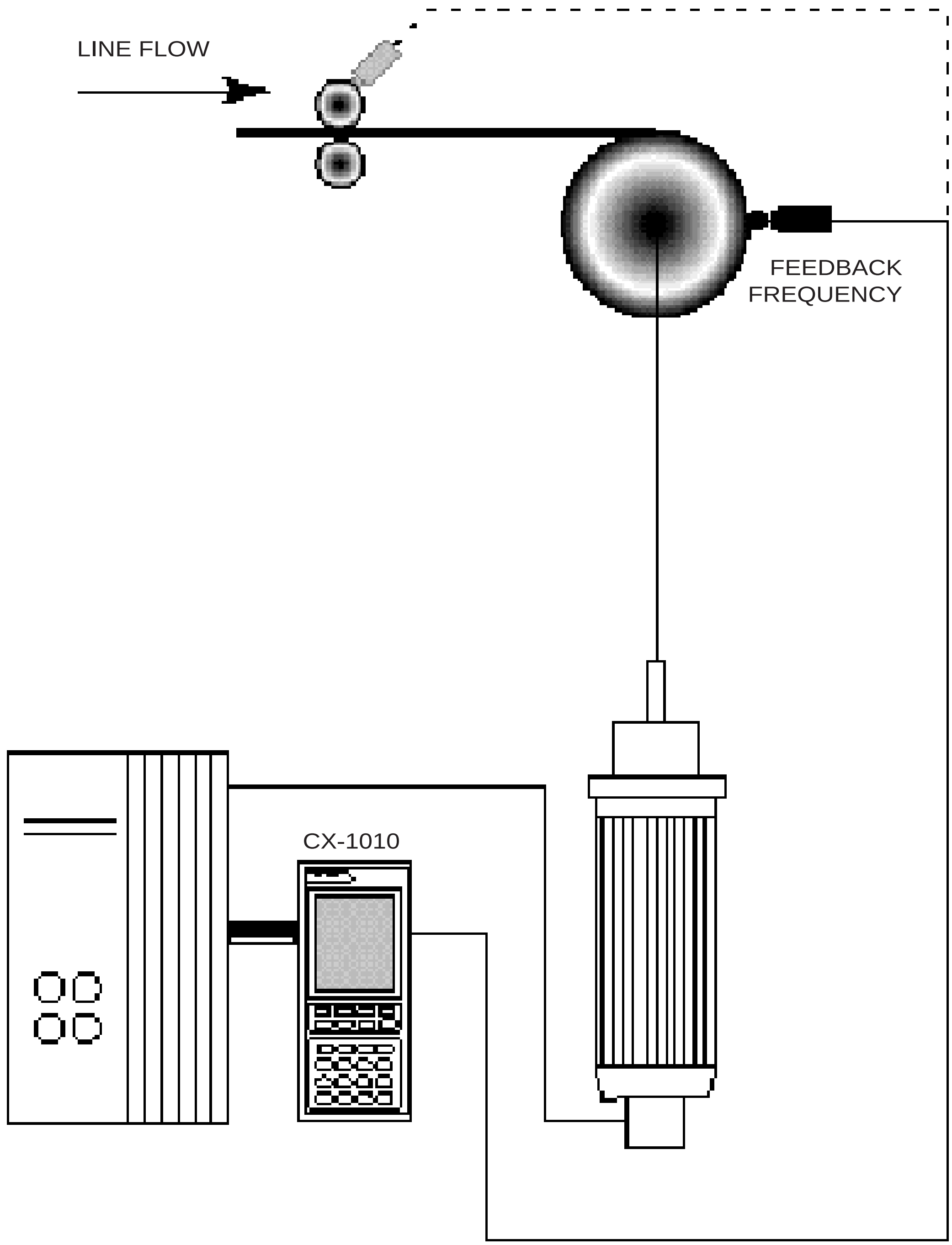


Figure 1-2 CX–1010 Constant Speed Windup Application

Figure 1-3 is an example of a the Windup with Dancer application. The CX–1010's advanced capabilities allow it to match the surface speed of the windup roll with the surface speed of the Lead encoder. The CX–1010 uses a signal from the dancer to make the necessary windup speed corrections that assure precise tension or position.

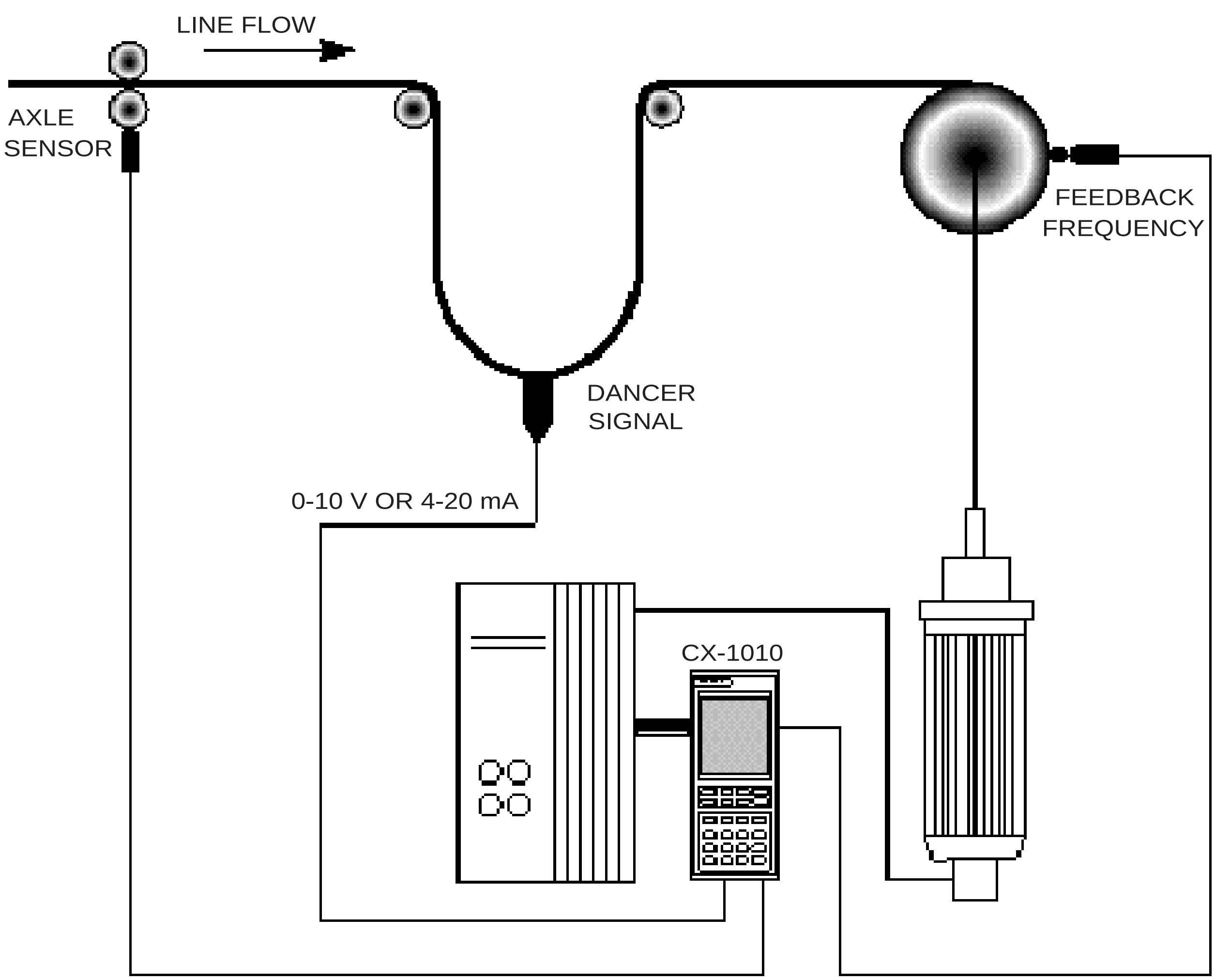


Figure 1-3   CX–1010 Windup with Dancer Application

Installation / Setup

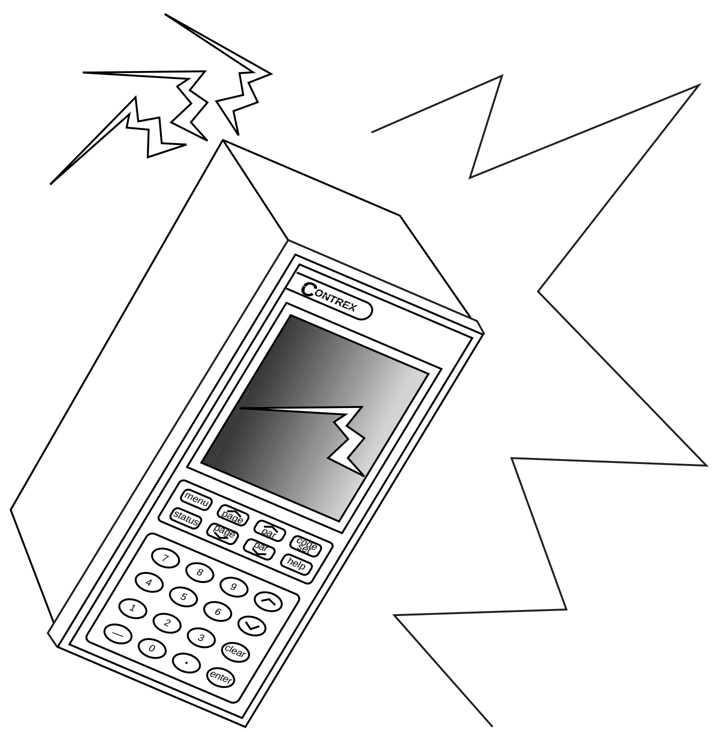
CONFIGURATION

This section will show you how to re-configure the CX-1010 for electrical compatibility. Complete this procedure prior to installation. This procedure does not require power to complete.

The area that is involved in re-configuring the CX-1010 is the AC Power Input Voltage switch. This switch is located in an external location on the CX-1010. You will not be required to access the interior of the CX-1010.

Figure 2-1 (page 2-5) illustrates the location of this switch.

WARNING



You will damage the CX-1010 if you apply 230VAC to the AC Power input while the AC Power Input Voltage switch is in the 15 V position.

The AC Power Input Voltage switch is located on the rear of the CX-1010. The default configuration for the AC Power Input Voltage switch is 115 VAC.

To re-configure for 230 VAC Input, move the switch from the 115V position (up) to the 230V position (down).

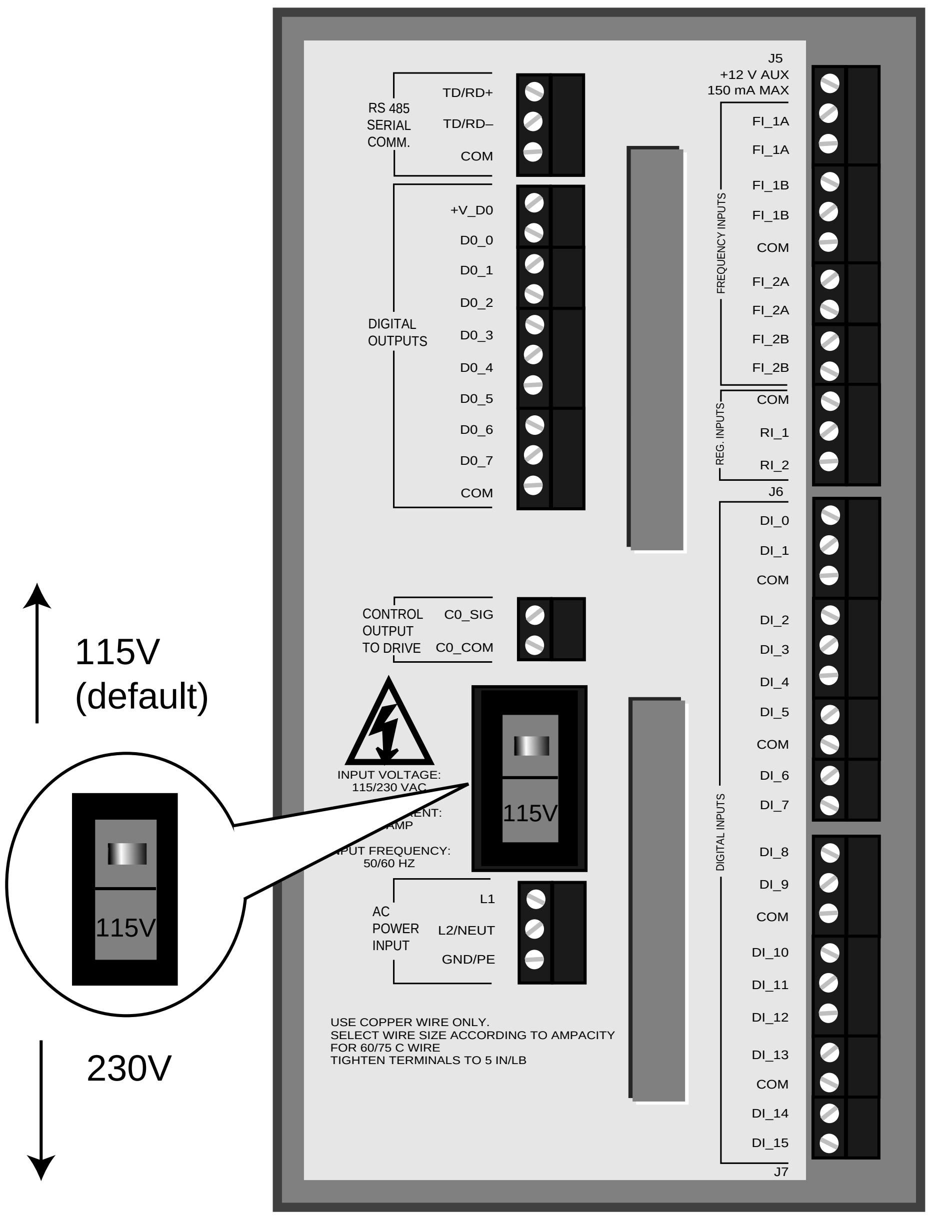
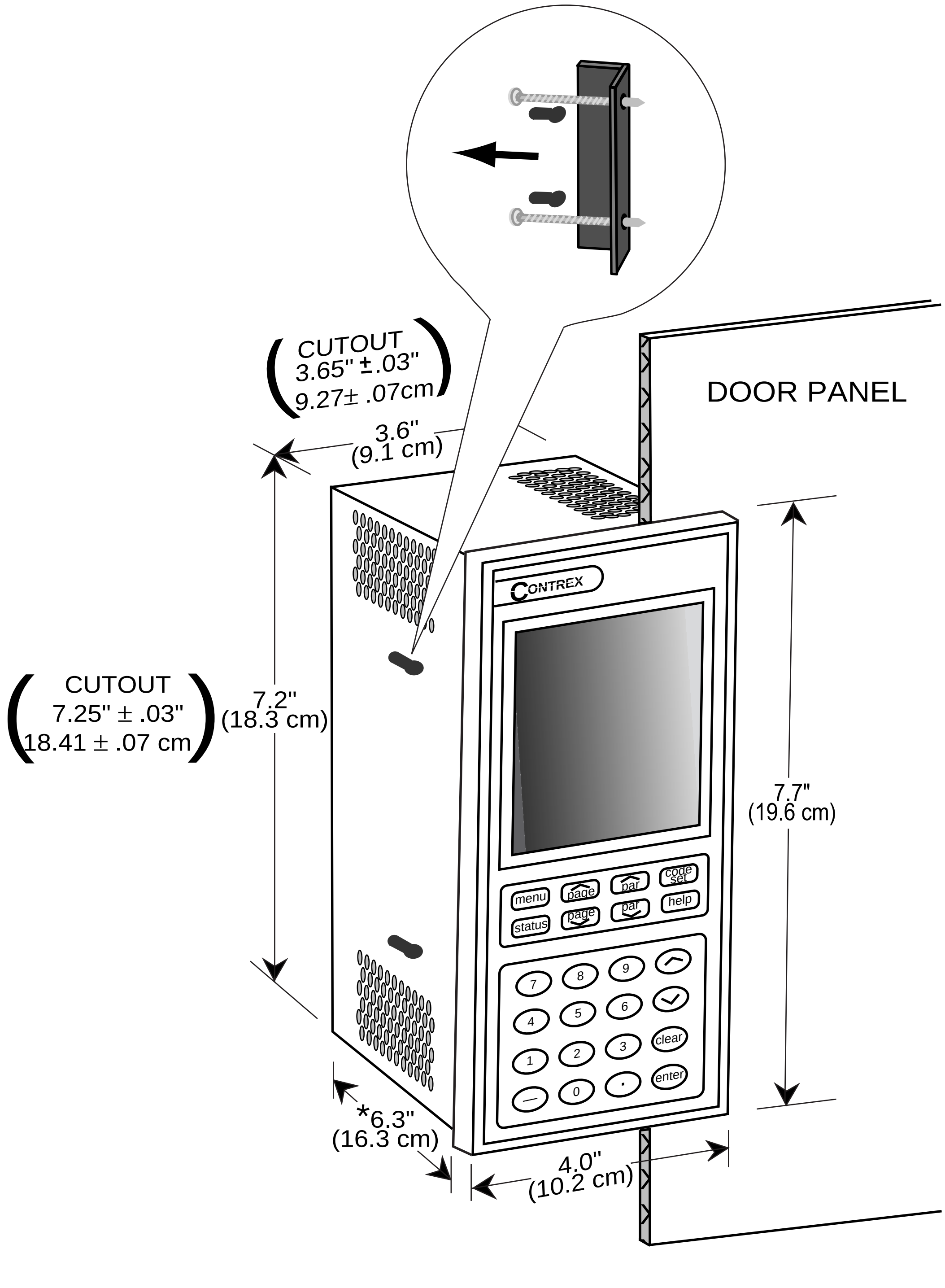


Figure 2-1   AC Power Input Voltage Switch



* From the rear of the door panel to the back of the connectors

Figure 2-2 CX–1010 Cutout Dimensions and Mounting Guide

MOUNTING

This section contains instructions for mounting the CX–1010 in the door panel of an industrial electrical enclosure. The CX–1010 is packaged in a compact 1/2 DIN vertical instrument enclosure that mounts easily in the door of your industrial electrical enclosure. The CX-1010 meets the NEMA 4 and the IP65 standards. To ensure compliance with these standards, enclose the CX-1010 in a Nema 4 or IP65 industrial electrical enclosure.

To mount the CX–1010:

1) The industrial electrical enclosure that will house the CX–1010 must conform to the following environmental conditions:

    Temperature: 0 - 55 degrees C
    (Internal enclosure temperature)

    Humidity: 0 - 95% RH non-condensing

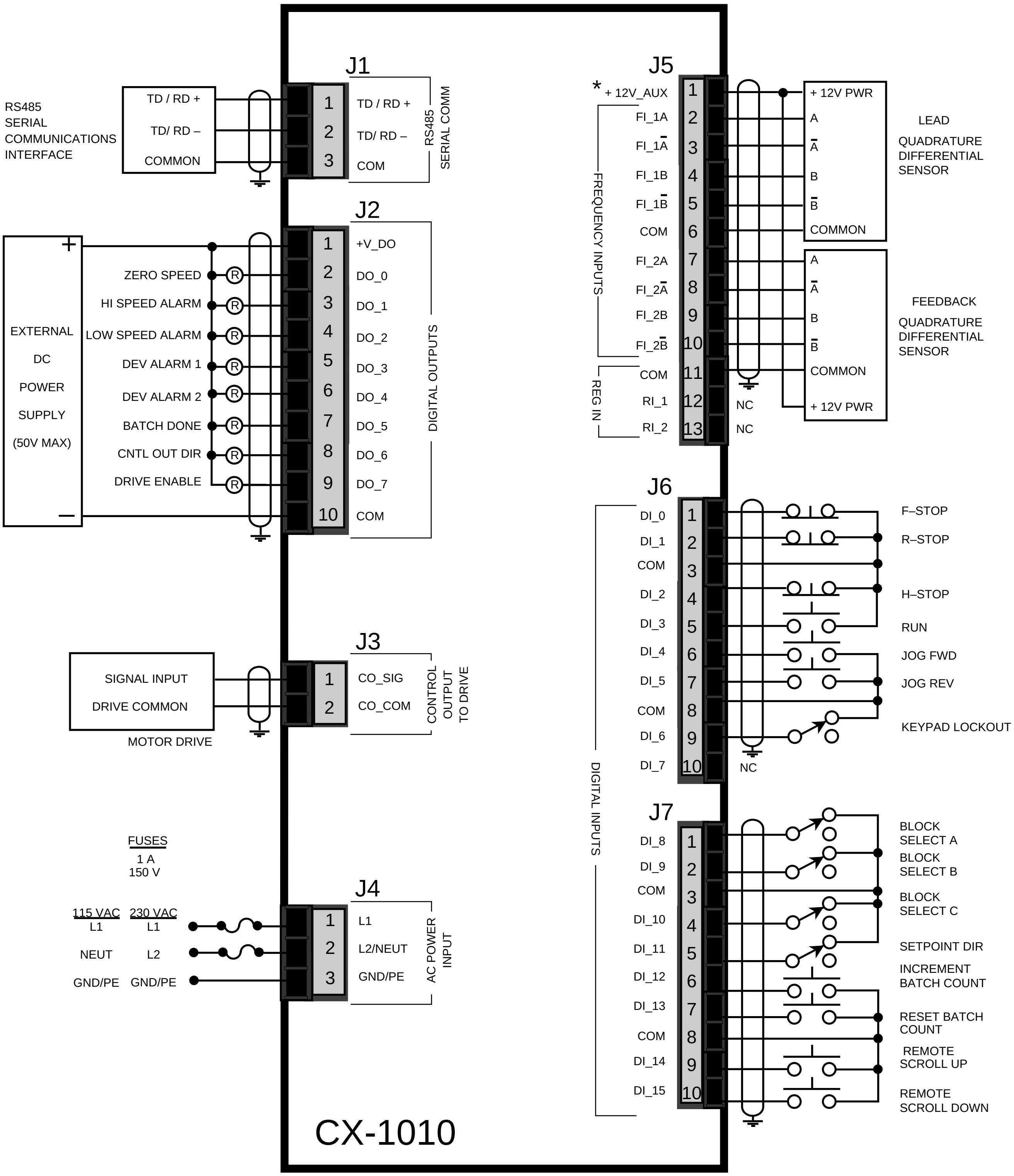
    Environment: Pollution degree 2 macro - environment

    Altitude: To 3300 feet (1000 meters)

2) The dimensions for the door panel cutout are 3.65"± .03" x 7.25 ±.03" (9.27 x 18.41cm). See figure 2-2. Allow two inches of clearance on both sides of the cutout and four inches of clearance on the top and bottom of the cutout for mounting clamp attachments, wire routing and heat convection.

3) Insert the CX–1010 through the door panel cutout until the gasket and bezel are flush with the door panel (see figure 2-2).

4) Slide the two mounting clamp bars into the slots that are located on either side of the CX–1010. See figure 2-2. Tighten the mounting screws until the CX–1010 is mounted securely in the electrical enclosure. Do not overtighten.



* Power for frequency input sensors may be supplied by J5, pin 1.

Total current should not exceed 150 mA .

Figure 2-3 CX–1010 General Wiring

WIRING

This section contains the input, output and serial communications wiring information for the CX–1010. Please read this section prior to wiring the CX–1010 to ensure that you make the appropriate wiring decisions.

NOTE: The installation of this motor control must conform to area and local electrical codes. See *The National Electrical Code* (NEC,) Article 430 published by the National Fire Protection Association, or *The Canadian Electrical Code* (CEC). Use local codes as applicable

Use a minimum wire gauge of 18 AWG.

Use shielded cable to minimize equipment malfunctions from electrical noise and terminate the shields at the receiving end only.

Keep the AC power wiring (J4) physically separated from all other wiring on the CX–1010. Failure to do so could result in additional electrical noise and cause the CX–1010 to malfunction.

Inductive coils on relay, contactors, solenoids that are on the same AC power line or housed in the same enclosure should be suppressed with an RC network across the coil.

A hand operated supply disconnect device must be installed in the final application. The primary disconnect device must meet EN requirements.

Install an AC line filter or isolation transformer to reduce excessive EMI noise, such as line notches or spikes, on the AC power line.

DANGER

Hazardous voltages.
Can cause severe injury, death
or damage the equipment.
The CX–1010 should only be installed by a
qualified electrician.

INPUTS

NOTE: The installation of this motor control must conform to area and local electrical codes. Refer to page 2-9 before you begin wiring.

AC Power Input

(J4 pins 1, 2,3)

The CX–1010 operates on either a 115 VAC - 10% + 15%, 0.250 Amp., 50/60 Hz or a 230 VAC -10% +15%, 0.125 Amp, 50/60 Hz. Use the separate 3 pin connector (J4) for the power connection.

* Fuse L1 for 115 VAC applications. Fuse L1 and L2 for 230 VAC applications. Use 1 Amp 250 normal blow fuses.

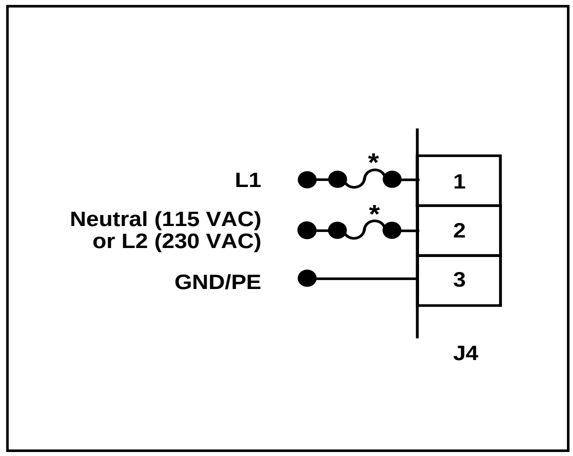


Figure 2-4 AC Power Input

	WARNING **You will damage the CX-1010 if you apply 230 VAC to the AC Power input when the AC Power Input Voltage switch is in the 115 V position.**	

Lead Frequency
(J5 pins 1, 2, 4, 5, 6)
Frequency Input 1

The LEAD FREQUENCY Input acts as the lead signal when the CX–1010 is in the Follower mode. The wiring for the LEAD FREQUENCY is determined by the sensor. Figures 2-5 through 2-8 illustrate the wiring for the various sensors. For signal level and performance specifications, refer to *Appendices: Appendix A* .

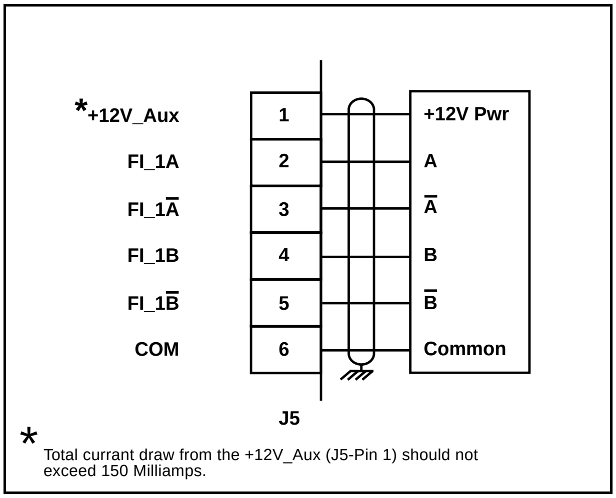


Figure 2-5 Lead Frequency
Quadrature Differential Sensor (Bidirectional)

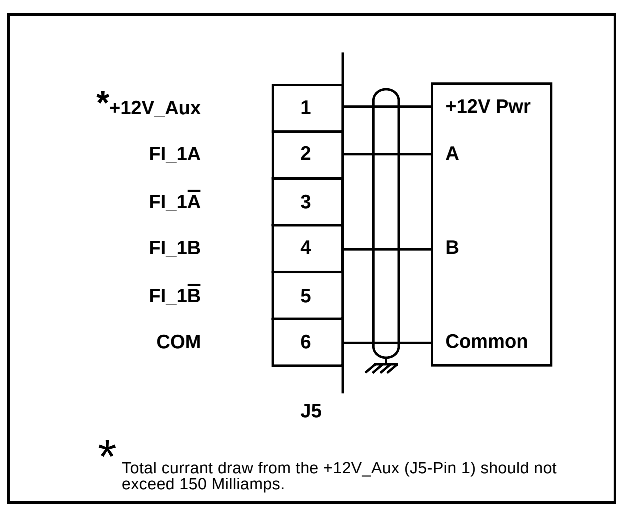


Figure 2-6 Lead Frequency
Quadrature Single-Ended Sensor (Bidirectional)

Lead Frequency continued...

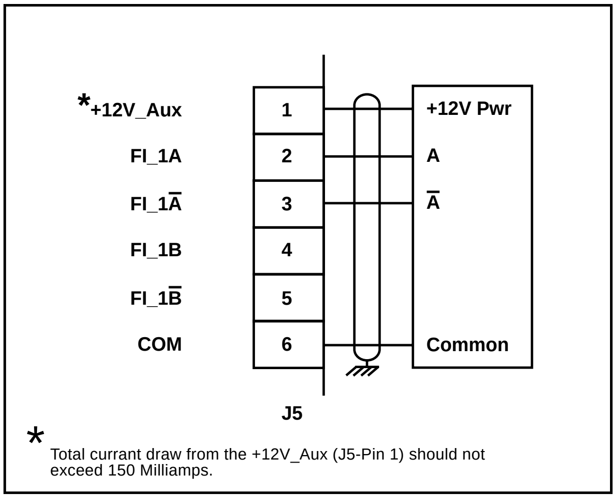
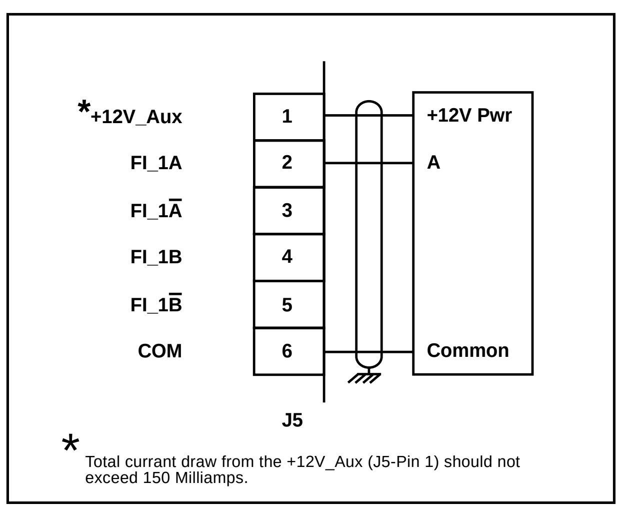


Figure 2-7 Lead Frequency
Single Channel Differential Sensor (Unidirectional)

Figure 2-8 Lead Frequency
Single Channel Single-Ended Sensor (Unidirectional)



Feedback Frequency
(J5 pins 1, 7, 8, 9, 10, 11)
Frequency Input 2

The FEEDBACK FREQUENCY detects the controlled motor speed. The wiring for FEEDBACK FREQUENCY is determined by the sensor. Figures 2-9 through 2-12 illustrate the wiring for the various sensors. For signal level and performance specifications refer to *Appendices: Appendix A*.

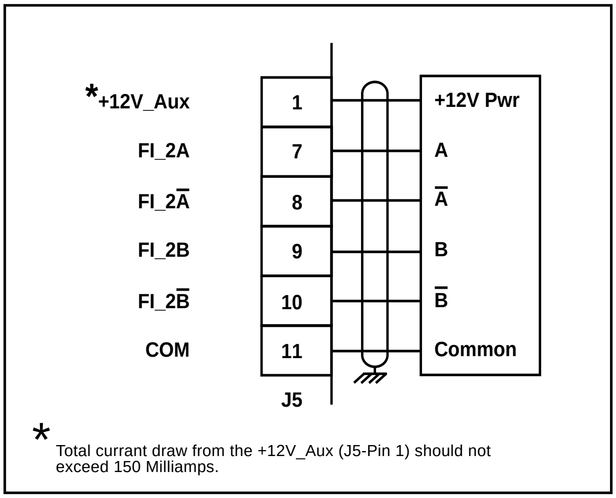


Figure 2-9 Feedback Frequency
Quadrature Differential Sensor (Bidirectional)

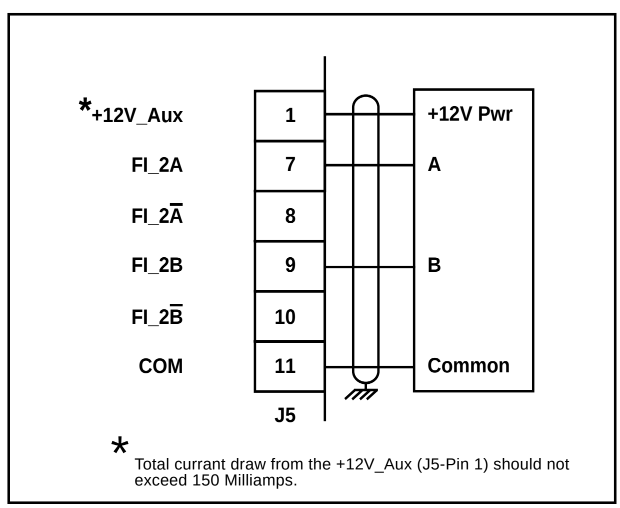


Figure 2-10 Feedback Frequency
Quadrature Single-Ended Sensor (Bidirectional)

Feedback Frequency continued...

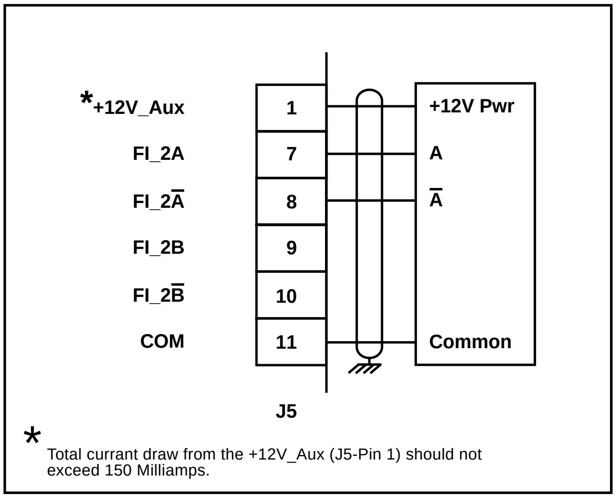
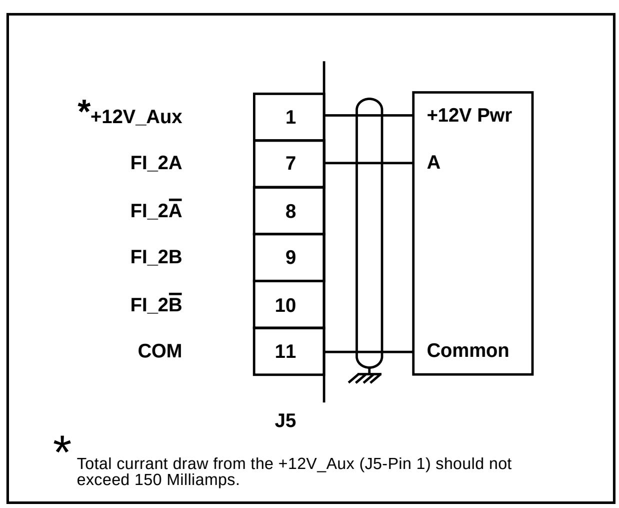


**Figure 2-11 Feedback Frequency
Single Channel Differential Sensor (Unidirectional)**

**Figure 2-12 Feedback Frequency
Single Channel Single-Ended Sensor (Unidirectional)**



F–Stop
(J6 pins 1,3)
Digital Input 0

F-STOP is a momentary input. When it is opened, the CX–1010 commands a zero speed immediately and ignores the specified deceleration rate. However, F–STOP does not hold zero speed or position (drive disabled). As a momentary input, F-STOP is internally latched and does not need to be maintained open by an operator device.

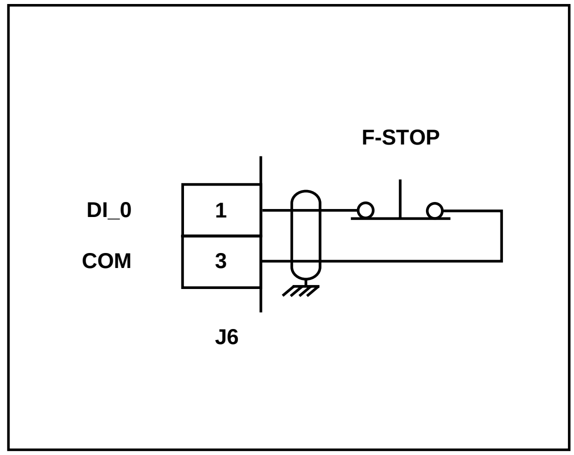


Figure 2-13   F–Stop

R–Stop
(J6 pins 2, 3)
Digital Input 1

R–STOP is a momentary input. When it is opened, the CX–1010 ramps to a zero speed command at the specified deceleration rate. However, R–STOP does not hold zero speed after the deceleration ramp has been completed (drive disabled) . As a momentary input, R–STOP is internally latched and does not need to be maintained open by an operator device.

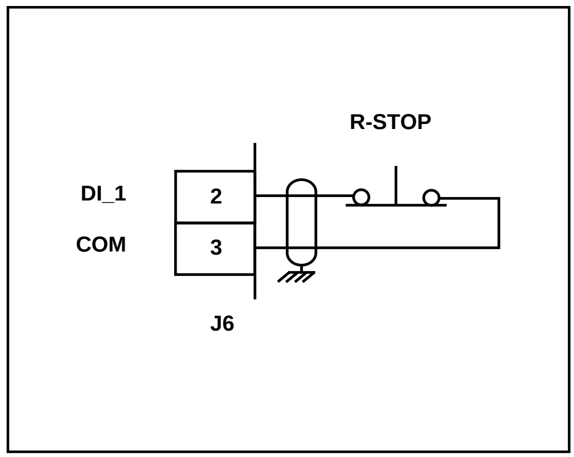


Figure 2-14 R–Stop

H–Stop
(J6 pins 3, 4)
Digital Input 2

H–STOP is a momentary input. When it is opened, the CX–1010 ramps to a zero speed command at the specified deceleration rate.   In addition, H–STOP holds zero speed after the deceleration ramp has been completed (drive enabled). As a momentary input, H–STOP is internally latched and does not need to be maintained open by an operator device.

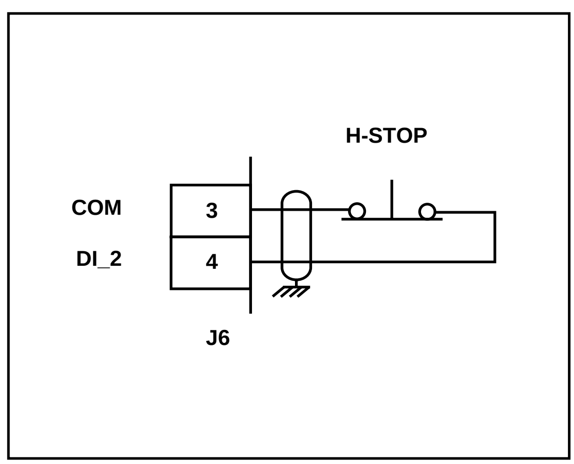


Figure 2-15   H–Stop

Run

(J6 pins 3, 5)
Digital Input 3

When the RUN input (J6, pin 5) is momentarily shorted to common, the CX–1010 enters the RUN state. As a momentary input, RUN is internally latched and does not need to be maintained closed by an operator device.

NOTE: Close the R–Stop, H-Stop and F–Stop inputs prior to entering the Run state. If you are only using one of the Stop inputs, wire short the other Stop inputs to the common or the CX–1010 will not enter run.

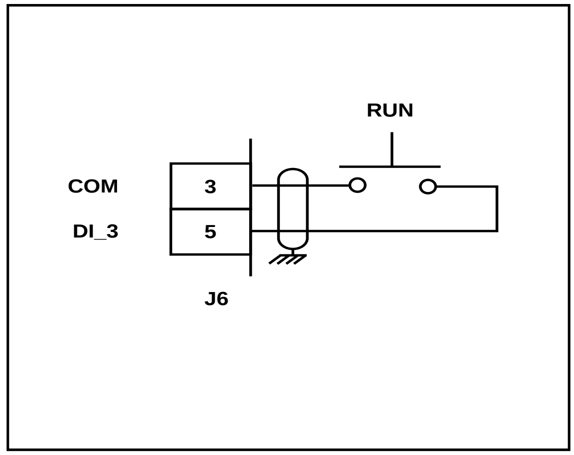


Figure 2-16   Run

Jog Forward

(J6 pins 6, 8)
Digital Input 4

JOG FORWARD is a maintained input. When it is closed, it sends a forward speed command signal to the drive at the selected Jog Setpoint . As a maintained input, JOG FORWARD is only active when the operator device is closed.

NOTE: Close the R–Stop, H-Stop and F–Stop inputs prior to entering the Jog state. If you are only using one of the Stop inputs, wire short the other Stop inputs to the common or the CX–1010 will not enter Jog.

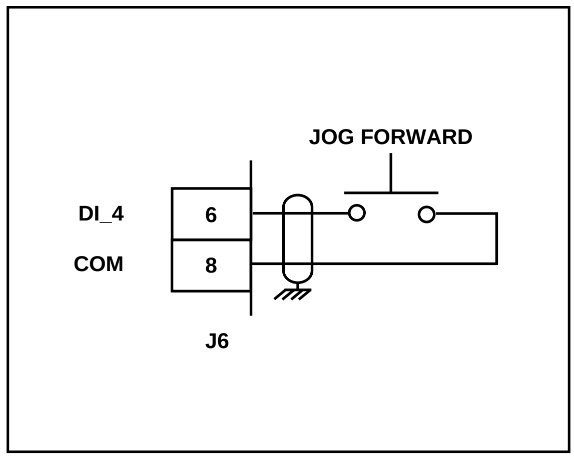


Figure 2-17   Jog Forward

Jog Reverse

(J6 pins 7, 8)
Digital Input 5

JOG REVERSE is a maintained input. When it is closed, it sends a reverse speed command signal to the drive at the selected Jog Setpoint . As a maintained input, JOG REVERSE is only active when the operator device is closed.

NOTE: Close the R–Stop, H-Stop and F–Stop inputs prior to entering the Jog state. If you are only using one of the Stop inputs, wire short the other Stop inputs to the common or the CX–1010 will not enter Jog.

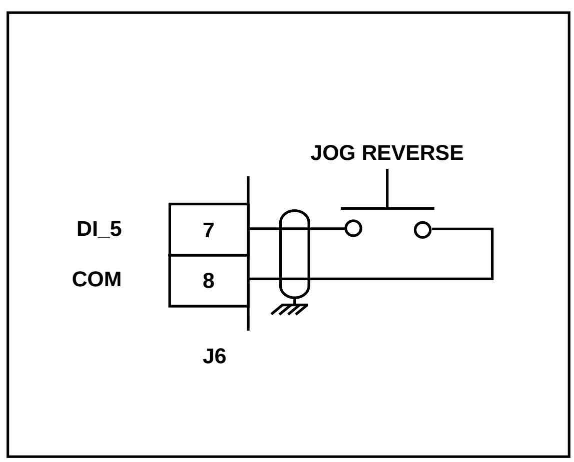


Figure 2-18   Jog Reverse

Keypad Lockout
(J7 pins 8, 9)
Digital Input 6

When the KEYPAD LOCKOUT input is closed, the Control Parameters that you have selected to "lock out" are inaccessible from the front keypad. All of the Monitor Parameters remain enabled.

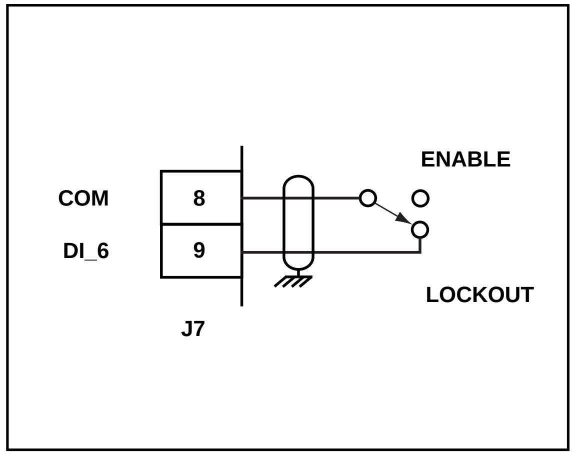


Figure 2-19   Keypad Lockout

Block Select A
(J7 pins 1, 3)
Digital Input 8

Use BLOCK SELECT A in conjunction with BLOCK SELECT B and BLOCK SELECT C inputs to select one of the eight Parameter Blocks. Refer to the chart on the next page.

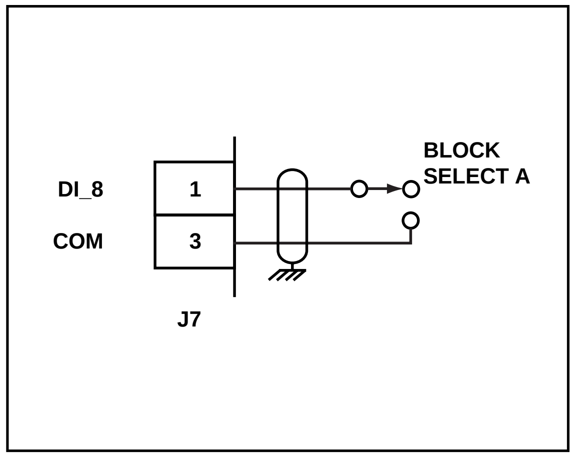


Figure 2-20   Block Select A

Block Select B
(J7 pins 2,3)
Digital Input 9

Use BLOCK SELECT B in conjunction with BLOCK SELECT A and BLOCK SELECT C inputs to select one of the eight Parameter Blocks. Refer to the chart below.

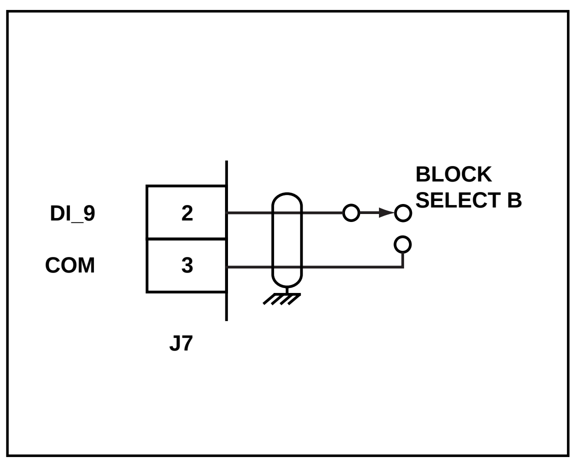


Figure 2-21   Block Select B

Block Select C

(J7 pins 3,4)
Digital Input 10

Use BLOCK SELECT C in conjunction with BLOCK SELECT A and BLOCK SELECT B inputs to select one of the eight Parameter Blocks. Refer to the chart below.

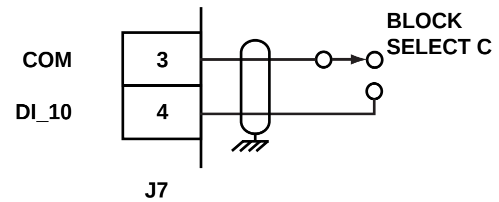


Figure 2-22   Block Select C

PARAMETER BLOCKS:	0	1	2	3	4	5	6	7
Block Select A	Open	Closed	Open	Closed	Open	Closed	Open	Closed
Block Select B	Open	Open	Closed	Closed	Open	Open	Closed	Closed
Block Select C	Open	Open	Open	Open	Closed	Closed	Closed	Closed

Setpoint Direction

(J7 pins 3,5)
Digital Input 11

Use SETPOINT DIRECTION in conjunction with a positive or a negative setpoint parameter value to select either a forward or reverse command direction. Refer to the chart below.

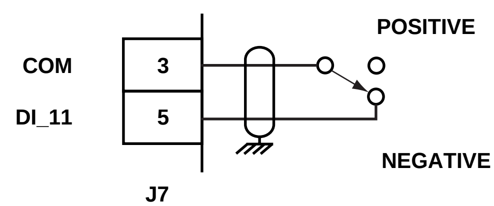


Figure 2-23   Setpoint Direction

	Positive Setpoint Value	Negative Setpoint Value
Setpoint Direction Open	Forward Command	Reverse Command
Setpoint Direction Closed	Reverse Command	Forward Command

Increment Batch Count

(J7 pins 6, 8)
Digital Input 12

INCREMENT BATCH COUNT is a momentary input. When it is closed, the CX–1010 increases the internal batch counter by one increment.

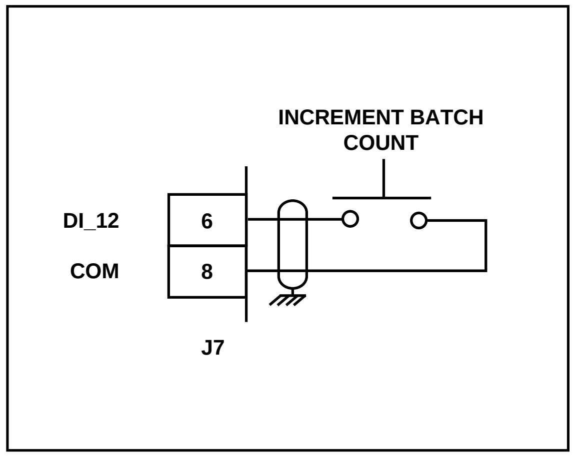


Figure 2-24   Increment Batch Count

Reset Batch Count

(J7 pins 7, 8)
Digital Input 13

RESET BATCH COUNT is a momentary input. When it is closed, the CX–1010 resets the internal batch counter to zero.

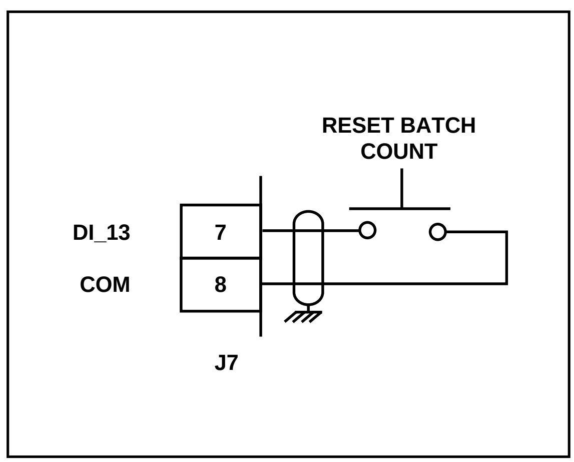


Figure 2-25   Reset Batch Count

Remote Scroll Up

(J7 pins 8, 9)
Digital Input 14

REMOTE SCROLL UP is a maintained input. When it is closed, any Control Parameter that you enter into the Remote Scroll Parameter (CP-300) can be incremented at the Remote Scroll Rate (CP-301). As a maintained input, REMOTE SCROLL UP is only active when the operator device is closed.

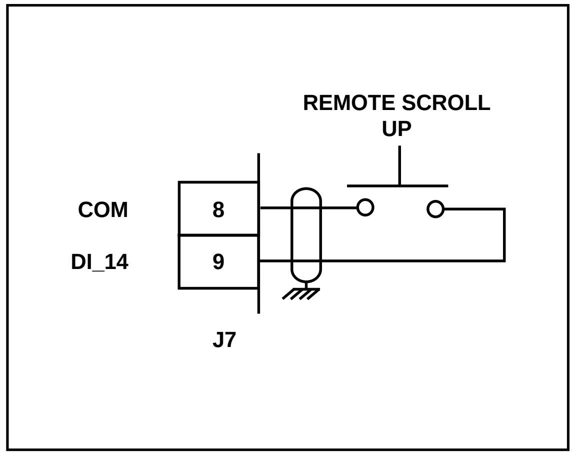


Figure 2-26 Remote Scroll Up

Remote Scroll Down

(J7 pins 8,10)
Digital Input 15

REMOTE SCROLL DOWN is a maintained input. When it is closed, any Control Parameter that you enter into the Remote Scroll Parameter (CP-300) can be decremented at the Remote Scroll Rate (CP-301). As a maintained input, REMOTE SCROLL DOWN is only active when the operator device is closed.

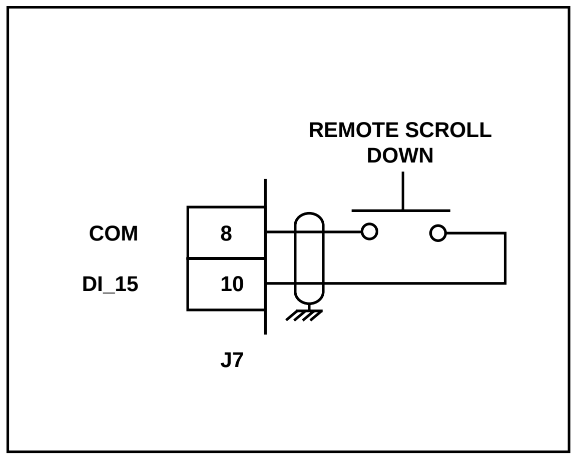


Figure 2-27 Remote Scroll Down

OUTPUTS

NOTE: The installation of this motor control must conform to area and local electrical codes. Refer to page 2-9 before you begin wiring.

Speed Command Out
(J3 pins 1, 2)

SPEED COMMAND OUT is an isolated analog output signal that is sent to the motor drive to control the speed of the motor. Wire the SPEED COMMAND OUT into the speed signal input of the drive. If the motor drive has a potentiometer speed control, remove the potentiometer connections and wire the SPEED COMMAND OUT output to the potentiometer wiper point. The CX–1010's Isolated Common should always be connected to the drive common.

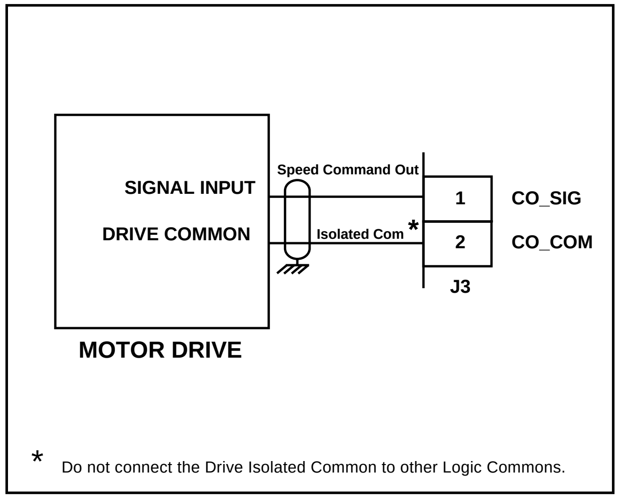


Figure 2-28 Speed Command Out

Zero Speed
(J2 pin 2)
Digital Output 0

The ZERO SPEED output is activated (driven low) when the feedback is less than or equal to zero speed, as determined by the value that you enter in the Zero Speed Alarm Control Parameter (CP-270).

Hi Speed Alarm
(J2 pin 3)
Digital Output 1

The HI SPEED ALARM output is activated (driven low) if the system's speed is greater than the speed alarm value that you enter in the CMPR1 Val Control Parameter (CP-292), See Figure 2-29.

Lo Speed Alarm
(J2 pin 4)
Digital Output 2

The LO SPEED ALARM output is activated (driven low) if the system's speed is lower than the value that you enter in the CMPR2 Val Control Parameter (CP-293). See Figure 2-29.

Dev Alarm 1
(J2 pin 5)
Digital Output 3

The DEV ALARM 1 output is activated (relay energized) when the Ramped Reference minus the Feedback is greater than the deviation band that you enter in the CMPR3 Val Control Parameter (CP-294). See Figure 2-29.

Dev Alarm 2
(J2 pin 6)
Digital Output 4

The DEV ALARM 2 output is activated (relay energized) when the difference between the Scaled Reference and Feedback is greater than the band that you enter in the CMPR4 Val Control Parameter (CP-295). See Figure 2-29.

Batch Done
(J2 pin 7)
Digital Output 5

The BATCH DONE output is activated (driven low) when the CX-1010's internal batch counter reaches the batch count that you enter in the Cntr1 Trig (CP-320). See Figure 2-29.

Control Output Dir
(J2 pin 8)
Digital Output 6

The CONTROL OUTPUT DIR is activated (driven low) when the CX-1010 commands a forward direction to the motor drive. The CONTROL OUTPUT DIR output is deactivated (driven high) when the CX-1010 commands a reverse direction to the motor drive. See Figure 2-29.

Drive Enable
(J2 pin 9)
Digital Output 7

The DRIVE ENABLE output is activated (driven low) when the CX–1010 signals a run command to the motor drive. The DRIVE ENABLE output is driven high (relay deactivated) after Power Up and at the completion of R–Stop and F–Stop. See Figure 2-29.

NOTE: The Digital Outputs are open-collector relay drivers. For specification details, see *Appendices: Appendix A* . Use an external DC power supply to power the relays. Free-wheeling diodes are incorporated internally in the CX-1010 and do not need to be added externally.

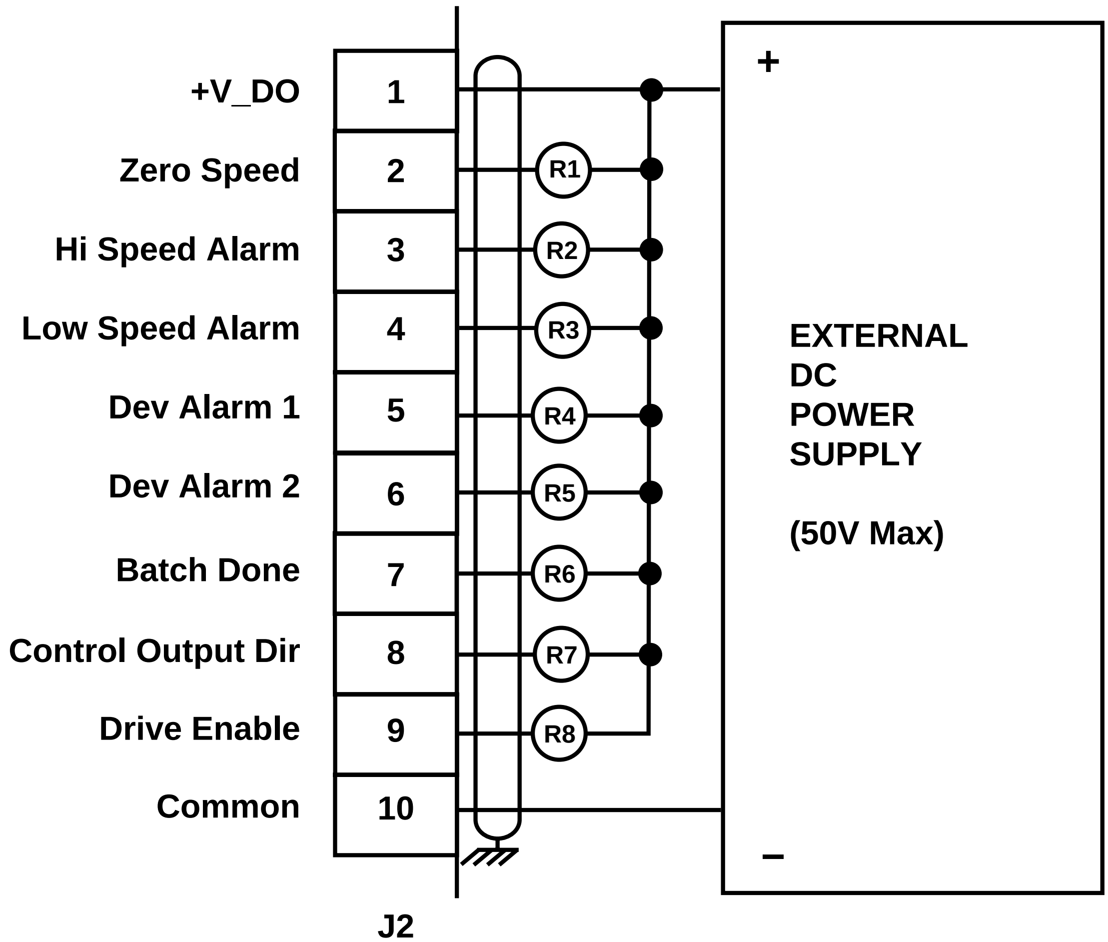


Figure 2-29 CX-1010 Digital Outputs

SERIAL COMMUNICATIONS

NOTE: The installation of this motor control must conform to area and local electrical codes. Refer to page 2-9 before you begin wiring.

The Serial Communications interface on the CX–1010 complies with EIA Standard RS–485-A for balanced line transmissions. This interface allows the host computer to perform remote computer parameter entry, status or performance monitoring, and remote control of the CX–1010. See *Serial Communications* for information on using Serial Communications.

Figures 2-30 and 2-31 illustrate a multidrop installation of the Serial Communications link and Serial Communications connections.

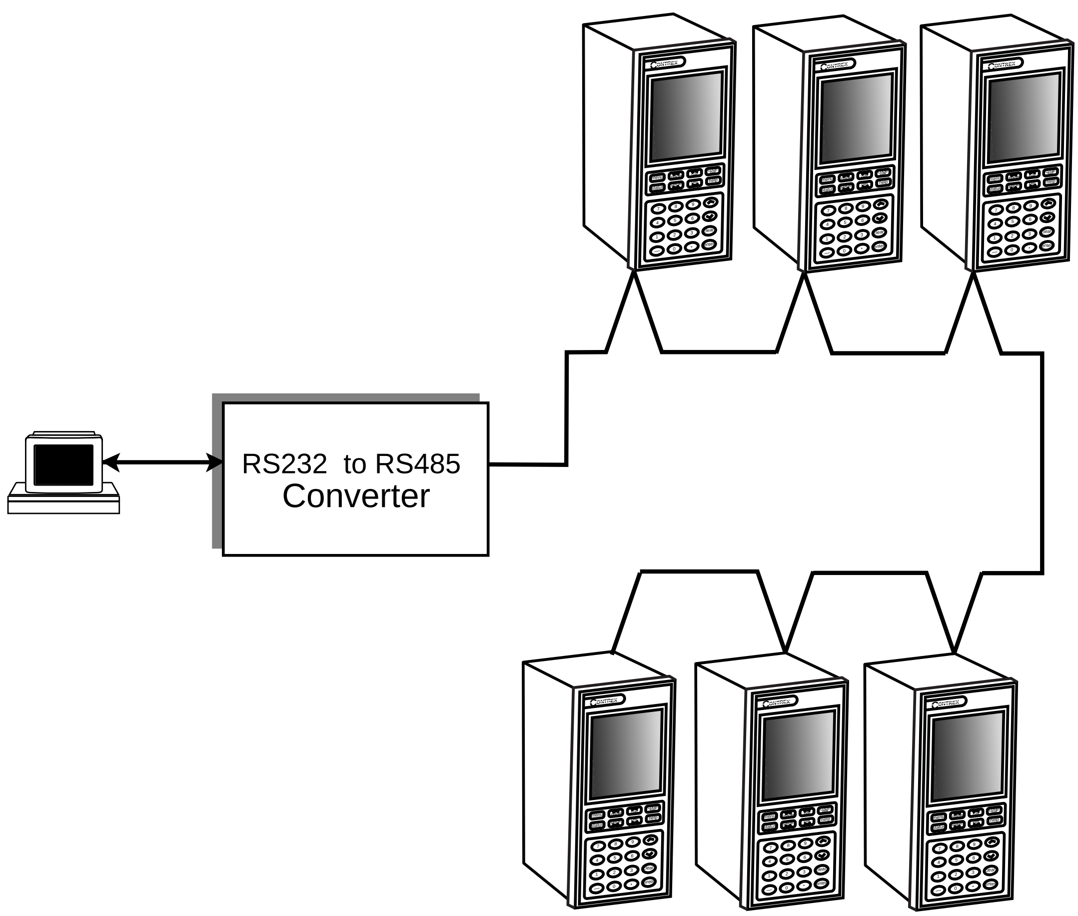
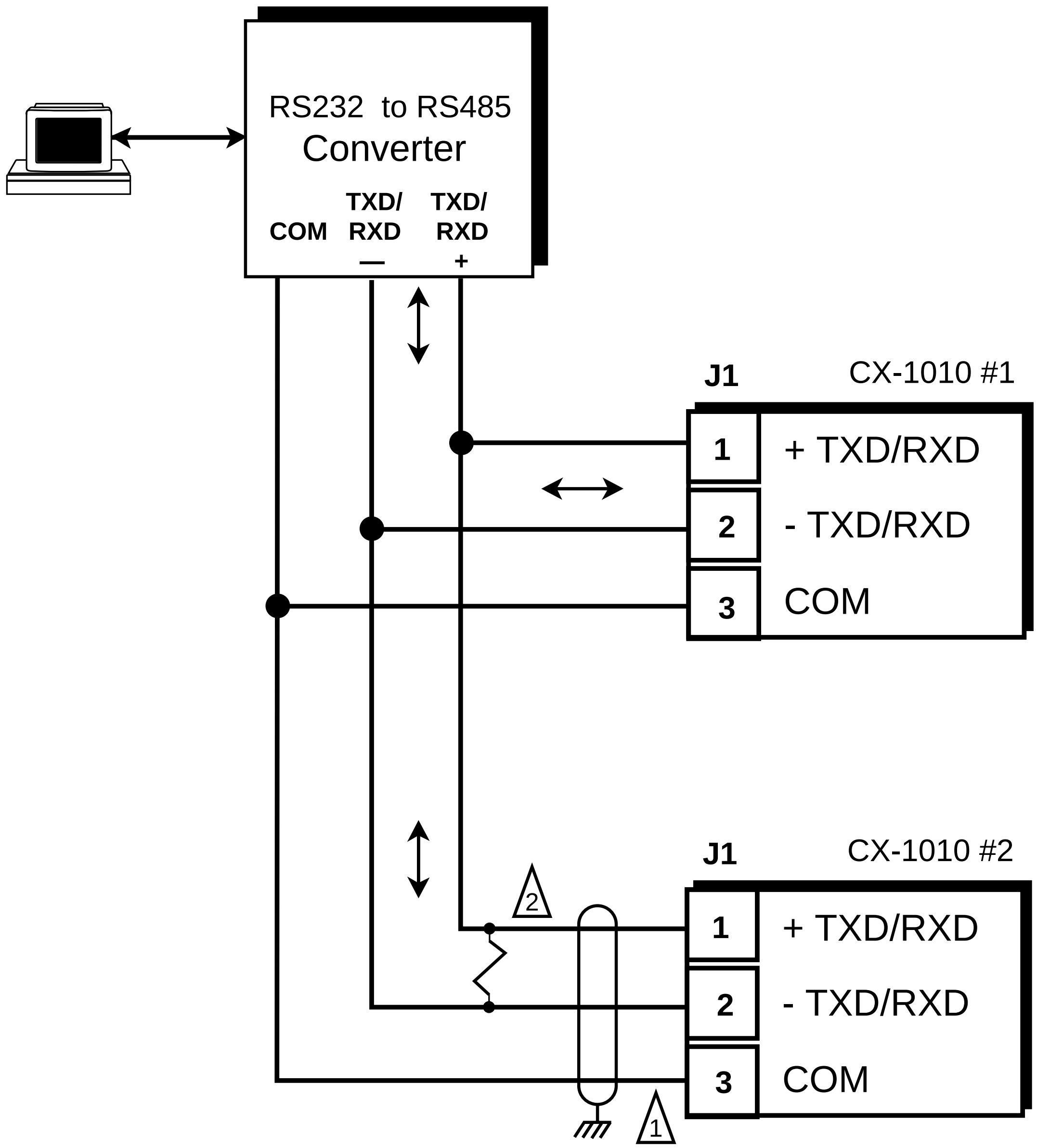


Figure 2-30 CX-1010 Multidrop Installation



1. Shield only at one end of the cable.

2. If you need to terminate the communication line, then terminate it at the unit which is the furthest away from the converter. A 100 ohm, 1/2 Watt resistor will usually terminate successfully. Refer to EIA Standard RS–485A, for more information.

Figure 2-31 CX-1010 Serial Communications Connections

—NOTES—

ANALOG I/O CARD (OPTIONAL)

This section contains the mounting and wiring information for the Analog I/O Card. Please read this section prior to mounting or wiring the Analog I/O Card to ensure that you make the appropriate decisions.

The Analog I/O Card is an auxiliary analog card with two analog inputs and one analog output. Both the inputs and output are factory calibrated for $\pm$ 12V or 0 to 20 mA signals. Some of the Monitor Parameters can be used in connection with the analog output for either auxilary control or monitoring. Analog process signals can be used in connection with the analog inputs to replace the following:

Lead Source
Offset source
V1,V2,V3,V4 Source
Feedback Source
Offset Source

—NOTES—

MOUNTING

This section contains the mounting information for the CX–1010 Analog I/O card. Please read this section as you mount the Analog I/O card to ensure that the Analog I/O card is mounted correctly. If the Analog I/O card does not function properly after installation, then verify that the mounting procedure has been completed accurately. For the specifications on the Analog I/O card, refer to *Appendices: Appendix A.*

The CX-1010 will support one Analog I/O card in either of the two available slots, however, the upper slot is preferred.

Warning

The Analog I/O Card should only be installed by a qualified technician.

Take the proper antistatic precautions.

1) If the CX-1010 unit has power connected to it, remove the power. If the CX-1010 has been mounted in your system, disable it from the system.

2) Remove the connectors on the rear of the CX-1010. Pay careful attention to the location of each connector so that you can replace them in their proper locations. It is possible to replace a connector incorrectly.

3) Remove the earth ground screw and ground connections.

4) Remove the four machine screws that hold the back plate in place, and set them aside. Carefully remove the back plate.

5) Remove the upper option card slot cover plate by removing the two machine screws.

6) Remove the CPU Board carefully - pull the CPU board straight out so that you do not bend the card guides or the CPU board, nor damage the internal backplane card-edge connector. See figure 2-32.

NOTE: Take the appropriate antistatic precautions when you handle the CPU board and the Analog I/O card.

7) Remove the Analog I/O card from it's antistatic bag, holding it by the edges.

8) Remove the 11-pin terminal strip plug from the 11-pin right angle terminal strip on the Analog I/O card. Make sure that the screws that hold the round standoffs and the 40-pin connector in place are secure. Tighten these screws, as needed.

9) Mount the Analog I/O card to the CPU Board by carefully inserting the three long pins of the Optional Analog connector to the three corresponding holes on the non-component side of the CPU board, and insert the 40-pin connector on the Analog I/O card into the 40-pin connector on the CPU board.

10) Verify that the standoffs are flush with the CPU board. Make sure that the 40-pin contacts are properly aligned.

11) Holding firmly to the edges of both boards to preserve the alignment, carefully flip the boards so that the component side of the CPU board faces up.

12) Insert the four screws and the attached lock washers into the round standoff holes and alternate between the screws as you tighten both screws into place snugly. Verify the alignment of the boards.

13) Reinsert the CPU Board into the CX-1010 unit by aligning the CPU board with the top and bottom card edge connectors and gently push the board straight back until the CPU board card edge connector tab seats fully into the internal backplane card-edge connector.

(continued)

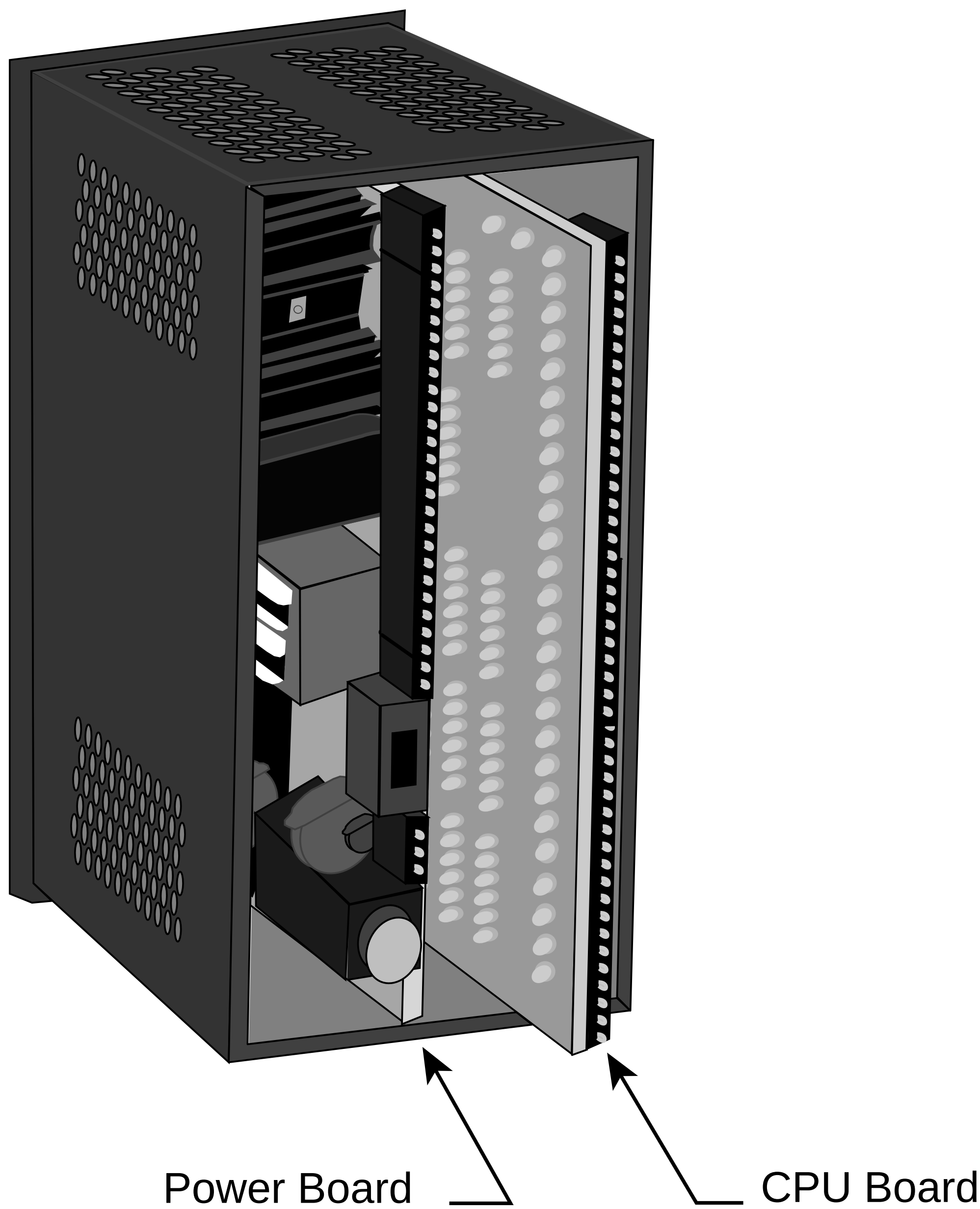


Figure 2-32 Removing the CPU Board

14) Replace the back plate, making sure that it seats properly and the connectors are all properly aligned in their slots.

15) Screw the back plate into place with the four machine screws.

16) Screw the ground screw back into place snugly. Replace the connectors. Replace the power connector.

NOTE: Be sure to follow the calibration procedure before engaging the CX-1010. Refer to *Drive Setup / Calibration: Calibration.*

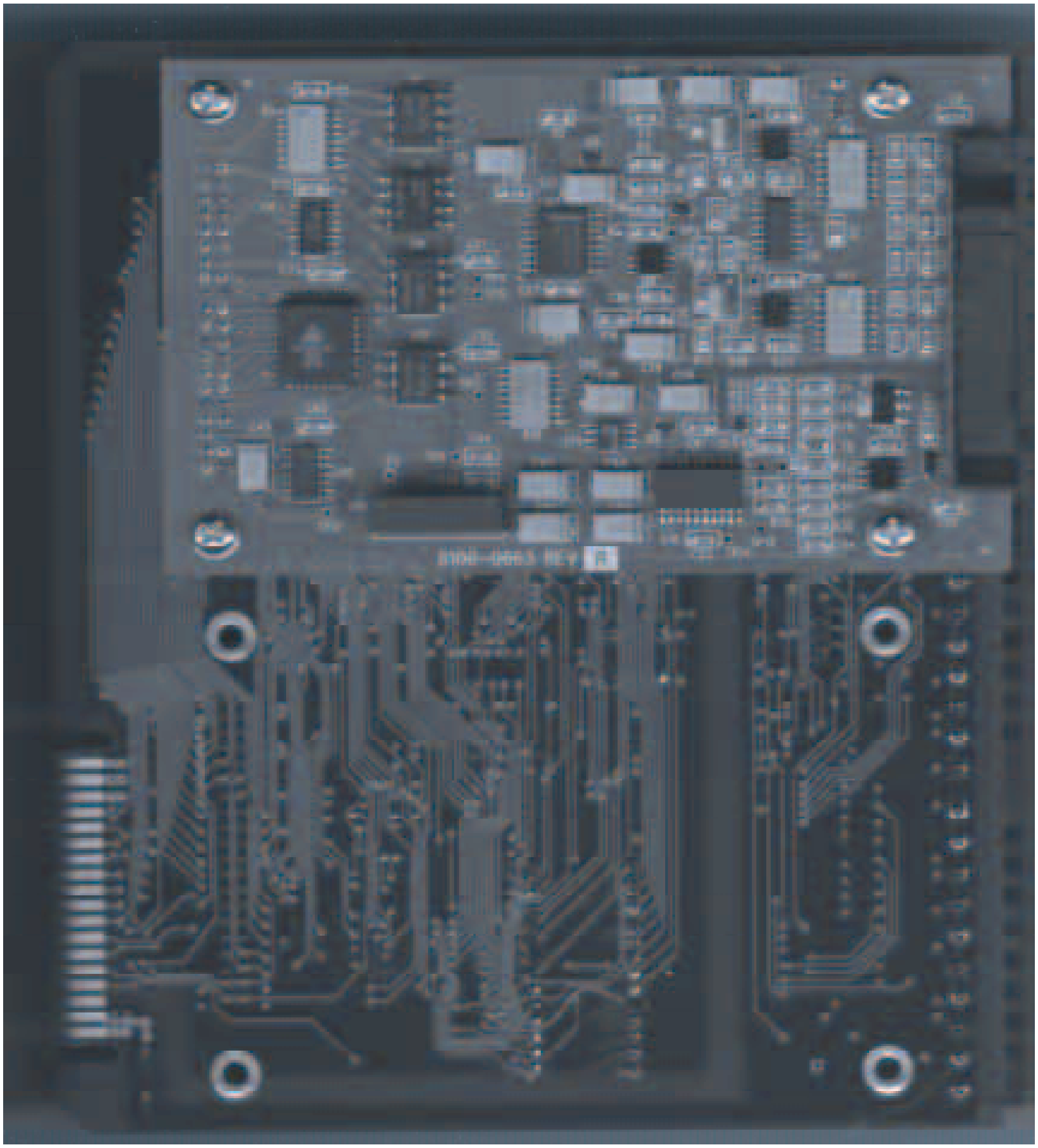


Figure 2-33 Mounting the Analog I/O Card on the CPU Board

—NOTES—

WIRING

This section contains the input and output wiring information for the CX–1010 Analog I/O Card. Please read this section prior to wiring the Analog I/O Card to ensure that you make the appropriate wiring decisions.

The CX-1010 will support one Analog I/O Card in either of the two available slots. The factory calibrated Analog I/O Card has two inputs and one output available. Both the inputs and output are calibrated for $\pm$ 12V or 0 to 20 mA signals. The Analog I/O Card is fully isolated from the CPU core. For the specifications for the Analog I/O Card, refer to *Appendices Appendix A.*

	Warning **The Analog I/O Card should only be installed by a qualified technician.** **Take the proper antistatic precautions.**	

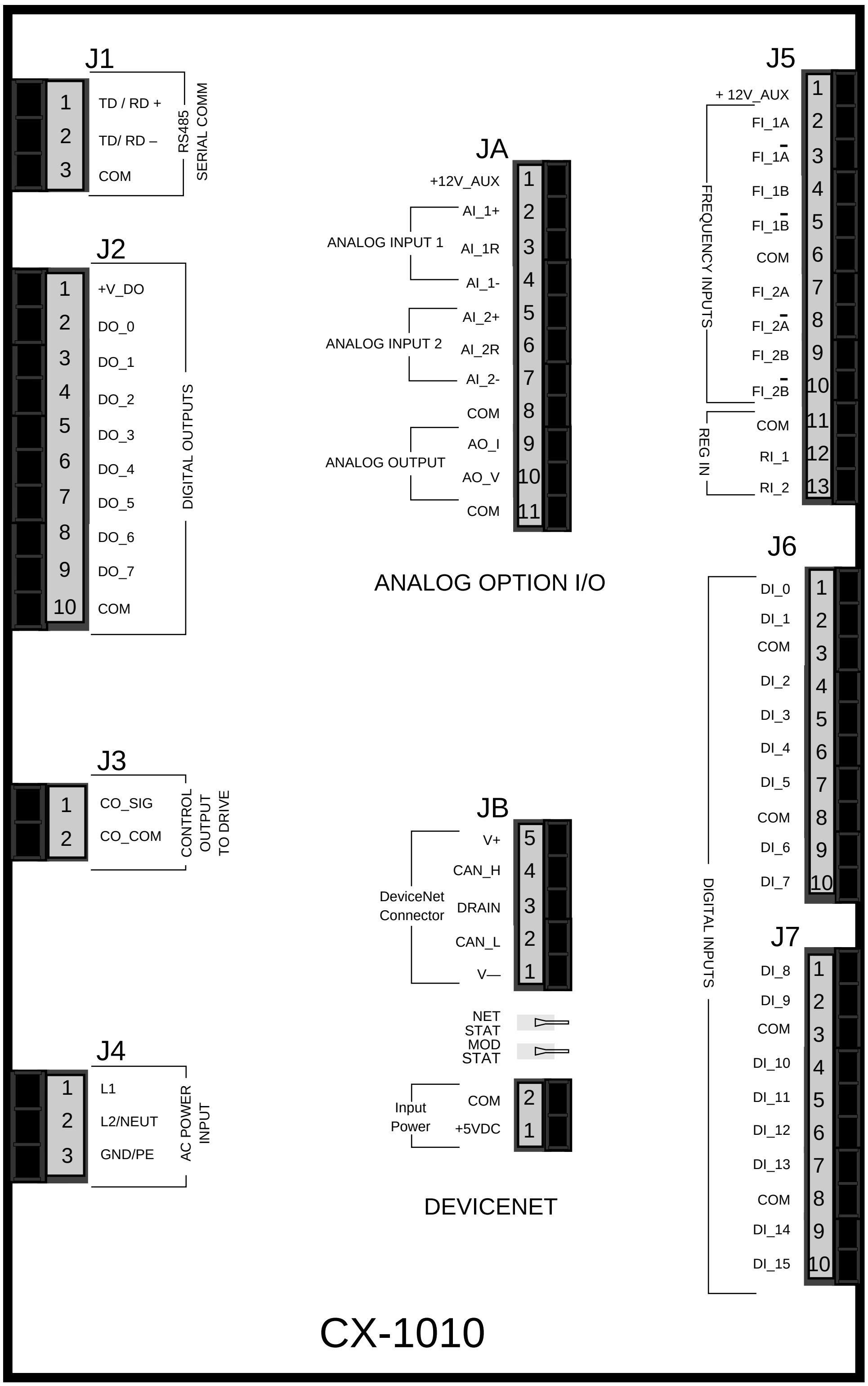


Figure 2-34 CX–1010 Analog I/O Card

INPUTS

NOTE: Refer to pages 2-9 and 2-35 before you begin wiring.

Analog Input 1: Voltage Input Wiring

(JA, Pins 2, 4, 8)

The Analog Input 1 can be used with either ±12 VDC or 0-20 mA inputs. Figure 2-35 displays the ±12 VDC option.

For the differential inputs:

- Connect JA pin 2 to the positive differential signal source.
- Connect JA pin 4 to the negative differential signal source.
- Connect JA pin 8 to the common of the differential signal source.

For the non-differential inputs:

- Connect JA pin 2 to the signal voltage source.
- Connect JA pin 4 and JA pin 8 to the common of the signal source.

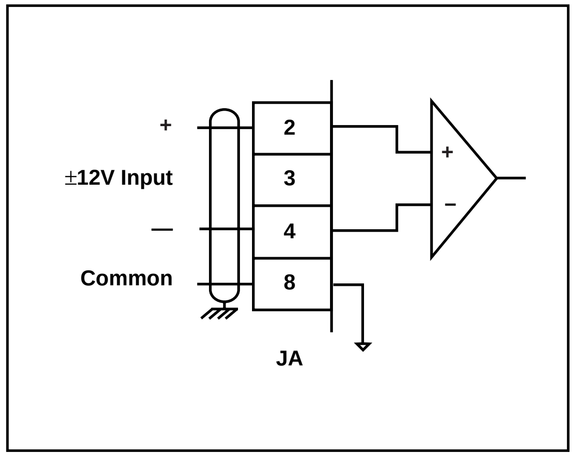


Figure 2-35 Analog Input 1: Voltage Input

Analog Input 2: Voltage Input Wiring

(JA, Pins 5, 7, 8)

The Analog Input 2 can be used with either ±12 VDC or 0-20 mA inputs. Figure 2-35 displays the ±12 VDC option.

For the differential inputs:

- Connect JA pin 5 to the positive differential signal source.
- Connect JA pin 7 to the negative differential signal source.
- Connect JA pin 8 to the common of the differential signal source.

For the non-differential inputs:

- Connect JA pin 5 to the signal voltage source.
- Connect JA pin 7 and JA pin 8 to the common of the signal source

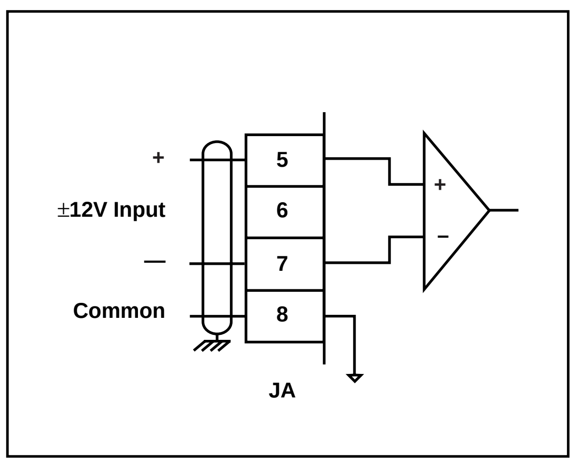


Figure 2-36 Analog Input 2: Voltage Input

Analog Input 1: Current Input Wiring

(JA, Pins 2,3,4)

The Analog Input 1 can be used with either ±12 VDC or 0-20 mA inputs. Figure 2-37 displays the 0-20 mA option.

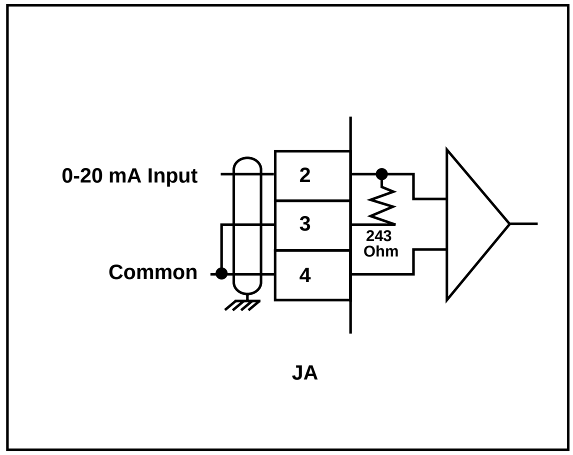


Figure 2-37 Analog Input 1: Current Input

Analog Input 2: Current Input Wiring

(JA, Pins 5,6,7)

The Analog Input 2 can be used with either ±12 VDC or 0-20 mA inputs. Figure 2-38 displays the 0-20 mA option.

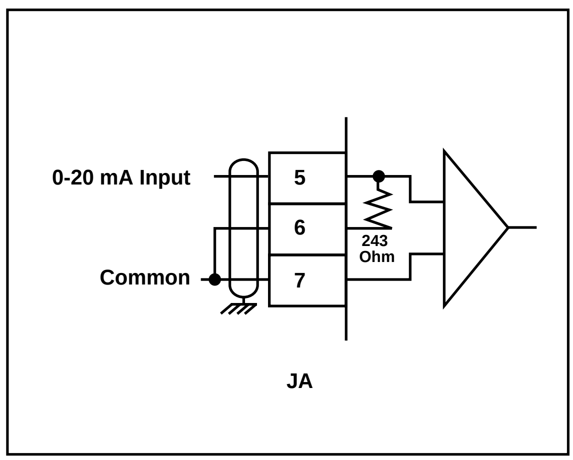


Figure 2-38 Analog Input 2: Current Input

Analog Input 1: Potentiometer Input Wiring
(JA, Pins 1, 2, 4, 8)

The Analog Input 1 can be used with a potentiometer (e.g., dancer pot). Figure 2-39 displays this option.

* The total current from JA pin 1 and J5 pin 1 (+12V_Aux) must not exceed 150 mA.

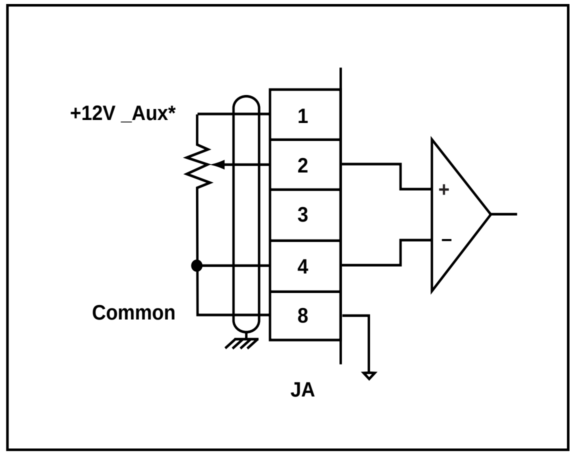


Figure 2-39 Analog Input 1: Potentiometer Input

Analog Input 2: Potentiometer Input Wiring
(JA, Pins 1, 5, 7, 8)

The Analog Input 1 can be used with a potentiometer (e.g., dancer pot). Figure 2-40 displays this option.

* The total current from JA pin 1 and J5 pin 1 (+12V_Aux) must not exceed 150 mA

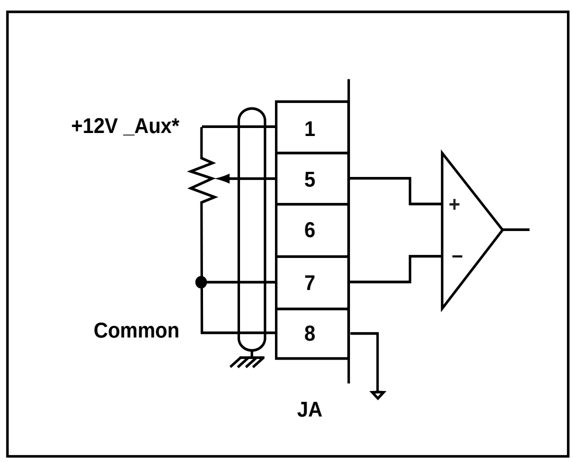


Figure 2-40 Analog Input 2: Potentiometer Input

OUTPUTS

NOTE: Refer to pages 2-9 and 2-35 before you begin wiring.

Analog Output: Voltage Output Wiring

(JA, Pins 9, 10, 11)

The Analog Output produces either an isolated ± 12V output signal or a 0-20 mA current source analog output signal into a load resistance of 0-500 Ohms.
Figure 2-41 displays the ±12V option.

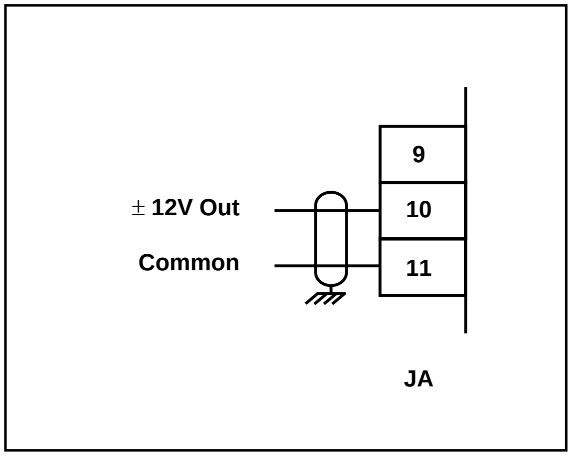


Figure 2-41 Analog Output: Voltage Output

Analog Output: Current Output Wiring

(JA, Pins 9, 10, 11)

The Analog Output produces either an isolated ± 12V output signal or a 0-20 mA current source analog output signal into a load resistance of 0-500 Ohms.
Figure 2-42 displays the 0-20 mA option.

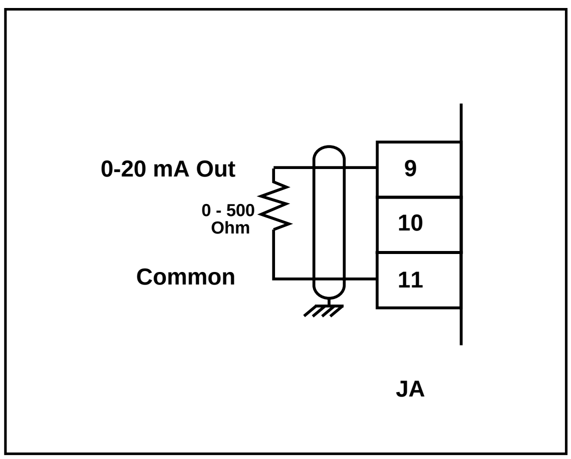


Figure 2-42 Analog Output: Current Output

DEVICENET CARD (OPTIONAL)

For the installation, wiring and operation of the optional DeviceNet card, refer to the *CX-Series DeviceNet Card Technical Manual*, # 0001-0132.

—NOTES—

LOGIC CONTROL

This section addresses the six digital inputs that control the CX-1010's operating state.
The six digital inputs (listed in by priority) are:

F–Stop
R–Stop
H-Stop
Run
Jog Forward
Jog Reverse

When the CX-1010 is powered up, it defaults to R–Stop. If either Run or Jog have been hardwired, the CX-1010 will operate in either Run or Jog instead of R–Stop. Run is hardwired by shorting Run, R–Stop and F–Stop to common. Jog Forward or Jog Reverse are hardwired by shorting Jog, R–Stop, and F–Stop to common.

Run is terminated by activating F-Stop, R-Stop, or H-Stop. The operating state changes to the input that terminated Run, provided that another input is not subsequently activated. Jog Forward or Jog Reverse are terminated by deactivating the Jog Forward or Jog Reverse inputs. Jog Forward or Jog Reverse can also be terminated by activating F-Stop, R-Stop, or H-Stop. The operating state automatically changes to R-Stop after the Jog ramp is completed. You can not enter Run from Jog with the Jog inputs active. However, you can enter Run during a deceleration from Jog after the Jog input is deactivated. You can not enter Jog Forward or Jog Reverse from Run. If two or more inputs become active at the same time, the input with the highest priority will dictate the operating state.

The sections that follow demonstrate how to use the digital inputs.

Caution

Do not use the AC line power to start or stop the system.

Use the Digital Inputs to start or stop the system.

Logic Inputs

F–Stop (Fast Stop) has priority over the other operating states. F-Stop forces the CO signal to “0” volts and monitors the feedback. When the feedback is less than the Zero Speed (CP-270), the Drive En (PLC bit 41) resets to “0”. This PLC bit is routed by the PLC program to an output that disables the drive. If the feedback does not reach Zero Speed within 1/2 second, the Drive En (PLC bit 41) automatically resets to “0”. The integral, trim and feedforward are also set to “0” and the loop is set to Open Loop (OL).

To activate F–Stop:

- Activate High (Open), Level Sensitive, Latched
- Wire to F-Stop interconnect
- Use momentary contact - does not need to be maintained to remain active

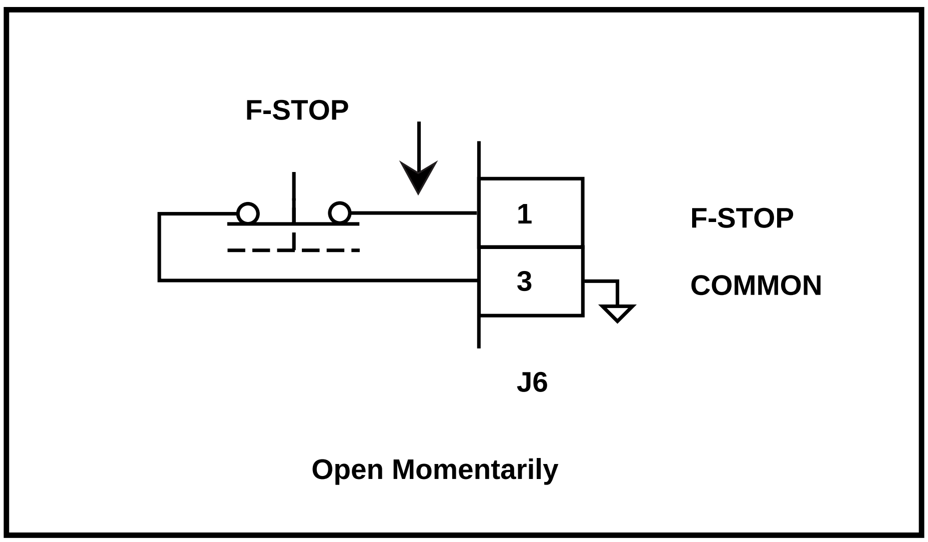


Figure 2-43 F-Stop Input

R–Stop (Ramp Stop) has the second highest operating priority. Use R-Stop to stop the drive with a deceleration ramp. The velocity command is ramped down to “0”. If the loop is “Closed”, the ramp is executed with velocity loop control (with feedforward, using Kff). If the loop is “Open”, the ramp is executed with feedforward only (using Kff). The deceleration rate for the ramp is determined by Dcl Tm RStp (CP-211) and Ref StopRmp (CP-210) or by the Dcl Rt RStp (CP-212). Once the ramp reaches “0”, the feedback is monitored. When the feedback is less than the Zero Speed (CP-270), the Drive En (PLC bit 41) resets to “0”. The PLC program routes the PLC bit to an output that is disables the drive. If the feedback does not reach the Zero Speed (CP-270) within 1/2 second, then the Drive EN PLC bit automatically resets to “0”. The integral, trim and feedforward set to “0” and the loop sets to “Open Loop” (OL).

To activate R–Stop:

- Activate High (Open), Level Sensitive, Latched
- Use momentary contact - does not need to be maintained to remain active

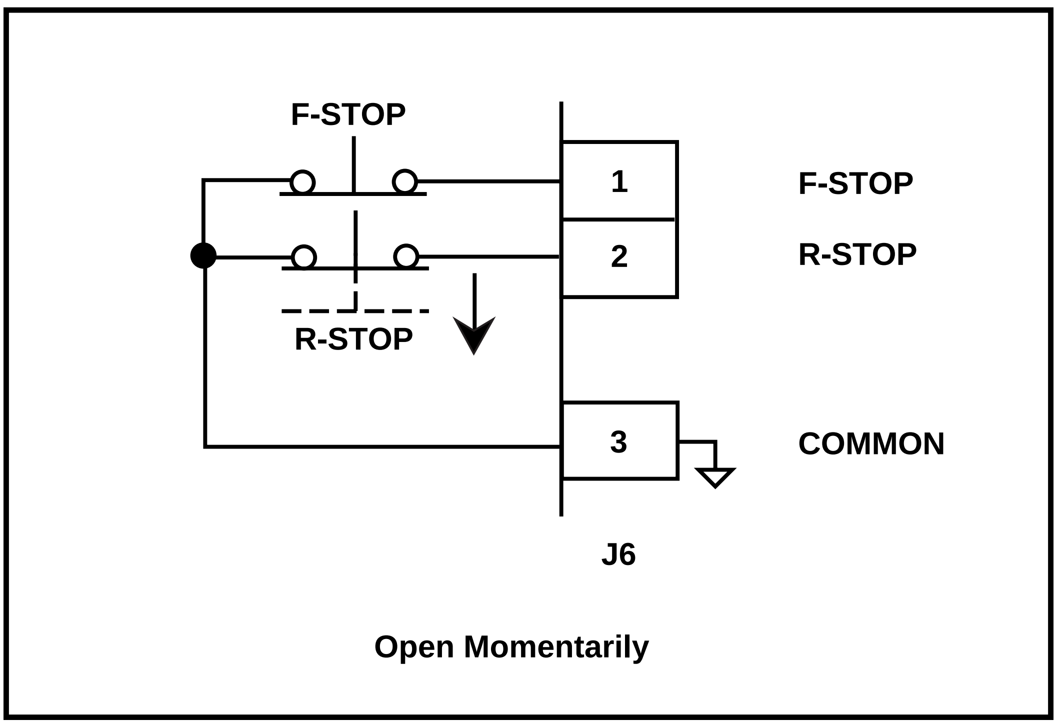


Figure 2-44 R-Stop Input

H–Stop (Stop and Hold) has the third highest operating priority. Use H-Stop to stop the drive with a deceleration ramp. The velocity command is ramped down to "0". If the loop is "Closed", the ramp is executed with velocity loop control (with feedforward, using Kff). If the loop is "Open", the ramp will be executed with feedforward only (using KffL). The deceleration rate for the ramp is determined by Dcl Tm HStp (CP-213) and Ref StopRmp (CP-210) or by the Dcl Rt RStp (CP-214). H-Stop differs from R-Stop in its operation after the deceleration ramp. The operation of the "Hold" function is dictated by Hstp LoopMode (CP-230). In quadrature feedback, when the velocity command reaches "0" and the feedback is less than the Zero Speed (CP-270), then H-Stop will; hold the CO Signal to "0" volts (Open Loop), hold the feedback velocity to Zero Speed (Closed Velocity Loop) or hold the feedback position to the position where the drive stopped (Closed Zero Error or Position Loop).

Note: For Non-Quadrature and Quadrature, see "Additional H-Stop Operating States", page 2-50.

To activate H–Stop:

- Activate High (Open), Level Sensitive, Latched
- Use momentary contact - does not need to be maintained to remain active

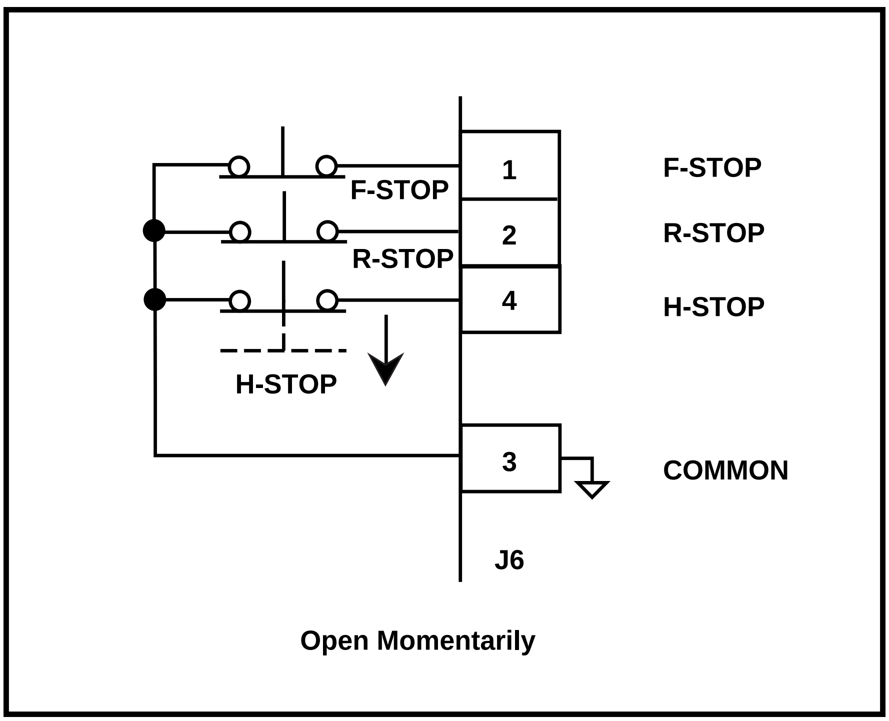


Figure 2-45 H-Stop Input

Run has the fourth highest operating priority. Run is the primary operating state. Setpoint Mode (CP-102) determines the mode of operation for Run, using either the master mode, the follower mode, the direct mode or the custom setpoint mode. The corresponding setpoint for the selected mode determines the operating speed. RUN Loop Mode (CP-220) determines the control loop that is used during Run. At times, the selected RUN Loop Mode is overridden. The direct mode will only operate in an open loop. The master mode and the custom setpoint mode will "Run" in velocity loop if the RUN Loop Mode (CP-220) is set to either "ZE Pos" or "Pos". Therefore, the follower mode is the only mode that can "Run" with the "ZE Pos" or the "Pos loop".

With the exception of the direct mode, the acceleration and deceleration ramps for the modes of operation are determined by Acl Tm RUN, (CP-201), Dcl Tm RUN (CP-203) and Ref RUN Rmp (CP-200). The direct mode ramps are determined by Acl Tm Drct (CP-206), Dcl Tm Drct (CP-208) and Ref Drct Rmp (CP-205).

To activate Run:

- Activate Low (closed to common), Level Sensitive, Latched
- Use momentary contact - does not need to be maintained to remain active

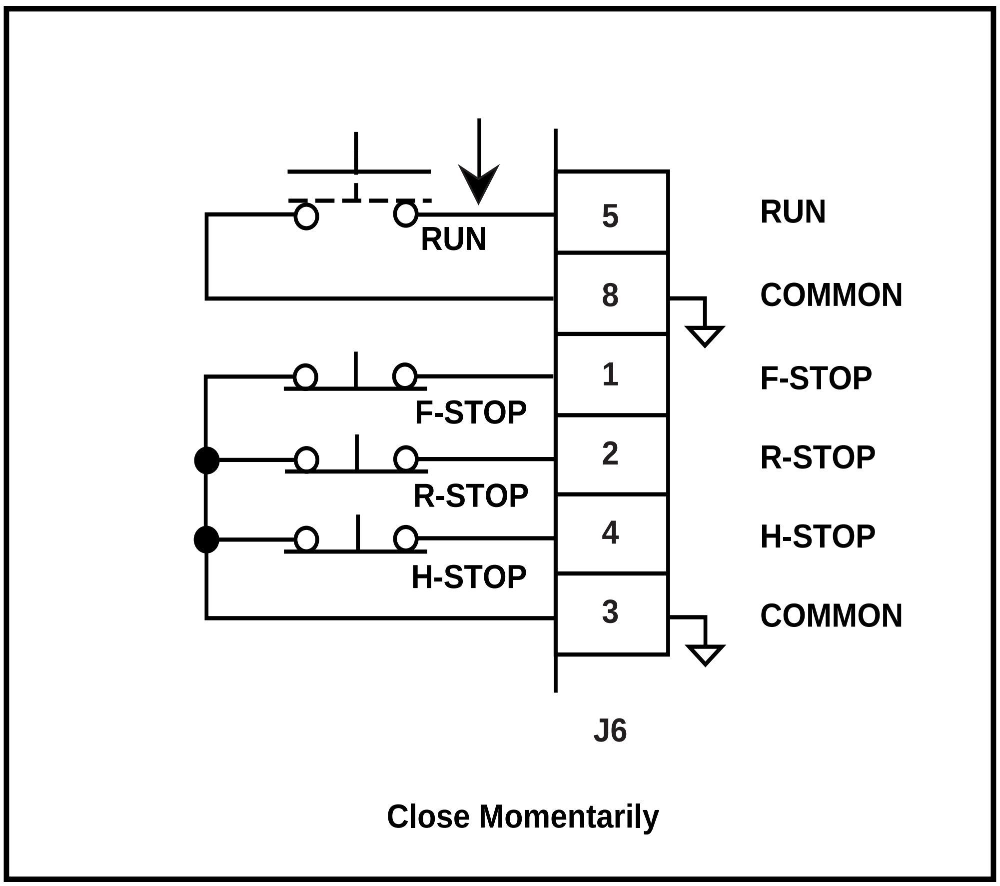


Figure 2-46   Run Input

Jog Forward has the fifth highest operating priority. Use Jog Fwd to “Jog” the drive Forward at the rate indicated in Jog SP (CP-215). The acceleration and deceleration ramps are dictated by Acl Tm Jog (CP-216), Dcl Tm Jog (CP-218) and Jog SP (CP-215). After the Jog FWD input is deactivated and the ramped reference has reached “0”, the CX-1010 automatically reverts to the R-Stop operating state.

To activate Jog Forward:

- Activate Low (closed to common), Level Sensitive, Not-Latched
- Use momentary contact - does not need to be maintained to remain active

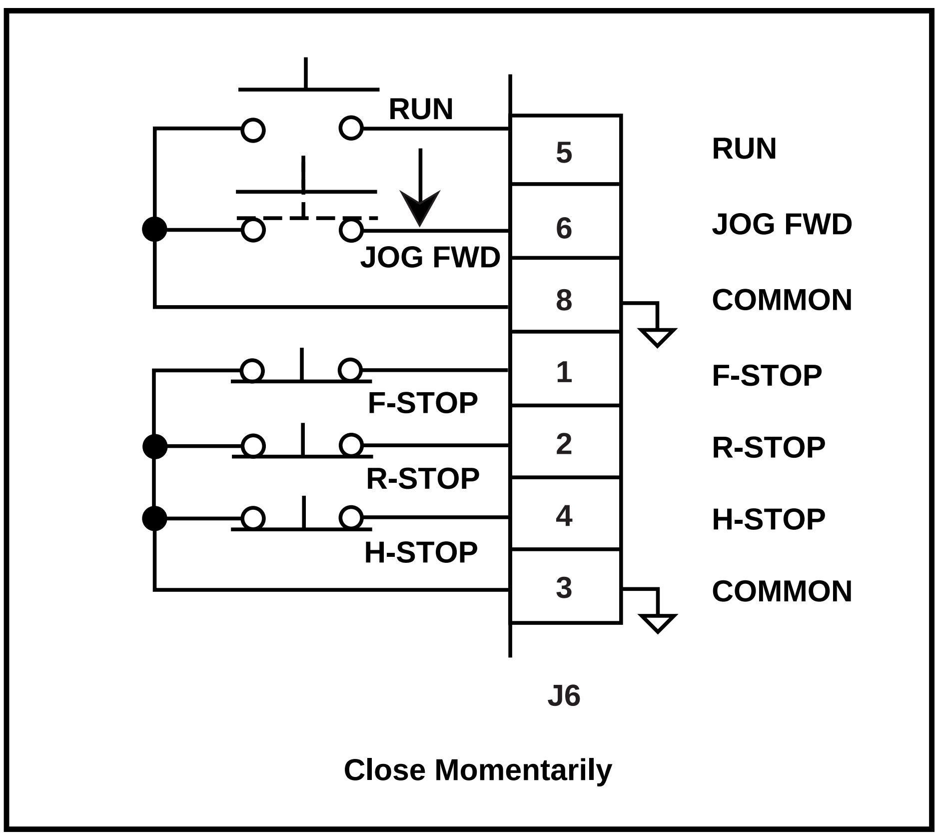


Figure 2-47   Jog Forward Input

Jog Reverse has sixth (the least) operating priority. Use Jog Revs to "Jog" the drive Forward at the rate indicated in Jog SP (CP-215). The acceleration and deceleration ramps are dictated by Acl Tm Jog (CP-216), Dcl Tm Jog (CP-218) and Jog SP (CP-215). After the Jog Revs input is deactivated and the ramped reference has reached "0", the CX-1010 automatically reverts to the R-Stop operating state.

To activate Jog Reverse:

- Activate Low (closed to common), Level Sensitive, Not-Latched
- Use momentary contact - does not need to be maintained to remain active

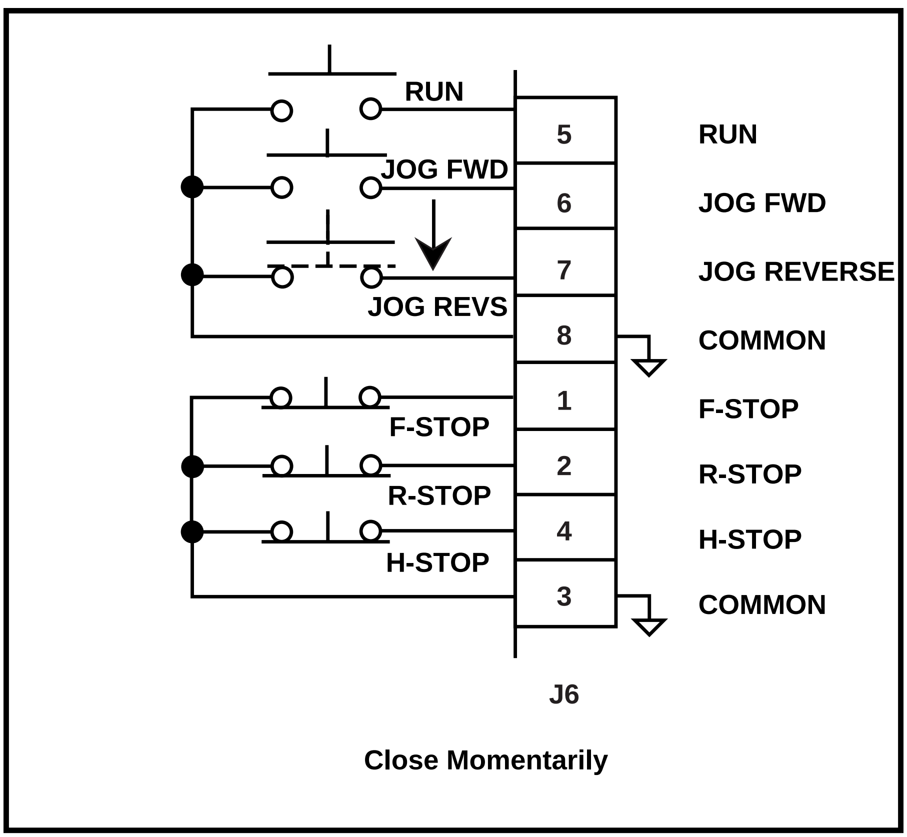


Figure 2-48 Jog Reverse Input

Additional H-Stop Operating States:

H-Stop with Non-Quadrature (INCremental) Feedback
The velocity command is ramped down to “0” and the feedback is monitored. When the feedback is less than Zero Speed (CP-270), the Drive En (PLC bit 41) is reset to “0”. The PLC program routes this PLC bit to an output that disables the drive. If the Feedback does not reach Zero Speed within 1/2 second after the ramp is finished, the Drive En (PLC bit 41) automatically resets to “0”. The integral, trim and feedforward set to “0” and the loop sets to Open Loop (OL).

H-Stop Quadrature FB and Loop Type H-S set to OL (0):
When the Feedback is less than Zero Speed (CP-270), the Drive En (PLC bit 41) is reset to “0”. The PLC program routes this PLC bit to an output that disables the drive. The CO SIG is maintained at “0” volts. If the Feedback does not reach Zero Speed within 1/2 second after the ramp is finished (velocity command has reached “0”), the Drive EN PLC bit automatically resets to “0”. The integral, trim and feedforward set to “0” and the loop sets to Open Loop (OL).

H-Stop Quadrature FB and Loop Type H-S set to Vel (1):
When the Feedback is less than Zero Speed (CP-270), the integral, trim and feedforward are reset to “0” and the Control Loop is set to Velocity. This provides some resistance to motion, but will not necessarily hold the drive at the current position. If the feedback does not reach Zero Speed within 1/2 second after the ramp is finished (the velocity command has reached “0”), the Drive En (PLC bit 41) automatically resets to “0”. The integral, trim and feedforward set to “0” and the loop sets to Open Loop (OL).

H-Stop Quadrature FB and Loop Type H-S set to ZE Pos (2):
When the Feedback is less than Zero Speed (CP-270), the current position becomes the “Hold” position, the integral, trim and feedforward are reset to “0”, and the Control Loop is set to Zero Error Position (position plus velocity). The ZE Loop holds the position at or close to the “Hold” position. If the Feedback does not reach Zero Speed within 1/2 second after the ramp is finished, the Drive En (PLC bit 41) automatically resets to “0”. The integral, trim and feedforward set to “0” and the loop sets to Open Loop (OL).

H-Stop Quadrature FB and Loop Type H-S set to Pos (3):
When the Feedback is less than Zero Speed (CP-270), the current position becomes the ‘hold’ position, the integral, trim and feedforward are reset to “0”, and the Control Loop is set to Position. The Position Loop holds the position at or close to the “Hold” position. If the Feedback does not reach Zero Speed within 1/2 second after the ramp is finished, the Drive En (PLC bit 41) automatically resets to “0”. The integral, trim and feedforward set to “0” and the loop sets to Open Loop (OL).

—NOTES—

Operator Interface

Figure 3-1 The CX–1010 Front Panel

KEYPAD OPERATION

The CX–1010 operates on a system of screens that are controlled by the front keypad. Figure 3-1 shows the location of the keys and LCD screen display on the front panel. You will find detailed descriptions of the interactions of the keys and screens throughout the “Operations” section. The following is a brief summary of how the front panel functions.

LCD Screen Display	The screens are displayed on the LCD Display.
Menu Key	The Menu key accesses the main menu from a sub-menu or status screen, and a sub-menu from a parameter screen.
Status Screen Key	The Status key will immediately pop-up the status screen from any other screen. To return to the previous screen, press the Status key again.
Page Up/Down Keys	Some screens have multiple pages. The Page Up/Down keys allow you to scroll through, one page at a time.
Numeric Keys	Use the Numeric keys to enter the Parameter Code of either a Control Parameter (CP) or a Monitor Parameter (MP) or to enter a Parameter Value for a Control Parameter. Use the Enter key to activate the entry. Use the Clear key to delete the entry and clear the Parameter Value to zero.
Parameter Up/Down Keys	Each time you press the Parameter (Par) up key, the cursor and highlight bar will move up by one line. Each time you press the Parameter (Par) down key, the cursor will move down by one line. It will also automatically scroll through the lines if you hold the key down.
Code Select Key	Use the Code Select key in the Status screen and in the parameter screens to display a Parameter Code line. When the Parameter Code line appears, you can use it to access a parameter and its value. Enter a Parameter Code, then press the Enter key and the parameter and its value will be displayed. You can change a Control Parameter value by entering a new value or by scrolling with the Increment Up/Down keys. Use the Clear key to delete the entry and clear the parameter value to zero.
Help Screen Key	The Help key accesses the Help screen and gives you a brief description of the parameter or subject that is highlighted (active). The Help screen also functions as an options screen, where you can select Control Parameter data. You can access help from any screen. Press the Help key again to return to the previous screen.
Increment Scroll/ Up/Down	Use these keys in the parameter screens to change the active value. Each time you press the Increment Scroll Up key, the active value will increase by one increment. Each time you press the Increment Scroll Down key, the active value will decrease by one decrement. It will also automatically scroll through the increments or decrements if you hold the key down.
Clear Key	Use the Clear key to delete a value or change which you have entered. However, the Clear key will not delete the entry or change once the Enter key has been used.
Enter Key	Use the Enter key to accept a value or change which you have entered.

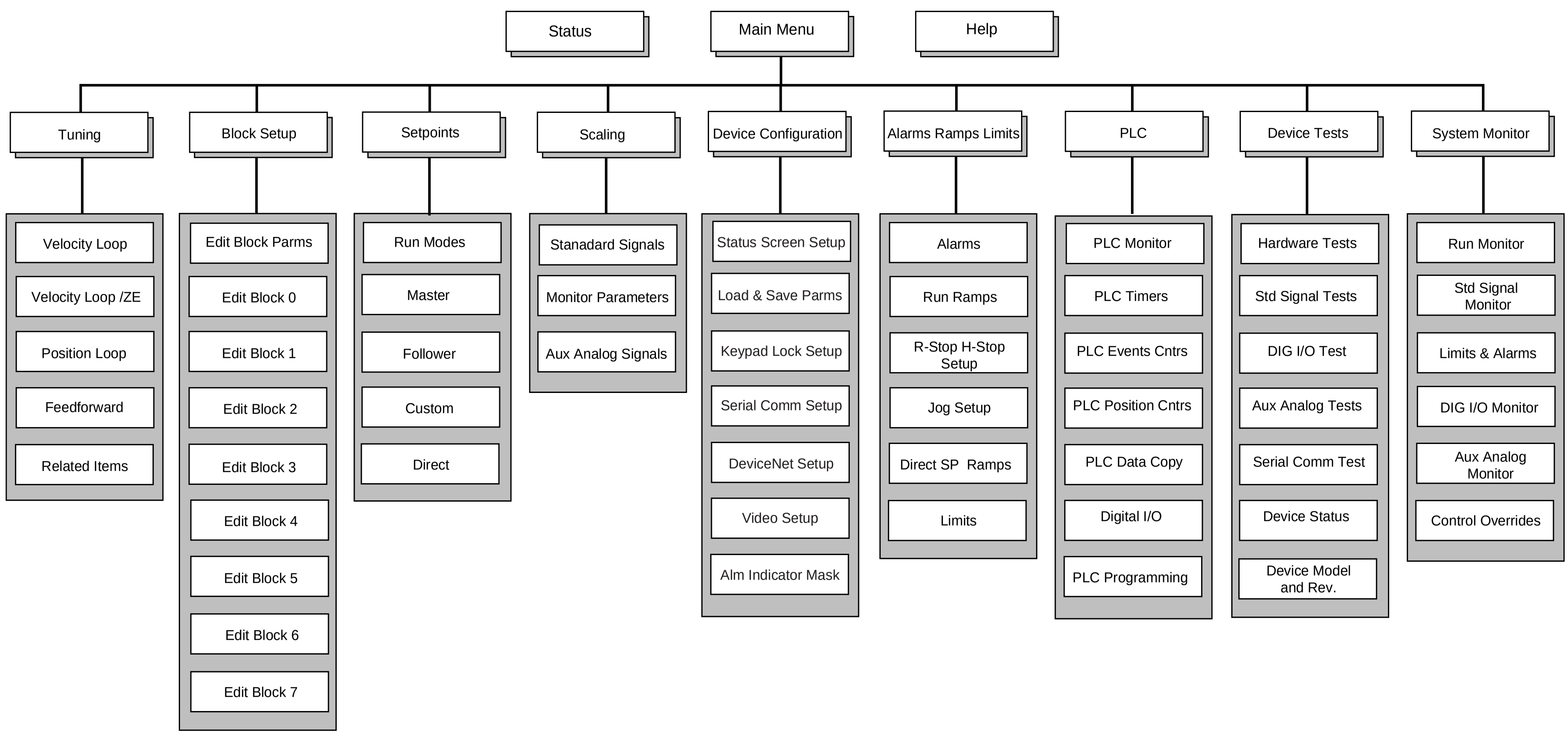


Fig 3-2 Overview of the CX–1010 Screen Matrix

SCREEN OPERATION

The CX–1010 screen matrix has three main screens. These screens are:

Status Screen
Main Menu
Help Screen

There are nine sub-menus that are accessed through the Main Menu screen. These sub-menus are:

Tuning
Block Setup
Setpoints
Scaling
Device Configuration
Alarms Ramps Limits
PLC
Device Test
System Monitor

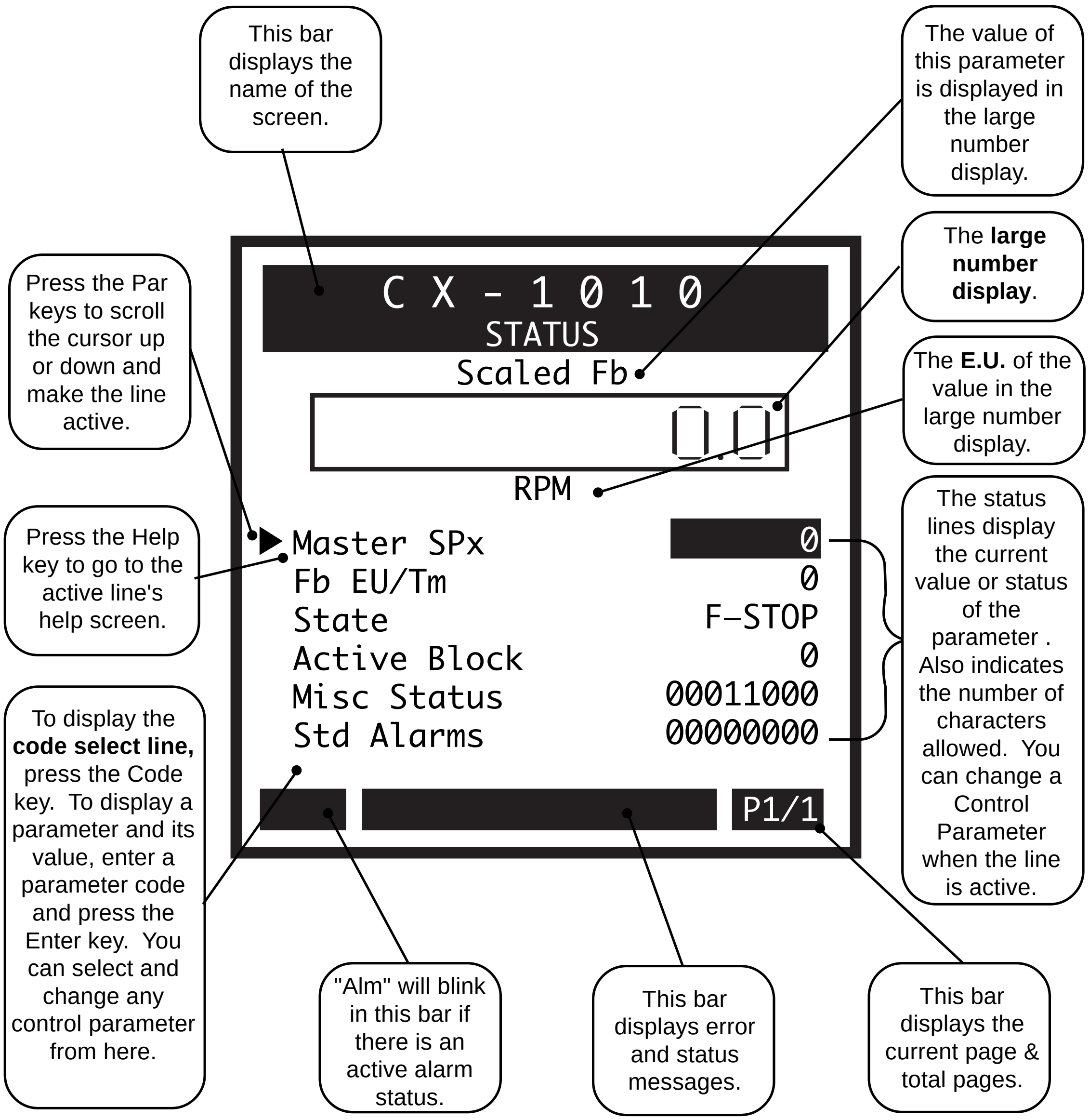
All of the parameter screens are accessed through these nine sub-menu screens. You can use the parameter screens to access the parameters. Parameters fall into two classifications; Control Parameters and Monitor Parameters. The Control Parameters allow you to enter data that is unique to you system. The Monitor Parameters allow you to monitor your system and diagnose problems.

This Screen Operation section is a basic overview of the three main screens; the Status screen, the Help screen and Main Menu screen. There is also a sample of a sub menu screen. For specific details on the parameter screens, refer to *System Setup- Control Parameters* and *System Monitoring-Monitor Parameters*. For the instructions to customize the Status screen, refer to *System Setup- Control Parameters :Device Configure/Status Screen Setup.*

Refer to Figure 3-2 for an overview of the CX–1010 screen matrix.

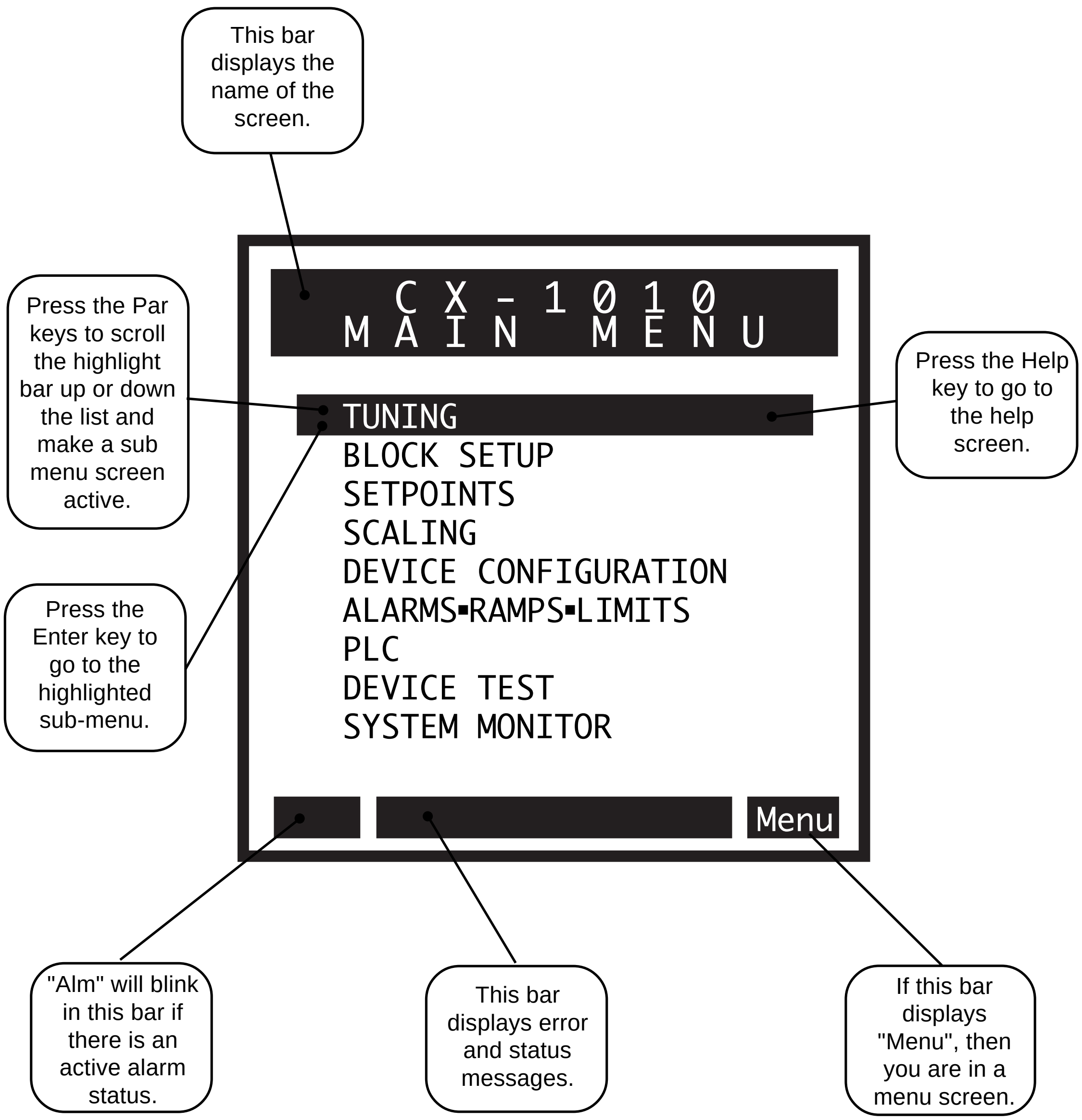
Status Screen

Press the Status key to access the Status screen. The Status screen has a **large number display** for a quick, visual reference to a frequently used parameter, as well as its value and E.U. (Scaled Feedback is the default parameter). Below the large number display, the Status screen lists six frequently used parameters. In addition to the frequently used parameters, the line at the bottom of the display, called the **code select line**, allows you to access and display any parameter and change any Control Parameter's value. The Status screen can be customized to reflect the parameters that you access most frequently. To customize the Status screen refer to *System Setup- Control Parameters: Device Configure/Status Screen Setup.*



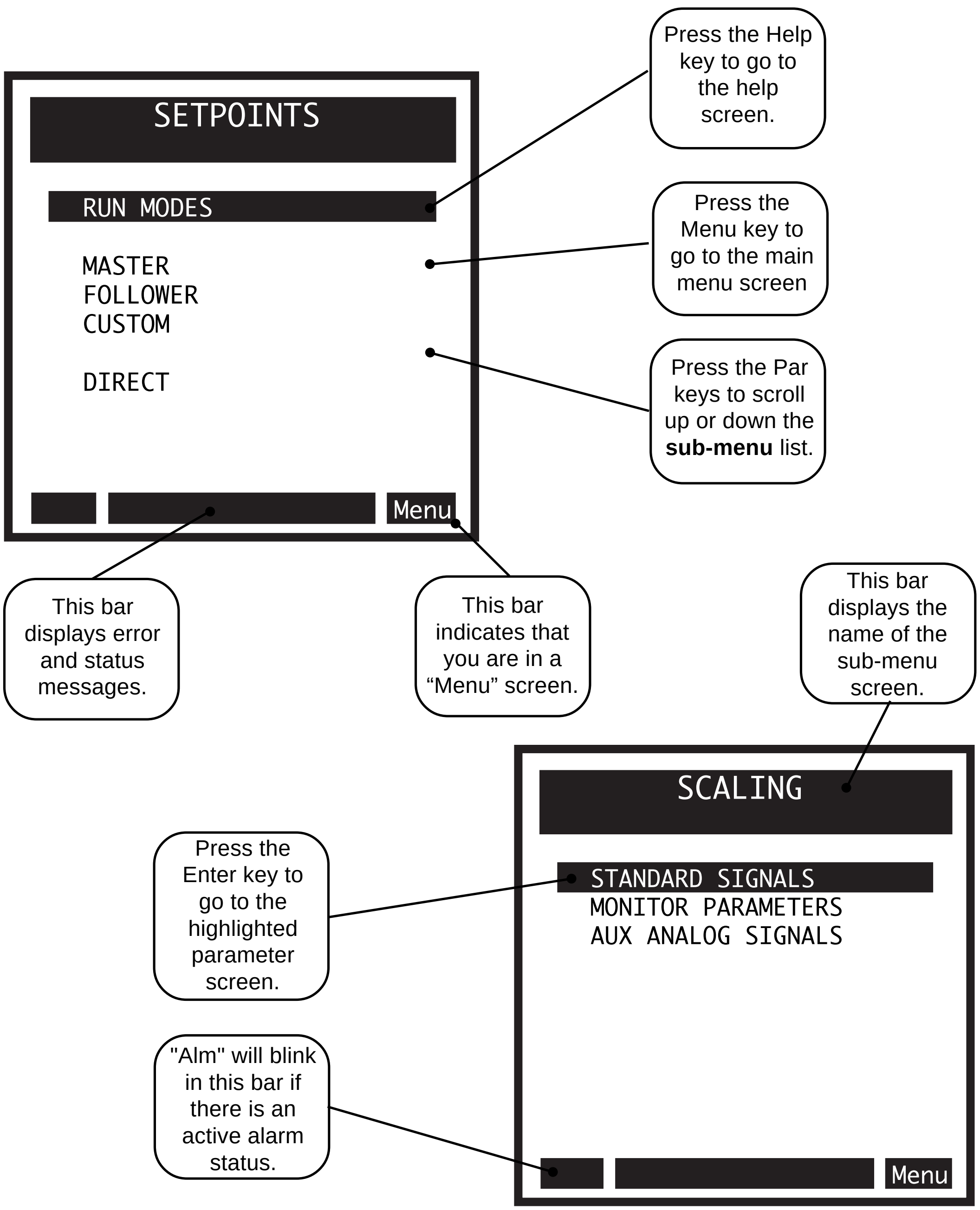
Main Menu Screen

Press the Menu key to access the Main Menu screen. The Main Menu screen displays the eight sub-menus that access all of the parameter screens.



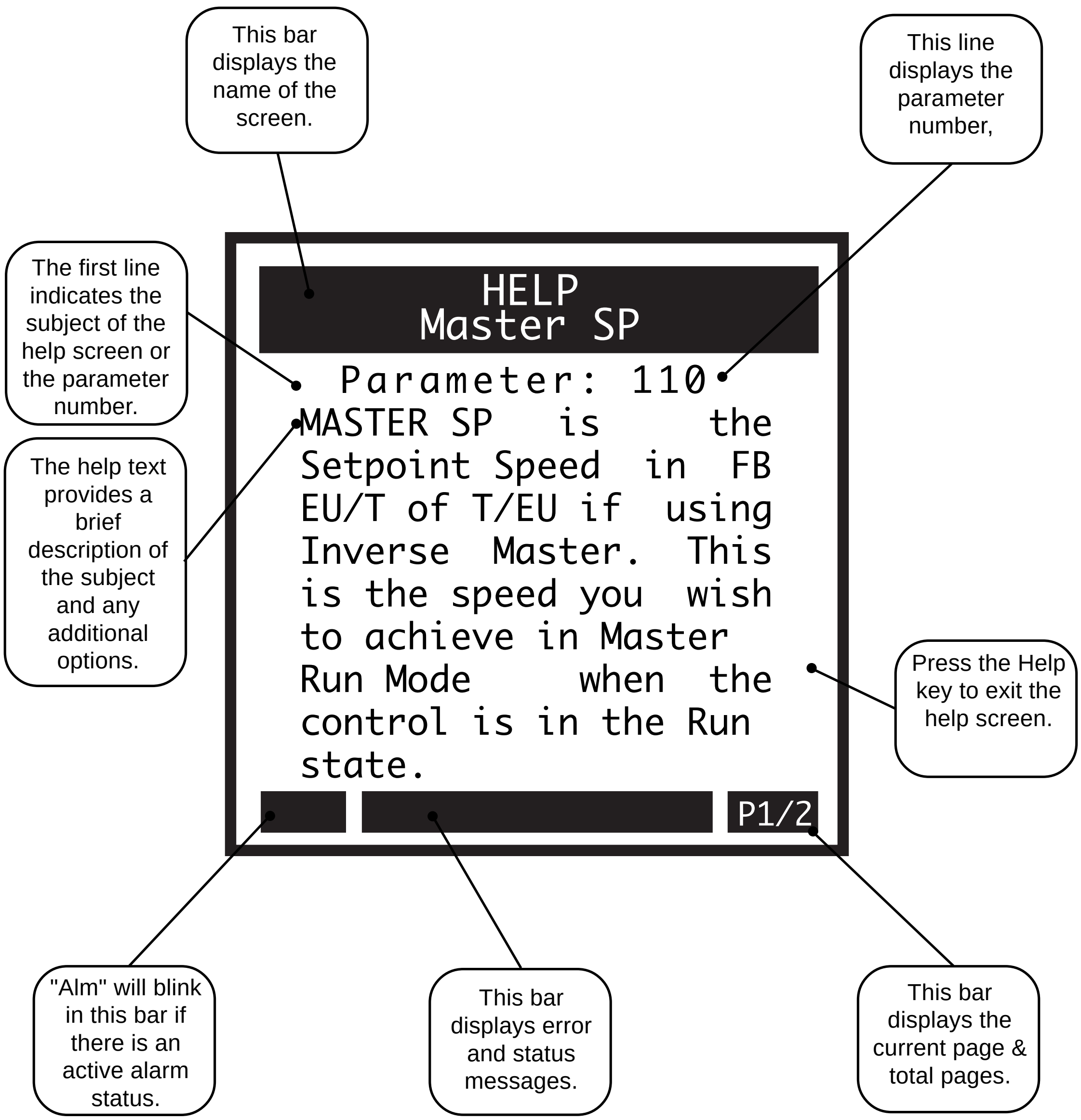
Sub-Menu Screen / Samples

Parameter screens are accessed through the sub-menu screens.



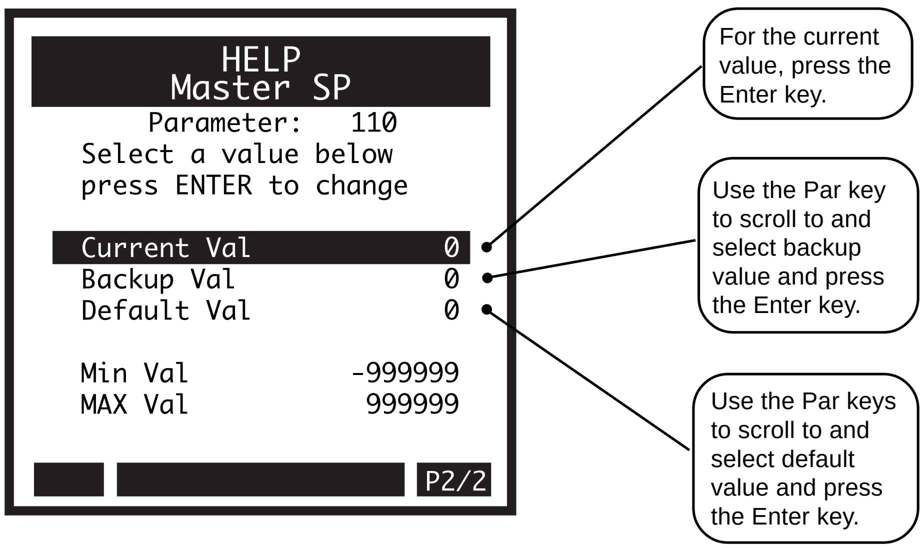
Help Screens

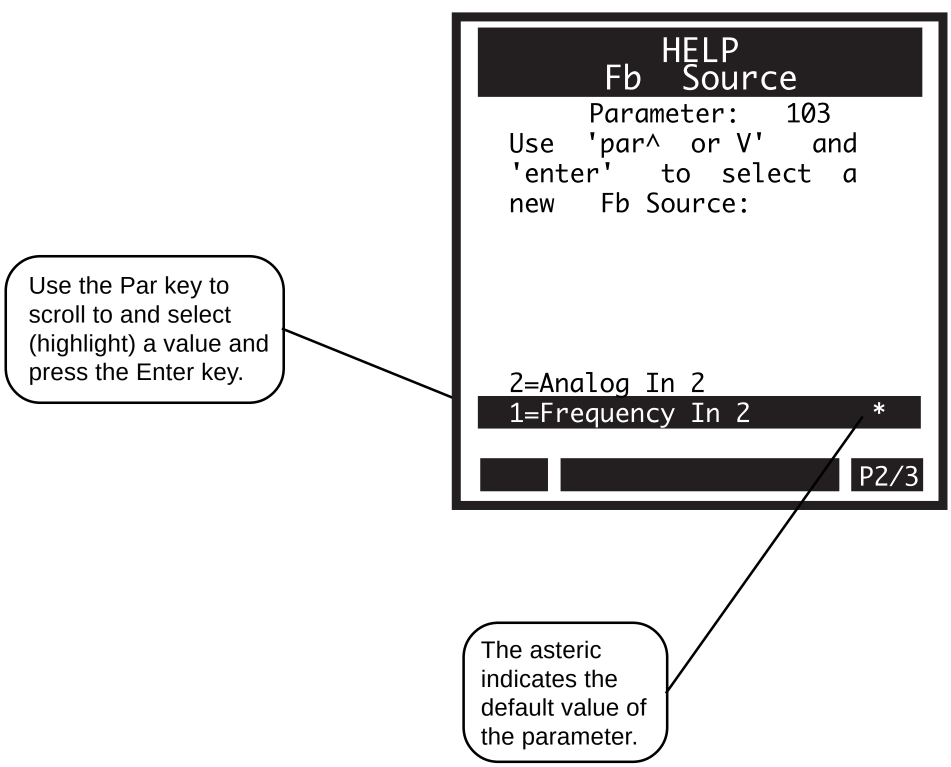
Press the Help key, to access the Help screens for an active (highlighted) Control Parameter line, an active Monitor Parameter line or an active menu line. You can access "Help" from any screen. To exit the Help screen and return to the previous screen, press the Help key again. In addition to the help information, the Help screens also function as an options screen. For more information on the help options, refer to "Help Screen / Sample Options" on the next page.



Help Screens / Sample Options

The Help screens also function as "options" screens where you can select a Control Parameter value. The last page of many Help screens (usually page 2) have parameter options that have three value lines; current value, backup value and default value. There are also Help screens that contain a list of options that you can scroll through and select. An asterisk next to an option indicates that it is the default value. See the samples below. To exit the Help screen and return to the previous screen, press the Help key again.





Drive Setup/Calibration

Calibration

CALIBRATION

This section contains information to calibrate the motor, drive and CX-1010. If you are uncertain how to use the keypad, refer to *Operator Interface: Keypad Operation*. If you are uncertain how to use the screens and parameters, refer to *Operator Interface: Screen Operation*.

NOTE: Before you begin calibration, the motor and drive must be wired and configured per the manufacturers instructions.
Before you begin calibration, the CX-1010 must be configured and installed in accordance with the installation procedures indicated in the *Installation* section.

These calibration procedures will allow you to:

- Make sure that motion occurs in the intended direction.
- Verify that the direction indicated by the feedback measurement (FB) is consistent with the motion in quadrature feedback devices.
- Verify that maximum speed is achievable
- Zero and Span the optional analog inputs and outputs

DANGER

Motion will occur in the calibration procedure. If possible, disconnect the motor shaft from the machine or sudden / violent motion could result and cause damage or personal injury. Make sure that the motor is secured in place. Take all possible precautions to ensure your safety.

DANGER

Hazardous voltages.

**Can cause severe
injury, death or
damage
the equipment.**

**Make adjustments
with caution.**

DIRECTION, CREEP AND RANGE CALIBRATION

Before you check the direction of motion, you need to scale the Controller Ouput Signal (CO SIG). This is the analog signal that is input to the drive. Make sure the unit is in F-Stop to start out. Make sure the Accel and Decel pots (or digital settings) on the subject drive are set to minimum times (maximum rates). Make sure the I.R. Comp, if present, is set to minimum.

1. Go to the SCALING/SIGNAL SCALING/P2 (CONTROL OUTPUT SIG) parameter screen.

2. Select CO SIG output format with CO SIG Mode (CP-180). You can use the Help screen to assist you in your selection. The options are discussed in detail below.

3. Refer to your drive manual and determine the maximum voltage allowed for the analog control signal that is input to your drive as the speed (or torque) command. Enter this value into CO Max Volts (CP-181).

4. Select CO SIG Polarity (CP-182). This needs to be changed ONLY if your drive expects negative voltage for forward motion.

5. a. CO SIG Mode (CP-180) is NOT set to UniBrake. (Optional)
   This step was performed at the factory with the default CO Max Volts.
   Use a voltmeter to check CO SIG output voltage (J3 1-2). If not within 20 millivolts of 0, enter 0 into the CO SIG Offset (CP-366) and take another voltage reading from the CO SIG output. Enter the negative of this value into CO SIG Offset (value is in volts). The CO SIG voltage should now be very close to 0 volts.
   b. CO SIG Mode (CP-180) is set to UniBrake.
   Use a voltmeter to check CO SIG output voltage (J3 1-2). If not within 20 millivolts of CO Max Volts (CP-181, enter 0 into the CO SIG Offset (CP-366) and take another voltage reading from the CO SIG output. Enter the negative of the difference between the CO Max Volts (CP-181) and enter this reading into CO SIG Offset (value is in volts). The CO SIG voltage should now be very close to CO Max Volts.

6. Go to the SETPOINTS/RUN MODE SELECTION/P1 screen and select Direct Mode by entering a 3 into the Run Mode parameter (CP-102). You can use the Help screen for CP-102 to select Direct Mode.

7. Go to the SETPOINT/DIRECT SETPOINT/P1 screen and make sure the Direct SP = 0.0 (include the decimal point). Make sure that the FB Source (CP-103) is set to FI2 (= 1).

8. Put the unit into RUN by activating the RUN input. The F-Stop, R-Stop, and H-Stop inputs must be closed in order to enter the RUN State. You should have the Drive Enable output connected to the drive enable input of your drive (or to a control relay that is connected to the Drive Enable input). If not, enable the drive by some external means.

9. If extremely fast motion occurs, F-Stop the unit and/or disable the drive by some means and check your motor/drive configuation and wiring. If motion occurs, but is relatively slow, attempt to eliminate it (stop the motion) with the balance pot (also called zero-speed pot) or digital adjustment in your drive. If there is no pot (or digital adjustment) in the drive, or if the motion can not be stopped, attempt to use the CO SIG Offset parameter to "offset" the creep. Be sure to record this parameter and/or make sure it gets into the backup parameter list at some point.

10. With the unit in RUN (Direct Mode) and the drive enabled, output a small positive voltage to the drive by slowly incrementing the Direct SP with the Increment Key"▲" until motion is detected (above any creep speed). If motion is in the direction that you would consider the positive (or forward) direction, continue with setup. If not, you must reconfigure the drive and/or motor to reverse direction, e.g. reverse armature leads, tach leads, etc. if applicable. Refer to your drive manual for procedure on changing directions. If it is not possible to reverse the motion by reconfiguring the drive/motor, you can simply set CO SIG Polarity (CP-182) to the other option, e.g. if NORM (1) results in reverse motion, change CO SIG Polarity to NEG (2).

Now we must scale the Feedback to monitor motor speed in RPM.

11. Go to SCALING/SIGNAL SCALING/P1 (FREQUENCY INPUT 2) screen set the Count Mode for FI2 by selecting either quadrature or incremental mode for Cnt Mode FI2 (CP-165). Use quadrature (Quad) if the encoder provides direction information in the form of two channels that are approximately 90 degrees out of phase. Quadrature mode infers direction information from two channels and records 4 counts (edges) per pulse. Do not confuse the two channels with single channel that provides both the signal and its compliment (refered to as differential line driver output). For single channel encoders, select Incremental (Inc). Incremental mode can not and does not infer direction information from the single channel and records only 1 count (edge) per pulse. Do not confuse incremental count mode with the term incremental encoder. Both quadrature and single channel encoders must be of the incremental type for this controller.

12. Set the PPR FI2 (CP-166) to the number of pulses per revolution. Here you want to monitor "MOTOR" RPM in FI2 RPM parameter (MP-7), so this value should be pulses per motor revolution. The value can be changed later to pulses per encoder revolution if you are interested in monitoring encoder speed in RPM.

For quadrature feedback devices complete step 13 to determine if the feedback measurement is consistent with the direction of motion. For signal channel encoders, skip step 13 and move on to step 14.

13. With the motion in the positive direction as done in step 10 above, check the sign of the feedback by monitoring FI2 Freq (MP-6). This can be accomplished by pressing the Code key, followed by "6" and Enter. If the value of FI2 Freq is a positive number (positive frequency), then move on to step 14. If the value is negative, the encoder wires must be changed. With the power off, move the wire(s) now on channel A (and /A) to channel B (and /B) and move the wire(s) that were on channel B (and /B) to Channel A (and /A). Interchanging A with /A should also produce the same result. Power the unit up again and enter RUN mode. Return to SCALING/SIGNAL SCALING/P1 to verify that the feedback is positive for a positive (command) motion. FI2 Freq should still be on the code select line.

Next you should see if the motor can reach its Maximum Speed (or your maximum operating speed) in RPM. DO NOT perform this step if the motor shaft is connected to the machine and you are not sure if the mechanism is ready for high speed operation. In addition, if there are physical travel limits, DO NOT perform this test with the motor shaft connected to the machine. In any case, make sure that the motor itself is securely held in place.

14. Go to SETPOINT/DIRECT SETPOINT and code select MP-7 (FI2 RPM) to monitor motor speed in RPM. With the unit in RUN and in Direct Mode, slowly increase the Direct SP (CP-140) until the FI2 RPM reads the maximum operating speed or the Direct SP exceeds 90% of the CO Max Volts (CP-181), whichever comes first.

    If you exceed 90% of the CO Max Volts with the Direct SP before the FI2 RPM reaches the maximum operating speed, then you need to rescale the drive. With the Direct SP at 90% of the CO Max Volts, adjust the maximum speed pot on the drive until the FI2 RPM reads your maximum operating speed. If the maximum operating speed is still not attainable, consult your drive manual to confirm the drive/motor maximum speed. If you are still not able to reach this maximum speed, check if anything is loading the motor and if the power line voltage for the drive is within specification. Confirm also that the PPR FI2 (CP-166) is correct for motor pulses per revolution.

    If you exceed the maximum operating speed before you reach 90% of the CO Max Volts with the Direct SP, then we should rescale the CO SIG to get better resolution and to prevent unnecessary integral windup. With the motor/drive running at your maximum operating speed, record the Direct SP value. Add 10% of this value to itself and enter the result into CO Max Volts (CP-181) using the code select line.

    If you have changed the CO Max Volts (CP-181), you may want to repeat steps 8 and 9 with the Direct SP = 0.0 to make sure that there is still minimal creep motion.

ANALOG CALIBRATION

The Analog Calibration allows you to calibrate the auxiliary Analog I/O, AI1, AI2, AO. The boards are calibrated at the factory and the accuracy should be adequate for most applications. However, you may need to re-calibrate if your application demands more accuracy in a specific range or if you need to calibrate directly to EU/T with a known signal level on the inputs. The Analog Calibrtation screen is accessed through Main Menu/Device Tests/Aux Analog Tests/pg 3.

Analog Output (voltage):

1. Connect a voltmeter between pins 10 and 11 with the positive lead on pin 10 (pin 11 is common).

2. Set AO Mode (CP-185) to “Volts” (1).

3. Set Analog Cal Sel (CP-361) to AO (3) to Select AO for calibration.

4. Set Analog Cal Ref (CP-362) to “A” (1) to select point A.

NOTE: The old calibration data will be overwritten.

5. Set Analog Cal EN (CP-360) to “On” (1) to start calibration.

6. Adjust AO Bit Set (CP-364) until the meter reads the voltage that you want set for point A. This is generally your smallest (or negative) voltage point. A -12 volts requires about -29500 bits, -10 volts about -24500 bits, 0 volts about 0 bits. For -12 volts, start with about -29400 and use the incremental scroll “▼” key .

7. Enter the exact voltage measured by the meter into AnalogRef Val (CP-363).

8. Set Analog Cal Ref (CP-362) to “B” (2) to select point B.

9. Adjust AO Bit Set (CP-364) until the meter reads the voltage that you want use for point B. This is usually your largest (or positive) voltage point. A +12 volts requires about 30100 bits, 10 volts about 25100 bits, 0 volts about 0 bits. For 12 volts, start with about 30000 and use the incremental scroll “▲” key.

10. Enter the exact voltage measured by the meter into AnalogRef Val (CP-363).

11. Set Analog Cal EN to “Off” (0) to disable further calibration.

Analog Output (current):

1. Connect a current meter in series with a 250 Ohm resistor between pins 9 and 11 with the positive lead on pin 9 (pin 11 is common). Connect the meter in series with the load.

2. Set AO Mode (CP-185) to “Current” (2).

3. Set Analog Cal Sel (CP-361) to AO (3) to Select AO for calibration.

4. Set Analog Cal Ref (CP-362) to “A” (1) to select point A.

NOTE: The old calibration data will be overwritten.

5. Set Analog Cal EN to “On” (1) to start calibration.

6. Adjust AO Bit Set (CP-364) until the meter reads the current you want to set for point A. This is generally your smallest current point. A 4 milliamp setting requires about -14450 bits, 0.5 milliamps about -24000 bits and 1.0 milliamps about -22600. For 4 milliamps, start with about -14300 and use the incremental scroll “▼” key.

7. Enter the exact current measured by the meter into AnalogRef Val (CP-363).

8 Set Analog Cal Ref (CP-362) to “B” (2) to select point B.

9. Adjust AO Bit Set (CP-364) until the meter reads the voltage that you want to set for point B. This is usually your largest current point. A 20 milliamp setting requires about 29300 bits, 10 milliamps about 1940. For 20 milliamps, start with about 29200 and use the incremental scroll “▲” key.

10. Enter the exact current measured by the meter into AnalogRef Val (CP-363).

11. Set Analog Cal EN to “Off” (0) to disable further calibration.

Analog Input 1 (voltage):

1. Connect the Analog Output voltage pins to the Analog Input 1 voltage pins - pin 10 to pin 2, pin 11 to pin 4. Connect a voltmeter between pins 2 and 4 with the positive lead on pin 2 (pin 4 is at common).

2. Set AO Mode (CP-185) to “Volts” (1).

3. Set AI1 Mode (CP-170) to “Volts” (1).

4. Set Analog Cal Sel (CP-361) to “AI1” (1) to Select AI1 for calibration.

5. Set Analog Cal Ref (CP-362) to “A” (1) to select point A.

NOTE: The old calibration data will be overwritten.

6. Set Analog Cal EN to “On” (1) to start calibration.

7. Adjust AO Bit Set (CP-364) until the meter reads the voltage that you want set for point A. This is generally your smallest (or negative) voltage point. A -12 volts requires about -29500 bits, -10 volts about -24500 bits, 0 volts about 0 bits. For -12 volts, start with about -29400 and use the incremental scroll “▼” key.

8. Enter the exact voltage measured by the meter into AnalogRef Val (CP-363).

9. Set Analog Cal Ref (CP-362) to “B” (2) to select point B.

10. Adjust AO Bit Set (CP-364) until the meter reads the voltage that you want use for point B. This is generally your largest (or positive) voltage point. A +12 volts requires about 30100 bits, 10 volts about 25100 bits, 0 volts about 0 bits. For 12 volts, start with about 30000 and use the incremental scroll “ ▲” key.

11. Enter the exact voltage measured by the meter into AnalogRef Val (CP-363).

12. Set Analog Cal EN to “Off” (0) to disable further calibration.

Analog Input 1 (current):

1. Connect a current meter between pin 9 and pin 2 with the positive lead on pin 9. Connect pin 3 to pin 4 and pin 4 to pin 11.

2. Set AO Mode (CP-185) to “Current” (2).

3. Set AI1 Mode (CP-170) to “Current” (2).

4. Set Analog Cal Sel (CP-361) to “AI1” (1) to Select AI1 for calibration.

5. Set Analog Cal Ref (CP-362) to “A” (1) to select point A.

NOTE: The old calibration data will be overwritten.

6. Set Analog Cal EN to “On” (1) to start calibration.

7. Adjust AO Bit Set (CP-364) until the meter reads the current you want to set for point A. This is generally your smallest current point. A 4 milliamp setting requires about -14450 bits, 0.5 milliamps about -24000 bits and 1.0 milliamps about -22600. For 4 milliamps, start with about -14300 and use the incremental scroll “ ▼” key.

8. Enter the exact current measured by the meter into AnalogRef Val (CP-363).

9. Set Analog Cal Ref (CP-362) to “B” (2) to select point B.

10. Adjust AO Bit Set (CP-364) until the meter reads the voltage that you want to set for point B. This is generally your largest current point. A 20 milliamp setting requires about 29300 bits, 10 milliamps about 1940. For 20 milliamps, start with about 29200 and use the incremental scroll “ ▲” key.

11. Enter the exact current measured by the meter into AnalogRef Val (CP-363).

12. Set Analog Cal EN to “Off” (0) to disable further calibration.

Analog Input 2 (voltage):

1. Connect the Analog Output voltage pins to the Analog Input 2 voltage pins - pin 10 to pin 5, pin 11 to pin 7 Connect a voltmeter between pins 5 and 7 with the positive lead on pin 5 (pin 7 is at common).

2. Set AO Mode (CP-185) to “Volts” (1).

3. Set AI2 Mode (CP-175) to “Volts” (1).

4. Set Analog Cal Sel (CP-361) to “AI2” (2) to Select AI2 for calibration.

5. Set Analog Cal Ref (CP-362) to “A” (1) to select point A.

NOTE: The old calibration data will be overwritten.

6. Set Analog Cal EN to “On” (1) to start calibration.

7. Adjust AO Bit Set (CP-364) until the meter reads the voltage that you want set for point A. This is generally your smallest (or negative) voltage point. A -12 volts requires about -29500 bits, -10 volts about -24500 bits, 0 volts about 0 bits. For -12 volts, start with about -29400 and use the incremental scroll “▼” key.

8. Enter the exact voltage measured by the meter into AnalogRef Val (CP-363).

9. Set Analog Cal Ref (CP-362) to “B” (2) to select point B.

10. Adjust AO Bit Set (CP-364) until the meter reads the voltage that you want use for point B. This is generally your largest (or positive) voltage point. A +12 volts requires about 30100 bits, 10 volts about 25100 bits, 0 volts about 0 bits. For 12 volts, start with about 30000 and use the incremental scroll “ ▲” key.

11. Enter the exact voltage measured by the meter into AnalogRef Val (CP-363).

12. Set Analog Cal EN to “Off” (0) to disable further calibration.

Analog Input 2 (current):

1. Connect a current meter between pin 9 and pin 5 with the positive lead on pin 9. Connect pin 6 to pin 7 and pin 7 to pin 11.

2. Set AO Mode (CP-185) to “Current” (2).

3. Set AI2 Mode (CP-175) to “Current” (2).

4. Set Analog Cal Sel (CP-361) to “AI2” (2) to Select AI2 for calibration.

5. Set Analog Cal Ref (CP-362) to “A” (1) to select point A.

NOTE: The old calibration data will be overwritten.

6. Set Analog Cal EN to “On” (1) to start calibration.

7. Adjust AO Bit Set (CP-364) until the meter reads the current you want to set for point A. This is generally your smallest current point. A 4 milliamp setting requires about -14450 bits, 0.5 milliamps about -24000 bits and 1.0 milliamps about -22600. For 4 milliamps, start with about -14300 and use the incremental scroll “ ▼” key.

8. Enter the exact current measured by the meter into AnalogRef Val (CP-363).

9. Set Analog Cal Ref (CP-362) to “B” (2) to select point B.

10. Adjust AO Bit Set (CP-364) until the meter reads the voltage that you want to set for point B. This is generally your largest current point. A 20 milliamp setting requires about 29300 bits, 10 milliamps about 1940. For 20 milliamps, start with about 29200 and use the incremental scroll “ ▲” key.

11. Enter the exact current measured by the meter into AnalogRef Val (CP-363).

12. Set Analog Cal EN to “Off” (0) to disable further calibration.

Calibrating and Scaling AI1 Together

In some applications you may not know the voltage (or current) to EU/T representation, e.g. you may know that your flow meter operates from 0 to 10 gallons per minute, but you have no idea the voltage produced by the meter at either end point. You can 'calibrate' the signal directly in terms of EU/T by setting the calibration references the same as the scaling references, i.e. set AI1 RA (CP-171) equal to Cal Ref A (MP-17) for this signal and set AI1 RB (CP-173) equal to Cal Ref B (mp18) for this signal. These two points should be discretely different from each other and should be reasonable estimates for the actual voltage or current range. You would then set the EU@ AI1 RA (CP-172) and EU@ AI1 RB (CP-174) to the sensor's operating points used during the calibration process for points A and B respectively.

1. Connect the sensor to the AI1 voltage (or current) pins. Connect pins 3 and 4 together if using current mode.
2. Set AI1 Mode (CP-170) to "Volts" (1) or "Current" (2).
3. Set Analog Cal Sel (CP-361) to "AI1" (1) to Select AI1 for calibration.
4. Set Analog Cal Ref (CP-362) to "A" (1) to select point A.

NOTE: The old calibration data will be overwritten.

5. Set Analog Cal EN to "On" (1) to start calibration.
6. Run the sensor at the operating point for calibration point A. This is generally your smallest (or negative) voltage point (or smallest current point). Record the value of this operating point as sensor operating point A in EU/T.
7. Enter an estimate of the voltage (or current) that the sensor is producing at this operating point into AnalogRef Val (CP-363). Record this value as point A reference voltage (or current) along side the sensor operating point A.
8. Set Analog Cal Ref (CP-362) to "B" (2) to select point B.
9. Run the sensor at the operating point for calibration point B. This is generally your largest (or positive) voltage point (or largest current point). Record the value of this operating point as point B EU/T.
10. Enter an estimate of the voltage (or current) that the sensor is producing at this operating point into AnalogRef Val (CP-363). Record this value as point B reference voltage (or current) along side the sensor operating point B.
11. Set Analog Cal EN to "Off" (0) to disable further calibration.
12. Go to SCALING/SIGNAL SCALING/P1. Enter voltage (or current) that you recorded as the point A reference voltage (or current) into AI1 RA (CP-171). Enter the sensor operating point A (EU/T) that the sensor was producing during the point A calibration into EU@AI1 RA (CP-172). This could actually be a time-less unit, but is considered as EU/T scaling because it assumes speed representation for the velocity loop. Enter voltage (or current) that you recorded as the point B reference voltage (or current) into AI1 RB (CP-173). Enter the sensor operating point B (EU/T) that the sensor was producing during the point B calibration into EU@AI1 RB (CP-174).

Repeat this procedure for AI2 if necessary. Calibrate AI2 and use the corresponding AI2 parameters.

—NOTES—

System Setup/Control Parameters

INTRODUCTION TO CONTROL PARAMETERS

Parameters are divided into two classifications; Control Parameters (CP) and Monitor Parameters (MP). This section is about Control Parameters. Monitor Parameters are explained in *System Monitoring: Monitor Parameters.*

The parameters appear on the screens by a Parameter Name. The Help screens list the parameters by both their Parameter Name and by a numbered code, which is called the Parameter Code. The operational data is the Parameter Value.

		Parameter Name	Parameter Code	Parameter Value
Parameters =	Monitor Parameter	Scaled Feedback	MP-40	0.0 (default)
	Control Parameter	Master Setpoint	CP-110	0 (default)

Note: All Control Parameters are designated by a small indicator "dot" to the left of the Parameter Name, as it appears on a screen (unlike Monitor Parameters, which do not have a small indicator "dot" to the left of the Parameter Name).

The CX-1010 is pre-loaded at the factory with a complete set of default Control Parameter values. The majority of these default settings are suitable for most applications and do not require modification.

Control Parameters allow you to enter data that is unique to your system (e.g., encoder resolution, Lead to Follower ratios, maximum RPM, setpoints, acceleration/deceleration ramp rates) by accessing a parameter screen and entering a parameter value. Once the Control Parameters are entered and the setup for the CX-1010 is complete, the Control Parameters can be "locked out" so that they become inaccessible from the Keypad. This feature prevents an inadvertent accidental entry. For details, refer to the Keypad Lockout screen in *System Setup/Control Parameters: Device Configuration/Keypad Lockout Setup*. A synopsis of the information is also available by referencing Keypad Lockout (CP-29) in *Appendices: Appendix C.*

The following sections demonstrate how to use the Control Parameter screens. These sections include:

- Scaling
- Setpoints
- Alarms*Ramps*Limits
- Tuning
- Block Setup
- PLC
- Device Configuration

—NOTES—

SCALING

This section discusses the setup procedures for scaling. The CX-1010 allows you to use Engineering Units (e.g., feet, inches, revolutions) relative to a specific time (e.g., seconds, minutes) to control and monitor your system. The scaling screens will walk you through the scaling of:

- the frequency inputs from the lead and feedback sensors
- the control output signal (CO SIG) to the drive
- the Auxiliary Analog inputs (2) and output (1) signals
- the Scaled Feedback (CP-40); which is the default parameter that appears in the large number display on the status screen

Caution: To avoid damage to your system, the CX-1010 must be calibrated and the motor drive set up before you operate your system. Refer to *Drive Setup / Calibration: Calibration*.

The CX-1010 scaling screens are:

- Standard Signals
- Monitor Parameter
- Aux Analog Signals

—NOTES—

STANDARD SIGNALS

The Standard Signals screens consist of the Frequency Input 1 screen (page 1), the Frequency Input 2 screen (page 2) and the Control Output screen (page 3).

Frequency Input 1

The Frequency Input 1 signal is typically used as the Lead signal. However, it can be used as the Offset for Offset applications and/or as one or more of the variables in the Custom Setpoint equation.

Go to the page one of the Scaling / Standard Signals screen. FI1 Pulses (CP-162), EU FI1 (CP-163), and Time Base (CP-109) scale the Frequency Input 1 signal from frequency (pulses per second, Hz) to EU/Tm.

To scale the Frequency Input 1 signal in terms of EU/Tm, determine what Engineering Units per time representative that you want to use for your feedback and setpoint. When you enter speed Control Parameters, you will enter them as the EU/Tm that you have chosen. Likewise, when you monitor certain speed parameters, they will be displayed in the chosen EU/Tm. Your Engineering Units (EU) may be in feet, inches, pages, cookies, to whatever you choose. Your speed representation for EU/Tm can be in feet/minute, inches/second, pages per second, cookies per minute, gallons per hour, or pounds. Therefore, your Engineering Units would be in feet, inches, pages, cookies, gallons or pounds respectively and the time base would be minute, second, hour (s).

Determine what number of pulses that will occur for a movement of your chosen EU/Tm (e.g., 60 pulses for every 3 cookies). Typically, you would determine the number of pulses per one Engineering Unit, but it may be easier to determine the number for multiple Engineering Units. In addition, fractional numbers can be used for both the number of pulses and the number of EU's. However, it is highly recommended that you use integer numbers for each to ensure the highest degree of accuracy. Enter the determined number of pulses into FI1 Pulses (CP-162) and enter the number of corresponding Engineering Units into EU FI1 (CP-163). For example, if your Engineering Unit is "Cookie" and 60 pulses occur for every 3 cookies, you would enter "60" in FI1 Pulses (CP-162) and "3 " in EU FI1 (CP-163). Refer to *Appendices / Appendix B* for formulas for these equations.

The Count Mode FI1 (CP-160) identifies the type of signal (quadrature or incremental) that is connected to the FI1 input. Quadrature sensors have two frequency signals that feedback information on direction as well as give you some protection from noise interference and more resolution. Quadrature sensors work well in bidirectional applications, however quadrature sensor are not required for bidirectional applications. Incremental sensors have one signal that feeds back speed information and are adequate for most applications.

The position counters, FI1 Hz (CP-01) and FI1 EU/Tm (CP-03), use the information from Count Mode FI1 (CP-160). These position counters count four edges per pulse and incorporate the directional information, if a quadrature sensor is used. If an incremental sensor is used, the position counters count one edge per pulse, and no directional information is available.

Frequency Input 2

The Frequency Input 2 signal is typically used as the feedback signal. However, it can be used as the Offset for Offset applications and/or as one or more of the variables in the Custom Setpoint equation.

Go to the page two of the Scaling / Standard Signals screen. FI2 Pulses (CP-167), EU FI2 (CP-168), and Time Base (CP-109) scale the Frequency Input 2 signal from frequency (pulses per second, Hz) to EU/Tm.

To scale the Frequency Input 2 signal in terms of EU/Tm, determine what Engineering Units per time representative that you want to use for your feedback and setpoint. When you enter speed Control Parameters, you will enter them as the EU/Tm that you have chosen. Likewise, when you monitor certain speed parameters, they will be displayed in the chosen EU/Tm. Your Engineering Units (EU) may be in feet, inches, pages, cookies, to whatever you choose. Your speed representation for EU/Tm can be in feet/ minute, inches/second, pages per second, cookies per minute, gallons per hour, or pounds. Therefore, your Engineering Units would be in feet, inches, pages, cookies, gallons or pounds respectively and the time base would be minute, second, hour (s).

Determine what number of pulses that will occur for a movement of your chosen EU/Tm (e.g., 60 pulses for every 3 cookies). Typically, you would determine the number of pulses per one Engineering Unit, but it may be easier to determine the number for multiple Engineering Units. In addition, fractional numbers can be used for both the number of pulses and the number of EU's. However, it is highly recommended that you use integer numbers for each to ensure the highest degree of accuracy. Enter the determined number of pulses into FI2 Pulses (CP-167) and enter the number of corresponding Engineering Units into EU FI2 (CP-168). For example, if your Engineering Unit is “Cookie” and 60 pulses occur for every 3 cookies, you would enter “60” in FI2 Pulses (CP-167) and “3 ” in EU FI2 (CP-168). Refer to *Appendices / Appendix B* for formulas for these equations.

Determine the time base for the speed representation. If you want speed represented as EU's/second for this signal as well as for Frequency Input 2, set Time Base (CP-109) to “1” (second). If the speed is to be represented in EU's/minute, then set Time Base (CP-109) to “2” (minute) If the speed is to be represented in EU's/hour, then set Time Base (CP-109) to “3” (hour).

Sometimes a “Timeless” timebase is used if there is an analog feedback. However, a “Timeless” timebase is rarely used with a frequency feedback. For those infrequent cases when the frequency input for FI1 and FI2 has no time dependency, you can choose “0” (Timeless EU/Tm) for the Time Base (CP-109). In other words, the frequency, in pulses/second (Hz), represents a physical measurement other than speed. For example, a frequency could represent pressure in pounds. In this instance, scale pulses/second directly to EU's. Enter the number of pulses/sec (Hz) into FI1 Pulses (CP-162) and the number of EU's this represents into EU FI1 (CP-163). Set Time Base (CP-109) to “0” (Timeless EU/Tm).

The default setting of “Hi to: 130,000” for EU/Tm Range (CO-108) is sufficient for most applications, however, if the speed of your lead signal, feedback signal or analog signal is greater than 130,000 (e.g., 145,000 products per hour) then increase the EU/Tm Range (CP-108) setting the “Max to : 9999,9999”. When you increase the range, you decrease the resolution of the internal representation of speed. Some applications , such as application that require more accuracy, may require a smaller range to increase the resolution of the feedback.

The Count Mode FI2 (CP-165) identifies the type of signal (quadrature or incremental) that is connected to the FI2 input. Quadrature sensors have two frequency signals that feedback information on direction as well as give you some protection from noise interference and more resolution. Quadrature sensors work well in bidirectional applications, however quadrature sensor are not required for bidirectional applications. Incremental sensors have one signal that feeds back speed information and are adequate for most applications.

PPR FI2 (CP-166) scales the Frequency Input 2 signal from a frequency representation (Hz) to Revolutions per Minute (RPM). The result is displayed in FI2 RPM (MP-07). Enter the number of pulses per revolution in PPR FI2 (CP-166) . If you want to monitor the rotational speed of the encoder, this value could be the line count of the encoder (pulses per encoder revolution). If you want to monitor motor speed in RPM, this value could be the number of pulses per motor revolution. If the encoder is not mounted on the motor, then you need to perform some calculation involving gear ratios, roller/wheel diameters, etc. to determine the number of pulses per motor revolution.

The position counters, FI2 Hz (CP-06) and FI2 EU/Tm (CP-08), use the information from Count Mode FI2 (CP-165). These position counters count four edges per pulse and incorporate the directional information, if a quadrature sensor is used. If an incremental sensor is used, the position counters count one edge per pulse, and no directional information is available.

Frequency Input 1

FI1 Pulses (CP-162)

Frequency Input 1 Pulses (CP-162) is used to scale the Frequency Input 1 in EU’s and EU/Tm. Enter the number of pulses that corresponds to the number of EU’s that are entered in EU FI1 (CP-163).

EU FI1 (CP-163)

EU Frequency Input 1 (CP-163) is used to scale the Frequency Input 1 in EU’s and EU/Tm. Enter the number of EU's that corresponds to the number of pulses that are entered in FI1 Pulses (CP-162).

Cnt Mode FI1 (CP-160)

Count Mode FI1 (CP-160) identifies the type of encoder that is connected to Frequency Input 1. The “Quad x4” setting is for a quadrature encoder that gives 4 counts per pulse and also gives direction information. The Incremental selection is for a single channel encoder, which gives 1 count per pulse but does not give direction information.

2 = Incremental
1 = Quad x4 (default)

PPR FI1 (CP-161)

Pulses Per Revolution FI1 (CP-161) is the number of pulses that are produced during one revolution of the encoder (or motor or any other rotating part of your machine) that is connected to Frequency Input 1. This value is only used to calculate RPM information for FI1 RPM (MP-02).

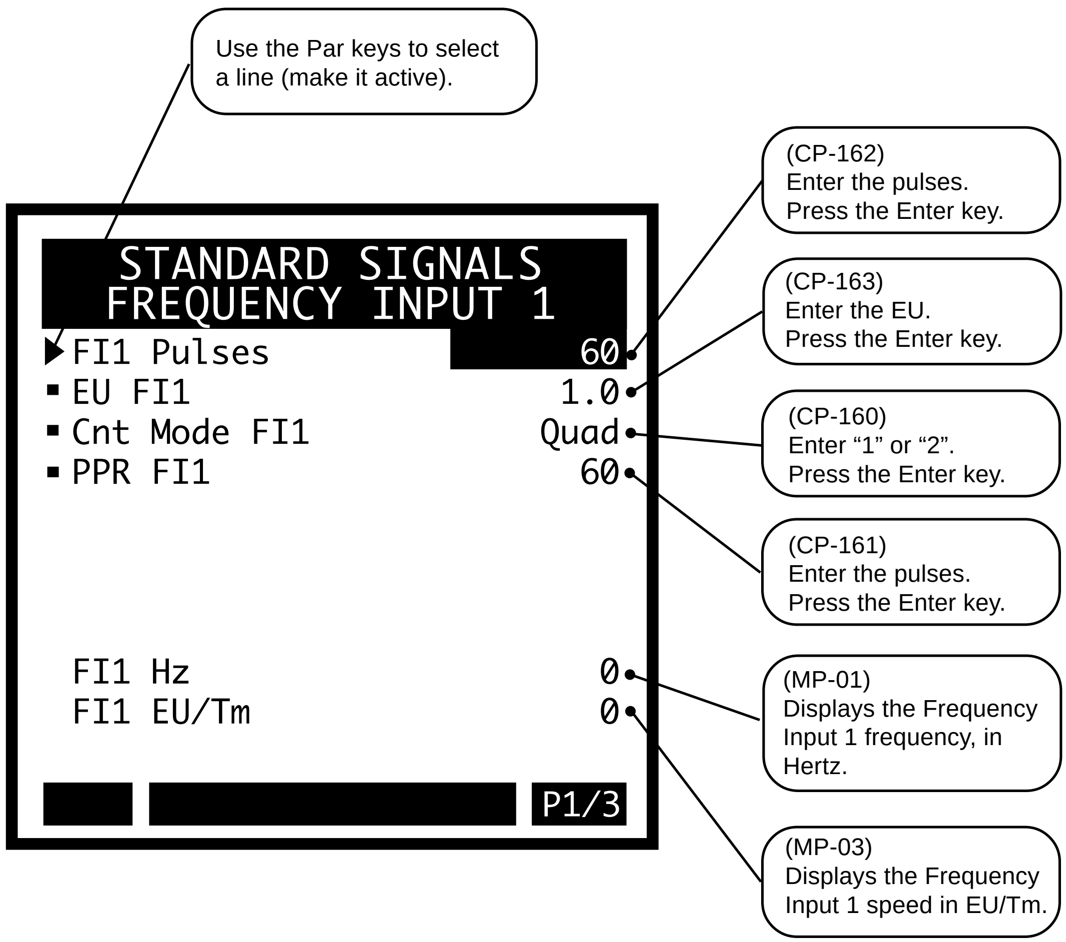
FI1 Hz (MP-01)

Frequency Input 1 Hertz (MP-01) displays the current frequency of the Frequency Input 1, in Hertz.

FI1 EU/Tm (MP-03)

Frequency Input 1 Engineering Units per Time (MP-03) displays the current speed of the Frequency Input 1 in the Engineering Units per Time (EU/Tm) relative to the FI1 Pulses (CP-162), EU FI1 (CP-163) and Time Base (CP-109). The placement of the decimal point is the same as the placement of the decimal point in Master SP (CP-110).

The Standard Signal screens are accessed through
—> Main Menu / Scaling <—



Frequency Input 2

FI2 Pulses (CP-167)

Frequency Input 2 Pulses (CP-167) is used to scale the Frequency Input 2 in EU's and EU/Tm. Enter the number of pulses that corresponds to the number of EU's that are entered in EU FI2 (CP-168).

EU FI2 (CP-168)

EU Frequency Input 2 (CP-168) is used to scale the Frequency Input 2 in EU's and EU/Tm. Enter the number of EU's that corresponds to the number of pulses that are entered in FI2 Pulses (CP-167).

Cnt Mode FI2 (CP-165)

Count Mode FI2 (CP-165) identifies the type of encoder that is connected to Frequency Input 2. The "Quad x4" setting is a for quadrature encoder that gives 4 counts per pulse and also gives direction information. The Incremental selection is for a single channel encoder which gives 1 count per pulse but does not give direction information.

2 = Incremental
1 = Quad x4 (default)

PPR FI2 (CP-166)

Pulses Per Revolution FI2 (CP-166) is the number of pulses that are produced during one revolution of the encoder (or motor or any other rotating part of your machine) that is connected to Frequency Input 2. This value is only used to calculate RPM information for FI2 RPM (MP-07).

Time Base (CP-109)

Time Base (CP-109) is the denominator, which represents the time (Tm) in the EU/Tm equation. The equation scales the Frequency Inputs (FI1 and FI2) to EU/Tm.

3 = per Hour
2 = per Minute (default)
1 = per Second
0 = Timeless EU/Tm

EU/Tm Range (CP-108)

Engineering Units per Time Range (CP-108) identifies the range and resolution (see list below) of your feedback in Engineering Units per Time (EU/Tm). For the most precise resolution, choose the range that your maximum EU/Tm falls within. If you need to change the current EU/Tm Range to a lower range, all of your Setpoints, Limits, and Alarms will also need to be changed to fall within the new range. Position parameters may also be affected when you change to a lower range.

4 = Max:	range to 999,999	resolution to 0.001
3 = Hi:	range to 130,000	resolution to 0.0001 (default)
2 = Mid:	range to 16,000	resolution to 0.00001
1 = Lo:	range to 1,000	resolution to 0.000001

PPR Mtr (CP-239)

PPR Mtr (CP-239) is the pulses per motor revolution for the FI2 signal. Use PPR Mtr to scale the PID parameters of the position loop: Kp, PL, Ki PL, Kd PL and Kp ZE.

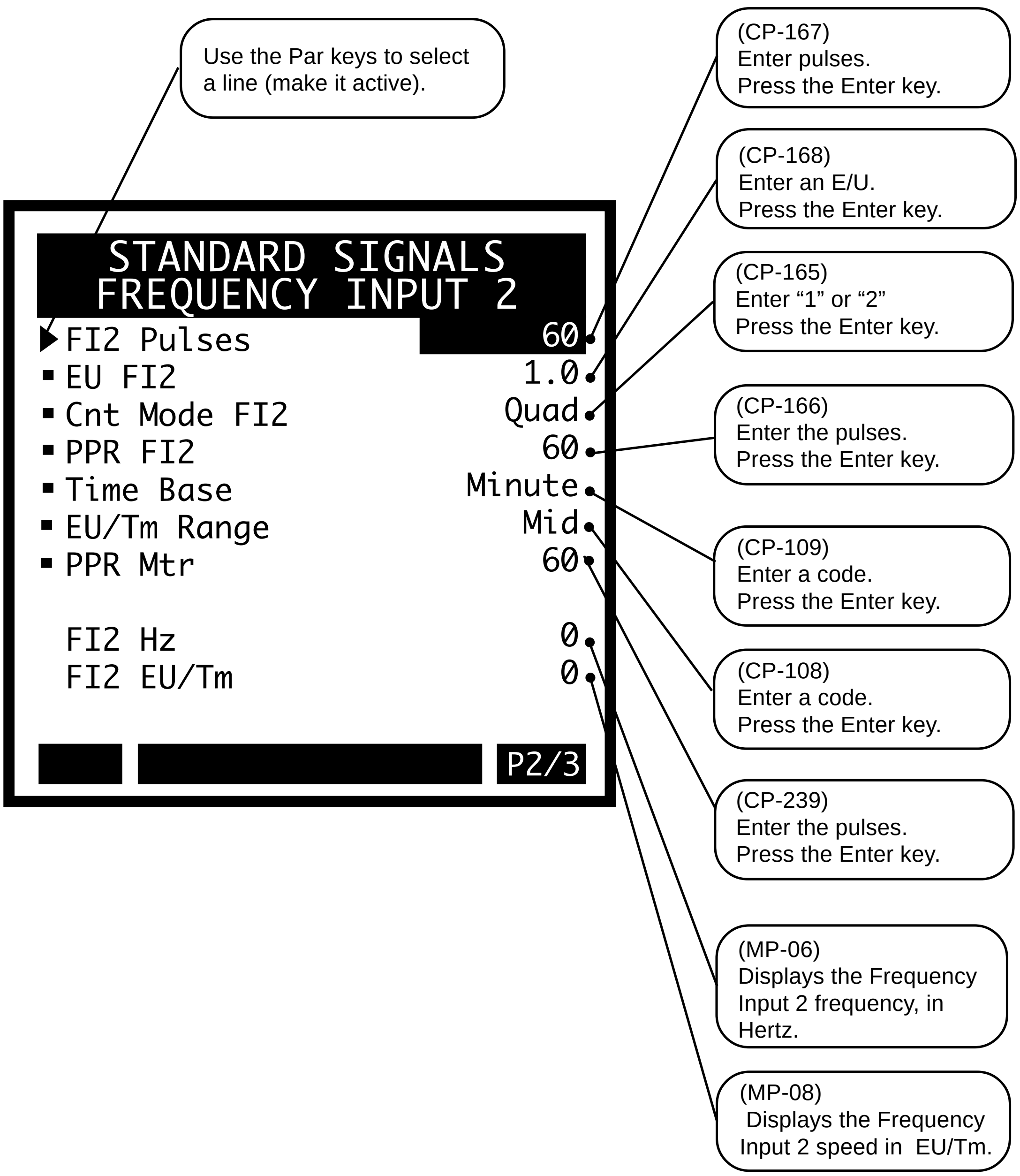
FI2 Hz (MP-06)

Frequency Input 2 Hz (MP-06) displays the present frequency of the Frequency Input 2, in Hertz.

FI2 EU/Tm (MP-08)

Frequency Input 2 Engineering Units per Time (MP-08) displays the current speed of the Frequency Input 2 in the Engineering Units per Time (EU/Tm) relative to the FI2 Pulses (CP-167), EU FI2 (CP-168) and Time Base (CP-109). The placement of the decimal point is the same as the placement of the decimal point in Master SP (CP-110).

The Scaling / Standard Signals / Frequency Input 2 screen (page 2).



Control Output

CO Mode (CP-180)

Control Output Mode (CP-180) controls the format (see list below) of the CO_SIG Analog Output (J3, pin 1) signal. This is the control output signal that is input to your drive.

4 = UniBrake = Unipolar Brake (CO Max Volts - Vout)
3 = BiPolAbs = Bipolar Absolute (Absolute Value - Vout)
2 = Bipolar (± Vout)
1 = Unipolar (0 to +Vout) (default)

CO Max Volts (CP-181)

The control signal output is limited to plus or minus Control Output Maximum Volts (CP-181). This value should be less than or equal to the input spec of the drive or any other device that is connected to this output.

CO Polarity (CP-182)

Control Output Polarity (CP-182) sets the polarity of the CO_SIG Analog Output (J3, pin 1) signal (see list below). An absolute value is established for the BiPolAbs CO Mode (CP-180) after the negation has been determined by the PLC bit 'Negate CO'.

CO Offset (CP-366)

Control Output Offset (CP-366) is the value (in volts) that is added to the CO_SIG Analog Output (J3, pin 1) signal. Control Output Offset (CP-366) can eliminate any voltage offset present on the DAC output circuitry or it can offset a motor-creep problem (i.e., a digital balance pot). CO Offset (CP-366) is set at the factory, but can also be verified with a voltmeter for a "0" volt output. If you change the value, make sure that it gets into the parameter backup.

CO Max Bits (MP-22)

The Control Output Maximum Bits (MP-22) corresponds to the voltage setting in Control Output Maximum Volts (CP-181) for the CO_SIG Analog Output signal, relative to the Control Output DAC Range (MP-23). This is a magnitude only.

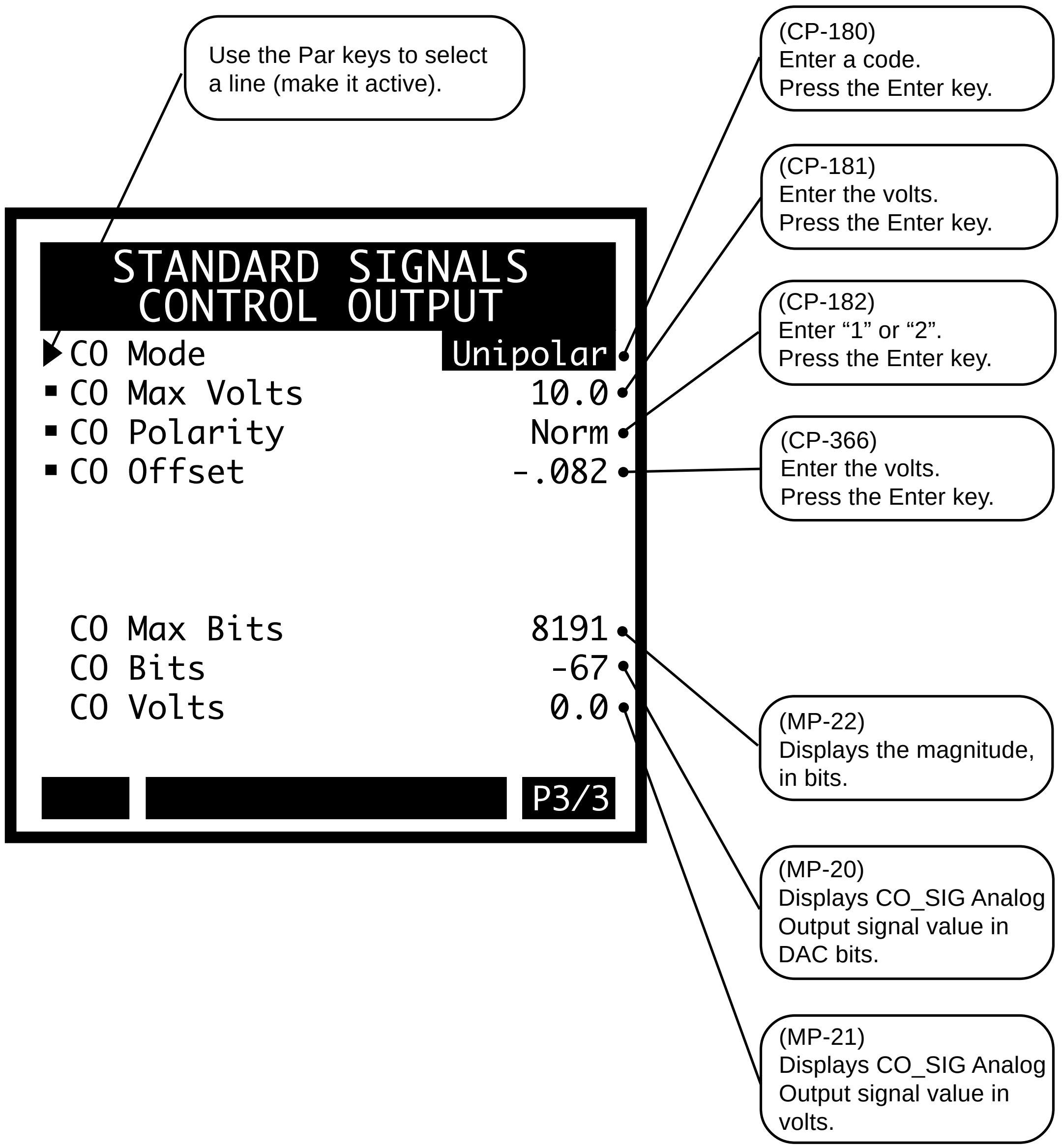
CO Bits (MP-20)

Control Output Bits (MP-20) displays the present value, in DAC bits, of the CO_SIG Analog Output signal.

CO Volts (MP-21)

Control Output Volts (MP-21) displays he present value, in volts, of the CO_SIG Analog Output signal.

The Scaling / Standard Signals / Control Output screen (page 3).



—NOTES—

MONITOR PARAMETERS

The Monitor Parameters screens consist of the Feedback screen (page 1) and the Selectable screen (page 2).

Feedback

Scaled Feedback has four possible display formats for the Scaled Fb display: Master, Follower, Inverse Master, and Inverse Follower. These display formats allow you to display the feedback in the same representation as the Setpoints. ScFb Eq (CP-190) determines the format. ScFb EU (CP-191) and Fb @ ScFb EU (CP-192) can be used to change the scale of the feedback. The resolution of the value you enter for ScFb EU (CP-191) determines the resolution of the Scaled Fb. The following equations define the four formats. The equations use an average value of the Fb EU/Tm (MP-39) rather than the last sample value.

In the following formulas, Fb EU/Tm (MP-39) is the current value of the signal that is selected in the Fb Source (CP-103) and Lead EU/Tm (MP-38) is the current value of the signal that is selected in Ld Source (CP-104).

For ScFb Eq {CP-190} = Std Master (1)

$$\text{Scaled Fb \{MP-40\}} = \frac{\text{Fb EU/Tm \{MP-39\}} * \text{ScFb EU \{CP-191\}}}{\text{Fb@ScFbEU \{CP-192\}}}$$

For ScFb Eq {CP-190} = Std Follower (2)

$$\text{Scaled Fb \{MP-40\}} = \frac{\text{Fb EU/Tm \{MP-39\}} * \text{ScFb EU \{CP-191\}} * \text{Ratio Norm \{CP-123\}}}{\text{Lead EU/Tm \{MP-38\}} * \text{Fb@ScFbEU \{CP-192\}}}$$

For ScFb Eq {CP-190} = Inverse Master (3)

$$\text{Scaled Fb \{MP-40\}} = \frac{\text{Fb @ScFb EU \{CP-192\}}}{\text{FbEU/Tm \{MP-39\}} * \text{ScFbEU \{CP-191\}}}$$

For ScFb Eq {CP-190} = Inverse Follower (4)

$$\text{Scaled Fb \{MP-40\}} = \frac{\text{Lead EU/Tm \{MP-38\}} * \text{Fb@ScFbEU \{CP-192\}} * \text{Ratio Norm \{CP-123\}}}{\text{FbEU/Tm \{MP-39\}} * \text{ScFbEU \{CP-191\}}}$$

ScFb EU (CP-191) and Fb @ ScFb EU (CP-192) are used to scale the feedback display in a different representation than Fb EU/Tm. Enter into ScFb EU the desired EU value and resolution when the feedback is at the value Fb @ ScFb EU. For example, if ScFb Eq (CP-190) is set to "MSTR" and an EU value of 40.00 gallons/minute is desired for a Feedback speed of 2000 RPM, then enter 40.00 into ScFb EU and 2000 into Fb @ScFb EU.

The Scaling/Monitor Parameter/Feedback (page 5-20) displays a graphic representation of the scaled feedback screen as well as a synopsis of the scaled feedback parameters.

Selectable

Sc Parm Eq (CP-194) has three equation formats (Standard, Inverse 1 and Inverse 2) which scale a selected parameter and then displays the result in ScParm Val (MP-30). Decide which Monitor Parameter you want to scale and then select the appropriate equation. The three equation formats are:

1. Standard: $y = mx + b$
2. Inverse 1: $y = \dfrac{1}{mx + b}$
3. Inverse 2: $y = m * \dfrac{1}{x} + b$

The "x " factor represents the parameter value of the monitor parameter that will be scaled. The "y" term is the parameter value that is displayed in ScParm Val (MP-30). The “m” factor and “b” term are the constants.

Select an equation format in Sc Parm Eq (CP-194).
Enter the number parameter code of the the monitor parameter that will be scaled in Sc Parm (CP-193).
Enter the value for the “m” constant in SC Parm M (CP-195).
Enter value for the “b” constant in SC Parm B (CP-196).

The resolution of the parameter value that you enter in SC Parm B (CP-196) determines the resolution of the ScParm Val (MP-30). The resolution of the selected monitor parameter may limit the accuracy of the ScParm Val (MP-30). Expand the resolution of the selected monitor parameter to improve the accuracy.

The following equations define the three equation formats:

For ScParm {CP-194} = Standard: y = mx+b (1)

$$\text{Scaled Val \{MP-30\}} = \text{ScParmM \{CP-195\}} * x + \text{ScParm B \{CP-196\}}$$

For ScParm {CP-194} = Inverse1: y = 1/(mx+b) (2)

$$\text{Scaled Val \{MP-30\}} = \frac{1}{\text{ScParmM \{CP-195\}} * x + \text{ScParm B \{CP-196\}}}$$

For ScParm {CP-194} = Inverse2: (M/x) +b (3)

ScParml {MP-30} = ScParmM {CP-195} / x) + ScParm B {CP-196}
"x" is the value of the Monitor Parameter selected in ScParm {CP-193}

Example of Follower Setpoint Mode - Percent Draw

The ratio of the faster speed of the feedback (FB) to that of the Lead is displayed as a percent. If the Follower Ratio is 1.01, the feedback (FB) is operating roughly one percent faster than the Lead. This is sometimes referred to as percent draw.

The equation for percent draw is :

% draw = 100 * (FB/LD - 1)

This can be written as:

% draw = 100 * FB/LD - 100

Use both the Scaled Fb (MP-40) and the ScParm Val (MP-30).
Set up the Scaled Fb (MP-40) for standard Follower:

ScFb Eq (CP-190)	= FOLL (2)
ScFb EU (CP-191)	= 1.000 (sets the resolution of Scaled Fb)
Fb @ ScFb EU (CP-192)	= 1

Set the Scaled Display to use Scaled Fb (MP-40) in the Standard equation:

Sc Parm (CP-193)	= 40
Sc Parm Eq (CP-194)	= STND (1)
SC Parm M (CP-195)	= 100
SC Parm B (CP-196)	= -100.0 (sets the resolution of ScParm Val)

Feedback

ScFb Eq (CP-190)

Scaled Feedback Equation (CP-190) identifies the scaling format (see list below) for the Scaled Fb (MP-40).

4 = Inverse Follower
3 = Inverse Master
2 = Standard Follower
1 = Standard Master (default)

ScFb EU (CP-191)

Scaled Feedback EU (CP-191) is used to scale the Scaled Fb (MP-40) in conjunction with the Fb @ ScFb EU (CP-192) and the ScFb Eq (CP-190).

Fb @ ScFb EU (CP-192)

Feedback@ Scaled Feedback EU (CP-192) is used to scale the Scaled Fb (MP-40) in conjunction with ScFb EU (CP-191) and ScFb Eq (CP-190).

Ld EU/Tm (MP-38)

Lead EU/Tm (MP-38) displays the current lead, in engineering units per time, as determined by the signal scaling for the selected lead signal (refer to CP-104). The resolution is set the same as that of Master SP (CP-110).

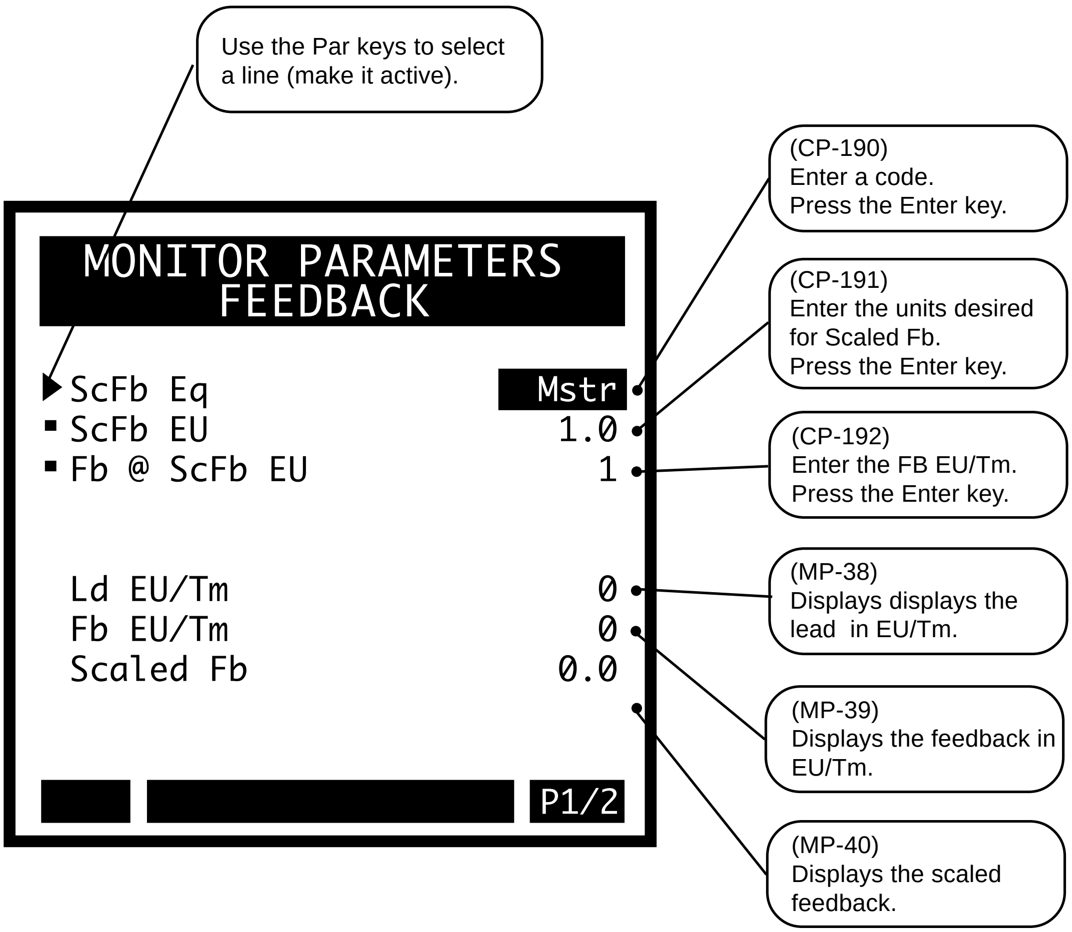
Fb EU/Tm (MP-39)

Feedback EU/Tm (MP-39) displays the feedback, in engineering units per time, that was scaled for the feedback signal that was selected in Fb Source (CP-103). The placement of the decimal point is the same as the placement of the decimal point in Master SP (CP-110).

Scaled Fb (MP-40)

Scaled Feedback (MP-40) displays the scaled feedback , which is scaled per ScFb Eq(CP-190), ScFb EU (CP-191) and Fb @ ScFb EU (CP-192). The placement of the decimal point is the same as the placement of the decimal point in ScFb EU (CP-191).

The Monitor Parameters screens are accessed through
—> Main Menu / Scaling <—



Selectable

Sc Parm (CP-193)

Use Scaled Parameter (CP-193) to select the Monitor Parameter that is used in the Scaled Parameter Equation (CP-194). The results of the equation are displayed in ScParm Val (MP-30).

Sc Parm Eq (CP-194)

Scaled Parameter Equation (CP-194) identifies the scaling format equation (see list below) for ScParm Val (MP-30):

3 = Inverse2:	(M/x) + b
	where x = value of selected monitor parameter
2 = Inverse1:	1/(M x + b)
	M = SC Parm M (CP-195)
1 = Standard:	M x + b (default)
	b = SC Parm B (CP-196)

Sc Parm M (CP-195)

Scaled Parameter M (CP-195) is the slope constant that multiplies the Sc Parm (CP-193) by "M" as specified by the Sc Parm Eq (CP-194).

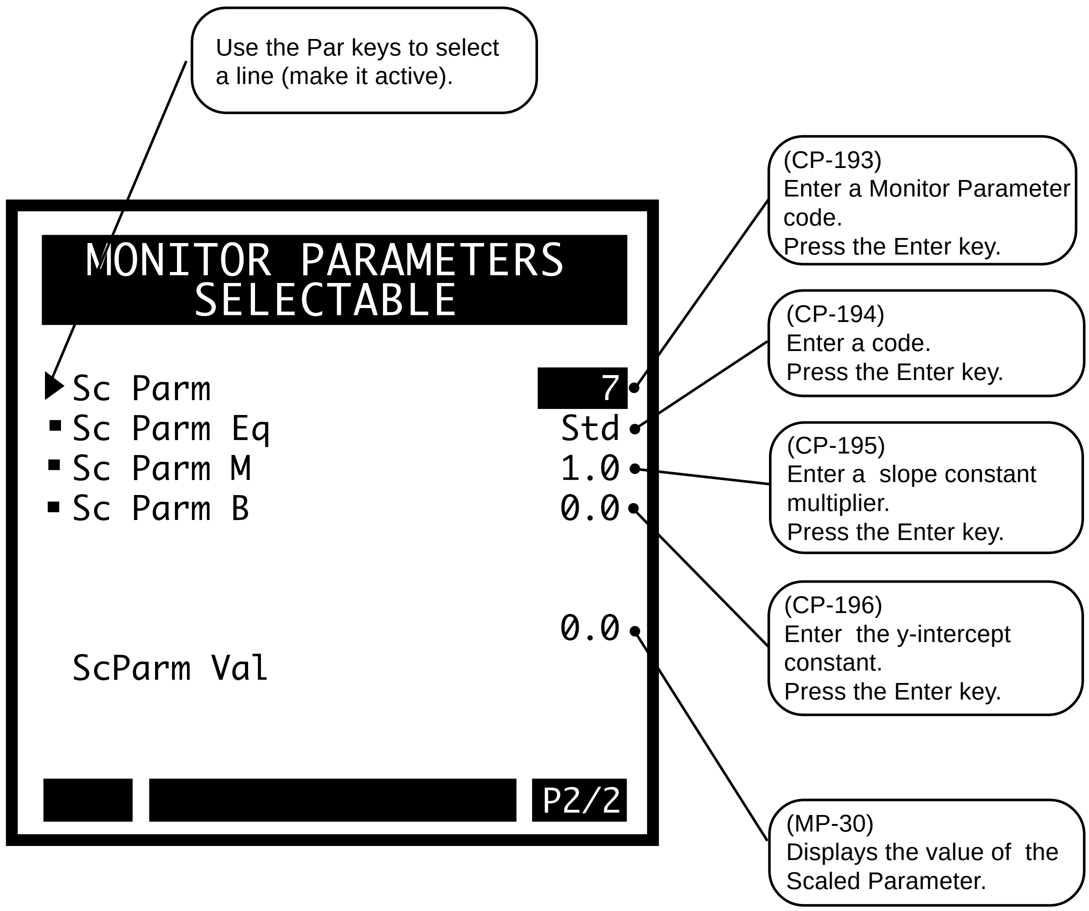
Sc Parm B (CP-196)

Scaled Parameter B (CP-196) is the y-intercept constant that is added to the product term as specified by the Sc Parm Eq (CP-194). The resolution of Scaled Parameter B (CP-196) dictates the resolution of the ScParm Val (MP-30).

Sc Parm Val (MP-30)

Scaled Parameter Value (MP-30) displays the value of the Scaled Parameter (CP-193). The placement of the decimal point is the same as the placement of the decimal point in Sc Parm B (CP-196).

The Scaling / Monitor Parameters / Selectable screen (page 2).



—NOTES—

AUX ANALOG SIGNALS

The Aux Analog Signals screens consist of the Input 1 screen (page 1), the Input 2 screen (page 2) and the Output screen (page 3).

Input 1

The Auxiliary Analog Input 1 signal (AI1) is typically used as an offset to the Lead signal in Lead plus Offset applications. It can also be used as the Lead and/or as one or more of the variables in the Custom Setpoint equation.

Go to the SIGNAL SCALING /Auxiliary Analog Input 1screen. AI1 RA (CP-171), EU@AI1 RA (CP-172), AI1 RB (CP-173) and EU@AI1 RB (CP-174) scale the Auxiliary Analog Input 1 signal from volts or milliamps to EU/Tm.

To scale the Auxiliary Analog Input 1 signal in terms of EU/Tm, you must first determine the Engineering Units that are relevant to your application and determine how this signal is used. When you enter certain speed CP's, you will enter them in the chosen EU/Tm. Likewise, when you monitor certain speed parameters, they will be displayed in the chosen EU/Tm. If used as an offset in offset applications, this signal is typically scaled to the same EU/Tm representation as the chosen Feedback. For example, your EU/Tm 'speed' representation for this signal may be in RPM, feet/minute, inches/second, pages per second, gallons per hour, or simply pounds.

Once you determine the EU/Tm representation for this signal, you need to scale the input voltage (or current) by means of a linear two point method. Typically, the two points (A and B) are chosen as the endpoints of the range of operation - the minimum and maximum voltage (or current) and the minimum and maximum EU/Tm. The two points also determine the 'polarity' of the signal by defining either a positive or negative slope. Enter a reference voltage (or current) for point A into AI1 RA (CP-171). Enter the EU/Tm that corresponds to this voltage (or current) into EU@AI1 RA (CP-172). Enter a different reference voltage (or current) for point B into AI1 RB (CP-173) and the corresponding EU/Tm into EU@AI1 RB (CP-174).

For example, a pot might be used to add an offset to a lead frequency. Your Feedback is scaled for RPM. The supply voltage on the pot is +10 volts. You want the midpoint (5 volts) to represent "0" EU/Tm (RPM). A voltage measurement of 10 volts needs to increase the speed by 100 RPM and a voltage measurement of "0" volts needs to decrease the speed by 100 RPM. Enter "0" into AI1 RA (CP-171) and -100 into EU@AI1 RA (CP-172). Enter 10 into AI1 RB (CP-173) and 100 into EU@AI1 RB (CP-174). AI1 Mode (CP-170) should be set to volts (1).

The scaled range of the Analog Input 1 signal (e.g., 0 to 10 volts) should be similar to that at which the input was calibrated. Go to the DIAGNOSTICS/CALIBRATION/P1 screen and select the signal with Analog Cal Sel (CP-361). Do not enable calibration. The two points for calibration should be displayed at the bottom of this screen in AnlgCal Ref A (MP-17) and AnlgCal Ref B (MP-18). Verify that the calibration range is the same range as the operating range. If not, recalibrate the input signal. Refer *to Drive Setup-Calibration: Calibration* for additional details.

There may be instances where you do know the voltage (or current) to EU/Tm representation (e.g., you may know your flow meter operates from 0 to 10 gallons per minute) but you have no idea the voltage produced by the meter at either end point. You can 'calibrate' the signal directly in terms of EU/Tm by setting the calibration references the same as the scaling references, i.e. set AI1 RA (CP-171) equal to

AnlgCal Ref A (MP-17) for this signal and set AI1 RB (CP-173) equal to AnlgCal Ref B (MP-18) for this signal. These two points should be discretely different from each other and should be reasonable estimates for the actual voltage or current range. Now you can perform the calibration procedure with the sensor connected to this input. Enter you estimates for AI1 RA and AI1 RB into AnalogRef Val (CP-363) for the two points of operation/calibration. Enter the EU/Tm corresponding to these two points into EU@AI1 RA and EU@AI1 RB after the calibration is completed. Refer *Drive Setup/Calibration: Calibration* for additional details. For the formulas for the Auxiliary Analog Input 1 calculations, refer to *Appendices: Appendix B.*

Input 2

The Auxiliary Analog Input 2 signal (AI2) can be used as an offset to the Lead signal in Lead plus Offset applications as one or more of the variables in the Custom Setpoint equation, or as the Feedback variable.

Go to the SIGNAL SCALING/ Auxiliary Analog Input 2 screen. AI2 RA (CP-176), EU@AI2 RA (CP-177), AI2 RB (CP-178) and EU@AI2 RB (CP-179) scale the Auxiliary Analog Input 2 signal from volts or milliamps to EU/Tm

To scale the Auxiliary Analog Input 2 signal in terms of EU/Tm, you must first determine the Engineering Units that are relevant to your application and determine how this signal is used. When you enter certain speed CP's, you will enter them in the chosen EU/Tm. Likewise, when you monitor certain speed parameters, they will be displayed in the chosen EU/Tm. If used as an offset in offset applications, this signal is typically scaled to the same EU/Tm representation as the chosen Feedback. For example, your EU/Tm 'speed' representation for this signal may be in RPM, feet/minute, inches/second, pages per second, gallons per hour, or simply pounds.

Once you determine the EU/Tm representation for this signal, you need to scale the input voltage (or current) by means of a linear two point method. Typically, the two points (A and B)are chosen as the endpoints of the range of operation - the minimum and maximum voltage (or current) and the minimum and maximum EU/Tm. The two points also determine the 'polarity' of the signal by defining either a positive or negative slope. Enter a reference voltage (or current) for point A into AI2 RA (CP-176). Enter the EU/Tm that corresponds to this voltage (or current) into EU@AI2 RA (CP-177). Enter a different reference voltage (or current) for point B into AI2 RB (CP-178) and the corresponding EU/Tm into EU@AI2 RB (CP-179).

For example, a pot might be used to add an offset to a lead frequency. Your Feedback is scaled for RPM. The supply voltage on the pot is +10 volts. You want the midpoint (5 volts) to represent "0" EU/Tm (RPM). A voltage measurement of 10 volts needs to increase the speed by 100 RPM and a voltage measurement of "0" volts needs to decrease the speed by 100 RPM. Enter "0" into AI2 RA (CP-176) and -100 into EU@AI2 RA (CP-177). Enter 10 into AI2 RB (CP-178) and 100 into EU@AI2 RB (CP-179). AI2 Mode (CP-175) should be set to volts (1).

The scaled range of the Auxiliary Analog Input 2 signal (e.g., 0 to 10 volts) should be similar to that at which the input was calibrated. Go to the DIAGNOSTICS/CALIBRATION/P1 screen and select the signal with Analog Cal Sel (CP-361). Do not enable calibration. The two points for calibration should be displayed at the bottom of this screen in AnlgCal Ref A (MP-17) and AnlgCal Ref B (MP-18). Verify that the calibration range is in the same range as the operating range. If not, recalibrate the input signal. Refer *to Drive Setup/Calibration: Calibration for* additional details.

There may be instances where you do know the voltage (or current) to EU/Tm representation, for example, you may know your flow meter operates from 0 to 10 gallons per minute, but you have no idea the voltage produced by the meter at either end point. You can 'calibrate' the signal directly in terms of EU/Tm by setting the calibration references the same as the scaling references, i.e. set AI2 RA (CP-176) equal to AnlgCal Ref A (MP-17) for this signal and set AI2 RB (CP-178) equal to AnlgCal Ref B (MP-18) for this signal. These two points should be discretely different from each other and should be reasonable estimates for the actual voltage or current range. Now you can perform the calibration procedure with the sensor connected to this input. Enter you estimates for AI2 RA and AI2 RB into AnalogRef Val (CP-363) for the two points of operation/calibration. Enter the EU/Tm corresponding to these two points into EU@AI2 RA and EU@AI2 RB after the calibration is completed. Refer *to Drive Setup/Calibration: Calibration* for additional details. For the formulas for the Auxiliary Analog Input 2 calculations, refer to *Appendices: Appendix B*.

Input 1

AI1 Mode (CP-170)

Analog Input 1 Mode (CP-170) identifies the mode of operation and the calibration that are used for the Auxiliary Board Analog Input 1 signal.

2 = Current
1 = Voltage (default)

AI1 RA (CP-171)

Analog Input 1 Reference A (CP-171) is used to scale the Auxiliary Board Analog Input 1 in EU/Tm. Enter the value for reference point A that corresponds to the EU/Tm that are entered in EU@AI1 RA (CP-172).

EU@AI1 A (CP-172)

EU at Analog Input 1 Reference A (CP-172) is used to scale the Auxiliary Board Analog Input 1 in EU/Tm. Enter the number of EU/Tm for point A that corresponds to the reference value that is entered in AI1 RA (CP-171).

AI1 RB (CP-173)

Analog Input 1 Reference B (CP-173) is used to scale the Auxiliary Board Analog Input 1 in EU/Tm. Enter the value for reference point B that corresponds to the EU/Tm that are entered in EU@AI1 RB (CP-174).

EU@AI1 RB (CP-174)

EU@Analog Input 1 Reference B (CP-174) is used to scale the Auxiliary Board Analg Input 1 in EU/Tm. Enter the number of EU/T’s for point A that corresponds to the reference value that is entered in AI1 RB (CP-173).

AI1 Bits (MP-11)

Analog Input 1 Bits (MP-11) displays the present value in ADC bits of Auxiliary Board Analog Input 1 signal.

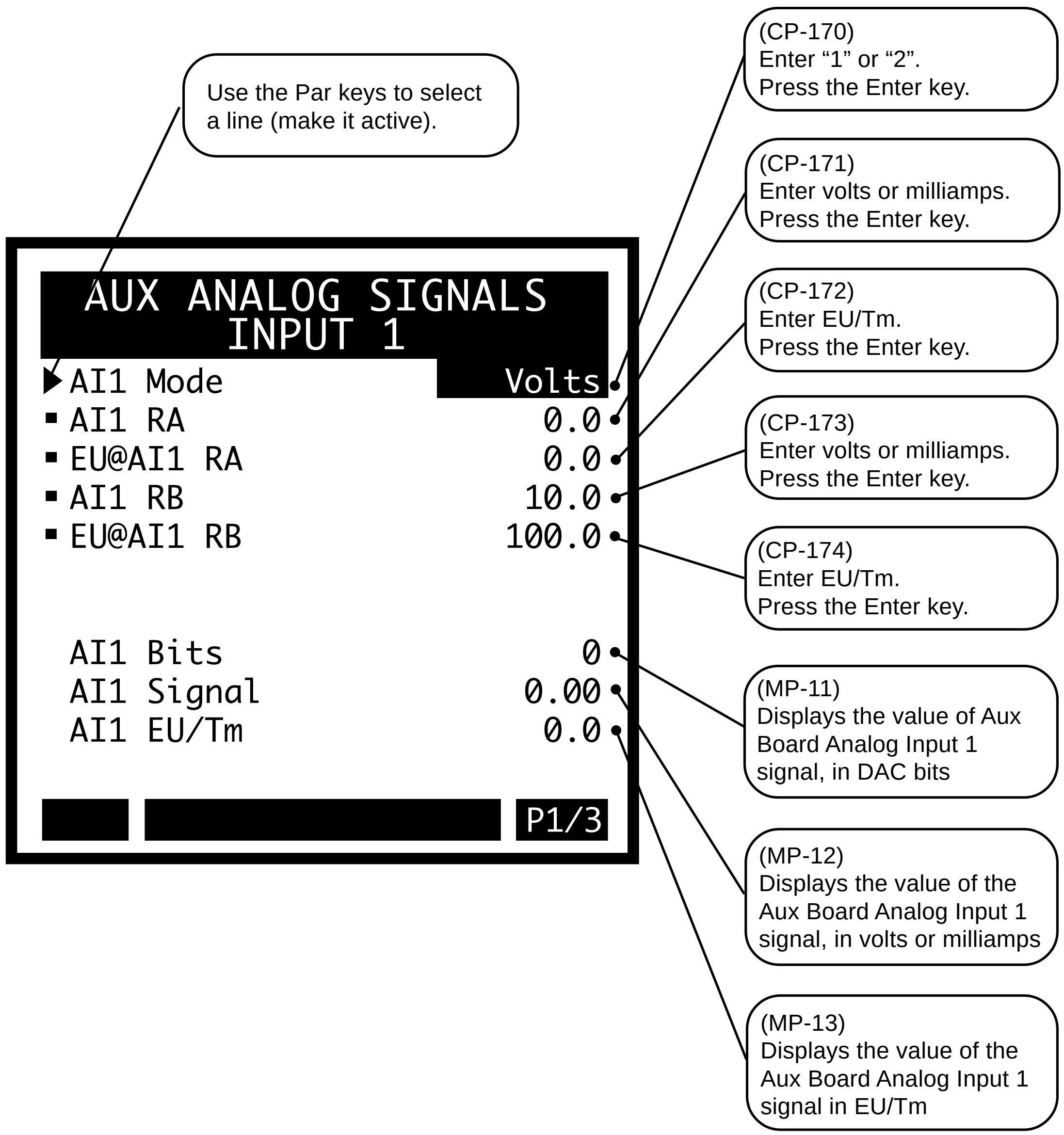
AI1 Signal (MP-12)

Analog Input 1 Signal (MP-12) displays the present value of the Auxiliary Board Analog Input 1 signal in either volts or milliamps relative to which setting (volts or current) has been entered in AI1 MODE (CP-170).

AI1 Eu/Tm (MP-13)

Analog Input 1 EU/Tm (MP-13) displays the present value of the Auxiliary Board Analog Input 1 signal in Engineering Units per Time (EU/Tm) as relative to the AI1 RA (CP-171), EU@AI1 RA (CP-172), AI1 RB (CP-173), EU@AI1 RB (CP-174) and Time Base (CP-109). The placement of the decimal point is the same as the placement of the decimal point in EU@AI1 RA (CP-172).

The Aux Analog Scaling screens are accessed through
—> Main Menu / Scaling <—



Input 2

AI2 Mode (CP-175)

Analog Input 2 Mode (CP-175) identifies the mode of operation and the calibration that are used for the Aux Board Analog Input 2 signal. Enter “2” for Current or “1” for Voltage (default).

AI2 RA (CP-176)

Analog Input 2 Reference A (CP-176) is used to scale the Aux Board Analog Input 2 in EU/Tm. Enter the value for reference point A that corresponds to the EU/T’s that are entered in EU@AI2 RA (CP-177).

EU@AI2 RA (CP-177)

EU@Analog Input 2 Reference A (CP-177) is used to scale the Aux Board Analog Input 2 in EU/Tm. Enter the number of EU/T’s for point A that corresponds to the reference value that is entered in AIN2 RA (CP-176).

AI2 RB (CP-178)

Analog Input 2 Reference B (CP-178) is used to scale the Aux Board Analog Input 2 in EU/Tm. Enter the value for reference point B that corresponds to the EU/T’s that are entered in EU@AI2 RB (CP-179).

EU@AI2 RB (CP-179)

EU@Analog Input 2 Reference B (CP-179) is used to scale the Aux Board Analog Input 2 in EU/Tm. Enter the number of EU/T’s for point A that corresponds to the reference value that is entered in AIN2 RB (CP-178).

Time Base (CP-109)

Time Base (CP-109) is the denominator, which represents the time (T) in the EU/Tm equation. The equation scales the Frequency Inputs (FI1 and FI2) to EU/Tm.

3 = per Hour	2 = per Minute (default)
1 = per Second	0 = Timeless EU/Tm

AI2 Bits (MP-14)

AI2 Bits (MP-14) displays the present value in DAC bits of Aux Board Analog Input 2 signal.

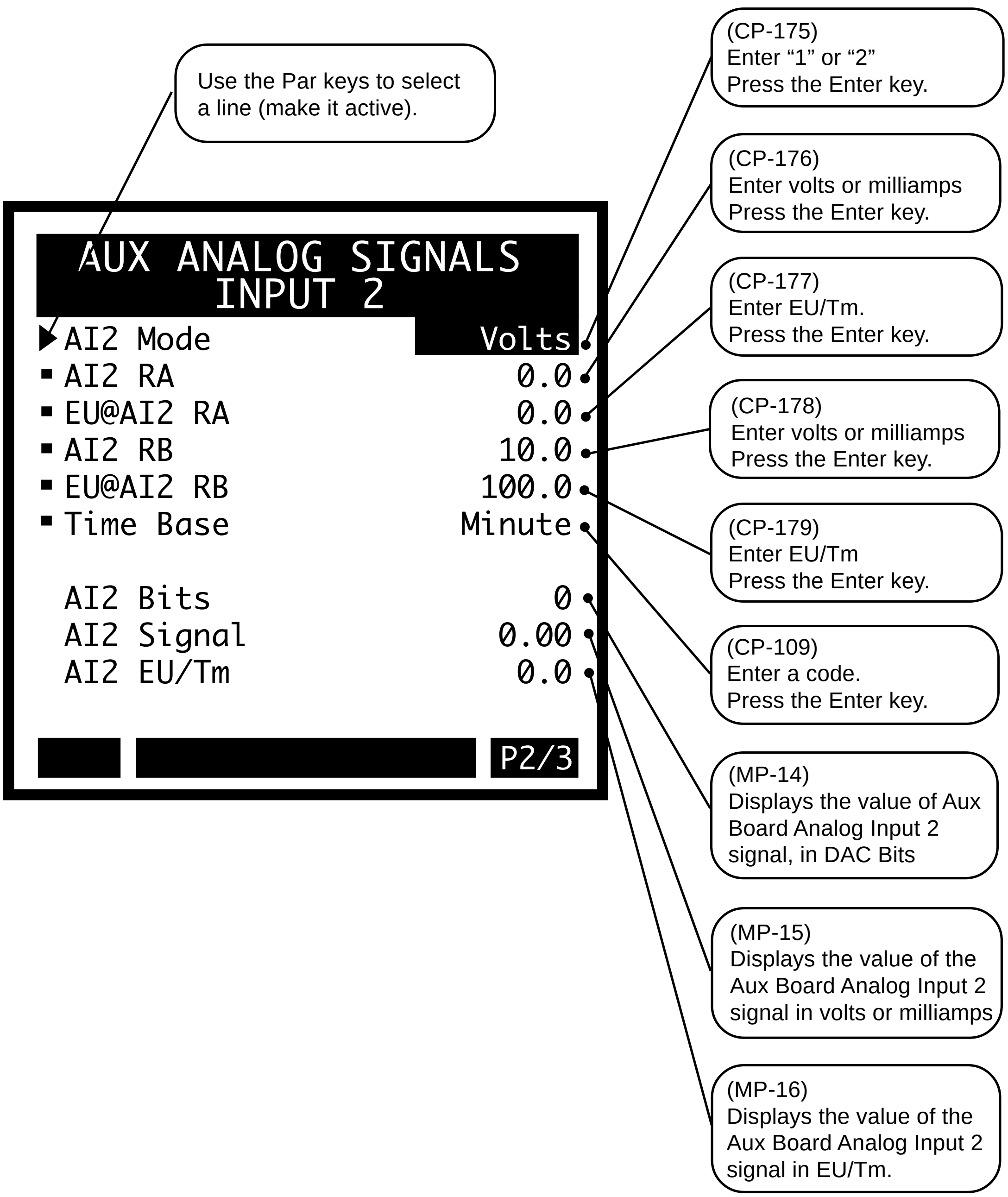
AI2 Signal (MP-15)

Analog Input 2 Signal (MP-15) displays the present value of the Aux Board Analog Input 2 signal in either volts or milliamps, relative to which setting (volts or current) has been entered in AI2 MODE (CP-175).

AI2 EU/Tm (MP-16)

Analog Input 2 EU/Tm (MP-16) displays the present value of the Aux Board Analog Input 2 signal in Engineering Units per Time (EU/Tm) relative to the A2 RA (CP-176), EU@AI2 RA (CP-177), AI2 RB (CP-178), EU@AI2 RB (CP-179) and Time Base (CP-109). The placement of the decimal point is the same as the placement of the decimal point in EU@AI2 RA (CP-177).

The Scaling / Aux Analog Signals / Input 2 screen (page 2).



Output

AO Mode (CP-185)

Analog Output Mode (CP-185) identifies the mode of operation and calibration that are used for the aux board analog output signal. Enter “2” for Current or “1” for Voltage (default).

AO Parameter (CP-184)

Analog Output Parameter (CP-184) identifies the Monitor or Control Parameter that is used for the Aux Analog output (JA, pins 9,10,11) . When the Analog Output Parameter (CP-184) set to “0”, the value of AO DIRECT (CP-365) is used as the output parameter.

NOTE: See *Appendices: Appendix C* for the Monitor Parameters that are not available for the Analog Output Parameter (CP-184).

AO RA (CP-186)

Analog Output Reference A (CP-186) scales the Aux Board Analog output from the units of the selected parameter to the units of the output (generally measured in volts or milliamperes).

Val@AO RA (CP-187)

Value@Analog Output Reference A (Value at Analog Output Reference A) scales the Aux Board Analog output from the units of the selected parameter to the units of the output (generally measured in volts or milliamperes). Enter the parameter value that corresponds to AO RA (CP-186).

AO RB (CP-188)

Analog Output Reference B (CP-188) scales the Aux Board Analog Output from the units of the selected parameter to the units of the output (generally measured in volts or milliampere). Enter the parameter value that corresponds to VAL@AO RB. (CP-189).

Val@AO RB (CP-189)

Value at Analog Output Reference B (CP-189) scales the Aux Board Analog Output from the units of the selected parameter to the units of the output, (generally measured in volts or milliampere). Enter the parameter value that corresponds to VAL@AO RB. (CP-187).

AO Direct (CP-365)

Analog Out Direct (CP-365) is the value output (in volts or milliamps) on the Auxiliary Analog Board's analog output when the AO Parameter (CP-184) is set to a “0”.

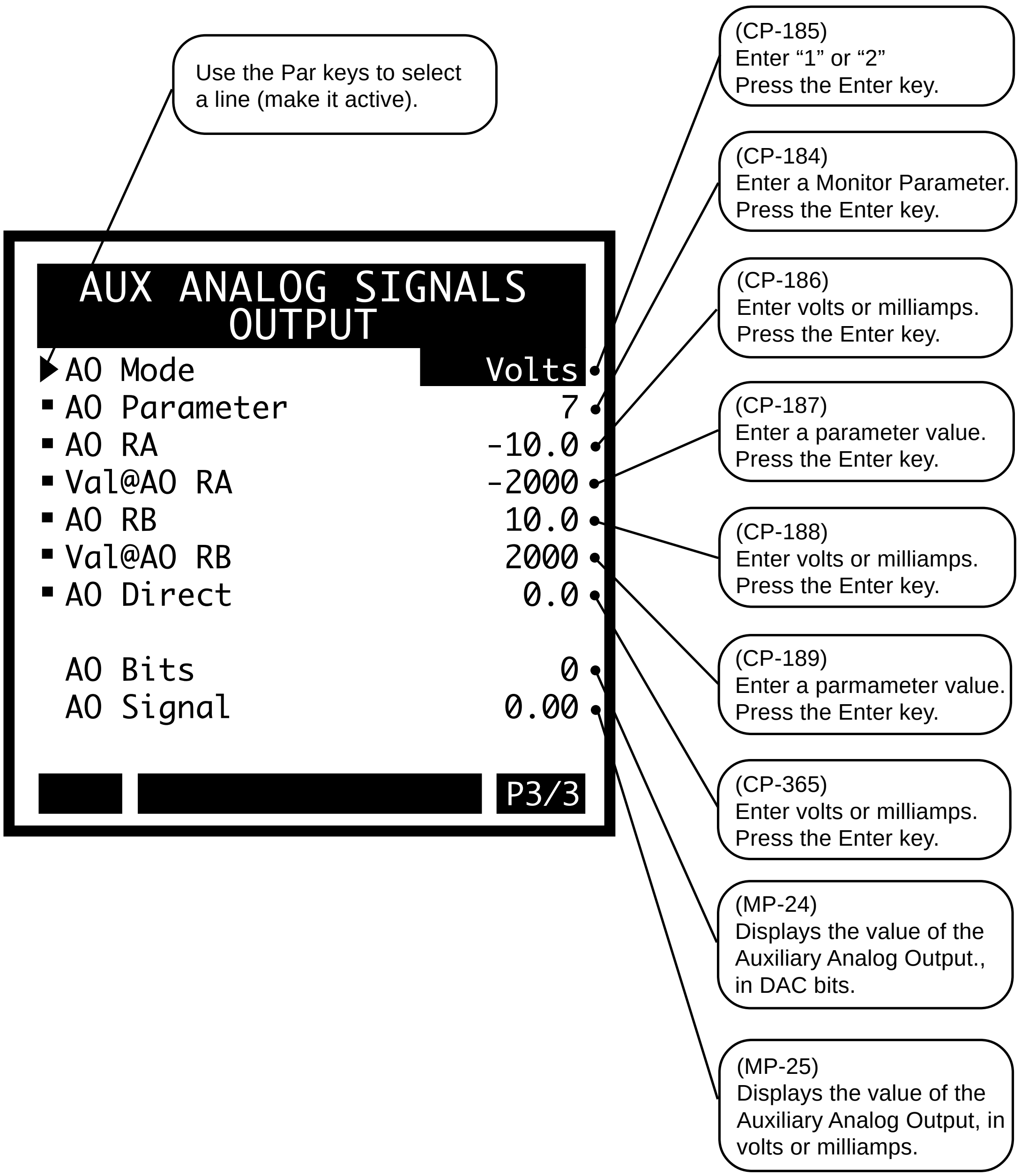
AO Bits (MP-24)

Analog Output Bits (MP-24) displays the present value, in DAC Bits, of the Auxiliary Analog Output.

AO Signal (MP-25)

Analog Output Signal (MP-25) displays the present value, in either volts or milliamps of the Auxiliary Analog Output, relative to AO Mode (CP-185).

The Scaling / Aux Analog Signals / Output screen (page 3).



—NOTES—

SETPOINTS

This section discusses the setup procedures for setpoints. The setpoint determines the speed at which you want your drive to operate when the CX-1010 is in the “Run” mode. The setpoint can be a speed (ft/min), a ratio (Follower to lead) or a setting that is relative to other factors, such as a dancer position. The CX-1010 can be run in:

- Standard Master Mode, Inverse Master Mode or Master Mode plus Offset.
- Standard Follower Mode, Inverse Follower Mode or Follower Mode plus Offset.
- Direct Mode
- Custom Mode

Use the “Run Modes” screen to select the mode of operation (e.g., Master, Follower. Custom, Direct) as well as to select the loop mode (e.g., open loop, velocity loop, ZE loop). Once you have selected the mode of operation, then use the corresponding screen (e.g., Master, Follower. Custom, Direct) to specify how that mode will operate.

Caution: To avoid damage to your system, the CX-1010 must be calibrated and the motor drive set up before you operate your system. Refer to *Drive Setup / Calibration: Calibration.*

The CX-1010 setpoint setup screens are:

- Run Modes
- Master
- Follower
- Custom
- Direct

RUN MODES

There are four modes of operation; the Master Mode, the Follower Mode, the Direct Mode and the Custom Mode. Use Setpoint Mode (CP-102) to enter the mode of operation that you want to use when your system is in "Run". The setpoints that correspond to these four modes of operation are; the Master Setpoint (CP-110), the Follower Setpoint (CP-120), the Direct Setpoint (CP-130) and the Custom Setpoint (CP-140). Only one of these setpoints is active at any one time. The active setpoint is determined by the mode of operation that you select in Setpoint Mode (CP-102). The active Setpoint will also appear as the Setpoint X (CP-101).

The Master Mode is generally used to control the *speed* of a single drive, but it can also be used to control the Master (Lead) speed of an entire process line.

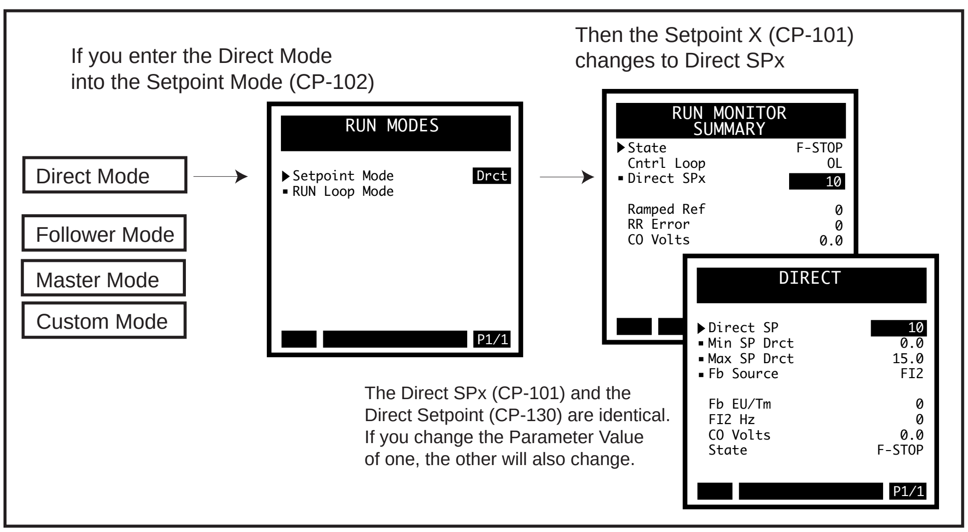
The Follower Mode is generally used to control the *ratio* of one drive to another.

The Direct Mode is used for *direct* control of the value of CO Volts (MP-21) and consequently the voltage at CO Sig (J3, pin 1). The Direct Mode is generally used as a diagnostic tool. However, the Direct Mode can also be used to set the drive's operating speed directly by simulating a pot.

The Custom Setpoint Mode is used in applications where the desired drive operation depends on several signals (e.g., frequencies, voltages) or where the math is more involved than can be achieved with the Master Mode or the Follower Mode.

The result of either the Master Mode, the Follower Mode or the Custom Setpoint Mode calculation is displayed in Scaled Ref (MP-41). The Scaled Ref (MP-41) is the reference speed in feedback Engineering Units per time (Fb EU/Tm). The Direct Mode caluclation is not displayed in Scaled Ref (MP-41) because the Direct Mode forces the CO Sig to match the Direct Setpoint (CP-130).

The following graphic matrix displays the interaction between the Setpoint Mode, Setpoint X and the Setpoint. This example uses the Direct Mode, however the same relationship applies to all four modes and their respective Setpoints:



Setpoint Mode (CP-102)

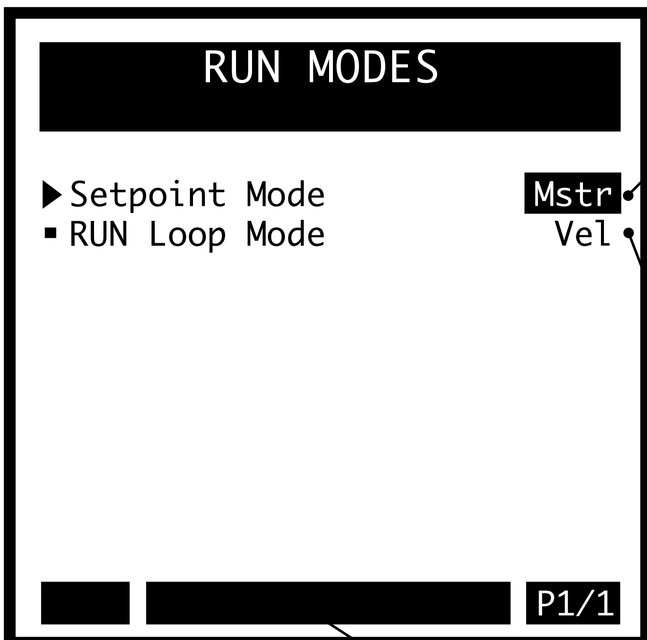
Setpoint Mode sets the mode of operation and the subsequent setpoint, that are used when your system is in "Run". The setpoint and mode of operation combined, determine the Reference Speed and, if applicable, the Reference Position. The modes of operation are: 4 = Custom Mode   3 = Direct Mode   2 = Follower Mode   1 = Master Mode

Run Loop Mode (CP-220)

RUN Loop Mode (CP-220) identifies the type of control loop (see list below) that is used during "Run" For specific information about Run Loop Modes (CP-220), refer to *System Setup/Control Parameters: Tuning*. This Control Parameter is only included in this screen for quick, convenient access.

3=Position Loop   2=ZE Loop (Psnt + Vel)   1=Velocity Loop   0=Open Loop

The Run Modes screen is accessed through
—> Main Menu / Setpoints <—



(CP-102)
Use the Increment Up or Increment Down key to scroll to the mode of operation that you want, then press the Enter key. You can also access the value options by pressing the Help key or by entering a numeric code. Master is the default mode.

(CP-220)
Enter a code (0-3)
Press the Enter key.

If “MIN Error” or "MAX Error” appear in the error message bar, it means that you can not scroll any further in that direction.

MASTER

The Master SP (CP-110) is the desired master speed (e.g., feet/minute) at which you want you system to operate. The Master Setpoint can be used in one of three ways as dictated by Master Equation (CP-113):

The Master Equation (CP-113) is set to “1” (Standard)
The Master Equation (CP-113) is set to “2” (Inverse Master)
The Master Equation (CP-113) is set to “3” (Master + Offset)

When Master Equation (CP-113) is set to “1” (Standard), then the Scaled Reference (MP-41) is equal to the Master SP (CP-110) when the CX-1010 is in “Run”. This is the most commonly used setting for the Master Equation (CP-113). The operating speed is determined directly by the Parameter Value that is in the Master SP (CP-110). The Master SP (CP-110) is represented in EU/Tm and is defined by the feedback signal. The feedback signal is selected in Fb Source (CP-103). The feedback source is usually set to “FI2” (frequency input 2) but it can also be “AI2” (analog input 2).   The equation that governs this mode of operating is:

For Master Equation {CP-113} = Standard (1)

Scaled Ref {MP-41} = Master SP {CP-110}

When Master Equation (CP-113) is set to “2” (Inverse Master), the Scaled Reference (MP-41) is equal to 1/ Master SP when the CX-1010 is in “Run”. This is an inverse mode and is used to set the Master SP (CP-110) in units of time rather than speed. The Parameter Value of Master SP (CP-110) is inverted to determine the operating speed. Inverse Master format is used for applications that require setting a time per EU (e.g., time-in-the-oven). The Master SP (CP-110) units are represented as T/EU; inverse of the units defined for the feedback signal. The Inv M Norm (CP-114) adjusts the Scaled Reference (MP-41) by the number of EU's (engineering units) per the distance that is being timed. For example, a value of 50.000 would be entered into Inv M Norm (CP-114) in order to adjust the setpoint for the 50 foot length of the oven. The equation governing this mode of operation is:

For Master Equation {CP-113} = Inverse Master (2)

$$\text{Scaled Ref \{MP-41\}} = \frac{\text{Inv M Norm \{CP-114\}}}{\text{Master SP \{CP-110\}}}$$

Therefore, the example above would be formulated as:

$$\text{5 feet/min (Scaled Ref)} = \frac{\text{50 feet/Oven Length (Inv M Norm)}}{\text{10 min in the oven (Master SP)}}$$

When Master Equation (CP-113) is set to “3” (Master + Offset), the Scaled Reference (MP-41) is equal to the Master SP (CP-110) plus the value of the offset signal.   The source of the offset signal is selected in Ofs Source (CP-105). The operating speed is determined directly by the Parameter Value that is in the Master SP (CP-110) plus the value of the Offset signal is added. The offset signal source is determined in the Ofs Source (CP-105). The Master SP (CP-110) is represented in EU/Tm, as defined for the feedback signal. The representation (units) of the offset signal should be of the same scaling as the feedback. This setting for the Master Equation (113) is generally be used if the system is required to operate at a specific amount above or below the Master Setpoint (CP-110) . The equation that governs this mode of operation is:

For Master Equation {CP-113} = Master + Offset (3)

Scaled Ref {MP-41} = Master SP {CP-110} + x

“x” is value of the signal that is selected in Ofs Source {CP-105}

.

For example:

110 feet/min. = 100 feet/min. + 10 feet/min
260 feet/min = 250 feet/min + 10 feet/min
180 feet/min = 200 feet/min + -20 feet/min

Use the Max SP Mstr (CP-111) and Min SP Mstr (CP-112) to determine the maximum and minimum value that can be entered into Master SP (CP-110). The Max SP Mstr (CP-111) and the Min SP Mstr (CP-112) define the range for positive and negative values (i.e. they are magnitude limits).

The following pages display graphics of the Master Mode screens as well as a synopsis of the Master Mode parameters.

Master

Master SP (CP-110)

Master Setpoint (CP-110) is the speed at which you want your system to operate (while in Run) when the Setpoint Mode (CP-102) is set to "1" (Master Mode). How the Master SP (CP-110) is interpreted (i.e., how the scaled Reference Speed is derived from the Master SP) is determined by the Master Equation (CP-113). When Master Equation (CP-113) is set to "1" (Standard), then the Master SP is the desired operating speed in EU/Tm . When Master Equation (CP-113) is set to the "2 " (Inverse Master), then the Master Setpoint (CP-110) is given in time (e.g., minutes) and the operating speed in inversely proportional to Master SP (Tm/EU). When Master Equation (CP-113) is set to the "3 " (Offset) then the operating speed is the Master SP plus the current value of the offset signal (which is selected in (CP-105).

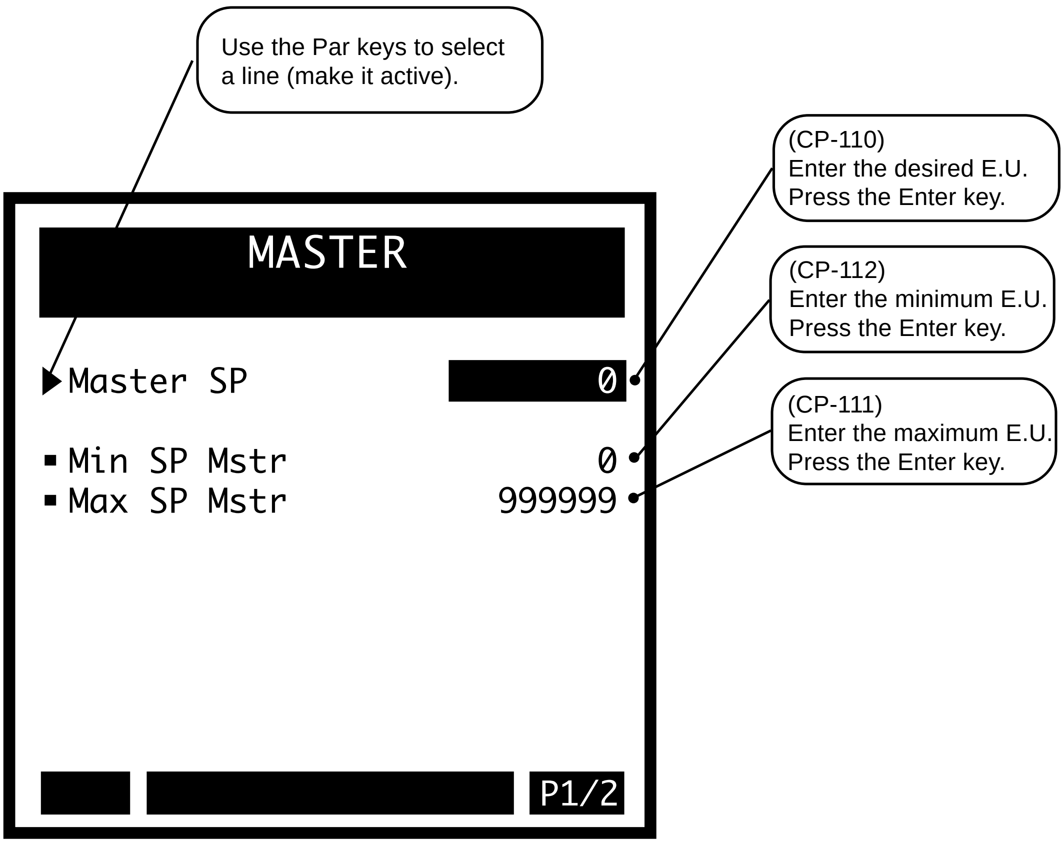
Min SP Mstr (CP-112)

Minimum Setpoint Master (CP-112) is the minimum value that will be allowed for the Master Setpoint (CP-110).

Max SP Mstr (CP-111)

Maximum Setpoint Master (CP-111) is the maximum value that will be allowed for the Master Setpoint (CP-110).

The Master screen is accessed through
—> Main Menu / Setpoints <—



Master

Master SP (CP-110)

Master Setpoint (CP-110) is the speed at which you want your system to operate (while in Run) when the Setpoint Mode (CP-102) is set to "1" (Master Mode). How the Master SP (CP-110) is interpreted (i.e., how the scaled Reference Speed is derived from the Master SP) is determined by the Master Equation (CP-113). When Master Equation (CP-113) is set to "1" (Standard), then the Master SP is the desired operating speed in EU/Tm . When Master Equation (CP-113) is set to the "2 " (Inverse Master), then the Master Setpoint (CP-110) is given in time (e.g., minutes) and the operating speed in inversely proportional to Master SP (Tm/EU). When Master Equation (CP-113) is set to the "3 " (Offset) then the operating speed is the Master SP plus the current value of the offset signal (which is selected in (CP-105).

Inv M Norm (CP-114)

Use the Inverse Master Norm (CP-114) to define the travel distance (EU) in the time specified in Master Setpoint (CP-110). Use Inverse Master Norm (CP-114) only in the Inverse Master Mode. In this mode, the setpoint speed is determined by the INV M Norm (CP-114) over the Master Setpoint (CP-110).

Master Equation (CP-113)

Master Equation (CP-113) allows you to choose a variable (see list below) that will affect the Master setpoint operation.

3 = Master + Offset
2 = Inverse Master
1 = Standard (default)

Fb Source (CP-103)

Feedback Source (CP-103) identifies the source of the feedback signal. The Feedback signal is also used by some of the Alarms as well as some of the Status Indications (e.g., Zero Speed). Feedback Source is ignored when RUN Loop Mode (CP-220) is set to "Position Loop" (the Feedback signal defaults to "Frequency Input 2"). The feedback sources are:

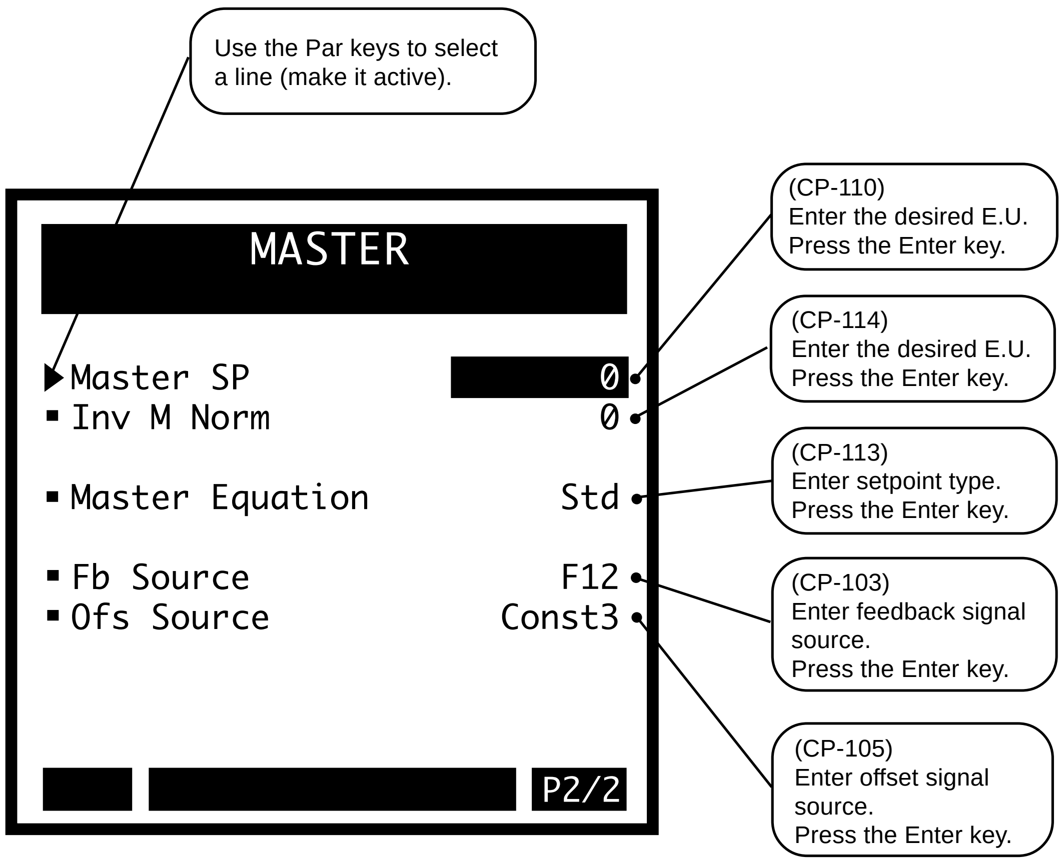
4 = Constant 2
3 = Analog Input 2
2 = Analog Input 1
1 = Frequency Input 2 (default)

Ofs Source (CP-105)

Offset Source (CP-105) identifies the source of the Offset in both the Master plus Offset and the Follower plus Offset applications. The Offset is added to the Master Setpoint (CP-110) when Master Equation (CP-113) is set to "Master plus Offset" and Setpoint Mode (CP-102) is set to "Master". The Offset is added to the result of the Lead Signal multiplied by the Ratio (CP-124) when Master Equation (CP-113) is set to "Follower Plus Offset" and Setpoint Mode (CP-102) is set to "Follower". The Ofs Sources are:

6 = Frequency Input 2
5 = Analog Input 2
4 = Constant 3
3 = Custom Setpoint (constant)
2 = Analog Input 1
1 = Frequency Input 1 (default)

The Master screen (page 2).



FOLLOWER

Use the Follower mode to follow an external signal at a ratio that you will define. The Follower SP (CP-120) sets the ratio at which the follower will operate with respect to the Lead. The Ratio (CP-124) is the desired Feedback EU/Tm per Lead EU/Tm in velocity mode of operation.

$$\text{Ratio (CP-124)} = \frac{\text{Follower speed (feet/min. of the follower)}}{\text{Lead speed (feet/min. of the lead)}}$$

The Ratio (CP-124) is set by the Follower SP (CP-120) and the Ratio Norm (CP-123). When the Fol Equation (CP-125) is set to “1” (STND or Standard) or “3” (OFST or Follower with offset), the Ratio is equal to the Follower SP divided by Ratio Norm. This equation is true when the Ratio Norm is set to “1.000”. Since in most cases, the Ratio Norm is usually set at “1.000”, the Ratio can be considered to be equal to the Follower SP.

NOTE: Ratio Norm (CP-123) has a default pamareter value of “1.000”

For Follower Equation {CP-125} = Standard (1)

$$\text{Scaled Ref \{MP-41\}} = \text{Ratio \{CP-124\}} = \frac{\text{Follower SP \{CP-120\}}}{\text{Ratio Norm \{CP-123\}}}$$

When the Fol Equation (CP-125) is set to “2” (Inverse Follower), the Ratio (CP-124) is equal to the Ratio Norm (CP-124) divided by Follower SP. Since in most cases, the Ratio Norm is usually set at “1.000”, the Ratio can be considered to be equal to the 1/Follower SP.

NOTE: Ratio Norm (CP-123) has a default pamareter value of “1.000”

For Follower Equation {CP-125} = Inverse Follower (2)

$$\text{Scaled Ref \{MP-41\}} = \text{Ratio \{CP-124\}} = \frac{\text{Ratio Norm \{CP-123\}}}{\text{Follower SP \{CP-120\}}}$$

When the Fol Equation (CP-125) is set to “3” (Follower + Offset), the current value of the offset signal is added to the product of the Ratio times the current value of the Lead signal. When you enter a new Follower SP or a new Ratio Norm, the Ratio (CP-124) updates automatically to reflect the new ratio. You can also enter the desired ratio directly into Ratio (CP-124). In this case, the Follower SP is automatically updated with a Parameter Value that will establish the new ratio.

NOTE: Ratio Norm (CP-123) has a default pamareter value of “1.000”

For Follower Equation {CP-125} = Follower + Offset (3)

$$\text{Scaled Ref \{MP-41\}} = \text{Ratio \{CP-124\}} = \frac{\text{Follower SP \{CP-120\}}}{\text{Ratio Norm \{CP-123\}}} + x$$

“x” is value of the signal that is selected in Ofs Source {CP-105}

The Max SP Fol (CP-121) and Min SP Fol (CP-122) determine the maximum and minimum value that can be entered into Follower SP (CP-120). They define the range for both positive and negative values; they are magnitude limits.

Standard Follower format uses the Follower SP (CP-120) and Ratio Norm (CP-123) to determine the ratio of the Feedback EU/Tm to the Lead EU/Tm. In this equation, the Follower SP (C-120) is the numerator of the ratio and Ratio Norm (CP-123) is the denominator.

Scaled Reference {MP-41} = Follower Setpoint {CP-120 } * Ld Signal EU/Tm (selected by Ld Source, CP-104)
Ratio Norm {CP-123}

Inverse Follower Mode is a modification to the standard follower mode to provide for programming convenience. The Follower SP (CP-120) is the denominator of the ratio while the Ratio Norm (CP-123) is numerator.

Scaled Reference {MP-41} = Ratio Norm {CP-123} * Lead Signal EU/Tm (selected by Lead Source, CP-104)
Follower Setpoint {CP-120}

Follower plus Offset format is similar to standard follower with the addition of the current value of the selected Offset signal included. The Offset signal is selected by Ofs Source (CP-105).

Scaled Reference {MP-41}= Follower Setpoint {CP-120} * Lead Signal EU/Tm (selected by Ld Source, CP-104)
Ration Norm {CP-123} + Offset Signal EU/Tm (selected by Ofs Source, CP-105)

The following pages display graphics of the Follower mode screens as well as a synopsis of the Follower mode parameters.

Follower

Follower SP (CP-120)

Follower Setpoint (CP-120) sets the ratio at which the Follower will follow the Lead signal (when in Run) when the Setpoint Mode (CP-102) is set to "2" (Follower Mode). If Follower Equation (CP-125) is set to either "1" (Standard) or "3" (Follower plus Offset), then the Follower SP is the numerator of the ratio. If the Follower Equation (CP-125) is set to "2" (Inverse Follower), then the Follower Setpoint is the denominator of the ratio.

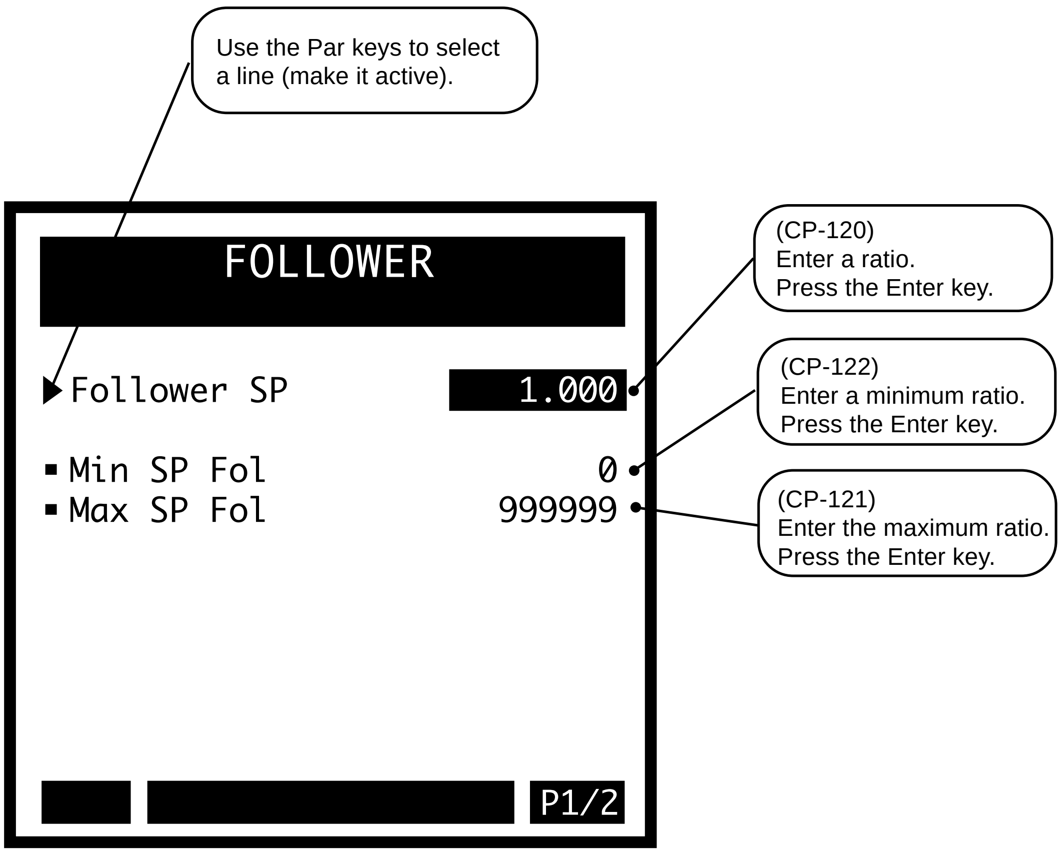
Min SP Fol (CP-122)

Minimum Setpoint Follower (CP-122) is the minimum value that will be allowed for the Follower Setpoint (CP-120).

Max SP Fol (CP-121)

Maximum Setpoint Follower (CP-121) is the maximum value that will be allowed for the Follower Setpoint (CP-120).

The Follower screen is accessed through
—> Main Menu / Setpoints <—



Follower

Follower SP (CP-120)

Follower Setpoint (CP-120) sets the ratio at which the Follower will follow the Lead signal (when in Run) when the Setpoint Mode (CP-102) is set to "2" (Follower Mode). If Follower Equation (CP-125) is set to either "1" (Standard) or "3" (Follower plus Offset), then the Follower SP is the numerator of the ratio. If the Follower Equation (CP-125) is set to "2" (Inverse Follower), then the Follower Setpoint is the denominator of the ratio.

Ratio (CP-124)

Ratio (CP-124) is the ratio at which the Follower will follow the Lead (while in Run) when the Setpoint Mode (CP-102) is set to "2 " (Follower Mode).

Ratio Norm (CP-123)

In the Standard and Offset Follower mode, Ratio Norm (CP-123) is the denominator of the ratio at which your system follows the lead signal. In the Inverse Follower mode, Ratio Norm is the numerator of the ratio at which your system follows the lead signal.

Fol Equation (CP-125)

Follower Equation (CP-125) allows you to choose a variable (see list below) that will affect the Follower setpoint operation.

3=Follower + Offset
2=Inverse Follower
1=Standard (default)

LD Source (CP-104)

Lead Source (CP-104) identifies the source of the Lead in Follower applications. This is the signal that the Follower will follow. The Lead Source is ignored when RUN Loop Mode (CP-220) is set to "Position Loop" (the Lead Signal defaults to "Frequency Input 1"). The lead sources are:

4 = Constant 1
3 = Custom SP
2 = Analog Input 1
1 = Frequency Input 1 (default)

Fb Source (CP-103)

Feedback Source (CP-103) identifies the source of the feedback signal. The Feedback signal is also used by some of the Alarms as well as some of the Status Indications (e.g., Zero Speed). Feedback Source is ignored when RUN Loop Mode (CP-220) is set to "Position Loop" (the Feedback signal defaults to "Frequency Input 2"). The feedback sources are:

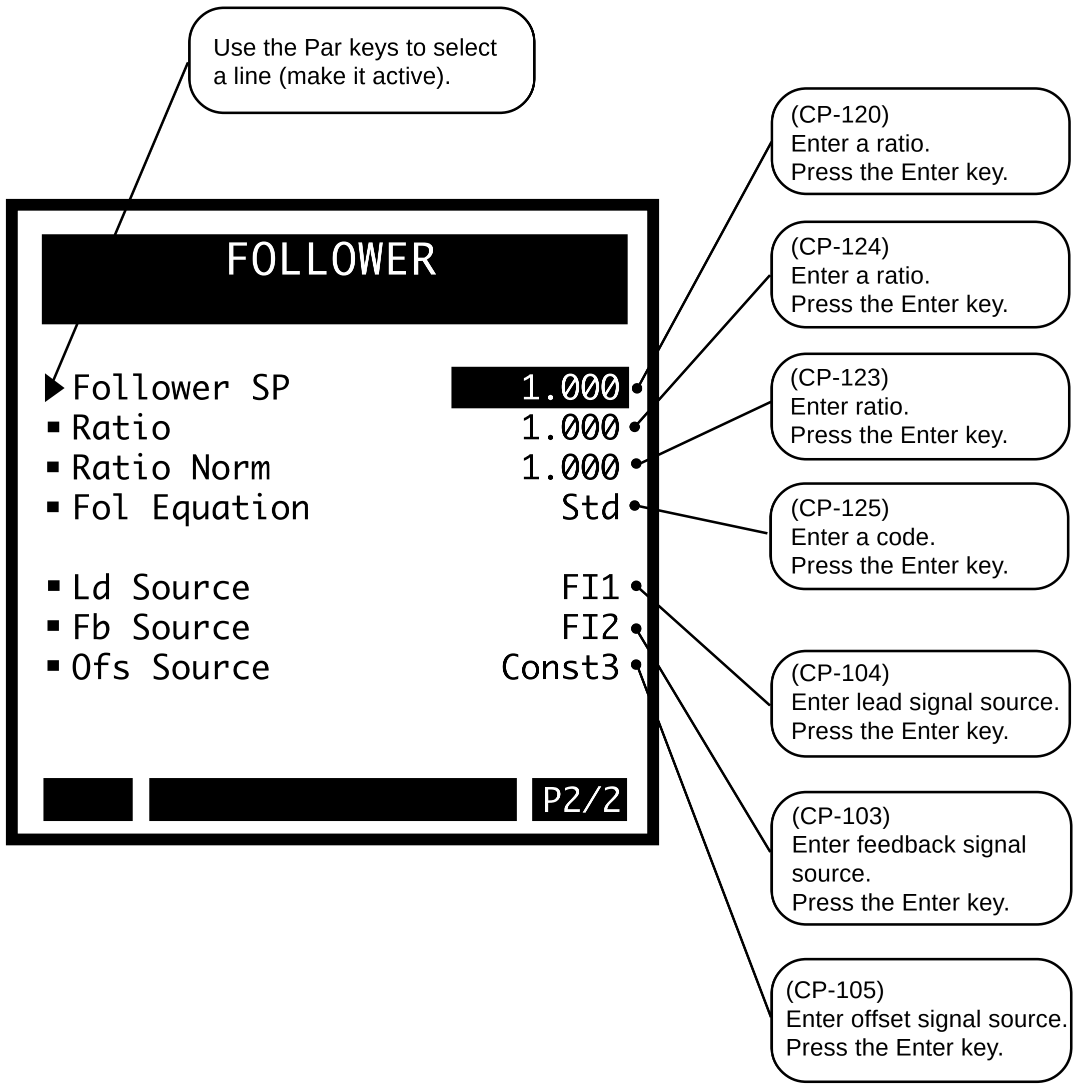
4 = Constant 2
3 = Analog Input 2
2 = Analog Input 1
1 = Frequency Input 2 (default)

Ofs Source (CP-105)

Offset Source (CP-105) identifies the source of the Offset in both the Master plus Offset and the Follower plus Offset applications. The Offset is added to the Follower Setpoint (CP-120) when Follower Equation (CP-125) is set to "Master plus Offset" and Setpoint Mode (CP-102) is set to "Follower". The Offset is added to the result of the Lead Signal multiplied by the Ratio (CP-124) when Follower Equation (CP-125) is set to "Follower Plus Offset" and Setpoint Mode (CP-102) is set to "Follower". The Ofs Sources are:

6 = Frequency Input 2
5 = Analog Input 2
4 = Constant 3
3 = Custom Setpoint (constant)
2 = Analog Input 1
1 = Frequency Input 1 (default)

The Follower screen (page 2).



CUSTOM

The Custom mode is used for complex applications that do not fit into the Master or Follower modes. It can be used when you need to multiply a signal (or setpoint) by another signal to produce the desired speed command (e.g., FI1 EU/Tm * AI1 Eu/Tm). It can also be used calculate a convenient representation of the Parameter Value for the Custom Setpoint (CP-140). The Custom Setpoint (CP-140) equation determines the operating speed that you want your system to operate at when your system is in “Run”. The Custom Setpoint equation format is fixed, but you can configure the variables.

The equation:

$$\text{Scaled Reference} = \left[\frac{(M1 * V1) + B1}{(M2 * V2) + B2} \right] * V4 + (M3 * V3 + B3)$$

V1 is the value of the signal (or constant) selected by CP-150, V1 Source
V2 is the value of the signal (or constant) selected by CP-151, V2 Source
V3 is the value of the signal (or constant) selected by CP-152, V3 Source
V4 is the value of the signal (or constant) selected by CP-153, V4 Source

To use the Custom Setpoint equation, first determine how the equation will be used to fit your application. Then select the variable(s) that you will use and set any that you will not use to “0” . Enter appropriate values for Custom SP (CP-140), for any constants (V1-V4) that are used and for the M1, B1, M2, B2, M3, B3 constants. The Custom SP (CP-140) can be used as any or all of the variables used in the Custom SP equation. Often, the variables in the equation are set to either 1.0000 or 0.0 .

The equation is configured by assigning a signal (or constant) to one of the four variables that are labeled V1, V2, V3, V4, and by defining values for the six other constants; M1, B1, M2, B2, M3, B3.

The (V1-V4) variables will take on the current values of the signal (or constant) that you have selected for operation. The equation is continually recalculated with the current value of the selected signal and the constants to update the Scaled Reference value.

There are four constants provided as well as the Custom SP (CP-140) that can be used in place of the variables V1-V4. If one or more of the variables are not needed for the application, they can be set to “0”. The result should be in Feedback EU/Tm.

The Max SP Cust (CP-146) and Min SP Cust (CP-147) determine the maximum and minimum value that can be entered into Custom SP (CP-140). They define the range for both positive and negative values (i.e., they are magnitude limits).

The products of M1*V1, M2*V2 and M3*V3 should not exceed the maximum allowable value of EU/Tm Range (CP-108). The EU/Tm Range is a limit that is related to the number size versus resolution (digits right of the decimal point).

Constant 1 (CP-141) can be used to replace the variable V1 in the Custom SP equation. The maximum value and resolution for Constant 1 are determined by EU/Tm Range (CP-108).

Constant 2 (CP-142) can be used to replace the variable V2 in the Custom SP equation. The maximum value and resolution for Constant 2 are determined by EU/Tm Range (CP-108).

Constant 3 (CP-143) can be used to replace the variable V3 in the Custom SP equation. The maximum value and resolution for Constant 3 are determined by EU/Tm Range (CP-108).

Constant 4 (CP-144) can be used to replace the variable V4 in the Custom SP equation. The maximum value and resolution for Constant 4 are determined by EU/Tm Range (CP-108).

The options available for V1 Source (CP-150) are:

6 = FI2 EU/Tm(MP-8)
5 = AI2 EU/Tm(MP-16)
4 = Constant 1(CP-141)
3 = Custom SP(CP-140)
2 = AI1 EU/Tm(MP-13)
1 = FI1 EU/Tm(MP-3)
0 = the value of 0

The options available for V2 Source (CP-151) are:

6 = FI2 EU/Tm(MP-8)
5 = AI2 EU/Tm(MP-16)
4 = Constant 2(CP-142)
3 = Custom SP(CP-140)
2 = AI1 Eu/Tm(MP-13)
1 = FI1 EU/Tm(MP-3)
0 = the value of 0

The options available for V3 Source (CP-152) are:

6 = FI2 EU/Tm(MP-8)
5 = AI2 EU/Tm(MP-16)
4 = Constant 3(CP-143)
3 = Custom SP(CP-140)
2 = AI1 Eu/Tm(MP-13)
1 = FI1 EU/Tm(MP-3)
0 = the value of 0

The options available for V4 Source (CP-153) are:

6 = FI2 EU/Tm(MP-8)
5 = AI2 EU/Tm(MP-16)
4 = Constant 4(CP-144)
3 = Custom SP(CP-140)
2 = AI1 Eu/Tm(MP-13)
1 = FI1 EU/Tm(MP-3)
0 = the value of 0

M1, B1, M2, B2, M3, B3 are constants, coefficients and offsets, that provide a linear mapping for each of the respective V1-V3 variables. However, they need not be used in such a dedicated manner. They can be used in any way that best fits the equation to your application, within some computational constraints. The products M1*V1, M2*V2 and M3*V3 should not be allowed to exceed the maximum allowable Feedback given by EU/Tm Range (CP-108). The maximum value for M1, M2, M3 is 32767. The resolution is given by 0.000015. The maximum value and resolution for B1, B2, B3, B4 are determined by EU/Tm Range (CP-108). The EU/Tm Range is a limit related to the number size versus resolution (digits right of the decimal point.

The following pages display graphics of the Custom Mode screens as well as a synopsis of the Custom Mode parameters.

Custom

Custom SP (CP-140)

Custom Setpoint can be any or all of the “V” variables in the Custom Setpoint Equation below and Custom Setpoint can also be a constant for a Lead or an Offset operation. The Custom Setpoint Equation:

$$\text{Scaled Reference} = \left[\frac{(M1 * V1) + B1}{(M2 * V2) + B2} \right] * V4 + (M3 * V3 + B3)$$

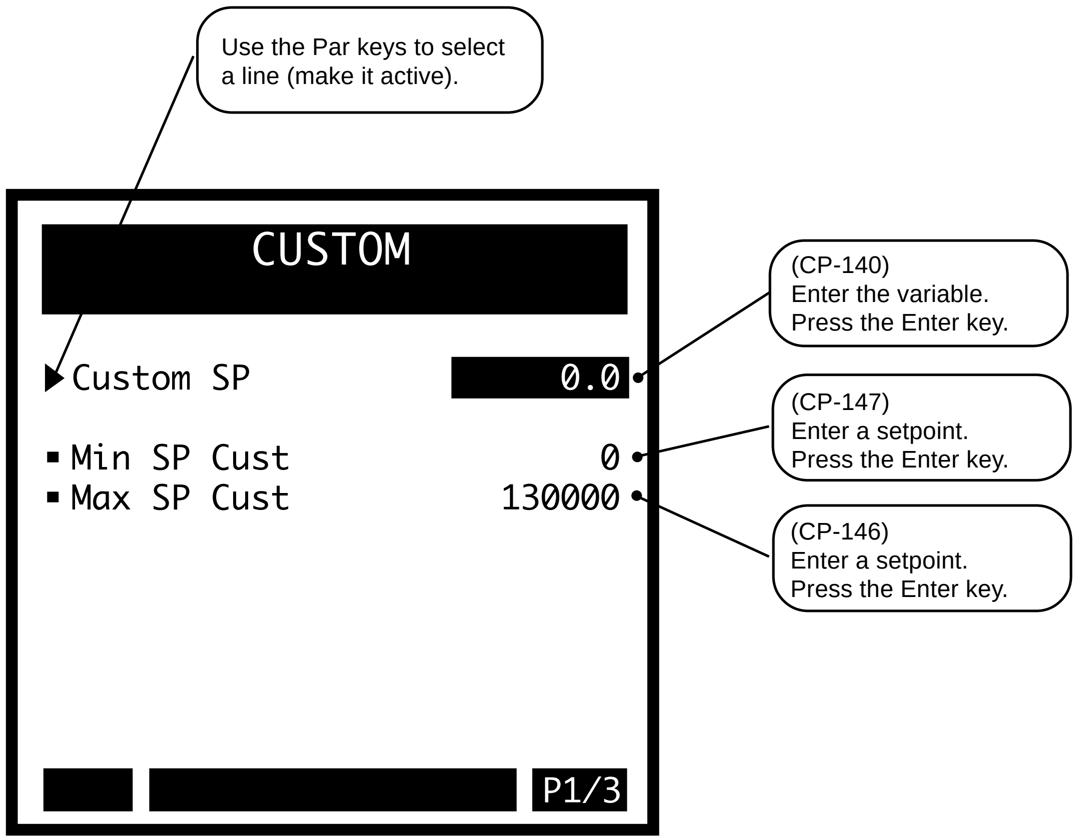
Max SP Cust (CP-146)

Maximum Setpoint Custom (CP-146) is the maximum value that will be allowed for the Custom Setpoint.

Min SP Cust (CP-147)

Minimum Setpoint Custom (CP-147) is the minimum value that will be allowed for the Custom Setpoint.

The Custom screens are accessed through
—> Main Menu / Setpoints <—



Custom

Constant 1 (CP-141)

Constant 1 can be the “V1” variable in the Custom Setpoint Equation (refer to (CP-140). It can also be a constant for a Lead operation.

Constant 2 (CP-142)

Constant 2 can be the “V2” variable in the Custom Setpoint Equation (refer to (CP-140).

Constant 3 (CP-143)

Constant 3 can be the “V3” variable in the Custom Setpoint Equation (refer to (CP-140). It can also be a constant for an Offset Operation.

Constant 4 (CP-144)

Constant 4 can be the “V4” variable in the Custom Setpoint Equation (refer to (CP-140).

Fb Source (CP-103)

Feedback Source (CP-103) identifies the source of the feedback signal. The Feedback signal is also used by some of the Alarms as well as some of the Status Indications (e.g., Zero Speed). Feedback Source is ignored when RUN Loop Mode (CP-220) is set to "Position Loop" (the Feedback signal defaults to "Frequency Input 2"). The feedback sources are:

4 = Constant 2
3 = Analog Input 2
2 = Analog Input 1
1 = Frequency Input 2 (default)

V1 Source (CP-150)

V1 Source (CP-150) identifies the source of the signal (or constant) that can be used as the “V1” variable in the Custom Setpoint Equation (refer to (CP-140). The V1 sources are:

6 = Frequency In 2	5 = Analog In 2	4 = Constant 3
3 = Custom SP (default)	2 = Analog In 1	1 = Frequency In 1
0 = the value of 0		

V2 Source (CP-151)

V2 Source (CP-151) identifies the source of the signal (or constant) that can be used as the “V2” variable in the Custom Setpoint Equation (refer to (CP-140). The V2 sources are:

6 = Frequency In 2	5 = Analog In 2	4 = Constant 3
3 = Custom SP (default)	2 = Analog In 1	1 = Frequency In 1
0 = the value of 0		

V3 Source (CP-152)

V3 Source (CP-152) identifies the source of the signal (or constant) that can be used as the “V3” variable in the Custom Setpoint Equation (refer to (CP-140). The V3 sources are:

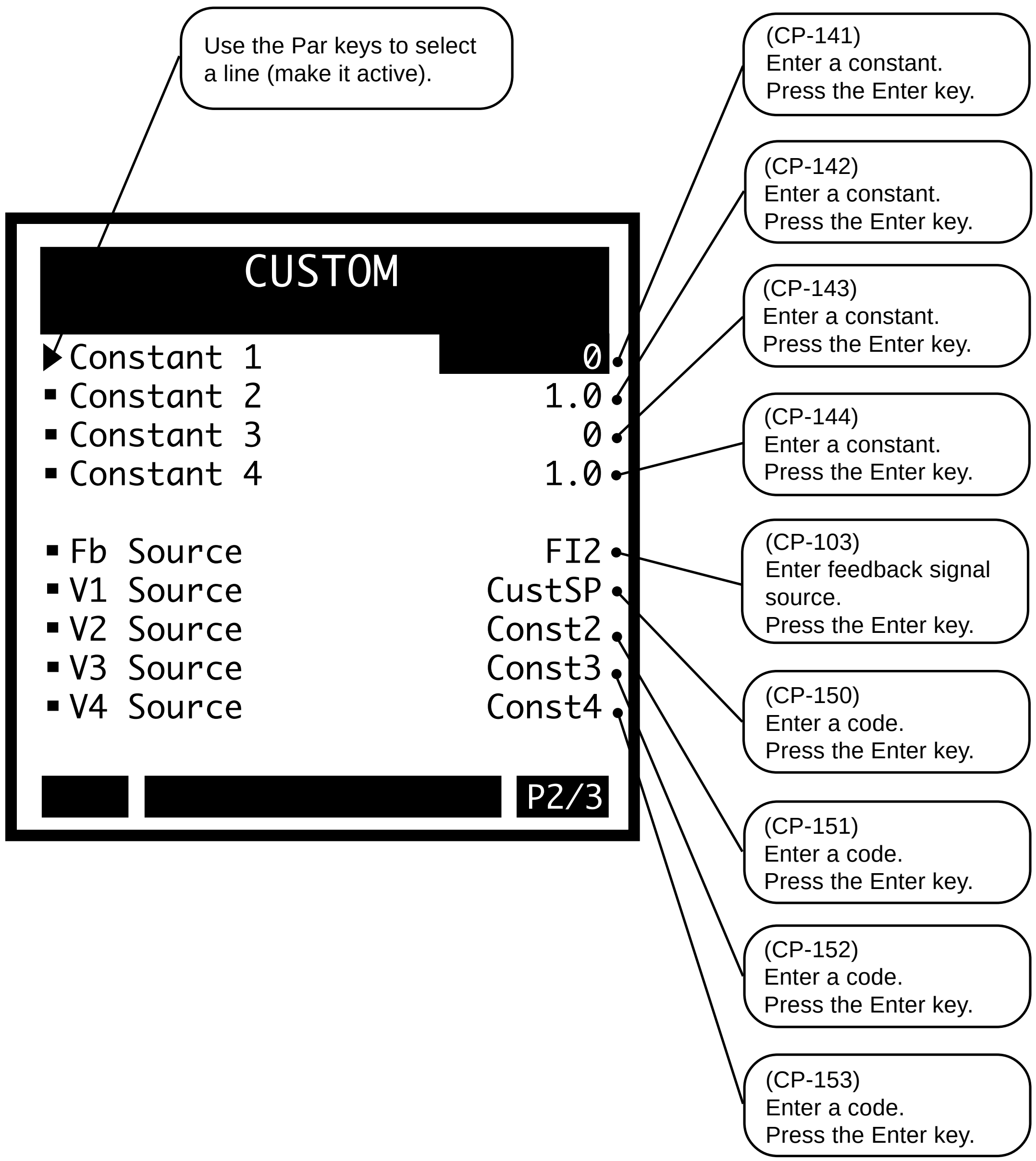
6 = Frequency In 2	5 = Analog In 2	4 = Constant 3
3 = Custom SP (default)	2 = Analog In 1	1 = Frequency In 1
0 = the value of 0		

V4 Source (CP-153)

V4 Source (CP-153) identifies the source of the signal (or constant) that can be used as the “V4” variable in the Custom Setpoint Equation (refer to (CP-140). The V4 sources are:

6 = Frequency In 2	5 = Analog In 2	4 = Constant 3
3 = Custom SP (default)	2 = Analog In 1	1 = Frequency In 1
0 = the value of 0		

The Custom screen (page 2).



Custom

M1 (CP-154)

M1 (CP-154) is the slope constant that multiplies the “V1” variable in the Custom Setpoint (CP-140) equation.

B1 (CP-155)

B1 (CP-155) is the (y-intercept) constant that is added to the product of “M1xV1” in the Custom Setpoint (CP-140) equation.

M2 (CP-156)

M2 (CP-156) is the (slope) constant that multiplies the “V2” variable in the Custom Setpoint (CP-140) equation.

B2 (CP-157)

B2 (CP-157) is the (y-intercept) constant that is added to the product of “M2xV2” in the Custom Setpoint (CP-140) equation.

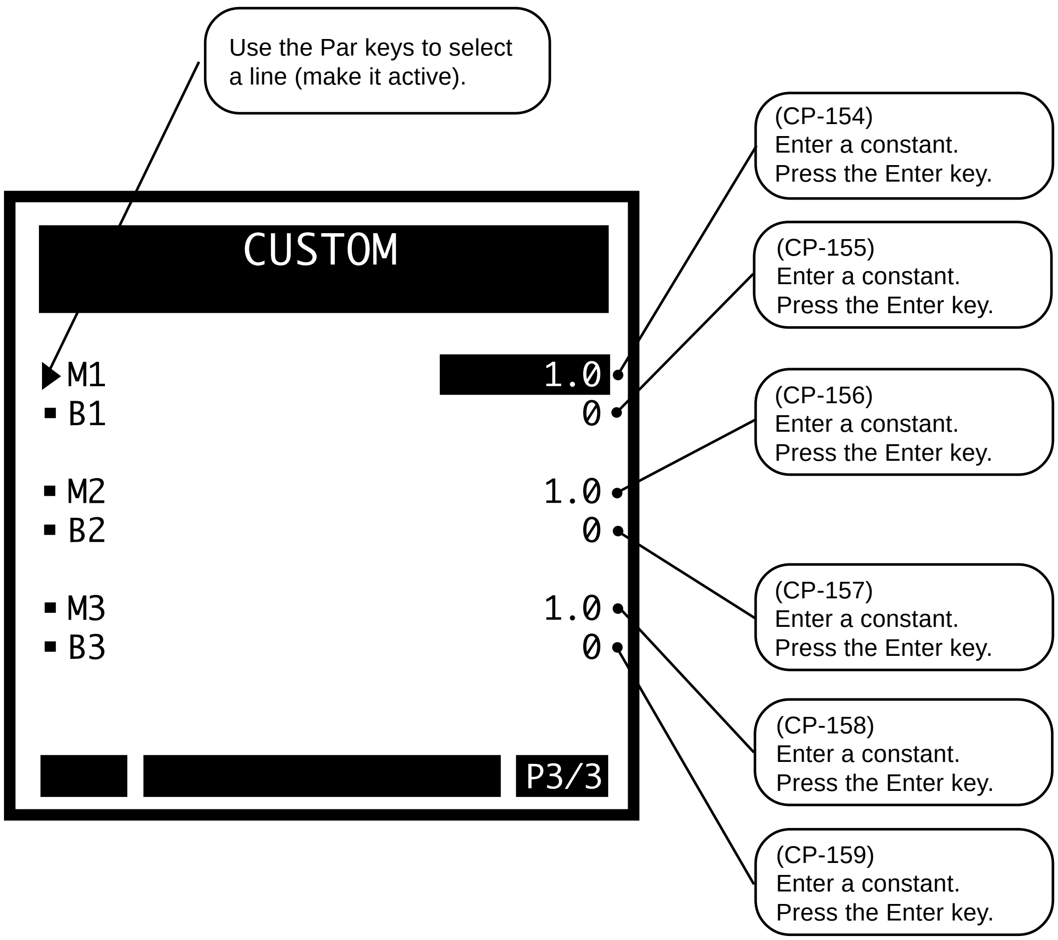
M3 (CP-158)

M3 (CP-158) is the (slope) constant that multiplies the “V3” variable in the Custom Setpoint (CP-140) equation.

B3 (CP-159)

B3 (CP-159) is the (y-intercept) constant that is added to the product of “M3xV3” in the Custom Setpoint (CP-140) equation.

The Custom screen (page 3).



—NOTES—

DIRECT

Direct mode puts a voltage on the CO SIG (Control Signal) output. The Direct SP (CP-130) sets this voltage directly. Setpoint Mode (CP-102) must be set to “3” (Direct) and the CX-1010 must be in “Run”. The RUN Loop Mode (CP-220) is ignored in Direct Setpoint Mode.

The Max SP Drct (CP-131) and Min SP Drct (CP-132) determine the maximum and minimum value that can be entered into Direct SP (CP-120). They define the range for both positive and negative values (i.e., they are magnitude limits). Restrictions to the polarity of the output signal can be done with the CO mode (CP-180) on page 3 of the Scaling / Standard Signals screen.

Direct Setpoint Mode is used to directly control the voltage on the CO SIG output , which connects to the drive. It is typically used as a diagnostic tool, but could be as a a pot replacement for indirectly setting the operating speed of the drive. When using Direct Setpoint Mode, the CO SIG voltage will be fixed at the value you enter into the Direct SP (CP-130). It is an open loop operation and there is no attempt at controlling the Feedback speed. There is only one format available to Direct mode operation. There are separate ramp parameters associated with Direct Mode.

The defining equation for Direct Setpoint Mode:

CO Volts (MP-21) volts = Direct SP (CP-130) volts

The following pages display a graphic of the Direct screen as well as a synopsis of the Direct mode parameters.

Direct

Direct SP (CP-130)

Direct Setpoint (CP-130) is used to output a constant value on the CO_SIG Analog Output (J3, pin 1) signal (while in Run) when the Setpoint Mode (CP-102) is set to "3" (Direct Mode). The Direct Setpoint value is entered in Volts.

Min SP Drct (CP-132)

Minimum Setpoint Direct (CP-131) is the minimum value that will be allowed for the Direct Setpoint.

Max SP Drct (CP-131)

Maximum Setpoint Direct (CP-131) is the maximum value that will be allowed for the Direct Setpoint.

Fb Source (CP-103)

Feedback Source (CP-103) identifies the source of the feedback signal. The Feedback signal is also used by some of the Alarms as well as some of the Status Indications (e.g., Zero Speed). Feedback Source is ignored when RUN Loop Mode (CP-220) is set to "Position Loop" (the Feedback signal defaults to "Frequency Input 2"). The feedback sources are:

2 = Analog Input 2
1 = Frequency Input 2 (default)

Fb EU/Tm (MP-39)

Feedback EU/Tm (MP-39) displays the feedback, in engineering units per time, that was scaled for the feedback signal that was selected in Fb Source (CP-103). The placement of the decimal point is the same as the placement of the decimal point in Master SP (CP-110).

FI2 Hz (MP-06)

Frequency Input 2 Hz (MP-06) displays the present frequency of the Frequency Input 2, in Hertz.

CO Volts (MP-21)

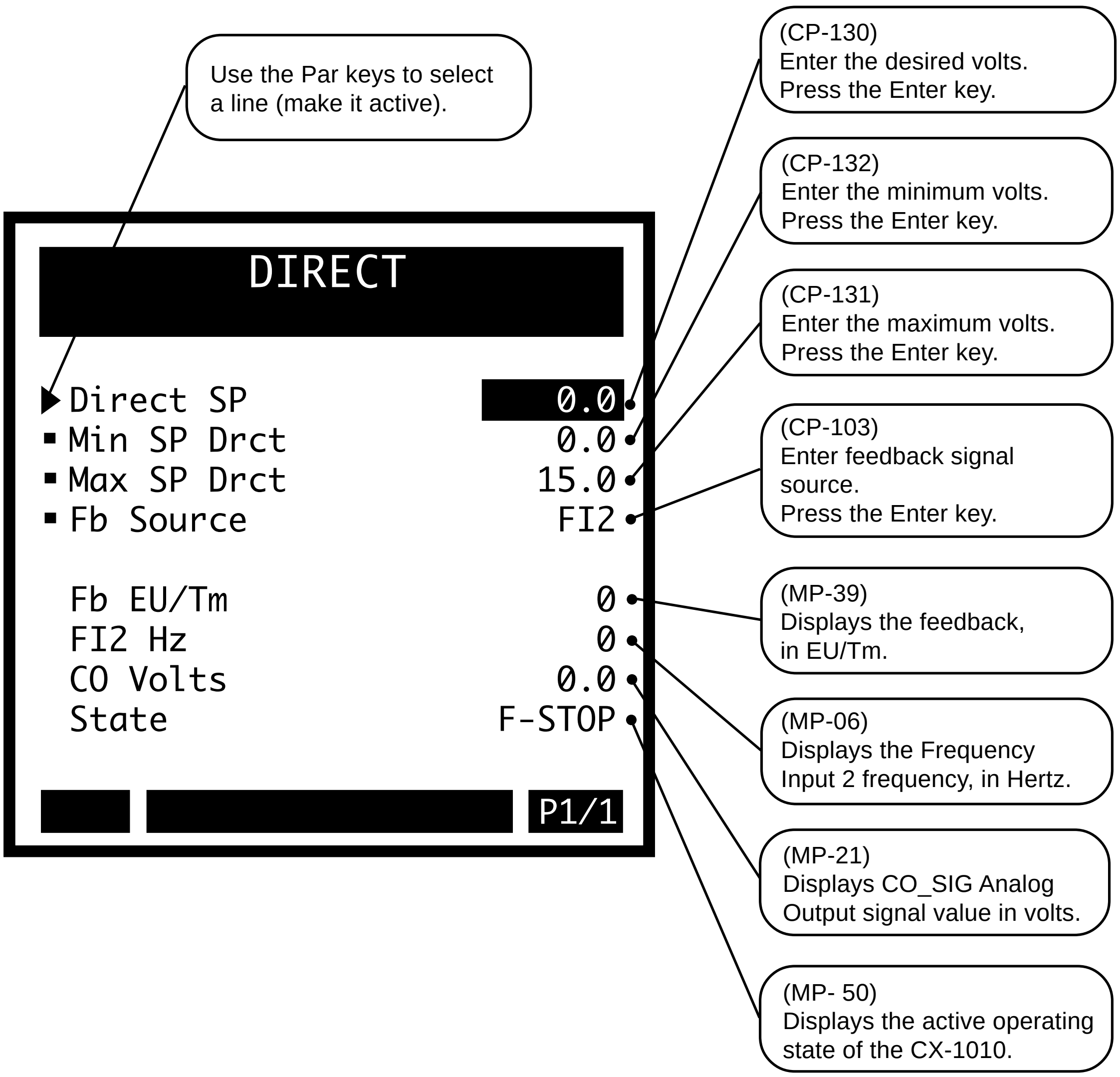
Control Output Volts (MP-21) displays the present value, in volts, of the CO_SIG Analog Output signal.

State (MP-50)

State (MP-50) displays the present operating state of the CX-1010 (see list below). Only one operating state may be active at a time. To access either the “Run” or the “Jog” operating state, the “F-Stop”, “H-Stop” and “R-Stop” inputs must be closed.

7 = Diagnostics
6 = Not used - reserved
5 = JOG (Rvs)
4 = JOG (Fwd)
3 = RUN
2 = H-Stop
1 = R-Stop
0 = F-Stop

The Direct screen is accessed through
—> Main Menu / Setpoints <—



—NOTES—

ALARMS*RAMPS*LIMITS

Alarms*Ramps*Limits includes setting alarms, acceleration and deceleration ramps, various operating limits and jog setpoint.

Caution: To avoid damage to your system, the CX-1010 must be calibrated and the motor drive set up before you operate your system. Refer to *Drive Setup / Calibration: Calibration*.

The CX-1010 Alarms*Ramps*Limits parameters are found in the following screens:

- Alarms
- Run Ramps
- R-Stop/H-Stop Setup
- Jog Setpoint
- Direct Sp Ramps
- Limits

ALARMS

There are several monitored alarms built-in to the CX-1010. These alarms are included in the PLC Bit-Map and can be used together or separately to activate an output or any other function that is available to the PLC. To customize the alarms for your system, modify the PLC program to include the alarm bit. In the PLC, Fb@0Spd (Bit 44) is defaulted to DO-O, which functions as a indicator for a “stop” condition. The PLC program defaults the MaxFB Spd (PLC Bit 48) to Digital Output 1 (DO-1) to serve as an Over-Speed indicator. The remaining alarms are not included in the default PLC program.

The PLC Bits that are influenced by the alarm Control Parameters are:

PLC Bit Name	Description
43 RR @ 0Spd	Ramped Reference < Zero Speed (CP-270) FB EU/Tm
44 Fb @ 0 Spd	Fb EU/Tm <= Zero Speed (CP-270) FB EU/Tm DO-O
48 MaxFbSpd	Fb EU/Tm >= Max Fb Alm (CP-271) FB EU/Tm
49 MaxAclDcl	FB Accel/Decel > Max Acl/Dcl (CP-272) (EU/Tm)/Sec
50 MtrNResp	Motor Drive NOT responding for No Resp Time (CP-273)
51 MaxFI2Psn	FI2 Position >= Max FI2 Psn (CP-274) FB EU

Since the CX-1010 uses the Fb @ 0Spd (PLC Bit 44) for internal control, it is critical that you enter a valid value for Zero Speed (CP-270). “F-Stop”, “H-Stop” and “R-Stop” use the Fb @ 0Spd (PLC Bit 44) to determine when to force the Drive En (PLC Bit 41) to “0” (Off). If the feedback does not reach zero speed as indicated by Fb @ 0Spd (PLC Bit 44) within 1/2 second, then the Drive En (PLC Bit 41) is reset to “0” (Off).

The CX-1010 has an internal 1/2 second timer that functions with “R-Stop” “H-Stop” and “F-Stop”. During “R-Stop” or “H-Stop” the timer engages only when the “R-Stop” or “H-Stop” ramp is completed. However, during “F-Stop” the timer engages immediately. If the feedback slows to zero speed before 1/2 second expires, the Drive En (PLC Bit 41) will immediately reset to “0” for “R-Stop” and “F-Stop”. For “H-Stop”, the Drive En bit will remain enabled if the feedback is from a quadrature encoder and if it is supposed to stop with the loop closed.

Use Max Fb Alm (CP-271) to determine the state of the MaxFbSpd (PLC Bit 48). The CX-1010 sets MaxFbSpd (PLC Bit 48) to “1” when Fb EU/Tm (MP-39) is greater than Max Fb Alm (CP-271). Otherwise the CX-1010 resets MaxFbSpd (PLC Bit 48) to “0”.

The change in the feedback speed is constantly being compared to MaxAcl/Dcl (CP-272). If the magnitude of the change in Feedback speed is greater than Max Acl/Dcl, then set the MaxAclDcl (PLC Bit 49) to “1”. Otherwise the CX-1010 resets the bit to “0”.

If the CX-1010 is in “Run” and the CO Volts (CP-21) is greater than 1/8 the CO Max Volts (CP-181), the Ramped Reference (MP-42) is greater than the Zero Speed (CP-270) and the feedback speed is less than Zero Speed (CP-270) in excess of the time specified in NO Resp Time (CP-273), then the CX-1010 sets MtrNResp (bit 50) to “1”. Otherwise, the CX-1010 resets MtrNResp (bit 50) to “0”.

Any number of problems is can be indicated when the CX-1010 sets MTrNResp (bit 50) to “1”. For example, it can indicate that neither the drive nor the motor is responding to a nonzero voltage input when the CX-1010 has a nonzero speed reference while in “Run”. If this occurs when the motor is turning, it may indicate a loss of feedback. The encoder or encoder wiring could be at fault. If this occurs and Fb EU/Tm (MP-39) displays a nonzero value, then check the feedback scaling and the value for Zero Speed (CP-270). If the motor is not moving, the drive may not be enabled. Check the enable logic and wiring. If the motor is not moving, it could also indicate that the CO SIG signal is not getting to the drive. Check the CO SIG wiring. In addition, there could be physical restrictions to motion or there could be a malfunction in the motor or the drive.

To further customize the alarms there are Control Parameters that you can use to make comparisons, which are reflected in the PLC. The four Control Parameters that compare the value of a user-selected Monitor Parameter to a user-entered Control Parameter value are:

Cmpr1 Val (CP-292)
Cmpr2 Val (CP-293)
Cmpr3 Val (CP-294)
Cmpr4 Val (CP-295)

There are also four Control Parameters that establish the type of comparison between the Monitor Parameter and corresponding Control Parameter. These four Control Parameters are:

Cmpr1 Parm (CP-280)
Cmpr2 Parm (CP-281)
Cmpr3 Parm (CP-282)
Cmpr4 Parm (CP-283)

In addition, there are four Control Parameters that establish the constant value (or threshold) that acts as the trigger point of comparison between the Monitor Parameter and corresponding comparison type. These four Control Parameters are:

Cmpr1 Type (CP-286)
Cmpr2 Type (CP-287
Cmpr3 Type (CP-288)
Cmpr4 Type (CP-289)

Enter the parameter number of the Monitor Parameter that you need for comparison, into one of the four "Cmprl Parm" Control Parameters listed above. Enter the comparison type into the corresponding "Cmpr1 Type " parameter.

For a "less than" comparison, use the '>=' compare type and use the compliment of the Cmpr Out PLC Bit in your PLC program.
For a "less than" or "equal to" comparison, use the '>' compare type with the NOT of the Cmpr PLC Bit in your PLC program.
NOTE: The compare type also determines if the comparison is performed with the signed value or with the magnitudes of the values (absolute values).

Enter the constant value (or threshold) that you want as the trigger point of the comparison into the corresponding "Cmpr1 Val" parameter.

There are four PLC bits that establish the "truth" of the comparison between the three corresponding parameters: Cmpr Parm, Cmpr1 Type and Cmpr Val. These four Control Parameters are:

Cmpr1 Out (Bit 56)
Cmpr2 Out (Bit 57)
Cmpr3 Out (Bit 58)
Cmpr4 Out (Bit 59)

The result of each comparison is reflected in the corresponding PLC Bit; "1" displayed in the corresponding bit indicates that the result of the corresponding comparison is "true". Otherwise, the bit is cleared ("0").

Standard

Zero Speed (CP-270)

When the magnitude of the Fb EU/Tm (MP-39) is less than or equal to Zero Speed (CP-270), the Fb @ 0Spd bit (44) in the PLC is set to “1”. This value, as well as the PLC Fb @ 0Spd bit condition, is used in other transparent internal calculations that are based on feedback information.

Max Fb Alm (CP-271)

Maximum Feedback Alarm (CP-271) signals an over-speed condition. When the magnitude of the Fb EU/Tm (MP-39) is greater than or equal to Maximum Feedback Alarm (CP-271), then the MaxFb Spd bit (48) in the PLC is set to “1”. You can output this alarm for indication or action, or you can use the alarm logically in the PLC.

Max Acl/Dcl (CP-272)

When either the feedback acceleration or the deceleration is greater than or equal to Max Acl/Dcl (CP-272), then the MacAclDcl bit (49) in the PLC is set to “1” . You can output this alarm for indication or action, or you can use the alarm logically in the PLC.

NO Resp Time (CP-273)

When the CO Signal output signal is greater than 1/16 CO Max Volts (CP-181) and the Fb EU/Tm (MP-39) is less than Zero Spd (CP-270) for longer than the value in No Resp Time (CP-273), then the MtrNResp bit (50) in the PLC is set to “1”. If this scenario occurs, it is generally an indication that the feedback has been lost. It can also indicate that the drive is not enabled (or faulted out), that the CO_SIG Output signal is not getting to the drive or that there may be a physical obstruction preventing motion.

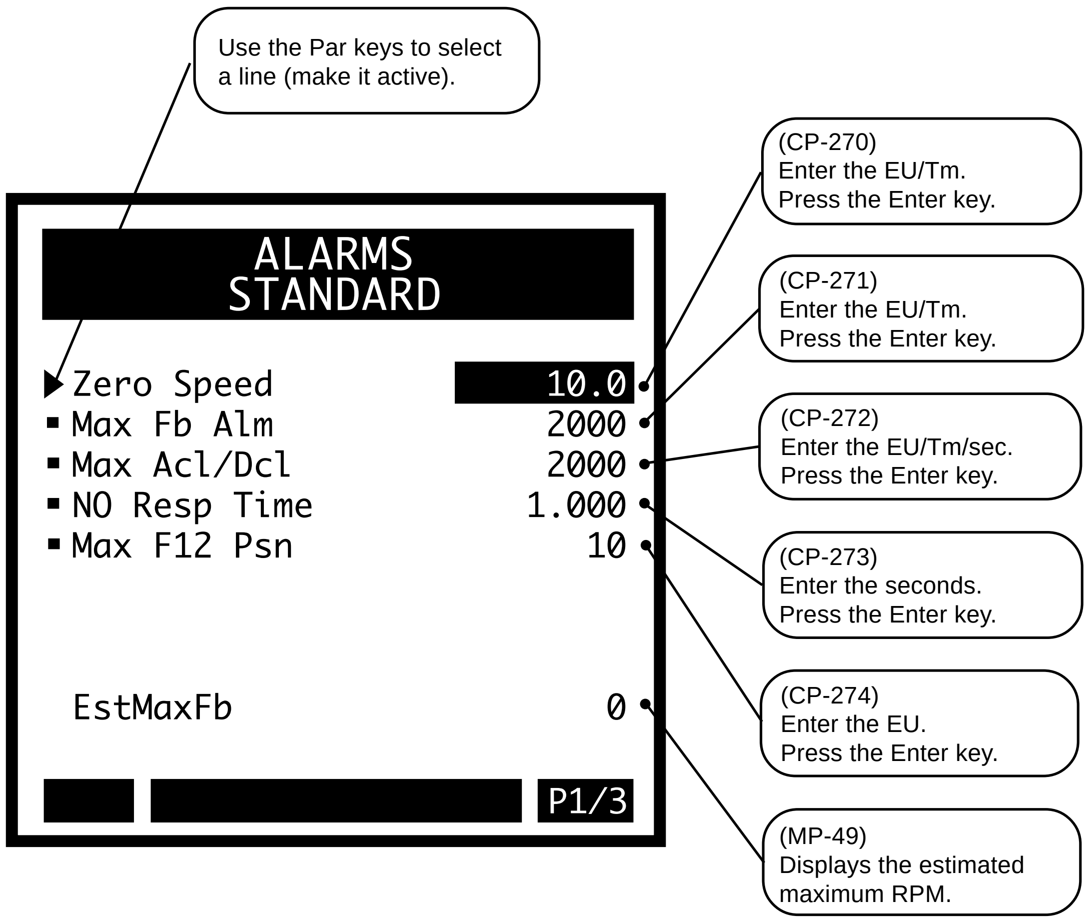
Max FI2 Psn (CP-274)

Maximum FI2 Position (CP-274) signals an over-travel condition. When the FI2 Position (MP-10) is greater than or equal to a positive Max FI2 Psn (CP-274) or less than or equal to a negative Max FI2 Psn, then the MaxFI2Psn bit (51) in the PLC is set to “1” .

EstMaxFb (MP-49)

Estimated Maximum Feedback (MP-49) displays the estimated maximum feedback in EU/Tm, which the CX-1010 calculates during the Kff adjustment, by referencing the CO Max Volts (CP-181), the CO Volts (MP-21) and the Fb EU/Tm (MP-39) . Use Estimated Maximum Feedback (MP-49) to determine if the drive and CO_SIG are scaled correctly.

The Alarms screens are accessed through
—> Main Menu / Alarms <—



Custom

Cmpr1 Parm (CP-280)

Enter a Monitor Parameter code in Compare 1 Parameter (CP-280) that will act on the value in Cmpr1 Val (CP-292), by using the comparison type that you entered in Cmp1 Type (CP-286). If the comparison that is established by these three parameters is "true", then the PLC sets the Cmpr1 Out bit (56) in the PLC to "1", which can be used to trigger a user defined indicator.

NOTE: See *Appendices: Appendix C* for the Monitor Parameters that are not available for the Compare 1 Parameter (CP-280).

Cmpr1 Type (CP-286)

Use Cmpr1 Type (CP-286) to establish the type of comparison (see list below) that will compare the Monitor Parameter that you entered in Cmpr1 Parm (CP-280) to the value that you entered in Cmpr1 Val (CP-292). If you require a comparison that is not listed, then set the Cmpr1 Out bit in the PLC to "Ld Not". This programs the comparison type to become a "Not" statement For example, to program "Magnitude Less Than" (<) use "NOT" Magnitude greater than or equal to (>=).

6 = 'mag =' if Magnitude of parm selected by Cmpr1 Parm = Cmpr1 Val, Cmpr1 Out = 1
5 = 'mag >=' if Magnitude of parm selected by Cmpr1 Parm >= Cmpr1 Val, Cmpr1 Out = 1
4 = 'mag >' if Magnitude of parm selected by Cmpr1 Parm > Cmpr1 Val, Cmpr1 Out = 1
3 = '=' if value of parm selected by Cmpr1 Parm = Cmpr1 Val, Cmpr1 Out = 1
2 = '>=' if value of parm selected by Cmpr1 Parm >= Cmpr1 Val, Cmpr1 Out = 1
1 = '>' if value of parm selected by Cmpr1 Parm > Cmpr1 Val, Cmpr1 Out = 1

Cmpr1 Val (CP-292)

Enter a value in Cmpr1 Val (CP-292) that will be compared to the Monitor Parameter in Cmpr1 Parm (CP-280), using the comparison type that you entered in Cmpr1 Type (CP-286). If the comparison that is established by these three parameters is "true", then the PLC sets the Cmpr1 Out bit (56) in the PLC to "1" .

Cmpr2 Parm (CP-281)

Enter a Monitor Parameter code in Compare 2 Parameter (CP-281) that will act on the value in Cmpr2 Val (CP-293), by using the comparison type that you entered in Cmp2 Type (CP-287). If the comparison that is established by these three parameters is "true", then the PLC sets the Cmpr2 Out bit (57) in the PLC to "1", which can be used to trigger a user defined indicator.

NOTE: See *Appendices: Appendix C* for the Monitor Parameters that are not available for the Compare 2 Parameter (CP-281).

Cmpr2 Type (CP-287)

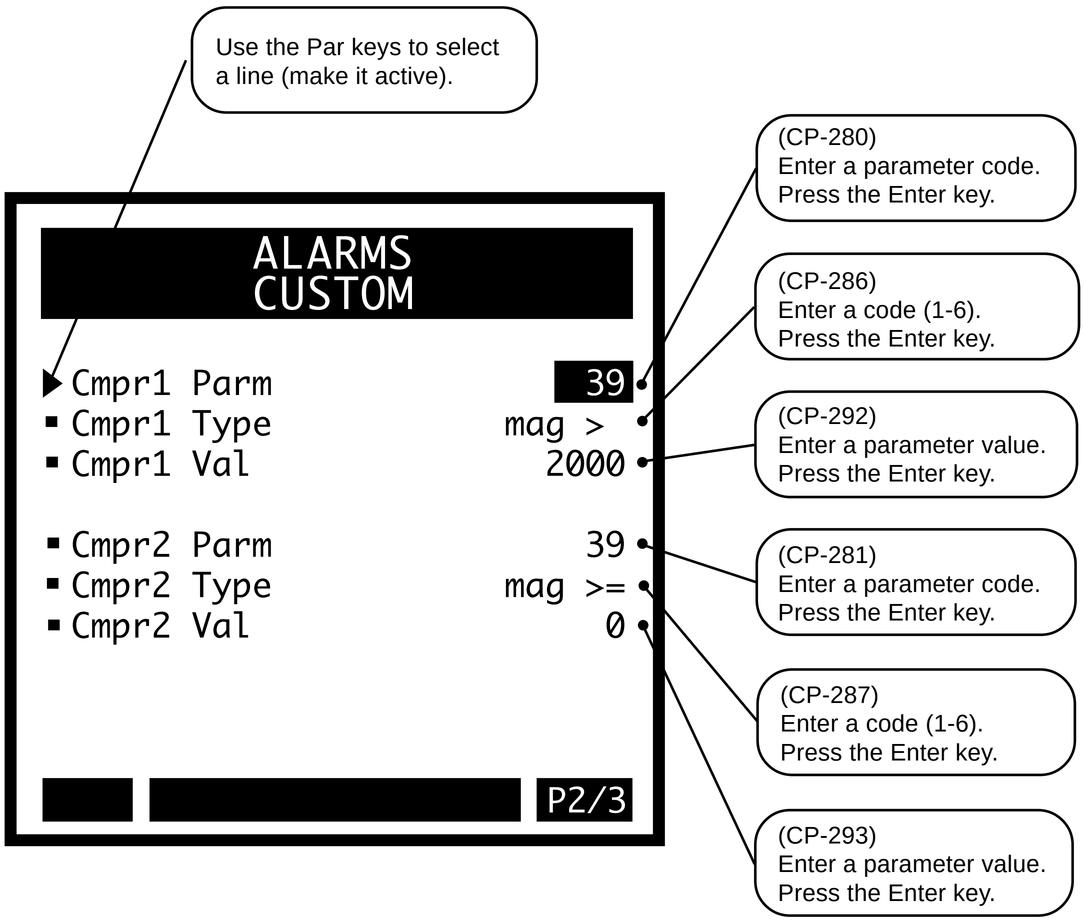
Use Cmpr2 Type (CP-287) to establish the type of comparison (see list below) that will compare the Monitor Parameter that you entered in Cmpr2 Parm, (CP-281) to the value that you entered in Cmpr2 Val (CP-293). If you require a comparison that is not listed, then set the Cmpr2 Out bit in the PLC to "Ld Not". This programs the comparison type to become a "Not" statement For example, to program "Magnitude Less Than " (<) use "NOT " Magnitude greater than or equal to (>=).

6 = 'mag =' if Magnitude of parm selected by Cmpr2 Parm) = Cmpr2 Val, Cmpr2 Out = 1
5 = 'mag >=' if Magnitude of parm selected by Cmpr2 Parm) >= Cmpr2 Val, Cmpr2 Out = 1
4 = 'mag >' if Magnitude of parm selected by Cmpr2 Parm) > Cmpr2 Val, Cmpr2 Out = 1
3 = '=' if value of parm selected by Cmpr2 Parm) = Cmpr2 Val, Cmpr2 Out = 1
2 = '>=' if value of parm selected by Cmpr2 Parm) >= Cmpr2 Val, Cmpr2 Out = 1
1 = '>' if value of parm selected by Cmpr2 Parm) > Cmpr2 Val, Cmpr2 Out = 1

Cmpr2 Val (CP-293)

Enter a value in Cmpr2 Val (CP-293) that will compared to the Monitor Parameter in Cmpr2 Parm (CP-281), using the comparison type that you entered in Cmpr2 Type (CP-287). If the comparison that is established by these three parameters is "true", then the PLC sets the Cmpr2 Out bit (57) in the PLC screen to "1".

The Alarms / Custom screen (page 2).



Custom

Cmpr3 Parm (CP-282)

Enter a Monitor Parameter in Compare 3 Parameter (CP-282) that will act on the value in Cmpr3 Val (CP-294), by using the comparison type that you entered in Cmp3 Type (CP-288). If the comparison that is established by these three parameters is “true”, then the PLC sets the Cmpr3 Out bit (58) in the PLC to “1” , which can be used to trigger a user defined indicator.

NOTE: See *Appendices: Appendix C* for the Monitor Parameters that are not available for the Compare 3 Parameter (CP-282).

Cmpr3 Type (CP-288)

Use Cmpr3 Type (CP-288) to establish the type of comparison (see list below) that will compare the Monitor Parameter that you entered in Cmpr3 Parm (CP-282) to the value that you entered in Cmpr3 Val (CP-294). If you require a comparison that is not listed, then set the Cmpr3 Out bit in the PLC to “Ld Not”. This programs the comparison type to become a “Not” statement For example, to program “Magnitude Less Than” (<) use “NOT” Magnitude greater than or equal to(>=).

6 = ‘mag =’ if Magnitude of parm selected by Cmpr3 Parm) = Cmpr3 Val, Cmpr3 Out = 1
5 = ‘mag >=’ if Magnitude of parm selected by Cmpr3 Parm) >= Cmpr3 Val, Cmpr3 Out = 1
4 = ‘mag >’ if Magnitude of parm selected by Cmpr3 Parm) > Cmpr3 Val, Cmpr3 Out = 1
3 = ‘=’ if value of parm selected by Cmpr3 Parm) = Cmpr3 Val, Cmpr3 Out = 1
2 = ‘>=’ if value of parm selected by Cmpr3 Parm) >= Cmpr3 Val, Cmpr3 Out = 1
1 = ‘>’ if value of parm selected by Cmpr3 Parm) > Cmpr3 Val, Cmpr3 Out = 1

Cmpr3 Val (CP-294)

Enter a value in Cmpr3 Val (CP-294) that will be compared to the Monitor Parameter in Cmpr3 Parm (CP-282), using the comparison type that you entered in Cmpr3 Type (CP-288). If the comparison that is established by these three parameters is “true”, then the PLC sets the Cmpr3 Out bit (58) in the PLC to “1”.

Cmpr4 Parm (CP-283)

Enter a Monitor Parameter in Compare 4 Parameter (CP-283) that will act on the value in Cmpr4 Val (CP-295), by using the comparison type that you entered in Cmpr4 Type (CP-289). If the comparison that is established by these three parameters is “true”, then the PLC sets the Cmpr4 Out bit (59) in the PLC Programming screen to “1”, which can be used to trigger a user defined indicator.

NOTE: See *Appendices: Appendix C* for the Monitor Parameters that are not available for the Compare 4 Parameter (CP-283).

Cmpr4 Type (CP-289)

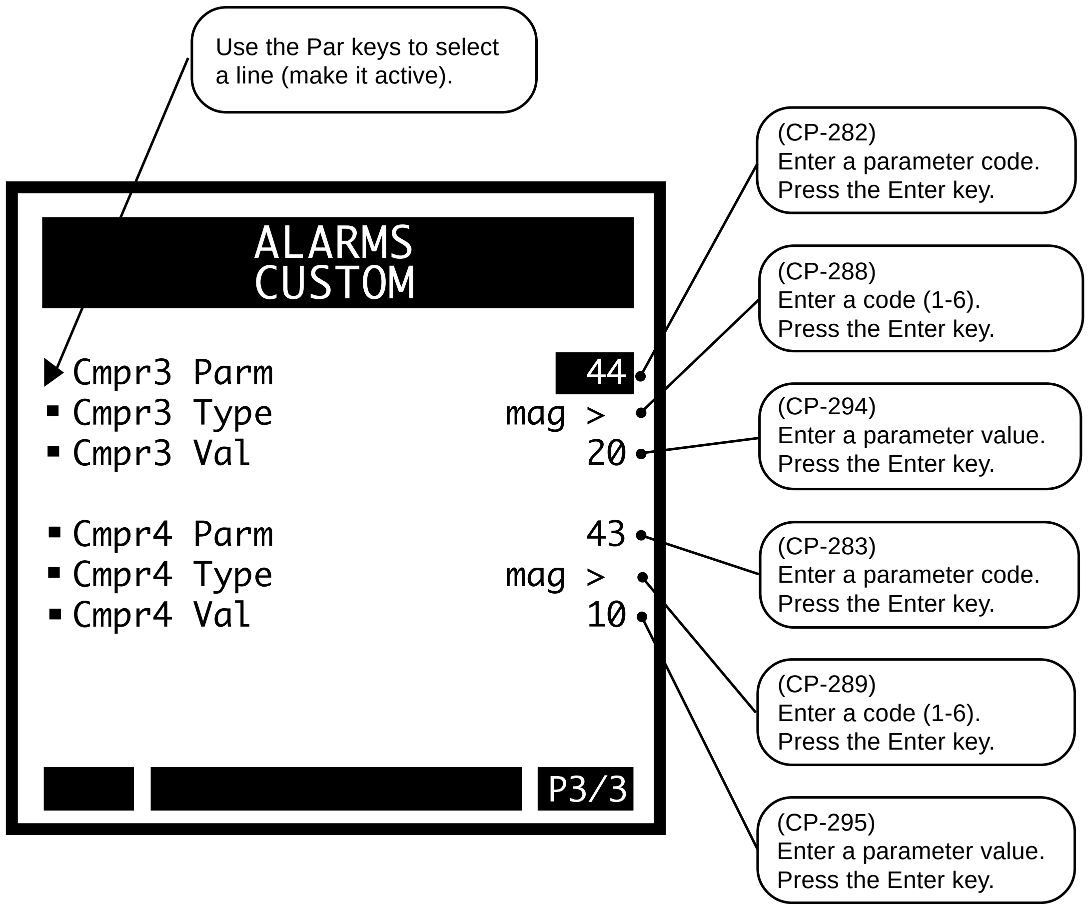
Use Cmpr4 Type (CP-289) to establish the type of comparison (see list below) that will compare the Monitor Parameter that you entered in Cmpr4 Parm (CP-283) to the value that you entered in Cmpr4 Val (CP-295). If you require a comparison that is not listed, then set the Cmpr4 Out bit in the PLC to “Ld Not”. This programs the comparison type to become a “Not” statement For example, to program “Magnitude Less Then ” (<) use “NOT ” Magnitude greater than or equal to (>=).

6 = ‘mag =’ if Magnitude of parm selected by Cmpr4 Parm) = Cmpr4 Val, Cmpr4 Out = 1
5 = ‘mag >=’ if Magnitude of parm selected by Cmpr4 Parm) >= Cmpr4 Val, Cmpr4 Out = 1
4 = ‘mag >’ if Magnitude of parm selected by Cmpr4 Parm) > Cmpr4 Val, Cmpr4 Out = 1
3 = ‘=’ if value of parm selected by Cmpr4 Parm) = Cmpr4 Val, Cmpr4 Out = 1
2 = ‘>=’ if value of parm selected by Cmpr4 Parm) >= Cmpr4 Val, Cmpr4 Out = 1
1 = ‘>’ if value of parm selected by Cmpr4 Parm) > Cmpr4 Val, Cmpr4 Out = 1

Cmpr4 Val (CP-295)

Enter a value in Cmpr4 Val (CP-295) that will be compared to the Monitor Parameter in Cmpr4 Parm (CP-283), using the boundary type that you entered in Cmpr4 Type (CP-289). If the comparison that is established by these three parameters is “true”, then the PLC sets the Cmpr4 Out bit (59) in the PLC to “1” .

The Alarms / Custom screen (page 3).



—NOTES—

RUN RAMPS

Since the ramp generator controls the rate of change of the velocity command, the velocity command is referred to as the ramped reference speed. The ramped reference speed is displayed in Ramped Ref (MP-42). When the Scaled Ref (MP-41) speed changes, the rate of change in the Ramped Ref (MP-42) speed is limited by the acceleration and deceleration rates that you specify. You can specify the rates for “Run”,“ “H-Stop””, “R-Stop” and “Jog” independently. Because the Direct Setpoint mode involves voltage rather than EU/Tm, the ramps for the Direct Setpoint mode are specified separately from the other Setpoint modes. In addition, since the Direct Setpoint mode controls the CO SIG directly, the Scaled Ref (MP-41) and the Ramped Ref (MP-42) equal “0”.

Ramps may be used in each of the following situations:

1. The application requires slow starting and stopping to prevent product damage.

2. Minimize stress on your system during starting and stopping.

3. Minimize the overshoot of the response to step changes in the Scaled Ref (MP-41).

4. Filter out high frequency components of the Scaled Ref (MP-41) signal.

5. Keep the drive out of current limit (saturation) and thus maintain the linear properties of the drive. The control loop will perform better and operate more predictably.

Your drive's capacity should not be exceeded under normal operating loads. If you use acceleration rates in excess of your drive’s potential, then overshoot can occur. However, if the Lead in follower applications provides adequate ramps, you can set the Acl Tm RUN (CP-201) or Dcl Tm RUN (CP-203) to “0”or use Ramp Thd (CP-255). The Ramp Thd (CP-255) allows the ramp for large changes in the Scaled Ref (MP-41) and bypasses the ramp for small or gradual changes. The ramp generator can be stopped in progress or bypassed through the PLC or by Cntrl Latch (CP-240).

Set the acceleration rate for the ramps by defining a reference speed for the ramps in Ref RUN Rmp (CP-200). This reference speed is generally a convenient number for calculating the rates. Set the “Run” ramps equal to a Master SP (CP-110) in order to specify the Setpoint's value in units of time. The acceleration rate can also be entered directly in Acl Rate RUN (CP-202), although you must also enter a valid reference speed in Ref RUN Rmp (CP-200). This reference speed is generally the operating speed. When you enter an acceleration time in Acl Tm RUN (CP-201), the CX-1010 automatically calculates the acceleration rate. Inversely, if you enter the acceleration rate in Acl Rt RUN (CP-202), the CX-1010 automatically calculates the acceleration time. The deceleration time and deceleration rate operate in the same way. When you enter a new reference speed, the CX-1010 automatically calculates the acceleration and deceleration times and preserves the given rates. The acceleration rate is defined by:

$$\text{acceleration rate} = \frac{\text{reference speed (EU/Tm)}}{\text{acceleration time (Seconds)}}$$

Likewise, the deceleration rate is defined by:

$$\text{deceleration rate} = \frac{\text{reference speed (EU/Tm)}}{\text{deceleration time (Seconds)}}$$

Run Ramps

The Run Ramps parameters determine the acceleration and deceleration rates that are used during Master Setpoint Mode, Follower Setpoint Mode and Custom SP Setpoint mode. The Ref RUN Rmp (CP-200) is the reference speed in EU/Tm used to define the RUN ramps. Acl Tm RUN (CP-201) is the time it would take to accelerate from “0” to the Ref RUN Rmp (CP-200) speed. The Acl Rt RUN (CP-202) is the acceleration rate in EU/Tm. Dcl Tm RUN (CP-203) is the time it would take to decelerate from the reference speed to “0” speed. The Dcl Rt RUN (CP-204) is the deceleration rate in EU/Tm. Note that there are separate parameters that define the deceleration rates that are used for “H-Stop” and “R-Stop”. The Dcl Rt RUN is used when the magnitude of the Scaled Reference speed is decreased.

Acl Tm RUN (CP-201)

Acceleration Time Run (CP-201) is the time, in seconds, that it takes to accelerate from “0” to the Ref RUN Ramp (CP-20), while operating in the Master, Follower or Custom Setpoint Equation modes.

Acl Rt RUN (CP-202)

Acceleration Rate Run (CP-202) is the acceleration rate that is used (while in Run) for the Master, Follower and Custom Setpoints when the magnitude of the Scaled Reference increases.

Dcl Tm RUN (CP-203)

Deceleration Time Run (CP-203) is the time in Seconds, that it takes to decelerate from Ref RUN Ramp (CP-200) speed to “0”, while operating in the Master, Follower or Custom Setpoint Equation modes.

Dcl Rt RUN (CP-204)

Deceleration Rate Run (CP-204) is the deceleration rate that is used (while in Run) for the Master, Follower and Custom Setpoints when the magnitude of the Scaled Reference decreases.

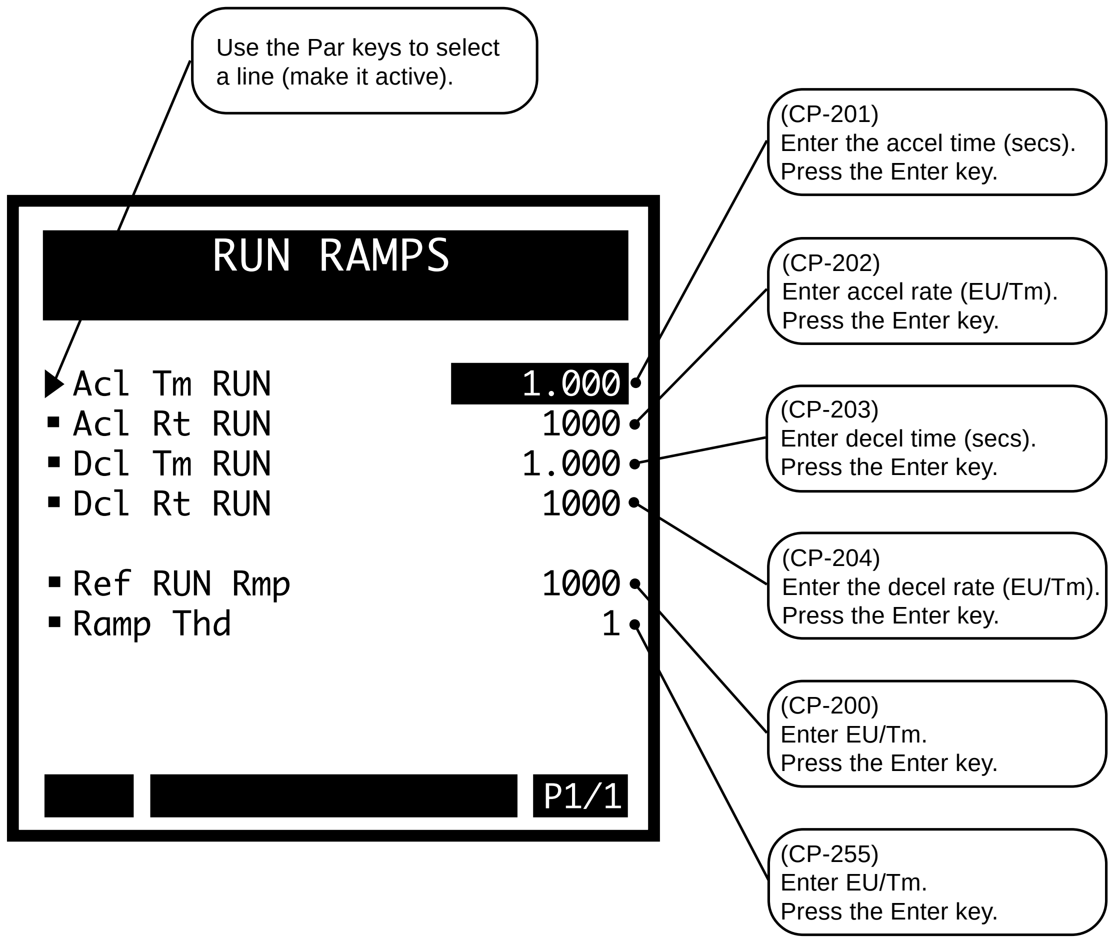
Ref RUN Rmp (CP-200)

The acceleration rate for the Master Mode, the Follower Mode and the Custom Setpoint Mode are determined by the Acl Tm RUN (CP-201) and the Reference Run Ramp (CP-200). The deceleration rate (from a faster speed to a slower speed) for the Master Mode, the Follower Mode and the Custom Setpoint Mode, are determined by the Dcl Tm RUN (CP-203) and the Reference Run Ramp (CP-200).

Ramp Thd (CP-255)

When the difference between the Scaled Reference Speed (MP-41) and the Ramped Reference Speed (MP-42) is greater than Ramp Threshold (CP-255), the ramp will work normally. When the difference between the Scaled Reference Speed (MP-41) and the Ramped Reference Speed (MP-42) is less than or equal to Ramp Threshold (CP-255), the ramp will be bypassed. This avoids ramp delays for small Lead changes but still allows a ramp for large Lead or for large Master Setpoint changes.

The Run Ramps screens are accessed through
—> Main Menu / Alarms*Ramps*Limits <—



R-STOP AND H-STOP SETUP

There are separate parameters that define the deceleration rate that is used for “R-Stop” and “H-Stop”. However, Ref StopRmp (CP-210) functions as the reference speed for both. Dcl Tm Rstp (CP-211) is the time it would take to decelerate from the Ref StopRmp speed to “0” for an “R-Stop”. Dcl Rt RStp (CP-212) is the deceleration rate for “R-Stop”. Dcl Tm HStp (CP-213) is the time it would take to decelerate from the Ref StopRmp speed to 0 for an “H-Stop”. Dcl Rt HStp (CP-214) is the deceleration rate for “H-Stop”.

Dcl Tm RStp (CP-211)

Deceleration Time R-Stop (CP-211) is the time, in seconds, that it takes to decelerate from the Ref StopRmp (CP-210) speed to “0”, during “R-Stop”, while operating in “Jog”, Master Mode, Follower Mode or the Custom Setpoint Equation Mode.

Dcl Rt RStp (CP-212)

Deceleration Rate R-Stop (CP-212) is the deceleration rate that is used for “R-Stop”, while operating in Jog, Master Mode, Follower Mode or the Custom Setpoint Equation Mode.

Dec Tm Hstp (CP-213)

Deceleration Time R-Stop (CP-213) is the time, in seconds, that it takes to decelerate from the Ref StopRmp (CP-210) speed to “0”, during “R-Stop”, while operating in “Jog”, Master Mode, Follower Mode or the Custom Setpoint Equation Mode.

Dcl Rt HStp (CP-214)

Deceleration Rate R-Stop (CP-214) is the deceleration rate that is used for “H-Stop”, while operating in “Jog”, Master Mode, Follower Mode or the Custom Setpoint Equation Mode.

Hstp LoopMode (CP-230)

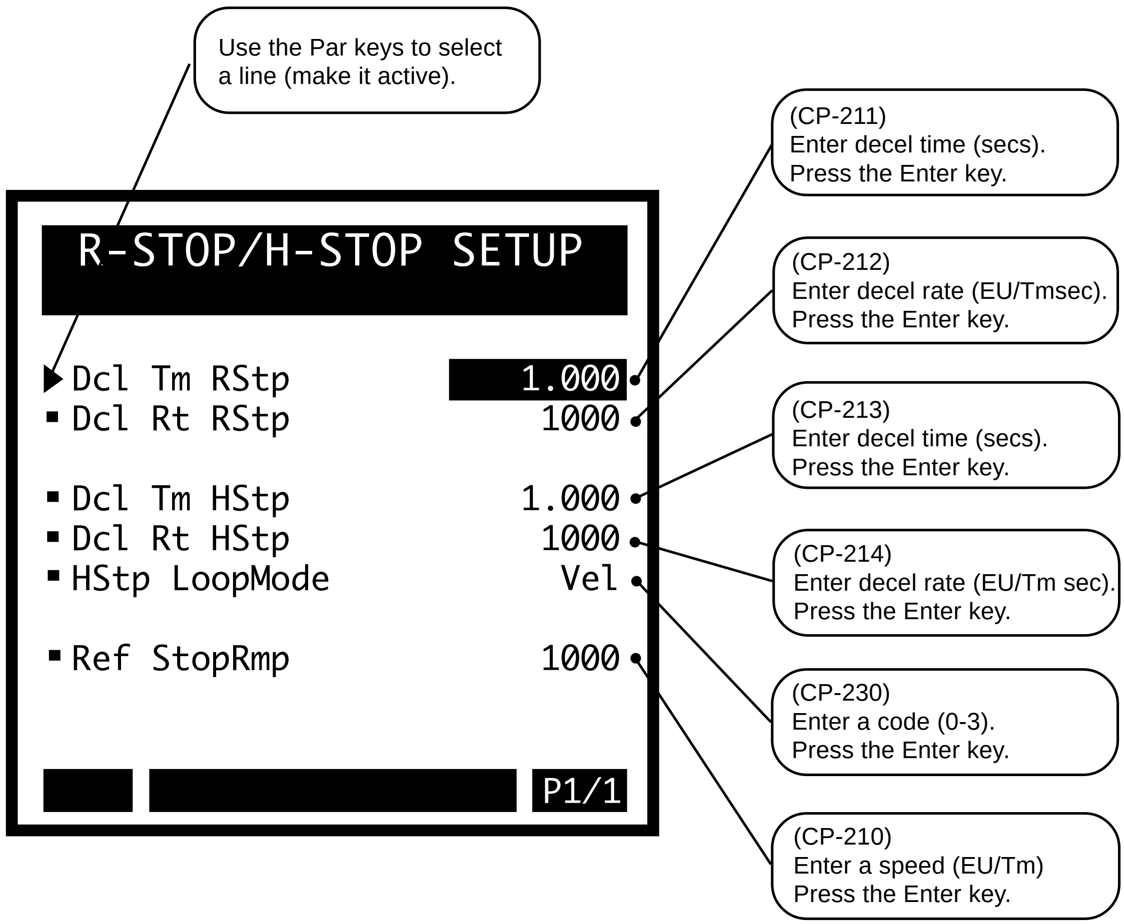
Use R-Stop Loop Mode (CP-230) to select the control-loop type that will be used after coming to a stop in “H-Stop”.

3 = Position Loop
2 = Zero Error (ZE) Loop
1 = Velocity Mode Loop (default)
0 = Open Loop

Ref Stop Rmp (CP-210)

The deceleration rate that is used for “R-Stop” (Master Mode, Follower Mode or Custom Setpoint Mode), is determined by the Dcl Tm RStp (CP-211) and the Reference Stop Ramp (CP-210). The deceleration rate that is used for “H-Stop” (Master Mode, Follower Mode or Custom Setpoint Mode), is determined by the Dcl Tm HStp (CP-213) and the Reference Stop Ramp (CP-210).

The R-Stop and H-Stop Setup screens are accessed through
—> Main Menu / Alarms*Ramps*Limits <—



DIRECT SETPOINT RAMPS

Since the Direct Setpoint Mode is used to directly output a given voltage rather than command a speed, it must have separate parameters to define the ‘voltage’ ramp. The Ref Drct Rmp (CP-1205) is the reference voltage to define the Direct ramp. The Acl Tm Drct (CP-206) is the time it would take to increase the CO SIG voltage from “0” volts to the Ref Drct Rmp voltage. The Dcl Tm Drct (CP-208) is the time it would take to decrease the CO Volts from Ref Drct Rmp voltage to “0” volts.

Acl Tm Drct (CP-206)

Acceleration Time Direct (CP-206) is the time, in seconds, that it takes to accelerate from “0” to the Ref Direct Ramp (CP-205) voltage, while operating in the Direct Mode.

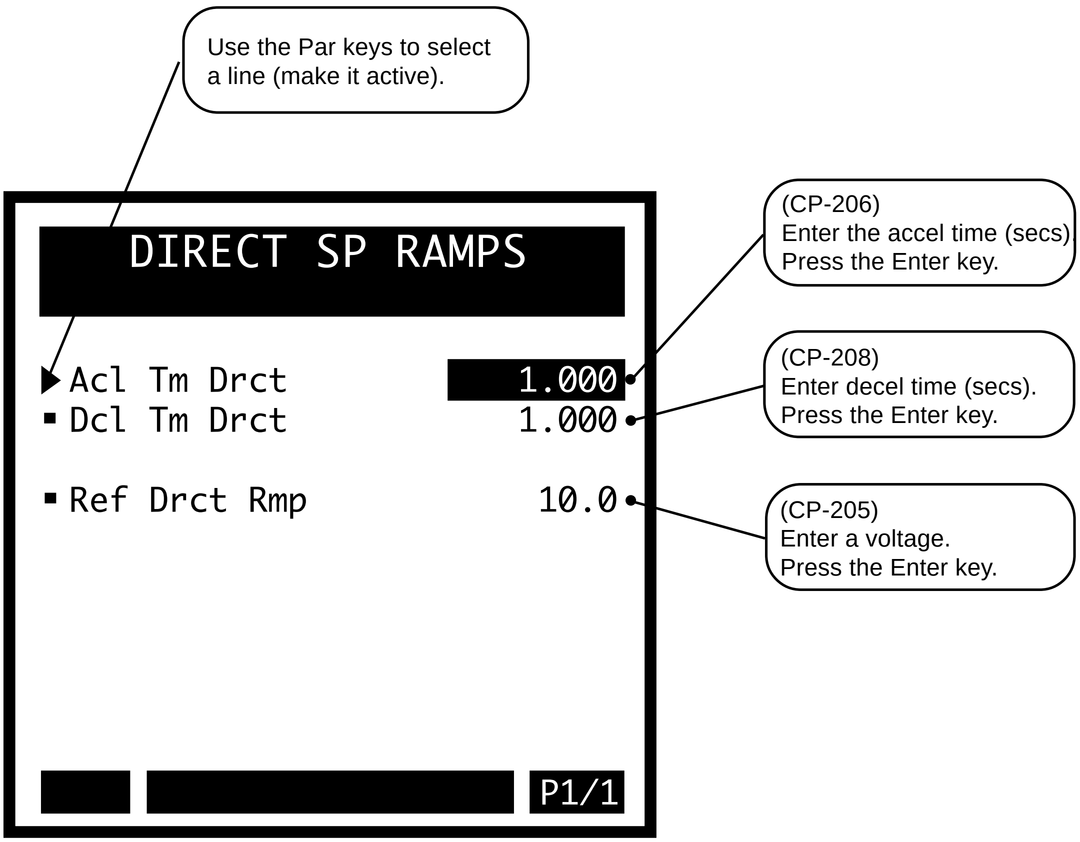
Dcl Tm Drct (CP-208)

Deceleration Time Direct (CP-208) is time, in seconds, that it takes to decelerate from the Ref DRCT Ramp (CP-205) voltage to “0” volts, while operating in the Direct Mode.

Ref Drct Rmp (CP-205)

The acceleration rate for the Direct Mode is determined by the Reference Direct Ramp (CP-205) and the Accel Time Direct (CP-206). The deceleration rate for the Direct Mode, as well as for “H-Stop” (while operating in the Direct Mode) is determined by Decel Time Direct (CP-208) and Ref Dirct Rmp (CP-205).

The Direct Setpoint screens are accessed through
—> Main Menu / Alarms*Ramps*Limits <—



JOG SETUP

The JOG screen includes the parameters that are related to “Jog” operation. The Jog Setpoint as well as the accel and decel rates can be set in this screen. The loop type selection for the “Jog” mode of operation is also available on this screen. You can “Jog” in open loop mode, which uses Kff to generate the CO SIG based on the desired Jog Setpoint You can also “Jog” in closed velocity loop which uses Kff and the PID loop to generate the CO SIG based on the desired Jog Setpoint. The closed loop operation requires Feedback, but should result in more accurate operating speed and better speed regulation.

There are also parameters to define the ramps used for “Jog”. The Jog SP (CP-215) in EU/Tm functions as the reference speed. The Acl Tm Jog (CP-216) is the that time it will take to accelerate from “0” speed to the Jog SP. The Acl Rt Jog (CP-217) is the acceleration rate for “Jog”. Dcl Tm Jog (CP-218) is the time it should take to decelerate from the Jog SP to “0” speed. The Dcl Rt Jog (CP-219) is the deceleration rate used when the Jog SP is changed to a lower value as well as when both the Jog-Forward and the Jog Reverse Inputs are deactivated and the speed is decreased to “0” speed before the state is changed to “R-Stop”.

Jog SP (CP-215)

The Jog Setpoint (CP-215) is the speed, in EU/Tm, at which Jog ramps when it is activated. The Jog ramp rates are referenced to this speed.

Jog Loop Mode (CP-221)

Jog Loop Mode (CP-221) identifies the type of control loop (see list below) that is used during Jog.

1=Velocity Loop *
0=Open Loop

Acl Tm Jog (CP-216)

Acceleration Time Jog (CP-216) is the time, in seconds, that it takes to accelerate from “0” to the Jog SP (CP-215).

Acl Rt Jog (CP-217)

Acceleration Rate Jog (CP-217) is the rate, in EU/Tm per second, that it takes to accelerate when Jog is activated.

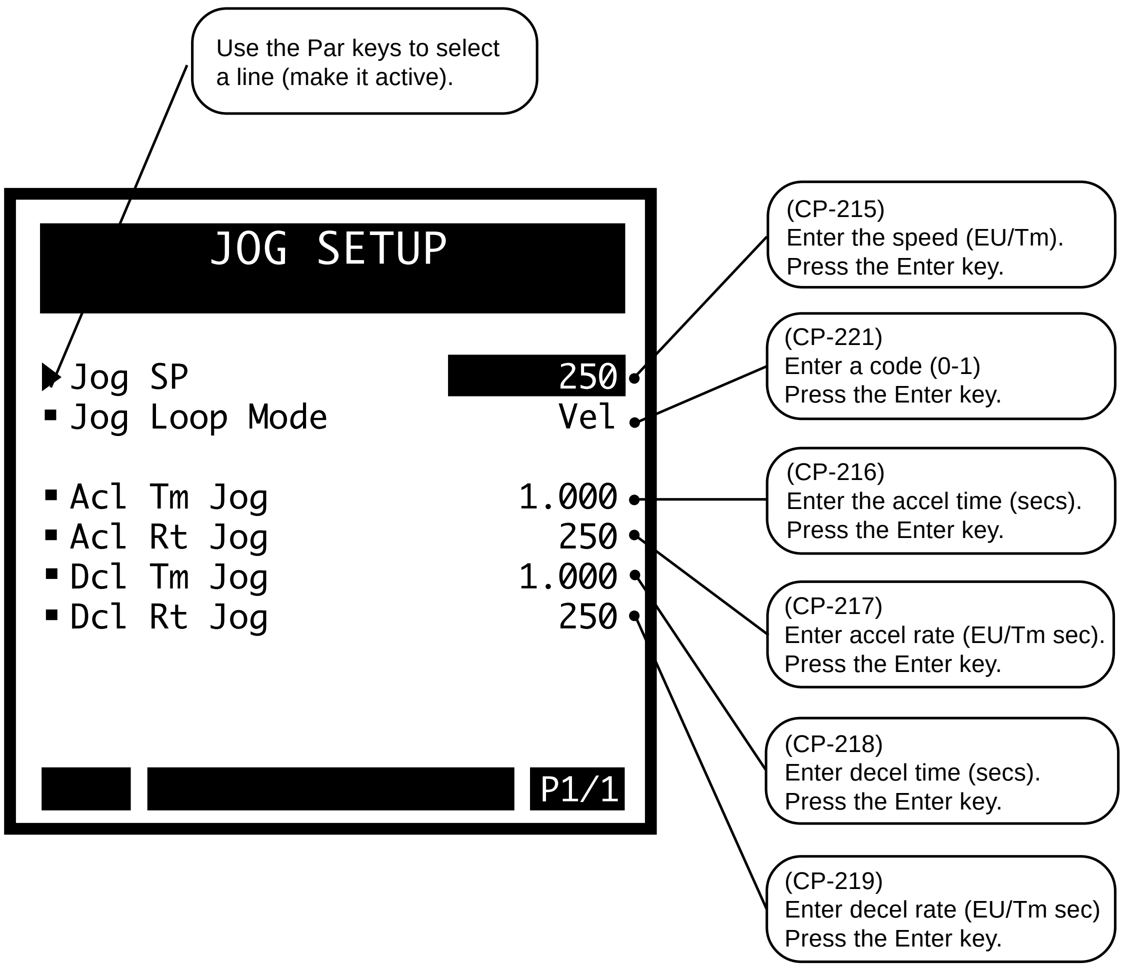
Dcl Tm Jog (CP-218)

Deceleration Time Jog (CP-218) is the time, in seconds, that it takes to decelerate from Jog SP (CP-215) to “0”, when the Jog Input is deactivated or when switching between “Jog Fwd” and “Jog Rvs”.

Dcl Rt Jog (CP-219)

Deceleration Rate Jog (CP-219) is the rate, in EU/Tm per second, that is used when the Jog Input is deactivated or when switching between “Jog Fwd” and “Jog Rvs”.

The Jog Setup screens are accessed through
—> Main Menu / Alarms*Ramps*Limits <—



LIMITS

The Limits screen includes the parameters that limit certain operating conditions. Some appear on other screens that are more relevant to their function. The Max Spd Lmt (CP-250) and the Min Spd Lmt (CP-251) limit the magnitude of the Scaled Reference speed to this range. If the Scaled Reference speed calls for a speed less than the Min Spd Lmt, the Scaled Reference is immediately set equal to the Min Spd Lmt. However, the Ramped Reference speed will proceed through the ramp.

Max Spd Lmt (CP-250)

The Scaled Reference (CP-41) is limited to the positive and negative Maximum Speed Limit (CP-250) while operating in "Run".

Min Spd Lmt (CP-251)

The Scaled Reference (CP-41) is limited to the positive and negative Minimum Speed Limit (CP-251) while operating in "Run".   The ramp accelerates to the Minimum Speed Limit (CP-251) if the reference speed is less than the Minimum Speed Limit .

Trim Authority (CP-258)

The trim contribution to the DAC output is limited to positive and negative Trim Authority (CP-258).

Integral Limit (CP-259)

The integral contribution to the trim term is limited to the positive and negative Integral Limit (CP-259). Integral Limit (CP-259) can decrease the effects of integral windup or it can limit the maximum effect of the integral term.

ZE Limit (CP-253)

ZE Limit (CP-253) is the maximum authority for the zero error term. The excess speed that is required to recover large position errors is limited to this value. Enter the EU's that are required to recover the Time Base (CP-109)

PsnErr+ (CP-260)

The maximum positive value of the accumulated position error is limited to Positive Position Error (CP-260). Use Positive Position Error (CP-260) when the Lead is in motion, but the Follower is stopped since the Follower does not have to recover its former position relative to the lead, the Positive Position Error (CP-260) can be used to limit the amount of position error that accumulates while the lead continues to move. In Positive Position Error (CP-260), the follower lags behind the lead when both are moving in the positive direction.

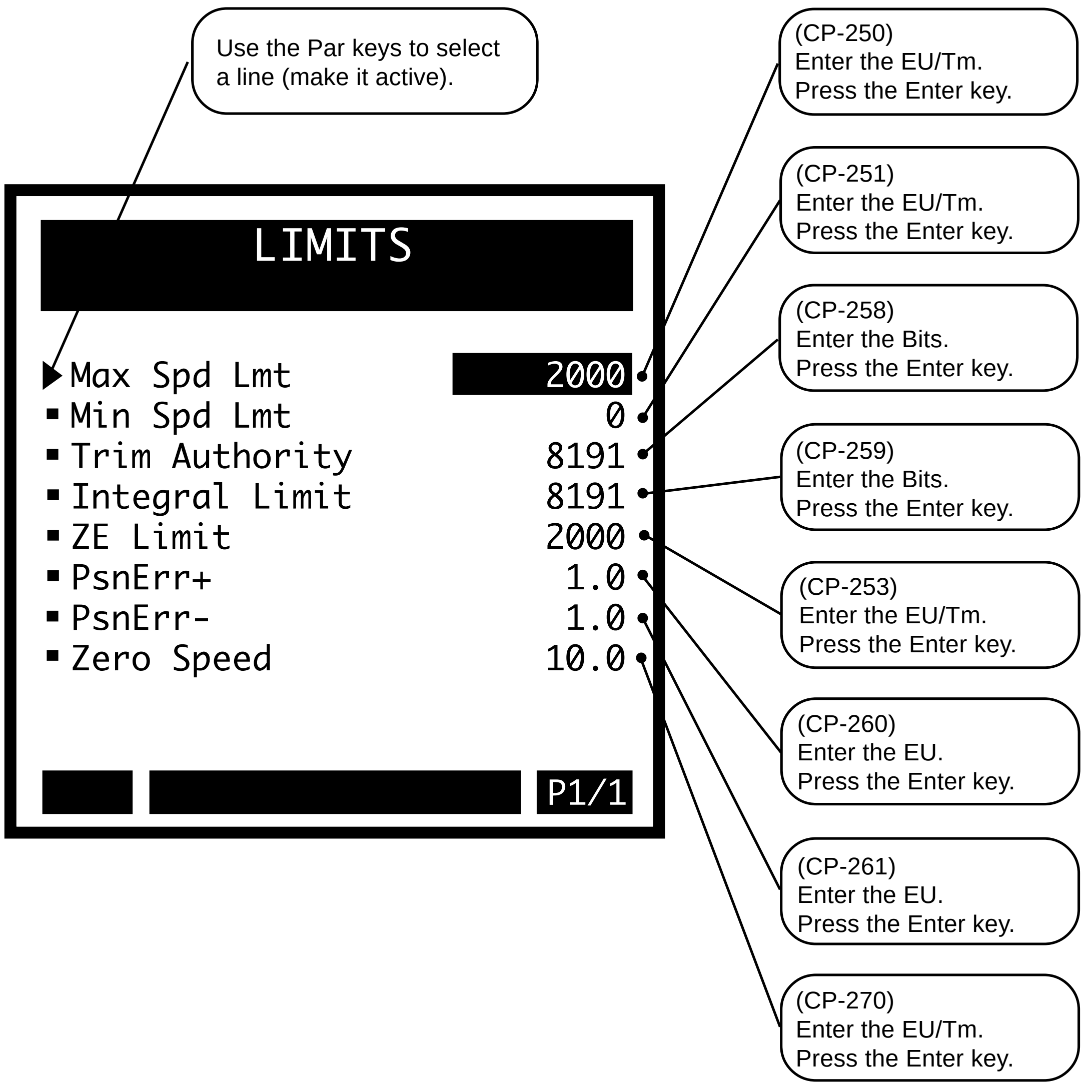
PsnErr- (CP-261)

The maximum negative value of the accumulated position error is limited to Negative Position Error (CP-261). In Negative Position Error (CP-261), the follower is ahead of the lead when both are moving in the positive direction. If both are moving in the negative direction in Negative Position Error (CP-261), the follower lags behind the lead.

Zero Speed (CP-270)

When the magnitude of the Fb EU/Tm (MP-39) is less than Zero Speed (CP-270), the Fb @ 0Spd bit (44) in the PLC is set to “1”. This value, as well as the PLC Fb @ 0Spd bit condition, is used in other transparent internal calculations that are based on feedback information.

The Limits screen is accessed through
—> Main Menu / Alarms*Ramps*Limits <—



—NOTES—

TUNING

Tuning includes setting the PID and Feedforward tuning parameters.

Caution: To avoid damage to your system, the CX-1010 must be calibrated and the motor drive set up before you operate your system. Refer to *Drive Setup / Calibration: Calibration*.

The CX-1010 Tuning parameters are found in the following screens:

- Velocity Loop
- Velocity Loop/ZE
- Position Loop
- Feedforward
- Related Items

—NOTES—

Tuning

Use the tuning screens to determine the parameter values that are related to the Control Loop and the Feedforward. The main objective in tuning is to maintain stability under the entire range of operating conditions. In addition, you may have specific requirements for your system's response to load changes or to Setpoint changes. There are also tuning parameters that determine the proper modes of operation. These parameters deal with the position data and signal conditioning.

Use the Drive Type (CP-222) to identify your drive as either a velocity mode drive or a torque mode drive. Use the RUN Loop Mode (CP-220) to determine the Control Loop structure that is used during Run (either closed or open loop). Use the Jog Loop Mode (CP-221) to determine the Control Loop structure that is used during Jog. Use the HStp LoopMode (CP-230) to determine the Control Loop structure that is used during "H-Stop".

The Control Loop has three closed loop structures and one open loop structure. The closed loop structures are: Velocity Loop, Position Loop, and Zero Error Loop. The Zero Error Loop has a subcategory called Zero Error Hold (ZE Hld), which is only used during "H-Stop". The Position Loop has a subcategory called Position Hold (Psn Hld), which is only used during "H-Stop".

Using the Closed Loop Structures:

Use Velocity Loop to control the velocity of the feedback. Velocity Loop is used for the majority of applications. It must be used for the Custom Setpoint, the Master Setpoint mode, the Follower plus Offset and the Follower Setpoint mode (with the Lead something other than FI1). It must be used when the Feedback is not FI2. The Velocity Loop parameters are Kp VL (CP-225), Ki VL (CP-226), Kd VL (CP-227).

Use the Position Loop (single loop) to control the position of the feedback (FI2) relative to the after-ratio position of the Lead (FI1). This works only in follower mode with FI2 as Feedback and FI1 as the Lead frequency and position. The Position Loop parameters are Kp PL (CP-235), Ki PL (CP-236), Kd PL (CP-237). The decision to use the Position Loop depends on the application. The Position Loop allows abrupt recovery. If there is no compelling reason to use the Position Loop, try the Zero Error Loop first and determine if it will provide adequate position control.

Use the Zero Error Loop to control the position of the feedback (FI2) relative to the after-ratio position of the Lead (FI1). Zero Error Loop is a dual (2) loop structure; the position loop is added as an outer loop to the velocity loop. Zero Error Loop is only used in the Follower mode with FI2 as Feedback and FI1 as the lead frequency and position. The operating speed is increased when the follower lags behind the lead or is decreased when the follower leads the lead. The velocity loop (zero error) parameters are Kp VL (CP-225), Ki VL (CP-226), Kd VL (CP-227). The position loop (zero error) parameters are Kp ZE (CP-229) and ZE Limit (CP-253). The integral term of the Velocity Loop should be used (Ki VL not equal to "0") to guarantee a zero position error. The position error is multiplied by Kp ZE (CP-229) to determine how much faster (or slower) the operating speed must be modified. Increasing the Kp ZE will more greatly effect the over-speed or under-speed and therefore reduce the position error more quickly. A value that is too large will cause instability. The ZE Limit (CP-253) is used to limit the amount of over-speed or under-speed the Zero Error Position Loop can request. The units are in EU/Tm.

The decision to use the Zero Error Loop depends on the application. In general, the Zero Error Loop should be used when the rate of convergence to zero position error needs to be controlled. It may be necessary to use the zero error structure with torque mode drives, in effect closing the Velocity Loop in the CX-1010 to provide damping action. There may be some processes where an additional Velocity Loop will cause instability. In this case, the Zero Error Loop may not be used.

The closed loop structures are a type of PID Loop; they employ the standard Proportional plus Derivative plus Integral (PID) algorithm. Different configurations of the PID are used, depending on the Drive Type (CP-222) and the loop mode: RUN Loop Mode (CP-220), Jog Loop Mode (CP-221), HStp Mode (CP-230).

In a closed loop, the feedback is used to generate the CO SIG output which in turn causes the feedback to respond. The PID terms operate on the error, either velocity or position. In the case of the Velocity Loop, the error is the difference between the ramped reference speed (MP-42) and the feedback speed in EU/Tm; Fb EU/Tm (MP-39). In the case of the Position Loop, the error is the difference between the lead position (multiplied by the ratio) and the feedback position in counts (edges if x4 Quad, pulses if x1 non-quad).

The Proportional term is the result of the error multiplied by the Kp VL (CP-225) or Kp PL (CP-235) constant. This is sometimes referred to as the ‘gain’ term. Increasing the proportional constant, Kp VL (CP-225) should result in a faster response and a smaller error. However, a value that is too large may cause instability. The entered value has a logarithmic influence. If you add 7 to your entered value, you would in effect increase the gain by a factor of 2.

The Integral term is the accumulated sum of the error times the Ki VL (CP-226) or Ki PL (CP-236) constant. Integral is used to ensure zero error in the steady state - constant speed operation. Increasing the integral constant, Ki VL (CP-226), should result in a faster convergence to “0” error. However, you may have to compromise between the convergence rate and overshoot in the response. A value that is too large may cause instability.

The derivative term is the difference between the current error and the previous error times the Kd VL (CP-227) or Kd PL (CP-237) constant. The derivative term is used to damp out overshoot in the response. Its influence is limited and is dependent on the values for Kp VL and Ki VL (Kp PL and Ki PL). A value that is too large may cause instability.

The Integral term is added to the Proportional. The Derivative term is added to the result to form the ‘Trim’. The ‘Trim’ is added to the Feedforward term to produce the CO SIG output. If the Feedforward term is accurate, the Trim Term (MP-47) should be near “0”. In general, this is the desired operation, but there may be reasons to use an inaccurate Kff (CP-224) value.

Using the Open Loop Structure:

You can also run in Open Loop mode. This mode does not act on the error. In Open Loop mode, the CO SIG output is based entirely on the Feedforward.

Additional Parameters that Affect the Loop Operation:

Ramp Thd (CP-255) is the threshold that defines the level which the difference between the Scaled Reference speed and the Ramped Reference speed must exceed for the ramp to function as normal. If the difference is less than Ramp Thd, then the ramp is bypassed and the Ramped Reference speed is set equal to the new Scaled Reference speed. Use Ramp Thd to avoid ramp delays for small changes in the lead, but still ramp for large changes (e.g. start-up).

Deriv Thd VL (CP-228) and Deriv Thd PL (CP-238) are the thresholds that define the level at which the change in the error (velocity and position respectively) must exceed for the derivative to operate. If the change in the error is less than the threshold, then set the derivative term has no effect. The CX-1010 will ignore low-level noise while acting on large signal changes.

If a signal exhibits a good deal of noise (high-frequency low-level fluctuation), you can introduce a low-pass filter to smooth the signal prior to its use in the control algorithms. Use Signal Filter Select (CP-248) to select the signal. Use Signal Fltr Tau (CP-249) to set the time constant of the low-pass filter (5 Milliseconds to 50 Milliseconds).

Tuning the Closed Loop Structures:

To control the response to load disturbances, simulate conditions by changing operating speeds with the ramps disabled (set to minimum accel/decel time) or set Kff (CP-224) to “0” To control the response to changes in the Setpoint/operating speed, use the ramps and Kff (CP-224). If you can not use the lead during the tuning procedure, then temporarily set the ramps to the accel/decel time that the lead would provide. Refer to the following sections to tune the (1) Velocity Loop, (2) Position Loop and (3) Zero Error Loop.

(1) Tuning the Velocity Loop:
If your system can withstand occilation, then use the following procedure (Part A), If your system can not withstand occilation, the go to “Part B” of Tuning the Velocity Loop

DANGER
When you send the drive into oscillations, the system may react with abrupt or violent operation.

Part A / Tuning with Oscillations:

Go to the MAIN MENU.
Go to TUNING \ VELOCITY LOOP\ page 2.
Enter “1” (Vel) in RUN Loop Mode (CP-220).
Go to page 1.
Enter “0” in Ki VL (CP-226) and Kd VL (CP-227).
Enter “100” in Kp VL (CP-225) if your maximum operating speed in less than 8000 EU/Tm.
Enter “50” in Kp VL (CP-225) if the maximum speed is greater than 8000 EU/Tm.
Use the Code key and enter “102” (Setpoint Mode). Scroll to “Mstr” (Master Mode).
Use the Code key and enter “110” (Master SP). Enter a normal operating speed (EU/Tm).
Enter “Run” by activating the Run input.
Go to Kp VL (CP-225) and use the increment key to slowly increment Kp VL until oscillations begin.
Use the decrement key to decrease the Kp VL (CP-225) value until the oscillations stop.
Subtract 20 from this value and enter the new value in Kp VL (CP-225).
Enter “50” in Ki VL (CP-226) and increment Ki VL until oscillations begin.
Decrease the Ki VL (CP-226) value until the oscillations stop.
Subtract 10 from this value and enter the new value in Ki VL (CP-226). The operation should be stable, with satisfactory response.
Use the Code key and enter “110” (Master SP).
Change the Master SP (CP-110) from a low speed to a high speed.
Observe the Scaled Fb (MP-40) or Fb EU/Tm (MP-39) to see if there is unacceptable overshoot.
Either decrease Ki VL (CP-226) or increase Kd VL (CP-227) to decrease the overshoot. However, using Kd VL (CP-227) can introduce a jittery operation at constant speed. You may not be able to completely eliminate the overshoot.
If you have an auxiliary analog card, you can assign the Fb EU/Tm (CP-39) to the Analog Output and observe the response to step changes with an oscilloscope.

Part B / Tuning without Oscillations:

Put the CX-1010 into either “F-Stop” or “R-Stop”.
Enter “50” in Kp VL (CP-225)
Enter “50 ” in Ki VL (CP-226).
Use the Code key and enter “102” (Setpoint Mode). Scroll to “Mstr” (Master Mode).

Use the Code key and enter “110” (Master SP). Enter a Master SP.
Use the Code key and enter “39” (Fb EU/Tm).
Put the CX-1010 in “Run”
Observe the Fb EU/Tm (CP-39) as it matches the Master SP (CP-110).
If there is excessive overshoot (the Fb EU/Tm goes beyond the Master SP), then decrease Ki VL (CP-226).
If there is minimal overshoot, but it takes a long time for the Fb EU/Tm to converge to the Master SP, then increase Ki VL (CP-226) by 10.

Put the CX-1010 into either “F-Stop” or “R-Stop”.
Put the CX-1010 into “Run” and observe the overshoot and convergence rate.
Increase Kp VL by 10 (CP-225).
Repeat this procedure until the convergence rate is acceptable or until oscillations start.
If oscillations occur, back off Ki VL (CP-226) by 10 and then back off Kp VL (CP-225) by 10. This may not result in optimum performance, however, it should stabilize the system.

(2) Tuning the Position Loop:

Go to the MAIN MENU.
Go to TUNING \ POSITION LOOP\ page 2.
Set PsnErr+ (CP-260) and PsnErr- (CP-261) to the maximum position that you want the CX-1010 to make up if the Follower should fall behind.

Use the Code key and enter “268” (FI1PsnRo). FI1PsnRO (CP-268) should be larger than PsnErr+ (CP-260).
Use the Code key and enter “269” (FI2PsnRo). FI2PsnRO (CP-269) should be larger than PsnErr- (CP-261).

If there is no gear reduction between the motor and the encoder:
enter the encoder Pulse per Revolution (PPR) in PPR Mtr (CP-239).
If there is not a one to one correspondence between motor revolutions and encoder Pulse per Revolution (PPR) then calculate the number of encoder Pulse per Revolution (PPR) that will occur for every revolution of the motor:
Enter the number of encoder Pulse per Revolution (PPR) that occur for every revolution of the motor in PPR Mtr (CP-239).

Go to the MAIN MENU.
Go to TUNING \ POSITION LOOP\ page 1.
Enter “50” in Kp PL (CP-235)
Enter “0” in Ki PL (CP-236).
Enter “0” in Kd PL (CP-237).
Use the Code key and enter “102” (Setpoint Mode). Enter “Fol” for Follower.
Put the CX-1010 in “Run”
Start the Lead moving.
The Feedback should follow the Lead speed however, it may lag behind in position.
Monitor the position error in PsnErr (MP-34).

The resolution given for PsnErr is set by the resolution of EU FI2 (CP-168).

Increase Kp PL (CP-235) until the PsnErr (CP-34) begins to converge on “0”.
Continue to Increase Kp PL (CP-235) until the error either reaches “0” or oscillations (instability) occurs.
If instability is reached before the error reaches “0”, then quickly decrease Kp PL (CP-235) until the oscillations cease and then subtract an additional “5” .

Enter “50” in Ki PL (CP-236).
Increase Ki PL (CP-236) until the error is reduced to “0”.
Stop the Lead and then start it again
Observe the rate at which the position error converges on “0”.
If the convergence is too slow, increase Ki PL (CP-236) and try again.
Continue until the convergence and overshoot is acceptable.
You can also use Kd PL (CP-237) to decrease the overshoot, however, it may not be possible to completely eliminate the overshoot.
If the response is too abrupt, use Trim Authority (CP-258) or Integral Limit (CP-259.

(3) Tuning the Zero Error Loop:

Tune the Velocity Loop (see Tuning the Velocity Loop)
Go to the MAIN MENU.
Go to TUNING \ POSITION LOOP\ page 2.
Set PsnErr+ (CP-260) and PsnErr- (CP-261) to the maximum position that you want the CX-1010 to make up if the Follower should fall behind.
Use the Code key and enter “268” (FI1PsnRo). FI1PsnRO (CP-268) should be larger than PsnErr+(CP-260).
Use the Code key and enter “269” (FI2PsnRo). FI2PsnRO (CP-269) should be larger than PsnErr- (CP-261).

If there is no gear reduction between the motor and the encoder:
Enter the encoder Pulse per Revolution (PPR) in PPR Mtr (CP-239).
If there is not a one to one correspondence between motor revolutions and encoder Pulse per Revolution (PPR) then calculate the number of encoder Pulse per Revolution (PPR) that will occur for every revolution of the motor:
Enter the number of encoder Pulse per Revolution (PPR) that occur for every revolution of the motor in PPR Mtr (CP-239).

Go to the MAIN MENU.
Go to TUNING \ VELOCITY LOOP/ZE\ page 1.
Enter “50” in Kp ZE (CP-229)
Use the Code key and enter “102” (Setpoint Mode). Enter “Fol” for Follower.
Put the CX-1010 in “Run”
Start the Lead moving.
The Feedback should follow the Lead speed however, it may lag behind in position.
Monitor the position error in PsnErr (MP-34).
The resolution given for PsnErr is set by the resolution of EU FI2 (CP-168).
Increase Kp ZE (CP-229) until the PsnErr (CP-34) begins to converge on “0”.
Stop the Lead and then start it again
If the convergence is too slow, increase Kp ZE (CP-239) and try again.
Continue until the convergence and overshoot is acceptable.
If large errors accumulate (with large values in PsnErr+ and PsnErr-), then use ZE Limit (CP-253) to control the rate at which the position is recovered.
Go to page 2 of Velocity Loop/ZE.
The ZE Limit (CP-253) limits the amount of speed that the CX-1010 will command in excess of the Lead to compensate for large position errors. The effect is equivalent to specifying the number of EU’s to make up in the given Time Base (CP-109).

Using the Feedforward:

The Feedforward provides the majority of the CO SIG output and the PID adds a small amount of trim . The combination produces the CO SIG output for the operating speed at which you want your system to run. The value of the signal (usually Ramped Reference) in Ff Source (CP-106) is multiplied by Kff (CP-224) in order to produce the feedforward term. The feedforward term is proportional to the desired operating speed and is only used in conjunction with velocity mode drives. The Kff (CP-224) constant is given in terms of volts/(1000 EU/Tm).

Kff (CP-224) is recalculated by the CX-1010 at each time interval that has been entered in KffAdjUpdt (CP-242). Kff (CP-224) is used for closed loop and open loop operation.

Kff Auto EN (CP-245) enables or disables the Kff and allows the Kff to be automatically adjusted by the CX-1010.

Automatic Feedforward Adjustment:

Go to the MAIN MENU.
Go to TUNING \ FEEDFORWARD\ page 1.
Enter MaxFb (CP-233).
Put the CX-1010 in either "Run" or "Jog"
Enter "1" (enabled) in Kff Auto En (CP-244).
Enter a time interval in KffAdjUpdt (CP-242).
The CX-1010 will calculate the Kff CL according the time interval in KffAdjUpdt (CP-242).

VELOCITY LOOP

The Velocity Loop screen includes parameters for the loop-type selection, the PID parameters for the Velocity Loop (Kp VL,Ki VL,Kd), and four tuning monitor parameters

CNTRL LOOP (MP-45)

Control Loop (MP-45) displays the type of loop (see list below) that is in current use. Only one type of loop can be active at a time.

5 = Psn Hld ("H-Stop" Position Loop)
4 = ZE Hld ("H-Stop" ZE Position Loop)
3 = Psn (Position Loop)
2 = ZE Psn (Zero Error Loop)
1 = Vel (Velocity Loop)
0 = OL (Open Loop)

KP VL (CP-225)

Kp Velocity Loop (CP-225) is the proportional gain constant for the PID velocity loop. An increase in Kp VL (CP-225) creates a quicker response and a smaller error. However, a value that is too large will cause instability. If the integral term is used, (i.e., Ki VL not equal to zero) then a nonzero Kp VL can actually improve the loop response and decrease the overshoot to some extent.

KI VL (CP-226)

Ki Velocity Loop (CP-226) is the Integral constant for the PID velocity loop. Integral action provides for zero steady state error. Increase Ki VL (CP-226) for a faster convergence to zero error. However, a value that is too large will cause instability.

KD VL (CP-227)

Kd Velocity Loop (CP-227) is the derivative constant for the PID velocity loop. Derivative action attempts to damp out overshoot. Its effect is highly dependent on Kp VL and Ki VL, but, generally, too large a value causes instability

Trim Out (MP-47)

Trim Out (MP-47) displays the value of the output of the PID compensator. Trim Out is displayed in CO DAC bits.

CO BITS (MP-20)

Control Output Bits (MP-20) displays the present value, in DAC bits, of the CO_SIG Analog Output signal.

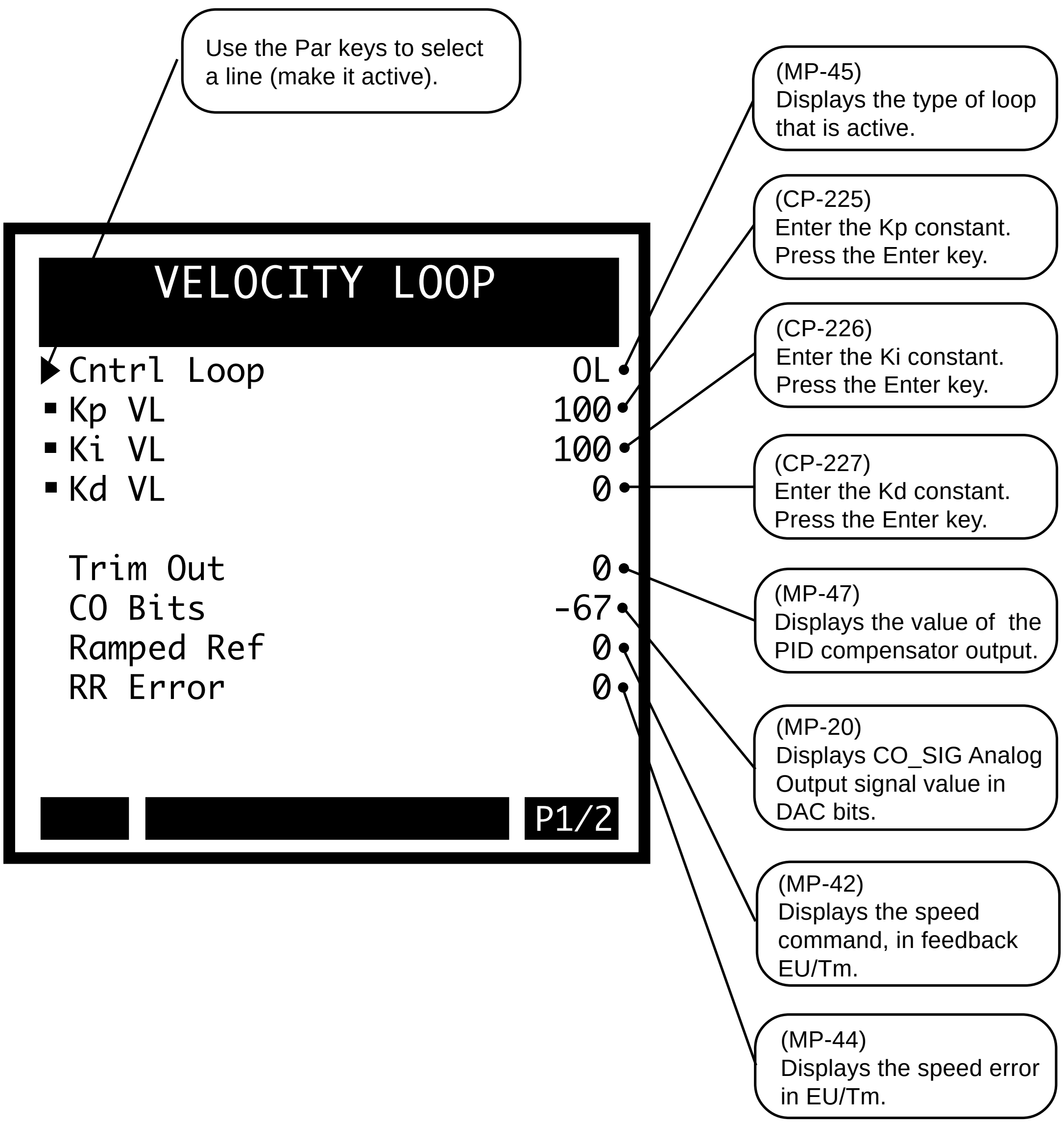
RAMPED REF (MP-42)

Ramped Reference (MP-42) displays the speed command, in feedback Engineering Units per Time. This is the output of the ramp calculations. When the ramp has been completed, the Ramped Reference (MP-42) should equal the Scaled Reference (MP-41).

RR ERROR (MP-44)

Ramped Reference Error (CP-44) displays the speed error in engineering units per time. This is the Ramped Reference (MP-42) minus the Fb EU/Tm (MP39). The Ramped Reference is the current speed command.

The Velocity Loop screens are accessed through
—> Main Menu / Tuning <—



Velocity Loop

Kff Auto En (CP-244)

Kff Automatic Enable (CP-244) enables the CX-1010 automatic adjustment of Kff (CP-224) at the specified KffAdjUpdt interval (CP-242) in “Run” or “Jog” with the loop closed.

1 = ON = Enabled
0 = OFF = Disabled (default)

RUN Loop Mode (CP-220)

RUN Loop Mode (CP-220) identifies the type of control loop (see list below) that is used during Run.

3=Position Loop
2=ZE Loop (Psn + Vel)
1=Velocity Loop *
0=Open Loop

Trim Authority (CP-258)

The trim contribution to the DAC output is limited to positive and negative Trim Authority (CP-258).

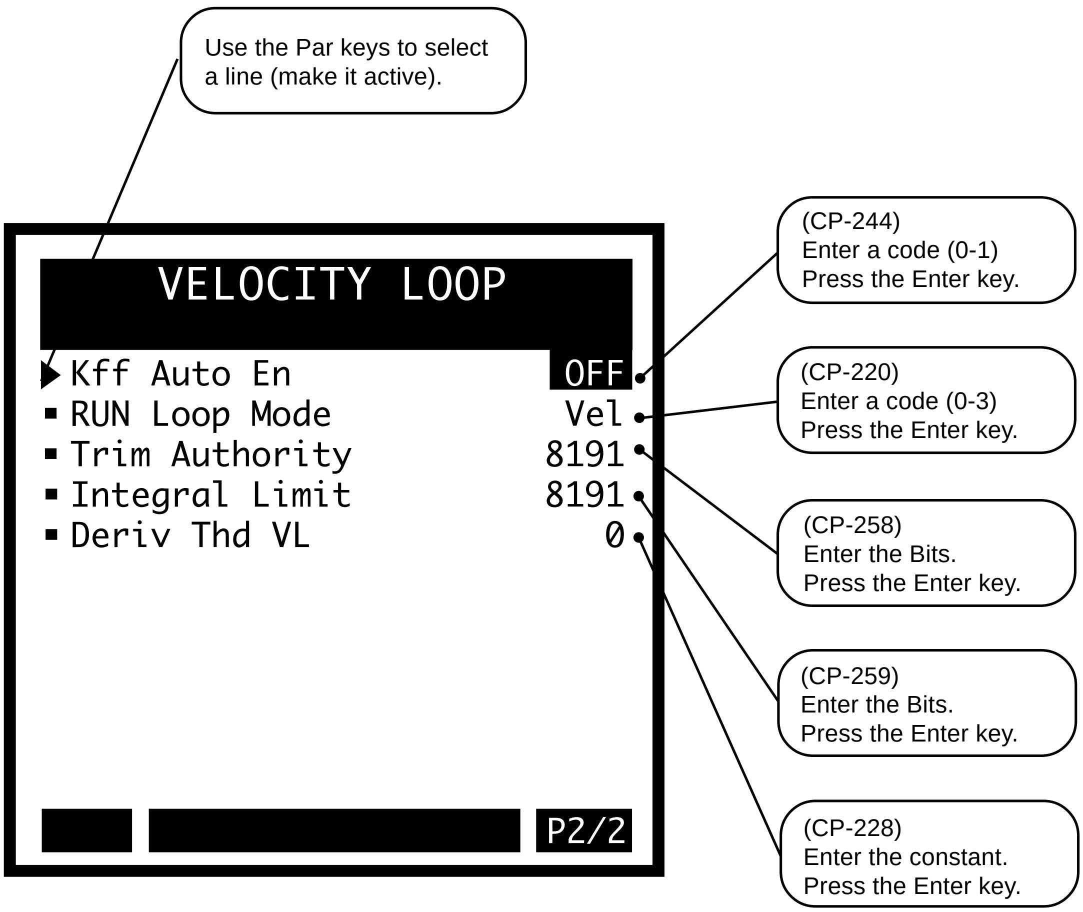
Integral Limit (CP-259)

The integral contribution to the trim term is limited to the positive and negative Integral Limit (CP-259). Integral Limit (CP-259) can decrease the effects of integral windup or it can limit the maximum effect of the integral term.

Deriv Thd VL (CP-228)

Derivative Threshold Velocity Loop (CP-228) is the minimum speed error that is required before the derivative term in the PID velocity algorithm gains influence. Increase the derivative threshold to prevent the derivative term from acting on either signal noise from the Lead.

The Velocity Loop screen (page 2).



VELOCITY LOOP / ZE

The Velocity Loop / ZE screen includes the relevant parameters for the zero error loop.

CNTRL LOOP (MP-45)

Control Loop (MP-45) displays the type of loop (see list below) that is in current use. Only one type of loop can be active at a time.

5 = Psn Hld (“H-Stop” Position Loop)
4 = ZE Hld (“H-Stop” ZE Position Loop)
3 = Psn (Position Loop)
2 = ZE Psn (Zero Error Loop)
1 = Vel (Velocity Loop)
0 = OL (Open Loop)

KP VL (CP-225)

Kp Velocity Loop (CP-225) is the proportional gain constant for the PID velocity loop. An increase in Kp VL (CP-225) creates a quicker response and a smaller error. However, a value that is too large will cause instability. If the integral term is used, (i.e., Ki VL not equal to zero) then a nonzero Kp VL can actually improve the loop response and decrease the overshoot to some extent.

KI VL (CP-226)

Ki Velocity Loop (CP-226) is the Integral constant for the PID velocity loop. Integral action provides for zero steady state error. Increase Ki VL (CP-226) for a faster convergence to zero error. However, a value that is too large will cause instability.

KD VL (CP-227)

Kd Velocity Loop (CP-227) is the derivative constant for the PID velocity loop. Derivative action attempts to damp out overshoot. Its effect is highly dependent on Kp VL and Ki VL, but, generally, too large a value causes instability.

Kp ZE (CP-229)

Kp ZE (CP-229) is the proportional gain constant that is used for the zero error loop. Increase the value to reduce the time that is required to converge to zero position error. A large value can cause instability.

Trim Out (MP-47)

Trim Out (MP-47) displays the value of the output of the PID compensator. Trim Out is displayed in CO DAC bits.

CO BITS (MP-20)

Control Output Bits (MP-20) displays the present value, in DAC bits, of the CO_SIG Analog Output signal.

RAMPED REF (MP-42)

Ramped Reference (MP-42) displays the speed command, in feedback Engineering Units per Time. This is the output of the ramp calculations. When the ramp has been completed, the Ramped Reference (MP-42) should equal the Scaled Reference (MP-41).

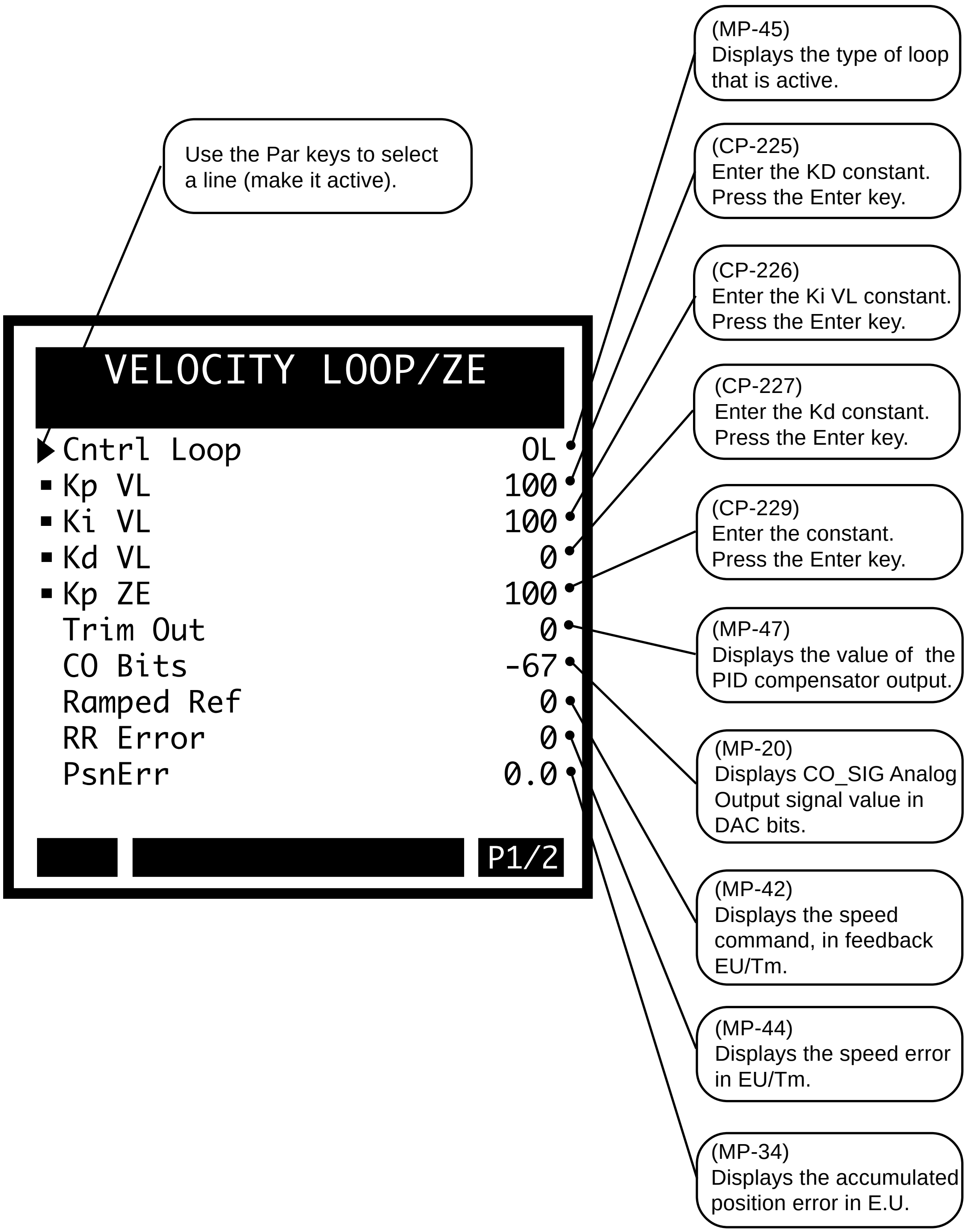
RR ERROR (MP-44)

Ramped Reference Error (CP-44) displays the speed error in engineering units per time. This is the Ramped Reference (MP-42) minus the Fb EU/Tm (MP39). The Ramped Reference is the current speed command.

PsnErr (MP-34)

Position Error (MP-34) displays the value, in engineering units, of the accumulated position error between the Lead (FI1) and the Feedback (FI2) input signals. The placement of the decimal point is the same as the placement of the decimal point in EU FI2 (CP-168).

The Velocity Loop / ZE screens are accessed through
—> Main Menu / Tuning <—



Velocity Loop / ZE

Kff Auto En (CP-244)

Kff Automatic Enable (CP-244) enables the CX-1010 automatic adjustment of Kff (CP-224) at the specified KffAdjUpdt interval (CP-242) in “Run” or “Jog” with the loop closed.

1 = ON = Enabled
0 = OFF = Disabled (default)

RUN Loop Mode (CP-220)

RUN Loop Mode (CP-220) identifies the type of control loop (see list below) that is used during Run.

3=Position Loop
2=ZE Loop (Psn + Vel)
1=Velocity Loop *
0=Open Loop

ZE Limit (CP-253)

ZE Limit (CP-253) is the maximum authority for the zero error term. The excess speed that is required to recover large position errors is limited to this value. Enter the EU's that are required to recover the Time Base (CP-109).

Trim Authority (CP-258)

The trim contribution to the DAC output is limited to positive and negative Trim Authority (CP-258).

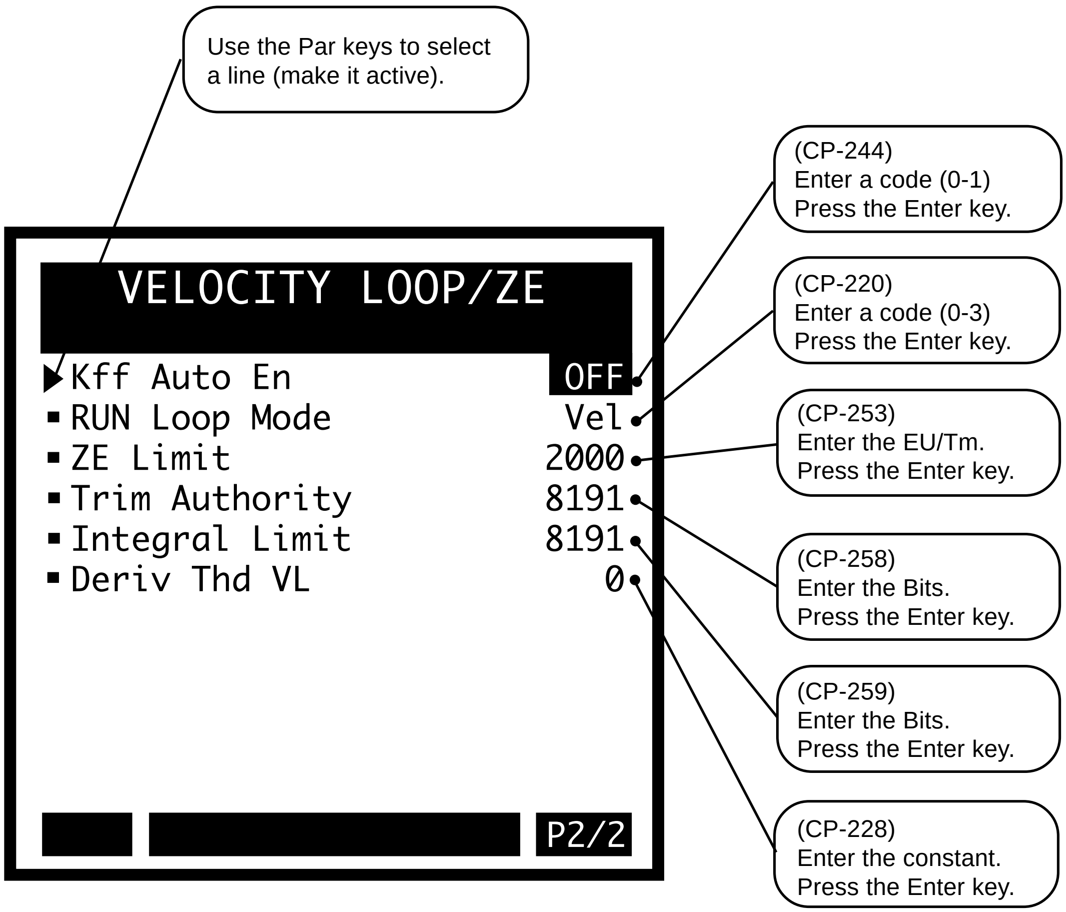
Integral Limit (CP-259)

The integral contribution to the trim term is limited to the positive and negative Integral Limit (CP-259). Integral Limit (CP-259) can decrease the effects of integral windup or it can limit the maximum effect of the integral term.

Deriv Thd VL (CP-228)

Derivative Threshold Velocity Loop (CP-228) is the minimum speed error that is required before the derivative term in the PID velocity algorithm gains influence. Increase the derivative threshold to prevent the derivative term from acting on either signal noise from the lead.

The Velocity Loop / ZE screen (page 2).



POSITION LOOP

The Position Loop screen includes the parameters for Kp PL, Ki PL, Kd PL for the standard Position Loop. The Position Loop screen also includes the relevant parameters for the position and the position error counters. The Position Loop screen includes other miscellaneous parameters related to the control loop and the signal conditioning.

CNTRL LOOP (MP-45)

Control Loop (MP-45) displays the type of loop (see list below) that is in current use. Only one type of loop can be active at a time.

5 = Psn Hld ("H-Stop" Position Loop)
4 = ZE Hld ("H-Stop" ZE Position Loop)
3 = Psn (Position Loop)
2 = ZE Psn (Zero Error Loop)
1 = Vel (Velocity Loop)
0 = OL (Open Loop)

Kp PL (CP-235)

Kp PL (CP-235) is the proportional gain constant for the PID position loop. Increasing Kp PL (CP-235) will have a quicker the response and a smaller position error. However, a value that is too large could result in overshoot and instability. You can eliminate most or all of the error in the position loop with the proportional term (Kp PL). Use an integral only if Kp PL (CP-235) alone can not eliminate the error to your specification.

Ki PL (CP-236)

Ki PL (CP-236) is the integral constant for the PID position loop. Integral action provides for zero steady state error. Increase Ki PL (CP-236) for a faster convergence to zero error. However, a value that is too large will cause instability. Use Ki PL (CP-236) first to eliminate the error to your specification. If this produces unacceptable results, then decrease Kp PL (CP-235) and introduce the integral by gradually increasing Ki PL (CP-236).

Kd PL (CP-237)

Kd PL (CP-237) is the derivative constant for the PID position loop. Derivative action damps out overshoots, however, its effect is limited and is highly dependent on Kp PL (CP- 235), Ki PL (CP- 236) and the given process dynamics. A value that is too large can cause instability.

Trim Out (MP-47)

Trim Out (MP-47) displays the value of the output of the PID compensator. Trim Out is displayed in CO DAC bits.

CO BITS (MP-20)

Control Output Bits (MP-20) displays the present value, in DAC bits, of the CO_SIG Analog Output signal.

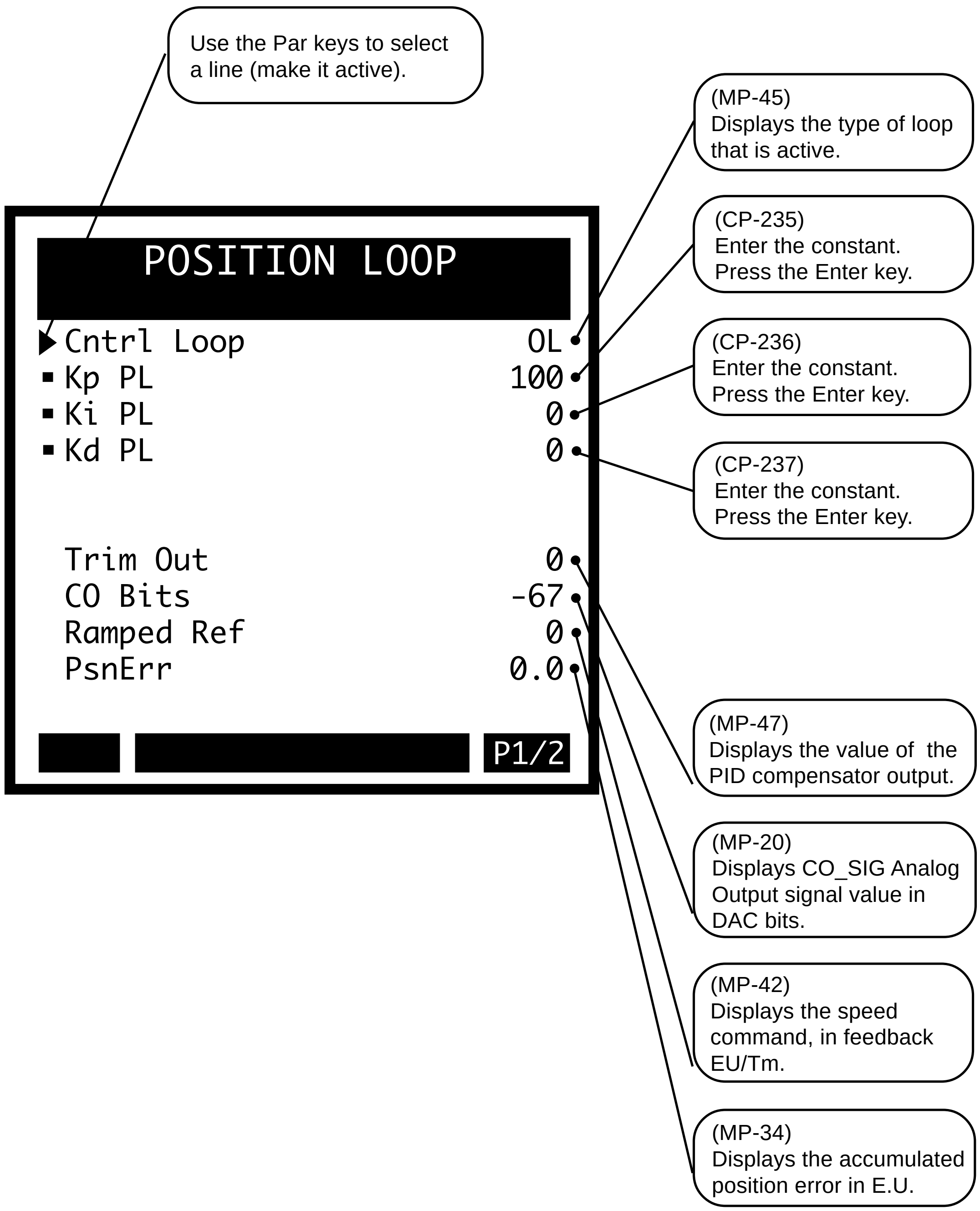
RAMPED REF (MP-42)

Ramped Reference (MP-42) displays the speed command, in feedback Engineering Units per Time. This is the output of the ramp calculations. When the ramp has been completed, the Ramped Reference (MP-42) should equal the Scaled Reference (MP-41).

PsnErr (MP-34)

Position Error (MP-34) displays the value, in engineering units, of the accumulated position error between the Lead (FI1) and the Feedback (FI2) input signals. The placement of the decimal point is the same as the placement of the decimal point in EU FI2 (CP-168).

The Position Loop screens are accessed through
—> Main Menu / Tuning <—



Position Loop

Kff Auto En (CP-244)

Kff Automatic Enable (CP-244) enables the CX-1010 automatic adjustment of Kff (CP-224) at the specified KffAdjUpdt interval (CP-242) in “Run” or “Jog” with the loop closed.

1 = ON = Enabled
0 = OFF = Disabled (default)

RUN Loop Mode (CP-220)

RUN Loop Mode (CP-220) identifies the type of control loop (see list below) that is used during Run.

3=Position Loop
2=ZE Loop (Psn + Vel)
1=Velocity Loop *
0=Open Loop

Trim Authority (CP-258)

The trim contribution to the DAC output is limited to positive and negative Trim Authority (CP-258).

Integral Limit (CP-259)

The integral contribution to the trim term is limited to the positive and negative Integral Limit (CP-259). Integral Limit (CP-259) can decrease the effects of integral windup or it can limit the maximum effect of the integral term.

Deriv Thd PL (CP-238)

Derivative Threshold Position Loop (CP-238) is the minimum position error that is required before the derivative term in the PID velocity algorithm gains influence. Increase the derivative threshold to prevent the derivative term from acting on either signal noise from the lead.

PsnErr+ (CP-260)

The maximum positive value of the accumulated position error is limited to Positive Position Error (CP-260). Use Positive Position Error (CP-260) when the lead is in motion, but the follower is stopped. Since the follower does not have to recover its former position relative to the lead, the Positive Position Error (CP-260) can be used to limit the amount of position error that accumulates while the lead continues to move. In Positive Position Error (CP-260), the follower lags behind the lead when both are moving in the positive direction.

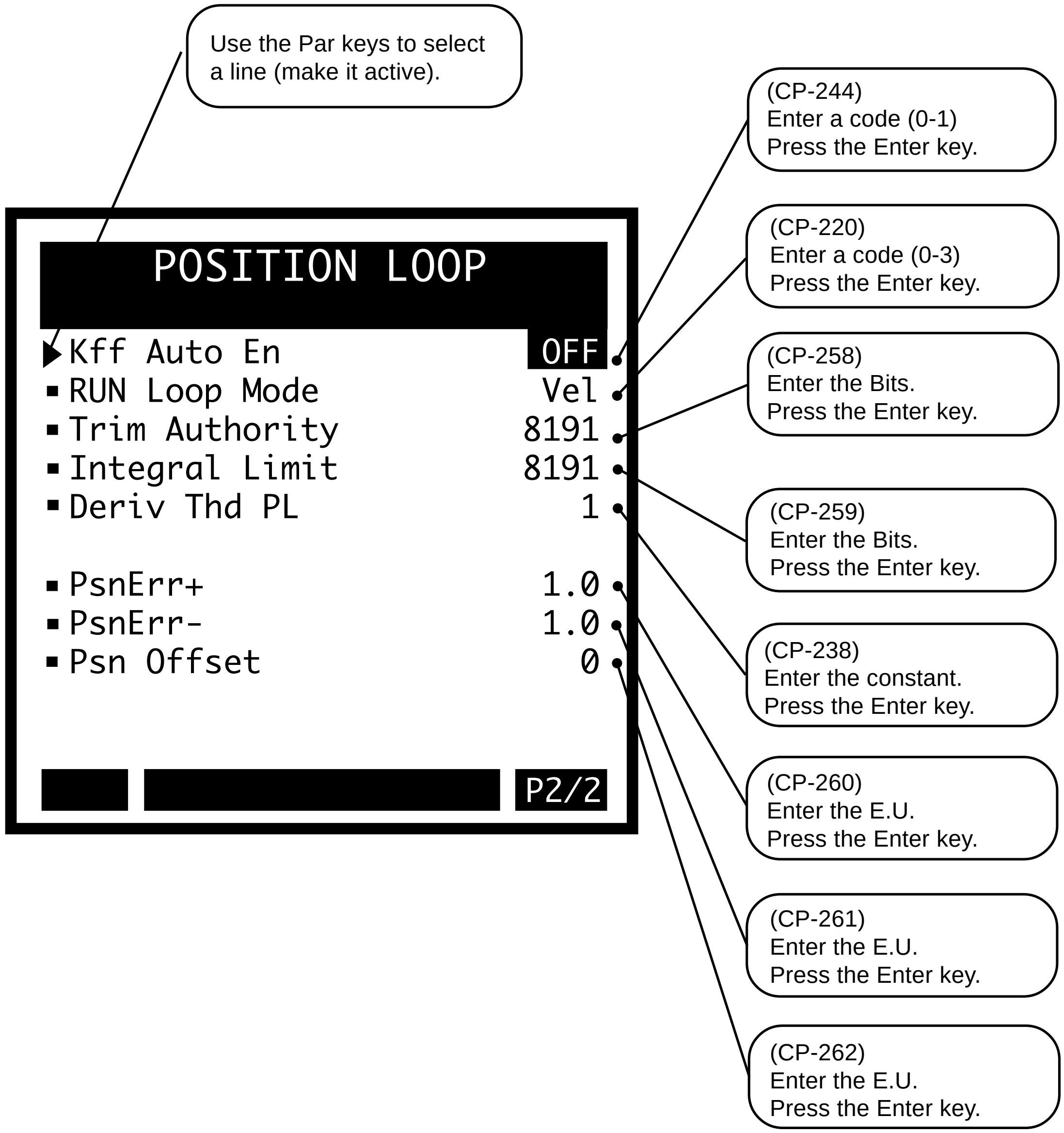
PsnErr- (CP-261)

The maximum negative value of the accumulated position error is limited to Negative Position Error (CP-261). In Negative Position Error (CP-261), the follower is ahead of the lead when both are moving in the positive direction. If both are moving in the negative direction in Negative Position Error (CP-261), the follower lags behind the lead.

Psn Offset (CP-262)

Add Position Offset (CP-262) to the PsnErr (CP-34) to offset the feedback position by the amount of EU’s that are specified in Psn Offset (CP-262). The position loop must be active for the offset to occur.

The Position Loop screen (page 2).



FEEDFORWARD

Kff Auto En (CP-244)

Kff Automatic Enable (CP-244) enables the CX-1010 automatic adjustment of Kff (CP-224) at the specified KffAdjUpdt interval (CP-242) in “Run” or “Jog” with the loop closed.

1 = ON = Enabled   0 = OFF = Disabled (default)

KffAdjUpdt (CP-242)

Kff Adjust Update (CP-242) sets the sampling period for the Kff calculation, when it is enabled, as well as for the EstMaxFb (CP-49) calculation. KffAdjUpdt (CP-242) is the time interval between each new Kff calculation and the automatic store to the Kff parameters depending on whether Kff Auto En (CP-244) is enabled.

5 = 10 Min Update	4 = 1 Min Update	3 = 10 Sec Update
2 = 1 Sec Update (default)	1 = 250 Msec Update	

Ff Source (CP-106)

Feedforward Source (CP-106) identifies the source of the Feedforward signal. Feedforward's default setting is "0” (Ramped-Reference) which is also the Velocity Command. The default setting is used most frequently.

WARNING: To insure proper operation, set Feedforward Source (CP-106) to "0” (Ramped Reference) when RUN Loop Mode (CP-220) is set to “2” (Position loop).

2=Analog In 1   1=Frequency In 1   0=Ramped Reference (default)

Kff (CP-224)

Kff (CP-224) scales the velocity feedforward that is selected in Ff Source (CP-106) to the CO_SIG Analog Output (J3, pin 1). Use Kff when operating in closed loop with velocity mode drives. You can either enter a value or you can have the CX-1010 calculate a value for you. The CX-1010 will automatically calculate a more accurate value for Kff (CP-224) at periodic intervals (which is based on KffAdjUpdt, CP-242), if you enable Kff Auto En (CP-244) when your system is in “Run”.

Max Fb (CP-233)

Maximum Feedback (CP-233) and CO Max Volts (CP-181) are used to calculate a rough approximation for Kff (CP-224). When a new Maximum Feedback (CP-233) value is entered, then Kff (CP-224) reflects a new value also . MaxFB also helps determine the limits used in the automatic adjustment of Kff when it is enabled.

EstMaxFb (MP-49)

Estimated Maximum Feedback (MP-49) displays the estimated maximum RPM, which the CX-1010 calculates during the Kff adjustment, by referencing the CO Max Volts (CP-181), the CO Volts (MP-31) and the Fb EU/Tm (MP-39) . Use Estimated Maximum Feedback (MP-49) to determine if the drive and CO_SIG are scaled correctly.

Trim Out (MP-47)

Trim Out (MP-47) displays the value of the output of the PID compensator. Trim Out is displayed in CO DAC bits.

Feedforward (MP-46)

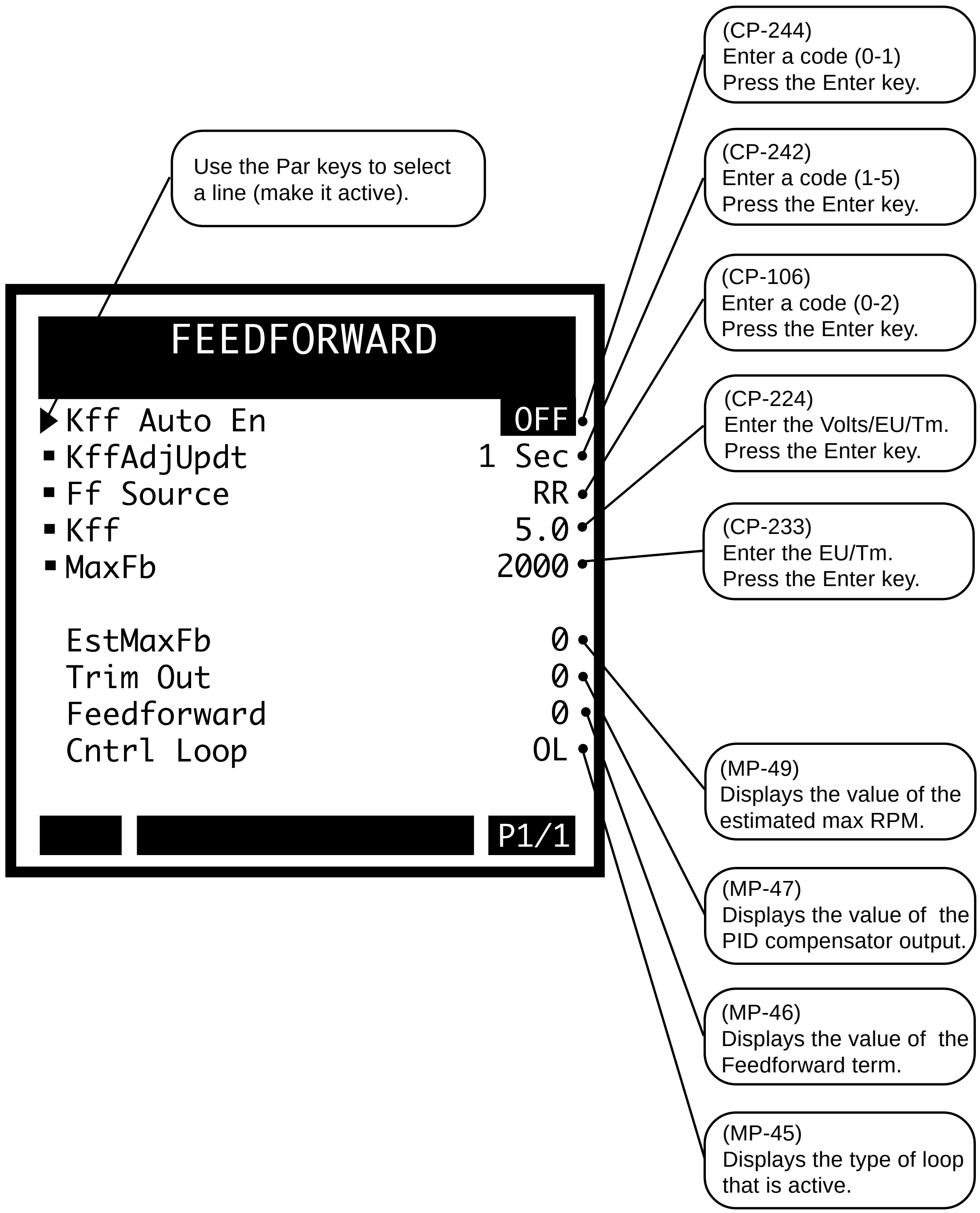
Feedforward (MP-46) displays the value of the feedforward term in CO DAC bits.

Cntrl Loop (MP-45)

Control Loop (MP-45) displays the type of loop (see list below) that is in current use. Only one type of loop can be active at a time.

5 = Psn Hld (“H-Stop” Position Loop)	4 = ZE Hld (“H-Stop” ZE Position Loop)	3 = Psn (Position Loop)
2 = ZE Psn (Zero Error Loop)	1 = Vel (Velocity Loop)	0 = OL (Open Loop)

The Feedforward screen is accessed through
—> Main Menu / Tuning <—



RELATED ITEMS

The Related Items screen includes

Drive Type (CP-222)

Drive Type (CP-222) allows you to choose either the torque or the velocity type (see list below) for the drive so you can give meaning to the CO_SIG. The velocity feedforward is disabled for the ”Torque Type” (2) drives.

2=Torque Type
1=Velocity Type *

Loop Update (CP-241)

Loop Update (CP-241) is the time interval between the CO_SIG output calculations. This interval sets the sampling rate of the PID control loop.

3 = 100 Msec Update
2 = 10 Msec Update
1 = 1 Msec Update (default)

Signal Fltr Sel (CP-248)

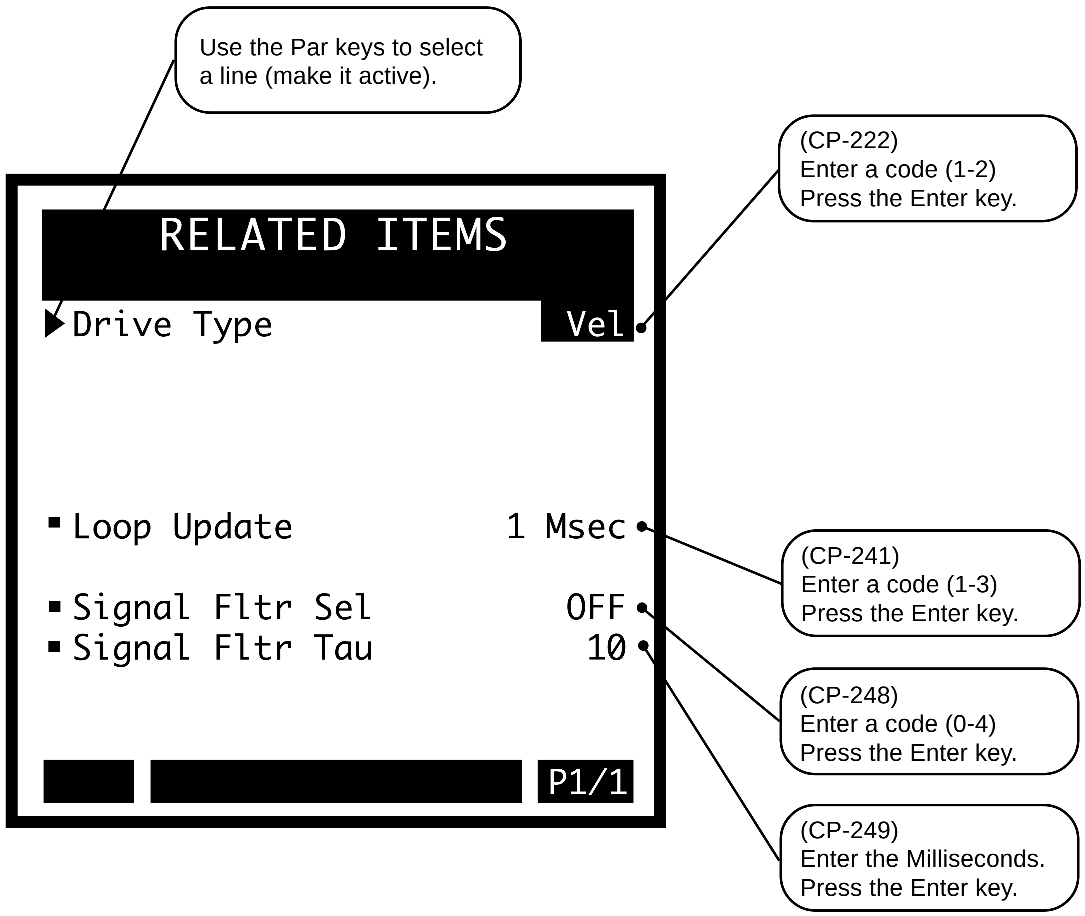
Signal Filter Select (CP-248) selects the signal to route through a low pass filter. The effect is visible on the speed value.

4 = Analog In 2	3 = Frequency In 2	2 = Analog In 1
1 = Frequency In 1	0 = Not Used (default)	

Signal Fltr Tau (CP-249)

Signal Fltr Tau sets the time constant in milliseconds for the signal filter.

The Related Items screen is accessed through
—> Main Menu / Tuning <—



—NOTES—

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BLOCK SETUP

The blocks are used as a quick access to a group of Control Parameters whose values will need to be changed over the course of your system's operation. For example, the Blocks could be used to switch between speed setpoints and ratio setpoints. You can assign up to sixteen Control Parameters to the blocks. There are eight blocks that allow you to assign eight values to each of the sixteen Control Parameters. The blocks can be set up so that the active block (the block currently in use) can be selected through a switch.

Caution: To avoid damage to your system, the CX-1010 must be calibrated and the motor drive set up before you operate your system. Refer to *Drive Setup / Calibration: Calibration*.

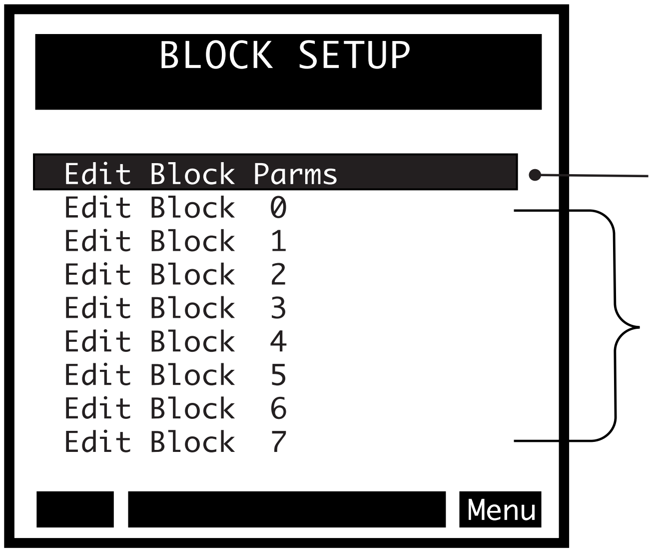
The Block Setup screens are:

- Edit Block Parms
- Edit Blk 0
- Edit Blk 1
- Edit Blk 2
- Edit Blk 3
- Edit Blk 4
- Edit Blk 5
- Edit Blk 6
- Edit Blk 7

—NOTES—

Block Setup

Use the blocks to assign eight different values to a single Control Parameter. Up to sixteen Control Parameters can each be assigned to each of the eight different blocks.



Up to sixteen Control Parameters are assigned to the blocks in Edit Block Parms.

Each one of the Control Parameters that was assigned in Edit Blocks Parms (above) can be assigned eight different parameter values in the Edit Block (0-7) screens.

The block (Edit Block 0-7) that is active determines which of the eight values is used.

You can use either the PLC or the Keypad to change the active block.

To use the PLC to change the active block:
There are 3 PLC bits that are associated with the block selection: Block Select A, Block Select B and Block Select C. Make bits active by setting the bit equal to “1”. Select the active block in a binary (octal). The following table represents the PLC Bit logic:

BlkSel C	BlkSel B	BlkSel A	Active Block
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

To use the Keypad to change the active block:
Transfer control to the keypad by entering “2” (kypd) in Blk Sel Source (CP-378). To make a block active, enter the block's number in Keypad Blk Sel (CP-379). The active block is displayed in Active Block (MP-51).

DANGER
When you change the active block, the new values are loaded and can operate the system immediately. This can cause abrupt operation.

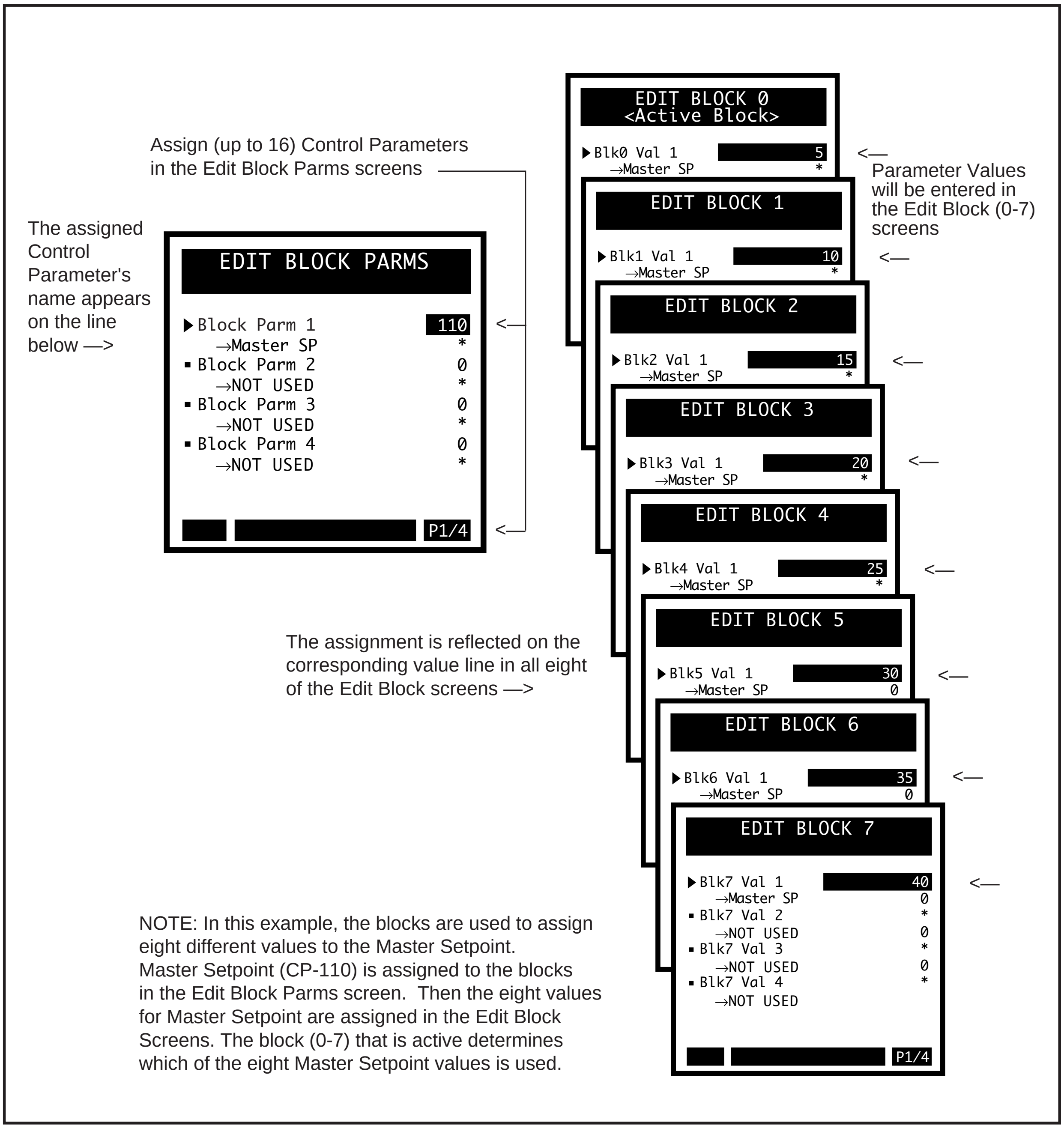
For more information on selecting and monitoring the active block, refer to *System Monitoring (MP) / System Monitor / Control Overrides*.

EDIT BLOCK PARMS

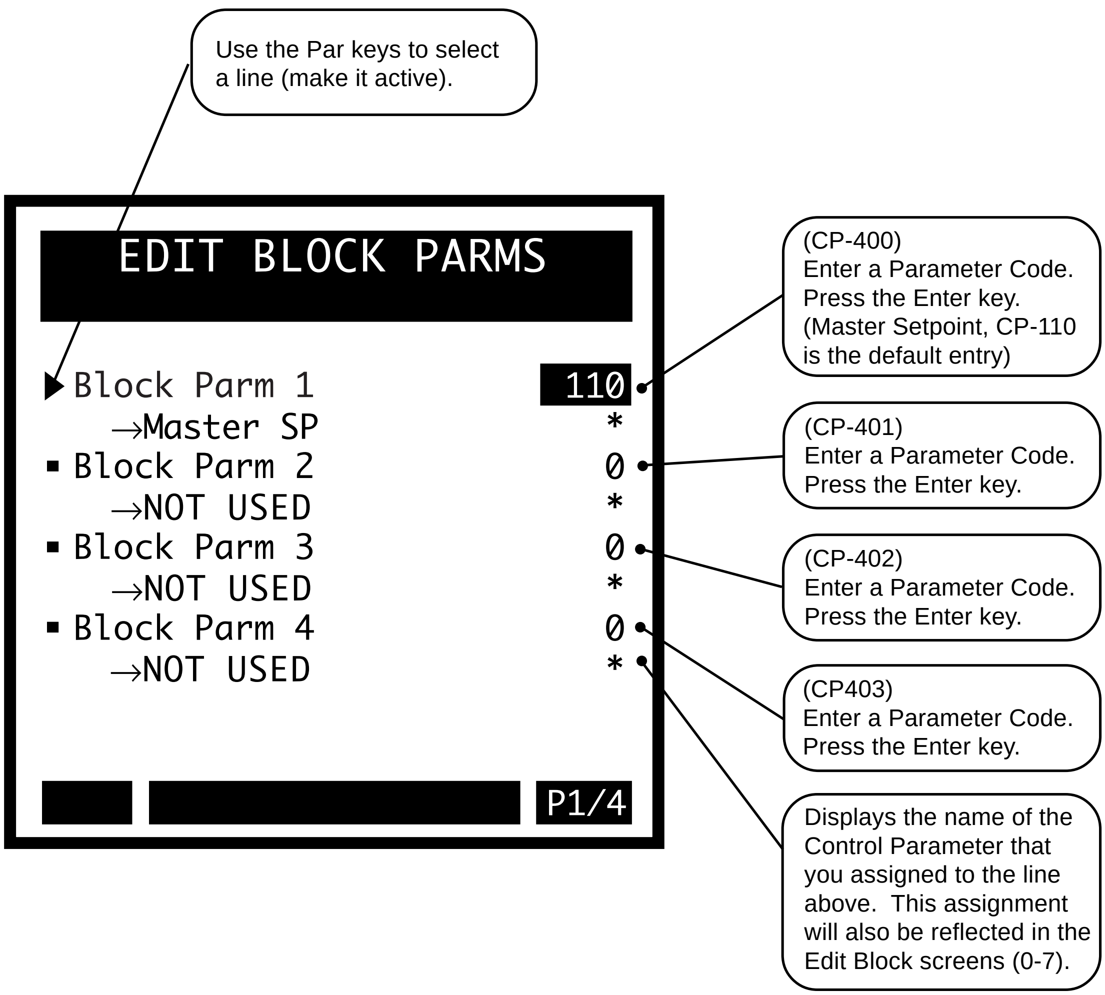
Block Parm 1 - Block Parm 16 (CP-400 to CP-415)

The Edit Block Parms screens (pages 1-4) contain sixteen lines (Block Parm 1- 16) that allow you to assign sixteen Control Parameters to Block Parms 1 through Block Parms 16 (CP-400 to CP-415). In turn, these Control Parameter assignments are reflected in corresponding lines in the Edit Blocks (0-7) screens (where the Control Parameter values are selected). When you enter a Parameter Code for a specific Control Parameter in a Block Parameter line (Block Parm 1-16) , the parameter's name will appear immediately below that Block Parameter line. Enter a "0" in the Block Parameter line(s) that you do not want to assigned Control Parameter. The line immediately below will display "Not Used". Master Setpoint (CP-110) is the default Control Parameter that is assigned to Block Parm 1. You can not assign Monitor Parameters to Edit Block Params.

The graphic matrix below displays the interaction between the Edit Block Parms screens and the Edit Block 0-7 screens:



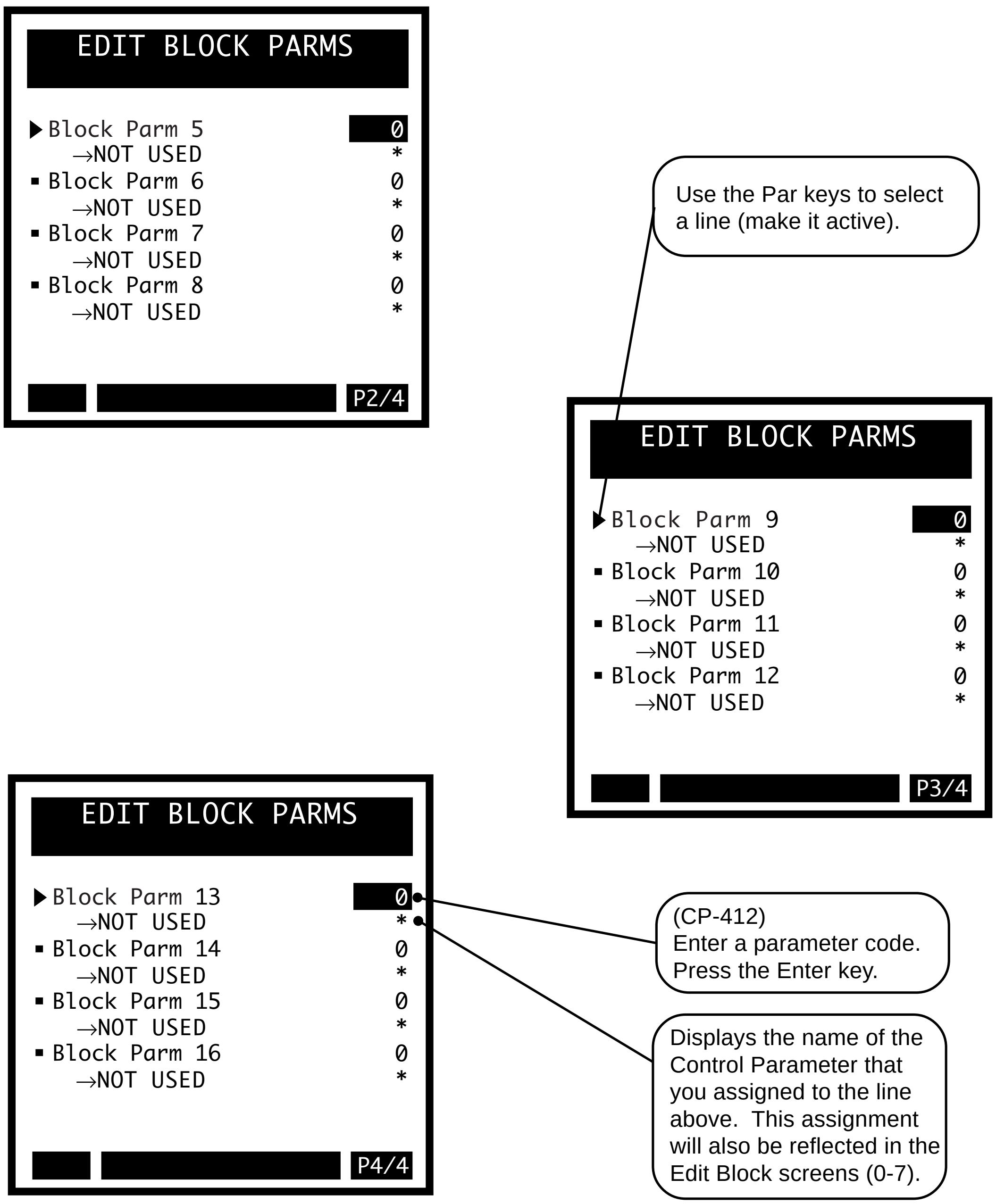
The Edit Block Parms screens are accessed through
—> Main Menu / Block Setup <—



Use the Page keys to scroll through pages 2 through 4 of the Edit Block Parms screens. These screens are similar to each other and to the page one screen that is displayed on the previous page. Enter Control Parameter codes in these screens, as noted below.

If you enter a Control Parameter code that is already in use, then the “Not Allowed“ messages will flash briefly in the error message bar. If you enter a code that does not exist, the “Not Used” designation (or Parameter Name if the line is in use) beneath the Block Parm line will change to “Not Defined”. However, if you enter a code that does not exist and the code number is higher than “350“, then the error message “Max Error” will flash briefly in the error message bar.

If you accidently enter too many digits for a code (e.g., 1022), the error message “Field Full” will flash briefly.

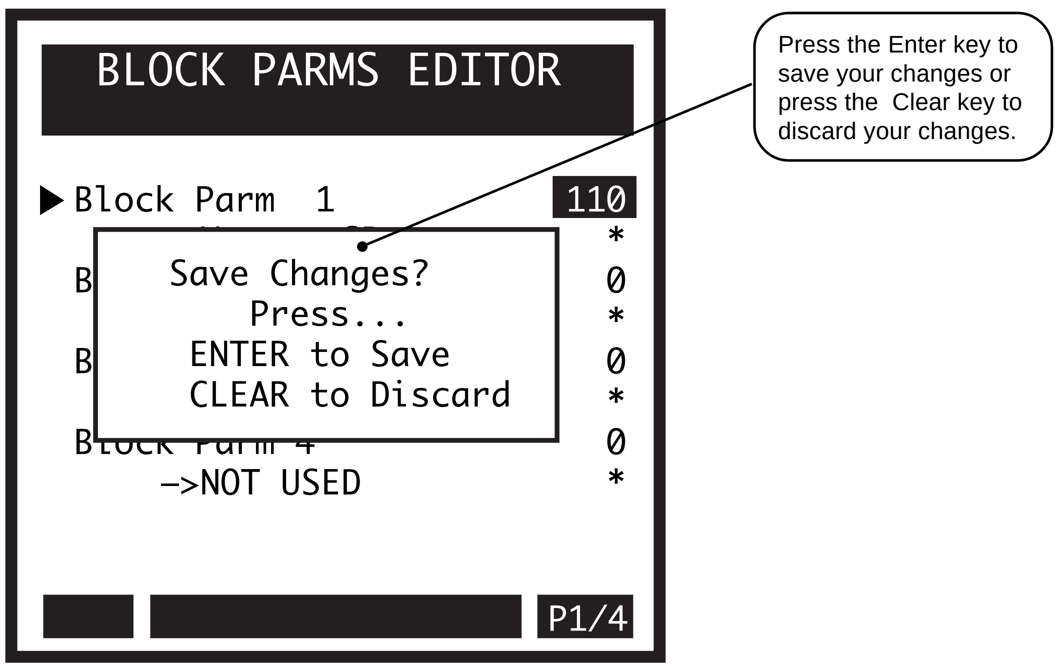


Edit Block Parms / Save

Press the Menu key from any of the Edit Block Parms screens to exit. If you have made changes in any of the screens, a dialog box will pop up and give you the opportunity to either save or to discard your changes.

If you have entered Control Parameters that can not be used in the blocks, then the code for each Control Parameter that can not be used are highlighted, one by one, and the error message “Invalid Parm” will flash five times in the error bar. Change all Control Parameter codes that are highlighted and exit Edit Block Parms again. You can not save changes unless all fo the“Invalid Parm” codes have been changed. Control Parameters that can be used are in the range of CP-102 through CP-106 and CP-109 through CP-349.

If you have entered a combination of 16 Control Parameters that create more internal variables than the CX-1010 can execute, then the error message“Parm Mem Lmt” will flash twice in the error bar. Any new Control Parameter codes that you entered will default back to “zero”.   Although this scenario is rare, it can occur. Either use different Control Parameters or use fewer Control Parameters.



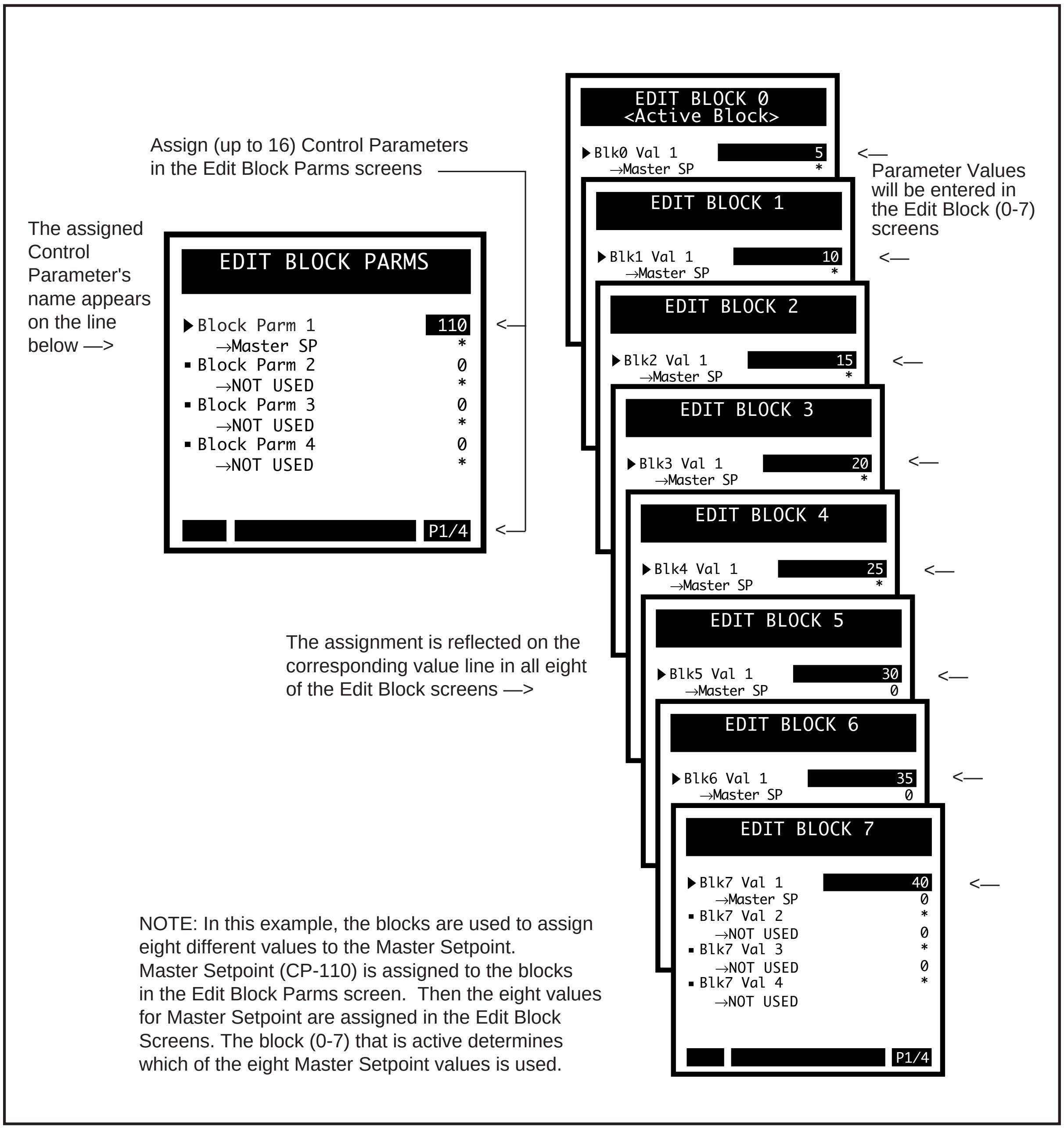
EDIT BLOCK 0 THROUGH 7

Blk0 Val 1 - Blk7 Val 16   (CP-440 to CP-567)

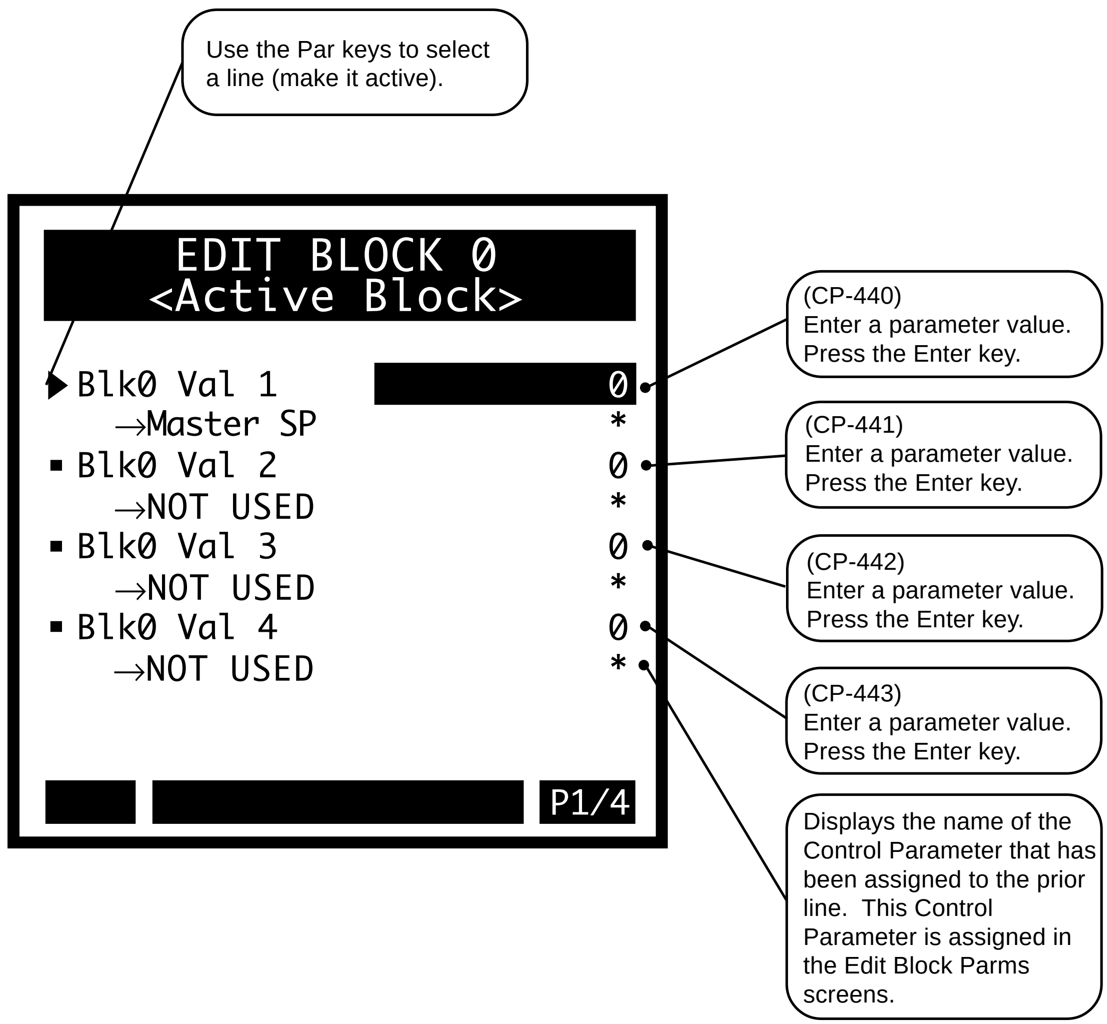
Use the Block Values (CP-440 to CP-567) to assign Parameter Values to the Control Parameters that were designated by name in the Edit Block Parms screens (CP-400 to CP-415). Edit Blocks 0-7 allow you to assign up to eight different values to a single Control Parameter by entering a different Parameter Value in each of the Edit Block screens (0-7). The graphic matrix below displays the interaction between the Edit Block Parms screens and the Edit Block 0-7 screens.

The block of Control Parameters and corresponding values that is in current use, is called the “active” block. The active block is selected in either the Keypad Block Select (CP-379) or in the PLC (in combination with the Digital inputs). The active block is monitored by Active Block (MP-51). For more information on selecting and monitoring the active block, refer to *System Monitoring (MP) / System Monitor / Control Overrides*.

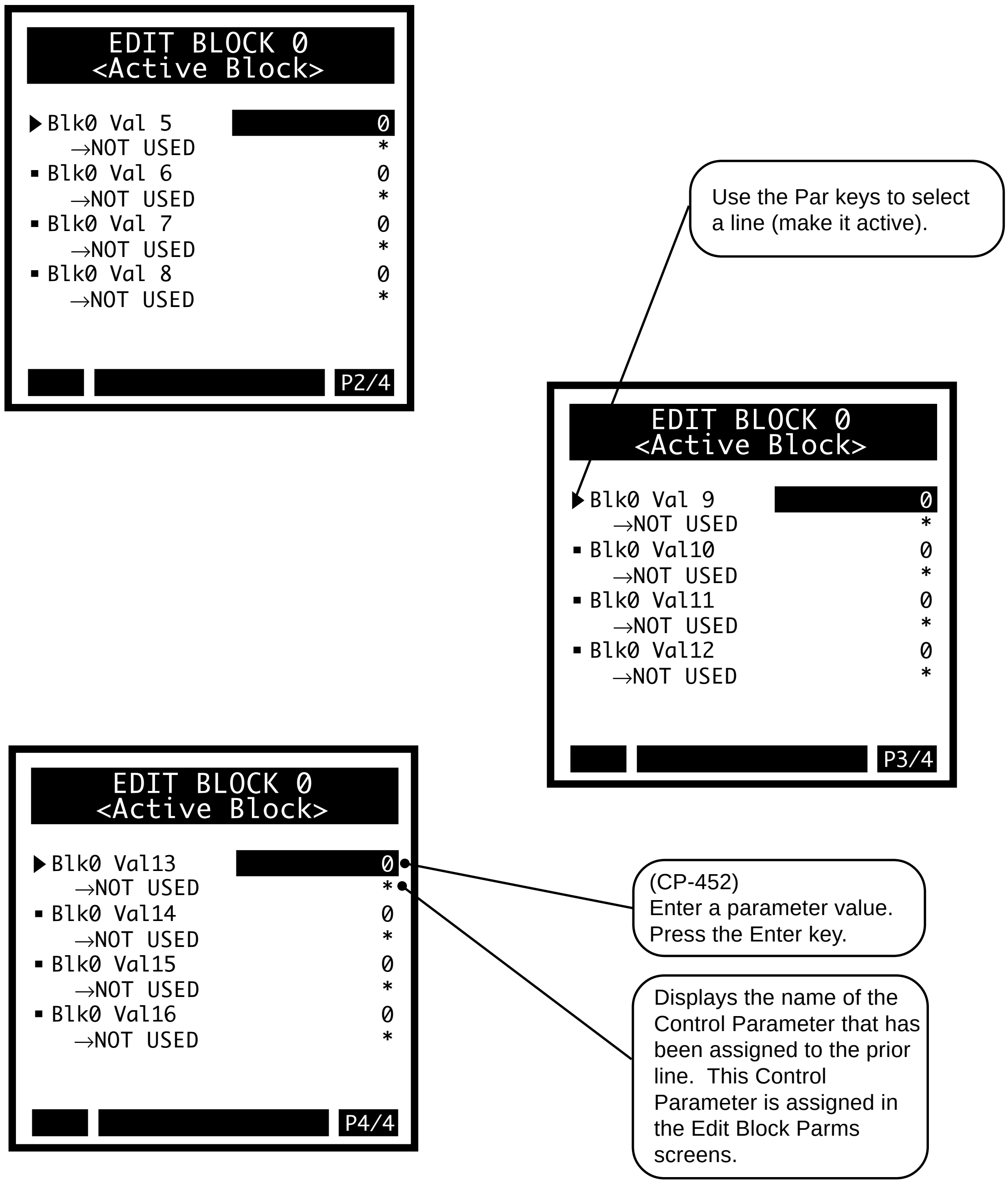
The default setting in the Val 1 line for Blocks 0-7 (Page 1), is Master Setpoint. This line can be reassigned in the Edit Block Parms screens.



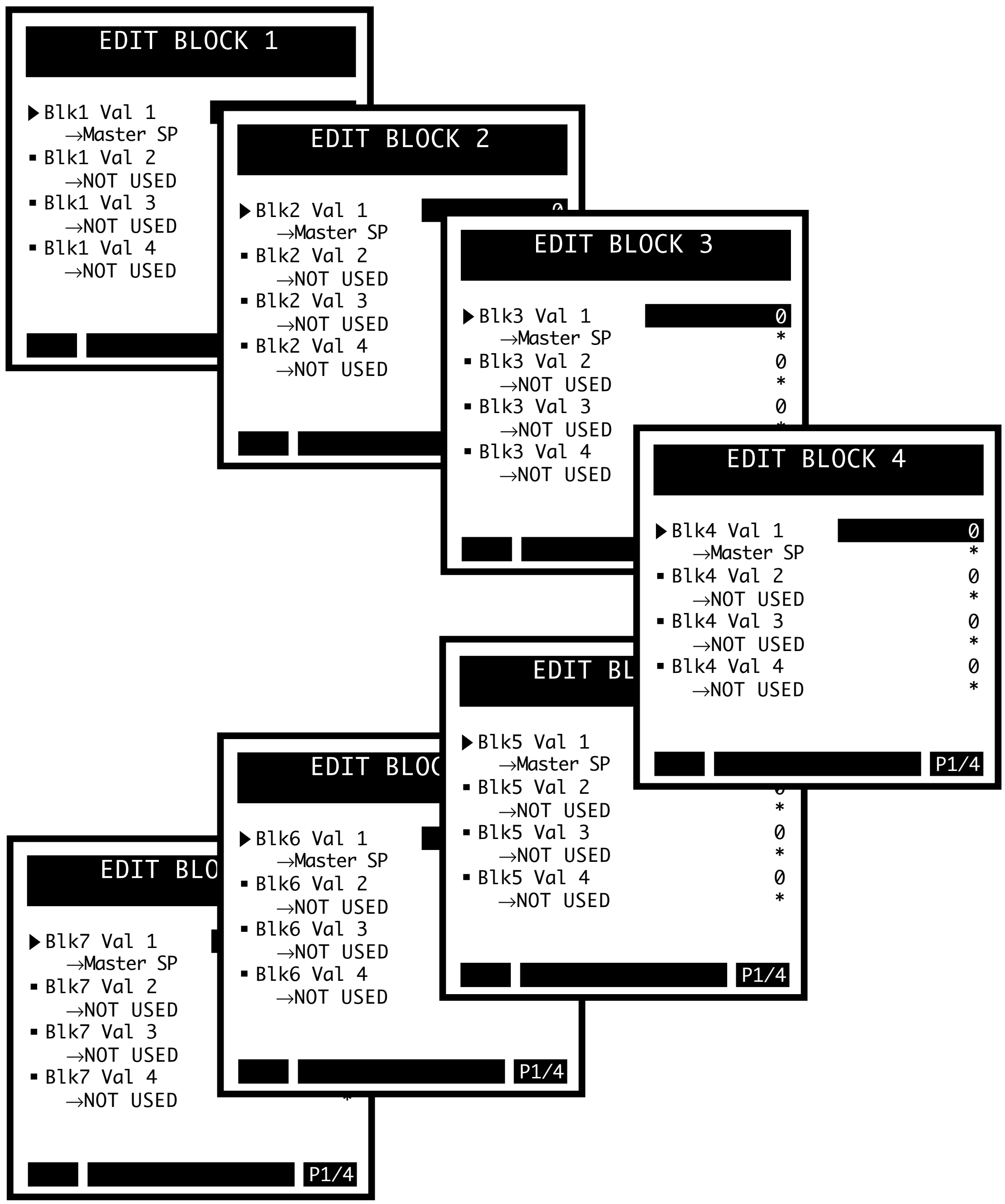
The Edit Block 0-7 screens are accessed through
—> Main Menu / Block Setup <—



Use the Page keys to go scroll through pages 2 through 4 of the Block 0 Data Edit screens. The setup for these screens is identical to the page one screen that is displayed on the previous page. Enter the relevant information in these screens.



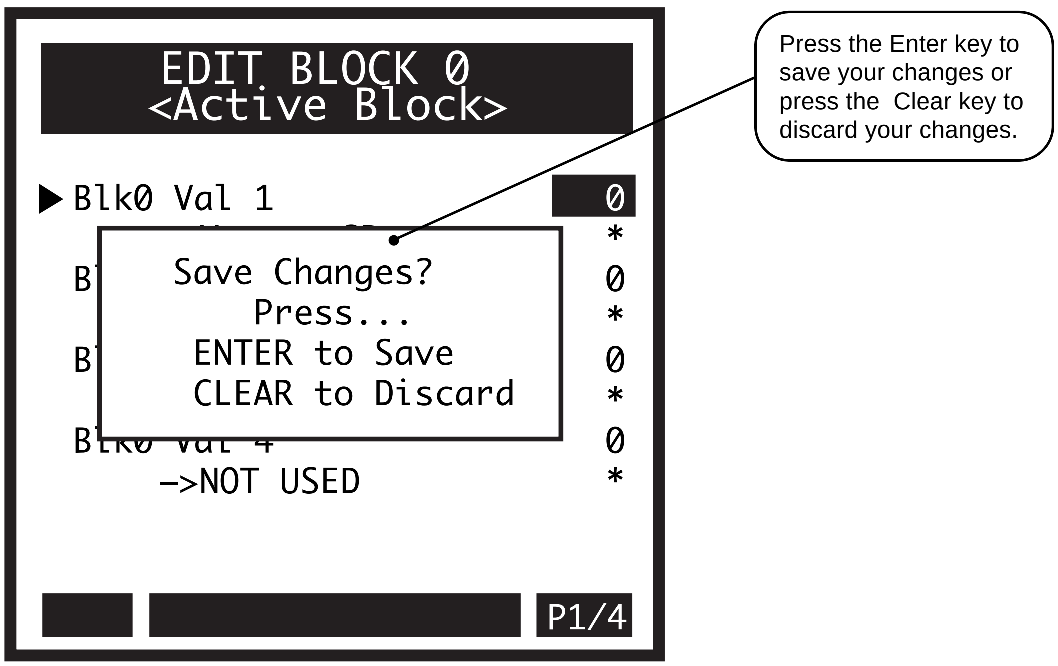
Use the Par keys to go scroll through the Block Setup menu and access the additional Edit Block screens (1-7). The set up for these screens is identical to the Block 0 Edit Block screens that are displayed on the previous pages. Enter the relevant Control Parameter values in these screens.



Edit Block / Save

Press the Menu key from any of the Edit Block screens to exit. If you have made changes in any of the screens (pages 1-4), a dialog box will popup and give you the opportunity to either save or to discard your changes.

NOTE: Once you have exited the Edit Block screen, if you change the value of a Control Parameter in any other screen (that is not a block screen) and that change can create problems with that Control Parameter when the block is put into use, then the error message “Invalid Blk” will flash briefly in the error message bar. Generally this scenario would only happen if a math error or an undefined operation were created in the block which houses the Control Parameter that changed. For example, If you change the value of a scaling parameter which is also used in a block and the affect that the change has on the block would create an overflow (e.g., a setpoint is too large in relationship to CP-108) then the block would become unusable or an “invalid block.”



PROGRAMMABLE LOGIC CONTROLLER (PLC)

This section discusses the setup procedures for the PLC (Programmable Logic Controller). The CX-1010 provides a basic PLC to compliment the motion control operation with I/O flexibility. The PLC allows you to redirect or redefine the eight digital outputs and eight (of the 16) digital inputs. You can also use the PLC to initiate a number of internal functions, or to test the state of status indicators. The PLC includes four timers, four event counters, four latches, and four numerical comparators. The alarms are generated by the PLC. The CX-1010 provides an editor for changing the PLC program without the need of a portable computer or proprietary pendant. The program is presented as a text-based list of commands (instructions) and operands (I/O, contacts, coils).

Caution: To avoid damage to your system, the CX-1010 must be calibrated and the motor drive set up before you operate your system. Refer to *Drive Setup / Calibration: Calibration*.

The PLC screens are:

- PLC Monitor
- PLC Timers
- PLC Event Counters
- PLC Position Counters
- PLC Data Copy
- PLC Digital I/O
- PLC Programming

—NOTES—

PLC

The PLC adds functionality to the CX-1010. There are default settings for the PLC, which are generally sufficient for most applications, and whose operations are transparent to the user. There are also PLC screens which allow the user additional access to the PLC in order to expand on the CX-1010's functionality. The PLC has a "scan time" of 2 milliseconds. The scan is divided into two parts:

- The state of the status indicators is determined (this includes the alarms and the results of the Custom alarms) and the PLC-dedicated digital inputs are captured.
- The PLC program is executed and the digital outputs are updated with the results.

Since there is only one copy of the PLC bit map in memory when the PLC program executes, it uses the most current state of the PLC bits. Therefore, if a rung changes the state of a PLC bit value, the new value is then used in subsequent rungs. Though this rule is not violated in the case of the latches, the state of the latches is not determined until after the PLC program has completed. This means that the set and reset PLC bits can change, but only their state at the end of the PLC program will determine the state of the Latch throughout the entire next scan. Likewise, the event counters are not incremented/decremented until after the PLC porgram is completed, and their associated outputs will not change state during the execution of the program.

The PLC program performs the logic on the PLC bits as dictated by the user-entered program. The state of these PLC bits is determined before hand via internal calculations. These bits are PLC bit 2 through PLC bit 99. These bits are consider status information that are set or reset based on their function, current data and the state (or change thereof) of other PLC bits. These bits should never be operands of an OUT command, and therefore the state of these 'status' bits should remain constant throughout the execution of the PLC program.

The scan is summarized as follows:

1. The digital output (from last scan) are output to the actual outputs, the digital inputs are captured as a group and saved for later use.

2. Status bits are setup - state, block select, RUN mode, loop type, event counter maintenance, position counter maintenance, alarms, compares, set/reset latches.

   The Timers are maintained (status bits set/reset if necessary). This ends the first 1 millisecond part of the scan.

3. The digital inputs (stamped at top of 2 millisecond boundary) are copied to PLC bits (while OR'ing in the DI Set (CP-303), and performing One-shot operation on the DI 1 Shot bits, (CP-302), set PLC Bit Set (CP-307) bit, reset PLC Bit Clear (CP-308) bit.

4. Execute the PLC program. This performs only the logic as given by the program. No functions called out by setting a bit to "1" in the execution of the program will get executed at this time. Counters are not incremented at this time, and therefore, the counter outputs remain unchanged during the execution. The state of the latches are not determined at this time.

5. The digital out PLC bits are saved, but not sent to the actual outputs at this time. The saved digital output data is output at the top of the next 2 millisecond boundary. This maintains a fixed time interval between the reading of the digital inputs and the writing of the digital outputs.

6. Misc. functions: Block Select A,B,C decoded to select current block, PLC bits FrzIntgrl, OPEN LOOP, Frz Ramp, BypRmp, Negate SR are OR'ed in with the Cntrl Latch (CP-240). The result will be used in the next Scaled and Ramped Reference determination, or Control Loop calculation.

   The Data Trace enable is maintained.

   The Timers are maintained (status bits set/reset if necessary). This ends the 2nd 1 millisecond part of the scan.

The PLC mimics the operation of Relay Logic. In this context, the relay "Coils" can be either energized (ON) or inactive (OFF). Likewise, the relay contacts, whether "open" or "closed", assume only one of the two states at any given time. Therefore, relays are binary devices. The state of a coil or contact can be represented as a "1" (ON") or a "0" (OFF). This is the basis for the PLC; it treats everything as binary entities with each assigned a particular function and it realizes only one state at any given time. The virtual "contacts" and "coils" that are available to the PLC program are defined in the PLC bit map. The PLC bit map assigns the function of the contacts and coils to a bit (single binary digit) memory location. The PLC program has access to the PLC bit map to logically combine the "contacts" (status) bits to activate (or deactivate), a "coil" bit. For example; the Block Selection default program routes the Digital Inputs DI-8, DI-9 and DI-10 to the Blk Sel A, B, C PLC Bits (coils) respectively. Note that the Digital Inputs are active low - so a closed contact to common (which would be "0" voltage on the input) would produce a "1 " (true = active) in the corresponding Bit in the PLC bit map. Refer to the PLC Bit-Map Reference Table in *Appendices: Appendix J.*

The status bits can be based on a binary condition (e.g., the Drive Enable /PLC bit 41) or they can be based on the result of a comparison between two nonbinary numbers (e.g., the MaxFb Spd /PLC Bit 48). The MaxFb Spd bit (48) is set (active = normally-open contact closed) when the value of the Feedback signal is greater than the value that you entered into Max Fb Alm (CP-271). Most of the numerical comparisons that are associated with the PLC status bits involve one (or more) Control Parameters. Some of the Control Parameters are used to setup the PLC operation. In addition, there are Monitor Parameters to monitor the state of the PLC bits.

The PLC uses a stack-based environment for moving bit data and computing boolean expressions. Your PLC program must conform to this format. Each rung of your ladder-logic program would be programmed as a group of commands (along with their operands) starting with a "LOAD" (or "LD NOT") command and ending with an "OUT" command. The stack allows you to enter a complicated logical combination (rung) without having to separate it into smaller groups (rungs) with temporary coils.

These are the commands:

LOAD
LD NOT (Load Not)
AND
AND NOT
OR
OR NOT
XOR (Exclusive OR)
XOR NOT
NOT
OUT
<END>

There are three parts to the stack: the Result Register (R); a bit mapped location named “S0” (bit location “0”); and a bit mapped location named “S1” (bit location “1”). When the stack is lifted with the “LOAD” and “LOAD NOT” commands, the contents of “S0” is copied to “S1” (the contents of “S1” is overwritten) and the contents of the Result Register (R), is copied to “S0” and the contents of the operand (or the complement of) is copied to the Result Register, “R”. When the Stack is dropped as in the “AND 0”, the “OR 0”, the “AND NOT 0” and the “OR NOT 0” commands, then the contents of “S0” (or its complement) is “AND’ed” or “OR’ed” with the Result Register (R) and the result is left in (R). The contents of “S1” is copied to “S0” (the contents of “S0” is overwritten), and the contents of “S1” remains the same. The following example shows the stack before and after the “LOAD” and “AND 0” commands.

Location 08 (DI_8): 1

Before “LOAD 8 DI_8”:	After “LOAD 8 DI_8”:
S1: 0	S1: 1
S0: 1	S0: 0
R: 0	R: 1

Before “AND 0 S0”:	After “AND 0 S0”:
S1: 1	S1: 1
S0: 0	S0: 1
R: 1	R: 0

For commands other than “LOAD” and “LD NOT” with an operand other than “0” (S0), there is no stack movement. For example; the “AND 9 DI_9” results in an “AND”s of the contents of Bit Location 09 (DI_9) with the Result Register (R) and the result of the operation stays in the Result Register (R). There is no stack movement and “S0” and “S1” remain the same. The “LOAD” and “LD NOT ”commands always lift the stack. The stack drops only when the operand is “0” (S0) for the “AND”, “OR”, “XOR”, “AND NOT”, “OR NOT ” and “XOR NOT ” commands.

THE COMMANDS

1. LOAD
This starts a new Rung (group of commands). The stack is lifted and the contents of the operand bit is loaded into the Result Register (R).

2. LD NOT
Same as “LOAD” but the Result Register is complemented after the load. This is used for starting the rung with a normally-closed contact.

3. AND
The contents (the bit value) of the operand bit is AND’ed with the Result Register (R). The operand is unaffected. The result is retained in the Result Register. If the operand is “0” (i.e., the “S0” register), then the stack is dropped.

4. AND NOT
The complement of the operand bit is AND’ed with the Result Register (R). The operand is unaffected. The result is retained in the Result Register. If the operand is “0” (i.e., the "S0" register), then the stack is dropped. This is typically used to “AND” in a normally-closed contact.

5. OR
The contents (the bit value) of the operand bit is OR’ed with the Result Register (R). The operand is unaffected. The result is retained in the Result Register. If the operand is “0” (i.e., the "S0" register), then the stack is dropped.

6. OR NOT
The complement of the operand bit is OR’ed with the Result Register. The operand is unaffected. The result is retained in the Result Register. If the operand is “0” (i.e., the "S0" register), then the stack is dropped. This is typically used to “OR” in a normally-closed contact.

7. XOR
The contents (the bit value) of the operand bit is Exclusively OR’ed with the Result Register. The operand is unaffected. The result is retained in the Result Register. If the operand is “0” (i.e., the "S0" register), then the stack is dropped.

8. XOR NOT
The complement of the operand bit is Exclusively OR’ed with the Result Register. The operand is unaffected. The result is retained in the Result Register. If the operand is “0” (i.e., the "S0" register), then the stack is dropped. This is typically used to XOR in a normally-closed contact.

9. NOT
The contents of the Result Register is complemented. The operand is ignored but must be included in the program - use one of the temporary coil locations or the No Opnd (171). This is typically used to complement the result before an “OUT” command. This could be the case if the rung is controlling an active-high output.

10. NOP
This is a No Operation Command. The command is ignored by the compiler. This can be used to temporarily remove a command.

11. OUT
This copies the contents of the Result Register (R), into the operand location. This terminates the rung.

12. <End>
This ends the PLC program. It signals the compiler that there are no more valid commands to follow. Every program must be terminated with an “<END>”. The operand is ignored but it must be included in the program . Use the No Opnd (171).

The OPERANDS

The operands are divided into two main areas: the status bits (contacts); and the function bits (coils). The status bits range from bit 2 through bit 95. Do not use these bits as operands for the “OUT” command, as the results could be unpredictable. The function bits range from bit 100 to bit 170. These are used in conjunction with the “OUT” command to activate the indicated function. Activation of the indicated function occurs when the “OUT” command moves a “1” into the bit location (the Result Register contains a “1” just prior the “OUT” command). All of the bits that are not defined, are “Reserved” for future expansion. Refer to *Appendices: Appendix H* for a complete list of the PLC Bit-map (operands).

Descriptions of the groups of operands and discussion of the associated Control Parameters follow:

Bit 0 is the top of the stack, S0 (first entry point).
Bit 1 is the bottom of the stack, S1, (lowest level).
Bit 2 is fixed at the value of 0.
Bit 3 is fixed at the value of 1.
Bit 4 is set to a 1 for the first PLC scan after power-up.

Bits 8 through 15 reflect the values captured on the Digital Inputs 8 through 15, respectively. DI Set (CP-303) can be used to set one or all of these bits even when the corresponding input is not active. This is typically used to test your program without having to actuate the input. DI 1 shot (CP-302) can be used to set one or more of the Inputs (DI- 8 through DI-15) to automatically generate a one shot in the PLC bit location (bit 8-15) from an open to closed transition on the input.

Bits 16 through 19 are the output of the latches. This would be the equivalent of the normally-open contact of a latching relay.

Bits 24 through 27 are the outputs of the timers. The running time for each timer is compared against the Timer Delay and Timer On- time CP's (CP-310, CP-317) to determine if these output bits should be active (1).

Bits 32 through 36 are the outputs of the event counters. When the count for each counter reaches the Trigger Count (CP-320, CP-322, CP-324, CP-326, CP-328), the corresponding counter output will be active (1).

Bits 38 and 39 are set for one scan time when the corresponding position counter reaches or exceeds the Rollover value (CP-268, CP-269). The bit is set for one scan when the rollover occurs and the counter is reset to the "0" plus the amount the count is over the rollover value.

Bits 40 through 47 are basic status indicator bits. Bit 40 (CO Sign) indicates the sign of the CO SIG. If CO Polarity is set to NEG (2), Bit 40 operates opposite of the actual voltage convention - if the voltage is negative, this is consider normal for CO Polarity set to NEG and the Bit 40 will be "0".

Bits 48 through 55 are alarm conditions.

Bits 56 through 59 indicate if the corresponding compare result is true (1) or not ("0").

Bits 64 through 67 reflect the value of Setpoint Mode (CP-102).

Bits 68 through 71 indicate the current control-loop structure that is in use. They reflect the value of Cntrl1 Loop (MV-45).

Bits 72 through 79 indicate the operating state of the controller. Only one of these bits can be active at a time. These bits are monitor (status) bits only. Do Not use these bits as operands for the "OUT" command. You can not request a state change with these bits.

Bits 80 through 87 indicate the active block. Only one of these bits can be active at a time. These bits are for monitoring status only. Do not use these bits as operands for the "OUT" command. You can not request a new block with these bits. You can do this only through the Blk Sel A,B,C bits. Bits 88 through 95 are reserved.

Bits 100 through 107 are used to activate the Digital Outputs 0 - 7 respectively. The outputs are active low. Therefore, when the "OUT" command moves a 1 into one of these bits, the corresponding output will become active and pull the connected device to common, sinking current as dictated.

Bits 108 through 115 are used for temporary storage. They can be used to store the intermediate results of relatively complicated rungs. They could be referred to as virtual "Control Relays" and they can be used in the logic of several rungs

Bits 116 through 123 are used to set and reset the latches.

BIts 124 through 127 are used to enable the timers.

Bit 128 is used to reset Timer 4 since it retains its state when the Tmr4 En bit (PLC bit 127) is “0”.

Bits 130 through 133 are used to increment the corresponding counters. Bit 134 is used to decrement the Counter 4 count. The count is incremented on the transition from a “0” to a 1 in the increment or decrement bit.

Bits 135 through 137 are used to reset the corresponding counters. These are level activated; as long as the reset bit remains active (1), the count will remain at “0”

Bit 139 is used to preset the Counter 4 count to the Cntr4 Preset value (CP-329). This is also a level activated function - as long as the reset bit is active, the count will remain at the preset value for Counter 4 even if transitions occur on the increment (or decrement) bits.

Bits 140 through 142 are used to select the active block. This is accomplished in a binary (octal) fashion.

The following table represents the logic:

PLC Bit 142 BlkSel C	PLC Bit 141 BlkSel B	PLC Bit 140 BlkSel A	Active Block
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

Bits 148 is used to reset the integral term of the PID.

Bits 149 through 151 are used to reset the position counters and the error. The error is the critical value that drives the zero-error and the position control loops. The counters are preset with the FI1PsnPrst and FI2PsnPrst values when the corresponding bits are active (level).

Bits 152 through 155 are used to control some control loop and ramp operations.

Bits 158 and 159 are used to negate the CO SIG signal and the Scaled Reference signal, respectively. The Negate CO bit is ignored when operating in Unipolar mode. You can not reverse the polarity of the output in this case. The Negate SR bit is used to reverse the direction of the commanded speed, the Scaled Reference.

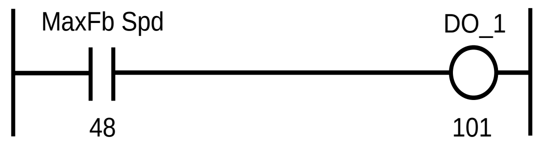
Bits 168 and 169 are used as the “Remote” scroll up and scroll down controls. The parameter that will be incremented or decremented is selected by Remote Scroll (CP-300). The Rmt Scroll Rate (CP-301) determines the rate at which the select parameter is incremented or decremented when the corresponding bit is active.

PROGRAMMING EXAMPLES

The Basic Rung - Moving Bit Data

Since the PLC is based on bit data, a bit value is moved from one location to another. The most basic rung (a normally open contact energizing a coil) is implemented in the PLC program by moving bit data.

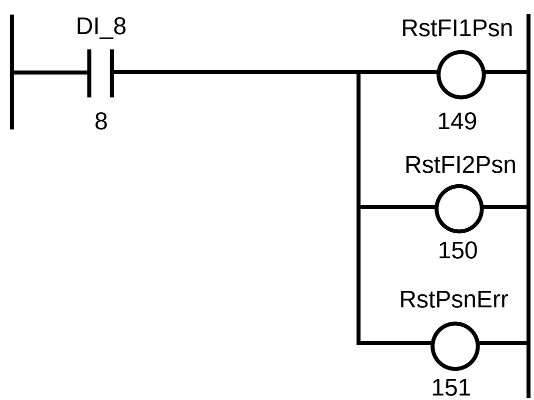
```
LOAD     48      Max FB Spd
OUT     101      DO-1
```



The value of MaxFb Spd bit (contact) is loaded into the Result Register (R) with the “LOAD 48 MaxFb Spd” command and copied to the Digital Output DO-1 bit location (coil) with the “OUT” command. When the MaxFb Spd bit is set (1), the DO-1 bit will get set also. As a result, the actual DO-1 pin will be active - pulled low to sink current and possibly energize an external-relay coil. All rungs (groups of commands) must start with a “LOAD” or “LD NOT” command and end with an “OUT” command. “LD NOT” starts the rung with a normally-closed contact.

Since the “OUT” command does not change the value of the Result Register (R), you can move the result of a rung to more than one Bit location without starting a new rung.

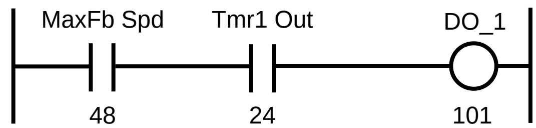
```
LOAD      8      DI_8
OUT     149      RstFl1Psn
OUT     150      RstFl2Psn
OUT     151      RstPsnErr
```



Series and Parallel Contacts - Operating on Bit Data

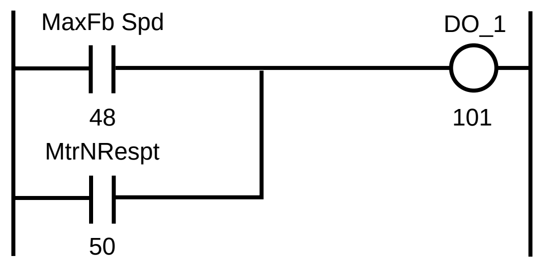
Often it is necessary to combine the state of more than one PLC bit (contact) to determine if another bit (coil) should be energized. The series connection of two contacts represents the “ANDing” of the states; both contacts need to be closed in order for energy to flow. The “AND” command is used to “AND” two PLC bits (contacts) together. The following example shows how to program a simple series connected rung.

```
LOAD     48      MaxFb Spd
AND      24      Tmrl Out
OUT     101      DO-1
```



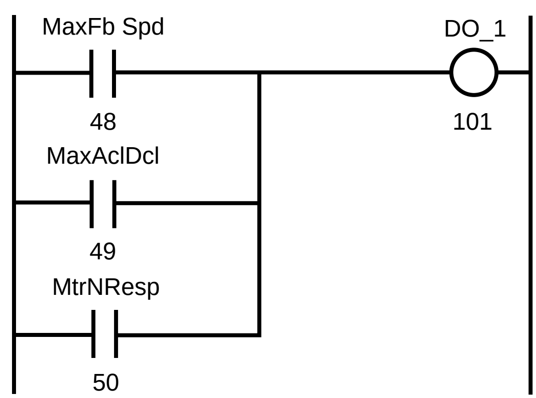
Similarly, the “OR” command is used to “OR” two PLC bits (contacts) together. This implements the ladder logic of parallel connected contacts as the following example illustrates.

```
LOAD     48      MaxFb Spd
OR       50      MtrNResp
OUT     101      DO-1
```



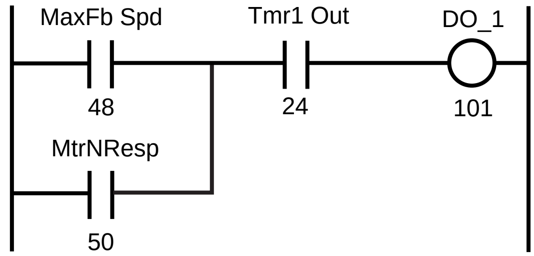
This can be expanded to include more bits.

```
LOAD     48      MaxFb Spd
OR       49      Max Acl Dcl
OR       50      MtrNResp
OUT     101      DO-1
```

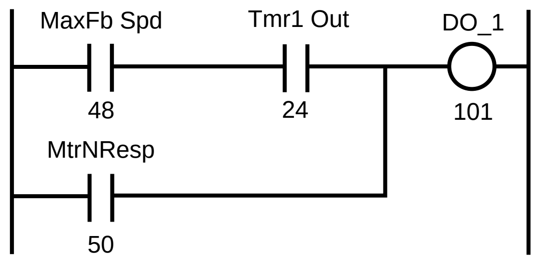


You can combine “AND’s” and “OR’s” to implement both the series and parallel connections.

```
LOAD    48    MaxFb Spd
OR      50    MtrNResp
AND     24    Tmr1 Out
OUT    101    DO-1
```




```
LOAD    48    MaxFb Spd
AND     24    Tmr1 Out
OR      50    MtrNResp
OUT    101    DO-1
```



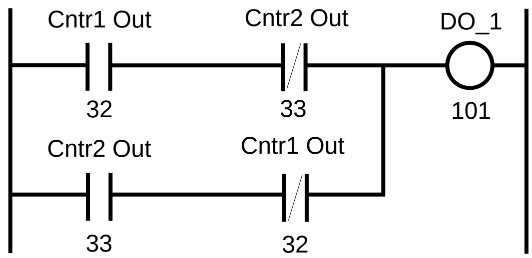
The order of the program commands effect the outcome. The result of each command is placed in the Result Register (R), which is then used in the next operation.

The exclusive “OR” command (“XOR”, “XOR NOT”) can be used to act on one of two true conditions, but not if both are true at the same time. The truth table for the “XOR” and “XOR NOT” is given by (1 = true):

R	Operand	XOR	XOR NOT
0	0	0	1
0	1	1	0
1	0	1	0
1	1	0	1

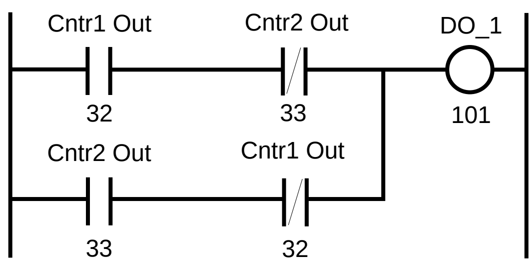
The following example implements an exclusive "OR" between Cntr1 Out and Cntr2 Out using ladder logic. The program commands use standard "AND" and "OR" logic.

LOAD	32	Cntr1 Out
AND NOT	33	Cntr2 Out
LOAD	33	Cntr2 Out
AND NOT	32	Cntr1 Out
OR	0	S0
OUT	101	DO-1



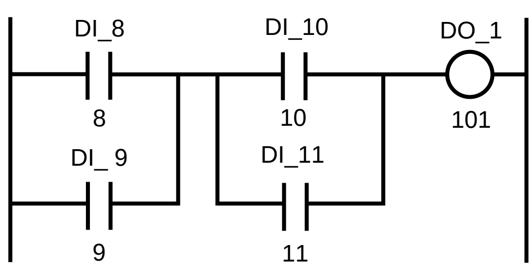
This programming can be greatly simplified with the "XOR" command as follows.

LOAD	32	Cntr1 Out
XOR	33	Cntr2 Out
OUT	101	DO-1



The "AND/OR" programming of the exclusive "OR" function above illustrates more complicated logic than we have seen thus far. It involves not only the use of normally-closed contacts, but the use of a second "LOAD" command to start the second branch, or sub-rung. If you understand the stack movement, the programming should seem quite obvious. Consider the following example:

LOAD	8	DI_8
OR	9	DI_9
LOAD	10	DI_10
OR	11	DI_11
AND	0	S0
OUT	101	DO_1



Assume the values of the Digital Input Bits DI_8,9,10,11 are 1,0,0,0 respectively. The "S1" and "S0" Bits are "0" to start. The Result Register is also "0" to start.

The stack movement proceeds as follows:

Before “LOAD 8 DI_8”:
    S1: 0
    S0: 0
    R: 0

After “LOAD 8 DI_8” (stack is lifted)
    S1: 0
    S0: 0
    R: 1

After “OR   9 DI_9”:
    S1: 0
    S0: 0
    R: 1

After “LOAD 10 DI_10” (stack is lifted):
    S1: 0
    S0: 1
    R: 0

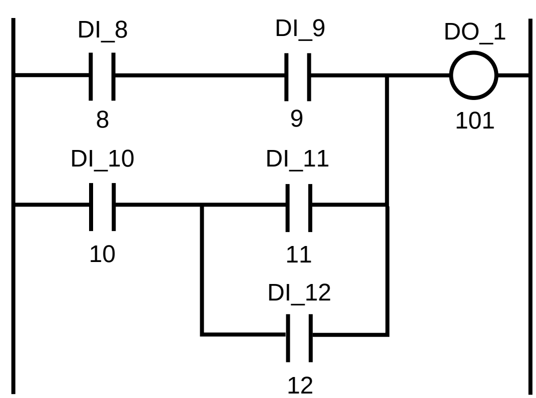
After “OR   11 DI_11”:
    S1: 0
    S0: 1
    R: 0

After “AND   0 S0” (stack falls):
    S1: 0
    S0: 0
    R: 0

After “OUT 101 D0-101”:
    S1: 0
    S0: 0
    R: 0

Another example:

```
LOAD      8    DI_8
AND       9    DI_9
LOAD     10    DI_10
LOAD     11    DI_11
OR       12    DI_12
AND       0    S0
OR        0    S0
OUT     101    DO_1
```



Assume DI_8,9,10,11,12 have values of 1,1,0,1,1

Before "LOAD 8 DI_8":

S1: 0
S0: 0
R: 0

After "LOAD 8 DI_8" (stack is lifted)

S1: 0
S0: 0
R: 1

After "AND   9 DI_9":

S1: 0
S0: 0
R: 1

After "LOAD 10 DI_10" (stack is lifted):

S1: 0
S0: 1
R: 0

After "LOAD 11 DI_11" (stack is lifted):

S1: 1
S0: 0
R: 1

After "OR   12 DI_12":

S1: 1
S0: 0
R: 1

After "AND   0 S0" (stack falls):

S1: 1   (S1 remains the same after the shift down)
S0: 1
R: 0

After "OR   0 S0" (stack falls):

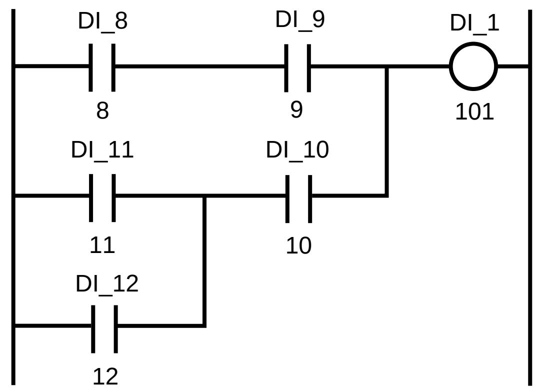
S1: 1
S0: 1
R: 1

After "OUT 101 D0_1":

S1: 1
S0: 1
R: 1

The ladder diagram can be constructed differently to simplify the programming.

LOAD	8	DI_8
AND	9	DI_9
LOAD	11	DI_11
OR	12	DI_12
AND	10	DI_10
OR	0	S0
OUT	101	DO_1



In fact, most rungs can be simplified to require only one additional “LOAD” (other than the opening “LOAD”) and one operation with the “S0” register (i.e., the “S1” register would not be needed).

The Latches

There are four latches that are available with the PLC. Each has two inputs and one output. The output reflects the state of the latch, either “1” (ON) or “0” (Off). When the set input is “1” (true), the state of the latch (the output) will be “1” (On). When the reset input is “1” (true), then the state of the Latch will be “O” (Off). The set and reset inputs need only be true for one scan. The latch will retain its state (while the power is “On”) until the opposite input becomes true. If both inputs are “1” (true) at the same time, the state of the latch will be “0” (Off).

The set inputs (act as coils) are labelled:

Lch1 Set (PLC Bit 116)
Lch2 Set (PLC Bit 117)
Lch3 Set (PLC Bit 118)
Lch4 Set (PLC Bit 119)

The reset inputs (act as coils) are labelled:

Lch1 Rst (PLC Bit 120)
Lch2 Rst (PLC Bit 121)
Lch3 Rst (PLC Bit 122)
Lch4 Rst (PLC Bit 123)

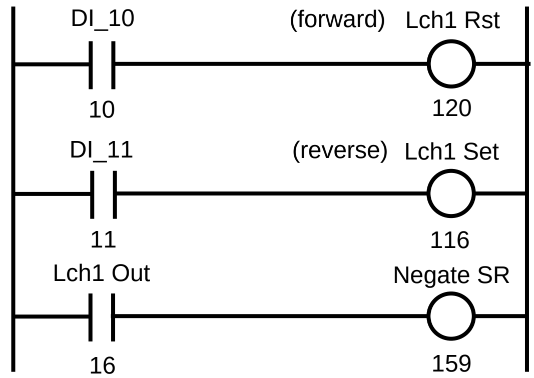
The outputs (used as contacts or status) are labelled:

Lch1 Out (PLC Bit 16)
Lch2 Out (PLC Bit 17)
Lch3 Out (PLC Bit 18)
Lch4 Out (PLC Bit 19)

A latch can be used to reverse the direction of motion with two sensors, one for forward, one for reverse. The sensors will only be active temporarily, so the latch retains the state until the opposite sensor is reached.

The forward sensor is connected to DI_10, the reverse input to DI_11.

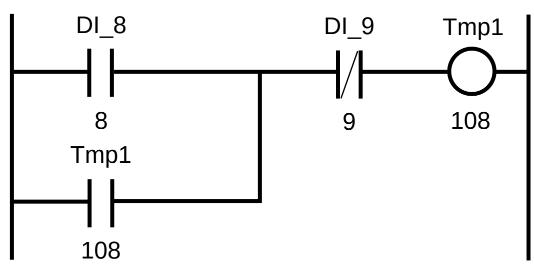
```
LOAD     10     DI_10
OUT     120     Lch1 Rst

LOAD     11     D_11
OUT     116     Lch1 Set

LOAD     16     Lch1 Out
OUT     159     Negate SR
```



The Latch set and reset rungs should be placed next to each other.   The output of the Latch is set at the conclusion of the scan.

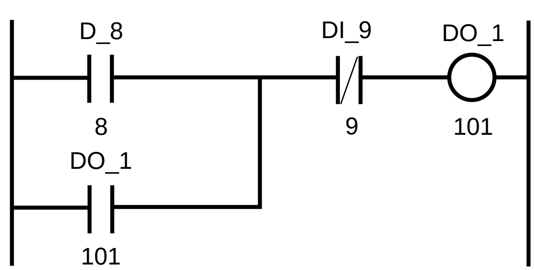
You can create your own custom latch using standard PLC logic.

```
LOAD         8     DI_8
OR         108     Tmp1
AND NOT      9     DI_9
OUT        108     Tmp1
```



Here DI_8 serves as the set input and DI_9 serves as the reset input. Tmp1 retains the state of the latch. If the Latch Output is used as a digital output, you can use the digital output PLC bit directly (DO-0 through DO-7, Bits 100-107) as the latch state.   The state of this latch is determined in the sequence of the PLC program .

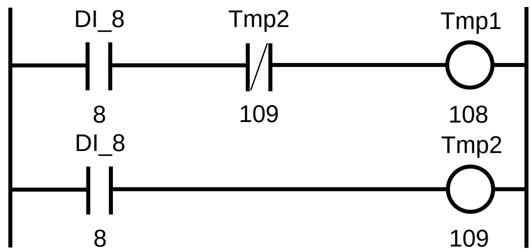
```
LOAD         8     DI_8
OR         101     DO_1
AND NOT      9     DI_9
OUT        101     DO_1
```



A Pulse Generator - One Shot

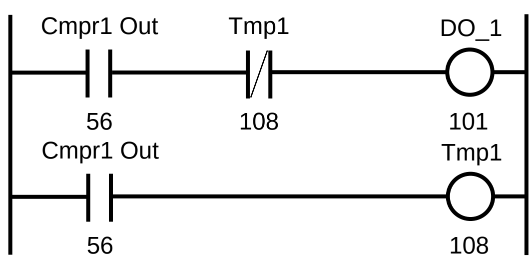
It may be necessary to create a logic true (1=on) condition for only one scan regardless of how long the initiating condition remains active. In addition, it may be necessary to trigger an event on the falling (or rising) edge of a digital input or on the transition of an internal PLC bit. Such a device can be created with standard PLC logic.

LOAD	8	DI_8
AND NOT	109	Tmp2
OUT	108	Tmp1
LOAD	8	DI_8
OUT	109	Tmp2



Here Tmp1 serves as the on shot which is true (1) for one PLC scan after DI_8 changes from off (0 - input open) to “On” (1 - input closed to common). If the one-shot is used to control only one function (PLC bit, coil), you could use that PLC bit in place of Tmp1. You can chose to have any or all of the PLC Digital Inputs function as one-shots without the need to create the one-shot with this logic. This is provided to simplify your programming. Refer to the DI 1 Shot (CP-302) which is explained on page 1 of the PLC/ Digital I/O/ screen and in *Appendices: Appendix C*. If both the one-shot and the logic level are needed internally, do not change or use the DI 1 Shot ; use the logic above for the one-shot version instead. The following is another example of a one-shot.

LOAD	56	Cmpr1 Out
AND NOT	108	Tmp1
OUT	101	DO-1
LOAD	56	Cmpr1 Out
OUT	108	Tmp1



—NOTES—

PLC MONITOR

Use the PLC Monitor screens to monitor the state of all the PLC operands. Pages 2 and 3 of the screens display the PLC bits in sequential order. Press the "help" key on each line to view the names for each bit. The Help screen will highlight the bits that are active.

Page 1 of the PLC Monitor screens displays the parameters that select the PLC bits and monitor the PLC. Use the Control Parameters Bit ; PLC Monitor 1 (CP-305) and PLC Monitor 2 (CP-306) to select a bit. The name and value of the bit that you choose is displayed in the corresponding Monitor Parameters ; PLC Mon 1 Val (MP-58) and PLC Mon 2 Val (MP-59). The default names for these Monitor Parameters (PLC Mon 1 Val and PLC Mon 2 Val) are replaced by the name and value of the PLC Bits selected in PLC Monitor 1 (CP-305) and PLC Monitor 2 (CP-306). You can also use the Code key when you are in any parameter screen to display the PLC Bit names and values of PLC Mon 1 Val (MP-58) or PLC Mon 2 Val (MP-59). You can also customize the Status screen to display them.

DI Set (CP-303) simulates an active low condition on one of the digital inputs, DI-8 through DI-15, without having to physically short the input connector to common. Enter a number with a "1" in the bit location corresponding to the digital input you want to force active. The action will be reflected in PLC 15- 8 (MP-60), which displays the bit values for the digital inputs DI-8 through DI-15.

PLC Bit Set (CP-307) and PLC Bit Clear (CP-308) allow you to force a PLC Bit "On" (1) or "Off" (0). You can set (or clear) one of the status bits (contacts), PLC Bits 8-95, but you can not control a PLC Bit (coil) that is controlled by the PLC program (with the "OUT" command). Enter the number of the PLC Bit that you want to set (1) into PLC Bit Set (CP-307) and the number that you want to clear (0) into PLC Bit Clear (CP-308). When you are done testing, enter a "0" into PLC Bit Set (CP-307) and PLC Bit Clear (CP-308) . They will automatically default back to PLC Bits 3 (ONE) and 2 (ZERO), respectively.

PLC Monitor

PLC Monitor 1 (CP-305)

PLC Monitor 1 (CP-305) determines which PLC bit will be monitored in PLC Mon 1 Val (MP-58). The PLC Mon 1 Val (MP-58) displays the name of the bit rather than “PLC Mon 1 Val”. To select a PLC bit to monitor, enter the number of the bit or by use the ‘Scroll’ keys (^ or v) to scroll through the list. This bit can be monitored in any screen when the code select line set to PLC Mon 1 Val (MP-58). For the bit list, refer to *Appendices: Appendix H.*

PLC Mon 1 Val (MP-58)

PLC Monitor 1 Value (MP-58) displays both the description and the value of the PLC bit that was selected in PLC Monitor 1 (CP-305). Please note that a description of the PLC bit appears on the display line instead of the parameter name (PLC Mon 1 Val).

PLC Monitor 2 (CP-306)

PLC Monitor 2 (CP-306) functions identically to PLC Monitor 1 (CP-305). See above.

PLC Mon 2 Val (MP-59)

PLC Monitor 2 Value (MP-59) functions identically toPLC Monitor 1 Value (MP-58). See above.

DI Set (CP-303)

Digital Input Set (CP-303) simulates an “ACTIVE” condition on any or all of the PLC dedicated Digital Inputs (DI 15-8). Digital Input Set (CP-303) is logically OR’ed with the actual DI 15..8 (MP-27) bits to form the PLC 15- 8 (MP-60) bits. The PLC 15- 8 (MP-60) bits are used by the PLC logic. The value of DI Set (CP-303) will not effect the actual DI 15..8 (MP-27) value, rather, DI 15..8 (MP-27) reflects the present status of the actual inputs. Enter a “1” in a bit location to simulate an active condition on the corresponding input. DI..15 to DI..8 get mapped into Bit 7 to Bit 0. Page two of the “Help” screen displays inputs 15-8. Refer to *Appendices: Appendic C*.

PLC 15-8 (MP-60)

PLC 15- 8 (MP-60) displays the status of PLC bits 15-8. A “1” in any bit indicates that the input is “active”. The digital inputs are active low. Page one of the “Help” screen displays the bit map for PLC 15-8 (CP-279). Also refer to *Appendices: Appendic C.*

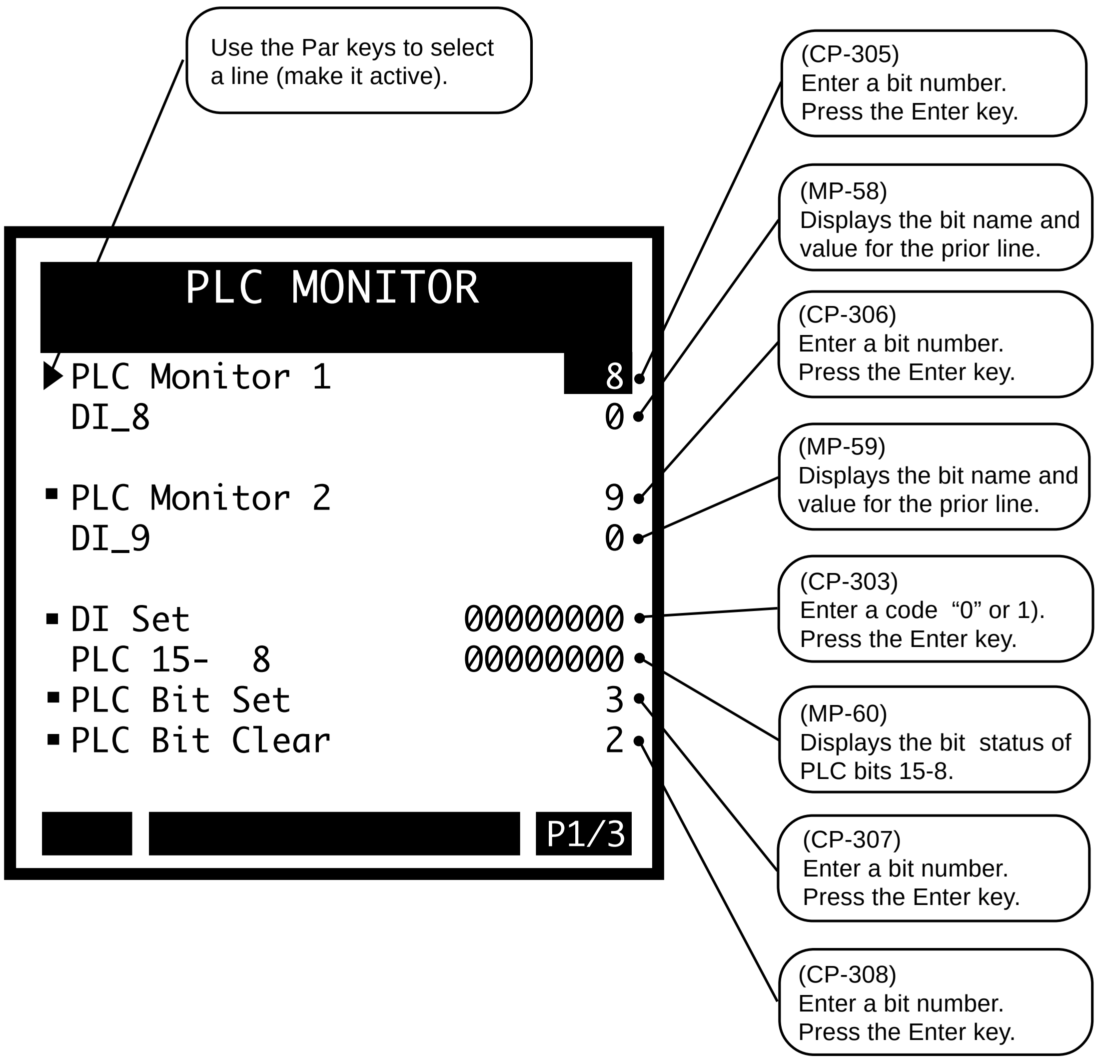
PLC Bit Set (CP-307)

PLC Bit Set (CP-307) forces a PLC bit to be set at “1”. Enter the number of the bit that you want to set at “1”. PLC Bit Set (CP-307) tests your PLC program rather than commanding a direct operation. The bit is set prior to the PLC program execution but after all the inputs, comparisons, timers and counters have had their status bits set up. However, the PLC could clear this bit and unpredictable results can occur. Do not attempt to set a PLC bit that is controlled by an OUT instruction in the PLC program. If you need to force an output, use DIG I/O TEST in the diagnostics screen. For the bit list, refer to *Appendices: Appendix H.*

PLC Bit Clear (CP-308)

PLC Bit Clear (CP-308) forces a PLC bit to be reset to “0”. Enter the number of the bit that you want to clear. PLC Bit Clear (CP-308) tests your PLC rather than to commanding a direct operation. The bit is cleared prior to the PLC program execution but after all the inputs, comparisons, timers and counters have set up their status bits. However, the PLC could set this bit and unpredictable results can occur. Do not attempt to clear set a PLC bit that is controlled by an OUT instruction in the PLC program. If you need to force an output, use DIG I/O TEST in the diagnostics screen. For the bit list, refer to *Appendices: Appendix H.*

The PLC Monitoring screens are accessed through
—> Main Menu / PLC <—



PLC Monitor

PLC 15-8 (MP-60)

PLC 15- 8 (MP-60) displays the status of PLC bits 15-8 . A “1” in any bit indicates that the input is “active”. The digital inputs are active low. Page one of the “Help” screen displays the bit map for PLC 15-8. Also refer to *Appendices: Appendic C*.

PLC 23-16 (MP-61)

PLC 23-16 (MP-61) displays the status of the internal PLC status bits 23-16 (See graphic below). A “1” in any bit indicates that the bit is “active”. Page one of the “Help” screen displays the bit map for PLC 23-16. Also refer to *Appendices: Appendic C*.

PLC 31-24 (MP-62)

PLC 31-24 (MP-62) displays the status of the internal PLC status bits 31-24 (See graphic below). A “1” in any bit indicates that the bit is “active”. Page one of the “Help” screen displays the bit map for PLC 31-24. Also refer to *Appendices: Appendic C*.

PLC 39-32 (MP-63)

PLC 39-32 (MP-63) displays the status of the internal PLC status bits 39-32 (See graphic below). A “1” in any bit indicates that the bit is “active”. Page one of the “Help” screen displays the bit map for PLC 39-32. Also refer to *Appendices: Appendic C*.

PLC 47-40 (MP-64)

PLC 47-40 (MP-64) displays the status of the internal PLC status bits 47-40 (See graphic below). A “1” in any bit indicates that the bit is “active”. Page one of the “Help” screen displays the bit map for PLC 47-40. Also refer to *Appendices: Appendic C*.

PLC 55-48 (MP-65)

PLC 55-48 (MP-65) displays the status of the internal PLC status bits 55-48 (See graphic below). A “1” in any bit indicates that the bit is “active”. Page one of the “Help” screen displays the bit map for PLC 55-48. Also refer to *Appendices: Appendic C*.

PLC 63-56 (MP-66)

PLC 63-56 (MP-66) displays the status of the internal PLC status bits 63-56 (See graphic below). A “1” in any bit indicates that the bit is “active”. Page one of the “Help” screen displays the bit map for PLC 63-56. Also refer to *Appendices: Appendic C*.

PLC 71-64 (MP-67)

PLC 71-64 (MP-67) displays the status of the internal PLC status bits 71-64. None of these bits are presently active. They are reserved for future use. Page one of the “Help” screen displays the bit map for PLC 71-64. Also refer to *Appendices: Appendic C*.

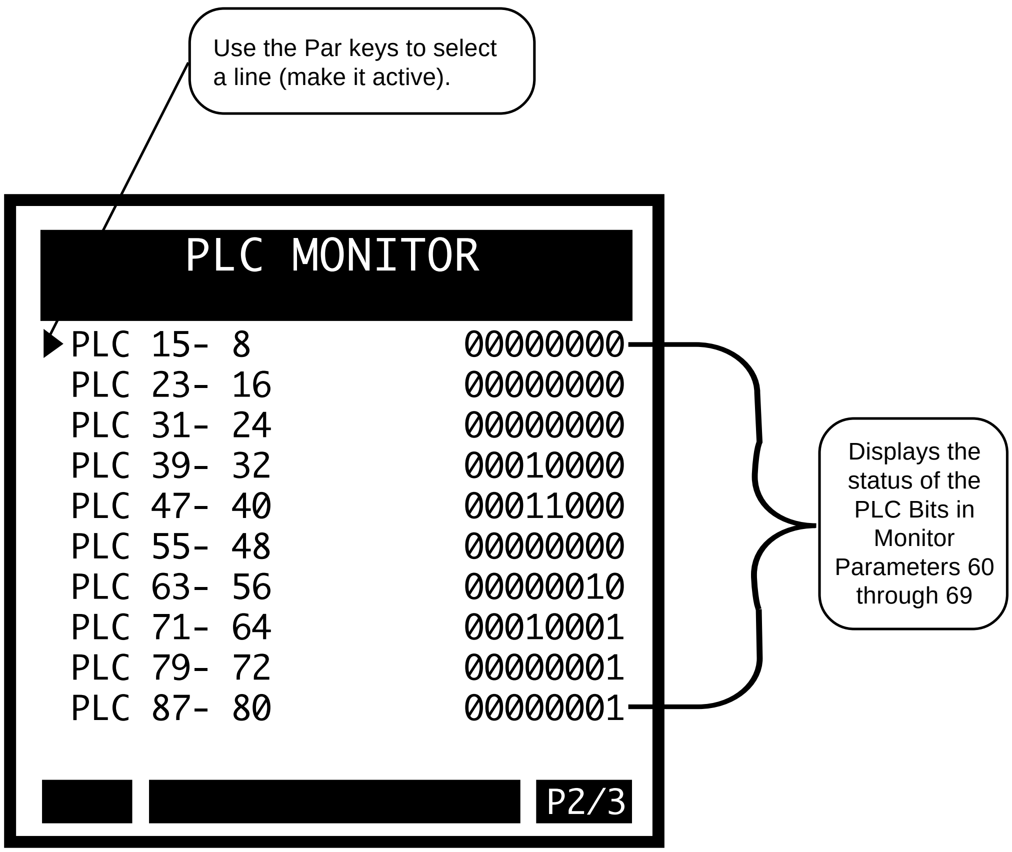
PLC 79-72 (MP-68)

PLC 79-72 (MP-68) displays the status of the internal PLC status bits 79-72 (See graphic below). A “1” in any bit indicates that the bit is “active”. These bits are only used to monitor the operating state of the CX-1010. Page one of the “Help” screen displays the bit map for PLC 79-72. Also refer to *Appendices: Appendic C*

PLC 87-80 (MP-69)

PLC 87-80 (MP-69) displays the status of the internal PLC status bits 87-80 (See graphic below). A “1” in any bit indicates that the bit is “active”. These bits are only used to monitor the parameter block that is active. Page one of the “Help” screen displays the bit map for PLC 87-80. Also refer to *Appendices: Appendic C*.

The PLC Monitor screen (page 2).



PLC Monitor

PLC 95-88 (MP-70)

PLC 95-88 (MP-70) displays the status of the internal PLC status bits 95-88. None of these bits are presently active. They are reserved for future use. Page one of the "Help" screen displays the bit map for PLC 95-88. Also refer to *Appendices: Appendic C.*

PLC 107- 100 (MP-71)

PLC 107- 100 (MP-71) displays the status of PLC bits 107-100. A "1" in any bit indicates that the output is "active". The digital outputs are active low (current sinking). Page one of the "Help" screen displays the bit map for PLC 107-100. Also refer to *Appendices: Appendic C.*

PLC 115-108 (MP-72)

PLC 115-108 (MP-72) displays the status of the internal PLC control bits 115-108. A "1" in any bit indicates that the bit is "active". These internal bits (control relays) can be used as global "control relays". For example, they can be used to create one-shots or latches. They can also be used to simplify programming. Page one of the "Help" screen displays the bit map for PLC 115-108. Also refer to *Appendices: Appendic C.*

PLC 123-116 (MP-73)

PLC 123-116 (MP-73) displays the status of the internal PLC control bits 123-116. A "1" in any bit indicates that the bit is "active". Page one of the "Help" screen displays the bit map for PLC 123-116. Also refer to *Appendices: Appendic C.*

PLC 131-124 (MP-74)

PLC 131-124 (MP-74) displays the status of the internal PLC control bits 131-124. A "1" in any bit indicates that the bit is "active". Page one of the "Help" screen displays the bit map for PLC 131-124. Also refer to *Appendices: Appendic C.*

PLC 139-132 (MP-75)

PLC 139-132 (MP-75) displays the status of the internal PLC control bits 139-132. A "1" in any bit indicates that the bit is "active". Page one of the "Help" screen displays the bit map for PLC 139-132. Also refer to *Appendices: Appendic C.*

PLC 147-140 (MP-76)

PLC 147-140 (MP-76) displays the status of the internal PLC control bits 147-140. A "1" in any bit indicates that the bit is "active". Blk Sel A, B, C select the block that is active, if Blk Sel Source (CP-378) has been set to "1" (DgIn). The chart below indicates which block has been selected, based on the Block Select A, B or C inputs. Page one of the "Help" screen displays the bit map for PLC 147-140. Also refer to *Appendices: Appendic C.*

PLC 155-148 (MP-77)

PLC 155-148 (MP-77) displays the status of the internal PLC control bits 155-148. A "1" in any bit indicates that the bit is "active". Page one of the "Help" screen displays the bit map for PLC 155-148. Also refer to *Appendices: Appendic C.*

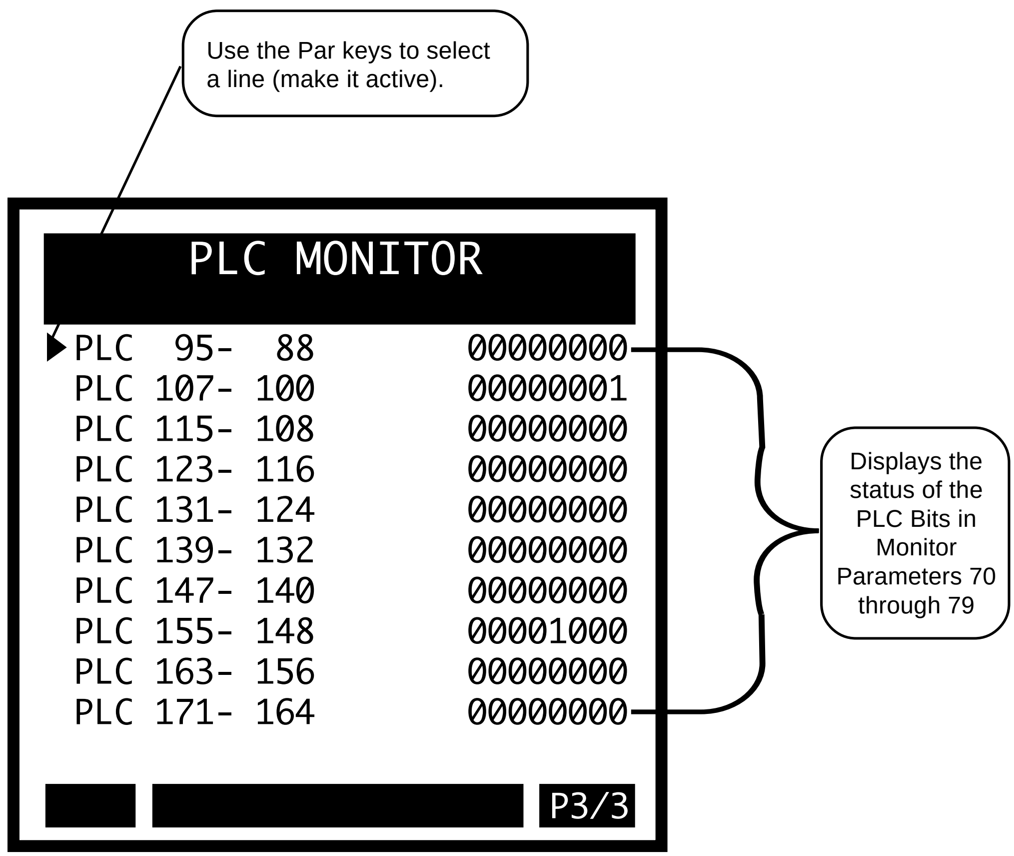
PLC 163-156 (MP-78)

PLC 163-156 (MP-78) displays the status of the internal PLC control bits 163-156. A "1" in any bit indicates that the bit is "active". Page one of the "Help" screen displays the bit map for PLC 163-156. Also refer to *Appendices: Appendic C.*

PLC 171-164 (MP-79)

PLC 171-164 (MP-79) displays the status of the internal PLC control bits 171-164. A "1" in any bit indicates that the bit is "active". Page one of the "Help" screen displays the bit map for PLC 171-164. Also refer to *Appendices: Appendic C.*

The PLC Monitor screen (page 3).

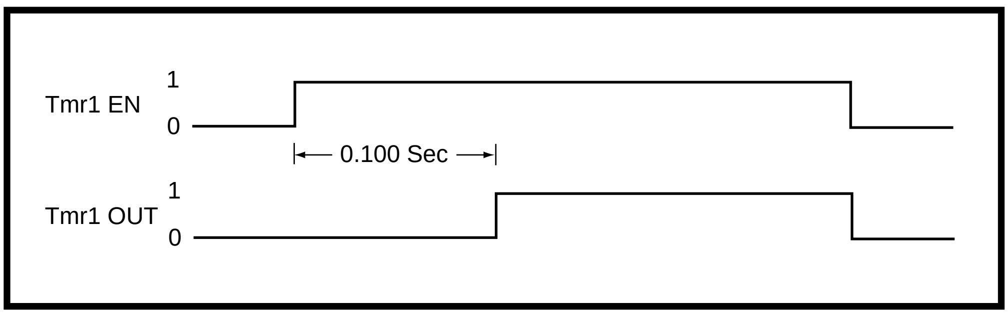


—NOTES—

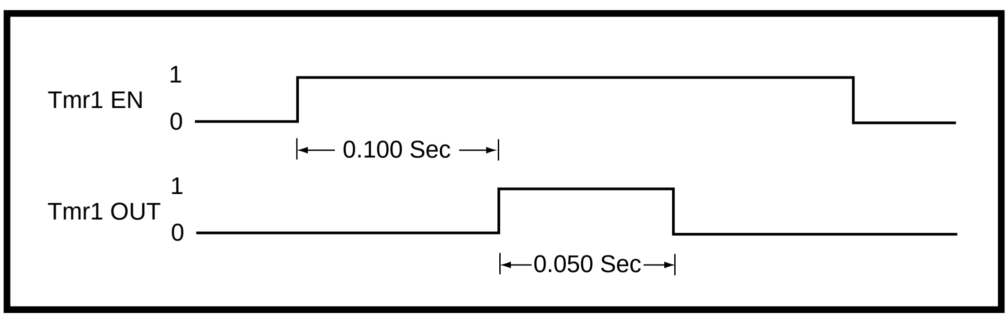
PLC TIMERS

The are four timers that work in conjunction with the PLC. Each timer can be set up to generate a pulse. The timers operate with 1 millisecond resolution. However, when the timer times out and the timer output becomes active, the PLC program may not react for another millisecond because of the two millisecond scan time. Therefore, enter the time values at “1” or “2” milliseconds shorter than you actually need to compensate. The timer outputs reflect the operation of an On-delay timer. If you need an Off-delay operation, use the “NOT” (complement) of the output. Timer 4, retains the accumulated time even when the Enable is deactivated.

The operation of each timer is dictated by their respective delay and on-time parameters. The following shows a typical time-trace of the Tmr1 Out when Tmr1 En changes from “0 ”to “1”. Tmr1 Delay (CP-310) equals “0.100” Seconds and Tmr1 on Tm (CP-311) equals “-1”.



The following shows a time-trace of the Tmr1 Out when Tmr1 En changes from “0” to “1”. Tmr1 Delay (CP-310) equals “0.100” Seconds and Tmr1 on Tm (CP-311) equals “0.050” Seconds.



PLC Timers

Tmr1 Delay (CP-310)

Timer 1 Delay (CP-310) is the time, in seconds, from which Timer 1 becomes enabled (Tmr1 En bit going from “0” to “1”) until Tmr1 Out bit (24) in the PLC is going active (1). When the Tmr1 En bit (124) returns to “0”, the Tmr1 Out bit (24) is reset to “0” and the delay-time is reset to “0”.

Tmr1 on Tm (CP-311)

Timer 1 on Time (CP-311) is the time, in seconds, from which Timer 1 is going active (= 1) until Tmr1 Out is going inactive (back to “0”). When the Tmr1 En bit (124) returns to “0”, the Tmr1 Out bit (24) is reset = “0” and the on-time is reset to “0”. If you want Timer 1on-time to be infinite (“On” until Tmr1 is disabled with Tmr1 En = “0”), then enter a value of "-1" into Tmr1 on Tm (CP-311).

Tmr2 Delay (CP-312)

Timer 2 Delay (CP-312) is the time in seconds from which Timer 2 becoming enabled (Tmr2 En bit going from “0” to “1”) until Tmr2 Out bit (25) in the PLC going active (1). When the Tmr2 En bit (125) returns to “0”, the Tmr2 Out bit (25) is reset to “0” and the delay-time is reset to “0”.

Tmr2 on Tm (CP-313)

Timer 2 on Time (CP-313) is the time, in seconds, from which Timer 2 is going active (= 1) until Tmr2 Out is going inactive (back to “0”). When the Tmr2 En bit (125) returns to “0”, the Tmr2 Out bit (25) is reset = “0” and the on-time is reset to “0”. If you want Tmr2 on-time to be infinite (“On” until Tmr2 is disabled with Tmr2 En = “0”), then enter a value of "-1" into Tmr2 on Tm (CP-313).

Tmr3 Delay (CP-314)

Timer 3 Delay (CP-314) is the time, in seconds, from which Timer 3 becomes enabled (Tmr3 En bit going from “0” to “1”) until Tmr3 Out bit (26) in the PLC is going active (1). When the Tmr3 En bit (126) returns to “0”, the Tmr3 Out bit (26) is reset to “0” and the delay-time is reset to “0”.

Tmr3 on Tm (CP-315)

Timer 3 on Time (CP-315) is the time, in seconds, from which Timer 3 is going active (= 1) until Tmr3 Out is going inactive (back to “0”). When the Tmr3 En bit (126) returns to “0”, the Tmr3 Out bit (26) is reset = “0” and the on-time is reset to “0”. If you want Timer 3 on-time to be infinite (“On” until Tmr3 is disabled with Tmr3 En = “0”), then enter a value of "-1" into Timer 3 on Time (CP-315).

Tmr4 Delay (CP-316)

Timer 4 Delay (CP-316) is the time, in seconds, from Timer 4 becoming enabled (Tmr4 En bit going from “0” to “1”) toTmr4 Out bit (27) in the PLC going active (1). If Tmr4 becomes disabled, the delay-time is retained so the timing can continue when Tmr4 is re-enabled. The Tmr4Rst bit (128) in the PLC must be used to reset the delay time to “0”.

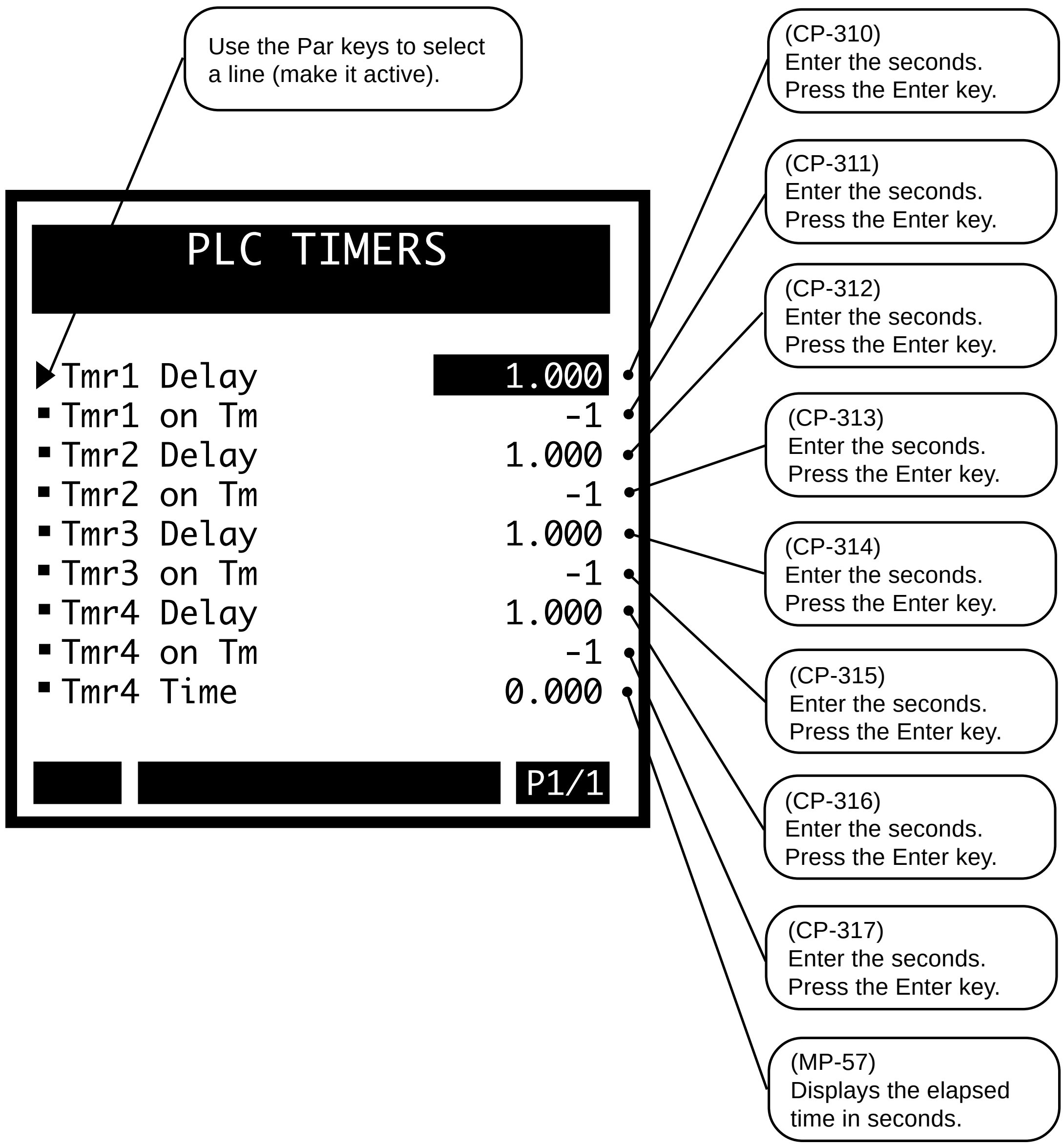
Tmr4 on Tm (CP-317)

Timer 4 on Tm (CP-317) is the time, in seconds, from Tmr4 Out going active (= 1) until Tmr4 Out going inactive (back to “0”). When Tmr4 becomes disabled, the on-time is retained so the timing can continue when Tmr4 is re-enabled. The Tmr4 Rst bit (128) in the PLC must be used to reset the on-time to “0”. If you want Tmr4 on-time to be infinite (“On” until Tmr4 is reset with Tmr4 Rst = 1) then enter a value of “-1” in Tmr4 on Tm (CP-317).

Tmr4 Time (MP-57)

Timer 4 Time (MP-57) displays the elapsed time, in seconds, for Timer 4 during the delay part of it's operation.

The PLC Timers screen is accessed through
—> Main Menu / PLC <—



—NOTES—

PLC Counters

There are four event counters that are associated with the PLC. One of these counters functions as an up/down counter. The other three counters operate as up-counters. The maximum count rate is approximately 100 counts per second (100 Hz). The up-counters all have upper trigger values associated with them. When the count reaches this trigger value, the counter output will be set automatically to “1”.   The count will continue past the trigger level when more transitions occur on the Increment PLC Bit. However, as long as the count is equal to or greater than the (up-counter) trigger level, the counter output PLC Bit will be “1”. Each up-counter has a reset PLC bit associated with it to reset the count to “0”. The up/down counter has a preset value that is loaded into the counter when the counter reset PLC Bit is set to a “1”. Special Control Parameters hold the current count of the counters. As a result, the values are retained during a power-down. In addition, you can enter a new value into the count or increment/decrement the value with the scroll keys. The up/down counter has a down count trigger value and an associated output to indicate when the count is less than or equal to this trigger level.

The position counters that are associated with FI1 and FI2 are available for monitoring as well as for use in the numerical comparators. These counters are also used to determine the position error, which in turn drives the zero-error and position loops. These counters count pulses for non-quadrature (x1) encoders or count edges for quadrature (x4) encoders. You can set the count at which the counters rollover (to “0”) with FI1PsnRO (CP-268) and FI2PsnRO (CP-269). When the position-counter count reaches (or exceeds) the rollover value, the counter is reset to “0” (plus any count over the rollover value) and the rollover bit in the PLC is set (1) for one scan (one-shot). The rollover bits for FI1 and FI2 are FI1PsnRO (PLC Bit 38) and FI2PsnRO (PLC Bit 39) respectively. The counters can be preset with the corresponding preset values.

PLC EVENT COUNTERS

Cntr1 Cnt (CP-321)

Counter 1 Count (CP-321) is the current count for “Counter 1”. The CX-1010 automatically increments it one count for every “0” to “1” transition of the Cntr1 Inc bit (130). Counter 1 Count is the default batch counter. Either use the “Scroll” keys or enter a new number to change this value. When the PLC program sets Cntr1 Rst bit (135) to “1”, then the Counter 1 Count (CP-321) resets to “0” .

Cntr1 Trig (CP-320)

When Counter 1 Count (CP-321) is greater than or equal to Counter 1 Trigger (CP-320), then the Cntr1 Out bit (32) in the PLC is set to “1”. If the count is less than, Cntr1 Out bit (32) will equal “0”.

Cntr2 Cnt (CP-323)

Counter 2 Count (CP-323) is the current count for “Counter 2”. The CX-1010 automatically increments it one count for every “0” to “1” transition of the Cntr1 Inc bit (131). Counter 2 Count is the default batch counter. Either use the “Scroll” keys or enter a new number to change this value. When the PLC program sets Cntr1 Rst bit (136) to “1”, then the Counter 2 Count (CP-323) resets to “0” .

Cntr2 Trig (CP-322)

When Counter 2 Count (CP-323) is greater than or equal to Counter 2 Trigger (CP-322), then the Cntr2 Out bit (33) in the PLC is set to “1”. If the count is less than, Cntr2 Out bit (33) will equal “0”.

Cntr3 Cnt (CP-325)

Counter 3 Count (CP-325) is the current count for “Counter 3”. The CX-1010 automatically increments it one count for every “0” to “1” transition of the Cntr3 Inc bit (132). Counter 3 Count is the default batch counter. Either use the “Scroll” keys or enter a new number to change this value. When the PLC program sets Cntr3 Rst bit (137) to “1”, then the Counter 3 Count (CP-325) resets to “0” .

Cntr3 Trig (CP-324)

When Counter 3 Count (CP-325) is greater than or equal to Counter 3 Trigger (CP-324), then the Cntr3 Out bit (34) in the PLC is set to “1”. If the count is less than, Cntr3Out bit (34) will equal “0”.

Cntr4 Cnt (CP-327)

Counter 4 Count (CP-327) is the current count for “Counter 4”. The CX-1010 automatically increments it one count for every “0” to “1” transition of the Cntr4 Inc bit (133). Counter 4 Count is the default batch counter. Either use the “Scroll” keys or enter a new number to change this value. When the PLC program sets Cntr4 Rst bit (138) to “1”, then the Counter 4 Count (CP-327) resets to “0” .

Cntr4 Preset (CP-329)

When the Counter 4 Rst bit in the PLC Programming screen is set to “ 1”, then Counter 4 Cnt (CP-327) is set to and held at the Counter 4 Preset (CP-329) value. If you need a transition preset , then create a one-shot or, when possible, use the DI 1 Shot (CP-302) mask.

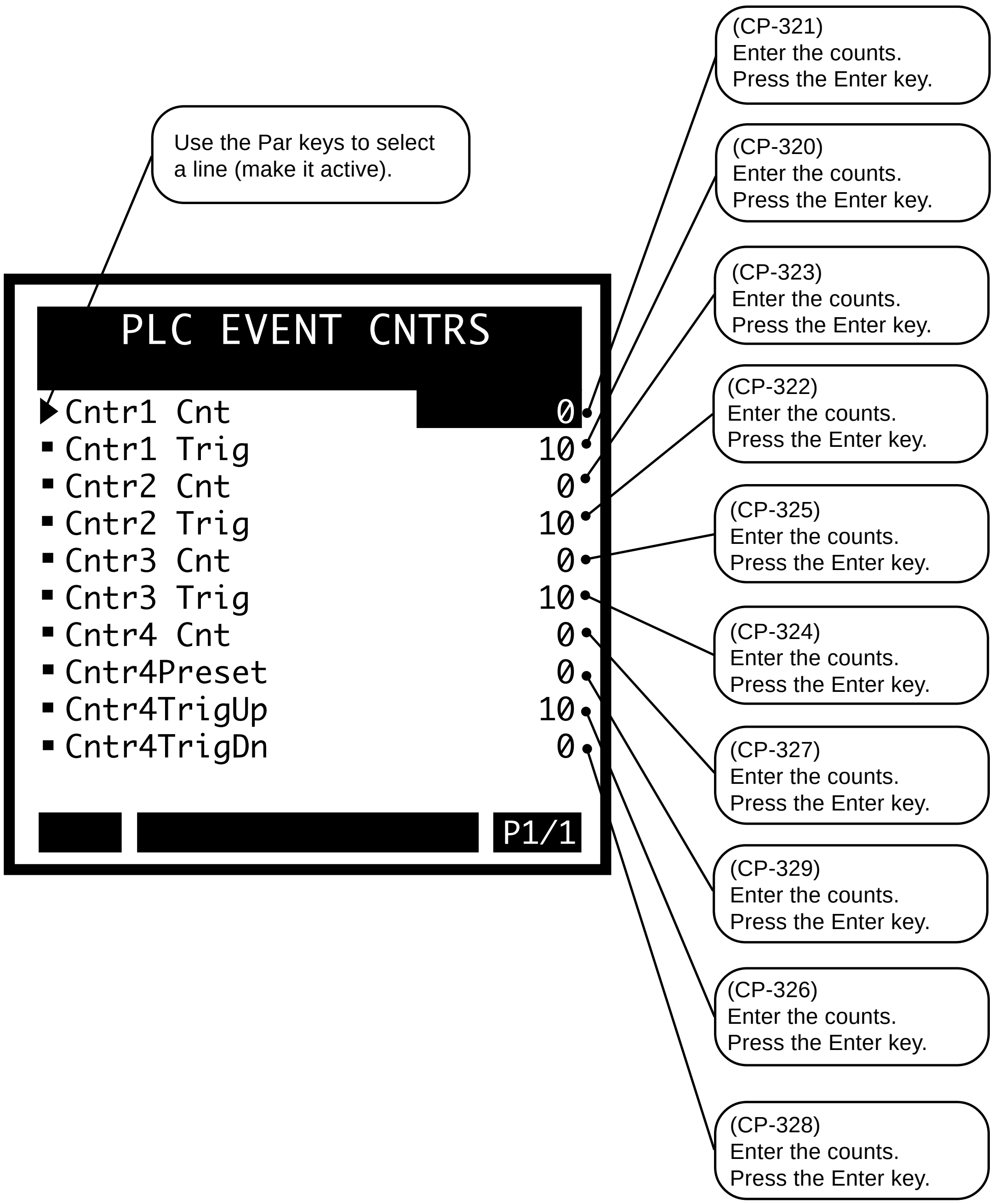
Cntr4 TrigUp (CP-326)

When Counter 4 Count (CP-327) is greater than or equal to Counter 4 Trigger Up (CP-326), then the Cntr4 UpOut bit (35) in the PLC is set to “1”. If the count is less than, Cntr4UpO bit (35) will equal “0”.

Cntr4 TrigDn (CP-328)

When Counter 4 Count (CP-327) is less than or equal to Counter 4 Trigger Down (CP-328), then the Cntr4DnO bit (36) in the PLC is set to “1”. If the count is greater than, Cntr4DnO bit (36) will equal “0”.

The PLC Event Counters screens are accessed through
—> Main Menu / PLC <—



PLC POSITION COUNTERS

FI1PsnPrst (CP-266)

When the RstFI1Pos bit (149) of the PLC is active (1) the value of FI1Position Prst (CP-266) is automatically inserted into FI1Position (MP-05). If a transition preset is required, either create a one-shot with PLC logic or use a Digital Input that is configured as a one-shot input by the DI 1 Shot (CP-302) mask.

FI2PsnPrst (CP-267)

When the RstFI2Pos bit (150) of the PLC is active (1) the value of FI2 Position Prst (CP-267) is automatically inserted into FI1Position (MP-10). If a transition preset is required, either create a one-shot with PLC logic or use a Digital Input that is configured as a one-shot input by the DI 1 Shot (CP-302) mask.

FI1PsnRO (CP-268)

When the FI1 position (MP-05) is equal to or greater than a positive FI1Position Roll Over (CP-268) or equal to or less than a negative FI1Position Roll Over, then the FI1PsnRO bit (38) in the PLC is set to “1” (for 1 PLC scan or one-shot). The FI1 position (MP-05) resets to “0”, plus the difference between FI1 position and FI1PsnRO (the difference is not discarded).

FI2PsnRO (CP-269)

When the FI2 Position (MP-10) is equal to or greater than a positive FI2 Position Roll Over (CP-269) or equal to or less than a negative FI2 Position Roll Over, then the FI2Psn RO bit (39) in the PLC is set to “1” (for 1 PLC scan or one-shot). The FI2 Position (MP-10) resets to “0”, plus the difference between FI2 position and FI2PsnRO (the difference is not discarded).

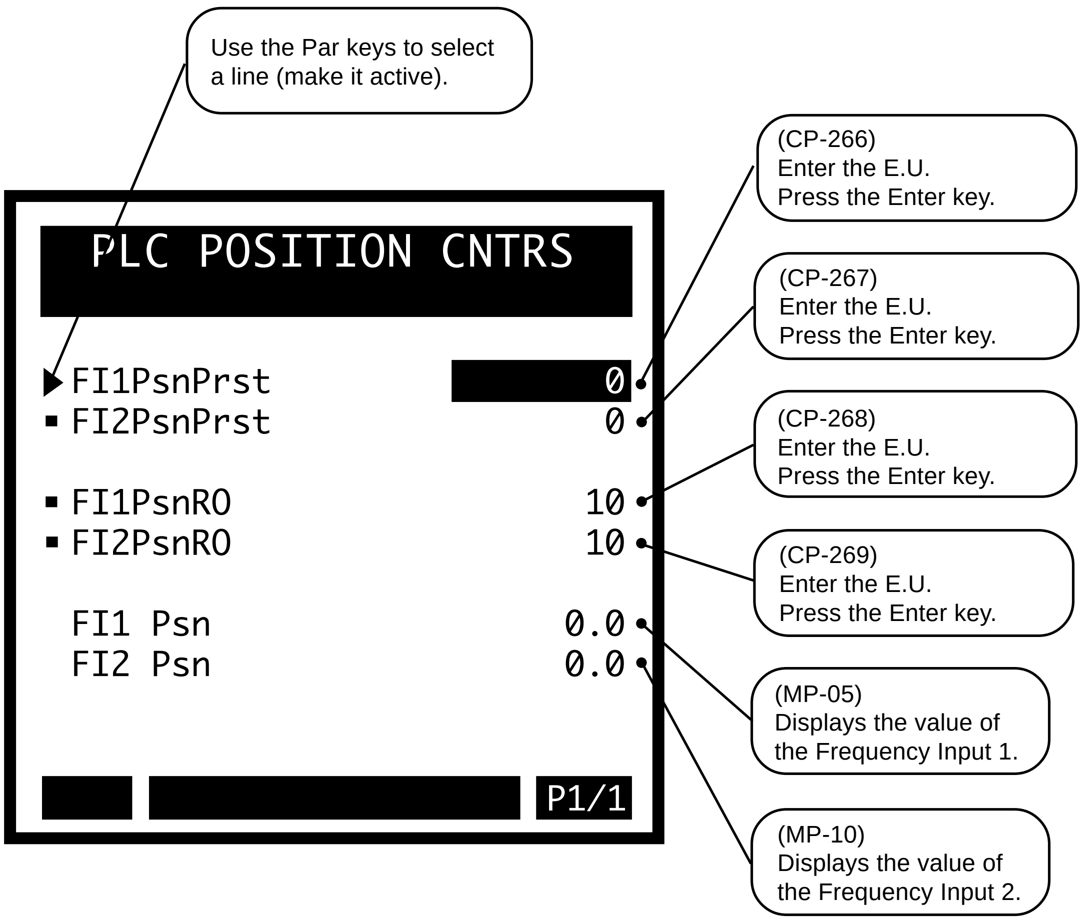
FI1 Psn (MP-05)

Frequency Input 1 Position (MP-05) displays the present value of the Frequency Input 1 Position (MP-05) in Engineering Units, as specified by FI1 Pulses (CP-162) and EU FI1 (CP-163). The placement of the decimal point is the same as the placement of the decimal point in EU FI1 (CP-163)

FI2 Psn (MP-10)

Frequency Input 2 Position (MP-10) displays the present value of the Frequency Input 2 Position (CP-10) in Engineering Units, as specified by FI2 Pulses (CP-167) and EU FI2 (CP-168). The placement of the decimal point is the same as the placement of the decimal point in EU FI2 (CP-168).

The PLC Position Counters screens are accessed through
—> Main Menu / PLC <—



PLC DATA COPY

The PLC Data Copy function is used to copy CP or MP data (values) to a different CP (copy from source to destination). When a 0 to 1 transition occurs in the DataCopy 1 PLC bit (160), the value of the CP or MP selected by Copy Source 1 (CP-296) is copied to the CP selected by Copy Dest 1 (CP-297). When a 0 to 1 transition occurs in the DataCopy 2 PLC bit (161), the value of the CP or MP selected by Copy Source 2 (CP-298) is copied to the CP selected by Copy Dest 2 (CP-299). The values of the Copy Source CP or MP is unaffected by the data copy function.

Copy Source 1 (CP-296)

Copy Source 1 (CP-296) identifies the CP or MP whose value is copied to Copy Dest 1 when a 0 to 1 transition occurs in the DataCopy 1 PLC bit.

Copy Dest 1 (CP-297)

Copy Dest 1 (CP-297) identifies the CP that takes on the value of the CP or MP identified by Copy Source 1 when a 0 to 1 transition occurs in the DataCopy 1 PLC bit.

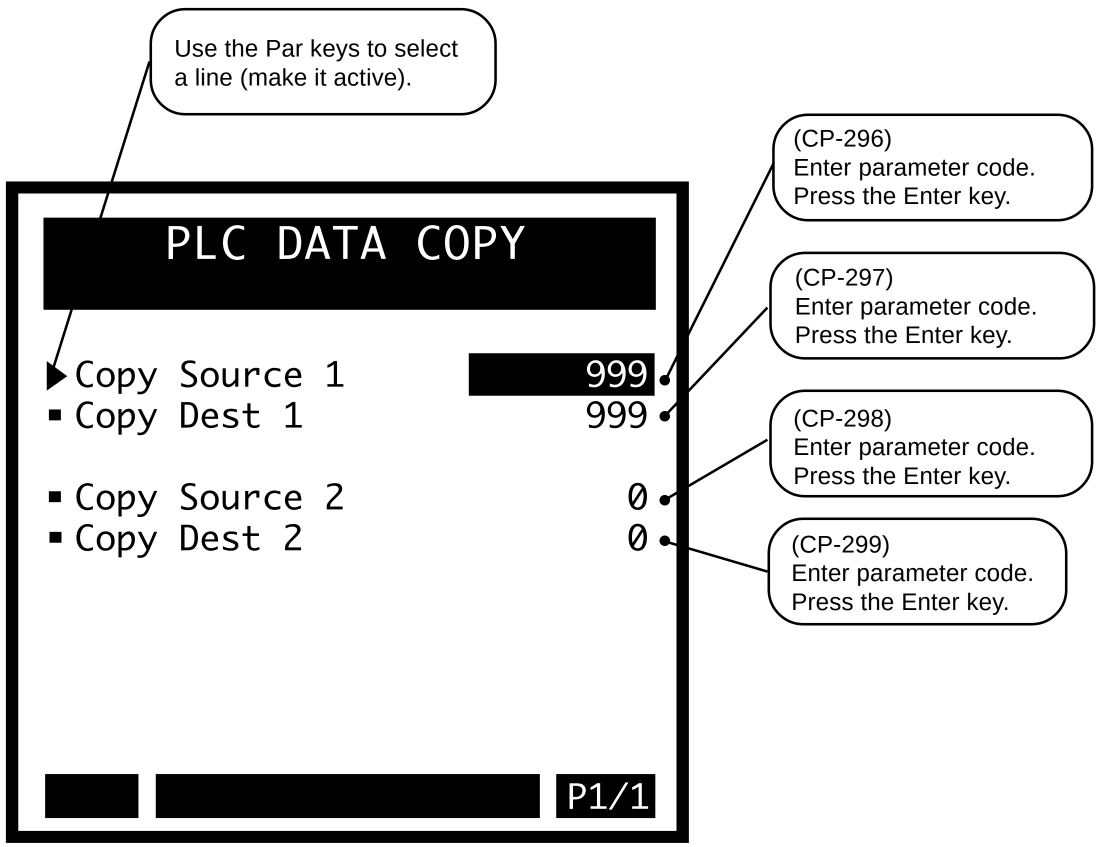
Copy Source 2 (CP-298)

Copy Source 2 (CP-298) identifies the CP or MP whose value is copied to Copy Dest 2 when a 0 to 1 transition occurs in the DataCopy 2 PLC bit.

Copy Dest 2 (CP-299)

Copy Dest 2 (CP-299) identifies the CP that takes on the value of the CP or MP identified by Copy Source 2 when a 0 to 1 transition occurs in the DataCopy 2 PLC bit.

The PLC Data Copy screens are accessed through
—> Main Menu / PLC <—



—NOTES—

DIGITAL I/O

The PLC / Digital I/O, (page 1) screen displays parameters that are associated with the digital inputs for the PLC (DI-8 through DI-15). The DI-14 and DI-15 are routed to the Scroll Up bit (168) and Scroll Dn bit (169) respectively by the default PLC program. This allows these digital inputs to control the remote scroll-up and remote scroll-down function. The remote- scroll function can be assigned to almost any of the Control Parameters. Use Remote Scroll (CP-300) to select the Control Parameter that you want to assign to the remote scroll function. The rate of change when the PLC Bit is “1” (On or Digital Input active with default PLC program) is determined by Rmt Scroll Rate (CP-301). This is the number of increments/ decrements to the least significant digit every second that the PLC bit (input) is active. Use Table 5-1 for the time-between increments or decrements of the various remote scroll rates.

DI 1 Shot (CP-302) determines which digital inputs will cause the corresponding PLC bit (8-15) to be “1” (On) for one PLC scan (one- shot) when an open-to-closed (active) transition occurs on the input. This is the default one-shot for the PLC.

Remote Scroll Rate	Increment Interval (Time)	Number of 10 - Msec Samples per Interval
1	1000 Msec = 1 Sec	100
2	500 Msec	50
3	333 Msec —> 330 Msec	33
4	250 Msec	25
5	200 Msec	20
10	100 Msec	10
11	91 Msec —> 90 Msec	9
12	83 Msec —> 80 Msec	8
14	71 Msec —> 70 Msec	7
15	67 Msec —> 60 Msec	6
20	50 Msec	5
25	40 Msec	4
30	33 Msec —> 30 Msec	3
50	20 Msec	2
100	10 Msec	1

Table 5-1 Remote Scroll Rates

Digital I/O

Remote Scroll (CP-300)

In Remote Scroll (CP-300), enter the number of the Control Parameter that you want the Remote Scroll Up bit (168) or the Remote Scroll Dn bit (169) to increment or decrement by 1 least significant digit, at the Scroll Rate (CP-301). To disable the function, set Remote Scroll (CP-300) to “0” .

Rmt Scroll Rate (CP-301)

Remote Scroll Rate (CP-301) is the number of times per second, that the Control Parameter that you entered in Remote Scroll (CP-300) is either incremented or decremented 1 least significant digit , when the Remote Scroll Up bit (168) or the Remote Scroll Dn bit (169) is active.

The Remote Scroll Up bit (168) and the Remote Scroll Dn bit (169) are monitored at a 10 millisecond (Msec) scan rate. The input (internal PLC function) must hold the PLC active (“1” in the PLC) for a minimum of 12 Msec (10 Msec if activated internally) to guarantee the first count and the subsequent operation. The first increment or decrement of the Control Parameter that you entered in Remote Scroll (CP-300) occurs when the PLC bit is recognized as active by the 10 Msec scan. If the PLC bit is low during the next 10 Msec scan when the next PLC bit is recognized as active by the 10 Msec scan, then the function resets and increments the parameter again. This allows a debounce of approximately 10 Msec, along with an additional 2 Msec hardware filtering. Once the PLC bit remains active, the increment or decrement occurs at a periodic rate, which is determined by Rmt Scroll Rate (CP-301). This time is given approximately by 1/(Rmt Scroll Rate {CP-301}). The increment or decrement is performed at integer multiples of 10 Msec (1-100), with some exceptions that are apparent on Table 5-1. If Rmt Scroll Rate (CP-301) is set to “10” (10 times per second or 100 Msec per increment update) and the PLC bit is only active (1) for 1/2 second, then the Control Parameter that was selected in Remote Scroll (CP-300) will increment by “5” (the least significant digit).

There is an upper limit to the actual scroll rate. It may not be possible to achieve a fast rate (e.g., 100 times per second, 10 Msec counting) because of the computation time that is required to process the scroll rate that you entered in Rmt Scroll Rate (CP-301). If the computation time to input the new value takes longer than the increment interval (10 Msec in this example) then the actual rate will be slower than the scroll rate that you entered in Rmt Scroll Rate (CP-301). Refer to the Table 5-1 for the time-between increment or decrement of the various remote scroll rates.

DI 1 Shot (CP-302)

Use the Digital Input 1 Shot (CP-302) to create a one scan pulse (one-shot) as the result of a high-to-low (open-to-closed) transition on any or all of the PLC dedicated inputs. To generate a 1- scan pulse for an inactive high to an active low transition, enter a “1” in the bit location of corresponding digital input. In the example below, the “1” has been entered in digital input 14.

DI 7..0 (MP-26)

Digital Input 7-0 displays the value of the “J6” digital inputs. A ‘1’ in the bit location indicates a “low voltage” condition on the corresponding input (which is consistent with a contact closure to common). Refer to Appendices: Appendix C for the DI 7..0 (MP-26) bit map list.

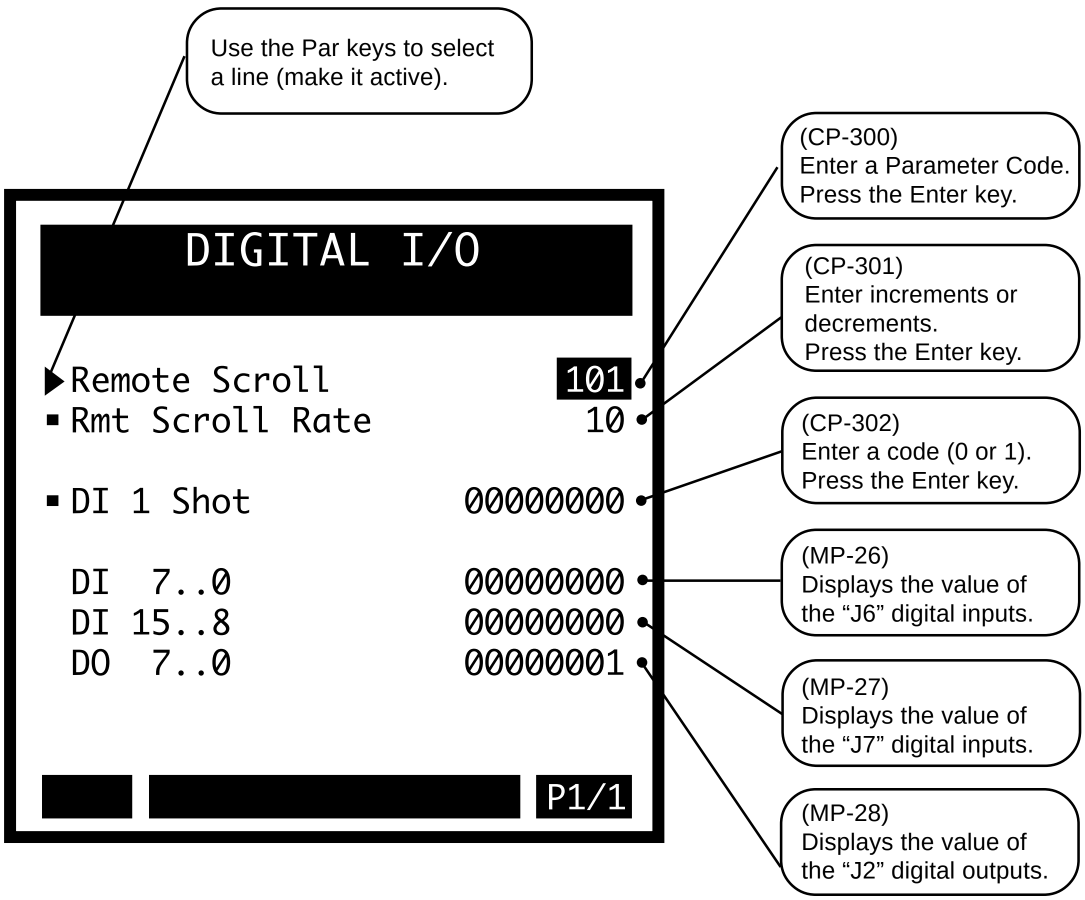
DI 15..8 (MP-27)

Digital Input 15-8 (MP-27) displays the value of the “J7” digital inputs. A ‘1’ in the bit location indicates a “low voltage” condition on the corresponding input (which is consistent with a contact closure to common). These eight inputs can be set up in the PLC Programming screen to generate a One-Shot Pulse on a high-to-low transition. Refer to Appendices: Appendix C for the DI 15..0 (MP-27) bit map list.

DO 7..0 (MP-28)

Digital Output 7-0 displays the value of the “J2” digital outputs. A ‘1’ in the bit location indicates an active “low voltage” condition on the corresponding open collector output (which would sink DC current). Refer to Appendices: Appendix C for the DO 7...0 (MP-28) bit map list.

The Digital I/O screens are accessed through
—> Main Menu / PLC <—



PLC PROGRAMMING

Editor and the Compiler:
The PLC program consists of a text-based list of commands (instructions) and operands that work on bit data to produce the same result as a ladder-logic language. Each rung of a ladder logic program is implemented as a group of commands/operands starting with the “LOAD” (or LD NOT) command and ending with the “OUT ”command. A special series of screens that function as an editor allow you to change the PLC program. You can add commands, delete commands or change a command or operand. This is done with the keypad and screens; programming computer is not required.

Go to PLC / PLC Programming. This will bring up the current PLC program. There are five pages with a total of 64 lines. Each line consists of one command and one operand. The simplest rung would require two lines: one for the opening “LOAD” and one for the closing “OUT”. Scroll through the lines with the Par Up or Par Down keys. The second line of the PLC Programming title block will display what line is active (highlight) and if the command or operand on that line is active. Use the Page Up and Page Down keys scroll quickly through the entire program. Any changes made to the PLC program will be compiled immediately. The changes go into effect as soon as the PLC Program has been exited and saved.

Changing Commands:
Scroll the Par Up or Par Down keys to the command that you want to change (highlight). Use the Page Up and Page Down keys scroll quickly through the entire program. The second line of the PLC Programming title block will display what line is active (highlight) and the command on the line that is active. When an command is active (highlight), it can be changed by using the “increment scroll up/down” keys to scroll through the list of available commands. Stop scrolling when the correct command appears. Use the Clear key to delete a the active line. The operand may need to be changed to be consistent with the new command. Use the Par Down key to scroll to the operand (highlight).

Changing Operands:
Scroll the Par Up or Par Down keys to the to the operand that you want to change. Use the Page Up and Page Down keys scroll quickly through the entire program. The second line of the PLC Programming title block will display what line is active (highlight) and the operand on the line that is active. When a operands is active, it can be changed either by entering the PLC Bit number or by scrolling through the list of operands with the “increment scroll ▲ or ▼” keys. The name of the operand appears on the line to the right of the PLC Bit number. Stop scrolling when the correct operand appears. Press the Enter key to enter operand. Use the Clear key to delete a the active line.

Inserting a New Line:
To insert a new line at the active line (highlight), scroll to the command and press the Enter key. The new line is now active and the prior active line, as well as the rest of the lines, move down one line. The new line appears as a “NOP” (no operation) command and a “No Opnd” (NOP operand).

To Insert a new line below the active line (highlight), scroll to the operand and press the Enter key. A new line is inserted on the next line and becomes the active line. The entire program, moves down one line. The new line appears as a “NOP” (no operation) command and a “No Opnd” (NOP operand).

Delete a Line:
To delete a line, scroll to either the command or operand of the line and press the Clear key. A dialog box appears and asks if you want to delete the line. Press the Enter key to delete the line or the Clear key to cancel the request to delete.

Status and Help screens:
Press the Help key to go to the help screen for a description of the PLC Programming. Press the Status key to access the status screen. Press the Status key again to return to the PLC Programming screen. The Code is still functional in the status screen. However, if you access the status screen from the PLC programming screen, then you can not access the menu screens from the status screen. You must exit the PLC Programming screen in order to access the menu screens.

Closing and Saving the PLC Programming screen:
To return to the menu screen, press the Menu key. If you made any changes, a dialog box will appear to confirm the changes. To keep the changes, press the Enter key. Pressing the Enter key to accept the changes does not alter the PLC backup or the PLC default program. To discard the current changes, press the Clear key.

DANGER

When you exit the PLC Programming screen and press the Enter key, the changes will take effect immediately.

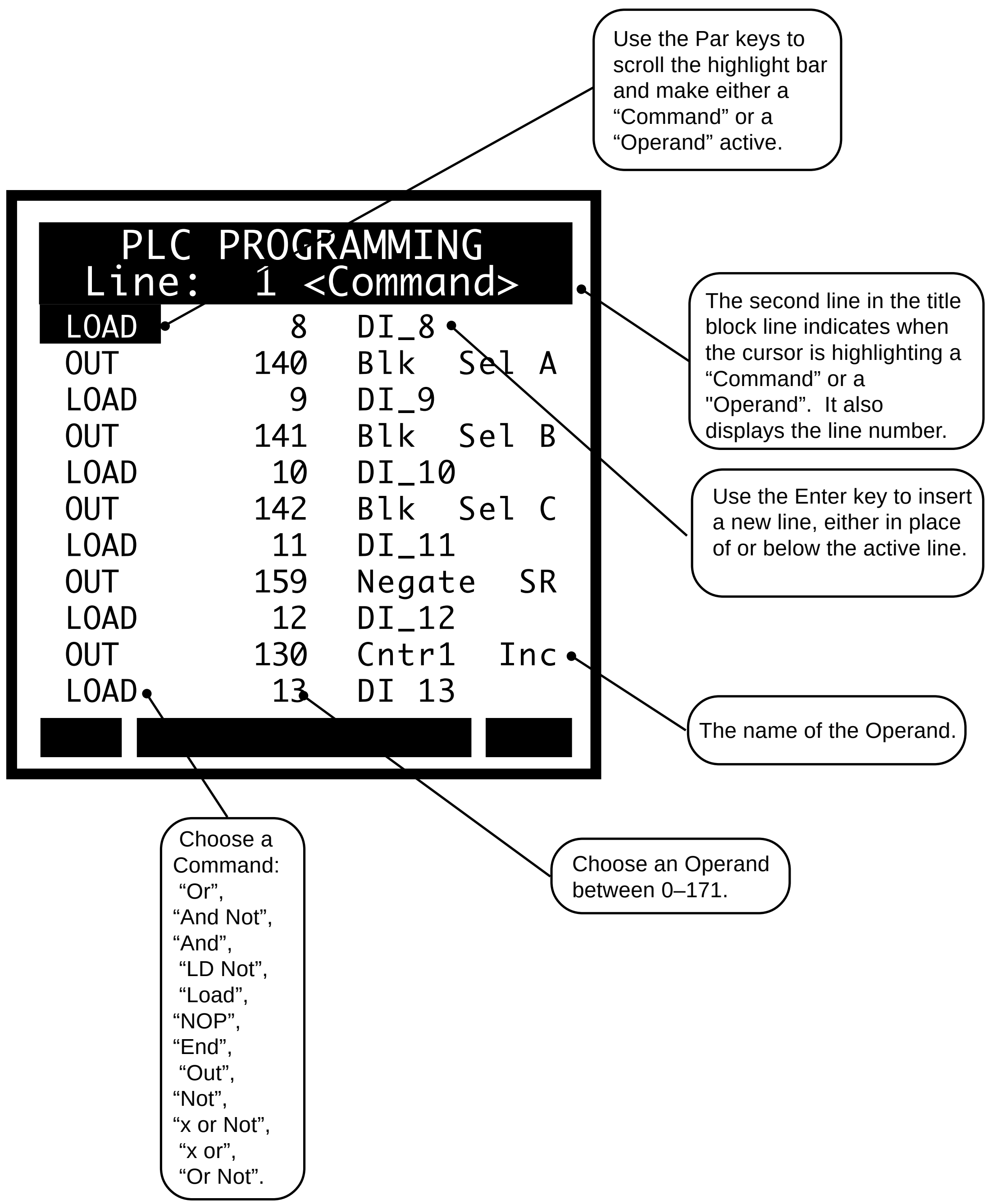
The new program could cause a digital output to change state, and cause an actuator to engage or disengage.

Creating a Customized Backup Program:
To save the changes that you have made to the PLC Program as a customized backup PLC program, go to the Device Configuration/Load & Save Parms screen (page 1) and enter “1” in Save PLC Parm (CP-399).

Loading the Backup Program or the Default Program:
The last page (page 5) of the PLC programming help screens (accessed from any line) allows you to choose between loading the backup PLC program (that you have customized) or loading the default PLC program that was shipped from the factory. “Load Default Program” is the default. You can also access the PLC backup or the PLC default programs from the Device Configuration/Load & Save Parms screen (page 1). For the list of the factory default PLC Program Logic, see *Appendices: Appendix I*.

NOTE: The backup PLC Program is identical to the default PLC Program until you customize the PLC and then save the backup in the Device Configuration/Load & Save Parms screen. In addition, if you perform a “Clear 9” power -up, your customized backup PLC Program will revert back to the default PLC Program.

The PLC Programing screens are accessed through
—> Main Menu / PLC <—



Use the Page keys to go scroll through the 64 command lines, a page at a time.
The screens below display the default sttings for lines 12 through 64.

```
PLC PROGRAMMING
Line: 12 <Command>
OUT       135 Cntr 1 RST
LOAD       14 DI_IN 14
OUT       168 Scroll UP
LOAD       15 DI_IN 15
OUT       169 Scroll DN
LOAD       68 Loop Open
OR         69 Loop Vel
OR         74 H-Stop
OUT       151 RstPsnErr1
LD NOT     44 Fb @ 0Spd
OUT       100 DO_0
```

```
PLC PROGRAMMING
Line: 23 <Command>
LOAD       48 MAx Fb Spd
OUT       101 DO_1
LD NOT     57 Cmpr2 Out
OUT       102 DO_2
LOAD       58 Cmpr3 Out
OUT       103 DO_3
LOAD       59 Cmpr4 Out
OUT       104 DO_4
LOAD       32 Cntrl1 Out
OUT       105 DO_5
LOAD       40 CO Sign
```

```
PLC PROGRAMMING
Line: 34 <Command>
OUT       106 DO_6
LOAD       41 Drive En
OUT       107 DO_7
<END>     171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
```

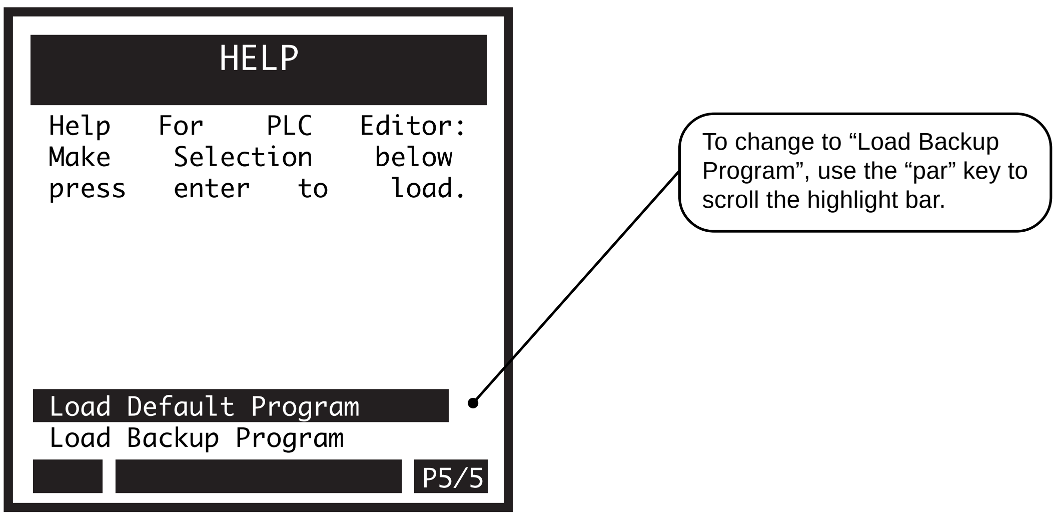
```
PLC PROGRAMMING
Line: 45 <Command>
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
```

```
PLC PROGRAMMING
Line: 56 <Command>
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
```

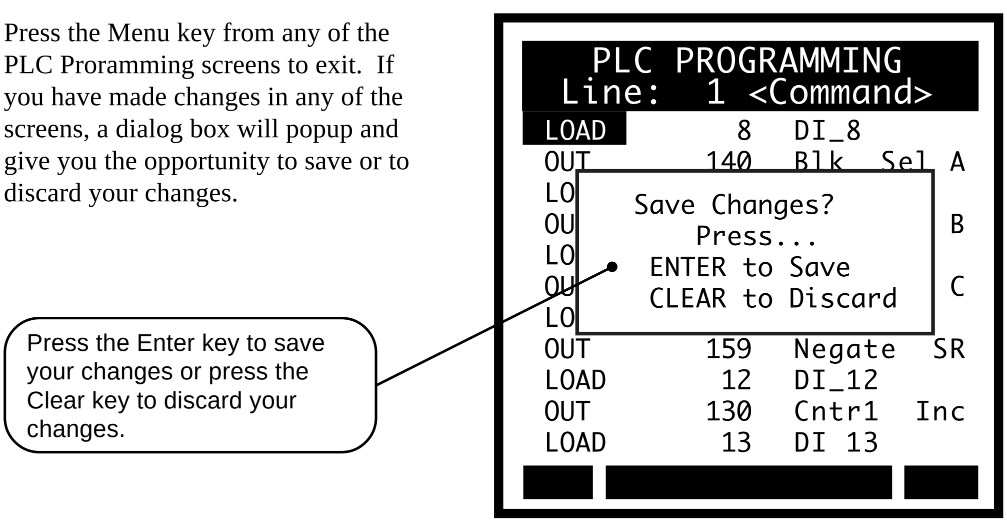
```
PLC PROGRAMMING
Line: 64 <Command>
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
NOP       171 No Opnd
```

PLC Programming / Help Screen Option and Save Screen

The last page of the Help screens (page 5) allows you to choose between creating a backup of the changes that you have entered or loading the default bit program that was shipped from the factory. “Load Default Program” is the default choice.



Press the Menu key from any of the PLC Proramming screens to exit. If you have made changes in any of the screens, a dialog box will popup and give you the opportunity to save or to discard your changes.



DEVICE CONFIGURE

The Device Configure screens allow you to perform a varitey of load, save and setup functions, The “Load” parameters allow you to load Control Parameter values and the PLC program from either the backup or from the factory default. The “Save” parameters allow you to save the Control Parameter values and the PLC program to a backup copy. You can customize the Status screen for your specific requirements. The Serial Communications Setup screen includes parameters that configure the serial communications port.   When Keypad Lock Input is active, Control Parameter values can not be changed. The Keypad Lockout Setup screens allow you to specify which Control Parameters will be exempt from the lockout when the Keypad Lockout Input is active.The Video Setup screen includes the parameters that control the screen operation. Display Setup contrast and adjust the pixel intensity of the screen display. The Alarm Indicator Mask screen includes the parameters that determine which alarms and which numerical comparator outcomes will cause the ‘alm’ to flash in the lower-left corner of the screen. The DeviceNet setup includes Control Parameters for DeviceNet network communications.

Caution: To avoid damage to your system, the CX-1010 must be calibrated and the motor drive set up before you operate your system. Refer to *Drive Setup / Calibration: Calibration*.

The Device Configure screens are:

- Status Screen Setup
- Load and Save Parms
- Keypad Lock Setup
- Serial Comm Setup
- DeviceNet Setup
- Video Setup
- Alm Indicator Mask

STATUS SCREEN SETUP

You can customize the six status lines, as well as the large number display and the E.U. line on the Status screen. To customize the large number display, enter this code of the parameter that you want displayed in Lg Number Parm (CP-340). Use Large Number Units (CP-199) to select and customize the E.U. line that appears immediately below the large number display. For each of the status lines (CP-341 through (CP-346), enter the code of the parameter that you want to appear on the corresponding line. You can enter a "0" in status lines 2 - 6 if you want them to remain blank. You can also access and change Control Parameters 341 through 346 while you are in the Status screen by using the Code key. For details on the Code key, refer to the Status screen in *Operator Interface: Screen Operation.*

Lg Number Parm (CP-340)

Use Large Number Parameter (CP-340) to select the parameter that displays in the Large Number Display in the Status screen (refer to the status screen in *Operator Interface: Screen Operation*. You can also use the Code key to access and change CP-340 in the Status Screen.

Lg Number Units (CP-199)

Use Large Number Units (CP-199) to select the E.U. text that displays immediately below the Large Number Display in the Status screen (refer to the status screen in *Operator Interface: Screen Operation*). Enter the numeric code that identifies the E.U. for the Control Parameter displayed in the Large Number Parameter (CP-340). Refer to CP-199 in *Appendices: Appendix C* for the numeric code list. The Help screen for CP-199 also contains a partial list of numeric code options. In addition, you can also scroll through the numeric code options by accessing CP-199 with the Code key while you are in the in the Status screen.

Status Line 1 (CP-341)

Use Status Line 1 (CP-341) to select the parameter that displays on the first line, under the Large Number Display, of the Status screen (refer to the status screen in *Operator Interface: Screen Operation)*. You can also use the Code key to access and change CP-341 in the Status screen.

Status Line 2 (CP-342)

Use Status Line 2 (CP-342) to select the parameter that displays on the second line (under the Large Number Display) of the Status screen (refer to the status screen in *Operator Interface: Screen Operation)*. If you want this line to remain blank, enter a "0" in CP- 342. You can also use the Code key to access and change CP-342 in the Status screen.

Status Line 3 (CP-343)

Use Status Line 3 (CP-343) to select the parameter that displays on the third line (under the Large Number Display) of the Status screen (refer to the status screen in *Operator Interface: Screen Operation)*. If you want this line to remain blank, enter a "0" in CP- 343. You can also use the Code key to access and change CP-343 in the Status screen.

Status Line 4 (CP-344)

Use Status Line 4 (CP-344) to select the parameter that displays on the fourth line (under the Large Number Display) of the Status screen (refer to the status screen in *Operator Interface: Screen Operation)*. If you want this line to remain blank, enter a "0" in CP- 344. You can also use the "Code key to access and change CP-344 in the Status screen.

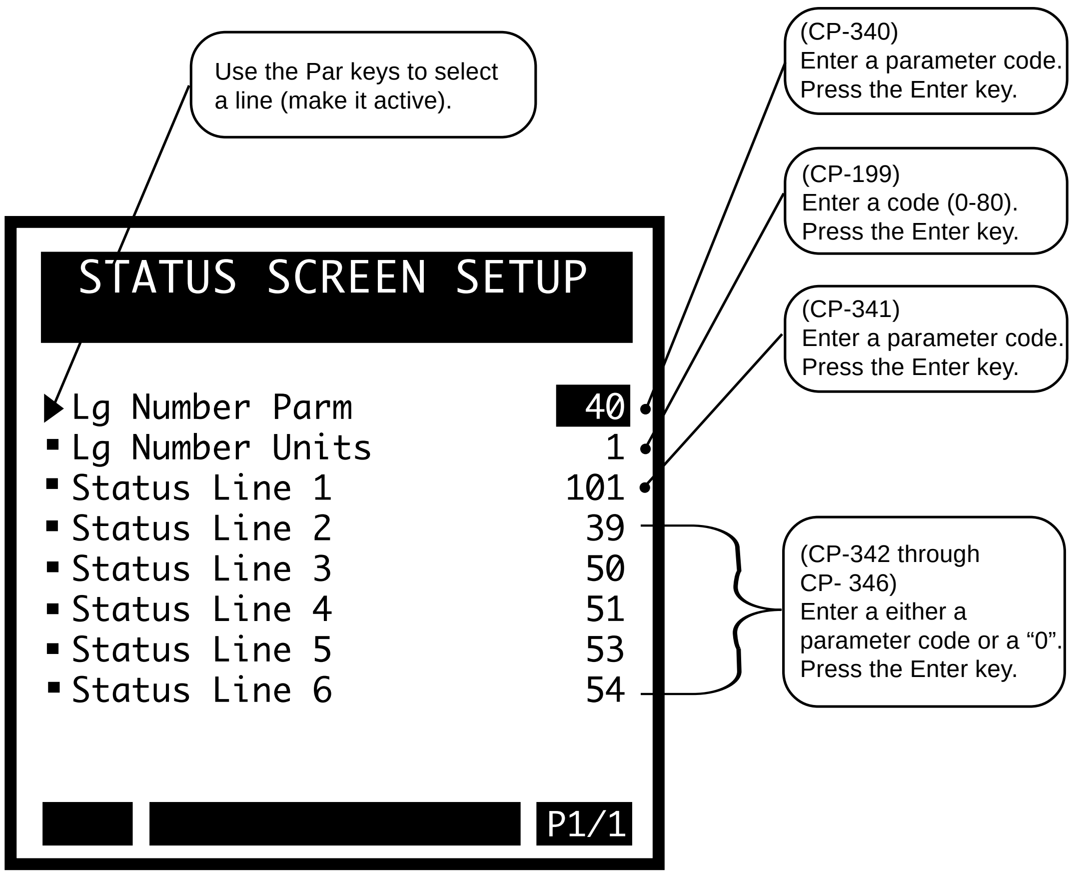
Status Line 5 (CP-345)

Use Status Line 5 (CP-345) to select the parameter that displays on the fifth line (under the Large Number Display) of the Status screen (refer to the status screen in *Operator Interface: Screen Operation)*. If you want this line to remain blank, enter a "0" in CP- 345. You can also use the "Code key to access and change CP-345 in the Status screen.

Status Line 6 (CP-346)

Use Status Line 6 (CP-346) to select the parameter that displays sixth line (under the Large Number Display) of the Status screen (refer to the status screen in *Operator Interface: Screen Operation)*. If you want this line to remain blank, enter a "0" in CP- 346. You can also use the "Code key to access and change CP-346 in the Status screen.

The Status Screen Setup screen is accessed through —> Main Menu / Device Configure <—



LOAD & SAVE PARMS

The Load and Store Parameters screen includes four parameters. The “Load” parameters allow you to load Control Parameter values and the PLC program from either the backup or from the factory default. The “Save” parameters allow you to save the Control Parameter values and the PLC program to a backup copy. The Control Parameters are located in two sections: the Main List CPs and the Block CPs. The Main List CPs are (CP-101 through CP-394). The Block CP’s are (CP-400 through CP-567). You can load and save each section separately, or you can load and save both sections together .

Load Parms (CP-396)

Use Load Parameters (CP-396) to retrieve (load) parameter values from either the factory or the default backup list. You can specify which parameter values to load form the back up, per the list below. It is easier to select the Load Parameters values through the Help screen, however, you can enter the corresponding number directly into the Load Parameters (CP-396). A message will flash in the error and message status bar at the bottom of the screen to indicate the completion of the operation . The Load Parameters operation will not function while the CX-1010 is in “RUN”.

6 = Load Dflts BlockCP	Load Factory Defaults into CP-400 through CP-567
5 = Load Dflts Main CP	Load Factory Defaults into CP-101 through CP-394
4 = Load Dflts All Cp	Load Factory Defaults into CP-101 through CP-567
3 = Load Backup BlockCP	Load Backup into CP-400 through CP-567
2 = Load Backup Main CP	Load Backup into CP-101 through CP-394
1 = Load Backup All Cps	Load Backup into CP-101 through CP-567
0 = No Change	

Load PLC Prgm (CP-397)

Use Load PLC Program (CP-397) to retrieve (load) either the backup for the PLC program which you have saved or the factory default PLC program. Enter “1” to load the backup PLC program or enter “2 ” to load the factory default PLC program. You can also select the one of the two values through the “Help” screen. The loaded program is compiled and a message will flash in the error and message status bar at the bottom of the screen to indicate the completion of the operation. The Load PLC Program operation will not function while the CX-1010 is in “RUN”.

2 = Load Dflt PLC Prg	Load Factory Default PLC program
1 = Load Backup PLC Prg	Load Backup PLC program
0 = No Change	

Save Parms (CP-398)

Use Save Parameters (CP-398) to save the current parameter values to the backup.   You can specify which parameter values to save as backup, per the list below   Either enter the corresponding number directly into the Save Parameters (see list below) or select the Save Parameters values through the “Help” screen. A message (Saved2 BkUp) will flash in the error and message status bar at the bottom of the screen to indicate the completion of the operation.

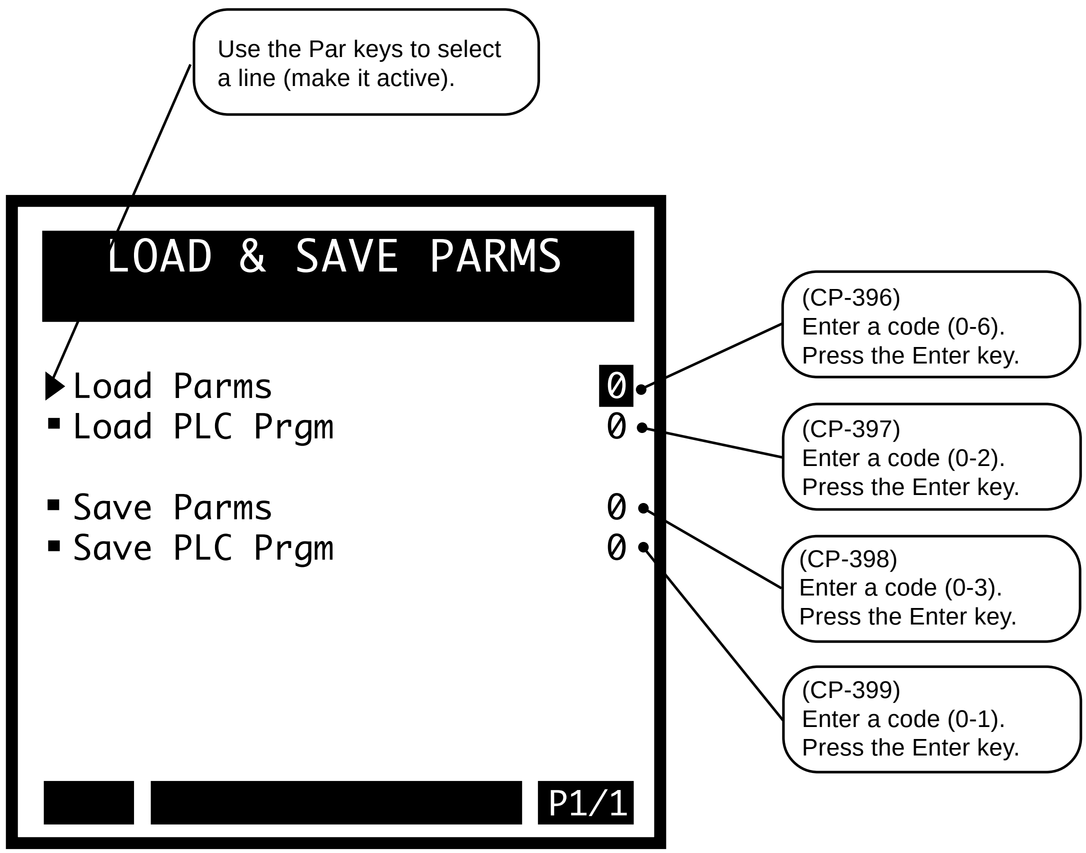
3 = Save Block CP’s	Save CP-400 through CP-567 to Backup
2 = Save Main CP’s	Save CP-101 through CP-394 to Backup
1 = Save All CP’s	Save CP-101 through CP-567 to Backup
0 = No Change	

Save PLC Prgm (CP-399)

Enter a “1” in Save PLC Program (CP-399) to save the current PLC program to the backup.   A message (Saved2 BkUp) will flash in the error and message status bar at the bottom of the screen to indicate the completion of the operation.

1 = Save PLC Program to Backup
0 = No Change

The Load & Store Parms screen is accessed through
—> Main Menu / Device Configure <—



KEYPAD LOCKOUT SETUP

When Keypad Lock Input is active, Control Parameter values can not be changed. The Keypad Lockout Setup screens allow you to specify which Control Parameters, or blocks of Control Parameters, will be exempt from the lockout when the Keypad Lockout Input is active. Use KyPdLk Mask (CP-380) in conjunction with the Unlock Control Parameters 381 - 388 to specify which Control Parameters are exempt from the lockout.

KyPdLk Mask (CP-380)

When the keypad lockout input is active (low), and Key Pad Lock Mask (CP-380) is set to either "0",“1”, “2”, “3”, or “4”, then certain groupings (see list below) of Control Parameters can be exempted (masked out) from the lockout. In addition, the individual Control Parameters that are specified in CPs 381 through 388 are also exempt. When Key Pad Lock Mask (CP-380) is set to “4”, then entire blocks of Control Parameters can be exempted in Unlock Block (CP-389). If Key Pad Lock Mask (CP-380) is set to “0”, then all of the Control Parameters are locked out and non are exempt, including CPs 318-389.

4 = UnLckBlk = Block Values of the Block Selected by Unlock Block (CP-389) and the Unlocked CP’s.
3 = Blk Vals = All BlockValues (CP-440-567) and the Unlocked CP’s are allowed to change.
2 = Setpnts = Setpoints (CP-110, 120, 130, 140) and the Unlocked CP’s are allowed to change.
1 = UnlckCP = CP’s selected by the Unlock CP A - F are allowed to changed.
0 = Total Lockout (default).

Unlock CP A (CP-381)

Unlock Control Parameter A (CP-381) determines which Control Parameter can change, even when the keypad-lockout is active. For the Unlock Control Parameter A (CP-381) to function, KyPdLk Mask (CP-380) must be set to a value other than “0” (All Lock). Enter “0” in Unlock Control Parameter A (CP-381) to disable it from selecting any Control Parameter.

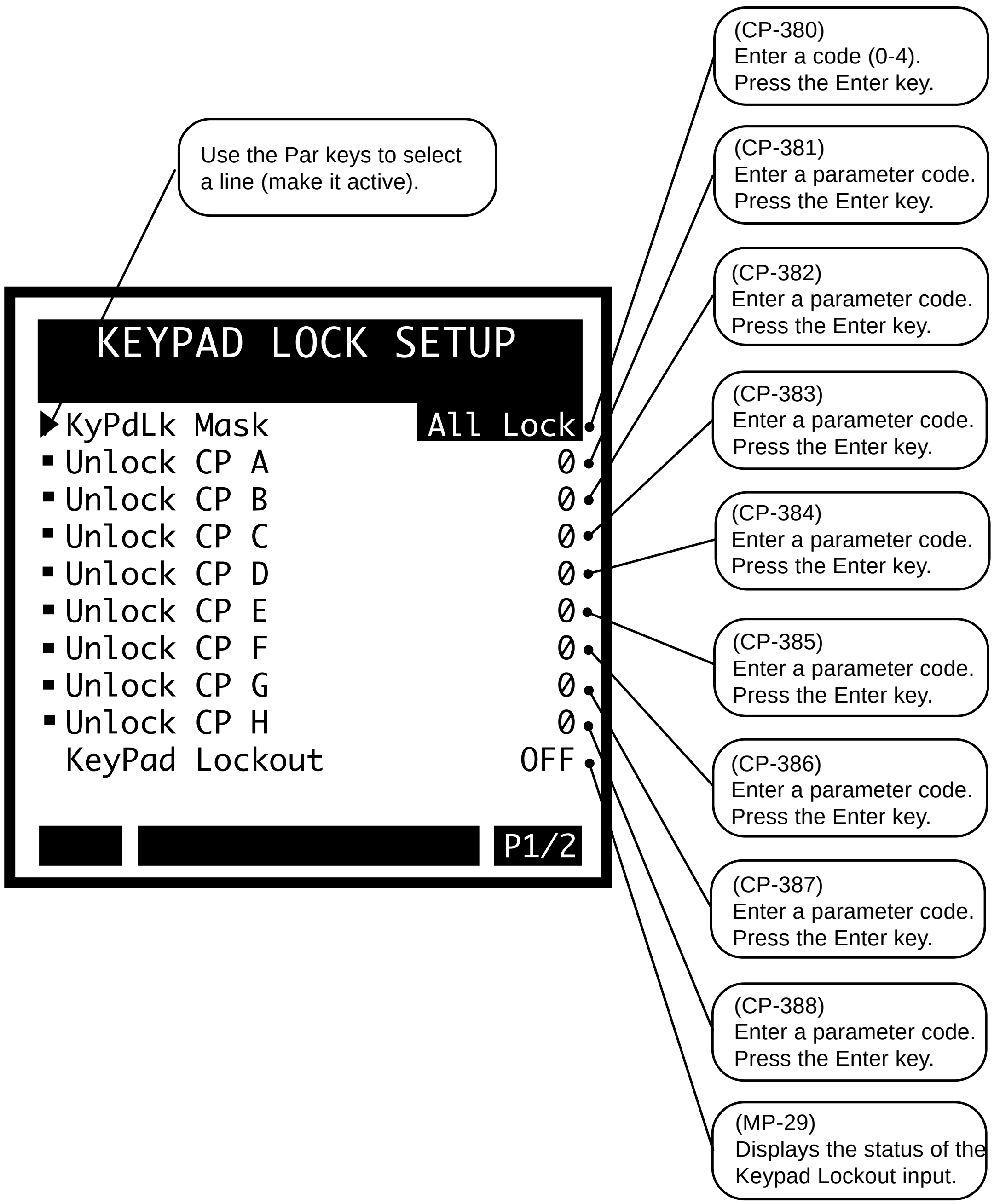
Unlock CP B (CP-382)
Unlock CP C (CP-383)
Unlock CP D (CP-384)
Unlock CP E (CP-385)
Unlock CP F (CP-386)
Unlock CP G (CP-387)
Unlock CP H (CP-388)

Control Parameters 381 - 388 are identical to each other. Refer to the description for Unlock CP A (CP-381).

KeyPad Lockout (MP-29)

Keypad Lockout (MP-29) displays the Keypad Lockout status. “On” indicates that the Keypad Lockout is active. When Keypad Lockout is active, Control Parameter values can not be changed. With the exception of the Control Parameters that are exempted by CP’s 380-389, the “OFF” indicates that the Keypad Lockout is not active. When the Keypad Lockout is not active, any Control Parameter can be changed.

The Keypad Lockout Setup screens are accessed through
—> Main Menu / Device Configure <—



Keypad Lockout Setup

KyPdLk Mask (CP-380)

When the keypad Lockout input is active (low), and Key Pad Lock Mask (CP-380) is set to either "0", “1”, “2”, “3”, or “4”, then certain groupings (see list below) of Control Parameters can be exempted (masked out) from the lockout. In addition, the individual Control Parameters that are specified in CPs 381 through 388 are also exempt. When Key Pad Lock Mask (CP-380) is set to “4”, then entire blocks of Control Parameters can be exempted in Unlock Block (CP-389). If Key Pad Lock Mask (CP-380) is set to “0”, then all of the Control Parameters are locked out and non are exempt, including CPs 318-389.

4 = UnLckBlk = Block Values of the Block Selected by Unlock Block (CP-389) and the Unlocked CP’s.
3 = Blk Vals = All BlockValues (CP-440-567) and the Unlocked CP’s are allowed to change.
2 = Setpnts = Setpoints (CP-110, 120, 130, 140) and the Unlocked CP’s are allowed to change.
1 = UnlckCP = CP’s selected by the Unlock CP A - F are allowed to changed.
0 = Total Lockout.

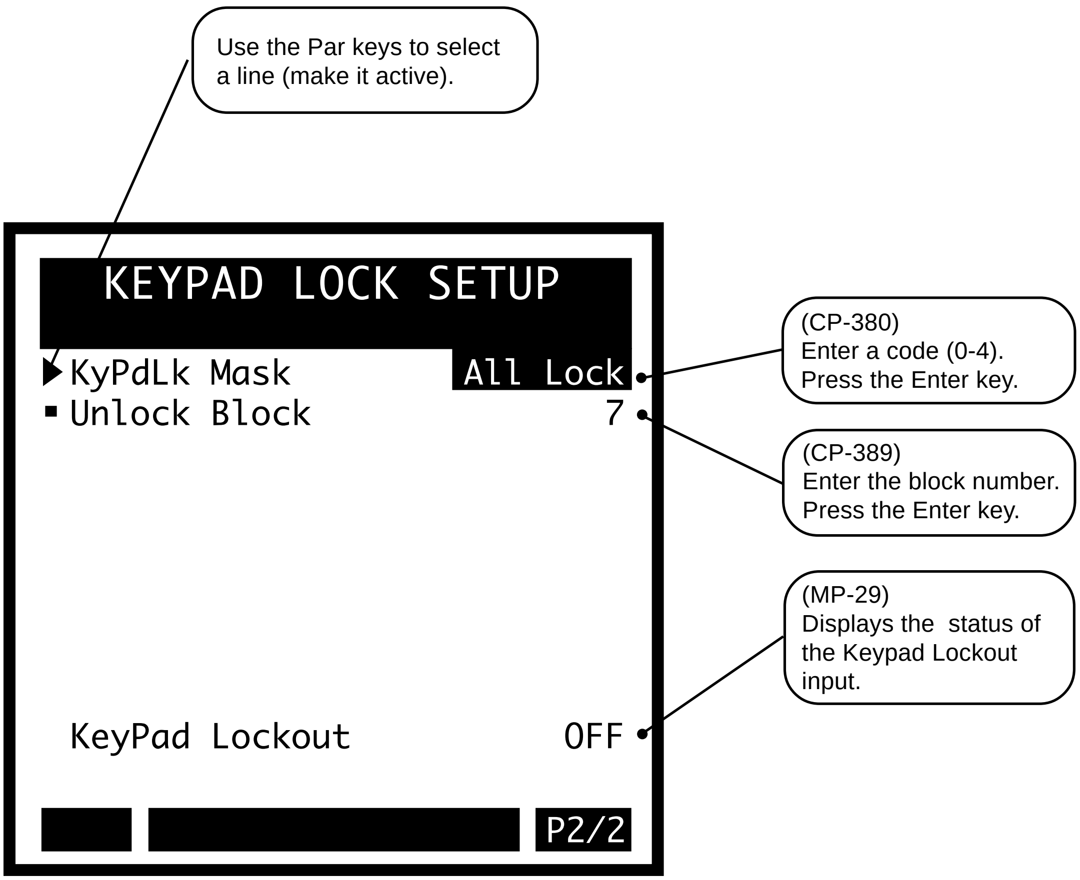
UnlockBlock (CP-389)

Use Unlock Block (CP-389) to choose which block of Control Parameters are exempt from the lockout, even when Keypad-lockout is active. Unlock Block (CP-389) is used in conjunction with KyPdLk Mask (CP-380), which must be set to “4” . Control Parameters 381 - 388 are also exempt when KyPdLk Mask (CP-380) is set to “4” . If Key Pad Lock Mask (CP-380) is set to “0”, all of the Control Parameters are locked out and none are exempt, including CPs 318-389.

KeyPad Lockout (MP-29)

Keypad Lockout (MP-29) displays the Keypad Lockout status. The Keypad Lockout is active when “On” is displayed. When Keypad Lockout is active, Control Parameter values can not be changed. With the exception of the Control Parameters that are exempted by CP’s 380-389. The Keypad Lockout is not active when “OFF” is displayed. When the Keypad Lockout is not active, any Control Parameter can be changed.

The Keypad Lockout Setup screen (page 2).



SERIAL COM SETUP

The Serial Communications Setup screen includes parameters that configure the serial communications port. Each CX-1010 that is connected on the same communications link, must have a unique Device Address (CP-370). The baud rate, frame format and record format must be consistent with other devices are communicating with the CX-1010.

Device Address (CP-370)

Device Address (CP-370) assigns the serial communications address for the CX-1010. This number should be different from any other units that are on the serial link.

Baud Rate (CP-371)

The Baud Rate (CP-371) determines the serial communications data transfer rate (see list below) in Bits/Sec. With a 10 bit frame length, the number of Frame/Sec would be 1/10 the Baud Rate.

1 = 300 bps = 300 Baud
2 = 600 bps = 600 Baud
3 = 1200 bps = 1200 Baud
4 = 2400 bps = 2400 Baud
5 = 4800 bps = 4800 Baud
6 = 9600 bps = 9600 Baud (default)
7 = 19200 bps = 19.2 Kbaud

Frame Format (CP-372)

Frame Format (CP-372) determines the parity, the number of data bits and the number of stop bits for the serial communications.

1 = N,8,1 = No Parity, 8 data bits, 1 stop bit (10 bit frame - ASCII or Binary)
2 = E,7,1 = Even Parity, 7 data bits, 1 stop bit (10 bit frame-ASCII only)

Record Format (CP-369)

Record Format (CP-369) determines which type of data format (see list below) will be used for the serial communication.

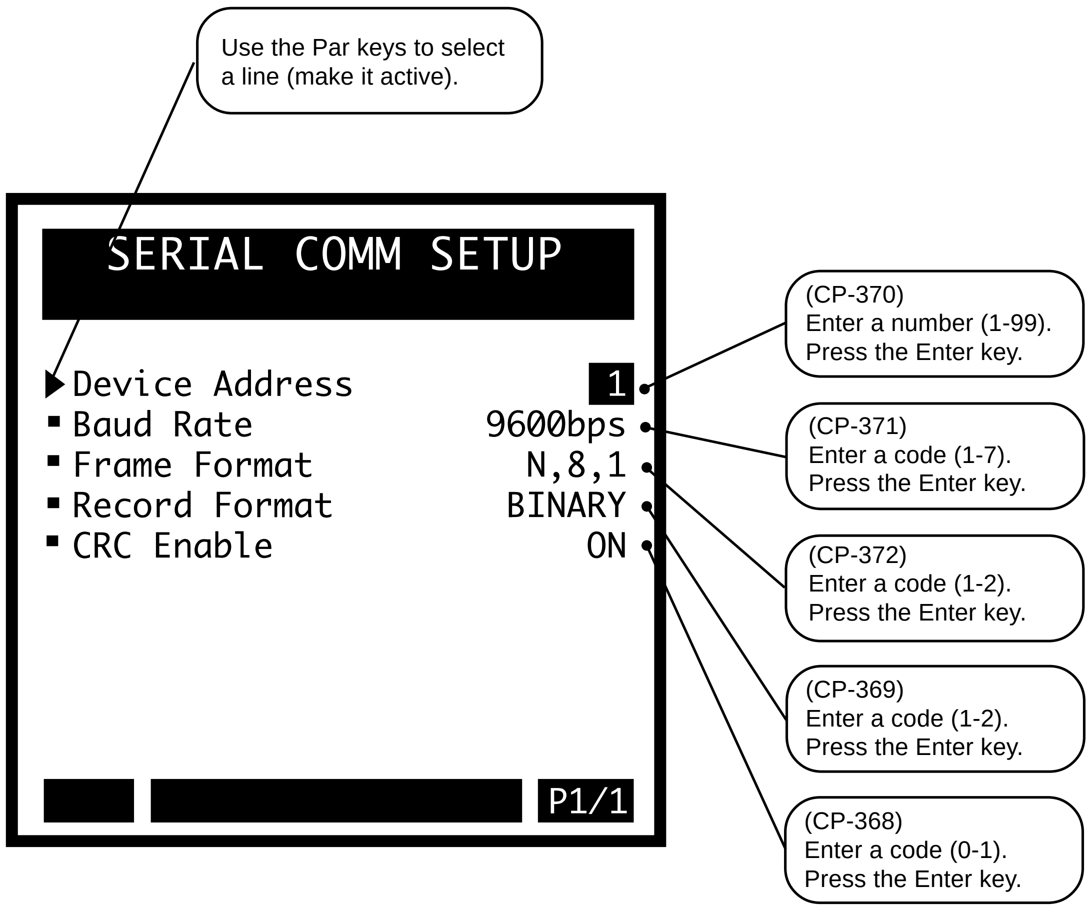
3 = ASCII2 2 = ASCII 1 = BINARY

CRC Enable (CP-368)

If CRC Enable (CP-368) is set to “ON” (1), you must append a CRC value to all serial communications messages that are received by the CX-1010 (See *Serial Communications: Using Serial Communications*). The CX-1010 checks the CRC value against the the message contents (excluding the “STX”), then calculates a CRC value and appends it to all serial communications responses. If CRC Enable (CP-368) is set to “OFF” (0), the CX-1010 will ignore any CRC value that is appended to a message and will not append a CRC value to any serial communications responses.

1 = On (Enabled) 0 = Off (Disabled)

The Serial Com Setup screen is accessed through
—> Main Menu / Device Configure <—



DEVICENET SETUP

The DeviceNet Setup screens include parameters to configure the DeviceNet option card for network communications. Page 1 of the DeviceNet Setup screens includes the Serial Number attribute of the Identity Object and the MAC ID and Baud Rate attributes from the DeviceNet Object. Page 2 is used to enter the eight Parameter Codes for the Assembly Queue. Refer to "CX-1010 DeviceNet Card Technical Manual" for more detailed information on CX-1010 DeviceNet operations.

DN MAC ID (CP-376)

DN MAC ID is the DeviceNet Media Access Control Identifier. The MAC ID is used to assign a unique identifier or address to each node on the network. Assign a different MAC ID to each CX-1010 device on the network from 0 to 63.

DN Baud Rate (CP-377)

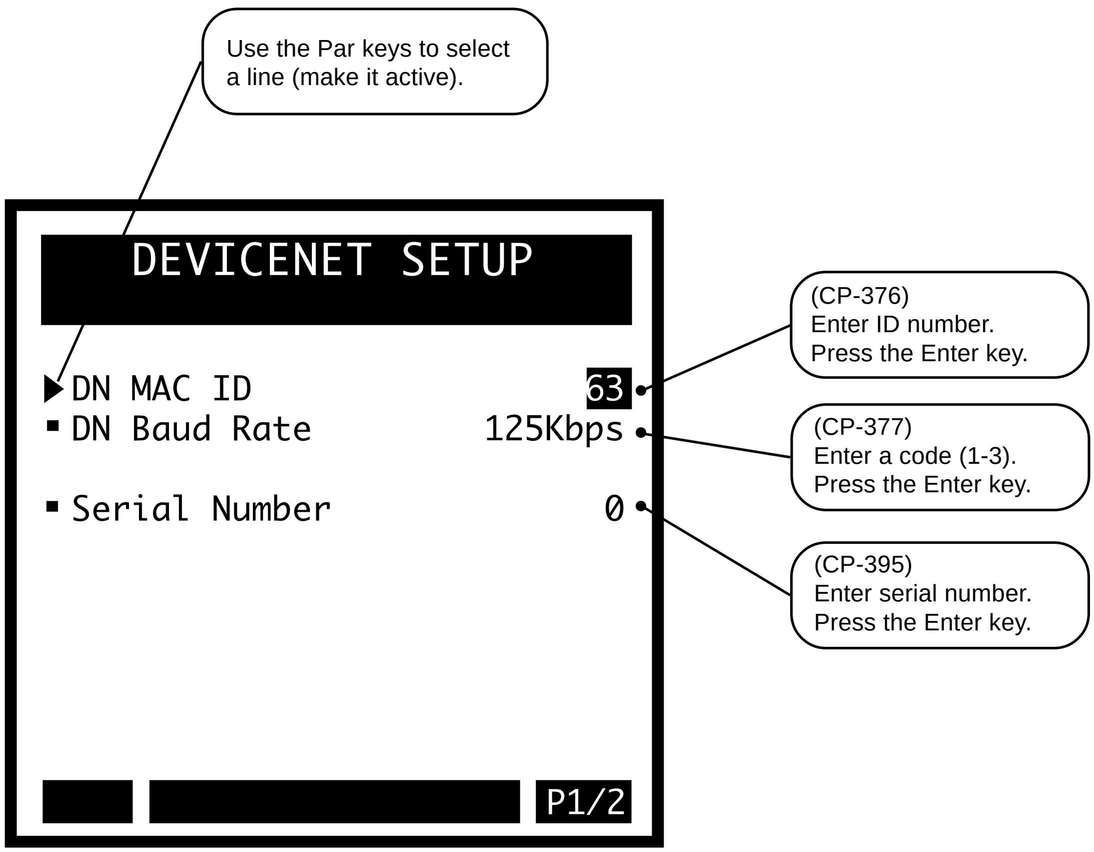
The DN Baud Rate is the network data or transfer rate. Enter the number from the listing below that corresponds to the desired baud rate:

1 = 125 Kbps
2 = 250 Kbps
3 = 500 Kbps

Serial Number (CP-395)

Serial Number is the serial number from the DeviceNet card in this CX-1010 controller. If the card was factory installed, the Serial Number should already be entered. If the card is being field installed, enter the Serial Number from the label on the card or recorded in the DeviceNet Card Technical Manual.

The DeviceNet Setup screen is accessed through
—> Main Menu / Device Configure <—



DeviceNet Setup

The following parameters are used to identify the eight parameters for the I/O Assembly Queue.

DN Write Parm 1 (CP-330)

Enter the number of a Control Parameter to be written to with the DeviceNet poll command in the I/O Assembly Queue.

DN Write Parm 2 (CP-331)

Enter the number of a Control Parameter to be written to with the DeviceNet poll command in the I/O Assembly Queue.

DN Write Parm 3 (CP-332)

Enter the number of a Control Parameter to be written to with the DeviceNet poll command in the I/O Assembly Queue.

DN Write Parm 4 (CP-333)

Enter the number of a Control Parameter to be written to with the DeviceNet poll command in the I/O Assembly Queue.

DN Read Parm 1 (CP-334)

Enter the number of a Control Parameter or Monitor Parameter to be read with the DeviceNet poll command in the I/O Assembly Queue.

DN Read Parm 2 (CP-335)

Enter the number of a Control Parameter or Monitor Parameter to be read with the DeviceNet poll command in the I/O Assembly Queue.

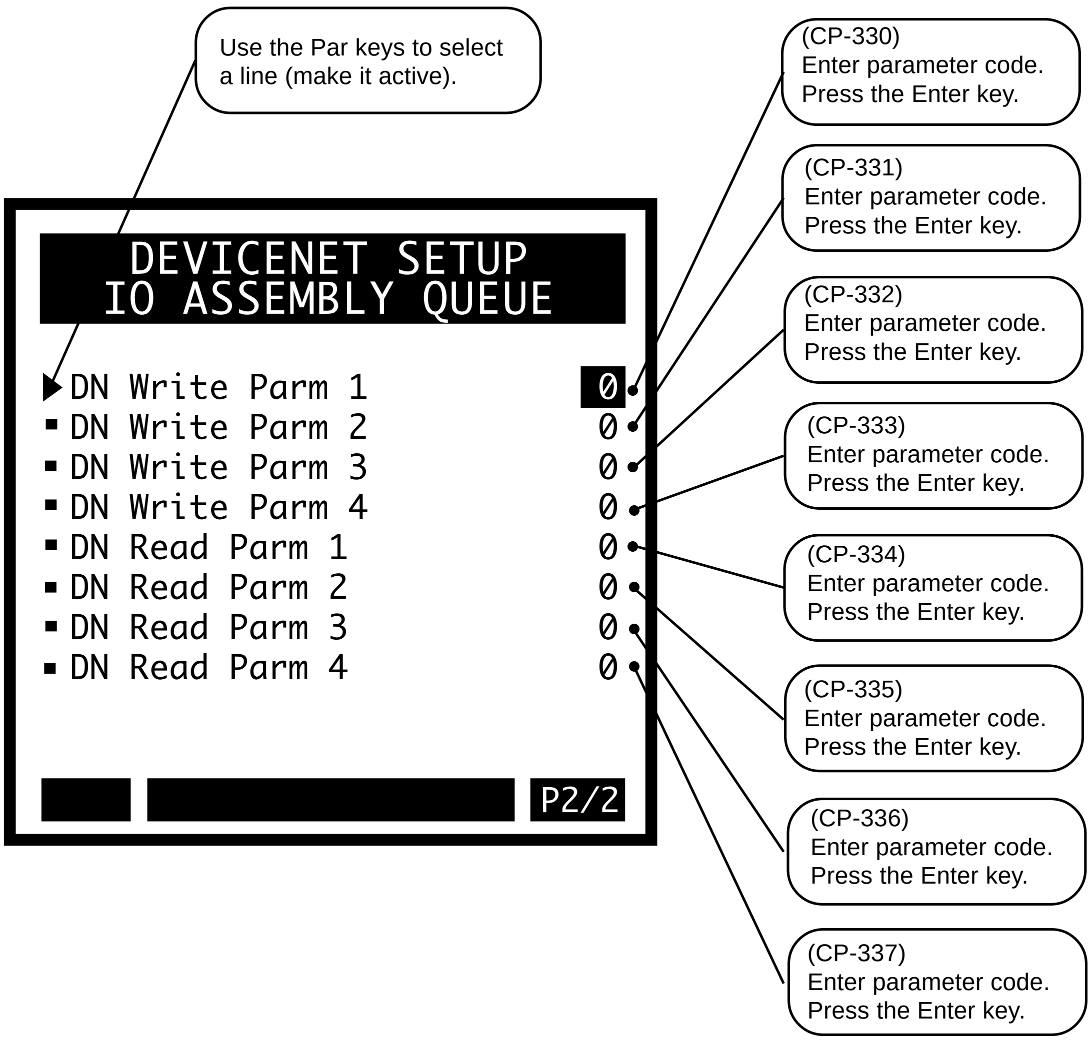
DN Read Parm 3 (CP-336)

Enter the number of a Control Parameter or Monitor Parameter to be read with the DeviceNet poll command in the I/O Assembly Queue.

DN Read Parm 4 (CP-337)

Enter the number of a Control Parameter or Monitor Parameter to be read with the DeviceNet poll Command in the I/O Assembly Queue.

The DeviceNet Setup screen is accessed through —> Main Menu / Device Configure <—



VIDEO SETUP

The Video Setup screen includes the parameters that control the screen operation. Video Mode (CP-374) allows you to change the format. Contrast Value (CP-375) allows you to adjust the intensity of the pixels. If the screen appears too light, increase the value in Contrast Value. If the screen appears too dark, decrease the value. This may vary from screen to screen.

Video Mode (CP-374)

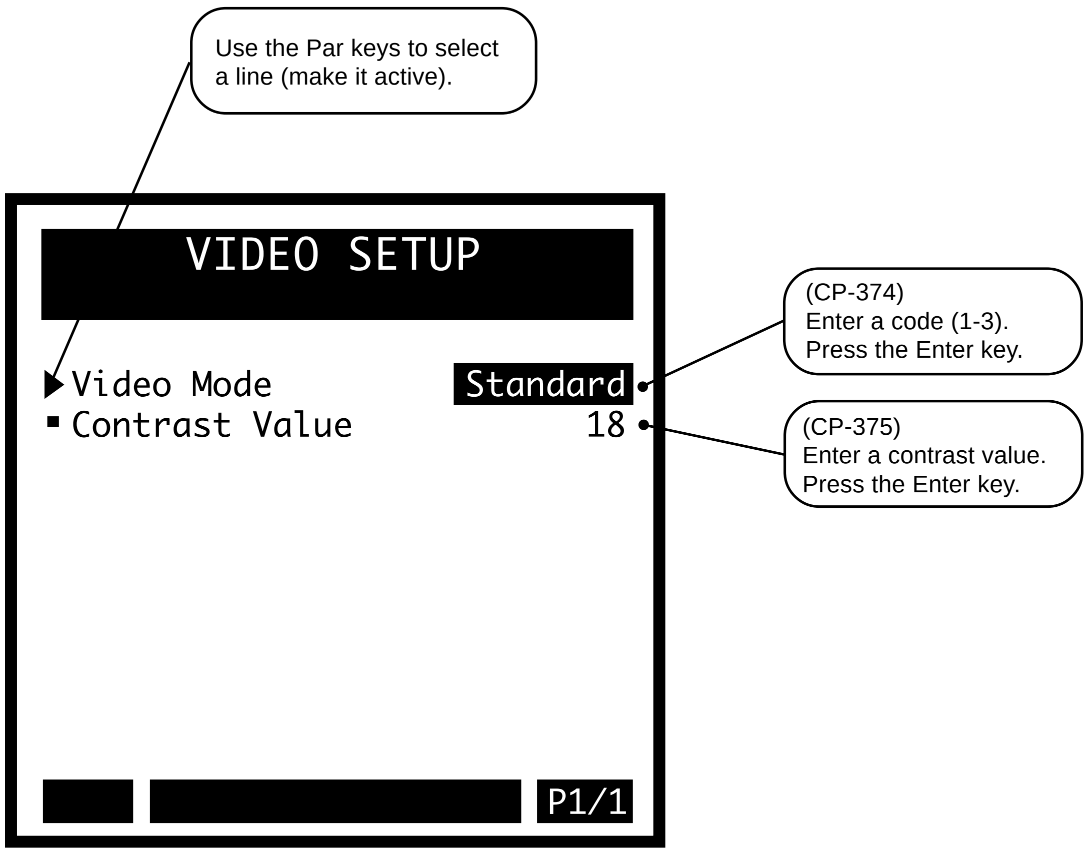
Video Mode (CP-374) determines how the LCD Screen Display will be displayed, per the list below:

3 = Standard w/Border
2 = Reverse Video
1 = Standard Video (default)

Contrast Value (CP-375)

Contrast Value (CP-375) determines the contrast for the LCD Screen Display. The higher values darken the pixels and lower values lighten the pixels.

The Video Setup screen is accessed through
—> Main Menu / Device Configure <—



ALARM INDICATOR MASK

The Alarm Indicator Mask screen includes the parameters that determine which alarms and which numerical comparator outcomes will cause the ‘alm’ to flash in the lower-left corner of the screen. The two parameters are bit mapped for each condition. Place a ‘1’ in the bit position corresponding to the alarms or compares that you want to activate the ‘alm’ indicator. In this case, a ‘0’ in the bit masks (or disables) the condition from activating the ‘alm’ indicator. Refer to *Appendices: Appendix C* for the Std Alm Msk (CP-278) and CustAlm Msk (CP-279) bit map list.

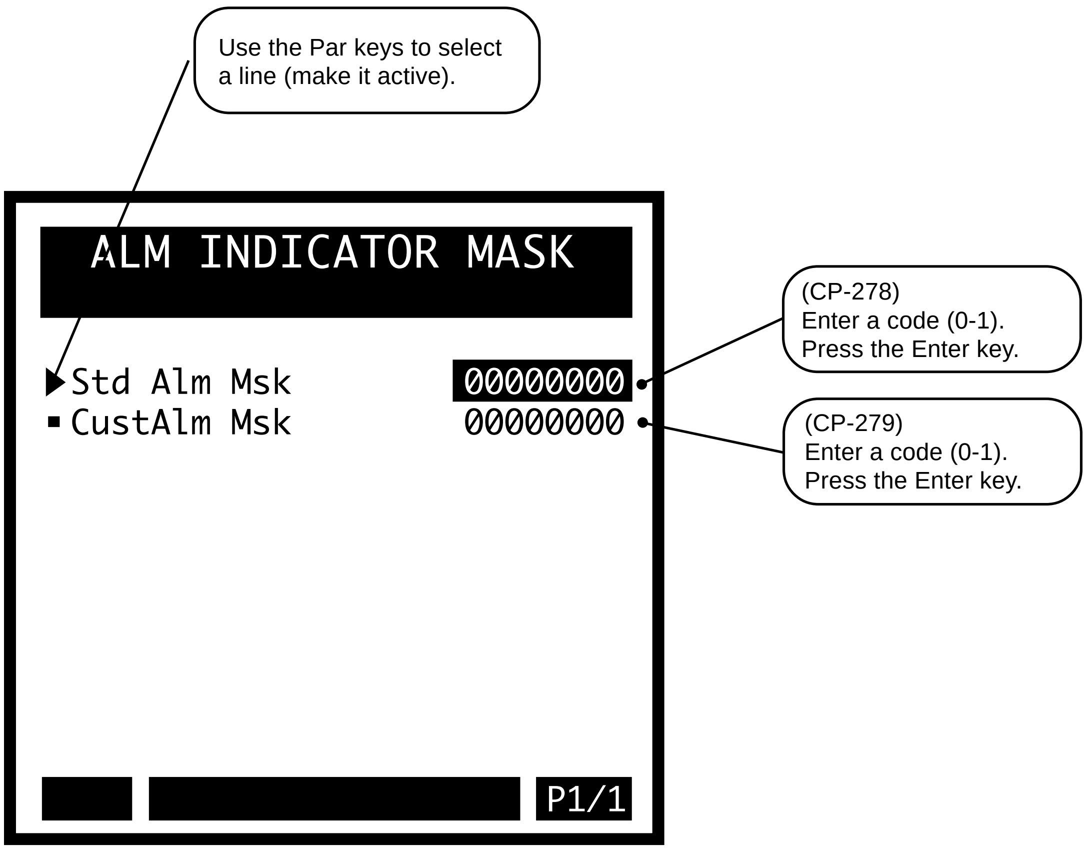
Std Alm Msk (CP-278)

The Standard Alarm Mask (CP-278) allows you to mask out specific alarms so that they will not cause the ‘alm’ indicator to flash (in the lower left-hand corner of the CX-1010 screen) by entering a “0” in the corresponding bit position (see figure below). You can also activate any of these alarm conditions by entering a “1” in the corresponding bit position. Refer to (CP-278 in *Appendices: Appendix C* for the Alarm Mask bit map list.

CustAlm Msk (CP-279)

Custom Alarm Mask (CP-279) allows you to mask out the compare results so that they will not cause the ‘alm’ indicator to flash (in the lower left-hand corner of the CX-1010 screen) by entering a “0” in the corresponding bit position (see figure below). You can also activate any of these compare conditions by entering a “1” in the corresponding bit position. Refer to CP-279 in *Appendices: Appendix C* for the Compare Mask bit map list.

The Alarm Indicator Mask screen is accessed through
—> Main Menu / Device Configure <—



—NOTES—

System Monitoring/Monitor Parameters

INTRODUCTION TO MONITOR PARAMETERS

Parameters are divided into two classifications; Control Parameters (CP) and Monitor Parameters (MP). This section is about Monitor Parameters. Control Parameters are explained in *System Setup/Control Parameters.*

The parameters appear on the screens by a Parameter Name. The Help screens list the parameters by both their name and by a numbered code, which is called the Parameter Code. The operational data is the Parameter Value.

		Parameter Name	Parameter Code	Parameter Value
Parameters =	Monitor Parameter	Scaled Feedback	MP-40	0.0 (default)
	Control Parameter	Master Setpoint	CP-110	0 (default)

Note: Monitor Parameters are status indicators only - you can not directly affect or change a Monitor Parameter. When Monitor Parameters are displayed on the screens, they do not have a small indicator “dot” to the left of the Parameter Name (unlike Control Parameters, which do have a small indicator “dot” to the left of the Parameter Name).

Monitor Parameter (MP) screens allow you to monitor the performance of the CX-1010 and your system. These screens also help you troubleshoot for problems as well as confirm the wiring and tuning. Monitor Parameter screens can be accessed at any time during the CX-1010's operation, including during Run, Jog and F–Stop. The Monitor Parameter screens are accessed through the System Monitor screen.

—NOTES—

SYSTEM MONITOR

Use the system monitor screens to access the Monitor Parameter screens that monitor the operation of the CX-1010. In addition to their monitoring capability, the Control Override screens provide limited control of the Run/Stop/Jog logic and the block selection.

The CX-1010 system monitor screens are:

- Run Monitor
- STD Signals Monitor
- Limits and Alarms Monitor
- Dig I/O Monitor
- Aux Analog Monitor
- Control Override

RUN MONITOR

Summary

The Run Monitor/Summary screen (page 1) contains monitor velocity data parameters. Setpoint X (CP-101) is also included on this screen to allow convenient assess to your active setpoint.

STATE (MP-50)

State (MP-50) displays the present operating state of the CX-1010 (see list below). Only one operating state may be active at a time. To access either the “Run” or the “Jog” operating state, the F-Stop, R-Stop and H-Stop inputs must be closed.

7 = Diagnostics	6 = Not used - reserved	5 = JOG (Rvs)
4 = JOG (Fwd)	3 = RUN	2 = H-Stop
1 = R-Stop	0 = F-Stop	

CNTRL LOOP (MP-45)

Control Loop (MP-45) displays the type of loop (see list below) that is in current use. Only one type of loop can be active at a time.

5 = Psn Hld (H-Stop Position Loop)	4 = ZE Hld (H-Stop ZE Position Loop)
3 = Psn (Position Loop)	2 = ZE Psn (Zero Error Loop)
1 = Vel (Velocity Loop)	0 = OL (Open Loop)

SETPOINT X (CP-101)

Setpoint X displays the name and value of the setpoint that corresponds with the mode of operation selected in Setpoint Mode (CP-102). The setpoint could be the Master Setpoint (CP-110), the Follower Setpoint (CP-120), the Direct Setpoint (CP-130) or the Custom Setpoint (CP-140). Setpoint X acts as a quick access to the setpoint value. In addition to changing a setpoint value in the setpoint screens, you can also change the value of the active setpoint by entering a new value in Setpoint X (CP-101).

Ramped Ref (MP-42)

Ramped Reference (MP-42) displays the speed command in feedback engineering units per time. This is the output of the ramp calculations. When the ramp has been completed, the Ramped Reference (MP-42) should equal the Scaled Reference (MP-41).

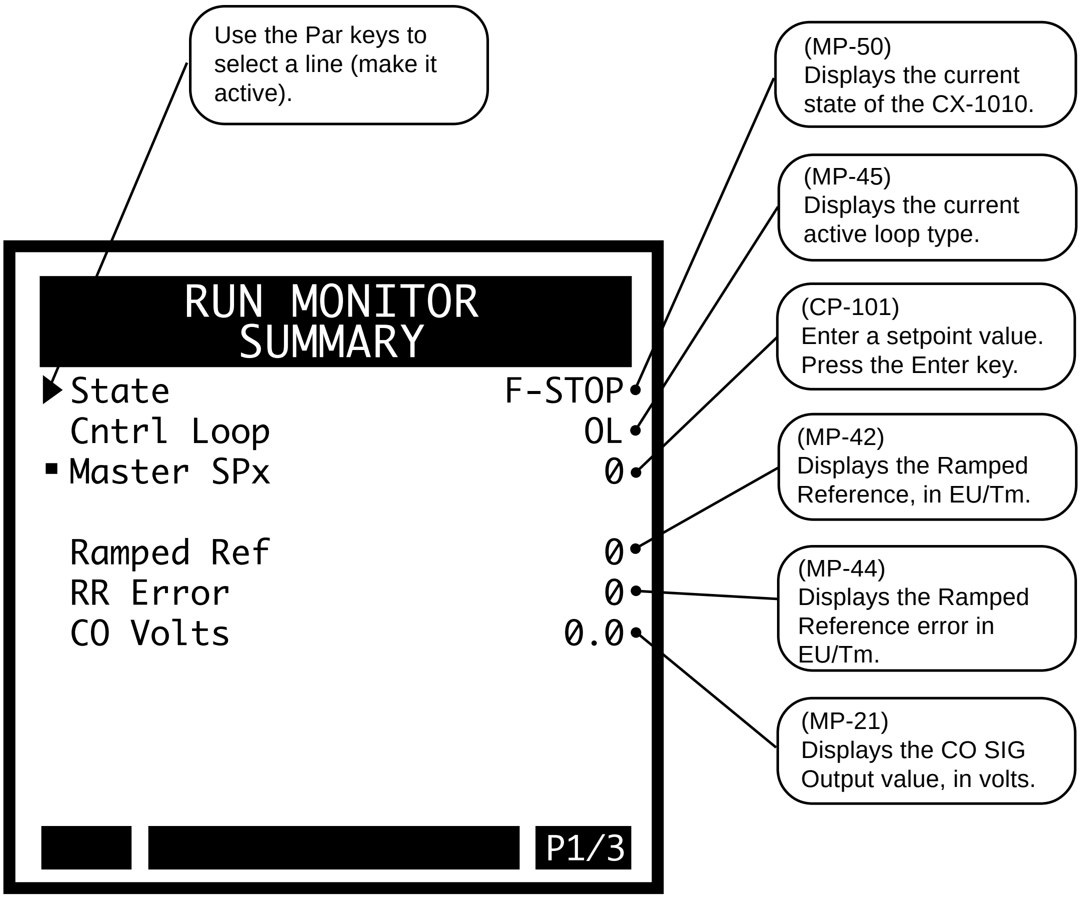
RR ERROR (MP-44)

Ramped Reference Error (CP-44) displays the speed error in engineering units per time. This is the Ramped Reference (MP-42) minus the Fb EU/Tm (MP-39). The Ramped Reference is the current speed command.

CO VOLTS (MP-21)

Control Output Volts (MP-21) displays the present value, in volts, of the CO_SIG Analog Output signal.

The Run Monitor screens are accessed through
—> Main Menu / System Monitor



Detail

The Run Monitor / Detail screen (page 2) monitor the parameters that are related to the control loop. Setpoint X (CP-101) is also included on this screen, to allow you convenient assess to your active setpoint.

STATE (MP-50)

State (MP-50) displays the present operating state of the CX-1010 (see list below). Only one operating state may be active at a time. To access either the “Run” or the “Jog” operating state, the F-Stop, R-Stop and H-Stop inputs must be closed.

7 = Diagnostics	6 = Not used - reserved	5 = JOG (Rvs)
4 = JOG (Fwd)	3 = RUN	2 = H-Stop
1 = R-Stop	0 = F-Stop	

SETPOINT X (CP-101)

Setpoint X displays the name and value of the setpoint that corresponds with the mode of operation selected in Setpoint Mode (CP-102). The setpoint could be the Master Setpoint (CP-110), the Follower Setpoint (CP-120), the Direct Setpoint (CP-130) or the Custom Setpoint (CP-140). Setpoint X acts as a quick access to the setpoint value. In addition to changing a setpoint value in the setpoint screens, you can also change the value of the active setpoint by entering a new value in Setpoint X (CP-101).

FI1 Hz (MP-01)

Frequency Input 1 Hertz (MP-01) displays the current frequency of the Frequency Input 1, in Hertz.

FI2 Hz (MP-06)

Frequency Input 2 Hz (MP-06) displays the present frequency of the Frequency Input 2, in Hertz.

Integral (MP-48)

Integral (MP-48) displays the value of the integral term (i.e., integrator error sum times the Ki VL constant) of the PID compensator. Integral is displayed in CO DAC bits.

Trim Out (MP-47)

Trim Out (MP-47) displays the value of the output of the PID compensator. Trim Out is displayed in CO DAC bits.

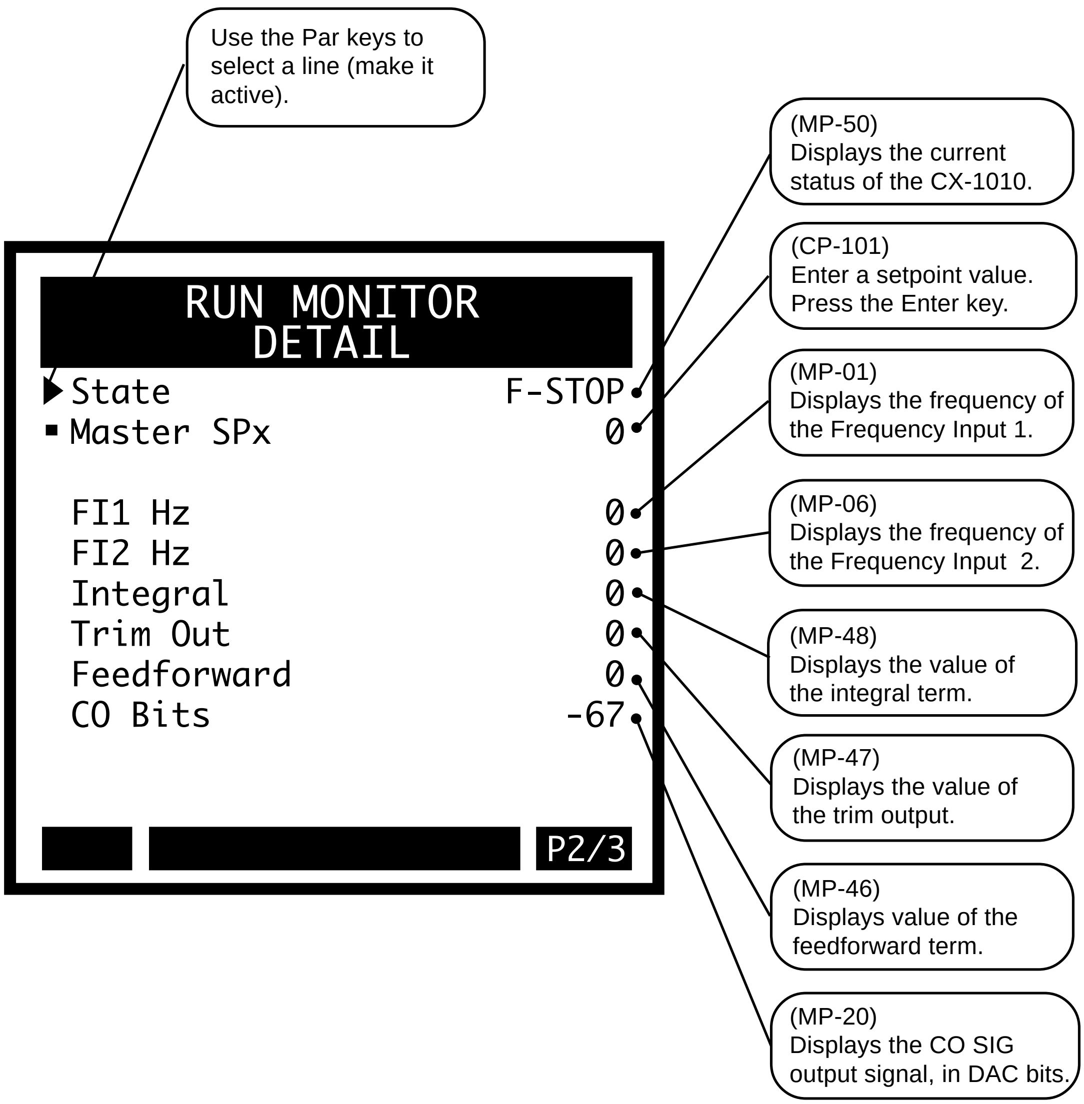
Feedforward (MP-46)

Feedforward (MP-46) displays the value of the feedforward term in CO DAC bits.

CO BITS (MP-20)

Control Output Bits (MP-20) displays the present value, in DAC bits, of the CO_SIG Analog Output signal.

The Run Monitor / Detail screen (page 2).



Errors

The Run Monitor / Errors screen (page 3) monitor speed and position error data. Setpoint X (CP-101) is also included on this screen to allow you convenient assess to your active setpoint.

STATE (MP-50)

State (MP-50) displays the present operating state of the CX-1010 (see list below). Only one operating state may be active at a time. To access either the "Run" or the "Jog" operating state, the F-Stop, R-Stop and H-Stop inputs must be closed.

7 = Diagnostics	6 = Not used - reserved	5 = JOG (Rvs)
4 = JOG (Fwd)	3 = RUN	2 = H-Stop
1 = R-Stop	0 = F-Stop	

SETPOINT X (CP-101)

Setpoint X displays the name and value of the setpoint that corresponds with the mode of operation selected in Setpoint Mode (CP-102). The setpoint could be the Master Setpoint (CP-110), the Follower Setpoint (CP-120), the Direct Setpoint (CP-130) or the Custom Setpoint (CP-140). Setpoint X acts as a quick access to the setpoint value. In addition to changing a setpoint value in the setpoint screens, you can also change the value of the active setpoint by entering a new value in Setpoint X (CP-101)

Scaled Fb (MP-40)

Scaled Feedback (MP-40) displays the scaled feedback , which is scaled per ScFb Eq (CP-190), ScFb EU (CP-191) and Fb @ ScFb EU (CP-192). The placement of the decimal point is the same as the placement of the decimal point in ScFb EU (CP-191).

SR Error (MP-43)

Scaled Reference Error (MP-43) displays the speed error between the Scaled Reference (MP-41) and the Fb EU/Tm (MP-39).

RR ERROR (MP-44)

Ramped Reference Error (CP-44) displays the speed error in engineering units per time. This is the Ramped Reference (MP-42) minus the Fb EU/Tm (MP-39). The Ramped Reference is the current speed command.

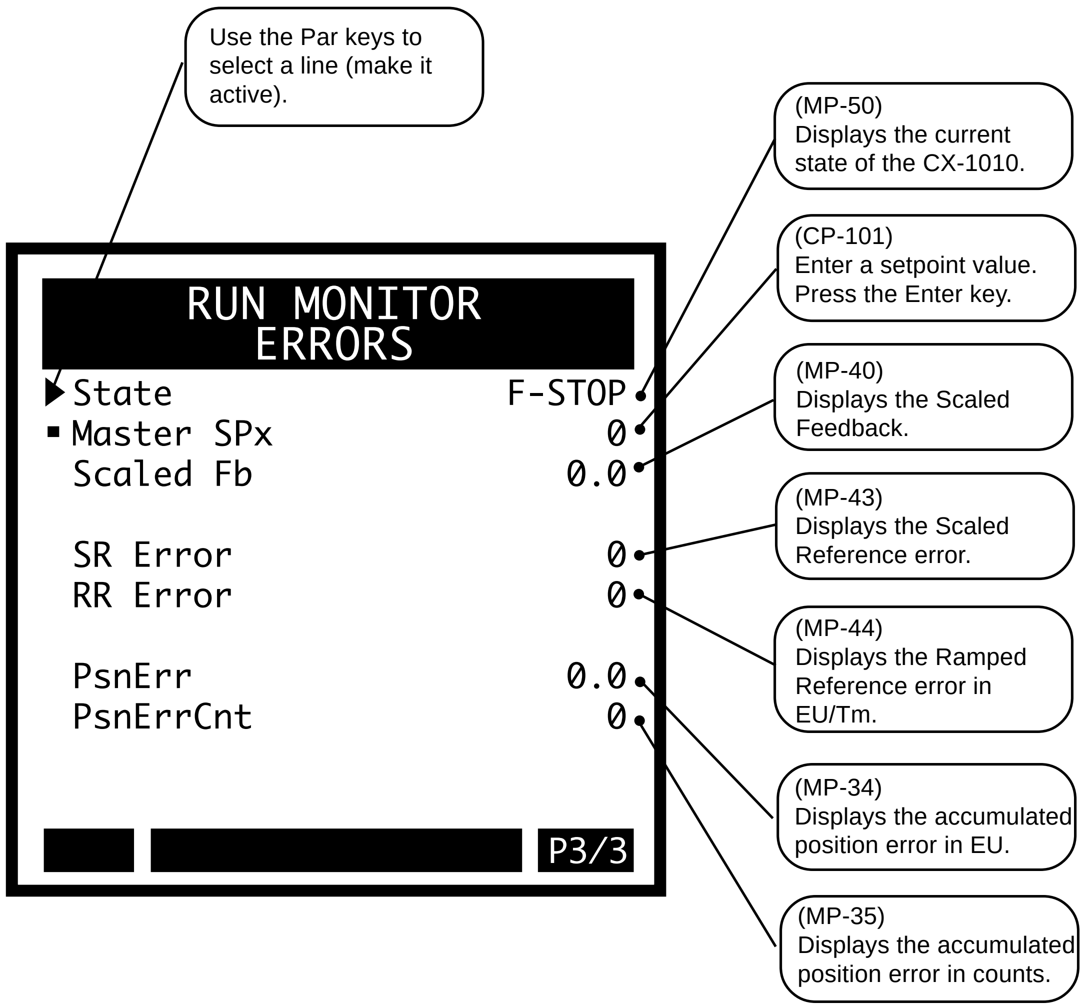
PSNERR (MP-34)

Position Error (MP-34) displays the value, in engineering units, of the accumulated position error between the lead (FI1) and the feedback (FI2) input signals. The placement of the decimal point is the same as the placement of the decimal point in EU FI2 (CP-168).

PSNERRCNT (MP-35)

Position Error Count (MP-35) displays the value, in encoder counts, of the accumulated position error between the lead (FI1) and feedback (FI2) input signals.

The Run Monitor / Errors screen (page 3).



STD SIGNAL MONITOR

Frequency Input 1

The STD Signal Monitor / Frequency Input 1 screen (page 1) displays parameters that are related to the Frequency Input 1 signal; velocity and position.

FI1 Hz (MP-01)

Frequency Input 1 Hertz (MP-01) displays the current frequency of the Frequency Input 1, in Hertz.

FI1 RPM (MP-02)

Frequency Input 1 RPM (MP-02) displays the current speed of the Frequency Input 1 encoder in RPM relative to PPR FI1 (CP-161).

FI1 EU/Tm (MP-03)

Frequency Input 1 Engineering Units per Time (MP-03) displays the current speed of the Frequency Input 1 in the Engineering Units per Time (EU/Tm) relative to the FI1 Pulses (CP-162), EU FI1 (CP-163) and Time Base (CP-109). The placement of the decimal point is the same as the placement of the decimal point in Master SP (CP-110).

FI1 Psn (MP-05)

Frequency Input 1 Position (MP-05) displays the present value of the Frequency Input 1 Position (MP-05) in engineering units, as specified by FI1 Pulses (CP-162) and EU FI1 (CP-163). The placement of the decimal point is the same as the placement of the decimal point in EU FI1 (CP-163).

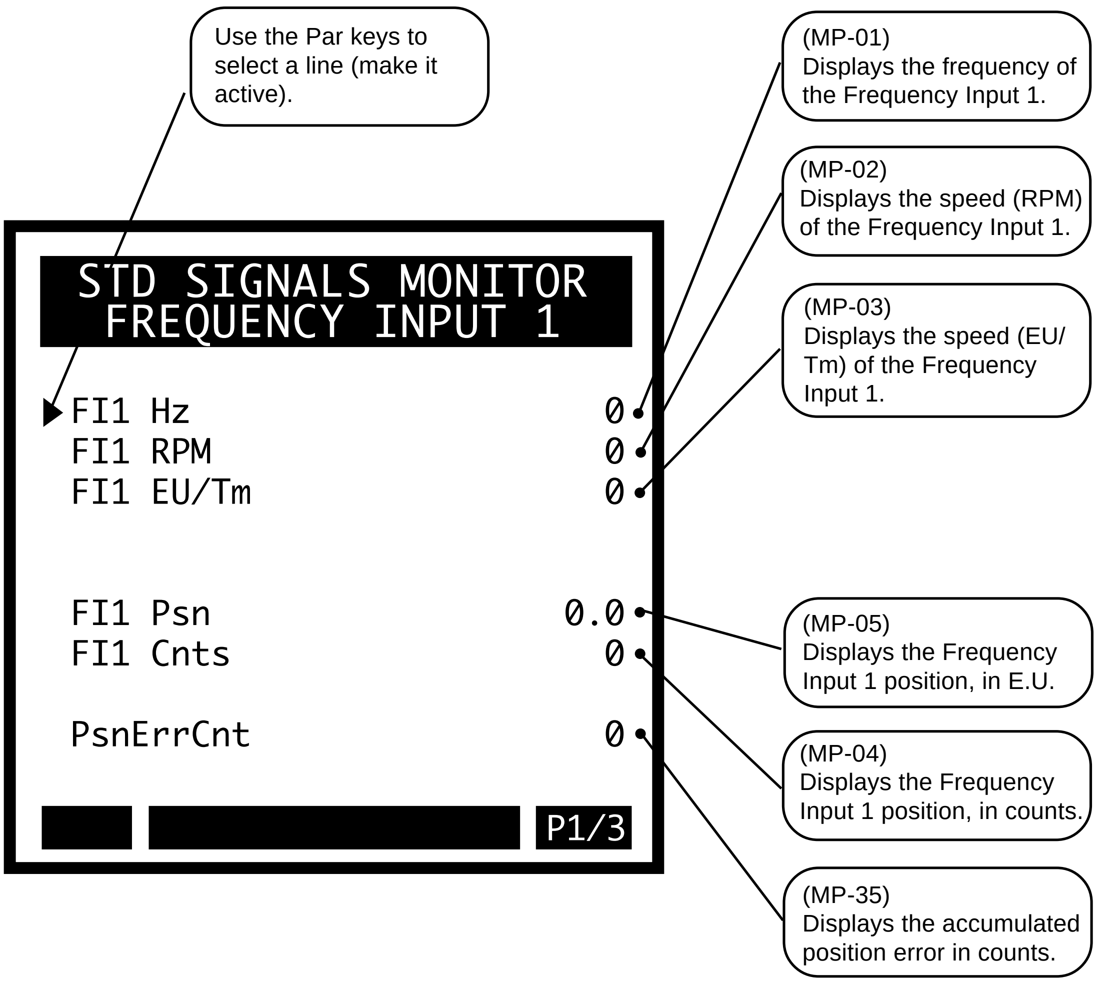
FI1 Cnts (MP-04)

Frequency Input 1 Counts (MP-04) displays the present value of the Frequency Input 1 Position (MP-05) in encoder edges (counts) if Count Mode FI1 (CP-160) is set to “Quad x 4”. Frequency Input 1 Counts (MP-04) displays the present value of the Frequency Input 1 Position in pulses if Count Mode FI1 (CP-160) is set to “Incremental”.

PsnErrCnt (MP-35)

Position Error Count (MP-35) displays the value, in encoder counts, of the accumulated position error between the lead (FI1) and feedback (FI2) input signals.

The STD Signal Monitor screens are accessed through —> Main Menu / System Monitor



Frequency Input 2

The STD Signal Monitor / Frequency Input 2 screen (page 2) displays the parameters that are related to the Frequency Input 2 signal; velocity and position.

FI2 Hz (MP-06)

Frequency Input 2 Hz (MP-06) displays the present frequency of the Frequency Input 2, in Hertz.

FI2 RPM (MP-07)

Frequency Input 2 RPM (MP-07) displays the current speed of the Frequency Input 2 encoder in RPM relative to PPR FI2 (CP-166).

FI2 EU/Tm (MP-08)

Frequency Input 2 Engineering Units per Time (MP-08) displays the current speed of the Frequency Input 2 in the Engineering Units per Time (EU/Tm) relative to the FI2 Pulses (CP-167), EU FI2 (CP-168) and Time Base (CP-109). The placement of the decimal point is the same as the placement of the decimal point in Master SP (CP-110).

FI2 Psn (MP-10)

Frequency Input 2 Position (MP-10) displays the present value of the Frequency Input 2 Position (CP-10) in engineering units, as specified by FI2 Pulses (CP-167) and EU FI2 (CP-168). The placement of the decimal point is the same as the placement of the decimal point in EU FI2 (CP-168).

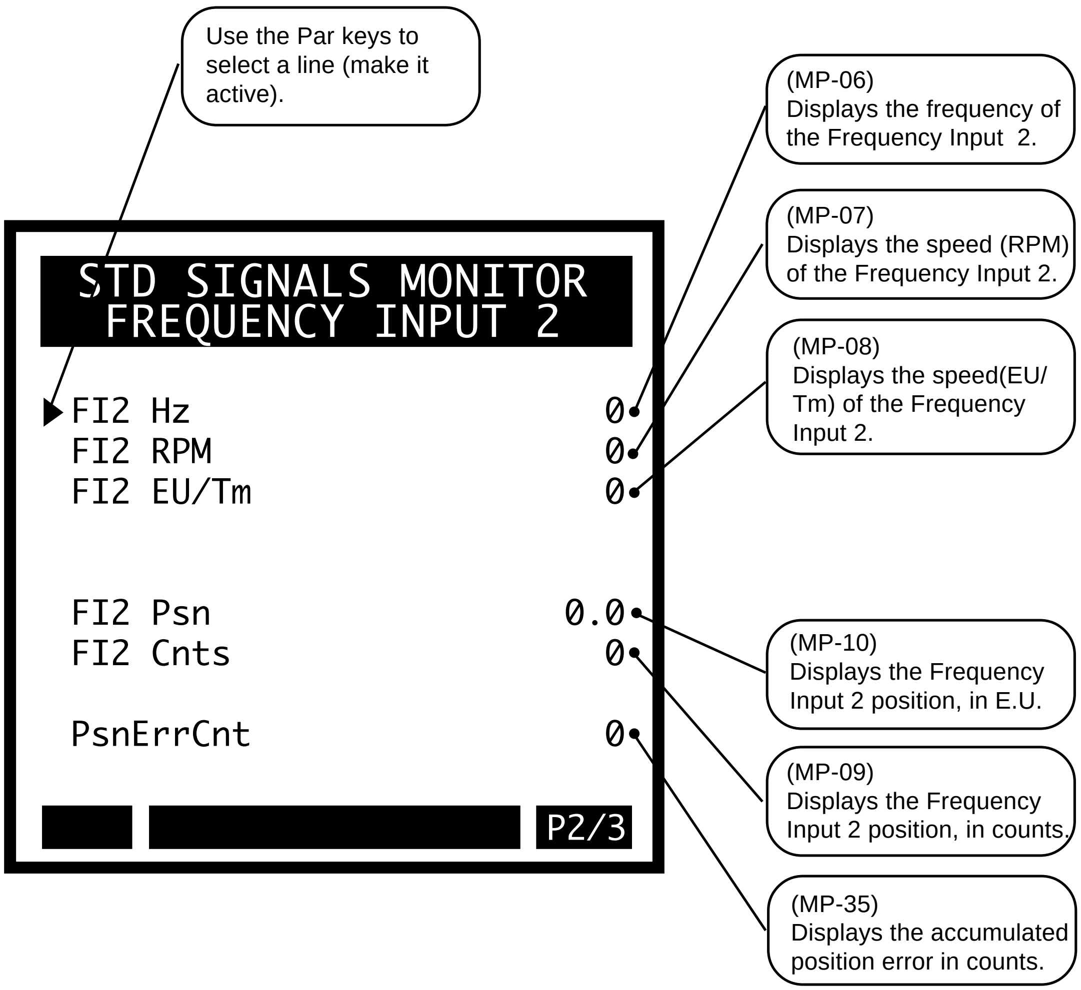
FI2 Cnts (MP-09)

Frequency Input 2 Counts (MP-09) displays the present value of the Frequency Input 2 Position (CP-10) in encoder edges (counts) if Count Mode FI2 (CP-165) is set to “Quad x4”. Frequency 2 Counts displays the present value of the Frequency Input 2 Position (CP-10) in pulses if Count Mode FI2 (CP-165) is set to is set to “Incremental”.

PsnErrCnt (MP-35)

Position Error Count (MP-35) displays the value, in encoder counts, of the accumulated position error between the lead (FI1) and feedback (FI2) input signals.

The STD Signal Monitor / Frequency Input 2 (page 2).



Control Output

The STD Signal Monitor / Control Output screen (page 3) displays CO_SIG signal data. The CO_SIG is the CX-1010 output signal that is input to the drive as a velocity (or torque) command.

CO Bits (MP-20)

Control Output Bits (MP-20) displays the present value, in DAC bits, of the CO_SIG Analog Output signal.

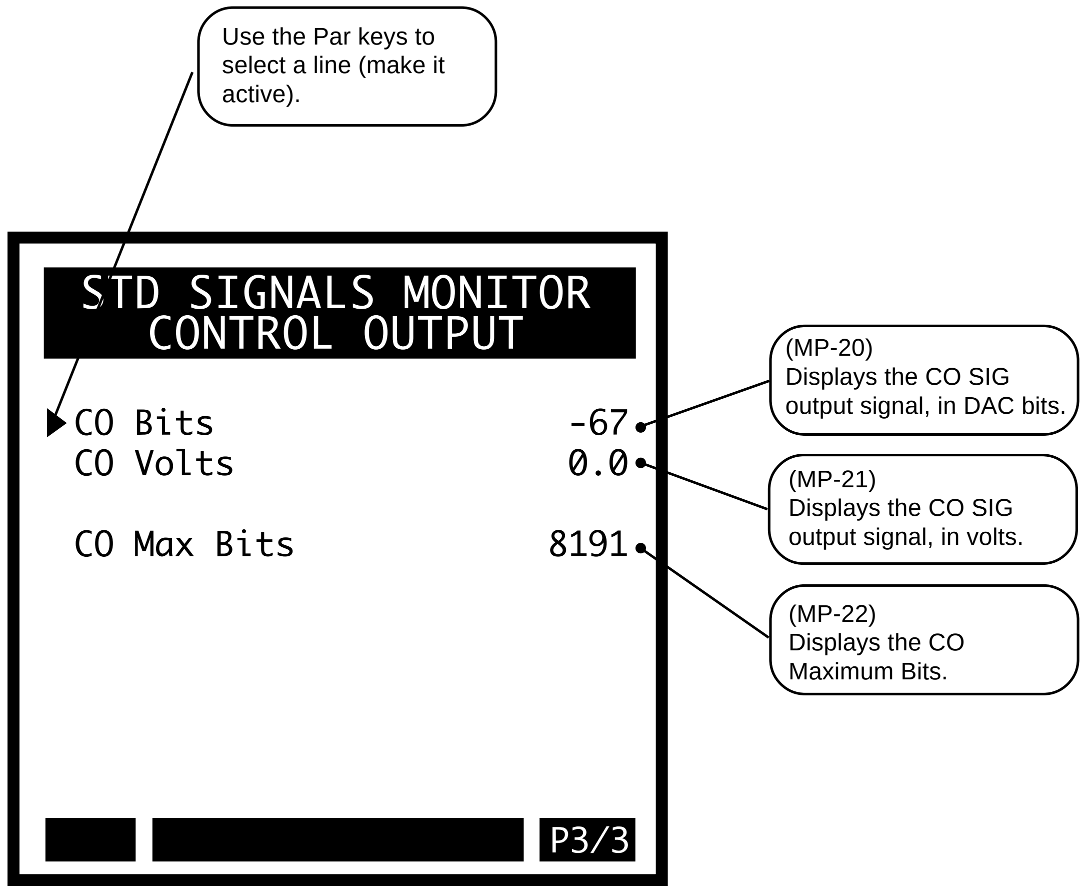
CO VOLTS (MP-21)

Control Output Volts (MP-21) displays he present value, in volts, of the CO_SIG Analog Output signal.

CO Max Bits (MP-22)

The Control Output Maximum Bits (MP-22) corresponds to the volt setting in Control Output Maximum Volts (CP-181) for the CO_SIG Analog Output signal, relative to the Control Output DAC Range (MP-23). This is a magnitude only.

The STD Signal Monitor / Control Output (page 3).

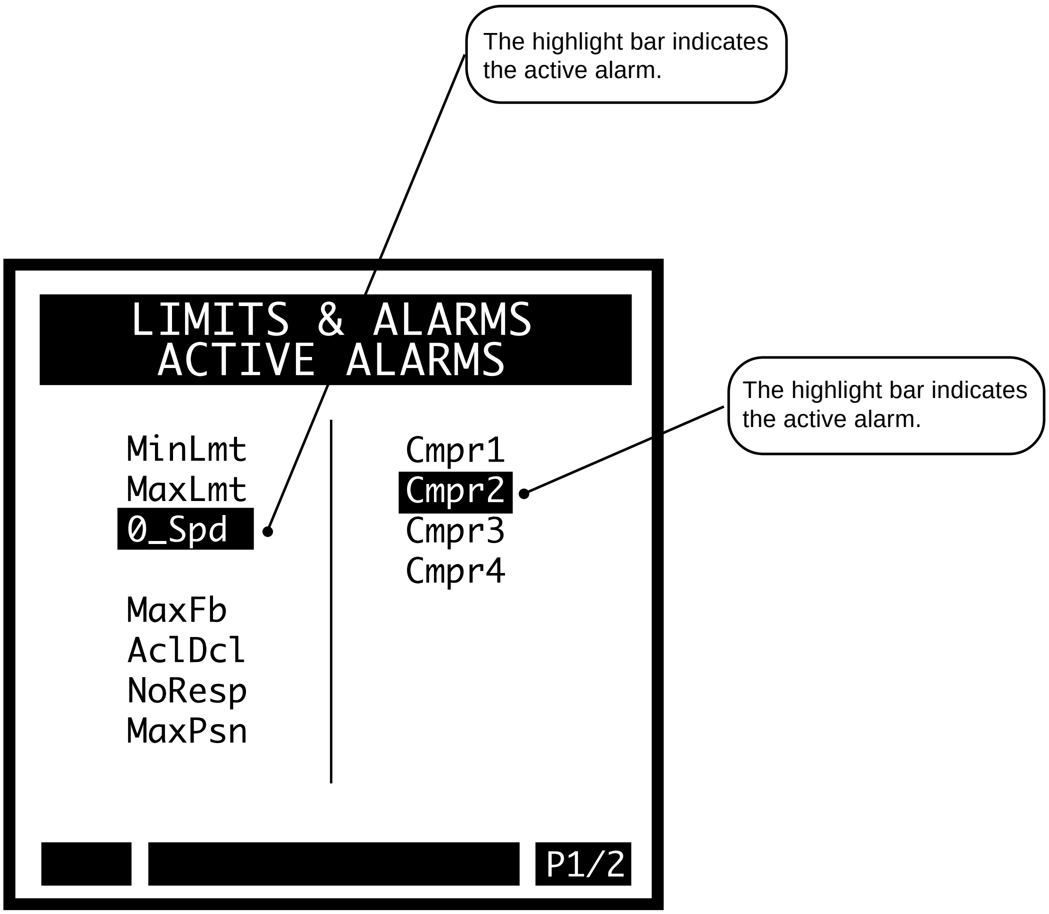


LIMITS AND ALARMS

Active Alarms

The Limits & Alarms / Active Alarms screen (page 1) displays the status of the limits and alarms. This screen displays a list of the Limits, General Alarms and Custom Alms. The active Limits, Alarms and Custom Alms are highlighted.

The Limits and Alarms screen is accessed through
—> Main Menu / System Monitor



Limits and Alarms

The Limits & Alarms screen (page 2) displays the bit-mapped Monitor Parameters that monitor the status of the Limits, Alarms and Custom Alms. Use either the *Appendices: Appendix C* or the "Help" screen to preview the bit map lists.

Misc Status (MP-53)

Miscellaneous Status (MP-53) displays various status conditions . A "1" in the CO Sign bit indicates a negative command output. A "1" in any other bit location indicates an active condition. Refer to *Appendices: Appendix C* for the Miscellaneous Status (MP-53) bit map list.

Std Alarms (MP-54)

Std Alarms (MP-54) displays various alarm conditions . A "1" in any bit location indicates an active condition. Refer to *Appendices: Appendix C* for the Std Alarms (MP-54) bit map list.

Custom Alms (MP-55)

Custom Alarms (MP-55) displays the outputs of the PLC numerical comparators. A "1" in bit locations 0-3 indicates that the result of the compare (Cmprx Parm value vs. Cmprx Val) is true for the given Cmprx Type. A "1" in bit locations 4-7 indicates that the result of the compare (Cmprx Parm value vs. Cmprx Val) is false for the given Cmprx Type (the NOT is true). Refer to CP-280 through CP-295. Refer to *Appendices: Appendix C* for the Custom Alarms (MP-55) bit map list.

Active Block (MP-51)

Active Block (MP-51) displays the active block (0-7). The block can be selected and made active by the Block select bits (Blk Sel A,B,C), in the PLC Programming screen if Block Select Source (CP-378) is set to "1" (DigIn & PLC). Or the block can be selected and made active by the keypad if Block Select Source (CP-378) is set to "2" (Keypad Blk Sel).

InvalidBlks (MP-52)

Invalid Blocks (MP-52) displays the status of the blocks in the Block Setup screens. A "1" indicates that there is an error with the corresponding block. Generally, this indicates that an overflow condition can occur if the corresponding block is activated. In addition, since other parameters are used in conjunction with the Block Parameters that you selected, an error can result from a parameter that is not selected in Block Parameters. If a bad block is activated, the CX-1010 will execute an F-Stop until either the block error is corrected or a another block is activated. Refer to *Appendices: Appendix C* for the Invalid Blocks (MP-52) bit map list.

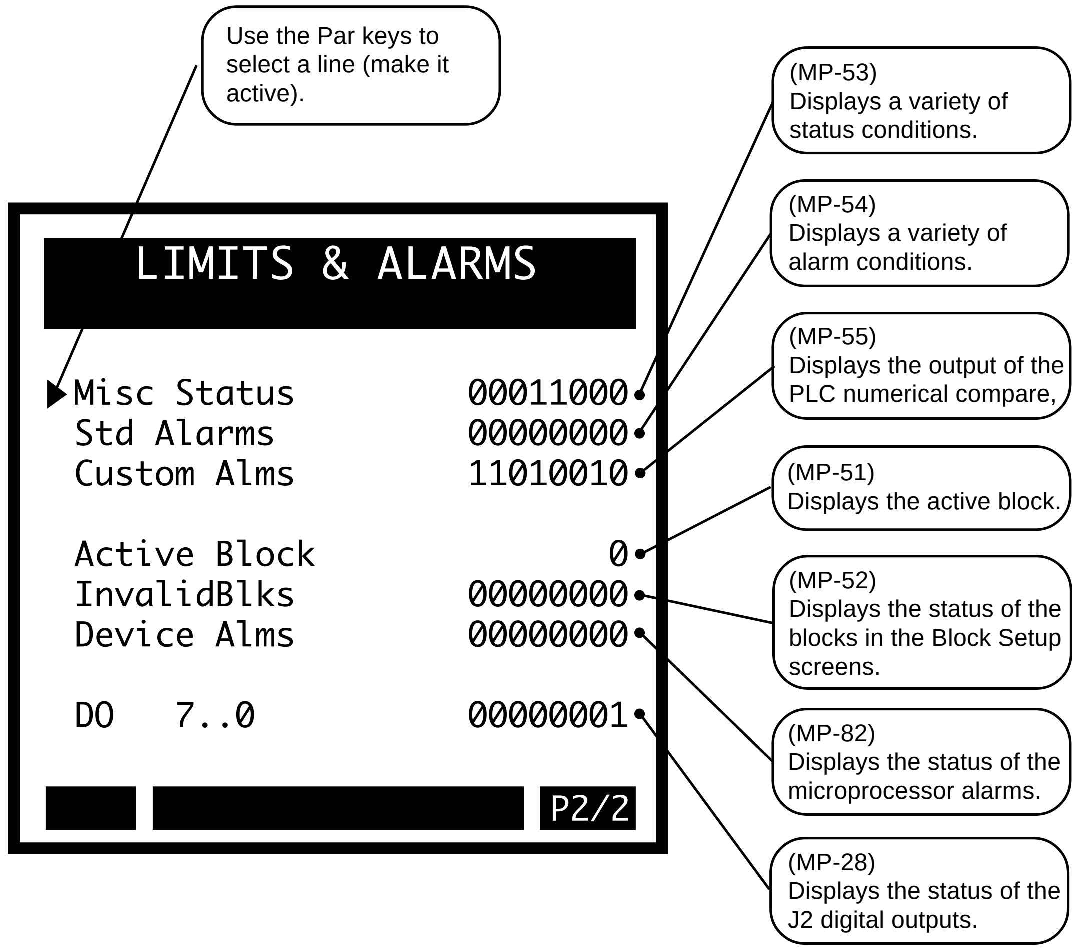
Device Alms (MP-82)

Device Alarms (MP-82) displays the status of microprocessor or other hardware related alarms. Notification of a bad block selection is also included. Refer to *Appendices: Appendix C* for the Device Alarms (MP-82) bit map list.

DO 7..0 (MP-28)

Digital Output 7..0 displays the value of the "J2" digital outputs. A '1' in the bit location indicates an active "low voltage" condition on the corresponding open collector output (which would sink DC current). Refer to *Appendices: Appendix C* for the Dig DO..7-0 (MP-28) bit map list.

The System Monitor / Limits and Alarms screen (page 2).



DIG I/O MONITOR

The DIG I/O Monitor screen displays the status (state) of all the digital inputs and outputs.

DI 7..0 (MP-26)

Digital Input 7..0 displays the value of the "J6" digital inputs. A '1' in the bit location indicates a "low voltage" condition on the corresponding input (which is consistent with a contact closure to common). Refer to *Appendices: Appendix C* for the Dig In 7-0 (MP-26) bit map list. The Help screen for DI 7..0 (MP-26) also contains a bit map list.

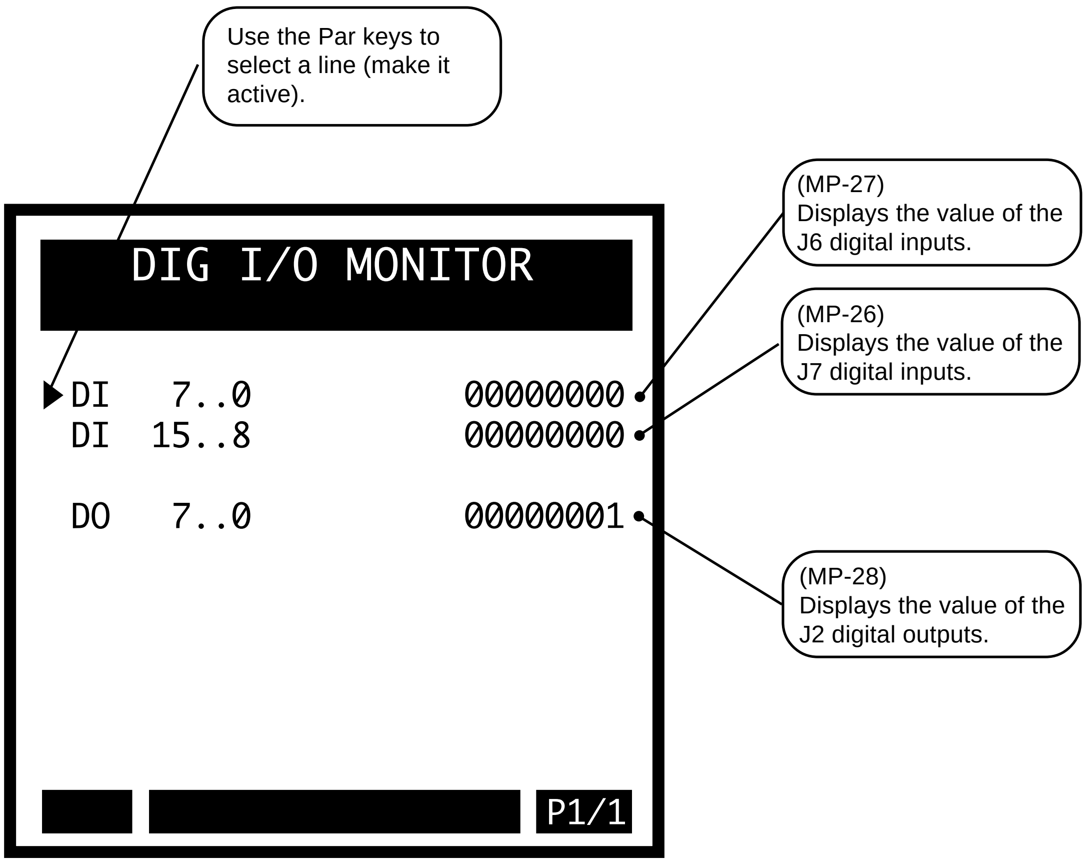
DI 15..8 (MP-27)

Digital Input 15..8 (MP-27) displays the value of the "J7" digital inputs. A '1' in the bit location indicates a "low voltage" condition on the corresponding input (which is consistent with a contact closure to common). These eight inputs can be set up in the PLC Programming screen to generate a One-Shot -Pulse on a high-to-low transition. Refer to *Appendices: Appendix C* for the DI 15..8 (MP-27).

DO 7..0 (MP-28)

Digital Output 7..0 displays the value of the "J2" digital outputs. A '1' in the bit location indicates an active "low voltage" condition on the corresponding open collector output (which would sink DC current). Refer to *Appendices: Appendix C* for the Dig Out 7-0 (MP-28) bit map list. The Help screen for DO 7..0 (MP-28) also contains a bit map list.

The DIG I/O Monitor screen is accessed through
—> Main Menu / Monitor and Control



AUX ANALOG MONITOR

Inputs

The Aux Analog Monitor / Inputs screen (page 1) monitors the input signals and displays the parameters for the auxiliary analog inputs (AI1 and AI2).

AI1 Bits (MP-11)

Analog Input 1 Bits (MP-11) displays the present value in ADC bits of Auxiliary Board Analog Input 1 signal.

AI1 Signal (MP-12)

Analog Input 1 Signal (MP-12) displays the present value of the Auxiliary Board Analog Input 1 signal in either volts or milliamps relative to which setting (volts or current) has been entered in AI1 MODE (CP-170).

AI1 Eu/Tm (MP-13)

Analog Input 1 EU/Tm (MP-13) displays the present value of the Auxiliary Board Analog Input 1 signal in Engineering Units per Time (EU/Tm) as relative to the AI1 RA (CP-171), EU@AI1 RA (CP-172), AI1 RB (CP-173), EU@AI1 RB (CP-174) and Time Base (CP-109). The placement of the decimal point is the same as the placement of the decimal point in EU@AI1 RA (CP-172).

AI1 Mode (CP-170)

Analog Input 1 Mode (CP-170) identifies the mode of operation that is used for the Auxiliary Board Analog Input 1 signal.

2 = Current
1 = Voltage (default)

AI2 Bits (MP-14)

AI2 Bits (MP-14) displays the present value in DAC bits of Auxiliary Board Analog Input 2 signal.

AI2 Signal (MP-15)

Analog Input 2 Signal (MP-15) displays the present value of the Auxiliary Board Analog Input 2 signal in either volts or milliamps, relative to which setting (volts or current) has been entered in AI2 MODE (CP-175).

AI2 EU/Tm (MP-16)

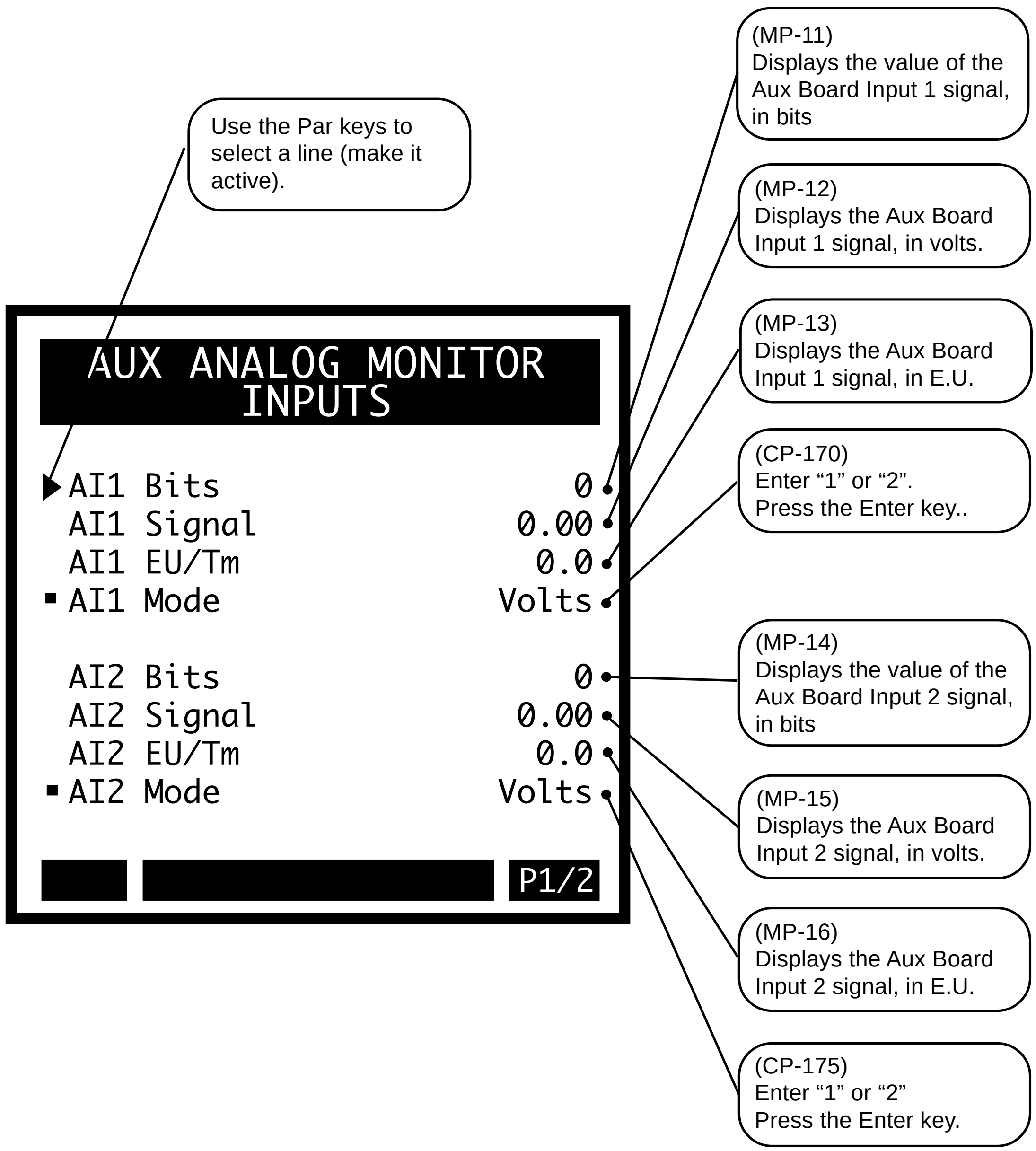
Analog Input 2 EU/Tm (MP-16) displays the present value of the Auxiliary Board Analog Input 2 signal in Engineering Units per Time (EU/Tm) relative to the AI2 RA (CP-176), EU@AI2 RA (CP-177), AI2 RB (CP-178), EU@AI2 RB (CP-179) and Time Base (CP-109). The placement of the decimal point is the same as the placement of the decimal point in EU@AI2 RA (CP-177).

AI2 Mode (CP-175)

Analog Input 2 Mode (CP-175) identifies the mode of operation that is used for the Auxiliary Board Analog Input 2 signal.

2=Current
1=Voltage (default)

The Aux Analog Monitor screens are accessed through
—> Main Menu / System Monitor



Outputs

The Aux Analog Monitor / Outputs screen (page 2) monitors the output signals and displays the parameters for the auxiliary analog output (AO).

AO Bits (MP-24)

Analog Output Bits (MP-24) displays the present value, in DAC Bits, of the Auxiliary Analog Output.

AO Signal (MP-25)

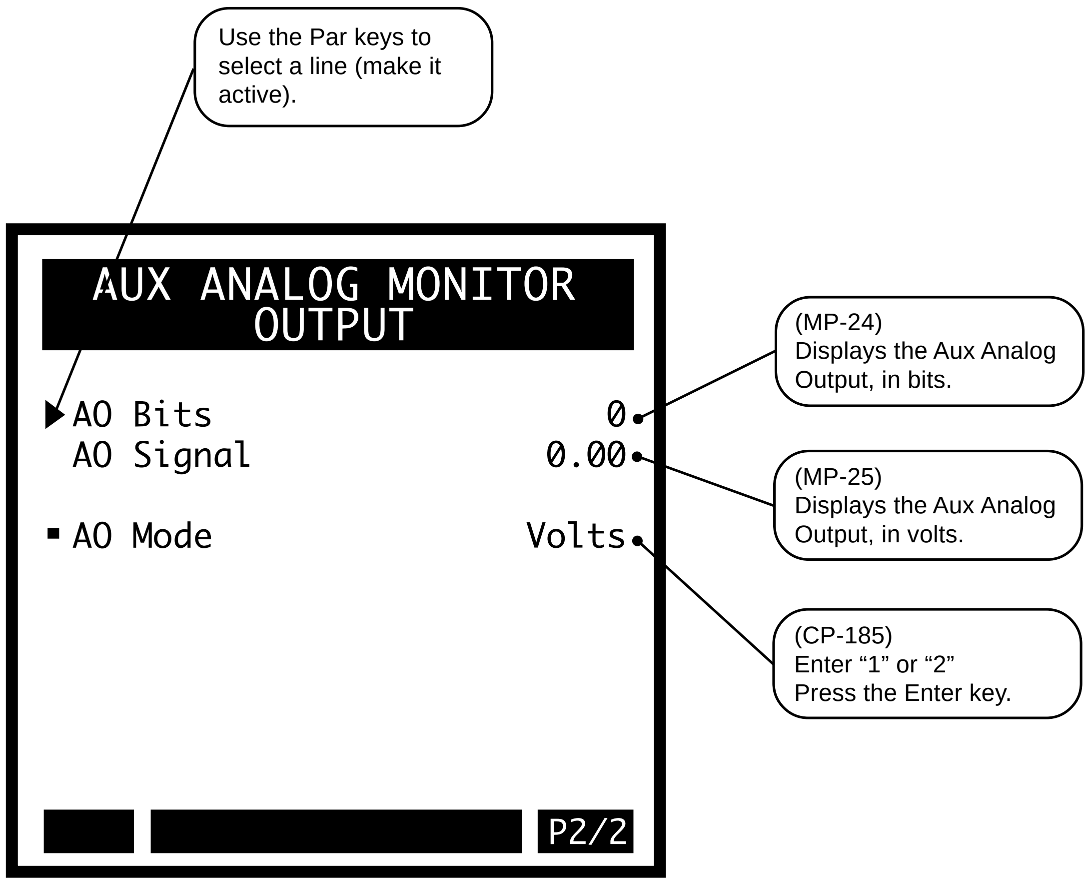
Analog Output Signal (MP-25) displays the present value, in either volts or milliamps of the Auxiliary Analog Output, relative to AO Mode (CP-185).

AO Mode (CP-185)

Analog Output Mode (CP-185) identifies the mode of operation that is used for the Auxiliary Board Analog Output signal.

2 = Current
1 = Voltage (default)

The Aux Analog Monitor / Output (page 2).



CONTROL OVERRIDES

State & Blocks

The Control Overrides / States & Blocks screen (page 1) allows you to select and monitor the operating state for the CX-1010. The first line on the screen displays the current operating state. Scroll to either F-Stop, Run, Jog Forward or Jog Reverse and then press the Enter key and make that line active. The corresponding inputs must be wired properly for the CX-1010 to function in the operating state that you activate. To change to a different operating state, scroll to that state, press Enter and the CX-1010 will change to the new state. The F-Stop, R-Stop, and H-Stop inputs should be closed (shorted to common) for the CX-1010 to enter "Run". If the "Run" digital input is active, then a request for "F-Stop" or "R-Stop" will be ignored.

You can also use this screen to select the source from which active block will be selected, as well as to monitor the active block. Use Blk Sel Source (CP-378) to determine the source (Digital Inputs & PLC, Keypad Blk Sel, or Cntr 4 Cnt) from which the active block is will be selected. Enter "Keypad Blk Sel" (2) in Blk Sel Source (CP-378) to control the selection of the blocks from Keypad Blk Sel (CP-379), using the keyboard. Enter "DI & PLC" (1) in Blk Sel Source (CP-378) to control the selection of the blocks from the inputs.

State (MP-50)

State (MP-50) displays the present operating state of the CX-1010 (see list below). Only one operating state may be active at a time. To access either the "Run" or the "Jog" operating state, the F-Stop, R-Stop and H-Stop inputs must be closed.

7 = Diagnostics	6 = Not used - reserved	5 = JOG (Rvs)
4 = JOG (Fwd)	3 = RUN	2 = H-Stop
1 = R-Stop	0 = F-Stop	

Blk Sel Source (CP-378)

Block Select Source (CP-378) determines whether the active block will be selected by the Digital Inputs & PLC, Keypad Blk Sel (CP-379) or Counter 4.

3 = Cntr 4 Cnt
2 = KyPd = Keypad Blk Sel
1 = DgIn = Digital Inputs & PLC (default)

Keypad Blk Sel (CP-379)

The Keypad Block Select (CP-379) determines which block will be active when Blk Sel Source (CP-378) is set to "2" (KyPd).

Active Block (MP-51)

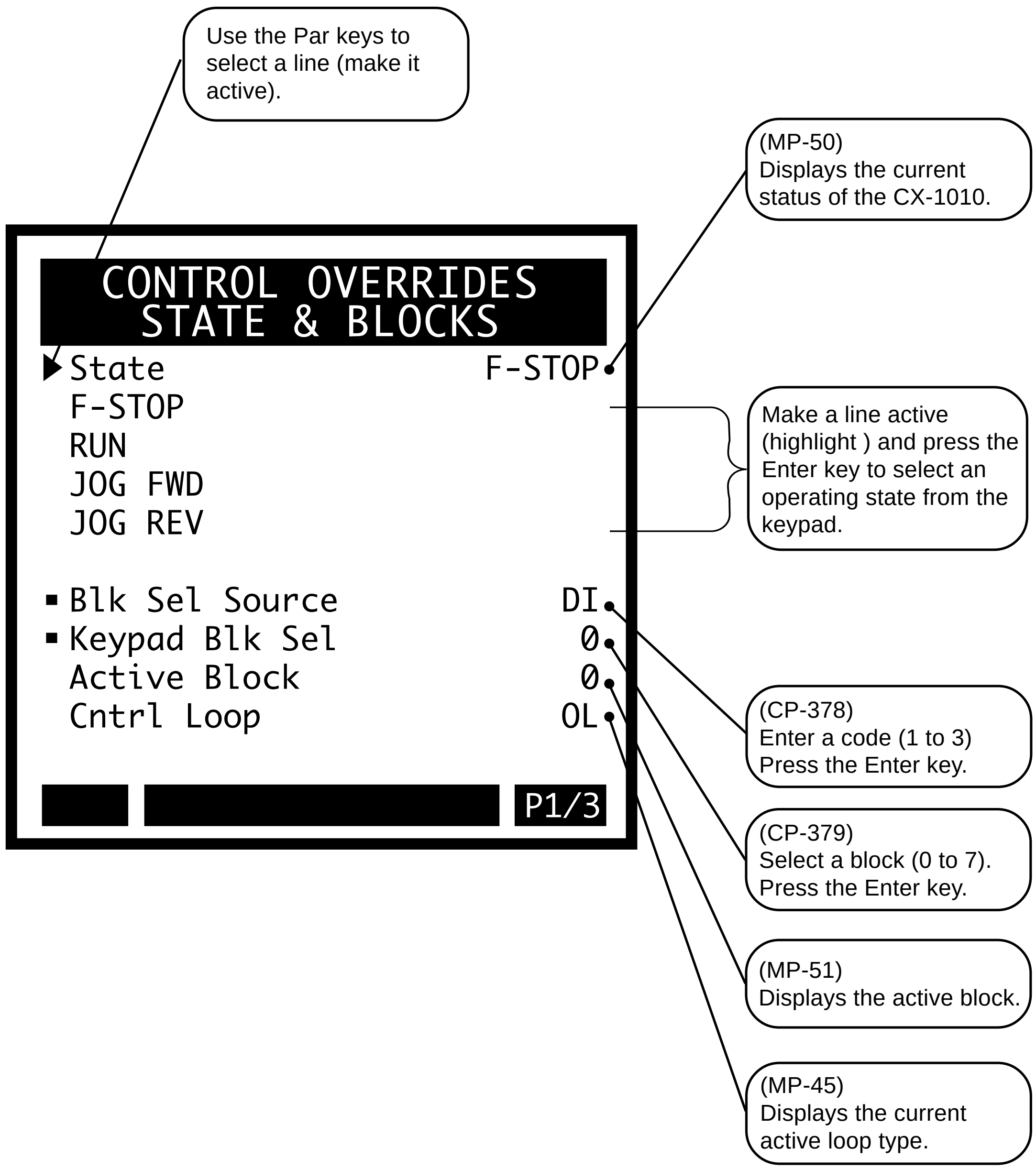
Active Block (MP-51) displays the active block. The block can be selected and made active by the Block Select bits (Blk Sel A,B.C), in the PLC Programming screen if Block Select Source (CP-378) is set to "1" (DigIn & PLC). Or the block can be selected and made active by the keypad if Block Select Source (CP-378) is set to "2" (Keypad Blk Sel).

Cntrl Loop (MP-45)

Control Loop (MP-45) displays the type of loop (see list below) that is in current use. Only one type of loop can be active at a time.

5 = Psn Hld (H-Stop Position Loop)	4 = ZE Hld (H-Stop ZE Position Loop)
3 = Psn (Position Loop)	2 = ZE Psn (Zero Error Loop)
1 = Vel (Velocity Loop)	0 = OL (Open Loop)

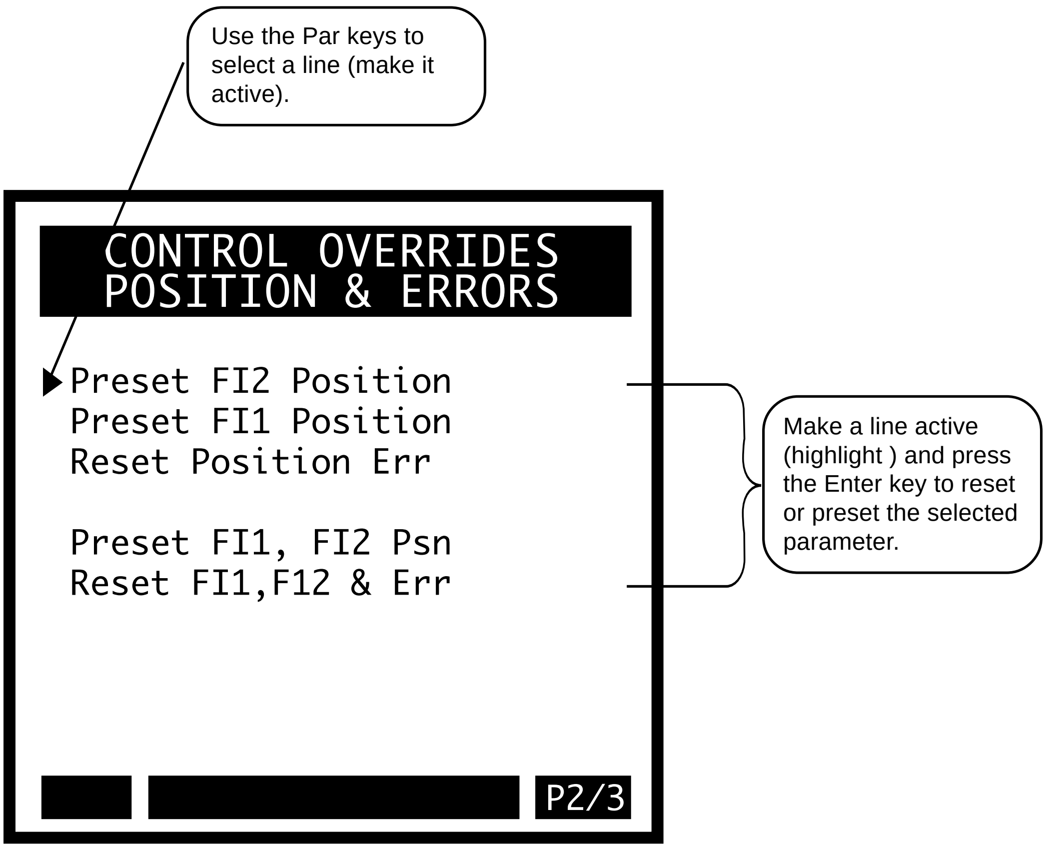
The Control Overrides screens are accessed through
—> Main Menu / System Monitor



Position & Error

Use the Control Overrides / Position & Error screen (page 2) to reset the position error or preset the position counters. Scroll to the item that you want to preset and press the Enter key to activate that item. If you activate either the “Reset Position Err” or the “Reset FI1, FI2 & Err”, then the position error will reset to “0”. If you activate any of the items that include “FI1” or “FI2”, then the counters will preset to the corresponding preset values; FI1PsnPrst (CP-266) and FI2PsnPrst (CP-267). Presetting the position counters does not effect the Position Error.

The Control Overrides / Position & Error screen (page 2).



Control Overrides

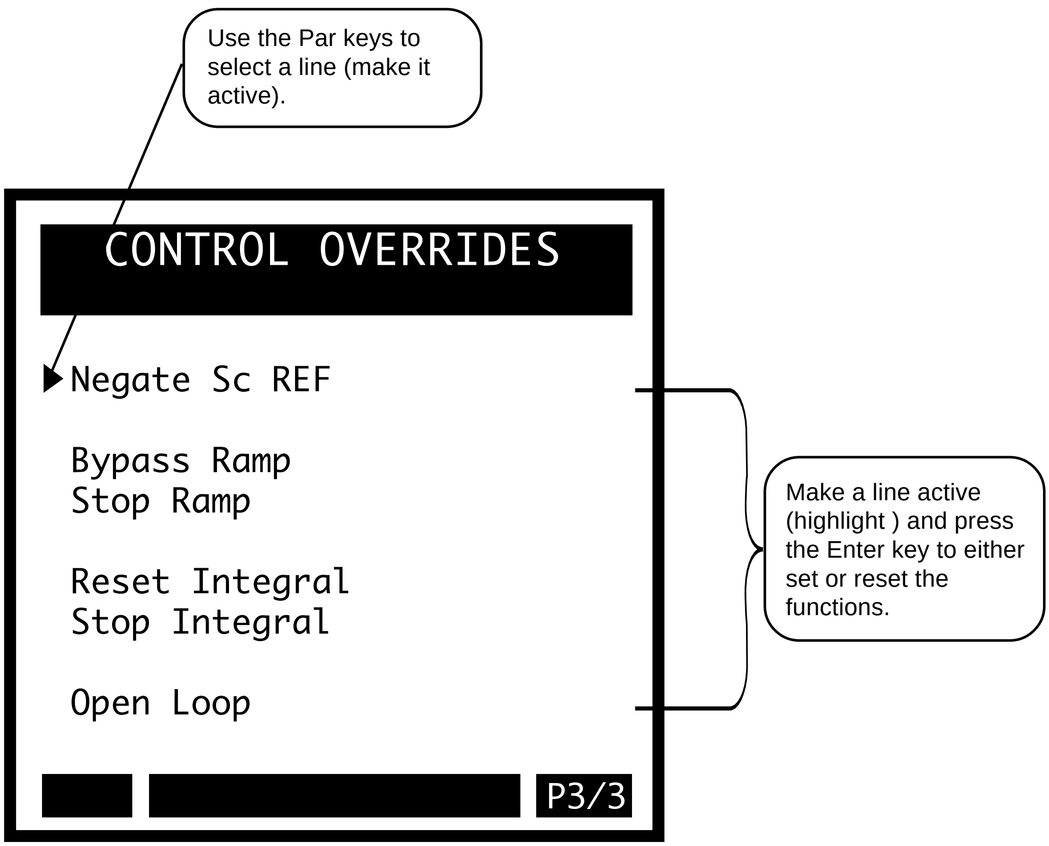
Use the Control Overrides screen (page 3) to effect the following control functions:

Negate Setpoint (change direction),
Bypass the Ramp,
Stop the Ramp,
Reset Integral
Stop the Integral
Open Loop

Scroll the cursor to the item that you want to activate and press Enter. The highlighter will appear and will remain on the function(s) that are active. If you want to deactivate a function, scroll the cursor to the function that you want to deactivate and press Enter. The highlighter will disappear and that function is no longer active.

The Cntrl Latch bits are OR'ed with the corresponding PLC Bits. Use either the PLC or the keypad to activate these functions.

The Control Overrides screen (page 3).



—NOTES—

Serial Communications

INTRODUCTION TO SERIAL COMMUNICATIONS

The CX-1010 can interface with a host computer through a RS485 Serial Communications Interface (refer to Figure 2-30, *CX-1010 Multidrop Installation*, page 2-24). This interface allows the host computer to perform remote control of the CX-1010, Control Parameter entry, and status or performance monitoring.

This following sections describe the three available interfaces for Serial Communications:

CX-1010 Serial Communications ASCII Data-Link Protocol
(Message Transmission / Response Structures)

CX-1010 Serial Communications ASCII2 Data-Link Protocol
(Message Transmission / Response Structures)

CX-1010 Serial Communications Binary Data-Link Protocol
(Message Transmission / Response Structures)

NOTE: Before you can apply Serial Communications, the CX-1010 must be interfaced with a host computer through a RS485 Serial Communications Interface.

The CX-1010 comes factory pre-loaded with default Control Parameters for Serial Communications. These Control Parameters set up the CX-1010 to accommodate the RS485 Serial Communications Interface. Generally, the default settings are suitable for most applications and do not require modification, however, these default parameters can be modified for your specific application.

All of the other Control Parameters can be modified as well, when communications have been established through the host computer using the Serial Communications Interface. To configure for Serial Communications, refer to *System Setup - Control Parameters: Device Configure, Serial Communications* section, page 5-176.

CX-1010 Serial Communications ASCII Data-Link Protocol

(Message Transmission / Response Structures)

STX	1 Byte ^B Char(2)
Address	2 ASCII Chars
Function	2 ASCII Chars
Message Error	2 ASCII Chars
Data Field	Number of characters defined by Function
ETX	1 Byte ^C Char(3)
CRC	4 ASCII HEX Chars (0000 - FFFF)

Number of constant characters per Transmission = 10 characters (Minimum # of characters)
CX-1010 Serial Communications Buffer Size = 255 characters (Maximum # of characters)
(leaves a maximum of 245 characters for the data field)

Note: In this document pertaining to ASCII protocols, any reference to ASCII HEX or “0-F” refers to ASCII representation of a HEX number using ASCII characters “0-9” & “A-F”.

Functions that are included in the ASCII Protocol:

01) Data Read Single Parameter
02) Data Write Single Parameter
03) Data Read Parm Block (14 parameter limit)
04) Data Write Parm Block (14 parameter limit)
05) Control Command Send
08) Data Read Custom Engineering Units
09) Data Write Custom Engineering Units
10) Data Read Constant Table (4 parameter limit)

Example:
Request Value for CP-110

Table 7-1 Data Read Single Parameter, Host Transmission

STX	ADDR		FUNC		DATA			EXT	CRC			
^B	0	1	0	1	1	1	0	^C	F	4	4	6

Definition of Message Elements

"STX"	Signals the start of transmission. (Host/CX-1010) A single byte ASCII Char (02) "^B".
"Address"	Address of the CX-1010 that will recognize and interpret the message. A two character ASCII number in the range of "01" - "99". ("@0" = Global Transmission)
"Function"	The CX-1010 function requested which defines the data structure to follow. It is a two character ASCII number in the range of "01"-"10" (accepted functions are defined above).
"Message Error" (Msg Error)	General transmission response from the CX-1010. This is a two character ASCII HEX number, in the range of "00" - "FF", which may indicate a serial communications error has occurred upon receipt of a message transmission.
"Data Field"	A field of variable length which contains the data for the function requested. The Data Field is defined for individual functions through out the following section.
"ETX"	Signals the end of the message. (Host/CX-1010) A single byte ASCII Char (03) "^C".
"CRC"	(Cyclic Redundancy Check) If CRC Enable is "ON", a CRC value is calculated and sent with each transmission. The CRC includes all message data except the STX byte. The data stream is checked against the CRC at the receiving end. The CRC is a four character ASCII HEX number in the range of "0000" - "FFFF".
"Format Character" (Fmt)	An ASCII character, in the range of "0-2"; where "0" indicates the value is "OK" as is, "1" indicates the value is negative and "2" indicates the value is in binary format.
"Resolution Character" (Res)	An ASCII character, in the range of "0-9", that indicates the number of digits to the right of the decimal point for the value.

FUNCTION (01) DATA READ SINGLE PARAMETER

Table 7-2 Host Transmission

Character #	1	2	3	4	5	6	7	8	9	10	11	12	13
DESC	STX	Address		Function		Parameter Number			ETX	CRC (0000 - FFFF)			
ASCII	^B	0-9	1-9	0	1	0-9	0-9	0-9	^C	0-F	0-F	0-F	0-F

Data Field - Parameter Number - 3 characters.

Message Length = 13 characters.

Table 7-3 CX-1010 Response

Character #	1	2	3	4	5	6-19	20	21	22	23	24
DESC	STX	Address		Msg Error		Data Field	ETX	CRC (0000 - FFFF)			
ASCII	^B	0-9	1-9	0-F	0-F	<below>	^C	0-F	0-F	0-F	0-F

Data Field per Table 7-3 (14 characters)

Character #	6	7	8	9	10	11	12	13	14	15	16	17	18	19
DESC	Error Code		Res	Fmt	Parameter Value (0000000000-9999999999)									
ASCII	0-3	0-9	0-9	0-2	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9

Parameter Error Code - 2 characters.
Resolution - 1 character (Number of digits to the right of the decimal point).
Format - 1 character (0 = OK as is, 1 = Negative value, 2 = Binary value).
Parameter Value - 10 character (Positive numeric value of the parameter).

Message Length = 24 characters.

FUNCTION (02) DATA WRITE SINGLE PARAMETER

Table 7-4 Host Transmission

Character #	1	2	3	4	5	6-20	21	22	23	24	25
DESC	STX	Address		Function		Data Field	ETX	CRC (0000 - FFFF)			
ASCII	^B	0-9	0-9	0	2	<below>	^C	0-F	0-F	0-F	0-F

Data Field per Table 7-4 (15 characters)

Character #	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DESC	Parm Number			Res	Fmt	Parameter Value (0000000000-9999999999)									
ASCII	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9

Parameter Number - 3 characters.
Resolution - 1 character.
Format - 1 character.
Parameter Value - 10 characters.

Message Length = 25 characters.

Table 7-5 CX-1010 Response

Character #	1	2	3	4	5	6	7	8	9	10	11	12
DESC	STX	Address		Msg Error		Error Code		ETX	CRC (0000 - FFFF)			
ASCII	^B	0-9	1-9	0-F	0-F	0-3	0-9	^C	0-F	0-F	0-F	0-F

Data Field - Parameter Error Code - 2 characters.

Message Length = 12 characters

FUNCTION (03) DATA READ PARAMETER BLOCK

Table 7-6 Host Transmission

Character #	1	2	3	4	5	6-8	9	10	11	12	13
DESC	STX	Address		Function		Data Field	ETX	CRC (0000 - FFFF)			
ASCII	^B	0-9	1-9	0	3	<below>	^C	0-F	0-F	0-F	0-F

Data Field per Table 7-6
Number of Parameters x 3 characters/parameter (14 parameters max. = 42 characters)

Character #	6	7	8
DESC	Parameter Number 100's	Parameter Number 10's	Parameter Number 1's
ASCII	0-9	0-9	0-9

Parameter Number - 3 characters.

Message Length = 13 to 52 characters.

Data Field Example:
Data Read Block of 3 Parameters (MP-40, CP-101, CP-440)

Character #	6	7	8	9	10	11	12	13	14
DESC	Parameter 40			Parameter 101			Parameter 440		
ASCII	0	4	0	1	0	1	4	4	0

Table 7-7 CX-1010 Response

Character #	1	2	3	4	5	6-22	23	24	25	26	27
DESC	STX	Address		Msg Error		Data Field	ETX	CRC (0000 - FFFF)			
ASCII	^B	0-9	1-9	0-F	0-F	<below>	^C	0-F	0-F	0-F	0-F

Data Field per Table 7-7
Number of Parameters x 17 characters/parameter (14 parameters max. = 238 characters)

Character #	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
DESC	Parm Number			Error Code		Res	Fmt	Parameter Value (0000000000-9999999999									
ASCII	0-9	0-9	0-9	0-3	0-9	0-9	0-2	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9

Parameter Number	- 3 characters.
Parameter Error Code	- 2 characters.
Resolution	- 1 character.
Format	- 1 character.
Parameter Value	- 10 characters.

Message Length = 27 to 248 characters.

FUNCTION (04) DATA WRITE PARAMETER BLOCK

Table 7-8 Host Transmission

Character #	1	2	3	4	5	6-20	21	22	23	24	25
DESC	STX	Address		Function		Data Field	ETX	CRC (0000 - FFFF)			
ASCII	^B	0-9	0-9	0	4	<below>	^C	0-F	0-F	0-F	0-F

Data Field per Table 7-8
Number of Parameters x 15 characters/parameter (14 parameters max. = 210 characters)

Character #	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DESC	Parm Number			Res	Fmt	Parameter Value (0000000000-9999999999)									
ASCII	0-9	0-9	0-9	0-9	0-2	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9	0-9

Parameter Number - 3 characters.
Resolution - 1 characters.
Format - 1 characters.
Parameter Value - 10 characters.

Message Length = 25 to 220 characters.

Table 7-9 CX-1010 Response

Character #	1	2	3	4	5	6-10	11	12	13	14	15
DESC	STX	Address		Msg Error		Data Field	ETX	CRC (0000 - FFFF)			
ASCII	^B	0-9	1-9	0-F	0-F	<below>	^C	0-F	0-F	0-F	0-F

Data Field per Table 7-9
Number of Parameters x 5 characters/parameter (14 parameters max. = 70 characters)

Character #	6	7	8	9	10
DESC	Parameter Number			Parameter Error Code	
ASCII	0-9	0-9	0-9	0-3	0-9

Parameter Number - 3 characters.
Parameter Error Code - 2 characters.

Message Length = 15 to 80 characters.

FUNCTION (05) CONTROL COMMAND SEND

Table 7-10 Host Transmission

Character #	1	2	3	4	5	6	7	8	9	10	11	12
DESC	STX	Address		Function		Command		ETX	CRC (0000 - FFFF)			
ASCII	^B	0-9	0-9	0	5	0-2	0-9	^C	0-F	0-F	0-F	0-F

Data Field - Control Command - 2 characters
Valid Control Commands:

01 = F-Stop.
02 = R-Stop.
03 = H-Stop.
04 = Run.
05 = Jog Forward.
06 = Jog Reverse.
07 = Jog Stop.
09 = Reset Integral.
10 = Preset FB Position.
11 = Preset LD Position.
12 = Reset Position Error.
13 = Preset FB & LD Position.
14 = Preset FB, LD, & Reset Position Error.
17 = Negate Scaled Reference.
21 = Bypass Ramp.
22 = Stop Ramp.
23 = Open Loop.
24 = Stop Integral.

Message Length = 12 characters.

Table 7-11 CX-1010 Response

Character #	1	2	3	4	5	6	7	8	9	10	11	12
DESC	STX	Address		Msg Error		Cmd Error		ETX	CRC (0000 - FFFF)			
ASCII	^B	0-9	1-9	0-F	0-F	0-3	0-9	^C	0-F	0-F	0-F	0-F

Data Field - Command Error Code - 2 characters.

Message Length = 12 characters.

FUNCTION (08) DATA READ CUSTOM ENGINEERING UNITS

Table 7-12 Host Transmission

Character #	1	2	3	4	5	6	7	8	9	10
DESC	STX	Address		Function		ETX	CRC (0000-FFFF)			
ASCII	^B	0-9	1-9	0	8	^C	0-F	0-F	0-F	0-F

Data Field - 0 characters.

Message Length = 10 characters.

Table 7-13 CX-1010 Response

Character #	1	2	3	4	5	6-20	21	22	23	24	25
DESC	STX	Address		Msg Error		Data Field	ETX	CRC (0000 - FFFF)			
ASCII	^B	0-9	1-9	0-F	0-F	<below>	^C	0-F	0-F	0-F	0-F

Data Field per Table 7-13
Engineering Units Text - (1 to 15 characters)

Character #	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DESC	Engineering Units Text														
ASCII	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~

Message Length = 11 to 25 characters.

Note: The Engineering Units Text string may be any string of printable ASCII characters of up to 15 characters long.

FUNCTION (09) DATA WRITE CUSTOM ENGINEERING UNITS

Table 7-14 Host Transmission

Character #	1	2	3	4	5	6-20	21	22	23	24	25
DESC	STX	Address		Function		Data Field	ETX	CRC (0000 - FFFF)			
ASCII	^B	0-9	0-9	0	9	<below>	^C	0-F	0-F	0-F	0-F

Data Field per Table 7-14
Engineering Units Text - (1 to 15 characters)

Character #	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DESC	Engineering Units Text														
ASCII	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~	!- ~

Message Length = 11 to 25 characters.

Note: The Engineering Units Text String may be any string of printable ASCII characters of up to 15 characters long.

Table 7-15 CX-1010 Response

Character #	1	2	3	4	5	6	7	8	9	10	11	12
DESC	STX	Address		Msg Error		Error Code		ETX	CRC (0000 - FFFF)			
ASCII	^B	0-9	1-9	0-F	0-F	0-3	0-9	^C	0-F	0-F	0-F	0-F

Data Field - EU Text Error Code - 2 characters.

Message Length = 12 characters.

FUNCTION (10) DATA READ PARAMETER CONSTANT TABLE

Table 7-16 Host Transmission

Character #	1	2	3	4	5	6-8	9	10	11	12	13
DESC	STX	Address		Function		Data Field	ETX	CRC (0000 - FFFF)			
ASCII	^B	0-9	1-9	1	0	<below>	^C	0-F	0-F	0-F	0-F

Data Field per Table 7-16
Number of Parameters x 3 characters/parameter (4 parameters max. = 12 characters)

Character #	6	7	8
DESC	Parameter Number 100's	Parameter Number 10's	Parameter Number 1's
ASCII	0-9	0-9	0-9

Parameter Number - 3 characters.

Message Length = 13 to 22 characters.

Table 7-17 CX-1010 Response

Character #	1	2	3	4	5	6-241	242	243	244	245	246
DESC	STX	Address		Msg Error		Data Field	ETX	CRC (0000 - FFFF)			
ASCII	^B	0-9	1-9	0-F	0-F	<below>	^C	0-F	0-F	0-F	0-F

Data Field - Number of Parameters x 59 characters/parameter (4 parameters max. = 236 characters).

Parameter Number	- 3 characters	(000 - 999).
Parameter Error Code	- 2 characters	(00 - 32).
Title Text String	- 15 characters	(String of 15 printable ASCII characters).
Minimum Value Format*	- 1 character	(0 - 2).
Minimum Value*	- 10 characters	(0000000000 - 9999999999).
Maximum Value Format*	- 1 character	(0 - 2).
Maximum Value*	- 10 characters	(0000000000 - 9999999999).
Default Value Format*	- 1 character	(0 - 2).
Default Value*	- 10 characters	(0000000000 - 9999999999).
Minimum Resolution*	- 1 character	(0 - 9) Resolution for Minimum Value.
Maximum Resolution*	- 1 character	(0 - 9) Maximum Resolution for any value.
Default Resolution*	- 1 character	(0 - 9) Resolution for Default Value.
Parameter Control byte	- 2 characters	(ASCII HEX Number, 00 - FF).
Field Length	- 1 character	(0 - 9) Length of parameter field.

* These fields will be filled with zeros for all Monitor Parameter requests.

Message Length = 69 to 246 characters

Message Error Bits Definitions:

Bit 7	=	(1) CRC Failure
Bit 6	=	(1) Buffer Overflow
Bit 5	=	(1) ETX Not Received/Data Field Error
Bit 4	=	(1) Invalid Function/Data Error
Bit 3	=	(1) Over-Run Error
Bit 2	=	(1) Noise Error
Bit 1	=	(1) Framing Error
Bit 0	=	(1) Parity Error

Example:

"86" = the number 10000110 (binary) would indicate a CRC failure with Noise errors and Framing errors occurred when the transmission message was received.

Other Errors Returned From The Control Through Serial Communications:

00	=	OK
01	=	General Data Error
02	=	Res Byte Error
03	=	Invalid Parameter
04	=	String too Long
05	=	Out of Range
06	=	Not Allowed
07	=	Lockout During Run
08	=	Not Ready
09	=	Block Parameter Error
10	=	Block Value Error
11	=	Block Parameter Memory Limit
12	=	MIN Error
13	=	MAX Error
14	=	Invalid Command (PLC/Control Command Send)
15	=	Invalid Operand (PLC)
16	=	<END> Statement Missing (PLC)
17	=	PLC Program Memory Limit
18	=	Defaults Loaded
19	=	Backup Loaded
20	=	Backup Saved
21	=	Checksum Error
22	=	Faults Cleared
23	=	Test Passed
24	=	Test Failed
25	=	No Compare Parameter
26	=	Divide by Zero
27	=	Long Word Overflow
28	=	Parameter Transfer Limit Overflow
29	=	Memory Read request too long
30	=	Data Field Length Error
31	=	Message Function Request/Parameter NOT Processed
32	=	Invalid Function Request

Parameter Control Byte Definitions:

Bit 7	=	(1) Negative Numbers are Possible (0) Positive Numbers Only
Bit 6	=	(1) Leading Zero's OK (0) No Leading Zero's
Bit 5	=	(1) Restricted (0) Not Restricted
Bit 4	=	(1) Parameter Defined (0) Parameter is NOT Defined
Bit 3	=	Not Used (Reserved) always 0
Bit 2	=	(1) Floating Point Number (0) Fixed Decimal Point Number
Bit 1	=	(1) Binary Number (0) Decimal Number
Bit 0	=	(1) Integer (0) Non-Integer

Example of CRC-16 Calculation (in C):

```
#define CRC16  0x8005                         /* CRC-16 Generating Poly */

/* function returns the accumulated CRC value calculated for the Buffer */
/* this value can be transmitted or compared to a CRC value received */
/* "*data" is a pointer to the Buffer of data bytes to calculate the CRC for */
/* "len" is the number of data bytes to use for the calculation */

unsigned int do_crc(unsigned char *data, int len)
{
   int i, j;                                  /* byte & bit counters */
   unsigned int accum = 0xFFFF;               /* CRC value accumulator */
   unsigned int dat;                          /* holds data byte */

   for(i = 0; i < len; ++i){                  /* for each byte of data */
         dat = *data++;                       /* get data byte & goto next */
         accum ^= (dat << 8);                 /* put data into high byte */
         j = 0;                               /* clear bit counter */
         while(j++ < 8){                      /* for each bit */
              if(accum & 0x8000)              /* if MSB set */
                   accum ^= CRC16;            /* Modulus-2 math w/CRC 16 */
              accum <<= 1;                    /* shift left 1 bit */
         }                                    /* end for each bit */
   }                                          /* end for each byte */

return(accum);                                /* return the CRC value */
}                                             /* End do_crc function */
```

Note: This "CRC" must be converted to 4 ASCII characters before transmission. (Chars 0 to 9 and A to F should be used). For all "ASCII HEX" values the A through F characters must be in Upper Case when Transmitted in order to keep the conversions consistent.

CX-1010 Serial Communications ASCII2 Data-Link Protocol

(Message Transmission / Response Structures)

STX	1 Byte ^B Char(2)
Address	1 or 2 ASCII characters, normally followed by a comma
Data Field	Flexible field of ASCII characters defined later in this document
ETX	1 Byte ^C Char(3)

Note: The “ETX” character may be followed by “CRC” characters if “CRC Enable” is “ON”. Any reference to ASCII HEX or “0-F” refers to ASCII representation of a HEX number using ASCII characters “0-9” & “A-F”.

Functions that are included in the ASCII2 Protocol:

1) Control Acknowledgment
2) Data Read Single Parameter
3) Data Write Single Parameter
4) Control Command Send
5) Data Read Custom Engineering Units
6) Data Write Custom Engineering units
7) Data Read Parameter Title
8) Data Read Maximum Parameter Value
9) Data Read Minimum Parameter Value
10) Data Read Default Parameter Value
11) Data Read Backup Parameter Value
12) Data Read Value of the Maximum Parameter Field length
13) Data Read Parameter Control Byte

Definition of Message Elements

"STX"	Signals the start of a transmission. (Host/CX-1010) A single byte ASCII Char (02) "^B".
"Address"	Address of the CX-1010 to recognize and interpret the message. One or two ASCII characters, followed by a comma, in the range of "0-99". ("0" indicates a Global Transmission to be received by all controls on the serial link).
"Message Error" (Msg Error)	General transmission response from the CX-1010. This is a two character ASCII HEX number, in the range of "00" - "FF", which may indicate a serial communications error has occurred upon receipt of a message transmission.
"Data Field"	A field of variable length which contains the data for the function requested. The Data Field is defined for individual functions through out the following section.
"?"	Field terminator requesting response from the CX-1010.
"**,**"	Address and Data Field separator.
"="	Assignment operator indicating assignment of data to follow, or indicator of a parameter value to follow.
"**.**"	Indicates a Constant Table Read of type to follow.
"!"	Indicates a Control Command Send.
"ETX"	Signals the end of the message. (Host/CX-1010) A single byte ASCII Char (03) "^C".
"CRC"	(Cyclic Redundancy Check) If CRC Enable is "ON", a CRC value is calculated and sent with each transmission. The CRC includes all message data except the STX byte. The data stream is checked against the CRC at the receiving end. The CRC is a four character ASCII HEX number in the range of "0000" - "FFFF".

Note: To conserve space, the CRC field has been omitted on all of the following message definition tables. If the CRC Enable is "ON", then a CRC value must be appended to each message transmission immediately following the ETX character.

FUNCTION (01) CONTROL ACKNOWLEDGMENT

Table 7-18 Host Transmission

Character #	1	2	3	4
DESC	STX	Address	Inquiry	ETX
ASCII	^B	1-99	?	^C

Address Field

This field may consist of one or two ASCII characters, depending on the address of the control. For example, if the address is less than 10, then only one ASCII character is required in this field. If the address is greater than 9, then two ASCII characters are required in this field to represent the address. Leading spaces in this field will be ignored.

Table 7-19 CX-1010 Response

Character #	1	2	3	4	5
DESC	STX	Msg Error	Separator	ACK	ETX
ASCII	^B	0-FF	,	^F	^C

Msg Error Field

This field may consist of one or two ASCII HEX characters that indicate any serial communications errors that may have occurred when the message transmission was received.

ACK

This field acknowledges that the control exists (represented by ASCII character #6). If there is not a control at the address indicated, there will not be a response.

FUNCTION (02) DATA READ SINGLE PARAMETER

Table 20 Host Transmission

Character #	1	2	3	4	5	6
DESC	STX	Address	Separator	Parm #	Inquiry	ETX
ASCII	^B	1-99	,	0-999	?	^C

Parm # Field

This field may consist of one or more ASCII characters representing the parameter number requested. If the parameter number is less than 10, then a single ASCII character may be used to represent the parameter number. If the parameter number is in the range of 10 to 99, then two characters are required to represent the parameter number. If the parameter number is 100 or greater, then three characters are required to represent the parameter number. Any leading spaces will be ignored.

Table 21 CX-1010 Response

Character #	1	2	3	4	5	6	7
DESC	STX	Msg Error	Separator	Parm #	Equals	Value	ETX
ASCII	^B	0-FF	,	0-999	=	<below>	^C

Value Field

This field will consist of an ASCII string representing the value for the parameter requested. If there is an error retrieving the parameter value, this field will contain the error code number preceded by an “E” (e.g., “E3”).

Examples with No Error:

decimal integer value of 1	“1”
decimal integer value of 1000	“1000”
decimal integer value of -20	“-20”
decimal value of 1234.56	“1234.56”
decimal value of -15.00	“-15.00”
Binary value of 89_D	“01011001”

FUNCTION (03) DATA WRITE SINGLE PARAMETER

Table 22 Host Transmission

Character #	1	2	3	4	5	6	7	8
DESC	STX	Address	Separator	Parm #	Assign	Value	Inquiry	ETX
ASCII	^B	0-99	,	0-999	=	<below>	?	^C

Value Field

This field will consist of an ASCII string representing the value to be assigned to the parameter. Leading spaces in this field will be ignored.

Examples:

decimal integer value of 1	“1”
decimal integer value of 1	“ 1”
decimal integer value of 1000	“1000”
decimal integer value of -20	“-20”
decimal value of 1234.56	“1234.56”
decimal value of -15.00	“-15.00”
Binary value of 89_D	“01011001”

Inquiry Field (Inq)

The inclusion of the inquiry designator is optional. If no response is required this character may be omitted from the message. If this character field is not included in the message, the operation will be performed, however the control will not respond.

Table 23 CX-1010 Response

Character #	1	2	3	4	5	6	7
DESC	STX	Msg Error	Separator	Parm #	Equals	Value	ETX
ASCII	^B	0-FF	,	0-999	=	<below	^C

Value Field

This field will consist of an ASCII string representing the value assigned to the parameter. If an error occurred in the assignment operation, this field will contain the error code number preceded by an “E” (e.g., “E3”).

Value Field Examples with No Error:

decimal integer value of 1	“1”
decimal integer value of 1000	“1000”
decimal integer value of -20	“-20”
decimal value of 1234.56	“1234.56”
decimal value of -15.00	“-15.00”
Binary value of 89_D	“01011001”

FUNCTION (04) CONTROL COMMAND SEND

Table 24 Host Transmission

Character #	1	2	3	4	5	6
DESC	STX	Address	Separator	Command	Inquiry	ETX
ASCII	^B	0-99	,	ASCII2 Command String	?	^C

List of Valid ASCII2 Command Strings:

FST! = F-Stop
RST! = R-Stop
HST! = H-Stop
RUN! = Run
JGF! = Jog Forward
JGR! = Jog Reverse
JGS! = Jog Stop
RSI! = Reset Integral
PFP! = Preset Feedback Position
PLP! = Preset Lead Position
RPE! = Reset Position Error
PFL! = Preset Feedback & Lead position
RAP! = Preset Feedback & Lead position, and Reset Position Error
NSR! = Negate Scaled Reference
BPR! = Bypass Ramp
STR! = Stop Ramp
OPL! = Open Loop
STI! = Stop Integral

Command Field

Insert any of the valid ASCII2 command strings defined above.

Inquiry Field (Inquiry)

The inclusion of the inquiry designator is optional. If no response is required this character may be omitted from the message. If this character field is not included in the message, the commanded operation will be performed, however the control will not respond.

Table 25 CX-1010 Response

Character #	1	2	3	4	5
DESC	STX	Msg Error	Separator	Command	ETX
ASCII	^B	0-FF	,	<below>	^C

Command Field

If the requested command is acted upon, this field will contain the command string that was sent. If an error occurred, this field will contain an “E” followed immediately by an ASCII representation of the error code number which occurred. (e.g., “E31”)

FUNCTION (05) DATA READ CUSTOM ENGINEERING UNITS

Table 26 Host Transmission

Character #	1	2	3	4	5	6	7
DESC	STX	Msg Error	Separator	EU Request		Inquiry	ETX
ASCII	^B	1-99	,	E	U	?	^C

Table 27 CX-1010 Response

Character #	1	2	3	4	5	6	7	8
DESC	STX	Msg Error	Separator	EU Indicator		Equals	EU Text	ETX
ASCII	^B	0-FF	,	E	U	=	<below>	^C

Engineering Unit Text Field

This field will contain the custom engineering units text string from the control's memory. (Up to 15 printable ASCII characters long)

FUNCTION (06) DATA WRITE CUSTOM ENGINEERING UNITS

Table 28   Host Transmission

Character #	1	2	3	4	5	6	7	8	9
DESC	STX	Address	Separator	EU Indicator		Assign	EU Text	Inquiry	ETX
ASCII	^B	0-99	,	E	U	=	<below>	?	^C

EU Text Field

This field should contain a string of up to 15 printable ASCII characters that are to be assigned to the custom engineering units text for the control at the indicated address.

Inquiry Field (Inquiry)

The inclusion of the inquiry designator is optional. If no response is required this character may be omitted from the message. If this character field is not included in the message, the commanded operation will be performed, however the control will not respond.

Table 29   CX-1010 Response

Character #	1	2	3	4	5	6	7	8
DESC	STX	Msg Error	Separator	EU Indicator		Equals	EU Text	ETX
ASCII	^B	0-FF	,	E	U	=	<below>	^C

Engineering Unit Text Field

If the assignment is successful, this field will contain the custom engineering units text string assigned. (Up to 15 printable ASCII characters long) If an error occurred in the assignment operation, this field will contain the error code number preceded by an “E” (e.g., “E4”).

Data Read Constant Table

7) Data Read Parameter Title
8) Data Read Maximum Parameter Value
9) Data Read Minimum Parameter Value
10) Data Read Default Parameter Value
11) Data Read Backup Parameter Value
12) Data Read Value of the Maximum Parameter Field length
13) Data Read Parameter Control Byte

Note: For all constant table reads, the host transmission message structure is the same differing only by the read command following the period.

Table 30 Host Transmission

Character #	1	2	3	4	5	6	7	8	9	10
DESC	STX	Address	Separator	Parm Number			CTR	Type	Inquiry	ETX
ASCII	^B	1-99	,	0-9	0-9	0-9	.	<below>	?	^C

Constant Table Read Type Strings:

TTL = Parameter Title Text
MAX = Maximum Parameter Value
MIN = Minimum Parameter Value
DEF = Default Parameter Value
BKU = Backup Parameter Value
FLD = Parameter Field length
CTB = Parameter Control Byte

CTR Field

This field should always be a period designating a Constant Table Read of type to follow for the indicated parameter.

Type Field

Insert the desired constant table read type string into this field. The control will respond with the appropriate data for the type of read requested. This is a three character field.

FUNCTION (07) DATA READ PARAMETER TITLE

Table 31 CX-1010 Response

Character #	1	2	3	4	5	6	7
DESC	STX	Msg Error	Separator	Parm #	Equals	Parm Title Text	ETX
ASCII	^B	0-FF	,	1-999	=	<below>	^C

Parm Title Text Field

This field will contain an ASCII string of 15 characters for the title of the parameter requested. If there is an error in the request, this field will contain the error code number preceded by an “E” (e.g., “E3”).

FUNCTION (08) DATA READ MAXIMUM PARAMETER VALUE

Table 32 CX-1010 Response

Character #	1	2	3	4	5	6	7
DESC	STX	Msg Error	Separator	Parm #	Equals	Max Parm Value	ETX
ASCII	^B	0-FF	,	1-999	=	<below>	^C

Max Parm Value Field

This field will contain an ASCII string Representation of the numeric maximum value for the parameter requested. If there is an error in the request, this field will contain the error code number preceded by an "E" (e.g., "E3").

FUNCTION (09) DATA READ MINIMUM PARAMETER VALUE

Table 33 CX-1010 Response

Character #	1	2	3	4	5	6	7
DESC	STX	Msg Error	Separator	Parm #	Equals	Min Parm Value	ETX
ASCII	^B	0-FF	,	1-999	=	<below>	^C

Min Parm Value Field

This field will contain an ASCII string Representation of the numeric minimum value for the parameter requested. If there is an error in the request, this field will contain the error code number preceded by an “E” (e.g., “E3”).

FUNCTION (10) DATA READ DEFAULT PARAMETER VALUE

Table 34 CX-1010 Response

Character #	1	2	3	4	5	6	7
DESC	STX	Msg Error	Separator	Parm #	Equals	Default Parm Value	ETX
ASCII	^B	0-FF	,	1-999	=	<below>	^C

Default Parm Value Field

This field will contain an ASCII string Representation of the numeric default value for the parameter requested. If there is an error in the request, this field will contain the error code number preceded by an “E” (e.g., “E3”).

FUNCTION (11) DATA READ BACKUP PARAMETER VALUE

Table 35 CX-1010 Response

Character #	1	2	3	4	5	6	7
DESC	STX	Msg Error	Separator	Parm #	Equals	Backup Parm Value	ETX
ASCII	^B	0-FF	,	1-999	=	<below>	^C

Backup Parm Value Field

This field will contain an ASCII string Representation of the numeric backup value for the parameter requested. If there is an error in the request, this field will contain the error code number preceded by an "E" (e.g., "E3").

FUNCTION (12) DATA READ VALUE OF THE MAXIMUM PARAMETER FIELD LENGTH

Table 36 CX-1010 Response

Character #	1	2	3	4	5	6	7
DESC	STX	Msg Error	Separator	Parm #	Equals	Parm Field Length	ETX
ASCII	^B	0-FF	,	1-999	=	0-9	^C

Parm Field Length Field

This field will contain an ASCII character, of the range 0 to 9, for the field length of the parameter requested. If there is an error in the request, this field will contain the error code number preceded by an "E" (e.g., "E3").

FUNCTION (13) DATA READ PARAMETER CONTROL BYTE

Table 37 CX-1010 Response

Character #	1	2	3	4	5	6-13	14
DESC	STX	Msg Error	Separator	Parm #	Equals	Parm Control Byte	ETX
ASCII	^B	0-FF	,	1-999	=	0-1	^C

Parameter Control Byte Field

This field will contain an ASCII string of 8 characters, of the range 0 to 1, representing, in binary format, the parameter control byte for the parameter requested. If there is an error in the request, this field will contain the error code number preceded by an “E” (e.g., “E3”).

Parameter Control Byte field per Table 37

Character #	6	7	8	9	10	11	12	13
DESC	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
ASCII	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1

Parameter Control Byte Definitions:

Bit 7 = (1) Negative Numbers are Possible (0) Positive Numbers Only
Bit 6 = (1) Leading Zero’s OK (0) No Leading Zero’s
Bit 5 = (1) Restricted (0) Not Restricted
Bit 4 = (1) Parameter Define (0) Parameter is NOT Defined
Bit 3 = Not Used (Reserved) always 0
Bit 2 = (1) Floating Decimal Point Number (0) Fixed Decimal Point Number
Bit 1 = (1) Binary Number (0) Decimal Number
Bit 0 = (1) Integer (0) Non-Integer

Message Error Response Field
Consists of 2 Bytes (ASCII “HEX”)
“ASCII HEX” means the numeric value in the field is NOT represented as a decimal (Base 10) Number. The Number is represented by the characters: 0 through 9 and A through F for the HEX equivalent of the binary number.

Message Error Bit Definitions:

Bit 7 = (1) CRC Failure
Bit 6 = (1) Buffer Overflow
Bit 5 = (1) ETX Not Received/Data Field Error
Bit 4 = (1) Invalid Function/Data Error
Bit 3 = (1) Over-Run Error
Bit 2 = (1) Noise Error
Bit 1 = (1) Framing Error
Bit 0 = (1) Parity Error

Example:

“86” = the number 10000110 (binary) would indicate a CRC failure with Noise errors and Framing errors occurred when the transmission message was received.

Other Errors Returned From The Control Through Serial Communications:

00	=	OK
01	=	General Data Error
02	=	Res Byte Error
03	=	Invalid Parameter
04	=	String too Long
05	=	Out of Range
06	=	Not Allowed
07	=	Lockout During Run
08	=	Not Ready
09	=	Block Parameter Error
10	=	Block Value Error
11	=	Block Parameter Memory Limit
12	=	MIN Error
13	=	MAX Error
14	=	Invalid Command (PLC/Control Command Send)
15	=	Invalid Operand (PLC)
16	=	<END> Statement Missing (PLC)
17	=	PLC Program Memory Limit
18	=	Defaults Loaded
19	=	Backup Loaded
20	=	Backup Saved
21	=	Checksum Error
22	=	Faults Cleared
23	=	Test Passed
24	=	Test Failed
25	=	No Compare Parameter
26	=	Divide by Zero
27	=	Long Word Overflow
28	=	Parameter Transfer Limit Overflow
29	=	Memory Read request too long
30	=	Data Field Length Error
31	=	Message Function Request/Parameter NOT Processed
32	=	Invalid Function Request

Note: In the ASCII2 protocol the error codes listed above are preceded by an “E” (e.g., “E32” indicates an Invalid Function Request)

Example of CRC-16 Calculation (in C):

```
#define CRC16  0x8005                          /* CRC-16 Generating Poly */

/* function returns the accumulated CRC value calculated for the Buffer */
/* this value can be transmitted or compared to a CRC value received */
/* "*data" is a pointer to the Buffer of data bytes to calculate the CRC for */
/* "len" is the number of data bytes to use for the calculation */

unsigned int do_crc(unsigned char *data, int len)
{
   int i, j;                                   /* byte & bit counters */
   unsigned int accum = 0xFFFF;                /* CRC value accumulator */
   unsigned int dat;                           /* holds data byte */

   for(i = 0; i < len; ++i){                   /* for each byte of data */
         dat = *data++;                        /* get data byte & goto next */
         accum ^= (dat << 8);                  /* put data into high byte */
         j = 0;                                /* clear bit counter */
         while(j++ < 8){                       /* for each bit */
              if(accum & 0x8000)               /* if MSB set */
                   accum ^= CRC16;             /* Modulus-2 math w/CRC 16 */
              accum <<= 1;                     /* shift left 1 bit */
         }                                     /* end for each bit */
   }                                           /* end for each byte */

return(accum);                                 /* return the CRC value */
}                                              /* End do_crc function */
```

Note: This "CRC" must be converted to 4 ASCII characters before transmission. (Chars 0 to 9 and A to F should be used). For all "ASCII HEX" values the A through F characters must be in Upper Case when Transmitted in order to keep the conversions consistent.

CX-1010 Serial Communications Binary Data-Link Protocol

(Message Transmission / Response Structures)

STX	BYTE
Length	BYTE
Address	BYTE
Function	BYTE
Message Error	BYTE
Data Field	Defined later for each function type
ETX	BYTE
CRC	WORD (2 BYTES)

<u>Valid Binary Protocol Functions:</u>

1) Data Read Single Parameter
2) Data Write Single Parameter
3) Data Read Parameter Block (Limit 16)
4) Data Write Parameter Block (Limit 16)
5) Control Commands
6) PLC Program Download from Control
7) PLC Program Upload to Control
8) Custom Engineering Units Download
9) Custom Engineering Units Upload
10) Data Read Constant Table (Limit 6)
11) Parameter Data Trace Enable/Disable (enables/disables the CX-1010's ability to collect data traces)
12) Data Read Parameter Trace (read consecutive trace data from the CX-1010)
13) Data Read Trace Status Byte

Example:
Request for CP-110

Table 38 Data Read Single Parameter, Host Transmission

STX	LEN	ADDR	FUNC	DATA	ETX	CRC
02	09	01	01	006E	03	0C56

Definition of Message Elements

"STX"	Signals the start of a transmission (Host/CX-1010)
"Length"	Length of complete message in bytes including STX, ETX, & CRC
"Address"	Address of the CX-1010
"Function"	Defines the data structure that is expected to follow and what action the CX-1010 will take.
"Message Error"	This is a general transmission error response from the CX-1010.
"Data Field"	A field of variable length which contains the data for the function requested. The Data Field is defined for individual functions through out the following section.
"ETX"	Signals the end of a data transmission (Host/CX-1010)
"CRC"	(Cyclic Redundancy Check) The CRC is calculated and sent with each transmission. It includes all message data except the STX byte. The data stream is checked against the CRC at the receiving end.
"Resolution Character" (Res)	An ASCII character, in the range of "0-9", that indicates the number of digits to the right of the decimal point for the value.

FUNCTION (01) DATA READ SINGLE PARAMETER

Table 39 Host Transmission

Byte #	1	2	3	4	5	6	7	8	9
DESC	STX	Length	Address	Function	Parm Number		ETX	CRC	
Decimal	2	9	1-99	1	1-999		3	0-65535	
Hex	02	09	01-63	01	0001-03E7		03	0000-FFFF	

Message Length = 9 bytes

Table 40 CX-1010 Response

Byte #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
DESC	STX	Length	Address	Msg Error	Error Code	Control Byte	Res	Parameter Value				ETX	CRC	
Decimal	2	14	1-99	0-255	0-32	0-244	0-9	-2147483648 2147483647				3	0-65535	
Hex	02	0E	01-63	00-FF	00-20	00-F4	00-09	80000000-7FFFFFFF				03	0000-FFFF	

Data Field -(7 Bytes)

Parameter Error Code - 1 byte
Parameter Control byte - 1 byte
Resolution - 1 byte
Parameter Value - LONG (4 bytes)

Message Length = 14 bytes

FUNCTION (02) DATA WRITE SINGLE PARAMETER

Table 41 Host Transmission

Byte #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
DESC	STX	Length	Address	Func	Parm Number		Res	Parameter Value				ETX	CRC	
Decimal	2	14	0-99	2	101-999		0-9	-2147483648 2147483647				3	0-65535	
Hex	02	0E	00-63	02	0065-03E7		00-09	80000000-7FFFFFFF				03	0000-FFFF	

Data Field -(7 Bytes)

Parameter Number - WORD (2 bytes)
Resolution - 1 byte
Parameter Value - LONG (4 bytes)

Message Length = 14 bytes

Table 42 CX-1010 Response

Byte #	1	2	3	4	5	6	7	8
DESC	STX	Length	Address	Msg Error	Error Code	ETX	CRC	
Decimal	2	8	1-99	0-255	0-32	3	0-65535	
Hex	02	08	01-63	00-FF	00-20	03	0000-FFFF	

Message Length = 8 bytes

FUNCTION (03) DATA READ PARAMETER BLOCK

Table 43 Host Transmission

Byte #	1	2	3	4	5	6	7	8	9
DESC	STX	Length	Address	Function	Parm Number		ETX	CRC	
Decimal	2	9-39	1-99	3	1-999		3	0-65535	
Hex	02	09-27	01-63	03	0001-03E7		03	0000-FFFF	

Data Field per Table 43
Number of parameters x 2 bytes/parameter (16 parameters max. = 32 bytes)

Parameter Number - WORD (2 bytes) for each parameter request

Message Length = 9 to 39 bytes

Table 44 CX-1010 Response

Byte #	1	2	3	4	5-13	14	15	16
DESC	STX	Length	Address	Msg Error	Data Field	ETX	CRC	
Decimal	2	16-151	1-99	0-255	<below>	3	0-65535	
Hex	02	10-97	01-63	00-FF	<below>	03	0000-FFFF	

Data Field per Table 44
Number of parameters x 9 bytes/parameter (16 parameters max. = 144 bytes)

Byte #	5	6	7	8	9	10	11	12	13
DESC	Error Code	Parmameter Number		Control Byte	Res	Parameter Value			
Decimal	0-32	1-999		0-244	0-9	-2147483648-2147483647			
Hex	00-20	0000-03E7		00-F4	00-09	80000000-7FFFFFFF			

Parameter Error Code - 1 byte
Parameter Number - WORD (2 bytes)
Parameter Control byte - 1 byte
Resolution - 1 byte
Parameter Value - LONG (4 bytes)

Message Length = 16 to 151 bytes

FUNCTION (04) DATA WRITE PARAMETER BLOCK

Table 45 Host Transmission

Byte #	1	2	3	4	5-11	12	13	14
DESC	STX	Length	Address	Function	Data Field	ETX	CRC	
Decimal	2	14-199	0-99	4	<below>	3	0-65535	
Hex	02	0E-77	00-63	04	<below>	03	0000-FFFF	

Data Field per Table 45
Number of parameters x 7 bytes/parameter (16 parameters max. = 112 bytes)

Byte #	5	6	7	8	9	10	11
DESC	Parameter Number		Resolution	Parameter Value			
Decimal	101-999		0-9	-2147483648 to 2147483647			
Hex	0065-03E7		00-09	80000000-7FFFFFFF			

Parameter Number - WORD (2 bytes)
Resolution - 1 byte
Parameter Value - LONG (4 bytes)

Message Length = 14 to 119 bytes

Table 46   CX-1010 Response

Byte #	1	2	3	4	5-7	8	9	10
DESC	STX	Length	Address	Msg Error	Data Field	ETX	CRC	
Decimal	2	10-55	1-99	0-255	<below>	3	0-65535	
Hex	02	0A-37	01-63	00-FF	<below>	03	0000-FFFF	

Data Field per Table 46
Number of Parameters x 3 bytes/parameter (16 parameters max. = 48 bytes)

Byte #	5	6	7
DESC	Error Code	Parameter Number	
Decimal	0-32	1-999	
Hex	00-20	001-03E7	

Parameter Error Code - BYTE
Parameter Number - WORD (2 Bytes)

Message Length = 10 to 55 bytes

FUNCTION (05) DATA WRITE CONTROL COMMAND

Table 47 Host Transmission

Byte #	1	2	3	4	5	6	7	8
DESC	STX	Length	Address	Function	Command	ETX	CRC	
Decimal	2	8	0-99	5	1-24	3	0-65535	
Hex	02	08	00-63	05	01-18	03	0000-FFFF	

Valid Control Commands:

01 (01) = F-Stop
02 (02) = R-Stop
03 (03) = H-Stop
04 (04) = Run
05 (05) = Jog Forward
06 (06) = Jog Reverse
07 (07) = Jog Stop
09 (09) = Reset Integral
10 (0A) = Preset Feedback Position
11 (0B) = Preset Lead Position
12 (0C) = Reset Position Error
13 (0D) = Preset Feedback & Lead Position
14 (0E) = Preset Feedback & Lead Position and Reset Position Error
17 (11) = Negate Scaled Reference
21 (15) = Bypass Ramp
22 (16) = Stop Ramp
23 (17) = Open Loop
24 (18) = Stop Integral

Message Length = 8 bytes

Table 48 CX-1010 Response

Byte #	1	2	3	4	5	6	7	8
DESC	STX	Length	Address	Msg Error	Error Code	ETX	CRC	
Decimal	2	8	1-99	0-255	0-32	3	0-65535	
Hex	02	08	01-63	00-FF	00-20	03	0000-FFFF	

Message Length = 8 bytes

FUNCTION (06) DATA READ PLC PROGRAM

Table 49   Host Transmission

Byte #	1	2	3	4	5	6	7	8
DESC	STX	Length	Address	Function	PLC Type	ETX	CRC	
Decimal	2	8	1-99	6	0-1	3	0-65535	
Hex	02	08	01-63	06	00-01	03	0000-FFFF	

PLC Program Type:

00 = Default Program

01 = Current User Program

Message Length = 8 bytes

Table 50   CX-1010 Response

Byte #	1	2	3	4	5-132	133	134	135
DESC	STX	Length	Address	Msg Error	PLC Program	ETX	CRC	
Decimal	2	9-135	1-99	0-255	0-255	3	0-65535	
Hex	02	09-87	01-63	00-FF	00-FF	03	0000-FFFF	

PLC Program Field **-** (2 to 128 Bytes)
This field will contain the PLC Program Requested, which may be any where from 2 to 128 bytes of data. The format for this data will be in pairs of Commands & Operands:

PLC Command **-** 1 byte

PLC Operand **-** 1 byte

Refer to *Appendices: Appendix K* for the PLC Program Commands and *Appendices: Appendix L* for the PLC Program Operands.

Message Length = 9 to 135 bytes

FUNCTION (07) DATA WRITE PLC PROGRAM

Table 51 Host Transmission

Byte #	1	2	3	4	5-132	133	134	135
DESC	STX	Length	Address	Function	PLC Program	ETX	CRC	
Decimal	2	9-135	0-99	7	0-255	3	0-65535	
Hex	02	09-87	00-63	07	00-FF	03	0000-FFFF	

PLC Program Field - (2 to 128 Bytes)
This field should contain a PLC Program, which may be any where from 2 to 128 bytes of data. The format for this data should be in pairs of Commands & Operands:

PLC Command - 1 byte
PLC Operand - 1 byte

Refer to *Appendices: Appendix K* for the PLC Program Commands and *Appendices: Appendix L* for the PLC Program Operands.

Message Length = 9 to 135 bytes

Table 52 CX-1010 Response

Byte #	1	2	3	4	5	6	7	8
DESC	STX	Length	Address	Msg Error	Error Code	ETX	CRC	
Decimal	2	8	1-99	0-255	0-32	3	0-65535	
Hex	02	08	01-63	00-FF	00-20	03	0000-FFFF	

Message Length = 8 bytes

FUNCTION (08) DATA READ CUSTOM ENGINEERING UNITS

Table 53 Host Transmission

Byte #	1	2	3	4	5	6	7
DESC	STX	Length	Address	Function	ETX	CRC	
Decimal	2	7	1-99	8	3	0-65535	
Hex	02	07	01-63	08	03	0000-FFFF	

Message Length = 7 bytes

Table 54 CX-1010 Response

Byte #	1	2	3	4	5-19	20	21	22
DESC	STX	Length	Address	Msg Error	EU Text	ETX	CRC	
Decimal	2	8-22	1-99	0-255	<below>	3	0-65535	
Hex	02	08-16	01-63	00-FF	<below>	03	0000-FFFF	

EU Text Field - Engineering Units Text String (0 to 15 Printable ASCII characters)

Message Length = 7 to 22 bytes

FUNCTION (09) DATA WRITE CUSTOM ENGINEERING UNITS

Table 55 Host Transmission

Byte #	1	2	3	4	5-19	20	21	22
DESC	STX	Length	Address	Function	EU Text	ETX	CRC	
Decimal	2	8-22	0-99	9	<below>	3	0-65535	
Hex	02	08-16	00-63	09	<below>	03	0000-FFFF	

EU Text Field - Engineering Units Text String (1 to 15 Printable ASCII characters)

Message Length = 8 to 22 bytes

Table 56 CX-1010 Response

Byte #	1	2	3	4	5	6	7	8
DESC	STX	Length	Address	Msg Error	Error Code	ETX	CRC	
Decimal	2	8	1-99	0-255	0-32	3	0-65535	
Hex	02	08	01-63	00-FF	00-20	03	0000-FFFF	

Message Length = 8 bytes

FUNCTION (10) DATA READ CONSTANT TABLE

Table 57 Host Transmission

Byte #	1	2	3	4	5-6	7	8	9
DESC	STX	Length	Address	Function	Parameter #	ETX	CRC	
Decimal	2	9-19	1-99	10	1-999	3	0-65535	
Hex	02	09-13	01-63	0A	0001-03E7	03	0000-FFFF	

Parameter Number Field - Number of parameters x 2 bytes/parameter (6 parameters max. = 12 bytes)

Message Length = 9 to 19 bytes

Table 58 CX-1010 Response

Byte #	1	2	3	4	5-220	221	222	223
DESC	STX	Length	Address	Msg Error	Data Field	ETX	CRC	
Decimal	2	43-223	1-99	0-255	<below>	3	0-65535	
Hex	02	2B-DF	01-63	00-FF	<below>	03	0000-FFFF	

Data Field - Number of parameters x 36 bytes/parameter (6 parameters max. = 216 bytes)

Parameter Number	-WORD (2 bytes) (0000 - 03E7)
Parameter Error Code	-1 byte (00 - 20)
Parameter Title	-16 bytes (String of 16 Printable ASCII characters)
Minimum Value*	-LONG (4 bytes) (80000000 - 7FFFFFFF)
Maximum Value*	-LONG (4 bytes) (80000000 - 7FFFFFFF)
Default Value*	-LONG (4 bytes) (80000000 - 7FFFFFFF)
Resolution for Minimum*	-1 byte (00 - 09)
Maximum Resolution*	-1 byte (00 - 09)
Resolution for Default*	-1 byte (00 - 09)
Parameter Control byte	-1 byte (00 - F4)
Field Length	-1 byte (00 - 09)

* These fields will be filled with zeros for all Monitor Parameter requests.

Message Length = 43 to 223 bytes

FUNCTION (11) PARAMETER TRACE ENABLE/DISABLE

This function is used to setup and control the CX-1010 internal data collection feature: "Data Trace".

CX-1010 internal data collection feature
The CX-1010 control has the capability to record 1 millisecond samples of up to 4 monitor parameters. The total size is 8192 samples (data points). The number of "Traces" (monitor parameters sampled) may be 1 (single trace), 2 (dual trace), or 4 (quad trace). The number of samples collected per trace are listed below:

Number of Samples per Trace

# of Trace Parameters	Description	Samples per Trace Parameter	Total Sample Time
1	Single Trace	8192	8.192 Sec
2	Dual Trace	4096	4.096 Sec
4	Quad Trace	2048	2.048 Sec

Configuration:

For a single trace, set the value for Trace Parameter 1 to the desired monitor parameter number, and set the rest of the Trace Parameters to zero (0).

For a dual trace, set the values for Trace Parameter 1 and 2 to the desired monitor parameter numbers, and set the rest of the Trace Parameters to zero (0).

For a quad trace, set all of the values for Trace Parameters 1 thru 4 to the desired monitor parameter numbers.

Trigger:

The trace sampling begins when a "trigger" is encountered, after the "data trace" has been enabled. The trigger is signaled through the PLC program by the "start trace" bit (167) transition from 0 to 1.

The CX-1010 control has the capability to collect "pre-trigger" data samples. These are samples collected prior to a "trigger". The "pre-trigger time" is variable from 0 seconds to 2.000 seconds, and is setup by the pre-trigger time (Pre-Trig) value and resolution in a "Set Trace Configuration" message (defined later in this section).

Actions taken by the CX-1010 control in response to this function (11) are controlled by a "message control byte" defined below.

Control Byte Definitions:

Bit 7 = Not Used (always 0)
Bit 6 = Not Used (always 0)
Bit 5 = Not Used (always 0)
Bit 4 = Not Used (always 0)
Bit 3 = Not Used (always 0)
Bit 2 = (1) Set Trace configuration (Pre-Trigger setting, and all Trace Parameter numbers)
Bit 1 = (1) Read Data Trace configuration (Pre-Trigger setting, and all Trace Parameter numbers)
Bit 0 = (1) Enable the Data Trace collection and wait for a trigger point (0) Disable the Trace collection "stop"

Message Control byte definition description:

Value	CX-1010 Control actions	CX-1010 Response
00	Disable Trace, stop collecting data	Error code
01	Enable Trace, wait for trigger	Error code
02	Read Trace Configuration, ignore bit 0	Status Byte, Trace Configuration
03	Read Trace Configuration, ignore bit 0	Status Byte, Trace Configuration
04	Set Trace Config, Disable Trace, stop	Configuration Error Codes
05	Set Trace Config, Reset Trace, wait for trigger	Configuration Error Codes
06	Set & Read Trace Config & Disable Trace, stop	Error Codes & Trace Configuration
07	Set & Read Trace Config & Reset, wait for trigger	Error Codes & Trace Configuration

Trace Status Byte Definitions:

Bit 7 = Not Used (always 0)
Bit 6 = Not Used (always 0)
Bit 5 = Not Used (always 0)
Bit 4 = Not Used (always 0)
Bit 3 = (1) Trace complete (0) Trace not complete
Bit 2 = (1) Trace active, trigger encountered, collecting data (0) No Trigger encountered
Bit 1 = (1) Trigger enabled, collecting data, waiting for trigger (0) Trigger disabled
Bit 0 = (1) Trace enabled (0) Trace disabled

Trace Status Byte values:

00 = Trace disabled
01 = Trace enabled
03 = Trace enabled, collecting pre-trigger data, waiting for trigger
05 = Trace enabled, trigger encountered, collecting data
08 = Trace complete, data collected

Set Trace Configuration, Read Trace Configuration, and enable or disable the internal trace data capture
Message Control byte value: 6 or 7

Table 59 Host Transmission

Byte #	1	2	3	4	5	6 - 16	17	18	19
DESC	STX	Length	Address	Function	Control	Data Field	EXT	CRC	
Decimal	2	19	1-99	11	6 or 7	<below>	3	0 - 65535	
Hex	02	13	01 - 63	0B	06 or 07	<below>	03	0000 - FFFF	

Data Field per Table 59

Byte #	6	7	8	9	10	11	12	13	14	15	16
DESC	Trace Parm 1		Trace Parm 2		Trace Parm 3		Trace Parm 4		Pre-Trigger		Resolution
Decimal	0 - 90		0 - 90		0 - 90		0 - 90		0.000 - 2.000		0 - 3
Hex	0000 - 005A		0000 - 005A		0000 - 005A		0000 - 005A		0000 - 07D0		00 - 03

Message length = 19 bytes
Result: Trace parameters 1 to 4 and the pre-trigger time value are all set, and the Trace Data collection is enabled or disabled. The values for the Trace Parameters are returned along with the Pre-Trigger setting.

Table 60 CX-1010 Response

Byte #	1	2	3	4	5 - 20	21	22	23
DESC	STX	Length	Address	Msg Error	Data Field	ETX	CRC	
Decimal	2	23	1 - 99	0 - 255	<below>	3	0 - 65535	
Hex	02	17	01-63	00 - FF	<below>	03	0000 - FFFF	

Data Field per Table 60

Byte #	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DESC	Error	Trace Parm 1		Error	Trace Parm 2		Error	Trace Parm 3		Error	Trace Parm 4		Error	Pre-Trigger		Res
Decimal	0-32	0-90		0-32	0-90		0-32	0-90		0-32	0-90		0-32	0.000-2.000		0-3
Hex	00-20	0000-005A		00-20	0000-005A		00-20	0000-005A		00-20	0000-005A		00-20	0000-07D0		00-03

Message length = 23 bytes

Response Data Field Definitions:

Byte #	Type	Description
5	byte	Error code result from Setting Trace Parameter 1
6-7	UINT	Trace Parameter 1 value
8	byte	Error code result from Setting Trace Parameter 2
9-10	UINT	Trace Parameter 2 value
11	byte	Error code result from Setting Trace Parameter 3
12-13	UINT	Trace Parameter 3 value
14	byte	Error code result from Setting Trace Parameter 4
15-16	UINT	Trace Parameter 4 value
17	byte	Error code result from Setting Pre-Trigger Time
18-19	UINT	Pre-Trigger Time value setting (seconds)
20	byte	Pre-Trigger Time value resolution byte

Set Trace Configuration and enable or disable the internal trace data capture.
Message Control byte value: 4 or 5

Table 61 Host Transmission

Byte #	1	2	3	4	5	6 - 16	17	18	19
DESC	STX	Length	Address	Function	Control	Data Field	EXT	CRC	
Decimal	2	19	1 - 99	11	4 or 5	<below>	3	0 - 65535	
Hex	02	13	01 - 63	0B	04 or 05	<below>	03	0000 - FFFF	

Data Field per Table 61

Byte #	6	7	8	9	10	11	12	13	14	15	16
DESC	Trace Parm 1		Trace Parm 2		Trace Parm 3		Trace Parm 4		Pre-Trigger		Resolution
Decimal	0 - 90		0 - 90		0 - 90		0 - 90		0.000 - 2.000		0 - 3
Hex	0000 - 005A		0000 - 005A		0000 - 005A		0000 - 005A		0000 - 07D0		00 - 03

Message length = 19

Result: Trace parameters 1 to 4 and the pre-trigger time value are all set, and the Trace Data collection is enabled or disabled.

Table 62 CX-1010 Response

Byte #	1	2	3	4	5 - 9	10	11	12
DESC	STX	Length	Address	Msg Error	Data Field	ETX	CRC	
Decimal	2	12	1 - 99	0 - 255	<below>	3	0 - 65535	
Hex	02	0C	01-63	00 - FF	<below>	03	0000 - FFFF	

Data Field per Table 62

Byte #	5	6	7	8	9
DESC	TrcParm 1 Error	TrcParm 2 Error	TrcParm 3 Error	TrcParm 4 Error	Pre-Trigger Error
Decimal	0 - 32	0 - 32	0 - 32	0 - 32	0 - 32
Hex	00 - 20	00 - 20	00 - 20	00 - 20	00 - 20

Message length = 12 bytes

Read Trace Configuration
Message Control byte value: 2 or 3

Table 63 Host Transmission

Byte #	1	2	3	4	5	6	7	8
DESC	STX	Length	Address	Function	Control	EXT	CRC	
Decimal	2	8	1 - 99	11	2 or 3	3	0 - 65535	
Hex	02	08	01 - 63	0B	02 or 03	03	0000 - FFFF	

Message length = 8 bytes

Result: The Data Trace is neither enabled nor disabled. The Trace configuration is simply returned in the response along with the Trace Status byte.

Table 64 CX-1010 Response

Byte #	1	2	3	4	5 - 16	17	18	19
DESC	STX	Length	Address	Msg Error	Data Field	ETX	CRC	
Decimal	2	19	1 - 99	0 - 255	<below>	3	0 - 65535	
Hex	02	13	01-63	00 - FF	<below>	03	0000 - FFFF	

Data Field per Table 64

Byte #		6	7	8	9	10	11	12	13	14	15	16
DESC	Status	Trace Parm 1		Trace Parm 2		Trace Parm 3		Trace Parm 4		Pre-Trigger		Res
Decimal	0-8	0 - 90		0 - 90		0 - 90		0 - 90		0 - 2.000		0 - 3
Hex	00-08	0000 - 005A		0000 - 005A		0000 - 005A		0000 - 005A		0000 - 07D0		00 - 03

Message length = 19 bytes

Table 65 Host Transmission

Byte #	1	2	3	4	5	6	7	8
DESC	STX	Length	Address	Function	Data	ETX	CRC	
Decimal	2	8	1-99	11	0-1	3	0-65535	
Hex	02	08	01-63	0B	00-01	03	0000-FFFF	

Data Field:

00 = Disable Data Trace Collection

01 = Enable Data Trace Collection and reset data pointers to the beginning, start collecting new data and wait for a trigger point.

Message Length = 8 bytes

Table 66 CX-1010 Response

Byte #	1	2	3	4	5	6	7	8
DESC	STX	Length	Address	Msg Error	Error Code	ETX	CRC	
Decimal	2	8	1-99	0-255	0-32	3	0-65535	
Hex	02	08	01-63	00-FF	00-20	03	0000-FFFF	

An Error Code of “00” indicates that the action was taken and was completed. Refer to page 7-53 for other error code responses.

Message Length = 8 bytes

FUNCTION (12) DATA READ PARAMETER TRACE

Use this function to read consecutive trace data from the control, re-read the last data set, or reset and re-read the trace data from the beginning again.

Table 67 Host Transmission

Byte #	1	2	3	4	5	6	7	8
DESC	STX	Length	Address	Function	Control	ETX	CRC	
Decimal	2	8	1-99	12	0-2	3	0-65535	
Hex	02	08	01-63	0C	00-02	03	0000-FFFF	

Control Byte (5) definition:

00 = Reset and re-read from beginning
01 = Continue reading from end of the last data point that was read
02 = Re-read the prior data segment

Message Length = 8 bytes

Table 68 CX-1010 Response

Byte #	1	2	3	4	5-245	246	247	248
DESC	STX	Length	Address	Msg Error	Data Field	ETX	CRC	
Decimal	2	12-248	1-99	0-255	<below>	3	0-65535	
Hex	02	0C	01-63	00-FF	<below>	03	0000-FFFF	

Data Field per Table 68
Length = 1 + [4 x Number of data points]

Byte #	5	6	7	8	9
DESC	Status/Error Code	Trace Data			
Decimal	0-32	-2147483648-2147483647			
Hex	00-20	80000000-7FFFFFFF			

Trace Read Status/Error Code - 1 byte/response
Trace Data - LONG (4 bytes/data point*)
*Maximum of 60 Data Points/Transmission (1 + [4 x 60] = 241 bytes)

Message Length = 12 to 248 bytes

FUNCTION (13) READ PARAMETER TRACE DATA/RE-READ PREVIOUS

Use this function to read the trace status byte.
Status Byte Definitions:

Bit 7	=	Not Defined (always 0)
Bit 6	=	Not Defined (always 0)
Bit 5	=	Not Defined (always 0)
Bit 4	=	Not Defined (always 0)
Bit 3	=	(1) Trace Complete (0) Not Complete
Bit 2	=	(1) Trace Active (trigger encountered, collecting data) (0) Not Active
Bit 1	=	(1) Trace Enabled (waiting for trigger to occur) (0) Disabled
Bit 0	=	(1) Trace Enabled (0) Disabled

Table 69 Host Transmission

Byte #	1	2	3	4	5	6	7
DESC	STX	Length	Address	Function	ETX	CRC	
Decimal	2	8	1-99	13	3	0-65535	
Hex	02	08	01-63	0D	03	0000-FFFF	

Message Length = 7 bytes

Table 70 CX-1010 Response

Byte #	1	2	3	4	5	6	7	8
DESC	STX	Length	Address	Msg Error	Status	ETX	CRC	
Decimal	2	8	1-99	0-255	0-8	3	0-65535	
Hex	02	08	01-63	00-FF	00-08	03	0000-FFFF	

Status Bytes values:

Bits:	76543210	Decimal:	Description
	00000000	= 0	Trace Disabled, no data collected.
	00000001	= 1	Trace Enabled.
	00000011	= 3	Trace Enabled, waiting for trigger.
	00000101	= 5	Trigger Encountered, collecting data.
	00001000	= 8	Trigger Complete, collecting data.

Message Length = 8 bytes

Message Error Response Field

This field consists of one byte. Each bit in the byte may be set to 1 indicating a specific error has occurred.

Message Error Bits Definitions:

Bit 7 = (1) CRC Failure
Bit 6 = (1) Buffer Overflow
Bit 5 = (1) ETX Not Received/Data Field Error
Bit 4 = (1) Invalid Function/Data Error
Bit 3 = (1) Over-Run Error
Bit 2 = (1) Noise Error
Bit 1 = (1) Framing Error
Bit 0 = (1) Parity Error

Example:

"86" = the number 10000110 (binary) would indicate a CRC failure with Noise errors and Framing errors occurred when the transmission message was received.

Other Errors Returned From Control Through The Serial Communications

0 (00) = OK
1 (01) = General Data Error
2 (02) = Res Byte Error
3 (03) = Invalid Parameter
4 (04) = String too Long
5 (05) = Out of Range
6 (06) = Not Allowed
7 (07) = Lockout During Run
8 (08) = Not Ready
9 (09) = Block Parameter Error
10 (0A) = Block Value Error
11 (0B) = Block Parameter Memory Limit
12 (0C) = MIN Error
13 (0D) = MAX Error
14 (0E) = Invalid Command (PLC/Control Command Send)
15 (0F) = Invalid Operand (PLC)
16 (10) = <END> Statement Missing (PLC)
17 (11) = PLC Program Memory Limit
18 (12) = Defaults Loaded
19 (13) = Backup Loaded
20 (14) = Backup Saved
21 (15) = Checksum Error
22 (16) = Faults Cleared
23 (17) = Test Passed
24 (18) = Test Failed
25 (19) = No Compare Parameter
26 (1A) = Divide by Zero
27 (1B) = Long Word Overflow
28 (1C) = Parameter Transfer Limit Overflow
29 (1D) = Memory Read request too long
30 (1E) = Data Field Length Error
31 (1F) = Message Function Request/Parameter NOT Processed
32 (20) = Invalid Function Request

Control Byte Definitions:

Bit 7	=	(1) Negative Numbers Allowed (0) Positive Numbers only
Bit 6	=	(1) Leading Zero's (0) No Leading Zero's
Bit 5	=	(1) Restricted Parameter (0) Unrestricted Parameter
Bit 4	=	(1) Parameter Defined (0) Undefined Parameter
Bit 3	=	Not Used (always 0)
Bit 2	=	(1) Floating Decimal Point (0) Fixed Decimal Point
Bit 1	=	(1) Binary Number (0) Decimal Number
Bit 0	=	(1) Integer (0) Non-Integer

Note: Applies to Parameters & Parameter Values

Example of CRC-16 Calculation (in C):

```
#define CRC16  0x8005                      /* CRC-16 Generating Poly */

/* function returns the accumulated CRC value calculated for the Buffer */
/* this value can be transmitted or compared to a CRC value received */
/* “*data” is a pointer to the Buffer of data bytes to calculate the CRC for */
/* “len” is the number of data bytes to use for the calculation */

unsigned int do_crc(unsigned char *data, int len)
{
   int i, j;                               /* byte & bit counters */
   unsigned int accum = 0xFFFF;            /* CRC value accumulator */
   unsigned int dat;                       /* holds data byte */

   for(i = 0; i < len; ++i){               /* for each byte of data */
         dat = *data++;                    /* get data byte & goto next */
         accum ^= (dat << 8);              /* put data into high byte */
         j = 0;                            /* clear bit counter */
         while(j++ < 8){                   /* for each bit */
              if(accum & 0x8000)           /* if MSB set */
                   accum ^= CRC16;         /* Modulus-2 math w/CRC 16 */
              accum <<= 1;                 /* shift left 1 bit */
         }                                 /* end for each bit */
   }                                       /* end for each byte */

return(accum);                             /* return the CRC value */
}                                          /* End do_crc function */
```

Troubleshooting/Diagnostics

DEVICE TESTS

The Device Tests screens allow you to test the memory, keypad and display of the CX-1010. You can also test the analog and digital I/O as well as the serial communications and calibrate the Auxiliary Analog. Processor fault conditions and counters can be monitored. The software revision level, the model and the release date is also available. If any test fails, contact Contrex Technical Support at (763) 424-7800 or (800) 342-4411.

The CX-1010 Device Tests screens are:

- Hardware Tests
- STD Signal Tests
- Digital I/O Tests
- Aux Analog Tests
- Serial Communications Test
- Device Status
- Device Model & Revision

HARDWARE TESTS

Memory

Use the Hardware Tests / Memory (page 1) to test the CX-1010's memory. Enter the number in Memory Test (CP-390) that corresponds to the section of memory that you want to test (see list below), then press the Enter key. To test all three sections, enter a “4”, then press the Enter key.

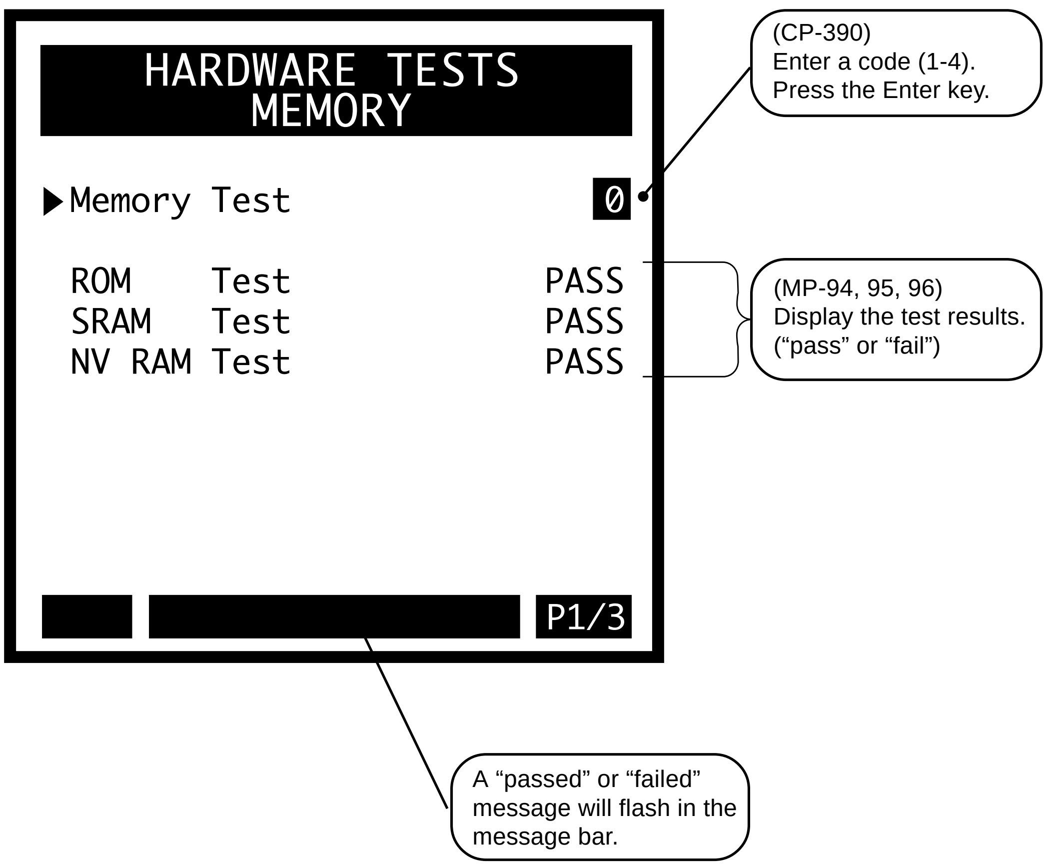
4 = All Memory Test
3 = NVRAM Test
2 = SRAM Test
1 = ROM Test
0 = Test Done

You can also refer to page 1 of the Memory Test's (CP-390) Help screen for the test list and the corresponding numeric codes. You can enter a test from the Help screen by scrolling the highlight bar to the test and pressing the Enter key.

When the test(s) are complete, the ROM Test (MP-94), SCRAM Test (MP-95) and NVRAM Test (MP-96) will update and indicate whether the test passed or failed. A message will flash in the message bar, as well. At the completion of the test, the value of Memory Test (CP-390) will automatically return to “0” (test done).

If any test fails, contact Contrex Technical Support at (763) 424-7800 or (800) 342-4411.

The Hardware Tests screens are accessed through —> Main Menu / Device Tests



Keypad

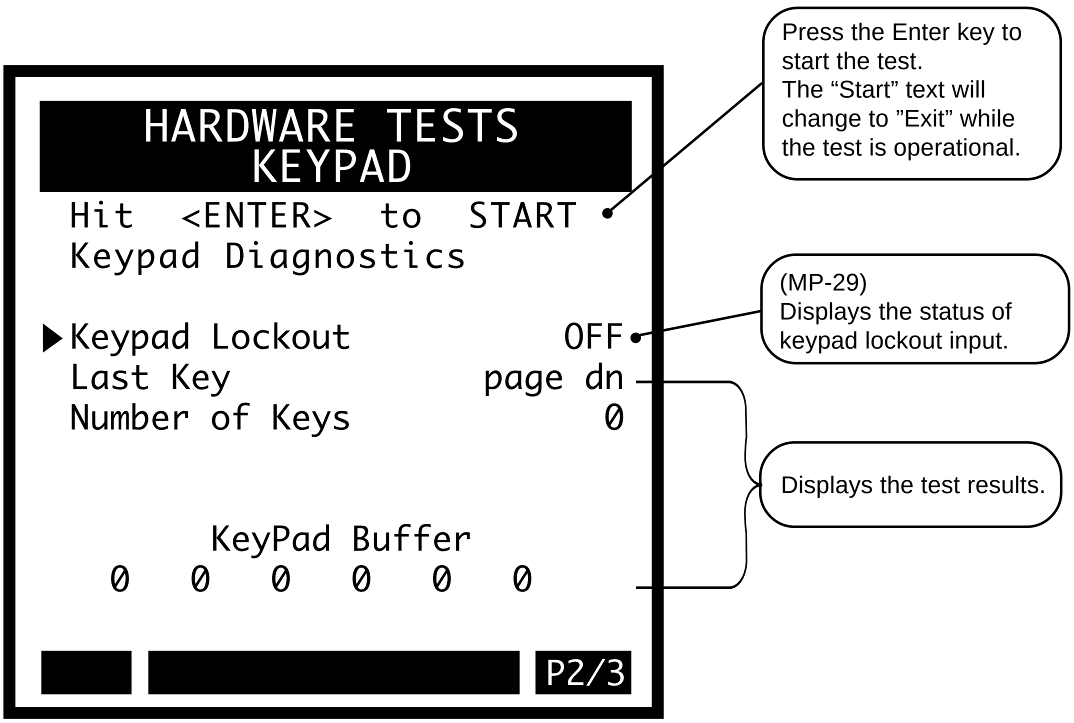
Use the Hardware Tests / Keypad (page 2) to test the keypad. Press the Enter key to start the test. The "START" text on the first line of screen will change to "EXIT" and you can begin testing the keys (with the exception of the Enter key). Press each key individually. Each of the keys should register a number in the Keypad Buffer line that corresponds with the numbers listed in Figure 8-1. A key has failed the test if its number does not correspond with the numbers that are listed in Figure 8-1. Press the Enter key to exit the test.

KeyPad Lockout (MP-29)

Keypad Lockout (MP-29) displays the Keypad Lockout status. The Keypad Lockout is active when "On" is displayed. When Keypad Lockout is active, Control Parameter values can not be changed, with the exception of the Control Parameters that are exempted by CP's 380-389. The Keypad Lockout is not active when "OFF" is displayed. When the Keypad Lockout is not active, any Control Parameter can be changed.

Figure 8-1 The Hardware Tests Corresponding Keypad Numbers

The Device Test / Hardware Tests / Keypad screen (page 2).



Video

Use the Hardware Tests / Video (page 3) to test the screen display. Either enter a “1 ”in Video Test (CP-292) and press the Enter key to start the test. You can also use the increment scroll-up key, to start the test. The Display Diagnostic instructional screen will appear. Use the Page Up or Page Down keys to step through each test.

Each screen uses a different display combination to test the display hardware. The Contrast Test will automatically scroll through a range of contrast. Refrain from pressing a key during this test and allow the Contrast Test to complete its cycle. To exit the tests, and return to the Hardware Tests Display screen (page 3), press the Menu key.

Video Test (CP-392)

To start the Video Test, enter “1” in Video Test (CP-392). Then use the Page Up/Down keys to page through tests. Press the Menu key to exit the tests and return to the previous screen.

Video Mode (CP-374)

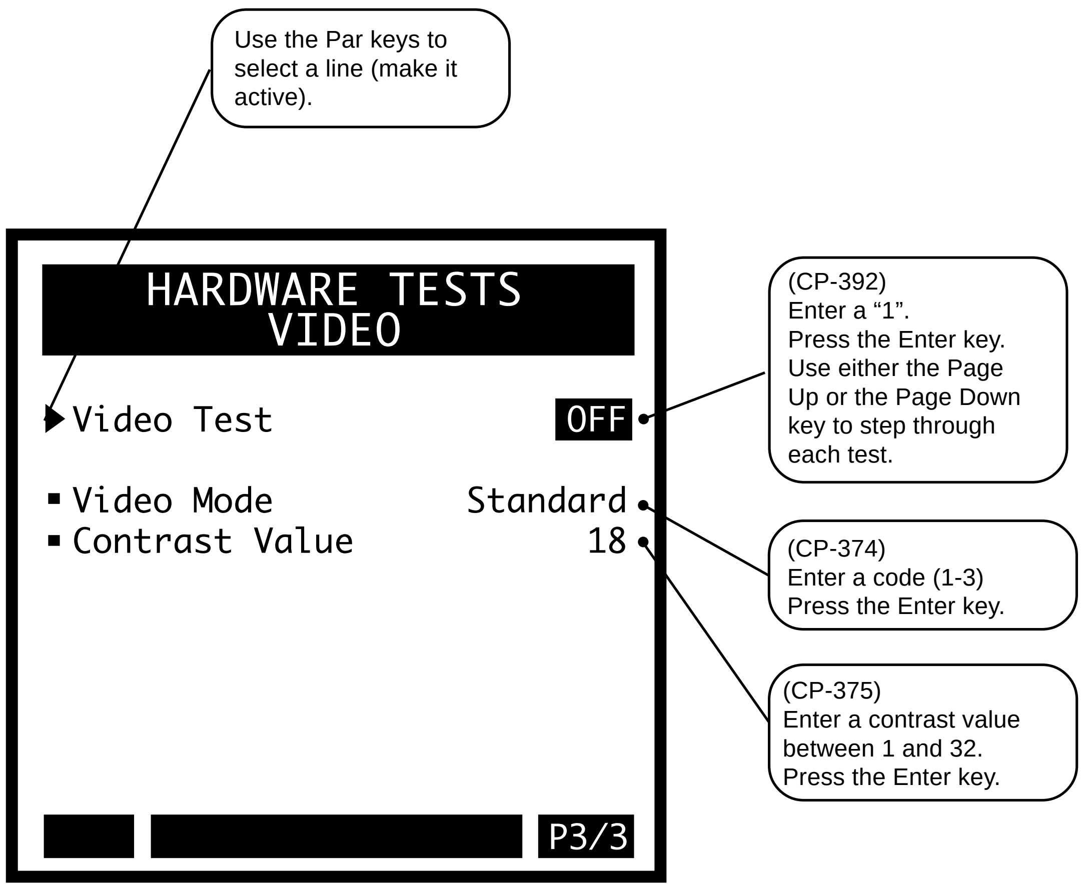
Video Mode (CP-374) determines how the LCD Screen Display will be displayed, per the list below:

3 = Standard Video w/Border
2 = Reverse Video
1 = Standard Video (default)

Contrast Value (CP-375)

Contrast Value (CP-375) determines the contrast for the LCD Screen Display. The higher values darken the pixels and lower values lighten the pixels.

The Device Test / Hardware Tests / Video screen (page 3).



—NOTES—

STD SIGNAL TESTS

The STD Signal Tests screens allow you to test the control output and the frequency inputs. The STD Signals Tests / Frequency Inputs screen (page 1) displays the Monitor Parameters that are associated with Frequency Input 1 (FI1) and the Frequency Input 2 (FI2). Input a known frequency and monitor the results here.

Use the STD Signals Tests / Control Output screen (page 2) to test the CO_SIG. The CO_SIG is the CX-1010 output signal that is input to the drive. Temporarily disconnect the signal from the drive and use a scope or voltmeter to verify the CO_SIG operation.

NOTE: The CX-1010 must not be in “Run” or “Jog” when you begin the diagnostics. To start the diagnostics, enter a “1” in Diagnostics En (CP-350) and press the Enter key.

Select the type of output test in Diag DAC Test (CP-353). The output test types are:

4 = High Frequency Oscillation Output (a high-frequency ramp)
3 = Continuous Ramp (a continuous ramp to plus and minus voltage -if bipolar mode)
2 = Ramp to DAC & Hold (a ramp to a constant voltage)
1 = Immediate Output (an immediate step to a constant voltage)
0 = Disabled (default)

In ramp to a constant voltage (2) and continuous ramp (3), you can set the ramp time. The high-frequency ramp exercises each bit individually (i.e. each samples’ output is two times the previous sample as the signal increases). The high-frequency ramp will reach plus and minus 10 or 15 volts, depending on the value in Diag DAC Volts (CP-354).

Diag DAC Volts (CP-354) determines the voltage that is output for the “Ramp to DAC & Hold” test (1) and the “Immediate Output” (2) test that are found in the Diag DAC Test (CP-353). This is also the peak voltage that the “Continuous Ramp” test (3) will reach. Diag DAC Bits (CP-355) also determines the voltage, but in terms of the DAC bit value. Diag DAC Test (CP-353) is limited to ±CO MAX Volts.

Diag Rmp Tm (CP-356) determines the slope of the ramp for the ramp-to-voltage and the continuous ramp. This is the time in seconds that it takes to increase the voltage from 0 volts to the Diag DAC Volts (CP-354). In order to get every possible bit combination, the continuous ramp must ramp at a time of 8.191 seconds or more and the Diag DAC Volts (CP-354) must be equal to the CO Max Volts (CP-181). In this scenario, CO Max Volts (CP-181) must be 10 to 15 volts. The ramp should appear without discontinuity, even at low voltage.

The purpose of the CO_SIG Offset is to cancel any electrical offsets that may be present on the CO_SIG when the CX-1010 is calling for “0” volts on the output. Set Diagnostics En (CP-350) to “1” (enabled) and Diag DAC Test (CP-353) to “1” (DCout), then set the Diag DAC Volts (CP-354) to “0” and measure the voltage on pin J3-1 relative to J3-2. Enter the negative of the voltage reading in CO Offset (CP-366) and then verify that the voltage on the CO_SIG reads at or close to “0” volts.

Frequency Inputs

The STD Signals Tests / Frequency Inputs screen (page 1) displays the Monitor Parameters that are associated with Frequency Input 1 (FI1) and the Frequency Input 2 (FI2). Input a known frequency and monitor the results here.

FI1 Hz (MP-01)

Frequency Input 1 Hertz (MP-01) displays the current frequency of the Frequency Input 1, in Hertz.

FI1 RPM (MP-02)

Frequency Input 1 RPM (MP-02) displays the current speed of the Frequency Input 1 encoder in RPM relative to PPR FI1 (Cp-161).

FI1 Cnts (MP-04)

Frequency Input 1 Counts (MP-04) displays the present value of the Frequency Input 1 Position (MP-05) in encoder edges (counts) if Count Mode FI1 (CP-160) is set to “Quad x4”. Frequency Input 1 Counts (MP-04) displays the present value of the Frequency Input 1 Position in pulses if Count Mode FI1 (CP-160) is set to “Incremental”.

FI2 Hz (MP-06)

Frequency Input 2 Hz (MP-06) displays the present frequency of the Frequency Input 2, in Hertz.

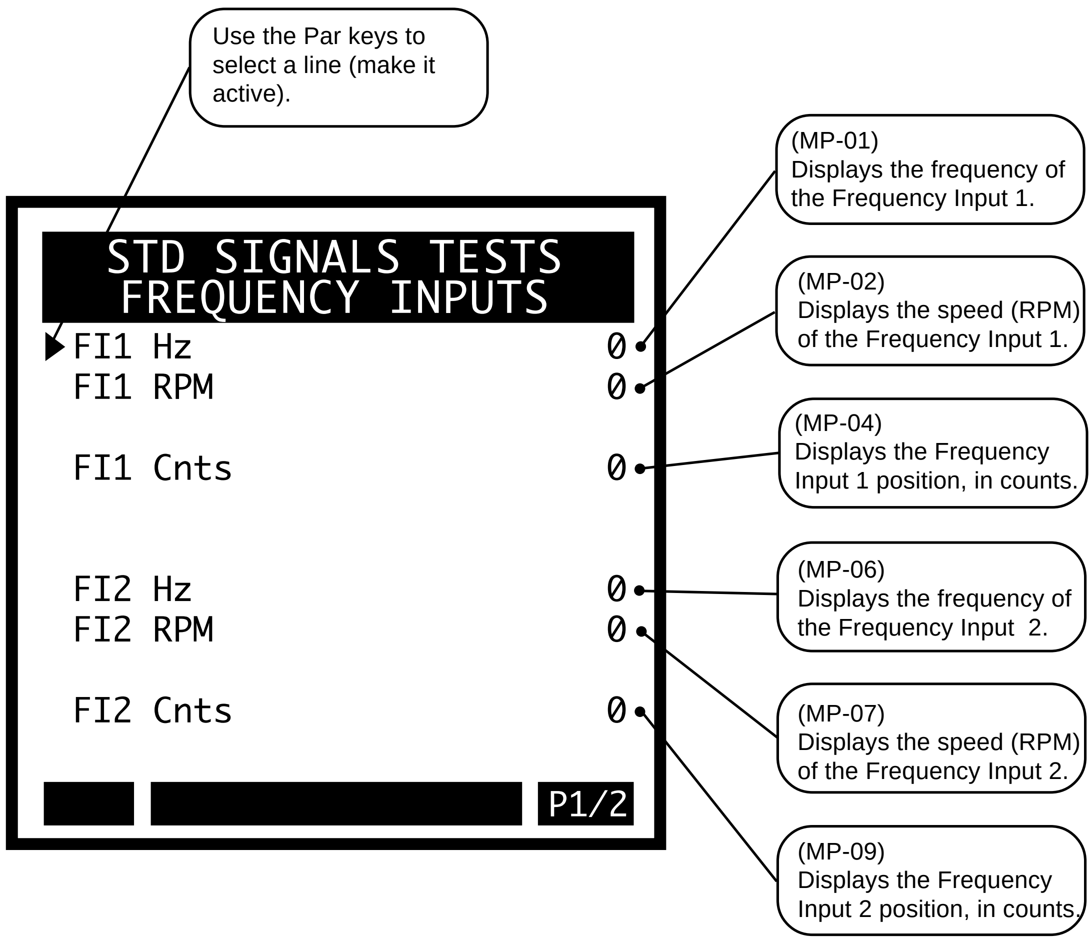
FI2 RPM (MP-07)

Frequency Input 2 RPM (MP-07) displays the current speed of the Frequency Input 2 encoder in RPM relative to PPR FI2 (CP-166).

FI2 Cnts (MP-09)

Frequency Input 2 Counts (MP-09) displays the present value of the Frequency Input 2 Position (CP-10) in encoder edges (counts) if Count Mode FI2 (CP-165) is set to “Quad x4”. Frequency 2 Counts displays the present value of the Frequency Input 2 Position (CP-10) in pulses if Count Mode FI2 (CP-165) is set to is set to “Incremental”.

The STD Signal Tests screens are accessed through
—> Main Menu / Device Tests



Control Output

The STD Signals Tests / Control Output screen (page 2) displays the Control and Monitor Parameters that are associated with the CO_SIG. Use this screen to perform a variety of tests that verify the operation of the CO-SIG.

Diagnostics En (CP-350)

When Diagnostics Enable (CP-350) is set to "1" (enabled), the digital inputs will not recognize their normal function and the digital outputs can be controlled by Diag DO (CP-352). The analog output can also be tested. When you enter diagnostics, Diag DO (CP-352) is forced equal to the current Dig Out 7 - 0 (MP-28) so that there is no unexpected change in the outputs. Change the outputs through Diag DO (CP-352) after performing the diagnostics.

1 = En 0 = OFF (default)

Warning: The actuator may energize if you change Diag DO (CP-352).

Diag DAC Test (CP-353)

Diagnostic DAC Test (CP-353) selects and enables the type of output control that is used for the diagnostic CO_SIG DAC Test.

4 = High Frequency Oscillation Output
3 = Continuous Ramp
2 = Ramp to DAC & Hold
1 = Immediate Output
0 = Disabled (default)

Diag DAC Volts (CP-354)

Diagnostic DAC Volts (CP-354) is the maximum voltage output (either positive or negative) at the CO_SIG DAC during a non zero Diagnostic DAC Test . The voltage corresponds to Diag DAC Bits (CP-355).

Diag DAC Bits (CP-355)

Diagnostic DAC Bits (CP-355) is the maximum value in bits written (either positive or negative) to the CO_SIG DAC during a non zero Diagnostic DAC Test (CP-353) and when Diagnostics En (CP-350) is set to "1" (On or enabled). The value corresponds to Diag DAC Volts (CP-354).

Diag Rmp Tm (CP-356)

Diagnostic Ramp Time (CP-356) is the time, in seconds, from 0 volts to either positive or negative Diag DAC Volts (CP-354) during a Diagnostic DAC Test with a Ramp.

CO Offset (CP-366)

Control Output Offset (CP-366) is the value (in volts) that is added to the CO_SIG Analog Output (J3, pin 1) signal. Control Output Offset (CP-366) can eliminate any voltage offset present on the DAC output circuitry or it can offset a motor-creep problem (i.e., a digital balance pot). CO Offset (CP-366) is set at the factory, but can also be verified with a voltmeter for a "0" volt output. If you change the value, make sure that it gets into the parameter backup.

CO Volts (MP-21)

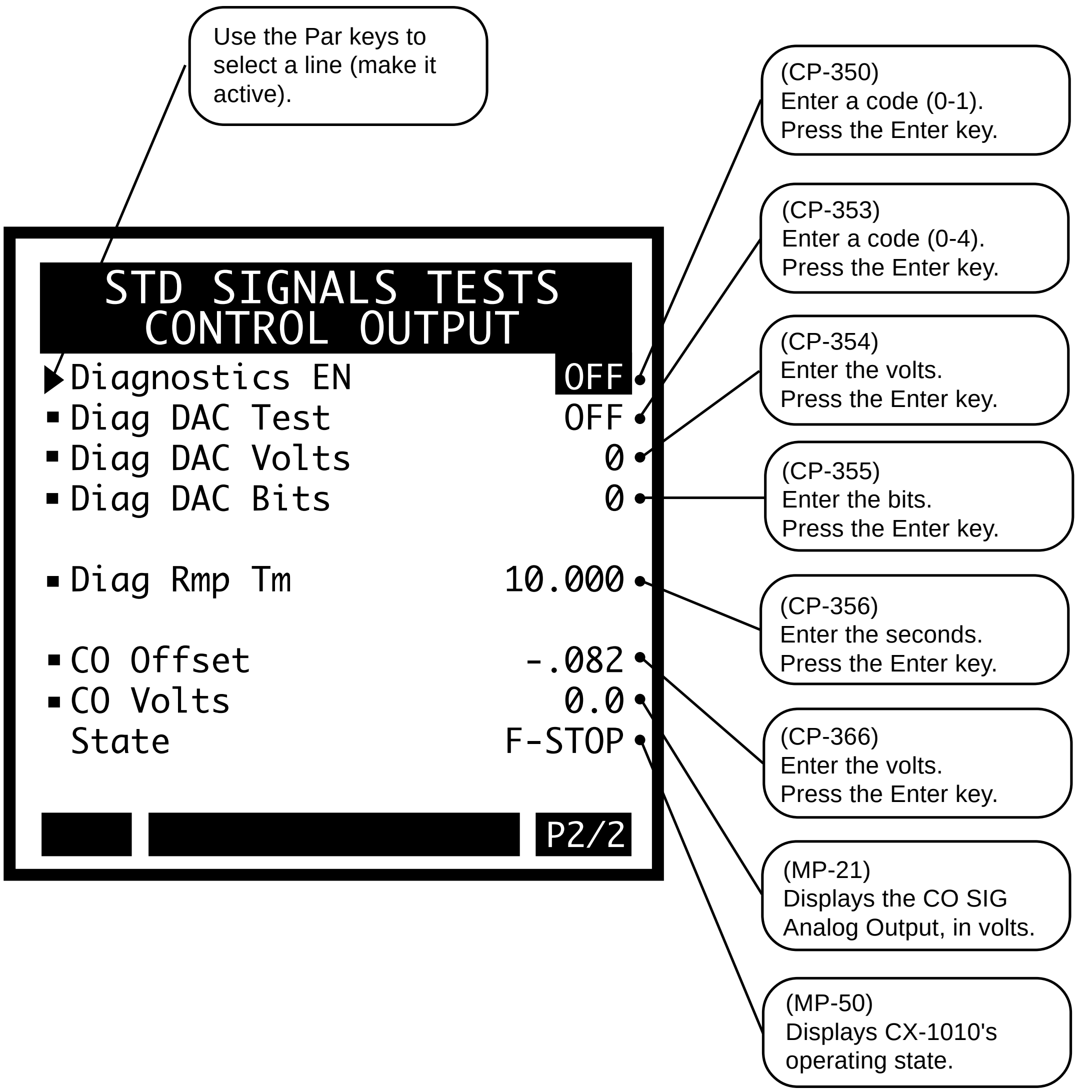
Control Output Volts (MP-21) displays he present value, in volts, of the CO_SIG Analog Output signal.

State (MP-50)

State (MP-50) displays the present operating state of the CX-1010 (see list below). Only one operating state may be active at a time. To access either the "Run" or the "Jog" operating state, the F-Stop, R-Stop and H-Stop inputs must be closed.

7 = Diagnostics	6 = Not used - reserved	5 = JOG (Rvs)
4 = JOG (Fwd)	3 = RUN	2 = H-Stop
1 = R-Stop	0 = F-Stop	

The STD Signal Tests / Control Output screen (page 2).



DIGITAL I/O TEST

Use the Digital I/O Test to activate the digital outputs and monitor the digital inputs without the inputs being in actual operation. To enter the diagnostics state, enter a "1" in Diagnostics En (CP-350) or use the increment scroll-up key. ***Danger: The CX-1010 should not be in "Run" or "Jog" when you begin the diagnostics.*** The Diag DO (CP-352) will automatically set to the current state of the Digital Outputs. This will prevent any unexpected change on the outputs. Determine the binary value for Diag DO (CP-352) that places a "1" in the bits corresponding to the digital outputs that you want active and a "0" in the bits corresponding to the outputs that you want inactive. ***Danger: Changing the digital outputs may cause movement in your system.*** Enter this value into Diag DO (CP-352). Verify that the outputs are active (low). The Digital Inputs can be monitored in DI 7..0 (MP-26) and DI 15..8 (MP-27). Short the corresponding pin common of the inputs to make the output active. Monitor these MP's to verify that the active pins are recognized (a "1" appears in the corresponding bit).

Diagnostics En (CP-350)

When Diagnostics Enable (CP-350) is set to "1" (On or enabled), the digital inputs will not recognize their normal function and the digital outputs can be controlled by Diag DO (CP-352). In addition, the CO_SIG analog output can be tested. When you enter diagnostics, Diag DO (CP-352) is forced equal to the current DO 7..0 (MP-28) so that there is no unexpected change in the outputs. Change the outputs through Diag DO (CP-352) while performing the diagnostics.

1 = ON = Enabled 0 = OFF (default)

Warning: The actuator may energize if you change Diag DO (CP-352).

Diag DO (CP-352)

Diagnostic Digital Out (CP-352) controls the digital outputs when Diagnostics En (CP-350) is set to "1" (On or enabled) during diagnostics. It is an 8 Bit Binary number with 1 bit per output. If the bit is a "1", then the corresponding output is pulled "low". When you enter diagnostics, Diag DO (CP-352) is forced equal to the current DO 7 ..0 (MP-28) so that there is no unexpected change in the outputs. Change the outputs through Diag DO (CP-352) while performing the diagnostics.

Warning: The actuator may energize if you change Diag DO (CP-352).

DI 7..0 (MP-26)

Digital Input 7..0 displays the value of the "J6" digital inputs. A '1' in the bit location indicates a "low voltage" condition on the corresponding input (which is consistent with a contact closure to common). Refer to *Appendices: Appendix C* for the DI 7..0 (MP-26) bit map list.

DI 15..8 (MP-27)

Digital Input 15..8 (MP-27) displays the value of the "J7" digital inputs. A '1' in the bit location indicates a "low voltage" condition on the corresponding input (which is consistent with a contact closure to common). These eight inputs can be set up in the PLC Programming screen to generate a One-Shot -Pulse on a high-to-low transition. Refer to *Appendices: Appendix C* for the DI 15..8 (MP-27) bit map list.

DO 7..0 (MP-28)

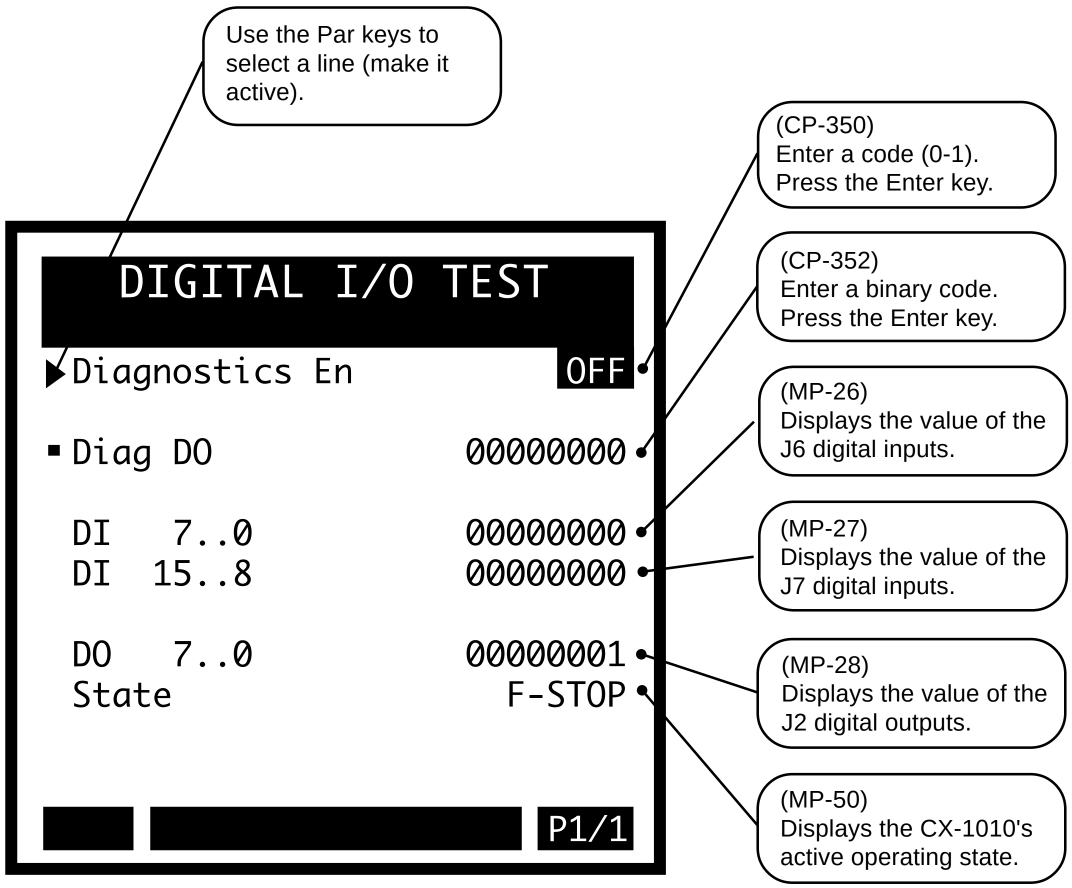
Digital Output 7..0 displays the value of the "J2" digital outputs. A '1' in the bit location indicates an active "low voltage" condition on the corresponding open collector output (which would sink DC current). Refer to *Appendices: Appendix C* for the DO 7..0 (MP-28) bit map list.

State (MP-50)

State (MP-50) displays the present operating state of the CX-1010 (see list below). Only one operating state may be active at a time. To access either the "Run" or the "Jog" operating state, the F-Stop, R-Stop and H-Stop inputs must be closed.

7 = Diagnostics	6 = Not used - reserved	5 = JOG (Rvs)
4 = JOG (Fwd)	3 = RUN	2 = H-Stop
1 = R-Stop	0 = F-Stop	

The Digital I/O Test screen is accessed through
—> Main Menu / Device Tests <—



DANGER

The CX-1010 should not be in “Run” or “Jog” when you begin the diagnostics.

Changing the digital outputs may cause movement in your system.

—NOTES—

AUXILIARY ANALOG TESTS

The Auxiliary Analog tests screens display the input screen (page 1), the output screen (page 2) and the calibration screen (page 3). The Auxiliary Analog Input screen displays the Monitor Parameters that monitor the results of inputing a voltage or current. The Auxiliary Analog Output screen displays the Monitor Parameters that monitor the Auxiliary Analog Output. Use the Aux Analog Calibration screen (page 3) to calibrate the Auxiliary Analog I/O; AI1, AI2 and AO. These boards are calibrated at the factory and are adequate for most applications. However, you may need to re-calibrate if your application demands more accuracy in a specific range or if you need to calibrate directly to EU/Tm with a known signal level on the inputs. The following sections will explain the calibration for Analog Output (voltage), Analog Output (current), Analog Input 1 (voltage), Analog Input 1 (current), Analog Input 2 (voltage), Analog Input 2 (current), and calibration together with scaling.

<u>Analog Calibration / Analog Output (voltage):</u>

1. Connect a voltmeter between pins 10 and 11 with the positive lead on pin 10 (pin 11 is common).

2. Set AO Mode (CP-185) to “Volts” (1).

3. Set Analog Cal Sel (CP-361) to “AO” (3) to select AO for calibration.

4. Set Analog Cal Ref (CP-362) to “A” (1) to select point A.

   NOTE: The calibration data will be overwritten.

5. Set Analog Cal En to “On” (1) to start calibration.

6. Adjust AO Bit Set (CP-364) until the meter reads the voltage that you want set for point A. This is typically your smallest (or negative) voltage point. A -12 volts requires -29500 bits, -10 volts about -24500 bits, 0 volts about 0 bits. For -12 volts, start with -29400 and use the incremental scroll “ ▼” key.

7. Enter the voltage measured by the meter into AnalogRef Val (CP-363).

8. Set Analog Cal Ref (CP-362) to “B” (2) to select point B.

9. Adjust AO Bit Set (CP-364) until the meter reads the voltage you want use for point B. This is typically your largest (or positive) voltage point. A +12 volts requires about 30100 bits, 10 volts about 25100 bits, 0 volts about 0 bits. For 12 volts, start with 30000 and use the incremental scroll “ ▲” key.

10. Enter the exact voltage measured by the meter into AnalogRef Val (CP-363).

11. Set Analog Cal En to “Off” (0) to disable further calibration.

<u>Analog Calibration / Analog Output (current):</u>

1. Connect a current meter in series with a 250 Ohm resistor between pins 9 and 11 with the positive lead on pin 9 (pin 11 is common). Connect the meter in series with the load.

2. Set AO Mode (CP-185) to “Current” (2).

3. Set Analog Cal Sel (CP-361) to “AO” (3) to select AO for calibration.

4. Set Analog Cal Ref (CP-362) to “A” (1) to select point A.

   NOTE: The calibration data will be overwritten.

5. Set Analog Cal En to “On” (1) to start calibration.

6. Adjust AO Bit Set (CP-364) until the meter reads the current you want to set for point A. This is typically your smallest current point. A 4 milliamp setting requires about -14450 bits, 0.5 milliamps about -24000 bits and 1.0 milliamps about -22600. For 4 milliamps, start with -14300 and use the incremental scroll “ ▼” key.

7. Enter the exact current measured by the meter into AnalogRef Val (CP-363).

8. Set Analog Cal Ref (CP-362) to “B” (2) to select point B.

9. Adjust AO Bit Set (CP-364) until the meter reads the voltage you want to set for point B. This is typically your largest current point. A 20 milliamp setting requires about 29300 bits, 10 milliamps about 1940. For 20 milliamps, start with 29200 and use the incremental scroll “ ▲” key.

10. Enter the exact current measured by the meter into AnalogRef Val (CP-363).

11. Set Analog Cal En to “Off” (0) to disable further calibration.

Analog Calibration / Analog Input 1 (voltage):

1. Connect the Analog Output voltage pins to the Analog Input 1 voltage pins - pin 10 to pin 2, pin 11 to pin 4. Connect a voltmeter between pins 2 and 4 with the positive lead on pin 2 (pin 4 is at common).

2. Set AO Mode (CP-185) to "Volts" (1).

3. Set AI1 Mode (CP-170) to "Volts" (1).

4. Set Analog Cal Sel (CP-361) to AI1 (1) to Select AI1 for calibration.

5. Set Analog Cal Ref (CP-362) to "A" (1) to select point A.

   NOTE: The calibration data will be overwritten.

6. Set Analog Cal En to "On" (1) to start calibration.

7. Adjust AO Bit Set (CP-364) until the meter reads the voltage you want set for point A. This is typically your smallest (or negative) voltage point. A -12 volts requires about -29500 bits, -10 volts about -24500 bits, 0 volts about 0 bits. For -12 volts, start with -29400 and use the incremental scroll " ▼" key.

8. Enter the exact voltage measured by the meter into AnalogRef Val (CP-363).

9. Set Analog Cal Ref (CP-362) to "B" (2) to select point B.

10. Adjust AO Bit Set (CP-364) until the meter reads the voltage you want use for point B. This is typically your largest (or positive) voltage point. A +12 volts requires about 30100 bits, 10 volts about 25100 bits, 0 volts about 0 bits. For 12 volts, start with 30000 and use the incremental scroll " ▲" key.

11. Enter the exact voltage measured by the meter into AnalogRef Val (CP-363).

12. Set Analog Cal En to "Off" (0) to disable further calibration.

Analog Calibration / Analog Input 1 (current):

1. Connect a current meter between pin 9 and pin 2 with the positive lead on pin 9. Connect pin 3 to pin 4 and pin 4 to pin 11.

2. Set AO Mode (CP-185) to “Current” (2).

3. Set AI1 Mode (CP-170) to “Current” (2).

4. Set Analog Cal Sel (CP-361) to “AI1” (1) to Select AI1 for calibration.

5. Set Analog Cal Ref (CP-362) to “A” (1) to select point A.

    NOTE: The calibration data will be overwritten.

6. Set Analog Cal En to “On” (1) to start calibration.

7. Adjust AO Bit Set (CP-364) until the meter reads the current you want to set for point A. This is typically your smallest current point. A 4 milliamp setting requires -14450 bits, 0.5 milliamps about -24000 bits and 1.0 milliamps about -22600. For 4 milliamps, start with -14300 and use the incremental scroll “ ▼” key.

8. Enter the exact current measured by the meter into AnalogRef Val (CP-363).

9. Set Analog Cal Ref (CP-362) to “B” (2) to select point B.

10. Adjust AO Bit Set (CP-364) until the meter reads the current you want to set for point B. This is typically your largest current point. A 20 milliamp setting requires 29300 bits, 10 milliamps about 1940. For 20 milliamps, start with 29200 and use the incremental scroll “ ▲” key.

11. Enter the exact current measured by the meter into AnalogRef Val (CP-363).

12. Set Analog Cal En to “Off” (0) to disable further calibration.

Analog Calibration / Analog Input 2 (voltage):

1. Connect the Analog Output voltage pins to the Analog Input 2 voltage pins - pin 10 to pin 5, pin 11 to pin 7 Connect a voltmeter between pins 5 and 7 with the positive lead on pin 5 (pin 7 is at common).

2. Set AO Mode (CP-185) to “Volts” (1).

3. Set AI2 Mode (CP-175) to “Volts” (1).

4. Set Analog Cal Sel (CP-361) to “AI2” (2) to Select AI2 for calibration.

5. Set Analog Cal Ref (CP-362) to “A” (1) to select point A.

   NOTE: The calibration data will be overwritten.

6. Set Analog Cal En to “On” (1) to start calibration.

7. Adjust AO Bit Set (CP-364) until the meter reads the voltage you want set for point A. This is typically your smallest (or negative) voltage point. A -12 volts requires -29500 bits, -10 volts about -24500 bits, 0 volts about 0 bits. For -12 volts, start with -29400 and use the incremental scroll “ ▼” key.

8. Enter the exact voltage measured by the meter into AnalogRef Val (CP-363).

9. Set Analog Cal Ref (CP-362) to “B” (2) to select point B.

10. Adjust AO Bit Set (CP-364) until the meter reads the voltage you want use for point B. This is typically your largest (or positive) voltage point. A +12 volts requires about 30100 bits, 10 volts about 25100 bits, 0 volts about 0 bits. For 12 volts, start with 30000 and use the incremental scroll “ ▲” key.

11. Enter the exact voltage measured by the meter into AnalogRef Val (CP-363).

12. Set Analog Cal En to “Off” (0) to disable further calibration.

Analog Calibration / Analog Input 2 (current):

1. Connect a current meter between pin 9 and pin 5 with the positive lead on pin 9. Connect pin 6 to pin 7 and pin 7 to pin 11.

2. Set AO Mode (CP-185) to “Current” (2).

3. Set AI2 Mode (CP-175) to “Current” (2).

4. Set Analog Cal Sel (CP-361) to “AI2” (2) to Select AI2 for calibration.

5. Set Analog Cal Ref (CP-362) to “A” (1) to select point A.

   NOTE: The calibration data will be overwritten.

6. Set Analog Cal En to “On” (1) to start calibration.

7. Adjust AO Bit Set (CP-364) until the meter reads the current you want to set for point A. This is typically your smallest current point. A 4 milliamp setting requires -14450 bits, 0.5 milliamps about -24000 bits and 1.0 milliamps about -22600. For 4 milliamps, start with -14300 and use the incremental scroll “ ▼” key.

8. Enter the exact current measured by the meter into AnalogRef Val (CP-363).

9. Set Analog Cal Ref (CP-362) to “B” (2) to select point B.

10. Adjust AO Bit Set (CP-364) until the meter reads the current you want to set for point B. This is typically your largest current point. A 20 milliamp setting requires about 29300 bits, 10 milliamps about 1940. For 20 milliamps, start with 29200 and use the incremental scroll “ ▲” key.

11. Enter the exact current measured by the meter into AnalogRef Val (CP-363).

12. Set Analog Cal En to “Off” (0) to disable further calibration.

Calibrating and Scaling Together

In some applications the voltage (or current) to EU/Tm representation may not be known. For example, that a flow meter operates from 0 to 10 gallons per minute may be a known factor, however, the voltage produced by the meter at either end point may be unknown. Despite the unknown factor, the input signal can be calibrated in terms of EU/Tm by setting the calibration references the same as the scaling references. To do this, set the AI1 RA (CP-171) equal to the AnlgCal Ref A (MP-17) for the input signal and set the AI1 RB (CP-173) equal to the AnlgCal Ref B (MP-18) fo the input signal. These two points should be discretely different from each other and should be reasonable estimates for the actual voltage or current range. Set the EU@ AI1 RA (CP-172) and EU@ AI1 RB (CP-174) to the sensor's operating points that are used during the calibration process for points A and B respectively.

1. Connect the sensor to the AI1 voltage (or current) pins. Connect pins 3 and 4 together if using current mode.

2. Set AI1 Mode (CP-170) to "Volts" (1) or to "Current" (2).
3. Set Analog Cal Sel (CP-361) to AI1 (1) to Select AI1 for calibration.
4. Set Analog Cal Ref (CP-362) to "A" (1) to select point A.

There is no turning back after the next step, the old calibration data will be overwritten.

5. Set Analog Cal En to "On" (1) to start calibration.

6. Run the sensor at the operating point for calibration point A. This is typically your smallest (or negative) voltage point (or smallest current point). Record the value of this operating point as sensor operating point A in EU/Tm.

7. Enter an estimate of the voltage (or current) that the sensor is producing at this operating point into AnalogRef Val (CP-363). Record this value as point A reference voltage (or current) along side the sensor operating point A.

8. Set Analog Cal Ref (CP-362) to "B" (2) to select point B.

9. Run the sensor at the operating point for calibration point B. This is typically your Largest (or positive) voltage point (or largest current point). Record the value of this operating point as point B EU/Tm.

10. Enter an estimate of the voltage (or current) that the sensor is producing at this operating point into AnalogRef Val (CP-363). Record this value as point B reference voltage (or current) along side the sensor operating point B.

11. Set Analog Cal En to "Off" (0) to disable further calibration.

12. Go to SCALING/SIGNAL SCALING/P1. Enter the voltage (or current) that you recorded as the point A reference voltage (or current) into AI1 RA (CP-171). Enter the sensor operating point A (EU/Tm) that the sensor was producing during the point A calibration into EU@AI1 RA (CP-172). This could be a timeless unit, but is considered as EU/Tm scaling because it assumes speed representation for the velocity loop. Enter voltage (or current) that you recorded as the point B reference voltage (or current) into AI1 RB (CP-173). Enter the sensor operating point B (EU/Tm) that the sensor was producing during the point B calibration into EU@AI1 RB (CP-174).

Repeat this procedure for AI2, if necessary. Calibrate AI2 and use the corresponding AI2 parameters.

Auxiliary Analog Input

The Auxiliary Analog Input screens display the Monitor Parameters that monitor the results of inputting a voltage or current .

AI1 Bits (MP-11)

Analog Input 1 Bits (MP-11) displays the present value in ADC bits of Auxiliary Board Analog Input 1 signal.

AI1 Signal (MP-12)

Analog Input 1 Signal (MP-12) displays the present value of the Auxiliary Board Analog Input 1 signal in either volts or milliamps relative to which setting (volts or current) has been entered in AI1 Mode (CP-170).

AI1 Mode (CP-170)

Analog Input 1 Mode (CP-170) identifies the mode of operation and the calibration that are used for the Auxiliary Board Analog Input 1 signal.

AI2 Bits (MP-14)

AI2 Bits (MP-14) displays the present value in DAC bits of Auxiliary Board Analog Input 2 signal.

AI2 Signal (MP-15)

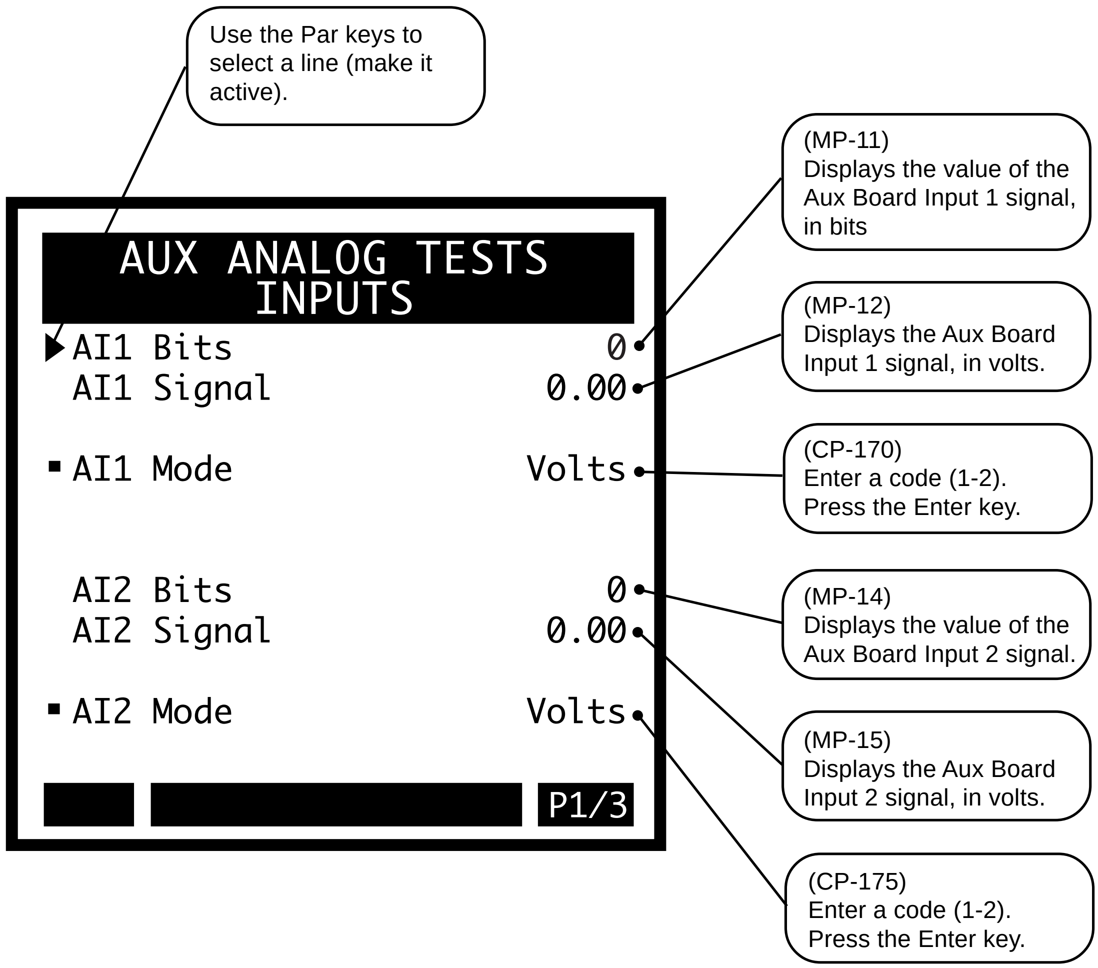
Analog Input 2 Signal (MP-15) displays the present value of the Auxiliary Board Analog Input 2 signal in either volts or milliamps, relative to which setting (volts or current) has been entered in AI2 Mode (CP-175).

AI2 Mode (CP-175)

Analog Input 2 Mode (CP-175) identifies the mode of operation and the calibration that are used for the Auxiliary Board Analog Input 2 signal.

2=Current
1=Voltage (default)

The Aux Analog Tests screens are accessed through
—> Main Menu / Device Tests



Auxiliary Analog Output

The Auxiliary Analog Output screen displays the Monitor Parameters that monitor the Auxiliary Analog Output. Set the AO Parameter (CP-184) to “0 ” and depending on the AO Mode (CP-185), either enter a voltage or a current in AO Direct (CP-365). Measure the voltage or the current on the output to confirm the setting. Be sure to return the AO Parameter to its previous value when the test is completed and set AO Direct back to “0”.

AO Parameter (CP-184)

Analog Output Parameter (CP-184) identifies the Monitor Parameter that is used for the Auxiliary Analog Output (JA, pins 9,10,11) . When the Analog Output Parameter (CP-184) is set to “0”, the value of AO Direct (CP-365) is used as the output.

AO Direct (CP-365)

Analog Out Direct (CP-365) is the value output (in volts or milliamps) at the Auxiliary Analog Board's analog output when the AO Parameter (CP-184) is set to a “0”.

AO Signal (MP-25)

Analog Output Signal (MP-25) displays the present value, in either volts or milliamps of the Auxiliary Analog Output, relative to AO Mode (CP-185).

AO Bits (MP-24)

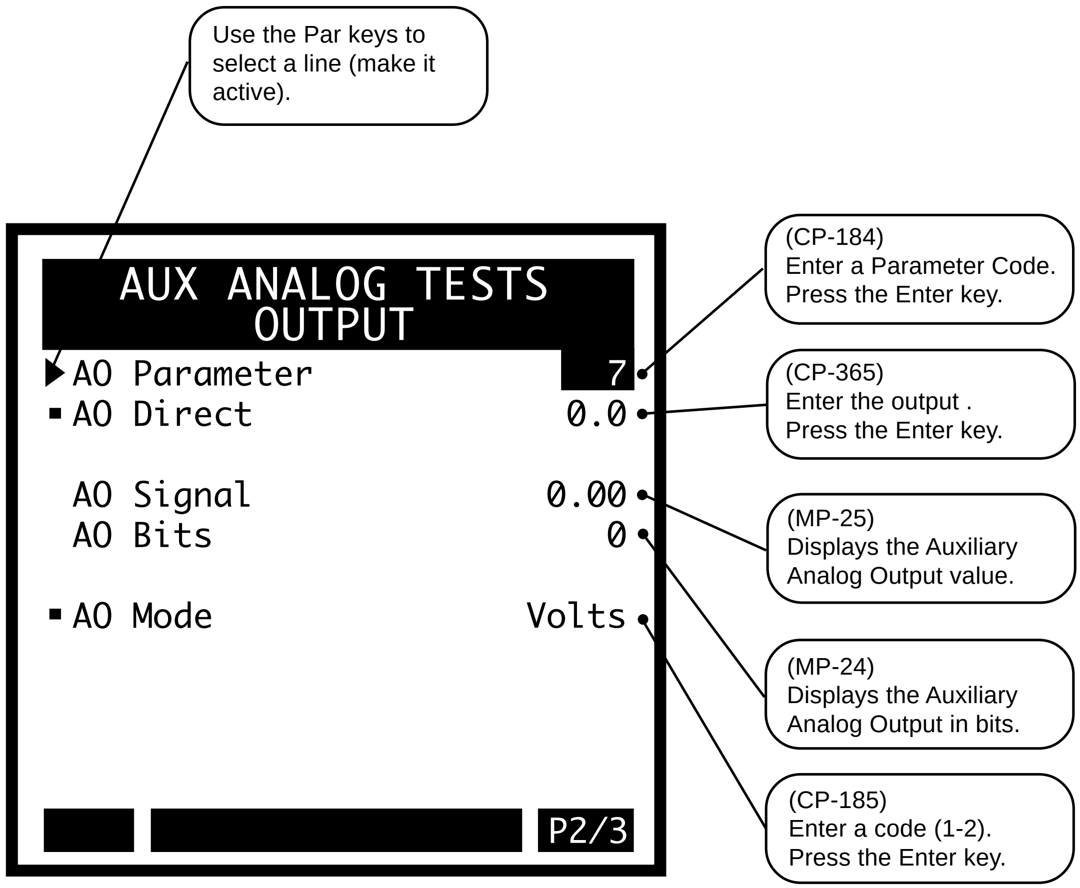
Analog Output Bits (MP-24) displays the present value, in DAC Bits, of the Auxiliary Analog Output.

AO Mode (CP-185)

Analog Output Mode (CP-185) identifies the mode of operation and calibration that are used for the Auxiliary Board Analog Output signal.

2 = Current
1 = Voltage (default)

The Aux Analog Tests / Output screen (page 2).



Aux Analog Tests / Calibration

AI1 Mode (CP-170)

Analog Input 1 Mode (CP-170) identifies the mode of operation and the calibration that are used for the Auxiliary Board Analog Input 1 signal.

2 = Current 1 = Voltage (default)

AI2 Mode (CP-175)

Analog Input 2 Mode (CP-175) identifies the mode of operation and the calibration that are used for the Auxiliary Board Analog Input 2 signal.

2=Current 1=Voltage (default)

AO Mode (CP-185)

Analog Output Mode (CP-185) identifies the mode of operation and calibration that are used for the Auxiliary Board Analog Output signal.

2 = Current 1 = Voltage (default)

Analog Cal En (CP-360)

Analog Calibration Enable (CP-356) enables the calibration process for the auxiliary analog board. When Analog Calibration En (CP-360) is set to "1" (On) then the signal that is selected in Analog Cal Select (CP-361) will be calibrated.

1 = Enabled 0 = Disabled (default)

Analog Cal Sel (CP-361)

Analog Calibration Select (CP-361) selects the signal (AI1, AI2, AO) on the auxiliary analog board for calibration.

3 = Analog Out 2 = Analog In 2 1 = Analog In 1 (default)

Analog Cal Ref (CP-362)

Analog Calibration Reference (CP-362) determines which of the two calibration reference points (see list below) are to be calibrated.

2 = point B 1 = point A (default)

Analog Ref Val (CP-363)

Analog Reference Value (CP-363) is the value of measured data for the signal at the specified reference point (Analog Cal Ref, CP-362). Use a voltmeter for voltage mode operation (or a current meter for current mode of operation) to measure the voltage (or current) on the analog signal selected for calibration at the specified reference point. Enter the measured value in the Analog Reference Value (CP-363).

AO Bit Set (CP-364)

Analog Out Bit Set (CP-364) sets the output value in bits that are used to calibrate the Auxiliary Analog Board's analog output. Change (tune) this value until the actual output matches the value that you entered for Analog Ref Val (CP-363), for the selected point.

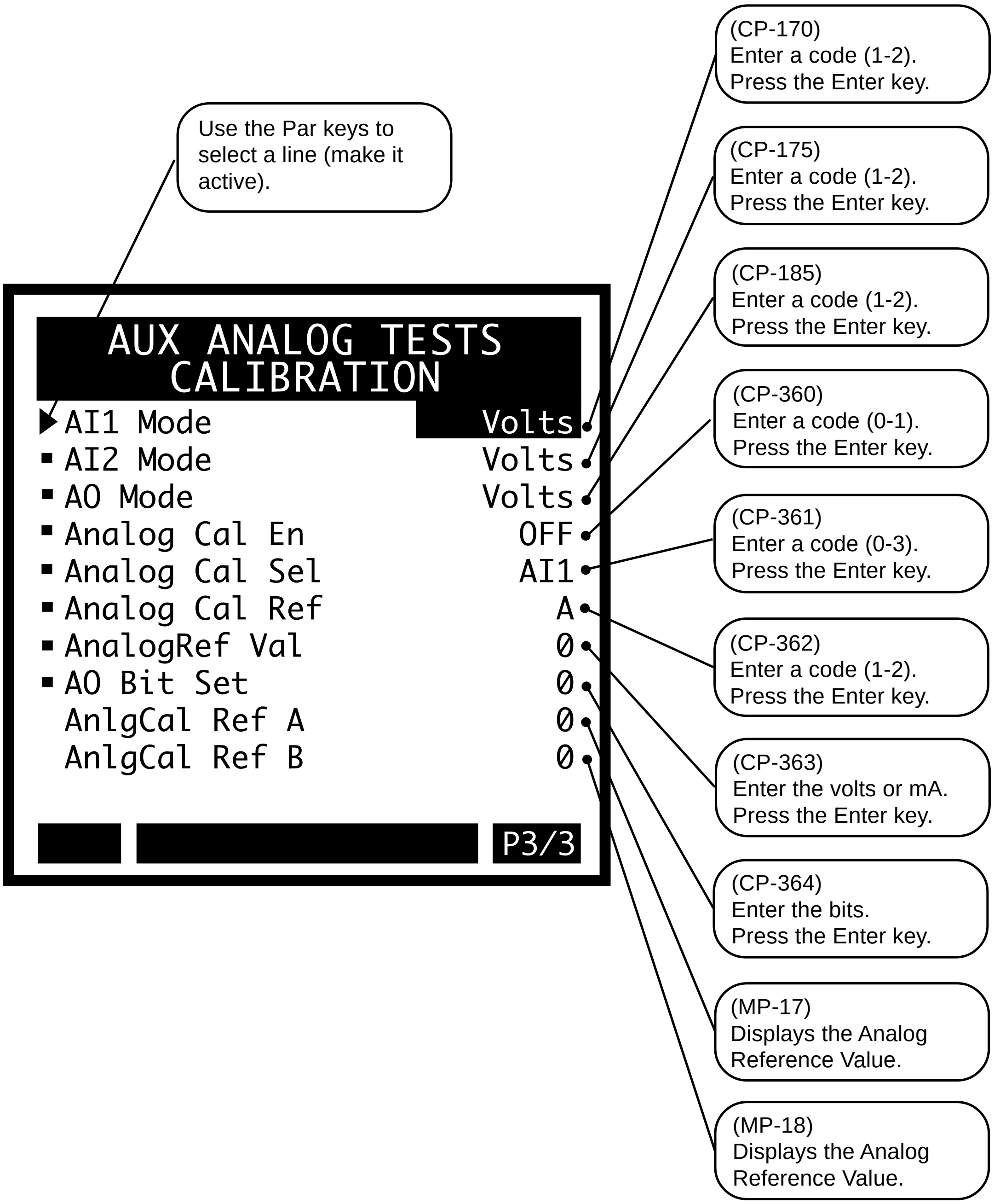
AnlgCal Ref A (MP-17)

Analog Calibration Reference A (MP-17) displays the Analog Reference Value (CP-363) for the signal (AI1, AI2, AO), which was selected in Analog Calibration Select (CP-361) and which was stored during the calibration of point A.

AnlgCal Ref B (MP-18)

Analog Calibration Reference B (MP-18) displays the Analog Reference Value (CP-363) for the signal (AI1, AI2, AO), which was selected in Analog Calibration Select (CP-361) and which was stored during the calibration of point B.

The Aux Analog Tests / Calibration screen (page 3).



SERIAL COMMUNICATIONS TEST

Use the Serial Communications Test screen to set up the Baud Rate, Frame Format and Record Format that will be used by the host computer. You can send a byte out and receive a byte on the RS485 port. These are decimal numbers. If you want to send ASCII, you must use the decimal equivalent. Likewise, if an ASCII character is received, it will be displayed as the decimal equivalent (e.g., ‘A’ = 65). Use the SerCom Errs (MP-91) “help” screen to decipher any errors.

Device Address (CP-370)

Device Address (CP-370) assigns a serial communications address to the CX-1010. This number should be different from any other units that are on the serial link.

Baud Rate (CP-371)

The Baud Rate (CP-371) determines the serial communications data transfer rate (see list below) in Bits/sec. With a 10 bit frame length, the number of frame/sec would be 1/10 the Baud Rate.

1 = 300 bps = 300 Baud	2 = 600 bps = 600 Baud	3 = 1200 bps = 1200 Baud
4 = 2400 bps = 2400 Baud	5 = 4800 bps = 4800 Baud	6 = 9600 bps = 9600 Baud (default)
7 = 19200 bps = 19.2 Kbaud		

Frame Format (CP-372)

Frame Format (CP-372) determines the parity, the number of data bits, and the number of stop bits for the serial communications.

1 = N,8,1 = No Parity, 8 data bits, 1 stop bit (10 bit frame - ASCII or Binary)
2 = E,7,1 = Even Parity, 7 data bits, 1 stop bit (10 bit frame-ASCII only)

Record Format (CP-369)

Record Format (CP-369) determines which type of data format (see list below) will be used for the serial communication.

3 = ASCII2 2 = ASCII 1 = BINARY

CRC Enable (CP-368)

If CRC Enable (CP-368) is set to “ON” (1), you must append a CRC value to all serial communications messages that are received by the CX-1010 (See *Serial Communications: Using Serial Communications*). The CX-1010 checks the CRC value against the the message contents (excluding the “STX”), then calculates a CRC value and appends it to all serial communications responses. If CRC Enable (CP-368) is set to “OFF” (0), the CX-1010 will ignore any CRC value that is appended to a message and will not append a CRC value to any serial communications responses.

1 = On (Enabled) 0 = Off (Disabled)

SerCom Char Out (CP-373)

When a new value is entered in SerCom Char Out (CP-373), it is transmitted out the RS-485 serial port at the Baud Rate (CP-371) and the Frame Format (CP-372). SerCom Char Out (CP-373) is a decimal number.

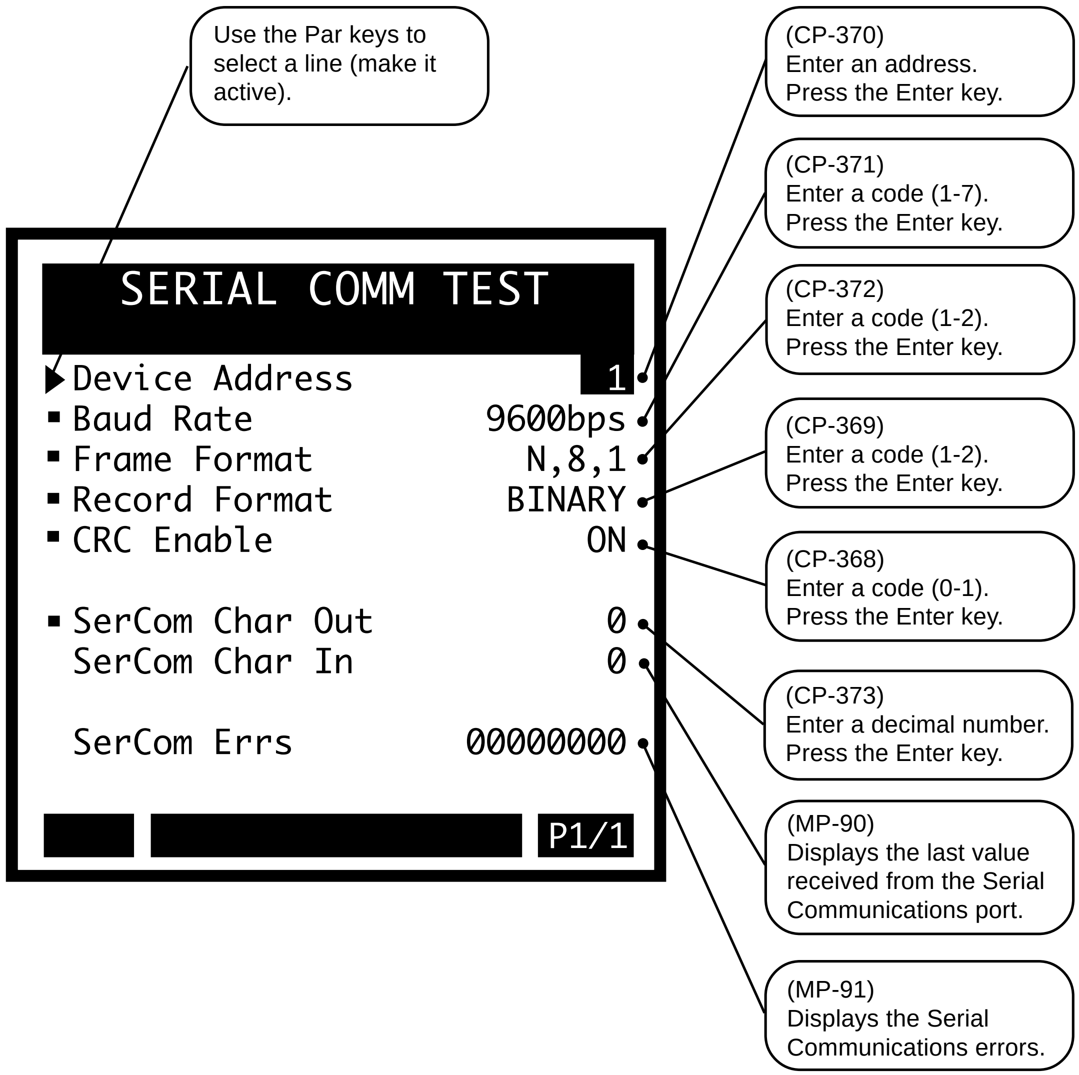
SerCom Char In (MP-90)

Serial Communications Character In (MP-90) displays the value of the last byte that was received by the Serial Communications port. SerCom Char In (MP-90) is displayed in a decimal format. SerCom Char In (MP-90) is used primarily for troubleshooting.

SerCom Errs (MP-91)

Serial Communications Errors (MP-91) displays all serial communications errors that occurred during the most recent transmission.

The Serial Communications Test screen is accessed through —> Main Menu / Device Tests <—



DEVICE STATUS

The Device Status screen displays the microprocessor related faults. Norm Pwr Ups (MP-84) indicates how many times power has been applied to the CX-1010 since the last “Clear-7” power-up. The Low Pwr Cntr (MP-85) shows the number of times the CX-1010 experienced low power before shutting down. If this number is greater than Norm Pwr Ups (MP-84), it can indicate that the line-power input has dipped below about 100 volts AC. However, this could also indicate that a “Clear-7” power-up was executed and the Low Pwr had not been reset. Therefore, it is important to reset the Low Pwr Cntr (MP-85) after a “Clear-7” power-up, to keep the numbers accurate. Use Clr Fault Cntrs (CP-391) to reset the Low Pwr Cntr (MP-85).

Last Reset (MP-80)

Last Reset (MP-80) displays a “1” in a bit to indicate the reason for the last reset. Refer to *Appendices: Appendix C* for the Last Reset (MP-80) bit map list. The Help screen for Last Reset (MP-80) also contains a bit map list.

Misc Intrpt (MP-81)

Miscellaneous Interrupts (MP-81) displays a “1” in a bit to indicate which of the various system interrupts may have caused the last reset. Refer to *Appendices: Appendix C* for the Miscellaneous Interrupts (MP-81) bit map list. The Help screen for Miscellaneous Interrupts (MP-81) also contains a bit map list.

Device Alms (MP-82)

Device Alarms (MP-82) displays the status of microprocessor or other hardware related alarms. Notification of a bad block selection is also included. Refer to *Appendices: Appendix C* for the Device Alarms (MP-82) bit map list. The Help screen for Device Alarms (MP-82) also contains a bit map list.

Norm Pwr Ups (MP-84)

Normal Power Ups (MP-84) displays the number of normal power-ups since the most recent “Clear-7” power-up . This value is reset only by a “Clear-7” power-up. Normal Power Ups (MP-84) is used primarily for troubleshooting.

Low Pwr Cntr (MP-85)

Low Power Counter (MP-85) displays the number of low power detections, including normal “Power Downs”. You can reset this numeric value, but only in Clr Fault Cntrs (CP-391). Low Power Counter (MP-85) is used primarily for troubleshooting.

Mem Err Cntr (MP-86)

Memory Error Counter (MP-86) displays the number of memory test failures that occurred during “Power Up”. You can reset this numeric value, but only in Clr Fault Cntrs (CP-391). Memory Error Counter (MP-86) is used primarily for troubleshooting.

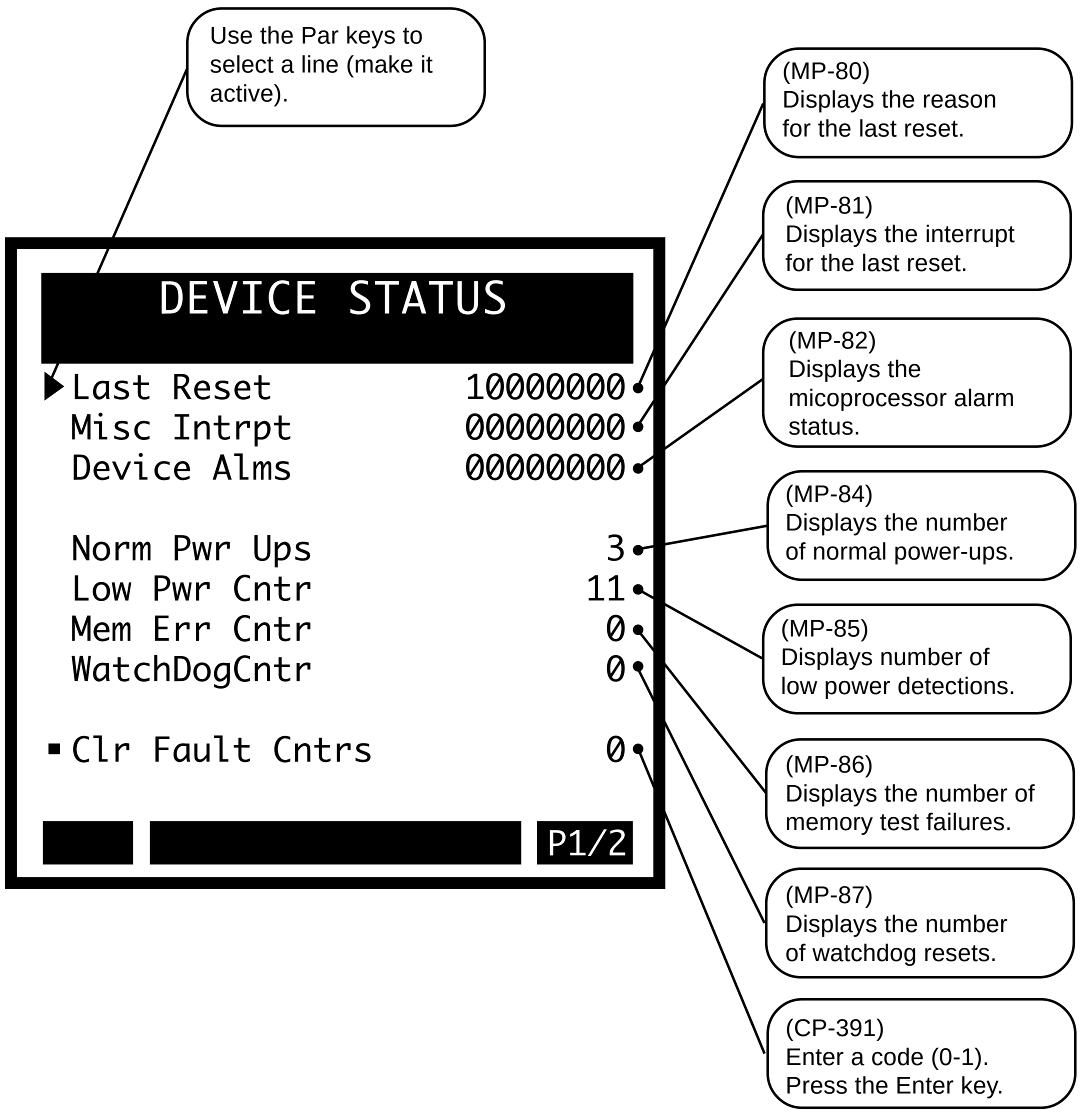
WatchDogCntr (MP-87)

Watch Dog Counter (MP-87) displays the number of watch dog resets that were caused by Watchdog time-out. Watch Dog Counter (MP-87) is used primarily for in troubleshooting. You can reset this numeric value, but only in ‘Clr Fault Cntrs’ CP (CP-391).

Clr Fault Cntrs (CP-391)

To reset all the system-fault counters except Norm- Pwr-Ups (MP-84), enter a “1” in Clear Fault Counters (CP-391). The error and message status bar at the bottom of the screen will flash “Flts Cleared” and the value will return to “0”.

The Device Status screens are accessed through
—> Main Menu / Device Tests <—



Device Status

Last Reset (MP-80)

Last Reset (MP-80) displays a “1” in a bit to indicate the reason for the last reset. Refer to *Appendices: Appendix C* for the Last Reset (MP-80) bit map list. The Help screen for Last Reset (MP-80) also contains a bit map list.

Misc Intrpt (MP-81)

Miscellaneous Interrupts (MP-81) displays a “1” in a bit to indicate which of the various system interrupts may have caused the last reset. Refer to *Appendices: Appendix C* for the Misc Intrpt (MP-81) bit map list. The Help screen for Misc Intrpt (MP-81) also contains a bit map list.

MiscIntrptCntr (MP-88)

Miscellaneous Interrupt Counter (MP-88) displays the number of miscellaneous interrupts that occurred as the result of bus errors, address errors, divide-by-0 errors, unexecuted instruction errors, general exceptions, and unexecuted and spurious interrupts. You can reset this numeric value, but only in Clr Fault Cntrs (CP-391). Miscellaneous Interrupt Counter (MP-88) is used primarily for troubleshooting.

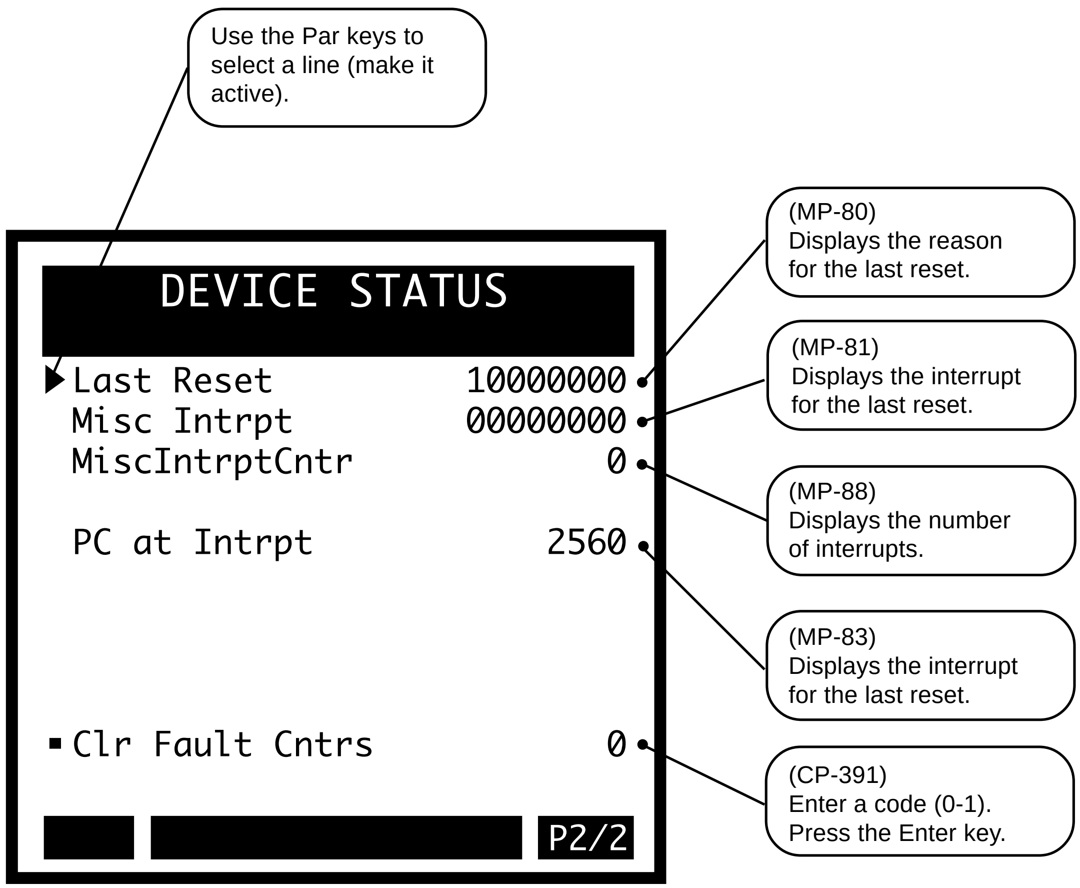
PC at Intrpt (MP-83)

Program Counter at Interrupt (MP-83) shows were the last interrupt of the microprocessor program counter occurred . If the CX-1010 repeatedly displays the “REST FAULT” error box, then record the “PC @Intrpt” value as well as the line just above it (which indicates the cause of the reset), before you press the clear key to continue. The program counter at interrupt is stored in the Program Counter at Interrupt (MP-83) Monitor Parameter for review. A value of “2560” is normal.

Clr Fault Cntrs (CP-391)

To reset all the system-fault counters except Norm- Pwr-Ups (MP-84), enter a “1” in Clear Fault Counters (CP-391). The error and message status bar at the bottom of the screen will flash “Flts Cleared” and the value will return to “0”.

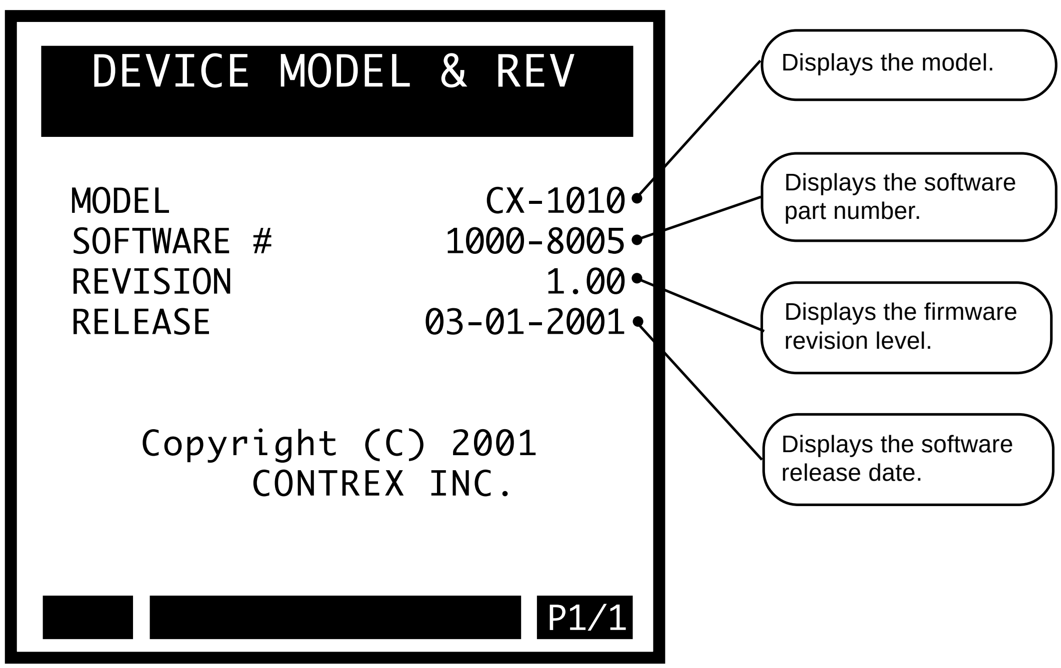
The Device Tests / Device Status screen (page 2).



DEVICE MODEL & REVISION

The Device Model and Revision screen displays the model of the CX-1010, the software number, the revision level of the software and the date that this software was released. The Contrex copyright is also displayed on this screen. If you call technical support for assistance, you may be asked for this information.

The Device Model & Revision screen is accessed through
—> Main Menu / Device Tests <—



—NOTES—

TROUBLESHOOTING

This section contains four troubleshooting flowcharts to help you resolve four possible system operating problems. The four scenarios that are addressed by the flowcharts are:

Motor Does Not Stop
Motor Runs Unstable
Motor Runs at Wrong Speed
Motor Does Not Run

If you need to verify the integrity of the CX-1010 independently, refer to the *Troubleshooting/Diagnostics: Device Tests* section. If the information in this section does not solve your problem, consult technical support:

Contrex Technical Support (763) 424-8700 or (800) 342-4411

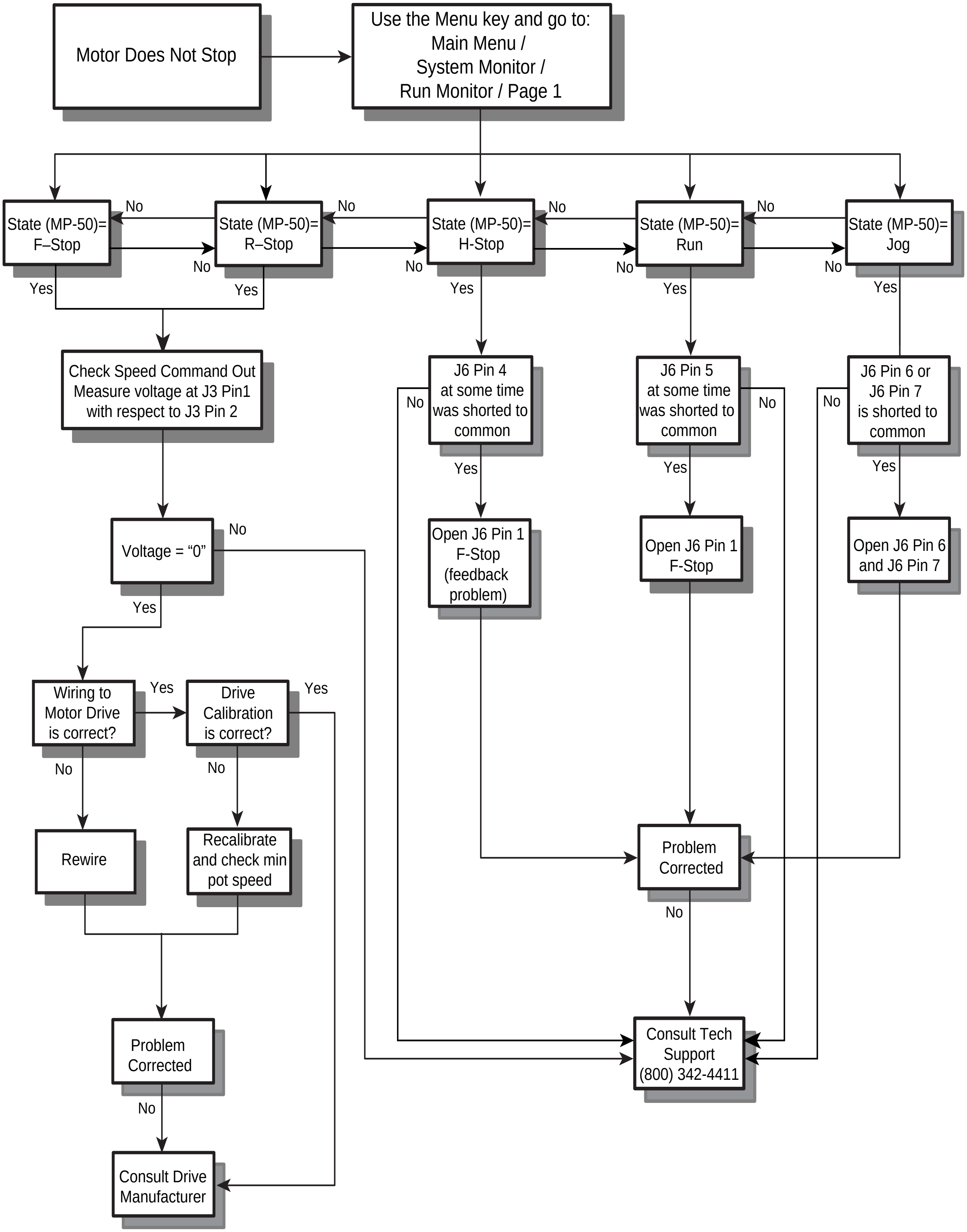
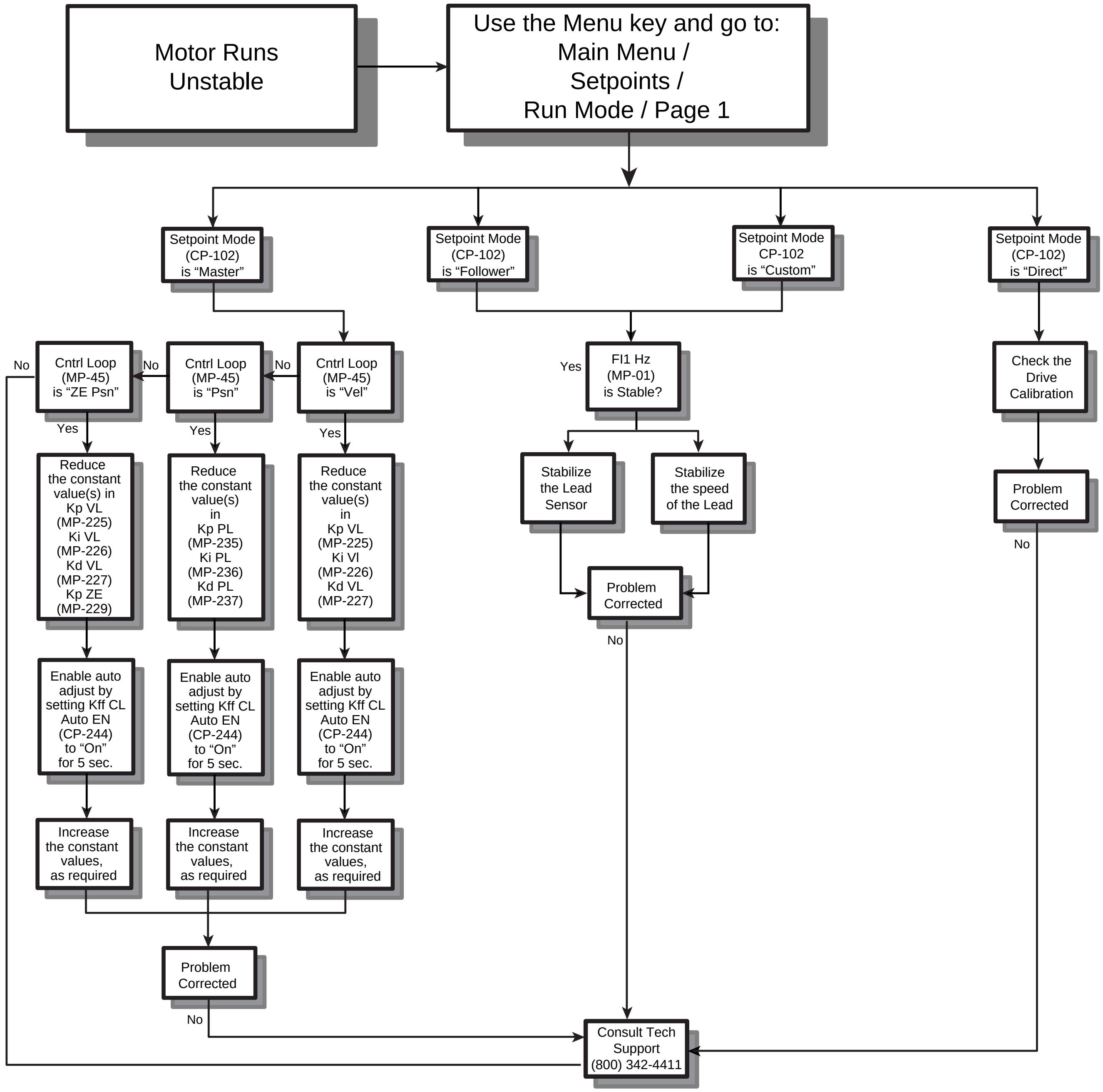


Figure 8-2 Motor Does Not Stop Flowchart



Screens that you will access for the Figure 8-3 Flowchart are:	
Cntrl Loop (MP-45) = System Monitor \ Run Monitor \ pg 1 FI1 Hz (MP-01) = System Monitor \ Run Monitor \ pg 2 Ki PL (CP-236) = Tuning \ Position Loop \ pg 1 Ki VL (CP-226) = Tuning \ Velocity Loop \ pg 1 Tuning \ Velocity Loop / ZE \ pg 1 Kd PL (CP-237) = Tuning \ Position Loop \ pg 1 Kd VL (CP-227) = Tuning \ Velocity Loop \ pg 1 Tuning \ Velocity Loop / ZE \ pg 1 Kff Auto En (CP-244) = Tuning \ Position Loop \ pg 1 Tuning \ Velocity Loop \ pg 1 Tuning \ Velocity Loop / ZE \ pg 1	Kp PL (CP-235) = Tuning \ Position Loop \ pg 1 Kp VL (CP-225) = Tuning \ Velocity Loop \ pg 1 Tuning \ Velocity Loop / ZE \ pg 1 Kp ZE (CP-229) = Tuning \ Velocity Loop / ZE \ pg 1 **Setpoints:** Master (CP-110) = Setpoint \ Master \ pg 1 Follower (CP-120) = Setpoint \ Follower \ pg 1 Custom (CP-140) = Setpoint \ Custom \ pg 1 Direct (CP-130) = Setpoint \ Direct \ pg 1 Setpoint X (CP-101) = System Monitor \ Run Monitor \ pg 1

Figure 8-3 Motor Runs Unstable Flowchart

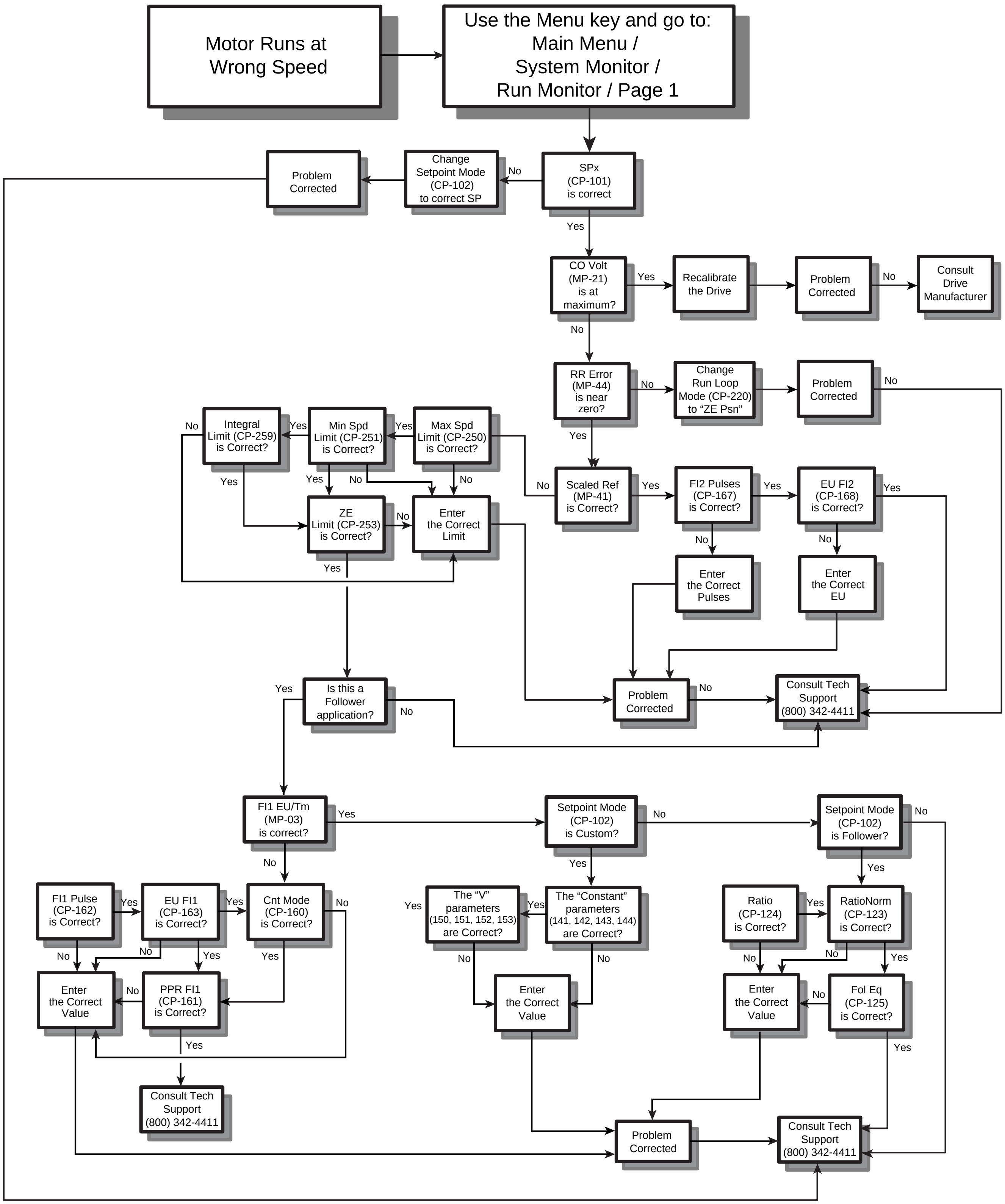
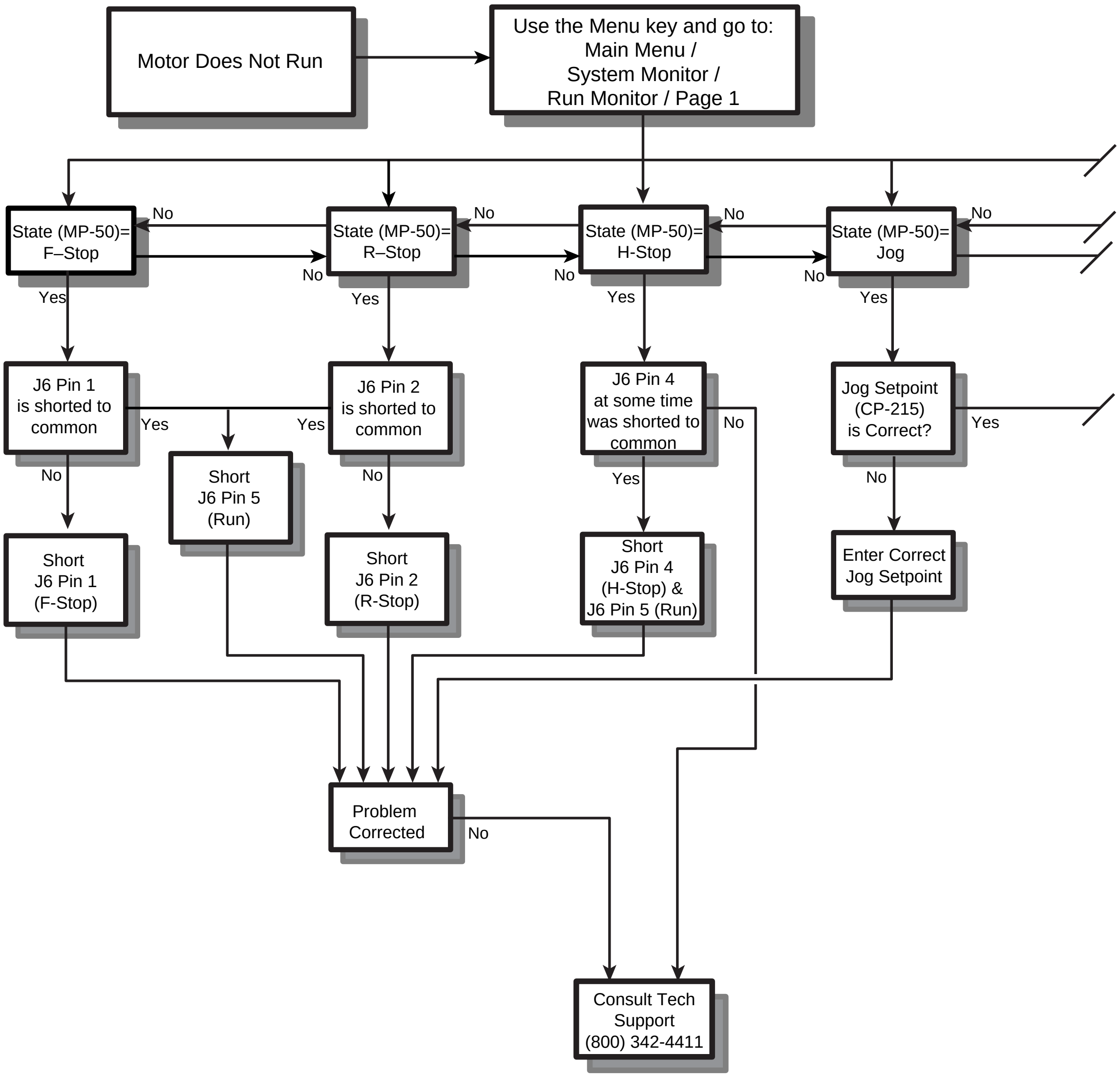


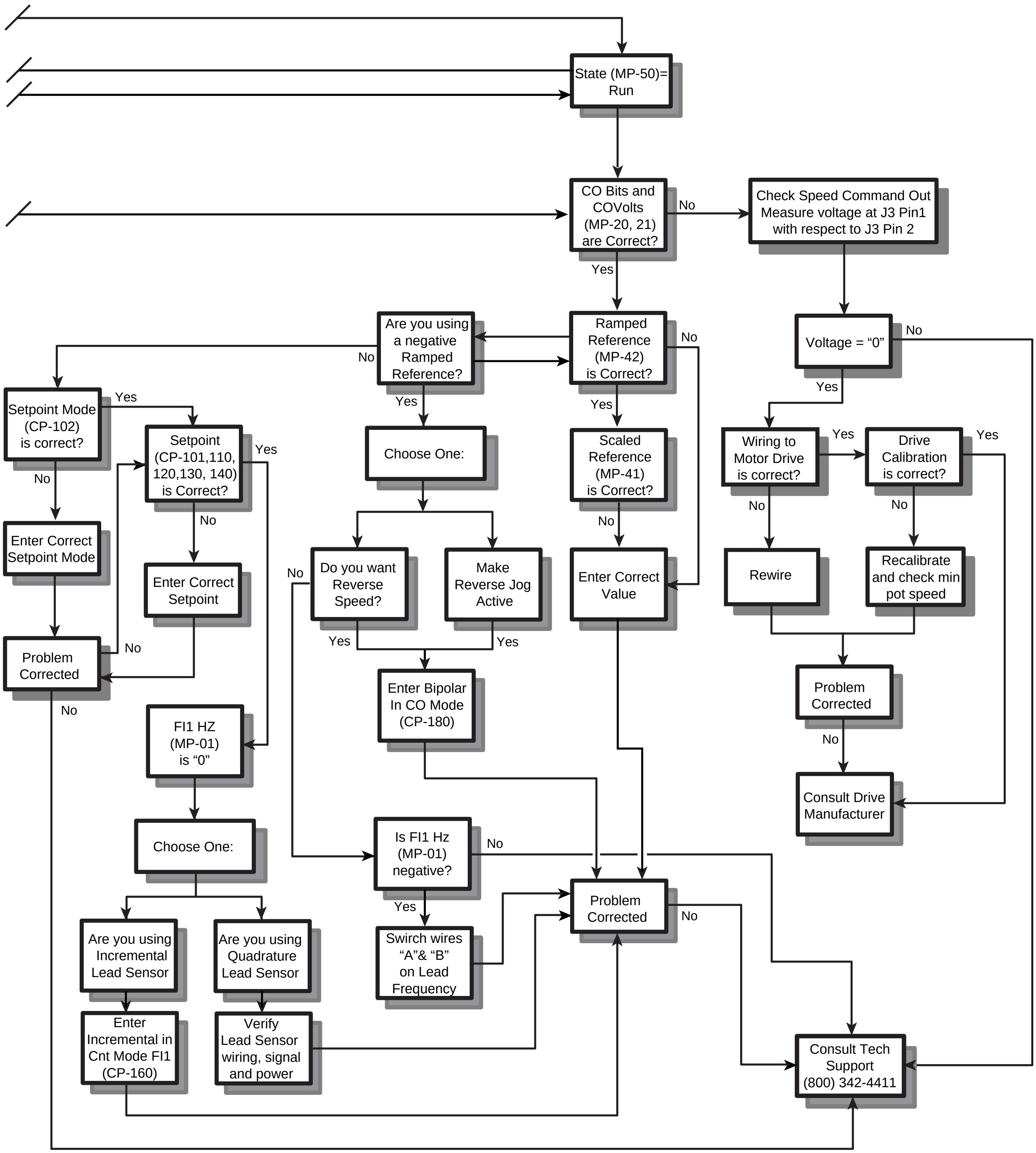
Figure 8-4 Motor Runs at Wrong Speed Flowchart

Screens that you will access for the Figure 8-4 Flowchart are:	
Constant 1 (CP-141) = Setpoints \ Custom \ pg 2 Constant 2 (CP-142) = Setpoints \ Custom \ pg 2 Constant 3 (CP-143) = Setpoints \ Custom \ pg 2 Constant 4 (CP-144) = Setpoints \ Custom \ pg 2 CO Volt (MP-21) = Scaling \ Standard Signal \ pg 3 Cnt Mode (CP-160) = Scaling \ Standard Signal \ pg 1 FI1 EU/Tm (MP-03) = Scaling \ Standard Signal \ pg 1 FI1 Pulse (CP-162) = Scaling \ Standard Signal \ pg 1 FI2 Pulse (CP-167) = Scaling \ Standard Signal \ pg 2 EU FI1(CP-163) = Scaling \ Standard Signal \ pg 1 EU FI2 (CP-168) = Scaling \ Standard Signal \ pg 2 Follower Eq (CP-125) = Setpoints \ Follower \ pg 2 Integral Limit (CP-259) = Alarms*Ramps*Limits \ Limits \ pg 1 Max Speed Limit (CP-250) = Alarms*Ramps*Limits \ Limits \ pg 1	Min Speed Limit (CP-251) = Alarms*Ramps*Limits \ Limits \ pg 1 PPR FI1 (CP-161) = Scaling \ Standard Signal \ pg 1 Ratio (CP-124) = Setpoints \ Follower \ pg 2 Ratio Norm (CP-123) = Setpoints \ Follower \ pg 2 RR Error (MP-44) = System Monitor \ Run Monitor \ pg 1 Run Loop Mode (CP-220) = Setpoints \ Run Modes \ pg 1 Setpoint Mode (CP-102) = Setpoints \ Run Mode \ pg 1 Scaled Reference (MP-41) = System Monitor \ Run Monitor \ pg 1 V1 Source (CP-150) = Setpoints \ Custom \ pg 2 V2 Source (CP-151) = Setpoints \ Custom \ pg 2 V3 Source (CP-152) = Setpoints \ Custom \ pg 2 V4 Source (CP-153) = Setpoints \ Custom \ pg 2 ZE Limit (CP-253) = Alarms*Ramps*Limits \ Limits \ pg 1



Screens that you will access for the Figure 8-5 Flowchart are:	
Co Bits (MP-20) = System Monitor \ Run Monitor \ pg 2 Co Mode (CP-180) = Scaling \ Standard Signal \ pg 3 Co Volts (MP-21) = System Monitor \ Run Monitor \ pg 1 Cnt Mode FI1 (CP-160) = Scaling \ Standard Signals \ pg 1 FI1 Hz (MP-01) = System Monitor \ Run Monitor \ pg 2 Jog Setpoint (CP-215) = Alarms*Ramps*Limits \ Jog Setup \ pg 1 Ramped Reference (MP-42) = System Monitor \ Run Monitor \ pg 1 Scaled Reference (MP-41) = System Monitor \ Run Monitor \ pg 1 Setpoint Mode (CP- 102) = Setpoints \ Run Mode \ pg 1	Setpoints: Master (CP-110) = Setpoint \ Master \ pg 1 Follower (CP-120) = Setpoint \ Follower \ pg 1 Custom (CP-140) = Setpoint \ Custom \ pg 1 Direct (CP-130) = Setpoint \ Direct \ pg 1 Setpoint X (CP-101) = System Monitor \ Run Monitor \ pg 1

Figure 8-5 Motor Does Not Run Flowchart


State (MP-50)= Run
CO Bits and COVolts (MP-20, 21) are Correct?
No
Yes
Check Speed Command Out Measure voltage at J3 Pin1 with respect to J3 Pin 2
Voltage = "0"
No
Yes
Ramped Reference (MP-42) is Correct?
No
Yes
Are you using a negative Ramped Reference?
No
Yes
Setpoint Mode (CP-102) is correct?
Yes
No
Setpoint (CP-101,110, 120,130, 140) is Correct?
Yes
No
Enter Correct Setpoint Mode
Enter Correct Setpoint
Problem Corrected
No
No
Choose One:
Do you want Reverse Speed?
No
Yes
Make Reverse Jog Active
Yes
Enter Bipolar In CO Mode (CP-180)
Scaled Reference (MP-41) is Correct?
No
Enter Correct Value
Wiring to Motor Drive is correct?
Yes
No
Drive Calibration is correct?
Yes
No
Rewire
Recalibrate and check min pot speed
Problem Corrected
No
Consult Drive Manufacturer
FI1 HZ (MP-01) is "0"
Choose One:
Are you using Incremental Lead Sensor
Are you using Quadrature Lead Sensor
Enter Incremental in Cnt Mode FI1 (CP-160)
Verify Lead Sensor wiring, signal and power
Is FI1 Hz (MP-01) negative?
No
Yes
Swirch wires "A"& "B" on Lead Frequency
Problem Corrected
No
Consult Tech Support (800) 342-4411

PARAMETER LOAD AT POWER-UP

This section contains instructions to restore either the default Control Parameter values or the back-up Control Parameter values. The procedures are:

Clear-7
Clear-8
Clear-9

CLEAR-7

Use the Clear-7 procedure to restore the Control Parameter's factory default settings, with the exception of these three Control Parameters: Contrast Value (CP-375), CO Offset (CP-366) and Serial Number (CP-395). The back-up settings for the Control Parameters are not altered.

NOTE: Clear-7 also restores the PLC to the factory default. The back-up for the PLC is not altered. The fault counters are not reset.

Norm Pwr Ups (MP-84) is reset to “1” (normal power-up) or “0” (if CPU reset occurs during power-up).

EstMaxFb (MP-49) is reset to “0”.

The Code Select line and the Large Number units in the “Status” screen are cleared.

To do the Clear-7 Procedure:

Press the Clear key and the “7” key, then continue to press the keys while you apply power to the CX-1010.

CLEAR-8

Use the Clear-8 procedure to restore the Control Parameters to the back-up settings, with the exception of these two Control Parameters: CO Offset (CP-366) and Serial Number (CP-395). This procedure uses the back-up settings which you have entered; the back-up settings are not reset to the factory default.

NOTE: Clear-8 also restores the PLC to the back-up settings which you have entered; the PLC back-up settings are not reset to the factory default.

The fault counters are not reset.

To do the Clear-8 Procedure:

Press the Clear key and the “8” key, then continue to press the keys while you apply power to the CX-1010.

CLEAR-9

Use the Clear-9 procedure to restore the Control Parameter's factory default settings. The back-up settings for the Control Parameters are also restored to the factory default.

NOTE: Clear-9 restores the PLC to the factory default. The back-up for the PLC is also restored to the factory default.

The fault counters are reset to "0".

Norm Pwr Ups (MP-84) is reset to "1" (normal power-up) or "0" (if CPU reset occurs during power-up).

EstMaxFb (MP-49) is reset to "0".

The Code Select line and the Large Number units in the "Status" screen are cleared.

To do the Clear-9 Procedure:

Press the Clear key and the "9" key, then continue to press the keys while you apply power to the CX-1010.

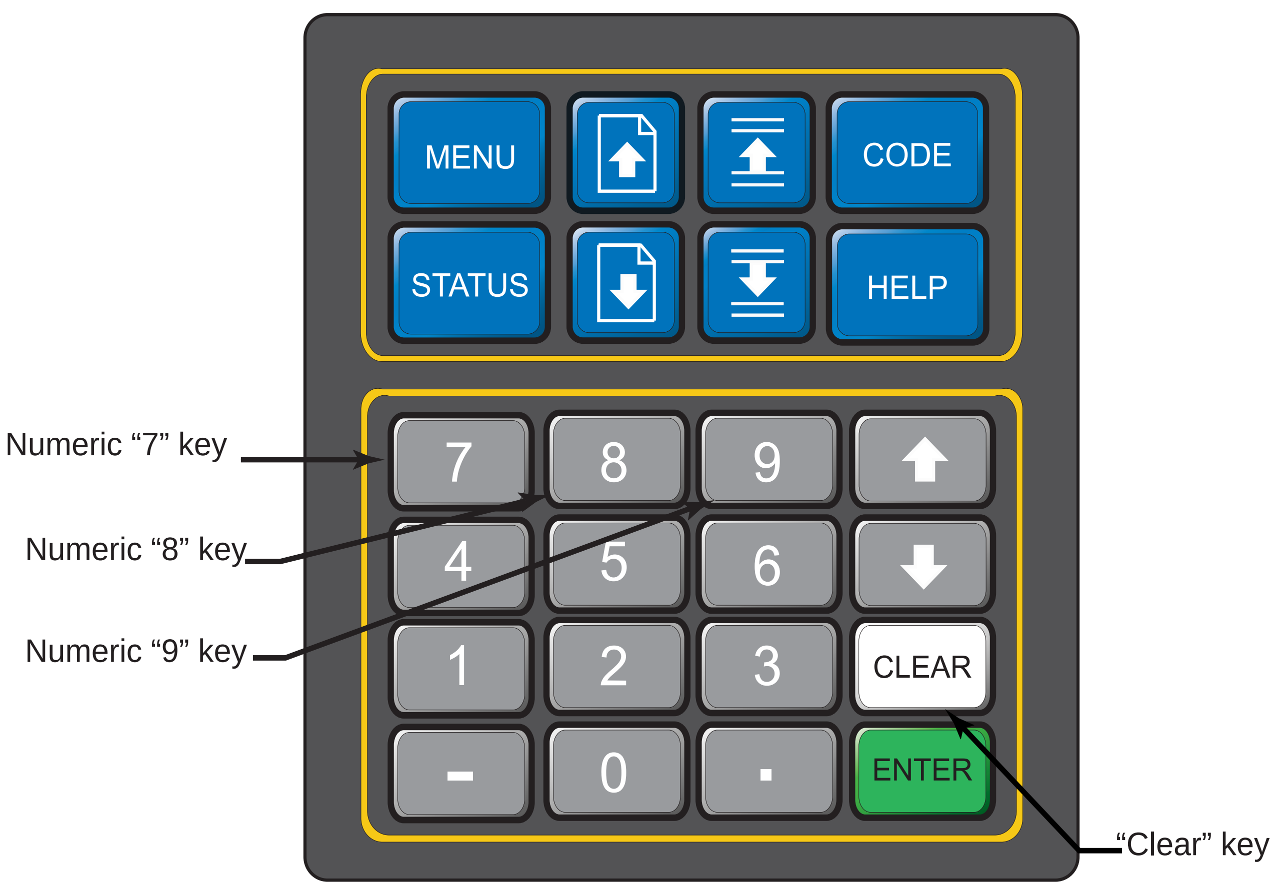


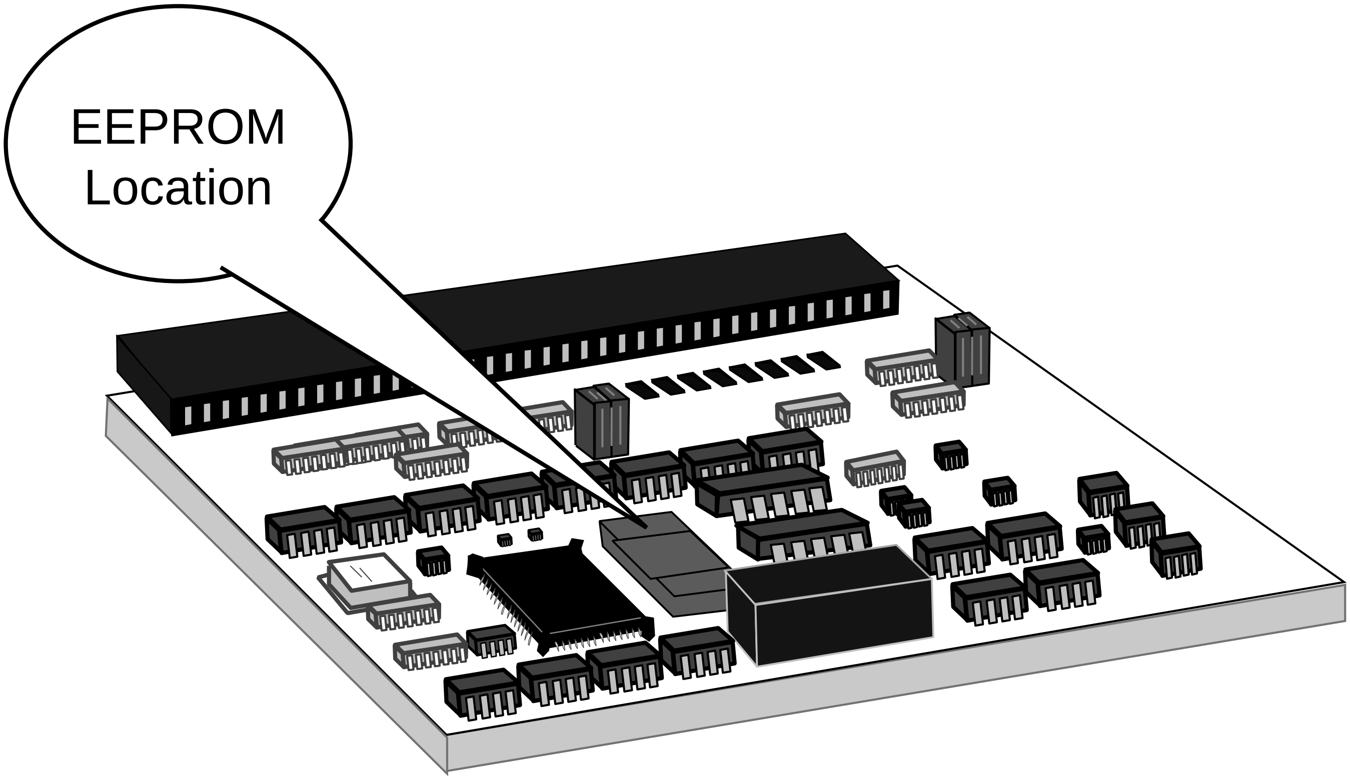
Figure 8-6 Parameter Load at Power-up Corresponding Keypad Numbers

EEPROM CHIP REPLACEMENT

The EEPROM (Electrical Erasable Programmable Read Only Memory) chip, which is also referred to as the "Flash Memory", is the software for the CX-1010. See Figure 8-7 for the EEPROM's location on the CPU Board and specific details for its replacement.

To replace the EEPROM chip:

- Make a record of your current Control Parameter values; the replacement chip contains default values that will replace your current values when you perform the Clear/7 step.
- Turn off the power to the CX-1010 and remove the back panel.
- Pull out the CPU board and locate the eeprom Socket that houses the EEPROM chip.
- **Ground yourself - Static electricity can damage the EEPROM chip.**
- Gently press the notch on the EEPROM Socket and the spring loaded doors will pop open. Open the doors fully to reveal the EEPROM chip.
- Gently place the palm of your hand over the EEPROM chip and invert the board so that the EEPROM falls into your hand.
- Position the CPU board with the pin connectors to your left. Grasp the replacement EEPROM by the top and bottom edges; **take great care not to touch the delicate IC pins**.
- Align the EEPROM chip so that the Pin 1 indicator (round indentation) on its corner is aligned with the upper left corner (north west quadrant) of the EEPROM Socket. Gently insert the replacement EEPROM in the socket.
- Keep the CPU board positioned so that the pin connectors are to your left. Check the larger door on the socket and make certain that the sliding panel is as far down (towards you) as it will go.
- Gently close the smaller door on the socket (positioned on your right) and then close the larger door over the smaller door. Press firmly on the door panel, however, be careful not to force the door. If the door will not fit, make certain that the EEPROM is seated properly in the socket. Hold the door closed and press the sliding panel up and into a locking position.
- Replace the CPU board and the back panel.
- Press the Clear key and the "7" key, then continue to press the keys while you apply power to the CX-1010.
- The "Clear 7" procedure restores the factory default settings and automatically performs the Power Up diagnostic routines.
- Reenter the values for your Code Parameters.



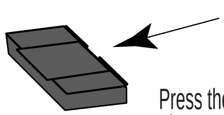
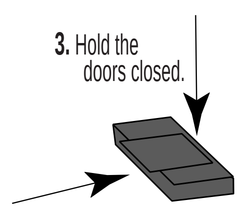
To open the EEPROM Surface Mount Socket	To close the EEPROM Surface Mount Socket (4 steps)
 Press the notch. The panel slides down and the doors pop open.	**2.** Close the large door - keep the sliding panel down.  **1.** Close the small door. **3.** Hold the doors closed.  **4.** Press the sliding panel up, into a locking position.

Figure 8-7 EEPROM Replacement

—NOTES—

Glossaries

ACRONYM GLOSSARY

Symbols

2 ------------------------ to
@ ----------------------- at
0Spd-------------------- Zero Speed

A

Acl --------------------- Acceleration
Actv -------------------- Active
Adj --------------------- Adjust
Adrs -------------------- Address
AI ----------------------- Analog Input
AIx --------------------- Analog Input x
AIx RA ---------------- Analog Input x Reference A
AIx RB ---------------- Analog Input x Reference B
Alm -------------------- Alarm
Amp -------------------- Amplifier
Anlg -------------------- Analog
AO --------------------- Analog Output
AO RA ----------------- Analog Output Reference A
AO RB ----------------- Analog Output Reference B
Auto -------------------- Automatic
Aux --------------------- Auxiliary

B

BIN --------------------- Binary
BiPolAbs -------------- Bipolar Absolute
BkUp ------------------- Backup
Blk --------------------- Block
bps ---------------------- Bits per second
BypRmp --------------- Bypass Ramp

C

Cal ---------------------- Calibrate/Calibration
Calc -------------------- Calculation
Char -------------------- Character
ChkSum --------------- Check Sum
CL ---------------------- Closed Loop
Clr ---------------------- Clear
CM --------------------- Centimeter(s)
Cmd -------------------- Command
Cmpr ------------------- Compare
Cmprx ----------------- Compare x
Cnt --------------------- Count
Cntr -------------------- Counter
Cntrx ------------------- Counter x
CntrxDnO ------------- Counter x Down Output
CntrxUpO ------------- Counter x Up Output
CO ---------------------- Command Output Signal
Comm ------------------ Communications
ContR ------------------ Continuous Ramp
CP ---------------------- Control Parameter

Cust -------------------- Custom

D

DAC ------------------- Digital to Analog Converter
DC --------------------- Direct Current
Dcl --------------------- Deceleration
DCOut ----------------- DC Out
Dec --------------------- Decrement
Deriv ------------------- Derivative
Dflt --------------------- Default
DI ----------------------- Digital Input
DI_x -------------------- Digital Input x
Diag -------------------- Diagnostics
Diag St ----------------- Diagnostic State
Dn ---------------------- Down
DO --------------------- Digital Out
DO_x ------------------ Digital Output x
DP ---------------------- Decimal Point
Drct -------------------- Direct
Dspl -------------------- Display

E

En ---------------------- Enable
Eq ---------------------- Equation
Err ---------------------- Error
EstMaxFb ------------- Estimated Maximum Feedback
EU ---------------------- Engineering Unit
EU/Tm ----------------- Engineering Units per Time
EU@AIx RA --------- Engineering Units at Analog Input x Reference A
EU@AIx RB ---------- Engineering Units at Analog Input x Reference B
EUs --------------------- Engineering Units
Exc --------------------- Exception

F

Fb ----------------------- Feedback
Ff ----------------------- Feedforward
FI ----------------------- Frequency Input
FIx ---------------------- Frequency Input x
Flt ---------------------- Fault
Fltr --------------------- Filter
Fol ---------------------- Follower
Frz ---------------------- Freeze

G

Gal --------------------- Gallon(s)
Gen --------------------- General

H

Hi ----------------------- High
HiFrO ------------------ High Frequency Oscillation Output
hr & Hr ---------------- Hour (Time)
Hz ---------------------- Hertz

I

I/O ---------------------- Input/Output
Inc ---------------------- Increment/Incremental
Inst --------------------- Instruction
Intgrl ------------------- Integral

Intrpt -------------------- Interrupt
Inv ----------------------- Inverse
Inv F -------------------- Inverse Follower
Inv M ------------------- Inverse Master
Invx --------------------- Inverse x

K

Kbps -------------------- Kilo-Bits per second
KHz --------------------- KiloHertz
kiloEU ------------------ Kilo-Engineering Units
KyPd -------------------- Keypad
KyPdLk ----------------- Keypad Lock

L

lb ------------------------ Pound
Lchx --------------------- Latch x
Ld ----------------------- Lead
Lg ----------------------- Large
LgWd ------------------- Long Word
Lmt ---------------------- Limit
Lo ----------------------- Low

M

mag ---------------------- Magnitude
Max --------------------- Maximum
Mem -------------------- Memory
Mid ---------------------- Middle
Min ---------------------- Minimum
min & Min ------------- Minute (Time)
Misc --------------------- Miscellaneous
MP ---------------------- Monitor Parameter
Msec -------------------- Millisecond(s)
Msk --------------------- Mask
Mstr --------------------- Master
Mtr ---------------------- Motor
MtrNResp -------------- Motor Drive Not Responding

N

Neg ---------------------- Negative
Norm -------------------- Normal
NVRAM ---------------- Non-Volatile RAM

O

Ofs ---------------------- Offset
OL ----------------------- Open Loop
Opnd -------------------- Operand
Out ---------------------- Output
Ovfl --------------------- Overflow
oz ------------------------ ounce(s)

P

Parm -------------------- Parameter
PC ----------------------- Program Counter
PL ----------------------- Position Loop
PLC --------------------- Programmable Logic Controller
PPR --------------------- Pulses Per Revolution
PPR Mtr ---------------- Pulses Per Motor Revolution
Prgm -------------------- Program

Prst ---------------------- Preset
psi ----------------------- Pounds per square inch
Psn ---------------------- Position
Pwr ---------------------- Power

Q

Quad -------------------- Quadrature

R

R2D&H ----------------- Ramp to DAC and Hold
RAM -------------------- Random Access Memory
Ref ---------------------- Reference
Res ---------------------- Resolution
Rev(s) ------------------ Revolution(s)
Rmp --------------------- Ramp
Rmt ---------------------- Remote
RO ------------------------ Roll Over
ROM -------------------- Read Only Memory
RPM -------------------- Revolutions Per Minute
RR ------------------------ Ramped Reference
Rst ----------------------- Reset
RStp --------------------- R-Stop
Rt ------------------------- Rate
Rvs ---------------------- Reverse

S

Sc ------------------------- Scaled
ScFb --------------------- Scaled Feedback
sec & Sec --------------- Second (Time)
Sel ------------------------ Select
SerCom ----------------- Serial Communications
SP ------------------------- Setpoint
Spd ---------------------- Speed
spec --------------------- Specification
SR ------------------------- Scaled Reference
SRAM ------------------ Static RAM
Std ------------------------ Standard
Std&Brdr --------------- Standard Display and Border

T

Thd ---------------------- Threshold
thru ---------------------- Through
Tm ------------------------ Time
Tmpx -------------------- Temporary x
Tmr ---------------------- Timer
Tmrx -------------------- Timer x
Trig ---------------------- Trigger
TrigDn ------------------ Trigger Down
TrigUp ------------------ Trigger Up
Trq ------------------------ Torque

U

UImpd ------------------ Unimplemented
ULckBlk ---------------- Unlock Block
ULckCPs --------------- Unlock CP's Only
Updt --------------------- Update

UPolBk ---------------- Unipolar Brake

V

Val ---------------------- Value

Val@AO RA ---------- Value at Analog Output Reference A

Val@AO RB ---------- Value at Analog Output Reference B

Var ---------------------- Variable

VO --------------------- Voltage Out

VL ---------------------- Velocity Loop

Z

ZE ---------------------- Zero Error

ZE PHld --------------- ZE Position Hold

—NOTES—

GLOSSARY

Acceleration/Deceleration	Acceleration/Deceleration controls the rate of the speed's change in response to setpoint changes. These parameters apply to both the Master and Follower modes of operation.
Acceleration Time	See Appendix C, CP-201
Alarms	See *System Setup - Control Parameters: Alarms/Ramps/Limits.*
Auxiliary Analog Tests	See *Troubleshooting/Diagnostics: Device Tests, Auxiliary Analog Tests.*
Calibration	Calibration matches the analog output of the CX-1010 with the analog input of the motor drive
Closed Loop	A system that is controlled by manipulating the output based on error (setpoint - feedback).
Closed Loop Compensation (PI) Software	A mathematical term for a control algorithm that resolves the control error (feedback - setpoint) to zero. PID represents Proportional + Integral + Deviation
CO Sig	Control Output Signal (CO Sig) is the analog output signal from the CX-1010 that is input to the drive's signal input (velocity or torque command).
Code Key	Use the Code key in the Status screen and in the parameter screens to display a "Parameter Code" line. When the "Parameter Code" line appears, you can use it to access a parameter and its value. Enter a Parameter Code, then press the Enter key and the parameter and its value will be displayed. You can change a Control Parameter value by entering a new value or by scrolling with the Increment Up/Down keys. Use the Clear key to delete the entry and clear the parameter value to zero.
Control Command Send	The Control Command Send allows the host computer to control the operating functions of the CX-1010 that are associated with the Logic inputs (Run, Stop, Setpoint Select and Master/Follower).

Control Parameters

Control Parameters allow you to enter data that is unique to your system (e.g., encoder resolution, Lead to Follower ratios) and modify the CX-1010 for your specific needs (e.g., maximum RPMs, setpoints, acceleration/deceleration ramp rates). Control Parameters are identified by a Parameter Name and a Parameter Code. The operational data that you enter into a Control Parameter is the Parameter Value. The CX-1010 comes factory pre-loaded with a complete set of default Control Parameter Values. *See also* Parameter Code, Parameter Name, Parameter Value, Control Parameters or Monitor Parameters.

		Parameter Name	Parameter Code	Parameter Value
Parameters =	Monitor Parameter	Scaled Feedback	MP-40	0.0 (default)
	Control Parameter	Master Setpoint	CP-110	0 (default)

CRC

Cyclical Redundancy Check (CRC) is an error checking mechanism that is used in serial communications to ensure the accuracy of a transmitted block of data. The CRC check option is enabled through CRC Enable (CP-368). CRC is based on the 16-bit polynomial division (8005H represents the generating polynomial).

Deceleration Time

See Appendix C, CP-203, CP-204, CP-208, CP-211, CP-212, CP-213, CP-214, CP-218, and CP-219.

Digital I/O Tests

See *Troubleshooting/Diagnostics: Device Tests, Digital I/O Test.*

Digital Motor Controller

A precision motor controller that uses digital compensation technology.

Direct Enable

See Appendix C, CP-130.

Direct Mode

In the Direct mode of operation, the analog output from the CX-1010 that is connected to the motor drive can be set directly. Direct mode is an open-loop mode of operation. Scaling, Acceleration/Deceleration, and closed loop compensation (PID) software are not involved in the Direct mode. The Direct mode is used in conjunction with the Run and Stop controls.

Direct Setpoint

See Appendix C, CP-130.

Drive Enable

Drive Enable activates the motor drive based on the Ramped Reference (MP-42) and the feedback. The Ramped Reference is the calculated setpoint that is output from the Acceleration/Deceleration routine.

EEPROM Chip

The EEPROM (Electrical Erasable Programmable Read Only Memory) chip, which is also referred to as the “Flash Memory” is the software for the CX-1010.

Engineering Units (E.U.)	Engineering units are the units of measure that your system operates at, such as: RPMs, gallons per hour, feet per minute.
F–Stop	One of four logic inputs. F–Stop brings the CX-1010's speed command (analog output) to an immediate zero. F–Stop has priority over the all if the other operating states.
Follower Mode	A complex multi-drive system. The scaling format can be structured to allow you to enter the setpoint as a ratio. The CX-1010 compares the setpoint ratio or percentage to the follower sensor shaft feedback and lead sensor shaft to calculate any speed error. When the CX-1010 finds speed error, the control algorithm adjusts the motor drive's Speed Command analog output and reduces the error to zero.
Gain	KP PL (CP-235) is the proportional gain constant for the PID position loop. Increasing KP PL (CP-235) will have a quicker response and a smaller position error. However, a value that is too large could result in overshoot and instability. You can eliminate most or all of the error in the position loop with the proportional term (KP PL). Use an integral only if KP PL (CP-235) alone can not eliminate the error to your specification.
Hardwired	Inputs that are wire shorted rather than using push buttons or switches.
Help Screen Key	The Help key accesses the Help screen and gives you a brief description of the parameter or subject that is highlighted (active). The Help screen also functions as an options screen, where you can select Control Parameter data. You can access help from any screen. Press the Help key again to return to the previous screen.
Increment Scroll/ Up/Down	Use these keys in the parameter screens to change the active value. Each time you press the Increment Scroll Up key, the active value will increase by one increment. Each time you press the Increment Scroll Down key, the active value will decrease by one decrement. It will also automatically scroll through the increments or decrements if you hold the key down.
Input Monitoring	FI1 Hz (MP-01) FI2 Hz (MP-06) DI7...0 (MP-26) DI15...8 (MP-27) DO7...0 (MP-28)
Inputs	AC Power Input (J4 pins 1, 2,3) Lead Frequency (J5 pins 2, 3, 4, 5, 6) Frequency Input 1 Feedback Frequency (J5 pins 7, 8, 9, 10, 11) Frequency Input 2 F–Stop (J6 pins 1,3) Digital Input 0 R–Stop (J6 pins 2, 3) Digital Input 1 H–Stop (J6 pins 3, 4) Digital Input 2 Run(J6 pins 3, 5) Digital Input 3

Jog Forward (J6 pins 6, 8)
Digital Input 4

Jog Reverse (J6 pins 7, 8)
Digital Input 5

Keypad Lockout (J6 pins 8, 9)
Digital Input 6

Block Select A (J7 pins 1, 3)
Digital Input 8

Block Select B (J7 pins 2,3)
Digital Input 9

Block Select C (J7 pins 3,4)
Digital Input 10

Setpoint Direction (J7 pins 3,5)
Digital Input 11

Increment Batch Count (J7 pins 6, 8)
Digital Input 12

Reset Batch Count (J7 pins 7, 8)
Digital Input 13

Remote Scroll Up (J7 pins 8, 9)
Digital Input 14

Remote Scroll Down (J7 pins 8,10)
Digital Input 15

Integral — See Appendix C, MP-48.

Jog — One of four logic inputs. Jog increases the RPMs at the acceleration rate that is specified in Acceleration Time Run (CP-201) until the Jog Setpoint (CP-215) is achieved. When Jog is terminated, there is no deceleration time; the drive motor comes to an immediate stop. This feature is used for brief bursts of speed to align the lead and follower or other fast forward advances.

Keypad Test — See *Troubleshooting/Diagnostics: Hardware Tests, Keypad.*

LCD Screen Display — The screens are displayed on the LCD Display.

Master Mode — A stand-alone control of a single motor. The scaling format allows the operator to enter a setpoint in Engineering Units. The CX-1010 compares the sensor shaft feedback to the scaled setpoint and calculates any speed error. When the CX-1010 finds speed error, the control algorithm adjusts the motor drive's Speed Command Out and reduces the error to zero.

Master Setpoints — See Appendix C, CP-110.

Menu Key — The Menu key accesses the main menu from a sub-menu or status screen, and a sub-menu from a parameter screen.

Mode of Operation — The method used to operate your system, for example, Master mode, Follower mode or Custom Mode.

Monitor Parameters — Monitor Parameters (MP) monitor the performance of the CX-1010 and the system which the CX-1010 is controlling. Monitor Parameters also confirm the wiring, the tuning and perform troubleshooting. Monitor Parameters can be accessed at any time during the CX-1010's operation, including during Run, Jog, R–Stop and F–Stop. *See also* Parameter Code, Parameter Name, Parameter Value or Control Parameters.

		Parameter Name	Parameter Code	Parameter Value
Parameters =	Monitor Parameter	Scaled Feedback	MP-40	0.0 (default)
	Control Parameter	Master Setpoint	CP-110	0 (default)

Numeric Keys — Use the Numeric keys to enter the Parameter Code of either a Control Parameter (CP) or a Monitor Parameter (MP) or to enter a parameter value for a Control Parameter. Use the Enter key to activate the entry. Use the Clear key to delete the entry and clear the parameter value to zero.

NV RAM Test — See *Troubleshooting/Diagnostics: Hardware Tests, Memory.*

Open Loop — A system that is controlled only by inputs without feedback.

Operating State — The systems status within a mode of operation, such as Run, R–Stop, F–Stop or Jog.

Output Monitoring — DO 7..0 (MP-28)

Outputs — Speed Command Out (J3 pins 1, 2)

Zero Speed (J2 pin 2)
Digital Output 0

Hi Speed Alarm (J2 pin 3)
Digital Output 1

Lo Speed Alarm (J2 pin 4)
Digital Output 2
Dev Alarm 1 (J2 pin 5)
Digital Output 3

Dev Alarm 2 (J2 pin 6)
Digital Output 4

Batch Done (J2 pin 7)
Digital Output 5

Control Output Dir (J2 pin 8)
Digital Output 6

Drive Enable (J2 pin 9)
Digital Output 7

Page Up/Down Keys

Some screens have multiple pages. The Page Up/Down keys allow you to scroll through, one page at a time.

Parameter

Parameters are divided into two classifications; Control Parameters (CP) and Monitor Parameters (MP). *See also* Control Parameters or Monitor Parameters.

Parameter Code

A numbered code, by which Control Parameters and Monitor Parameters are referenced, The Code Parameter is cross referenced to its Parameter Name, in the Help screen. Parameters can be accessed by the Code key only by using the Parameter Code. *See also* Parameter Name, Parameter Value, Control Parameters or Monitor Parameters.

Parameter Name

Control Parameters and Monitor Parameters are displayed on the parameter screens by a Parameter Name. They are cross referenced in the Help screens by a Parameter Code. The Parameter Code is required to find a parameter using the Code key. *See also* Parameter Code, Parameter Value, Control Parameters or Monitor Parameters.

Parameter Value

The Parameter Value is the operational data. The CX-1010 comes factory pre-loaded with a complete set of default Parameter Values. When you enter a Parameter Value in the Control Parameter, you enter data that is unique to your system (e.g., encoder resolution, lead to follower ratios) and modify the CX-1010 for your specific needs (e.g., maximum RPMs, setpoints, acceleration/deceleration ramp rates). However, the Parameter Value for Monitor Parameters is only for monitoring; the Parameter Value of a Monitor Parameter can no be changed. Monitor Parameters monitor the performance of the CX-1010 and the system which the CX-1010 is controlling. Monitor Parameters also confirm the wiring, the tuning and perform troubleshooting. *See also* Parameter Code, Parameter Name, Control Parameters or Monitor Parameters.

Parameter Up/Down Keys

Each time you press the Par Up key, the cursor and highlight bar will move up by one line. Each time you press the Par Down key, the cursor will move down by one line. It will also automatically scroll through the lines if you hold the key down.

Ring Kits

Ring Kits are flange motor mounted sensors that measure the pulses per revolution (PPR) of the motor shaft.

RPM Feedback

The operating speed of the follower.

RPM Lead

The operating speed of the lead.

ROM Test	See *Troubleshooting/Diagnostics: Hardware Tests, Memory.*
Run	One of four Logic inputs. Run ramps to the scaled setpoint speed. Run can be activated when the CX-1010 is in R–Stop or F–Stop, however Run cannot be activated when the CX-1010 is in Jog. Run has the third highest operating priority.
R–Stop	One of four Logic inputs. R–Stop decelerates the speed command (analog output) to Zero. R–Stop has the second highest operating priority.
Scaling	Scaling Control Parameters supply the CX-1010 with the information that it needs to calculate the ratio of RPM's to Engineering Units and run at the entered setpoint.
SRAM Test	See *Troubleshooting/Diagnostics: Hardware Tests, Memory.*
Serial Communications	The CX-1010 can interface with a host computer through a RS485 Serial Communications Interface This interface allows the host computer to perform remote computer parameter entry, status or performance monitoring, and remote control of the CX-1010.
Status Screen Key	The Status key will immediately pop-up the status screen from any other screen. To return to the previous screen, press the Status key again.
STD Signal Tests	See *Troubleshooting/Diagnostics: Device Tests, STD Signals Tests.*
Tuning	Tuning stabilizes speed error differences between the setpoint and feedback.
Video Test	See *Troubleshooting/Diagnostics: Hardware Tests, Video.*

—NOTES—

Appendices

APPENDIX A: CX-1010 SPECIFICATIONS

Electrical

AC Power Input:	115 VAC +15% -10% 48 to 62 Hertz 0.250 Amps Maximum 30 Watts Maximum or (switch selectable) 230 VAC +15% -10% 48 to 62 Hertz 0.125 Amps Maximum 30 Watts Maximum
Frequency Inputs(2):	Differential Mode (26LS32): 5 to 15 VDC Operating Voltage 200 mV Differential Input Voltage 100 mV Hysteresis Typical 2.0 kOhm, 1/8 W to 5 V Internal Pullup 0 to 180 kHertz Operating Frequency Quadrature or Single-Channel Optically Isolated (Dig_Com) Single-Ended Mode: Current Sinking 5 to 15 VDC Operating Voltage 2.5 V Switching Threshold 100 mV Hysteresis Typical 2.0 kOhm, 1/8 W to 5 V Internal Pullup 0 to 180 kHertz Operating Frequency Quadrature or Single-Channel Optically Isolated (Dig_Com)
Digital Inputs(16):	Single-Ended (74HC14) Current Sinking 5 to 24 VDC Operating Voltage 3.15 V Rising Edge Threshold Maximum 0.90 V Falling Edge Threshold Minimum 1.0 V Hysteresis Typical 10.0 kOhm, 1/8 W to 5 V Internal Pullup 1 mSec Response Time (DI0 - DI7) 2 mSec Response Time (DI8 - DI15) Optically Isolated (Dig_Com)
Digital Outputs(8):	NPN Darlington (ULN2003) Current Sinking 50 VDC Maximum Operating Voltage 1.0 V Saturation at 200 mA Typical 0.6 V Saturation at 1 mA Typical 200 mA Continuous/Channel 500 mA Peak/Channel (50% Duty Cycle) 750 mA Continuous Total All Channels Internal Freewheeling Diodes 2 mSec Update Rate Optically Isolated (Dig_Com)

(Continued)

Appendix A: CX-1010 Specifications (continued)

Speed Command Output:	±5 V to ±15 V Bipolar Analog Zero/Span Software Calibration 16 Bits Bipolar Resolution (15+Sign) 18 mA Maximum Drive Current Optically Isolated (CO-Com)
Aux. Power Output:	+12 VDC ±5% 150 mA Maximum Optically Isolated (Dig_Com)
Serial Communications:	RS485 Compatible 5 VDC Differential Operation 300 to 19200 Baud Rate Selectable Character Format Half Duplex Optically Isolated (Dig_Com)
Optional Analog I/O:	2 Input Channels/1 Output Channel 0 to 20 mA or ±12 VDC 80 kOhm Input Resistance Voltage Mode 243 Ohm Input Resistance Current Mode 500 Ohm Max Resistance Current Output 15 mA Max Current Voltage Output 16 Bits Resolution ±0.1% Drift Error Typical (50C Range) Zero Monotonic Error Software Calibration NOVRAM Calibration Storage Optically Isolated (Dig_Com)

Physical

Construction:	NEMA4, 4X, 12, 13 IP65 Compatible Frontpanel 14 Line by 21 Character LCD Display Sealed Membrane Keypad Polycarbonate ABS Front Bezel Paint over Zync Plate CRS Enclosure
Overall Dimensions:	19.6 cm (7.7 in) Bezel Height 10.2 cm (4.0 in) Bezel Width 17.8 cm (7.0 in) Total Depth
Panel Dimensions:	18.41 cm (7.25 in) Panel Height Cutout 9.27 cm (3.65 in) Panel Width Cutout 14.50 cm (5.70 in) Panel Inside Depth
Weight:	2.3 kilograms (5.1 Pounds)

(Continued)

Appendix A: CX-1010 Specifications (continued)

<u>Environmental</u>

Operating Temperature:	0 to 55C (32 to 131F) Int. Enclosure 0 to 40C (32 to 104F) Ext. Enclosure
Storage Temperature:	-25 to 70C (-13 to 158F)
Environment:	The CX-1010 shall be installed in a pollution degree 2 macro-environment.
Relative Humidity:	0 to 95% Non-condensing
Altitude:	To 3,300 Feet (1000 Meters)

<u>Performance</u>

Setpoint Resolution:	6 Digits in Engineering Units
Speed Regulation:	0.01% Error in Master Modes (>10Hz) 0.00% Error in Follower Modes (>10Hz) (Zero Error Loop Enabled)
Accel/Decel Ramps:	Settable in Time or Rate 0.1 to 3600.0 Seconds 0.001 to 999,999 EUs/T/Second Separate for Run, Direct, Jog, H-Stop and R-Stop
Limits:	Maximum Speed Minimum Speed Trim Authority Integral Limit Positive Position Error Negative Position Error
Alarms:	Zero Speed Maximum Feedback Maximum Accel/Decel No Response Maximum Feedback Position Programmable Custom Alms (6)

(Continued)

Appendix A: CX-1010 Specifications (continued)

PLC:	64 Program Instructions Total 9 Instruction Types 8 Digital Inputs (DI8-DI15) 8 Digital Outputs (DO0-DO7) 4 Timers 4 Counters 4 Latches
Setpoint Scaling Modes:	Direct Master Inverse Master Offset Master Follower Inverse Follower Offset Follower Custom Setpoint Equation
Digital Inputs:	F-Stop R-Stop H-Stop Run Jog Forward Jog Reverse Keypad Lockout Block Select A Block Select B Block Select C Setpoint Direction (Scaled Ref. Sign) Increment Batch Counter Reset Batch Counter Remote Scroll Up Remote Scroll Down
Digital Outputs:	Zero Speed Hi Speed Alarm Low Speed Alarm Dev Alarm 1 (Ramped Ref-Feedback) Dev Alarm 2 (Scaled Ref-Feedback) Batch Done Control Output Direction Drive Enable
Control Loop Formats:	Velocity Zero Error Loop Position Open Loop
Closed Loop Algorithm:	PID + FF Adaptive or Self-Adjust Feedforward

(Continued)

Appendix A: CX-1010 Specifications (continued)

Control Loop Response:	1mSec Speed and Position Loop 2mSec PLC Functions
Block Parameters:	8 Switch Selectable Parameter Blocks Permissible Setpoint Mode Switching 16 Parameters per Block Full Control Parameter Selection
Device Configuration:	Parameter Load and Store PLC Program Load and Store Status Screen Configuration Serial Communications Format Selectable Keypad Lockout Normal/Reverse Video Video Contrast Adjust Annunciator Enable Std Alm Msk
Diagnostics:	Memory Test Keypad Test Video Test I/O Signal Tests Serial Communications Test Annunciator Test
Help Screens:	Help Screen for all Parameters Displays Minimum, Maximum and Default Summary of Parameter Operation Retrieve Default or Backup Values Decode/Select of Bit Mapped Parameters

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APPENDIX B: FORMULAS

The equations used to scale the Frequency Input 2 signal are given by:

$$\text{MP-8 EU/T} = \text{MP-6}\ \frac{\text{Pulses}}{\text{Second}} * \frac{\text{CP-168 EU's}}{\text{CP-167 Pulses}} * \frac{\text{X Seconds}}{\text{CP-109 , ,Sec, Min, Hour}}$$

written with parameter text:

$$\text{FI2 EU/Tm} = \text{FI2 Hz} * \frac{\text{EU FI2}}{\text{FI2 Pulses}} * \frac{\text{X Seconds}}{\text{Time Base}}$$

where X = 1 for CP-109 = 0, None
X = 1 for CP-109 = 1, Second
X = 60 for CP-109 = 2, Minute
X = 3600 for CP-109 = 3, Hour

FI2 EU/Tm (MP-08) given in EU/T is routed to Fb EU/Tm (MP-39) when the Fb Source (CP-103) is set equal to FI2 (1). Fb EU/Tm (MP-39) is subsequently used as feedback under control.

$$\text{MP-7 RPM} = \text{MP-6}\ \frac{\text{Pulses}}{\text{Second}} * \frac{\text{1 Rev}}{\text{CP-166 Pulses}} * \frac{\text{60 Seconds}}{\text{Minute}}$$

written with parameter text:

$$\text{FI2 RPM} = \text{FI2 Hz} * \frac{1}{\text{PPR FI2}} * \frac{\text{60 Seconds}}{\text{Minute}}$$

$$\text{MP-10 EUs'} = \text{MP-9 Counts} * \frac{\text{X Pulses (CP-165)}}{\text{Count}} * \frac{\text{CP-168 EU}}{\text{CP-167 Pulse}}$$

written with parameter text:

$$\text{FI2 Psn} = \text{FI2 Cnts} * \frac{\text{X Pulses (CP-165)}}{\text{Count}} * \frac{\text{EU FI2}}{\text{FI2 Pulses}}$$

where X = 4 for CP-165 = 1, Quad (quadrature mode)
X = 1 for CP-165 = 2, Incr (incremental mode)

Keep in mind that FI2 Psn is not used directly in follower mode position loop control. The scaling is included in the ratio calculation for more accurate results. This further justifies using integers when possible for the scaling numbers.

(Continued)

Appendix B: Formulas (continued)

The equations used to scale the Frequency Input 1 signal are given by:

$$\text{MP-3 EU/T} = \frac{\text{MP-1 Pulses}}{\text{Second}} * \frac{\text{CP-163 EU's}}{\text{CP-162 Pulses}} * \frac{\text{X Seconds}}{\text{CP-109, Sec, Min, Hour}}$$

written with parameter text:

$$\text{FI1 EU/Tm} = \text{FI1 Hz} * \frac{\text{EU FI1}}{\text{FI1 Pulsees}} * \frac{\text{X Seconds}}{\text{Time Base}}$$

where X = 1 for CP-109 = 0, None
X = 1 for CP-109 = 1, Second
X = 60 for CP-109 = 2, Minute
X = 3600 for CP-109 = 3, Hour

FI1 EU/Tm (MP-03) given in EU/T is multiplied by the ratio (given by CP-124) to obtain the desired speed in follower applications with the Ld Source (CP-104) is set equal to FI1 (1).

$$\text{MP-2 RPM} = \text{MP-1}\ \frac{\text{Pulses}}{\text{Second}} * \frac{\text{1 Rev}}{\text{CP-161 Pulses}} * \frac{\text{60 Seconds}}{\text{Minute}}$$

written with parameter text:

$$\text{FI1 RPM} = \text{FI1 Hz} * \frac{1}{\text{PPR FI1}} * \frac{\text{60 Seconds}}{\text{Minute}}$$

$$\text{MP-5 EUs'} = \text{MP-4 Counts} * \frac{\text{X Pulses (CP-160)}}{\text{Count}} * \frac{\text{CP-163 EU}}{\text{CP-162 Pulse}}$$

written with parameter text:

$$\text{FI1 Psn} = \text{FI1 Cnts} * \frac{\text{X Pulses (CP-160)}}{\text{Count}} * \frac{\text{EU FI1}}{\text{FI1 Pulses}}$$

where X = 4 for CP-160 = 1, Quad (quadrature mode)
X = 1 for CP-160 = 2, Incr (incremental mode)

Keep in mind that FI1 Psn is not used directly in follower mode position loop control. The scaling is included in the ratio calculation for more accurate results. This further justifies using integers when possible for the scaling numbers.

(Continued)

The equations used to scale the Auxiliary Analog Input 1 signal are given by:

$$\text{MP-13 EU/T} = \text{SS\_AIN1} * \text{MP-12 volts(or mA)} + \text{SI\_AIN1}$$

written with parameter text:

$$\text{AI1 Eu/Tm} = \text{SS\_AIN1} * \text{AI1 Signal} + \text{SI\_AIN1}$$

where

$$\text{SS\_AIN1} = \frac{\text{CP-174} - \text{CP-172} \quad \text{EU/T}}{\text{CP-173} - \text{CP-171 volts(or mA)}} \quad \text{is the Scaling Slope}$$

written with parameter text:

$$\text{SS\_AIN1} = \frac{\text{EU@AI1 RB} - \text{EU@AI1 RA}}{\text{AI1 RB} - \text{AI1 RA}}$$

$$\text{SI\_AIN1} = \frac{\text{CP-172} * \text{CP-173} - \text{CP-174} * \text{CP-171} \quad \text{EU/T}}{\text{CP-173} - \text{CP-171}} \quad \text{is the Scaling Intercept}$$

written with parameter text:

$$\text{SI\_AIN1} = \frac{\text{EU@AI1 RA} * \text{AI1 RB} - \text{EU@AI1 RB} * \text{AI1 RA}}{\text{AI1 RB} - \text{AI1 RA}}$$

and AI1 Signal (MP-12) is assumed to be a calibrated value.

(Continued)

Appendix B: Formulas (continued)

The equations used to scale the Auxiliary Analog Input 2 signal are given by:

MP-16 EU/T = SS_AIN2 * MP-15 volts(or mA) + SI_AIN2

written with parameter text:

AI2 Speed = SS_AIN2 * AI2 Signal + SI_AIN2

where

$$\text{SS\_AIN2} = \frac{\text{CP-179} - \text{CP-177} \quad \text{EU/T}}{\text{CP-178} - \text{CP-176 volts(or mA)}}$$ is the Scaling Slope

written with parameter text:

$$\text{SS\_AIN2} = \frac{\text{EU@AI2 RB} - \text{EU@AI2 RA}}{\text{AI2 RB} - \text{AI2 RA}}$$

$$\text{SI\_AIN2} = \frac{\text{CP-177} * \text{CP-178} - \text{CP-179} * \text{CP-176} \quad \text{EU/T}}{\text{CP-178} - \text{CP-176}}$$ the Scaling Intercept

written with parameter text:

$$\text{SI\_AIN2} = \frac{\text{EU@AI2 RA} * \text{AI2 RB} - \text{EU@AI2 RB} * \text{AI2 RA}}{\text{AI2 RB} - \text{AI2 RA}}$$

and AI2 Signal (MP-15) is assumed to be a calibrated value.

(Continued)

Appendix B: Formulas (continued)

The equations used to scale the Auxiliary Analog output signal are given by:

MP-25 volts(or mA) = SS_AO * MP (selected by CP-184) + SI_AO

written with parameter text:

AO Signal = SS_AO * MP (selected by CP-184) + SI_AO

where

$$SS\_AO = \frac{\text{CP-188 - CP-186 volts (or mA)}}{\text{CP-189 - CP-187 in selected MP units}}$$ is the Scaling Slope

written with parameter text:

$$SS\_AO = \frac{\text{AO RB - AO RA}}{\text{Val@AO RB - Val@AO RA}}$$

$$SI\_AO = \frac{\text{CP-186 * CP-189 - CP-188 * CP-187}}{\text{CP-189 - CP-187}}$$ is the Scaling Intercept

written with parameter text:

$$SI\_AO = \frac{\text{AO RA * Val@AO RB - AO RB * Val@AO RA}}{\text{Val@AO RB - Val@AO RA}}$$

The AO is assumed calibrated so that the actual voltage (or current) is reflected by AO Signal (MP-25).

—NOTES—

APPENDIX C: PARAMETER SUMMARY
NUMERIC QUICK REFERENCE

MP-01 FI1 HZ

Frequency Input 1 Hertz (MP-01) displays the current frequency of the Frequency Input 1, in Hertz.

Minimum Value: -120000   Maximum Value: 120000
Units: Hertz

MP-02 FI1 RPM

Frequency Input 1 RPM (MP-02) displays the current speed of the Frequency Input 1 encoder in RPM relative to PPR FI1 (CP-161).

Minimum Value: -999999   Maximum Value: 999999
Units: RPM

MP-03 FI1 EU/TM

Frequency Input 1 Engineering Units per Time (MP-03) displays the current speed of the Frequency Input 1 in the Engineering Units per Time (EU/Tm) relative to the FI1 Pulses (CP-162), EU FI1 (CP-163) and Time Base (CP-109). The placement of the decimal point is the same as the placement of the decimal point in Master SP (CP-110).

Minimum Value: -999999   Maximum Value: 999999
Units: EU/Tm

MP-04 FI1 CNTS

Frequency Input 1 Counts (MP-04) displays the present value of the Frequency Input 1 Position (MP-05) in encoder edges (counts) if Count Mode FI1 (CP-160) is set to “Quad x4”. Frequency Input 1 Counts (MP-04) displays the present value of the Frequency Input 1 Position in pulses if Count Mode FI1 (CP-160) is set to “Incremental”.

Minimum Value: -999999   Maximum Value: 999999
Units: Counts

MP-05 FI1 PSN

Frequency Input 1 Position (MP-05) displays the present value of the Frequency Input 1 Position (MP-05) in Engineering Units, as specified by FI1 Pulses (CP-162) and EU FI1 (CP-163). The placement of the decimal point is the same as the placement of the decimal point in EU FI1 (CP-163).

Minimum Value: -999999   Maximum Value: 999999
Units: EU

(Continued)

MP-06 FI2 HZ

Frequency Input 2 Hz (MP-06) displays the present frequency of the Frequency Input 2, in Hertz.

Minimum Value: -120000 Maximum Value: 120000
Units: Hertz

MP-07 FI2 RPM

Frequency Input 2 RPM (MP-07) displays the current speed of the Frequency Input 2 encoder in RPM relative to PPR FI2 (CP-166).

Minimum Value: -999999 Maximum Value: 999999
Units: RPM

MP-08 FI2 EU/TM

Frequency Input 2 Engineering Units per Time (MP-08) displays the current speed of the Frequency Input 2 in the Engineering Units per Time (EU/Tm) relative to the FI2 Pulses (CP-167), EU FI2 (CP-168) and Time Base (CP-109). The placement of the decimal point is the same as the placement of the decimal point in Master SP (CP-110).

Minimum Value: -999999 Maximum Value: 999999
Units: Counts

MP-09 FI2 CNTS

Frequency Input 2 Counts (MP-09) displays the present value of the Frequency Input 2 Position (CP-10) in encoder edges (counts) if Count Mode FI2 (CP-165) is set to “Quad x4”. Frequency 2 Counts displays the present value of the Frequency Input 2 Position (CP-10) in pulses if Count Mode FI2 (CP-165) is set to is set to “Incremental”.

Minimum Value: -999999 Maximum Value: 999999
Units: Counts

MP-10 FI2 PSN

Frequency Input 2 Position (MP-10) displays the present value of the Frequency Input 2 Position (CP-10) in Engineering Units, as specified by FI2 Pulses (CP-167) and EU FI2 (CP-168). The placement of the decimal point is the same as the placement of the decimal point in EU FI2 (CP-168).

Minimum Value: -999999 Maximum Value: 999999
Units: EU

MP-11 AI1 BITS

Analog Input 1 Bits (MP-11) displays the present value in ADC bits of Auxiliary Board Analog Input 1 signal.

Minimum Value: -8192 Maximum Value: 8192
Units: Bits

(Continued)

MP-12 AI1 SIGNAL

Analog Input 1 Signal (MP-12) displays the present value of the Auxiliary Board Analog Input 1 signal in either volts or milliamps relative to which setting (volts or current) has been entered in AI1 MODE (CP-170).

Minimum Value: -12 Maximum Value: 20
Units: Volt or Milliamps

MP-13 AI1 EU/TM

Analog Input 1 EU/Tm (MP-13) displays the present value of the Auxiliary Board Analog Input 1 signal in Engineering Units per Time (EU/Tm) as relative to the AI1 RA (CP-171), EU@AI1 RA (CP-172), AI1 RB (CP-173), EU@AI1 RB (CP-174) and Time Base (CP-109). The placement of the decimal point is the same as the placement of the decimal point in EU@AI1 RA (CP-172).

Minimum Value: -999999 Maximum Value: 999999
Units: EU/Tm

MP-14 AI2 BITS

AI2 Bits (MP-14) displays the present value in ADC bits of Auxiliary Board Analog Input 2 signal.

Minimum Value: -8192 Maximum Value: 8191
Units: Bits

MP-15 AI2 SIGNAL

Analog Input 2 Signal (MP-15) displays the present value of the Auxiliary Board Analog Input 2 signal in either volts or milliamps, relative to which setting (volts or current) has been entered in AI2 MODE (CP-175).

Minimum Value: -12 Maximum Value: 20
Units: Volt or Milliamps

MP-16 AI2 EU/TM

Analog Input 2 EU/Tm (MP-16) displays the present value of the Auxiliary Board Analog Input 2 signal in Engineering Units per Time (EU/Tm) relative to the AI2 RA (CP-176), EU@AI2 RA (CP-177), AI2 RB (CP-178), EU@AI2 RB (CP-179) and Time Base (CP-109). The placement of the decimal point is the same as the placement of the decimal point in EU@AI2 RA (CP-176).

Minimum Value: -999999 Maximum Value: 999999
Units: EU/Tm

MP-17 ANLGCAL REF A

Analog Calibration Reference A (MP-17) displays the Analog Reference Value (CP-363) for the signal (AI1, AI2, AO), which was selected in Analog Calibration Select (CP-361) and which was stored during the calibration of point A.

Minimum Value: -15 Maximum Value: 25
Units: Volt or Milliamps

(Continued)

MP-18 ANLGCAL REF B

Analog Calibration Reference B (MP-18) displays the Analog Reference Value (CP-363) for the signal (AI1, AI2, AO), which was selected in Analog Calibration Select (CP-361) and which was stored during the calibration of point B.

Minimum Value: -15 Maximum Value: 25
Units: Volt or Milliamps

MP-20 CO BITS

Control Output Bits (MP-20) displays the present value, in DAC bits, of the CO_SIG Analog Output signal.

Minimum Value: -32768 Maximum Value: 32767
Units: Bits

MP-21 CO VOLTS

Control Output Volts (MP-21) displays the present value, in volts, of the CO_SIG Analog Output signal.

Minimum Value: -15 Maximum Value: 25
Units: Volt or Milliamps

MP-22 CO MAX BITS

The Control Output Maximum Bits (MP-22) corresponds to the voltage setting in Control Output Maximum Volts (CP-181) for the CO_SIG Analog Output signal, relative to the Control Output DAC Range (MP-23). This is a magnitude only.

Minimum Value: 0 Maximum Value: 32767
Units: Bits

MP-24 AO BITS

Analog Output Bits (MP-24) displays the present value, in DAC Bits, of the Auxiliary Analog Output.

Minimum Value: -32768 Maximum Value: 32767
Units: Bits

(Continued)

Appendix C: Parameter Summary Numeric Quick Reference (continued)

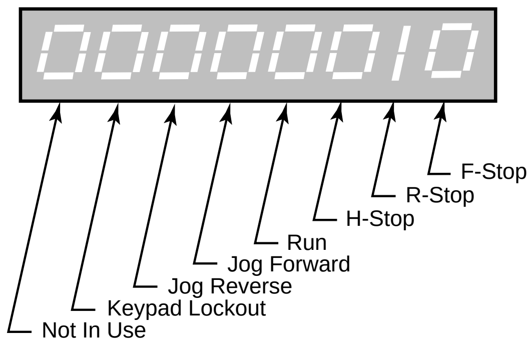
MP-25 AO SIGNAL

Analog Output Signal (MP-25) displays the present value, in either volts or milliamps of the Auxiliary Analog Output, relative to AO Mode (CP-185).

Minimum Value: -12   Maximum Value: 20
Units: Volt or Milliamps

MP-26 DI 7..0

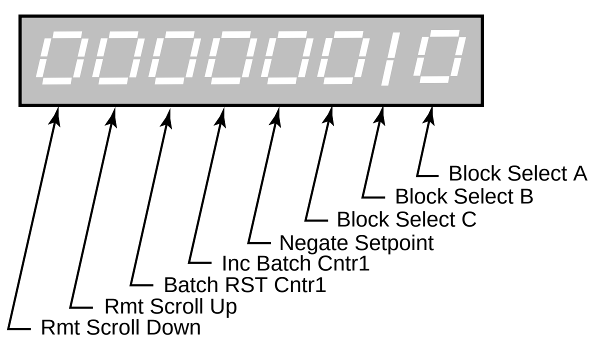
Digital Input 7..0 displays the value of the "J6" digital inputs. A '1' in the bit location (see graphic below) indicates a "low voltage" condition on the corresponding input (which is consistent with a contact closure to common).



Minimum Value: 00000000   Maximum Value: 01111111
Units: Coded

MP-27 DI 15..8

Digital Input 15..8 (MP-27) displays the value of the "J7" digital inputs. A '1' in the bit location (see graphic below) indicates a "low voltage" condition on the corresponding input (which is consistent with a contact closure to common). These eight Inputs can be set up in the PLC Programming screen to generate a One-Shot -Pulse on a high-to-low transition.

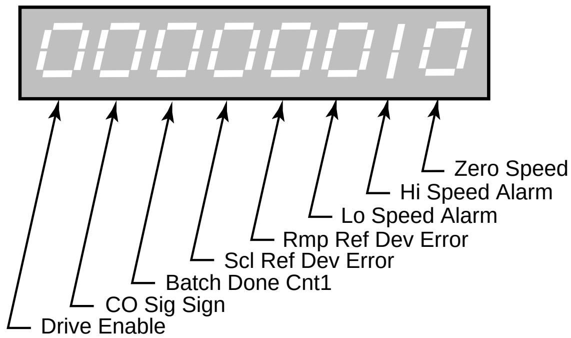


Minimum Value: 00000000   Maximum Value: 11111111
Units: Coded

(Continued)

MP-28 DO 7..0

Digital Output 7..0 displays the value of the "J2" digital outputs. A '1' in the bit location (see graphic below) indicates an active "low voltage" condition on the corresponding open collector output (which would sink DC current).



Minimum Value: 00000000 Maximum Value: 11111111
Units: Coded

MP-29 KEYPAD LOCKOUT

Keypad Lockout (MP-29) displays the Keypad Lockout status. The Keypad Lockout is active when "On" is displayed. When Keypad Lockout is active, Control Parameter values can not be changed, with the exception of the Control Parameters that are exempted by CP's 380-389. The Keypad Lockout is not active when "OFF" is displayed. When the Keypad Lockout is not active, any Control Parameter can be changed.

Minimum Value: 0 Maximum Value: 1
Units: Coded

MP-30 SCPARM VAL

Scaled Parameter Value (MP-30) displays the value of the Scaled Parameter (CP-193). The placement of the decimal point is the same as the placement of the decimal point in Sc Parm B (CP-196).

Minimum Value: -999999 Maximum Value: 999999
Units: User Scaled

MP-34 PSNERR

Position Error (MP-34) displays the value, in engineering units, of the accumulated position error between the lead (FI1) and the feedback (FI2) input signals. The placement of the decimal point is the same as the placement of the decimal point in EU FI2 (CP-168).

Minimum Value: -999999 Maximum Value: 999999
Units: EU

(Continued)

MP-35 PSNERRCNT

Position Error Count (MP-35) displays the value, in encoder counts, of the accumulated position error between the lead (FI1) and feedback (FI2) input signals.

Minimum Value: -999999 Maximum Value: 999999
Units: Counts

MP-38 LD EU/TM

Lead EU/Tm (MP-38) displays the current lead, in engineering units per time, as determined by the signal scaling for the selected lead signal (refer to CP -104). The resolution is set the same as that of Master SP (CP-110).

Minimum Value: -999999 Maximum Value: 999999
Units: EU/Tm

MP-39 FB EU/TM

Feedback EU/Tm (MP-39) displays the feedback, in engineering units per time, that was scaled for the feedback signal that was selected in Fb Source (CP -103). The placement of the decimal point is the same as the placement of the decimal point in Master SP (CP-110).

Minimum Value: -999999 Maximum Value: 999999
Units: EU/Tm

MP-40 SCALED FB

Scaled Feedback (MP-40) displays the scaled feedback , which is scaled per ScFb Eq(CP-190), ScFb EU (CP-191) and Fb @ ScFb EU (CP-192). The placement of the decimal point is the same as the placement of the decimal point in ScFb EU (CP-191).

Minimum Value: -999999 Maximum Value: 999999
Units: User Scaled

MP-41 SCALED REF

Scaled Reference (MP-41) displays the reference speed, in feedback Engineering Units per Time. This is the calculated setpoint before the accel/decel ramps are applied. The placement of the decimal point is the same as the placement of the decimal point in Master SP (CP-110).

Minimum Value: -999999 Maximum Value: 999999
Units: EU/Tm

MP-42 RAMPED REF

Ramped Reference (MP-42) displays the speed command, in feedback Engineering Units per Time. This is the output of the ramp calculations. When the ramp has been completed, the Ramped Reference (MP-42) should equal the Scaled Reference (MP-41).

Minimum Value: -999999 Maximum Value: 999999
Units: EU/Tm

(Continued)

MP-43 SR ERROR

Scaled Reference Error (MP-43) displays the speed error between the Scaled Reference (MP-41) and the Fb EU/Tm (MP-39).

Minimum Value: -999999 Maximum Value: 999999
Units: EU/Tm

MP-44 RR ERROR

Ramped Reference Error (CP-44) displays the speed error in engineering units per time. This is the Ramped Reference (MP-42) minus the Fb EU/Tm (MP-39). The Ramped Reference is the current speed command.

Minimum Value: -999999 Maximum Value: 999999
Units: EU/Tm

MP-45 CNTRL LOOP

Control Loop (MP-45) displays the type of loop (see list below) that is in current use. Only one type of loop can be active at a time.

5 = Psn Hld (H-Stop Position Loop)
4 = ZE Hld (H-Stop ZE Position Loop)
3 = Psn (Position Loop)
2 = ZE Psn (Zero Error Loop)
1 = Vel (Velocity Loop)
0 = OL (Open Loop)

Minimum Value: 0 Maximum Value: 5
Units: Coded

MP-46 FEEDFORWARD

Feedforward (MP-46) displays the value of the feedforward term in CO DAC bits.

Minimum Value: -32768 Maximum Value: 32767
Units: Bits

MP-47 TRIM OUT

Trim Out (MP-47) displays the value of the output of the PID compensator. Trim Out is displayed in CO DAC bits.

Minimum Value: -32768 Maximum Value: 32767
Units: Bits

MP-48 INTEGRAL

Integral (MP-48) displays the value of the integral term (i.e., integrator error sum times the Ki VL constant) of the PID compensator. Integral is displayed in CO DAC bits.

Minimum Value: -32768 Maximum Value: 32767
Units: Bits

(Continued)

MP-49 ESTMAXFB

Estimated Maximum Feedback (MP-49) displays the estimated maximum RPM, which the CX-1010 calculates during the Kff adjustment, by referencing the CO Max Volts (CP-181), the CO Volts (MP-31) and the Fb EU/Tm (MP-39). Use Estimated Maximum Feedback (MP-49) to determine if the drive and CO_SIG are scaled correctly.

Minimum Value: 0 Maximum Value: 999999
Units: RPM

MP-50 STATE

State (MP-50) displays the present operating state of the CX-1010 (see list below). Only one operating state may be active at a time. To access either the "Run" or the "Jog" operating state, the F-Stop, R-Stop and H-Stop inputs must be closed.

7 = Diagnostics
6 = Not used - reserved
5 = JOG (Rvs)
4 = JOG (Fwd)
3 = RUN
2 = H-Stop
1 = R-Stop
0 = F-Stop

Minimum Value: 0 Maximum Value: 7
Units: Coded

MP-51 ACTIVE BLOCK

Active Block (MP-51) displays the active block (0-7). The block can be selected and made active by the Block select bits (Blk Sel A,B.C), in the PLC Programming screen if Block Select Source (CP-378) is set to "1" (DigIn & PLC). Or the block can be selected and made active by the keypad if Block Select Source (CP-378) is set to "2" (Keypad Blk Sel).

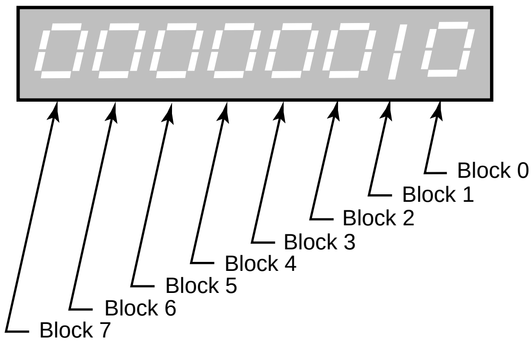
Minimum Value: 0 Maximum Value: 7
Units: Coded

(Continued)

Appendix C: Parameter Summary Numeric Quick Reference (continued)

MP-52 INVALIDBLKS

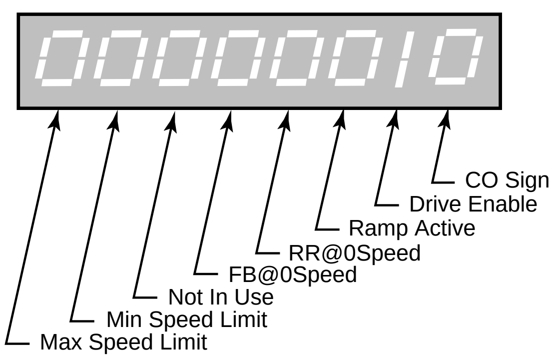
InvalidBlks (MP-52) displays the status of the blocks in the Block Setup screens. A "1" indicates that there is an error with the corresponding block (see graphic below). Generally, this indicates that an overflow condition can occur if the corresponding block is activated. In addition, since other parameters are used in conjunction with the Block Parameters that you selected, an error can result from a parameter that is not selected in Block Parameters. If a bad block is activated, the CX-1010 will execute an F-Stop until either the block error is corrected or a another block is activated.



Minimum Value: 00000000 Maximum Value: 11111111
Units: Coded

MP-53 MISC STATUS

Miscellaneous Status (MP-53) displays various status conditions (see graphic below). A "1" in the CO Sign bit indicates a negative command output. A "1" in any other bit location indicates an active condition.

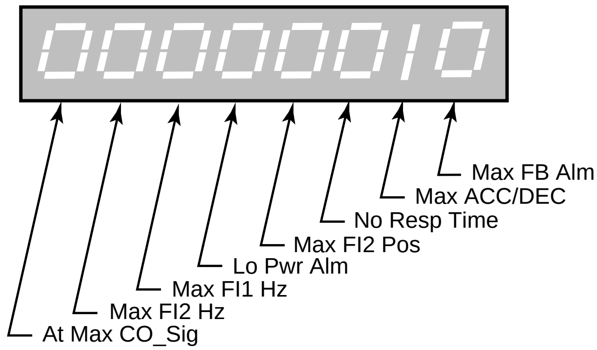


Minimum Value: 00000000 Maximum Value: 11011111
Units: Coded

(Continued)

MP-54 STD ALARMS

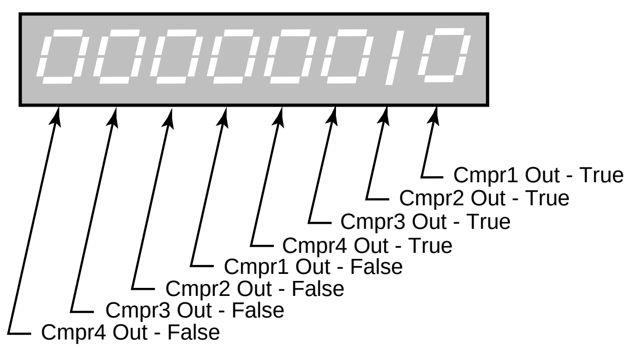
Std Alarms (MP-54) displays various alarm conditions (see graphic below). A "1" in any bit location indicates an active condition.



Minimum Value: 00000000 Maximum Value: 11111111
Units: Coded

MP-55 CUSTOM ALMS

Custom Alarms (MP-55) displays the outputs of the PLC numerical comparators. A "1" in bit locations 0-3 indicates that the result of the compare (Cmprx Parm value vs. Cmprx Val) is true for the given Cmprx Type. A "1" in bit locations 4-7 indicates that the result of the compare (Cmprx Parm value vs. Cmprx Val) is false for the given Cmprx Type (the NOT is true). Refer to CP-280 through CP-295.



Minimum Value: 00000000 Maximum Value: 11111111
Units: Coded

MP-57 TMR4 TIME

Timer 4 Time (MP-57) displays the elapsed time, in seconds, for Timer 4 during the delay part of its operation.

(Continued)

MP-58 PLC MON 1 VAL

PLC Monitor 1 Value (MP-58) displays both the description and the value of the PLC bit that was selected in PLC Monitor 1 (CP-305). Please note that a description of the PLC bit appears on the display line instead of the parameter name (PLC Mon 1 Val).

Minimum Value: 0 Maximum Value: 1
Units: Coded

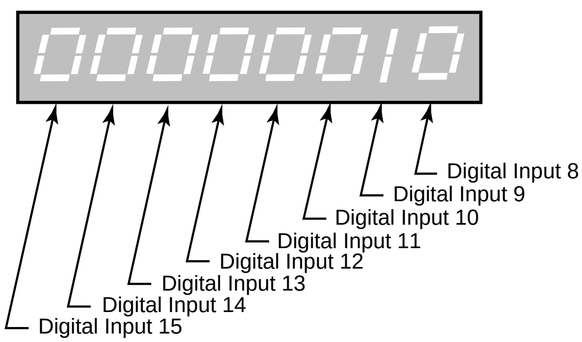
MP-59 PLC MON 2 VAL

PLC Monitor 2 Value (MP-59) displays both the description and the value of the PLC bit that was selected in PLC Monitor 2 (CP-306). Please note that a description of the PLC bit appears on the display line instead of the parameter name (PLC Mon 2 Val).

Minimum Value: 0 Maximum Value: 1
Units: Coded

MP-60 PLC 15-8

PLC 15- 8 (MP-60) displays the status of PLC bits 15-8 (See graphic and list below). A “1” in any bit indicates that the input is “active”. The digital inputs are active low.



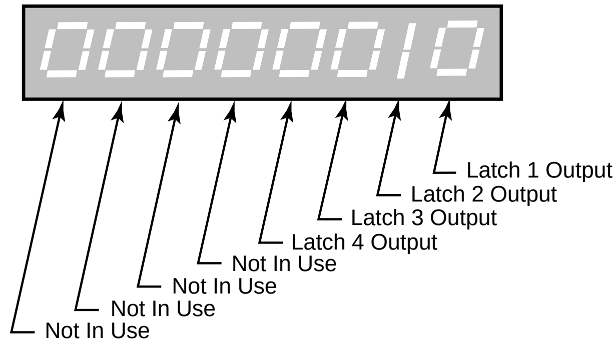
Description	Default Function
Digital Input 8	Block Select A (CP-378, MP-51)
Digital Input 9	Block Select B (CP-378, MP-51)
Digital Input 10	Block Select C (CP-378, MP-51)
Digital Input 11	Negate Scaled Reference (MP-41)
Digital Input 12	Increment Batch Count (Counter 1, CP-320, 321)
Digital Input 13	Batch Reset (Counter 1, CP-321)
Digital Input 14	Remote Scroll Up (CP-300, 301)
Digital Input 15	Remote Scroll Down (CP-300, 301)

Minimum Value: 00000000 Maximum Value: 11111111
Units: Coded

(Continued)

MP-61 PLC 23-16

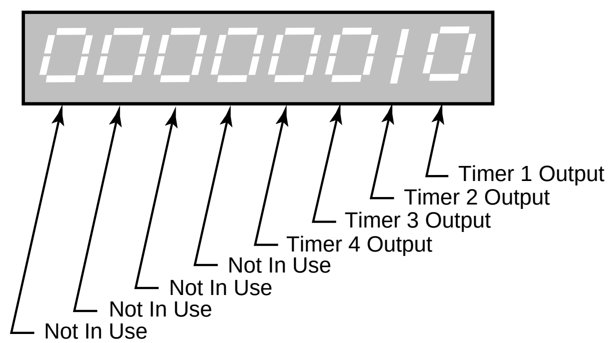
PLC 23-16 (MP-61) displays the status of the internal PLC status bits 23-16 (See graphic below). A “1” in any bit indicates that the bit is “active”.



Minimum Value: 00000000 Maximum Value: 00001111
Units: Coded

MP-62 PLC 31-24

PLC 31-24 (MP-62) displays the status of the internal PLC status bits 31-24 (See graphic below). . A “1” in any bit indicates that the bit is “active”



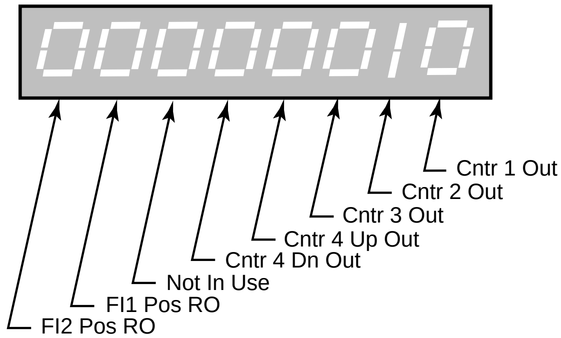
Minimum Value: 00000000 Maximum Value: 00001111
Units: Coded

(Continued)

Appendix C: Parameter Summary Numeric Quick Reference (continued)

MP-63 PLC 39-32

PLC 39-32 (MP-63) displays the status of the internal PLC status bits 39-32 (See graphic below). A “1”   in any bit indicates that the bit is “active”



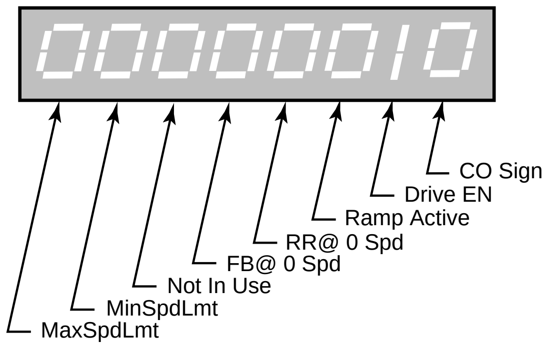
Bit Name	Description
Cntr1 Out	Counter 1 Output
Cntr2 Out	Counter 2 Output
Cntr3 Out	Counter 3 Output
Cntr4UpO	Counter 4 Up counter Output
Cntr4DnO	Couter 4 Down counter Output
Not In Use	
FI1PsnRO	FI1 reached FI1PsnRO (CP-268) = FI1 Rollover Position (one-shot)
FI2PsnRO	FI2 reached FI2PsnRO (CP-269) = FI2 Rollover Position (one-shot)

Minimum Value: 00000000   Maximum Value: 11011111
Units: Coded

(Continued)

MP-64 PLC 47-40

PLC 47-40 (MP-61) displays the status of the internal PLC status bits 47-40 (See graphic below). A "1" in any bit indicates that the bit is "active"



Bit Name	Description
CO Sign	Command Output sign
Drive En	Drive Enable
Ramp Active	Ramp is active
RR @ 0 Spd	Ramp Reference (MP-42) less than Zero Speed (CP-270)
Fb @ 0 Spd	Feedback (MP-39) less than Zero Speed (CP-270)
Not In Use	
MinSpdLmt	Scaled Reference is clamped at Min Spd Lmt (CP-251)
MaxSpdLmt	Scaled Reference is clamped at Max Spd Lmt (CP-250)

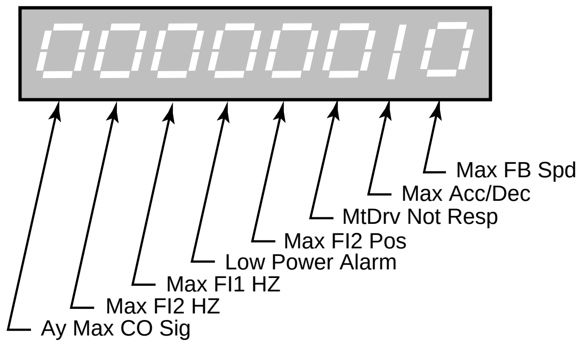
Minimum Value: 00000000   Maximum Value: 11011111
Units: Coded

(Continued)

Appendix C: Parameter Summary Numeric Quick Reference (continued)

MP-65 PLC 55-48

PLC 55-48 (MP-61) displays the status of the internal PLC status bits 55-48 (See graphic below). A "1"   in any bit indicates that the bit is "active".

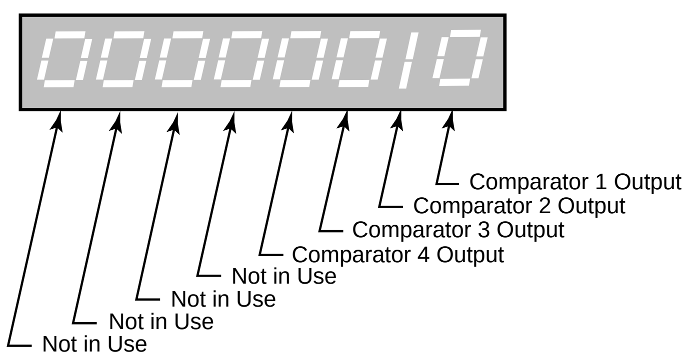


Bit Name	Description
MaxFb Spd	Fb EU/Tm (MP-39) greater than Max Fb Alm (CP-271)
Max Acl/Dcl	Fb Ac/Dcl greater than Max Acl/Dcl (CP-272)
MtrNResp	Fb @ 0 Speed & CO-Sig Volts > (CO Max Volts/16) in Run or Jog
Max FI2 Psn	Magnitude (FI2 Position) > Max FI2 Psn (CP-274)
Low Power Alm	Low Power-supply voltage Detected
Max FI1 Hz	FI1 Frequency > Max allowed Frequency = 120 KHz
Max FI2 Hz	FI2 Frequency > Max allowed Frequency = 120 KHz
At Max CO	CO_SIG Volt railed at + or - CO Max volts

Minimum Value: 00000000   Maximum Value: 11111111
Units: Coded

MP-66 PLC 63-56

PLC 63-56 (MP-66) displays the status of the internal PLC status bits 63-56 (See graphic below). A "1"   in any bit indicates that the bit is "active".

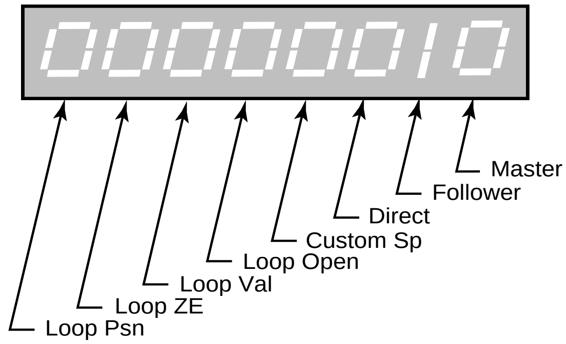


Minimum Value: 00000000   Maximum Value: 00001111
Units: Coded

(Continued)

MP-67 PLC 71-64

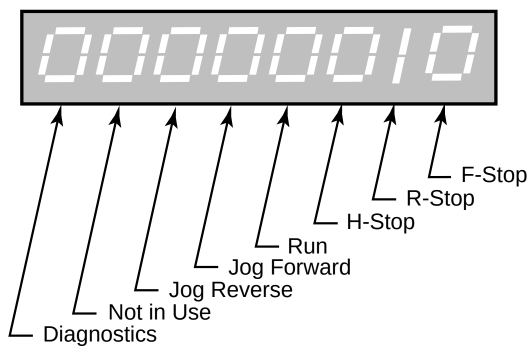
PLC 71-64 (MP-66) displays the status of the internal PLC status bits 71-64.



Minimum Value: 00000000 Maximum Value: 11111111
Units: Coded

MP-68 PLC 79-72

PLC 79-72 (MP-68) displays the status of the internal PLC status bits 79-72 (See graphic below). A “1”   in any bit indicates that the bit is “active”. These bits are only used to monitor the operating state of the CX-1010.

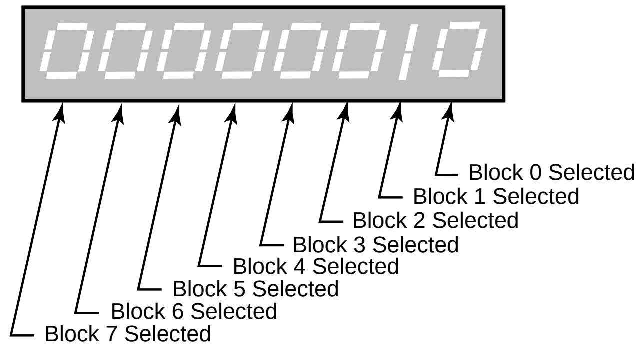


Minimum Value: 00000000 Maximum Value: 10111111
Units: Coded

(Continued)

MP-69 PLC 87- 80

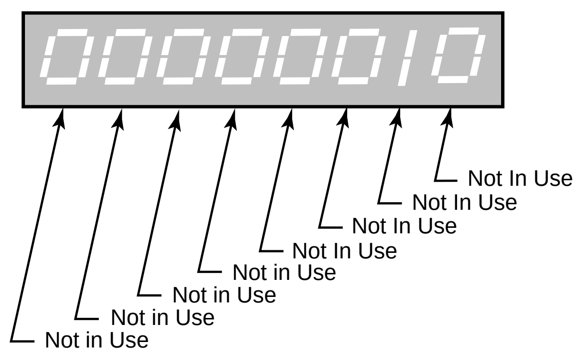
PLC 87-80 (MP-69) displays the status of the internal PLC status bits 87-80 (See graphic below). A “1” in any bit indicates that the bit is “active”. These bits are only used to monitor the parameter block that is active.



Minimum Value: 00000000 Maximum Value: 11111111
Units: Coded

MP-70 PLC 95- 88

PLC 95-88 (MP-70) displays the status of the internal PLC status bits 95-88. None of these bits are presently active. They are reserved for future use.

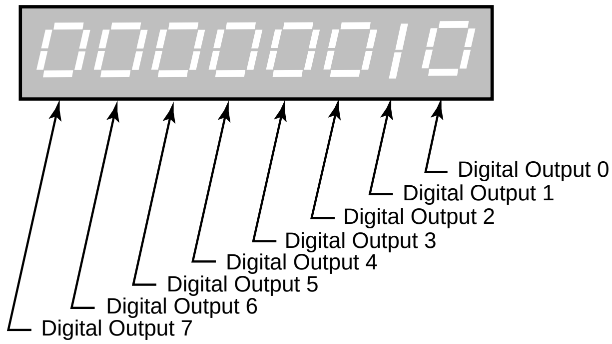


Minimum Value: 00000000 Maximum Value: 00000000
Units: Coded

(Continued)

MP-71 PLC 107-100

PLC 107- 100 (MP-71) displays the status of PLC bits 107-100 (See graphic and list below).   A “1” in any bit indicates that the output is “active”. The digital outputs are active low (current sinking).

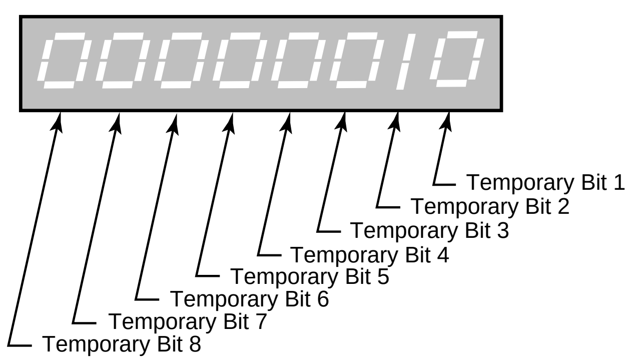


Bit Name	Description	Default Function
DO_0	Digital Output 0	/Zero Speed (CP-270)
DO_1	Digital Output 1	/Hi Speed Alarm (cmpr1, CP-292)
DO_2	Digital Output 2	/Lo Speed Alarm (cmpr2, CP-293)
DO_3	Digital Output 3	/Ramp Ref Dev Error (cmpr3, CP-294)
DO_4	Digital Output 4	/Scaled Ref Dev Error (cmpr4, CP-295)
DO_5	Digital Output 5	/Batch Done (Counter1, CP-320,321)
DO_6	Digital Output 6	/CO_SIG Sign (Active Low = Negative)
DO_7	Digital Output 7	/Drive Enable

Minimum Value: 00000000 Maximum Value: 11111111
Units: Coded

MP-72 PLC 115-108

PLC 115-08 (MP-72) displays the status of the internal PLC control bits 115-108 (See graphic below).   A “1” in any bit indicates that the bit is “active”. These internal bits (control relays) can be used as global “control relays”.   For example, they can be used to create one-shots or latches. They can also be used to simplify programming.

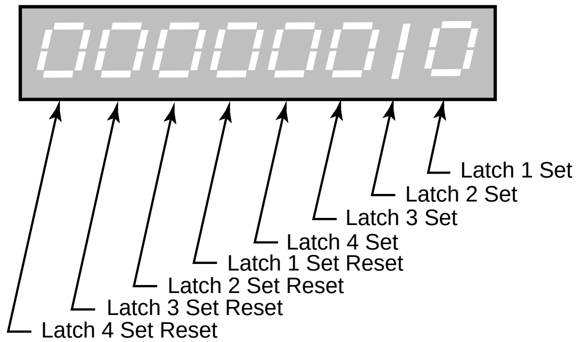


Minimum Value: 00000000 Maximum Value: 11111111
Units: Coded

(Continued)

MP-73 PLC 123-116

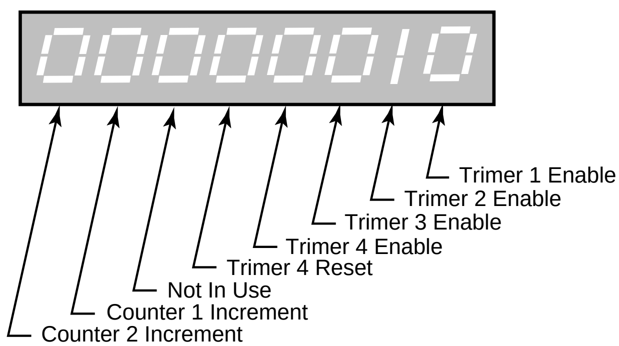
PLC 123-116 (MP-73) displays the status of the internal PLC control bits 123-116 (See graphic below). A "1" in any bit indicates that the bit is "active".



Minimum Value: 00000000 Maximum Value: 11111111
Units: Coded

MP-74 PLC 131-124

PLC 131-124 (MP-74) displays the status of the internal PLC control bits 131-124 (See graphic below). A "1" in any bit indicates that the bit is "active".

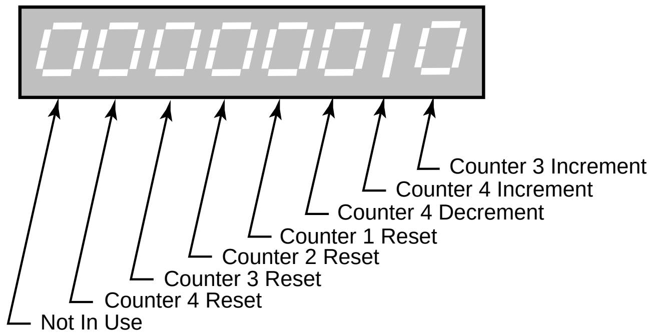


Minimum Value: 00000000 Maximum Value: 11011111
Units: Coded

(Continued)

MP-75 PLC 139-132

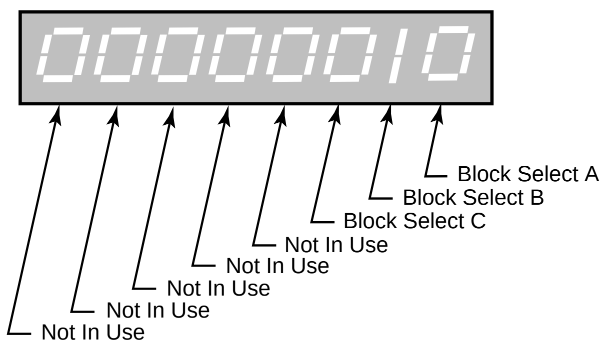
PLC 139-132 (MP-75) displays the status of the internal PLC control bits 139-132 (See graphic below). A "1" in any bit indicates that the bit is "active".



Minimum Value: 00000000 Maximum Value: 01111111
Units: Coded

MP-76 PLC 147-140

PLC 147-140 (MP-76) displays the status of the internal PLC control bits 147-140 (See graphic below). A "1" in any bit indicates that the bit is "active". Blk Sel A, B, C select the block that is active, if Blk Sel Source (CP-378) has been set to "1" (DgIn). The chart below indicates which block has been selected, based on the Block Select A, B or C inputs.



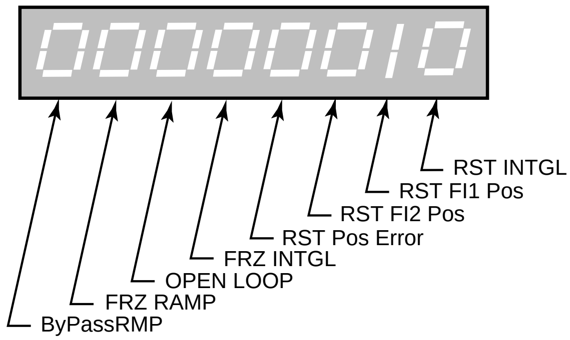
Blk Sel C	B	A	Block Selected
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

Minimum Value: 00000000 Maximum Value: 00000111
Units: Coded

(Continued)

MP-77 PLC 155-148

PLC 155-148 (MP-77) displays the status of the internal PLC control bits 155-148 (See graphic below). A "1" in any bit indicates that the bit is "active".



Bit Name	Description
RstIntgrl	Reset the Integral term
RstFI1Psn	Reset FI1Position = FI1PsnPrst (CP-266, FI1 Position Preset)
RstFI2Psn	Reset FI2 Position = FI2PsnPrst (CP-267, FI2 Position Preset)
RstPsnErr	Reset Position Error = 0
FrzIntgrl	Freeze (stop) integral term
OPEN LOOP	Open the Loop (position or velocity, CP-220, 221)
Frz Ramp	Freeze (stop) Ramp, keep Ramp Reference (MP-42) at current value
BypRmp	Bypass the Ramp, go immediately to Scaled Reference (MP-41 = MP-42)

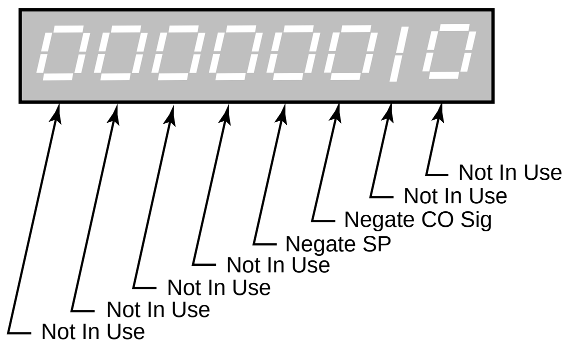
Minimum Value: 00000000 Maximum Value: 11111111
Units: Coded

(Continued)

Appendix C: Parameter Summary Numeric Quick Reference (continued)

MP-78 PLC 163-156

PLC 163-156 (MP-78) displays the status of the internal PLC control bits 163-156 (See graphic below).   A "1" in any bit indicates that the bit is "active".



Bit Name	Description
Not In Use	
Not In Use	
Negate CO	Negate CO_SIG voltage (not for setup, see CP-182)
Negate SR	Negate SR, change sign of Scaled Reference, MP-41
Not In Use	
Not In Use	
Not In Use	
Not In Use	

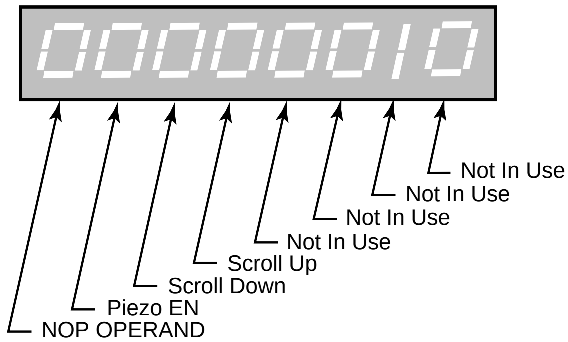
Minimum Value: 00000000 Maximum Value: 00001100
Units: Coded

(Continued)

Appendix C: Parameter Summary Numeric Quick Reference (continued)

MP-79 PLC 171-164

PLC 171-164 (MP-79) displays the status of the internal PLC control bits 171-164. (See graphic below). A “1” in any bit indicates that the bit is “active”.

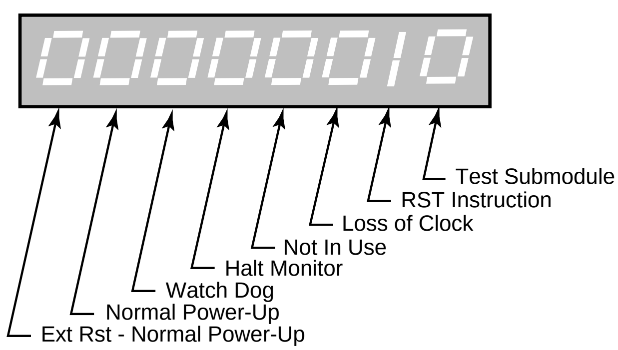


Bit Name	Description
Not In Use	
Not In Use	
Not In Use	
Not In Use	
Scroll Up	Remote Scroll Up (CP-300, 301)
Scroll Down	Remote Scroll Down (CP-300, 301)
Not In Use	
NOP OPERAND	dummy operand

Minimum Value: 00000000 Maximum Value: 10110000
Units: Coded

MP-80 LAST RESET

Last Reset (MP-80) displays a “1” in a bit to indicate the reason for the last reset.

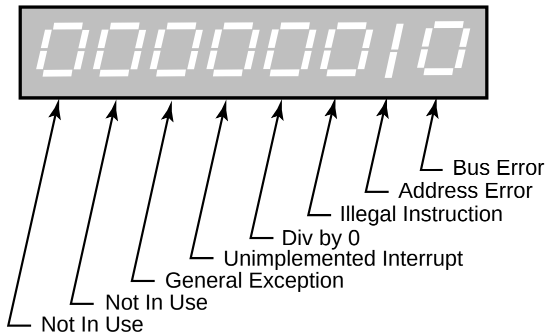


Minimum Value: 00000000 Maximum Value: 11110111
Units: Coded

(Continued)

MP-81 MISC INTRPT

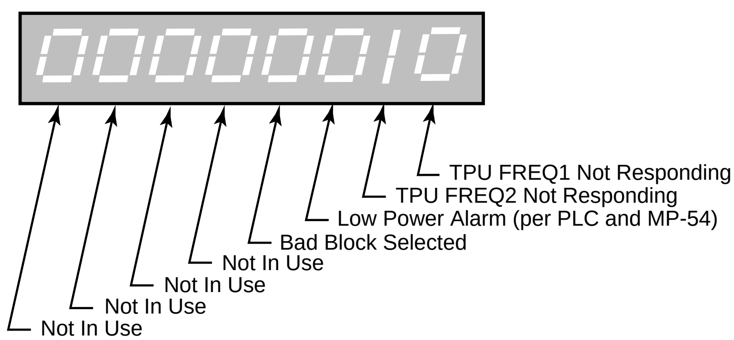
Miscellaneous Interrupts (MP-81) displays a “1” in a bit to indicate which of the various system interrupts may have caused the last reset.



Minimum Value: 00000000   Maximum Value: 00111111
Units: Coded

MP-82 DEVICE ALMS

Device Alarms (MP-82) displays the status of microprocessor or other hardware related alarms. Notification of a bad block selection is also included .



Minimum Value: 00000000   Maximum Value: 00001111
Units: Coded

MP-83 PC AT INTRPT

Program Counter at Interrupt (MP-83) shows where the last interrupt of the microprocessor occurred . If the CX-1010 repeatedly displays the “RESET FAULT” error box, then record the “PC @Intrpt” value as well as the line just above it (which indicates the cause of the reset), before you press the clear key to continue. The program counter at interupt is stored in the Program Counter at Interrupt (MP-83) Monitor Parameter for review. A value of “2560” is normal.

Minimum Value: 2560   Maximum Value: 16777215
Units: Address

(Continued)

MP-84 NORM PWR UPS

Normal Power Ups (MP-84) displays the number of normal power-ups since the most recent “Clear-7” power-up . This value is reset only by a “Clear-7” power-up. Normal Power Ups (MP-84) is used primarily for troubleshooting.

Minimum Value: 1   Maximum Value: 65535
Units: Counts

MP-85 LOW PWR CNTR

Low Power Counter (MP-85) displays the number of low power detections, including normal “Power Downs”. You can reset this numeric value, but only in Clr Fault Cntrs (CP-391). Low Power Counter (MP-85) is used primarily for troubleshooting.

Minimum Value: 0   Maximum Value: 65535
Units: Counts

MP-86 MEM ERR CNTR

Memory Error Counter (MP-86) displays the number of memory test failures that occurred during “Power Up”. You can reset this numeric value, but only in Clr Fault Cntrs (CP-391). Memory Error Counter (MP-86) is used primarily for troubleshooting.

Minimum Value: 0   Maximum Value: 65535
Units: Counts

MP-87 WATCHDOGCNTR

Watch Dog Counter (MP-87) displays the number of watch dog resets that were caused by watchdog time-out. Watch Dog Counter (MP-87) is used primarily for troubleshooting. You can reset this numeric value, but only in ‘Clr Fault Cntrs’ CP (CP-391).

Minimum Value: 0   Maximum Value: 65535
Units: Counts

MP-88 MISCINTRPTCNTR

Miscellaneous Interrupt Counter (MP-88) displays the number of miscellaneous interrupts that occurred as the result of bus errors, address errors, divide-by-0 errors, unexecuted instruction errors, general exceptions, and unexecuted and spurious interrupts. You can reset this numeric value, but only in Clr Fault Cntrs (CP-391). Miscellaneous Interupt Counter (MP-88) is used primarily for troubleshooting.

Minimum Value: 0   Maximum Value: 65535
Units: Counts

MP-90 SERCOM CHAR IN

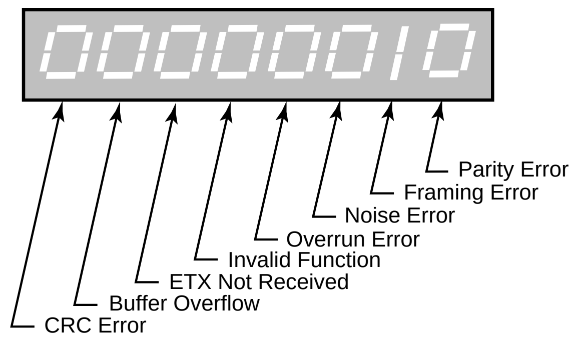
Serial Communications Character In (MP-90) displays the value of the last byte that was received by the Serial Communications port. SerCom Char In (MP-90) is displayed in a decimal format. SerCom Char In (MP-90) is used primarily for troubleshooting.

Minimum Value: 0   Maximum Value: 255
Units: Binary Character

(Continued)

MP-91 SERCOM ERRS

Serial Communications Errors (MP-91) displays all serial communications errors that occurred during the most recent transmission.



Minimum Value: 00000000   Maximum Value: 11111111
Units: Coded

MP-94 ROM TEST

ROM Test (MP-94) displays the result of the most recent ROM Test . ROM Test runs a checksum test on the CX-1010 program memory.

1 = Memory Test Fail
0 = Memory Test Pass

Minimum Value: 0   Maximum Value: 1
Units: Coded

MP-95 SRAM TEST

SRAM Test (MP-95) displays the result of the most recent SRAM Test . SRAM Test runs a read/write test on the scratch-pad memory.

1 = Memory Test Fail
0 = Memory Test Pass

Minimum Value: 0   Maximum Value: 1
Units: Coded

MP-96 NV RAM TEST

Non Volatile RAM Test (MP-96) displays the result of the most recent Non Volatile RAM Test . The test runs both a read/write and a checksum test on the nonvolatile memory. The parameter values, the PLC program and the backups are all stored in this memory.

1 = Memory Test Fail
0 = Memory Test Pass

Minimum Value: 0   Maximum Value: 1
Units: Coded

(Continued)

MP-97 MODEL

MODEL # (MP-97) displays the model number for this CX-1010. This model number is unique to the CX-1010 series of controllers.

Minimum Value: 1000	Maximum Value: 60000
Units: Model Number	

MP-98 RELEASE DATE

Release Date (MP-98) is the date that the software for this individual CX-1010 was released. The numeric, six digit format is: month, day, year

Minimum Value: 090396	Maximum Value: 123199
Units: Date	

MP-99 REVISION

REVISION (MP-99) is the revision level of the software for this individual CX-1010.

Minimum Value: 1.00	Maximum Value: 99.99
Units: Rev Level	

CP-101 SETPOINT X

Setpoint X displays the name and value of the setpoint that corresponds with the mode of operation selected in Setpoint Mode (CP-102). The setpoint could be the Master Setpoint (CP-110), the Follower Setpoint (CP-120), the Direct Setpoint (CP-130) or the Custom Setpoint (CP-140). Setpoint X acts as a quick access to the setpoint value. In addition to changing a setpoint value in the setpoint screens, you can also change the value of the active setpoint by entering a new value in Setpoint X (CP-101).

Minimum Value: -999999	Maximum Value: 999999
Default Value: 0	Units: EU/Tm

CP-102 SETPOINT MODE

Setpoint Mode sets the mode of operation and the subsequent Setpoint, that are used when your system is in “Run”. The Setpoint and mode of operation combined, determine the Reference Speed and, if applicable, the Reference Position. The modes of operation are:

4 = Custom Mode
3 = Direct Mode
2 = Follower Mode
1 = Master Mode

Minimum Value: 1	Maximum Value: 4 (General)
Default Value: 1 (Master)	Units: Coded

(Continued)

CP-103 FB SOURCE

Feedback Source (CP-103) identifies the source of the feedback signal. The feedback signal is also used by some of the alarms as well as some of the status indications (e.g., Zero Speed). Feedback Source is ignored when RUN Loop Mode (CP-220) is set to "Position Loop" (the Feedback signal defaults to "Frequency Input 2"). The feedback sources are:

4 = Constant 2
3 = Analog Input 2
2 = Analog Input 1
1 = Frequency Input 2 (default)

Minimum Value: 1	Maximum Value: 4
Default Value: 1	Units: Coded

CP-104 LD SOURCE

Lead Source (CP-104) identifies the source of the lead in follower applications. This is the signal that the follower will follow. The Lead Source is ignored when RUN Loop Mode (CP-220) is set to "Position Loop" (the lead signal defaults to "Frequency Input 1"). The lead sources are:

4 = Constant 1
3 = Custom SP
2 = Analog Input 1
1 = Frequency Input 1 (default)

Minimum Value: 1	Maximum Value: 4
Default Value: 1	Units: Coded

CP-105 OFS SOURCE

Offset Source (CP-105) identifies the source of the offset in both the Master plus Offset and the Follower plus Offset applications. The offset is added to the Master Setpoint (CP-110) when Master Equation (CP-113) is set to "Master plus Offset" and Setpoint Mode (CP-102) is set to "Master". The offset is added to the result of the lead signal multiplied by the Ratio (CP-124) when Follower Equation (CP-125) is set to "Follower Plus Offset" and Setpoint Mode (CP-102) is set to "Follower". The Ofs Sources are:

6 = Frequency Input 2
5 = Analog Input 2
4 = Constant 3
3 = Custom Setpoint (constant)
2 = Analog Input 1
1 = Frequency Input 1 (default)

Minimum Value: 1	Maximum Value: 6
Default Value: 4	Units: Coded

(Continued)

CP-106 FF SOURCE

Feedforward Source (CP-106) identifies the source of the feedforward signal. Feedforward's default setting is "0" (Ramped-Reference) which is also the velocity command. The default setting is used most frequently.

WARNING: To insure proper operation, set Feedforward Source (CP-106) to "0" (Ramped Reference) when RUN Loop Mode (CP-220) is set to "2" (Position loop).

2=Analog In 1
1=Frequency In 1
0=Ramped Reference (default)

Minimum Value: 0	Maximum Value: 2
Default Value: 0	Units: Coded

CP-108 EU/TM RANGE

Engineering Units per Time Range (CP-108) identifies the range and resolution (see list below) of your feedback in Engineering Units per Time (EU/Tm). For the most precise resolution, choose the range that your maximum EU/Tm falls within. If you need to change the current EU/Tm Range to a lower range, all of your setpoints, limits, and alarms will also need to be changed to fall within the new range. Position parameters may also be affected when you change to a lower range.

4 = Max:	range to 999,999	resolution to 0.001
3 = Hi:	range to 130,000	resolution to 0.0001 (default)
2 = Mid:	range to 16,000	resolution to 0.00001
1 = Lo:	range to 1,000	resolution to 0.000001

Minimum Value: 1	Maximum Value: 4
Default Value: 2	Units: EU/Tm

CP-109 TIME BASE

Time Base (CP-109) is the denominator, which represents the time (Tm) in the EU/Tm equation. The equation scales the frequency inputs (FI1 and FI2) to EU/Tm.

3 = per Hour
2 = per Minute (default)
1 = per Second
0 = Timeless EU/Tm

Minimum Value: 0	Maximum Value: 3
Default Value: 2	Units: Coded

(Continued)

CP-110 MASTER SP

Master Setpoint (CP-110) is the speed at which you want your system to operate (while in Run) when the Setpoint Mode (CP-102) is set to "1" (Master Mode). How the Master SP (CP-110) is interpreted (i.e., how the scaled Reference Speed is derived from the Master SP) is determined by the Master Equation (CP-113). When Master Equation (CP-113) is set to "1" (Standard), then the Master SP is the desired operating speed in EU/Tm . When Master Equation (CP-113) is set to the "2 " (Inverse Master), then the Master Setpoint (CP-110) is given in time (e.g., minutes) and the operating speed in inversely proportional to Master SP (Tm/EU). When Master Equation (CP-113) is set to the "3 " (Offset) then the operating speed is the Master SP plus the current value of the offset signal (which is selected in CP-105).

Minimum Value: -999999	Maximum Value: 999999
Default Value: 0	Units: EU/Tm or Tm/EU

CP-111 MAX SP MSTR

Maximum Setpoint Master (CP-111) is the maximum value that will be allowed for the Master Setpoint (CP-110).

Minimum Value: 0	Maximum Value: 999999
Default Value: 2000	Units: EU/Tm or Tm/EU

CP-112 MIN SP MSTR

Minimum Setpoint Master (CP-112) is the minimum value that will be allowed for the Master Setpoint (CP-110).

Minimum Value: 0	Maximum Value: 999999
Default Value: 0	Units: EU/Tm or Tm/EU

CP-113 MASTER EQUATION

Master Equation (CP-113) allows you to choose a variable (see list below) that will affect the Master setpoint operation.

3 = Master + Offset
2 = Inverse Master
1 = Standard (default)

Minimum Value: 1	Maximum Value: 3
Default Value: 1	Units: Coded

CP-114 INV M NORM

Use the Inverse Master Norm (CP-114) to define the travel distance (EU) in the time specified in Master Setpoint (CP-110). Use Inverse Master Norm (CP-114) only in the Inverse Master Mode. In this mode, the setpoint speed is determined by the INV M Norm (CP-114) over the Master Setpoint (CP-110).

Minimum Value: -999999	Maximum Value: 999999
Default Value: 1.000	Units: EU

(Continued)

CP-120 FOLLOWER SP

Follower Setpoint (CP-120) sets the ratio at which the follower will follow the lead signal (when in Run) when the Setpoint Mode (CP-102) is set to "2” (Follower Mode). If Follower Equation (CP-125) is set to either "1” (Standard) or "3” (Follower plus Offset),   then the Follower SP is the numerator of the ratio. If the Follower Equation (CP-125) is set to "2” (Inverse Follower), then the Follower Setpoint is the denominator of the ratio.

Minimum Value: -999999	Maximum Value: 999999
Default Value: 1.000	Units: Ratio

CP-121 MAX SP FOL

Maximum Setpoint Follower (CP-121) is the maximum value that will be allowed for the Follower Setpoint (CP-120).

Minimum Value: 0	Maximum Value: 999999
Default Value: 1.000	Units: Ratio

CP-122 MIN SP FOL

Minimum Setpoint Follower (CP-122) is the minimum value that will be allowed for the Follower Setpoint (CP-120).

Minimum Value: 0	Maximum Value: 999999
Default Value: 0	Units: Ratio

CP-123 RATIO NORM

In the Standard and Offset Follower mode, Ratio Norm (CP-123) is the denominator of the ratio at which your system follows the lead signal. In the Inverse Follower mode, Ratio Norm is the numerator of the ratio at which your system follows the lead signal.

Minimum Value: 0	Maximum Value: 999999
Default Value: 1.000	Units: Ratio

CP-124 RATIO

Ratio (CP-124) is the ratio at which the follower will follow the lead (while in Run) when the Setpoint Mode (CP-102) is set to "2 ” (Follower Mode).

Minimum Value: -1000	Maximum Value: 1000
Default Value: 1.000	Units: Ratio

CP-125 FOL EQUATION

Follower Equation (CP-125) allows you to choose a variable (see list below) that will affect the follower setpoint operation.

3=Follower + Offset
2=Inverse Follower
1=Standard (default)

Minimum Value: 1	Maximum Value: 3
Default Value: 1	Units: Coded

(Continued)

CP-130 DIRECT SP

Direct Setpoint (CP-130) is used to output a constant value on the CO_SIG Analog Output (J3, pin 1) signal (while in Run) when the Setpoint Mode (CP-102) is set to "3" (Direct Mode). The Direct Setpoint value is entered in volts.

Minimum Value: -15	Maximum Value: 15
Default Value: 0.0	Units: Volts

CP-131 MAX SP DRCT

Maximum Setpoint Direct (CP-131) is the maximum value that will be allowed for the Direct Setpoint.

Minimum Value: -15	Maximum Value: 15
Default Value: 0	Units: Volts

CP-132 MIN SP DRCT

Minimum Setpoint Direct (CP-131) is the minimum value that will be allowed for the Direct Setpoint.

Minimum Value: -15	Maximum Value: 15
Default Value: 0	Units: Volts

CP-140 CUSTOM SP

Custom Setpoint can be any or all of the “V” variables in the Custom Setpoint Equation below and Custom Setpoint can also be a constant for a lead or an offset operation. The Custom Setpoint Equation:

$$\text{Scaled Reference} = \left[\frac{(M1 * V1) + B1}{(M2 * V2) + B2}\right] * V4 + (M3 * V3 + B3)$$

Minimum Value: -999999	Maximum Value: 999999
Default Value: 0.0	Units: EU/Tm

CP-141 CONSTANT 1

Constant 1 can be the “V1” variable in the Custom Setpoint Equation (refer to CP-140). It can also be a constant for a lead operation.

Minimum Value: -999999	Maximum Value: 999999
Default Value: 0	Units: Constant

CP-142 CONSTANT 2

Constant 2 can be the “V2” variable in the Custom Setpoint Equation (refer to CP-140).

Minimum Value: -999999	Maximum Value: 999999
Default Value: 1.0	Units: Constant

(Continued)

CP-143 CONSTANT 3

Constant 3 can be the "V3" variable in the Custom Setpoint Equation (refer to CP-140). It can also be a constant for an offset operation.

Minimum Value: -999999 Maximum Value: 999999
Default Value: 0 Units: Constant

CP-144 CONSTANT 4

Constant 4 can be the "V4" variable in the Custom Setpoint Equation (refer to CP-140).

Minimum Value: -999999 Maximum Value: 999999
Default Value: 1.0 Units: Constant

CP-146 MAX SP CUST

Maximum Setpoint Custom (CP-146) is the maximum value that will be allowed for the Custom Setpoint.

Minimum Value: -32768 Maximum Value: 32767
Default Value: 2000 Units: EU/Tm

CP-147 MIN SP CUST

Minimum Setpoint Custom (CP-147) is the minimum value that will be allowed for the Custom Setpoint.

Minimum Value: -32768 Maximum Value: 32767
Default Value: 130000 Units: EU/Tm

CP-150 V1 SOURCE

V1 Source (CP-150) identifies the source of the signal (or constant) that can be used as the "V1" variable in the Custom Setpoint Equation (refer to CP-140). The V1 sources are:

6 = Frequency In 2
5 = Analog In 2
4 = Constant 1
3 = Custom SP (default)
2 = Analog In 1
1 = Frequency In 1
0 = the value of 0

Minimum Value: 0 Maximum Value: 6
Default Value: 3 Units: Coded

(Continued)

CP-151 V2 SOURCE

V2 Source (CP-151) identifies the source of the signal (or constant) that can be used as the "V2" variable in the Custom Setpoint Equation (refer to CP-140). The V2 sources are:

6 = Frequency In 2
5 = Analog In 2
4 = Constant 2 (default)
3 = Custom SP
2 = Analog In 1
1 = Frequency In 1
0 = the value of 0

Minimum Value: 0	Maximum Value: 6
Default Value: 4	Units: Coded

CP-152 V3 SOURCE

V3 Source (CP-152) identifies the source of the signal (or constant) that can be used as the "V3" variable in the Custom Setpoint Equation (refer to CP-140). The V3 sources are:

6 = Frequency In 2
5 = Analog In 2
4 = Constant 3 (default)
3 = Custom SP
2 = Analog In 1
1 = Frequency In 1
0 = the value of 0

Minimum Value: 0	Maximum Value: 6
Default Value: 4	Units: Coded

CP-153 V4 SOURCE

V4 Source (CP-153) identifies the source of the signal (or constant) that can be used as the "V4" variable in the Custom Setpoint Equation (refer to CP-140). The V4 sources are:

6 = Frequency In 2
5 = Analog In 2
4 = Constant 4 (default)
3 = Custom SP
2 = Analog In 1
1 = Frequency In 1
0 = the value of 0

Minimum Value: 0	Maximum Value: 6
Default Value: 4	Units: Coded

CP-154 M1

M1 (CP-154) is the slope constant that multiplies the "V1" variable in the Custom Setpoint (CP-140) equation.

Minimum Value: -32768	Maximum Value: 32767
Default Value: 1.0	Units: Constant

(Continued)

CP-155 B1

B1 (CP-155) is the (y-intercept) constant that is added to the product of “M1xV1” in the Custom Setpoint (CP-140) equation.

Minimum Value: -999999	Maximum Value: 999999
Default Value: 0	Units: Constant

CP-156 M2

M2 (CP-156) is the (slope) constant that multiplies the “V2” variable in the Custom Setpoint (CP-140) equation.

Minimum Value: -32768	Maximum Value: 32767
Default Value: 1.0	Units: Constant

CP-157 B2

B2 (CP-157) is the (y-intercept) constant that is added to the product of “M2xV2” in the Custom Setpoint (CP-140) equation.

Minimum Value: -999999	Maximum Value: 999999
Default Value: 0	Units: Constant

CP-158 M3

M3 (CP-158) is the (slope) constant that multiplies the “V3” variable in the Custom Setpoint (CP-140) equation.

Minimum Value: -32768	Maximum Value: 32767
Default Value: 1.0	Units: Constant

CP-159 B3

B3 (CP-159) is the (y-intercept) constant that is added to the product of “M3xV3” in the Custom Setpoint (CP-140) equation.

Minimum Value: -999999	Maximum Value: 999999
Default Value: 0	Units: Coded

CP-160 CNT MODE FI1

Count Mode FI1 (CP-160) identifies the type of encoder that is connected to Frequency Input 1. The “Quad x4” setting is for a quadrature encoder that gives 4 counts per pulse and also gives direction information. The Incremental selection is for a single channel encoder, which gives 1 count per pulse but does not give direction information.

2 = Incremental
1 = Quad x4 (default)

Minimum Value: 1	Maximum Value: 2
Default Value: 1	Units: Coded

(Continued)

CP-161 PPR FI1

Pulses Per Revolution FI1 (CP-161) is the number of pulses that are produced during one revolution of the encoder (or motor or any other rotating part of your machine) that is connected to Frequency Input 1. This value is only used to calculate RPM information for FI1 RPM (MP-02).

Minimum Value: 1 Maximum Value: 60000
Default Value: 60 Units: Pulses/Rev

CP-162 FI1 PULSES

FI1 Pulses (CP-162) is used to scale the Frequency Input 1 in EU's and EU/Tm. Enter the number of pulses that corresponds to the number of EU's that are entered in EU FI1 (CP-163).

Minimum Value: 0 Maximum Value: 999999
Default Value: 60 Units: Pulses

CP-163 EU FI1

EU FI1 (CP-163) is used to scale the Frequency Input 1 in EU's and EU/Tm. Enter the number of EU's that corresponds to the number of pulses that are entered in FI1 Pulses (CP-162).

Minimum Value: 0 Maximum Value: 999999
Default Value: 1.0 Units: EU (F11)

CP-165 CNT MODE FI2

Count Mode FI2 (CP-165) identifies the type of encoder that is connected to Frequency Input 2. The "Quad x4" setting is a for quadrature encoder that gives 4 counts per pulse and also gives direction information. The Incremental selection is for a single channel encoder which gives 1 count per pulse but does not give direction information.

2 = Incremental
1 = Quad x4 (default)

Minimum Value: 1 Maximum Value: 2
Default Value: 1 Units: Coded

CP-166 PPR FI2

Pulses Per Revolution FI2 (CP-166) is the number of pulses that are produced during one revolution of the encoder (or motor or any other rotating part of your machine) that is connected to Frequency Input 2. This value is only used to calculate RPM information for FI2 RPM (MP-07).

Minimum Value: 1 Maximum Value: 60000
Default Value: 60 Units: Pulses/Rev

CP-167 FI2 PULSES

Frequency Input 2 Pulses (CP-167) is used to scale the Frequency Input 2 in EU's and EU/Tm. Enter the number of pulses that corresponds to the number of EU's that are entered in EU FI2 (CP-168).

Minimum Value: 0 Maximum Value: 999999
Default Value: 2000 Units: Pulses

(Continued)

CP-168 EU FI2

EU Frequency Input 2 (CP-168) is used to scale the Frequency Input 2 in EU's and EU/Tm. Enter the number of EU's that corresponds to the number of pulses that are entered in FI2 Pulses (CP-167).

Minimum Value: 0	Maximum Value: 999999
Default Value: 1.00	Units: EU (F2)

CP-170 AI1 MODE

Analog Input 1 Mode (CP-170) identifies the mode of operation and the calibration that are used for the Auxiliary Board Analog Input 1 signal.

2 = Current
1 = Voltage (default)

Minimum Value: 1	Maximum Value: 2
Default Value: 1	Units: Coded

CP-171 AI1 RA

Analog Input 1 Reference A (CP-171) is used to scale the Auxiliary Board Analog Input 1 in EU/Tm.   Enter the value for reference point A that corresponds to the EU/Tm that are entered in EU@AI1 RA (CP-172).

Minimum Value: -15.0	Maximum Value: 25
Default Value: 0.0	Units: Volts or milliamps

CP-172 EU@AI1 RA

EU at Analog Input 1 Reference A (CP-172) is used to scale the Auxiliary Board Analog Input 1 in EU/Tm. Enter the number of EU/Tm for point A that corresponds to the reference value that is entered in AI1 RA (CP-171).

Minimum Value: -9999999	Maximum Value: 9999999
Default Value: 0.0	Units: EU/Tm

CP-173 AI1 RB

Analog Input 1 Reference B (CP-173) is used to scale the Auxiliary Board Analog Input 1 in EU/Tm.   Enter the value for reference point B that corresponds to the EU/Tm that are entered in EU@AI1 RB (CP-174).

Minimum Value: -15.0	Maximum Value: 25
Default Value: 10.0	Units: Volts or milliampere

CP-174 EU@AI1 RB

EU@Analog Input 1 Reference B (CP-174) is used to scale the Auxiliary Board Analg Input 1 in EU/Tm. Enter the number of EU/T's for point A that corresponds to the reference value that is entered in AI1 RB (CP-173).

Minimum Value: -9999999	Maximum Value: 9999999
Default Value: 100.0	Units: EU/Tm

(Continued)

CP-175 AI2 MODE

Analog Input 2 Mode (CP-175) identifies the mode of operation and the calibration that are used for the Auxiliary Board Analog Input 2 signal.

2=Current
1=Voltage (default)

Minimum Value: 1	Maximum Value: 2
Default Value: 1	Units: Coded

CP-176 AI2 RA

Analog Input 2 Reference A (CP-176) is used to scale the Auxiliary Board Analog Input 2 in EU/Tm. Enter the Analog Input 2 signal value for reference point A that corresponds to the EU/Tm that are entered in EU@AI2 RA (CP-177).

Minimum Value: -15.0	Maximum Value: 25
Default Value: 0.0	Units: Volts or milliamperes

CP-177 EU@AI2 RA

EU at Analog Input 2 Reference A (CP-177) is used to scale the Auxiliary Board Analog Input 2 in EU/Tm. Enter the number of EU/T's for point A that corresponds to the reference value that is entered in AI2 RA (CP-176).

Minimum Value: -9999999	Maximum Value: 9999999
Default Value: 0.0	Units: EU/Tm

CP-178 AI2 RB

Analog Input 2 Reference B (CP-178) is used to scale the Auxiliary Board Analog Input 2 in EU/Tm. Enter the Analog Input 2 signal value for reference point B that corresponds to the EU/T's that are entered in EU@AI2 RB (CP-179).

Minimum Value: -15.0	Maximum Value: 25
Default Value: 10.0	Units: Volts or milliamps

CP-179 EU@AI2 RB

EU at Analog Input 2 Reference B (CP-179) is used to scale the Auxiliary Board Analog Input 2 in EU/Tm. Enter the number of EU/Tm for point B that corresponds to the reference value that is entered in AI2 RB (CP-178).

Minimum Value: -9999999	Maximum Value: 9999999
Default Value: 100.0	Units: EU/Tm

CP-180 CO MODE

Control Output Mode (CP-180) controls the format (see list below) of the CO_SIG Analog Output (J3, pin 1) signal. This is the control output signal that is input to your drive.

4 = UniBrake = Unipolar Brake (CO Max Volts - Vout)
3 = BiPolAbs = Bipolar Absolute (Absolute Value - Vout)
2 = Bipolar (± Vout)
1 = Unipolar (0 to +Vout) (default)

Minimum Value: 1	Maximum Value: 4
Default Value: 1	Units: Coded

(Continued)

CP-181 CO MAX VOLTS

The control signal output is limited to plus or minus Control Output Maximum Volts (CP-181). This value should be less than or equal to the input spec of the drive or any other device that is connected to this output.

Minimum Value: 0.1	Maximum Value: 15
Default Value: 10.0	Units: Volts

CP-182 CO POLARITY

Control Output Polarity (CP-182) sets the polarity of the CO_SIG Analog Output (J3, pin 1) signal (see list below). An absolute value is established for the BiPolAbs CO Mode (CP-180) after the negation has been determined by the PLC bit 'Negate CO'.

2 = Negate Output
1 = Normal Output (default)

Minimum Value: 1	Maximum Value: 2
Default Value: 1	Units: Coded

CP-184 AO PARAMETER

Analog Output Parameter (CP-184) identifies the Monitor or Control Parameter that is used for the Auxiliary Analog Output (JA, pins 9,10,11) . When the Analog Output Parameter (CP-184) is set to "0", the value of AO DIRECT (CP-365) is used as the output .

Minimum Value: 0	Maximum Value: 48
Default Value: 7	Units: Parameter Code

NOTE: The following Monitor and Control Parameters are not available for the Analog Output Parameter (CP-184):

MP-17 ..... AnlgCal Ref A
MP-18 ..... AnlgCal Ref B
MP-22 .... CO Max Bits
MP-23 ... CO DAC Range
MP-24 .... AO Bits
MP-25 .... AO Signal
MP-26 .... DI 7..0
MP-27 .... DI 15..8
MP-29 .. KeyPad Lockout
MP-38 .... Ld EU/Tm
MP-45 .... Cntrl Loop
CP-184 ..... AO Parameter

(Continued)

CP-185 AO MODE

Analog Output Mode (CP-185) identifies the mode of operation and calibration that are used for the Auxiliary Board Analog Output signal.

2 = Current
1 = Voltage (default)

Minimum Value: 1	Maximum Value: 2
Default Value: 1	Units: Coded

CP-186 AO RA

Analog Output Reference A (CP-186) scales the Auxiliary Board Analog Output from the units of the selected parameter to the units of the output, generally measured in volts or milliamps.

Minimum Value: -15.0	Maximum Value: 20
Default Value: 10.0	Units: Volts or Milliamps

CP-187 VAL@AO RA

Value at Analog Output Reference A (CP-187) scales the Auxiliary Board Analog Output from the units of the selected parameter to the units of the output; generally measured in volts or milliamps. Enter the parameter value that corresponds to AO RA (CP-186).

Minimum Value: -9999999	Maximum Value: 9999999
Default Value: 2000	Units: Parameter Value

CP-188 AO RB

Analog Output Reference B (CP-188) scales the Auxiliary Board Analog Output from the units of the selected parameter to the units of the output; generally measured in volts or milliamps. Enter the parameter value that corresponds to VAL@AO RB (CP-189).

Minimum Value: -15.0	Maximum Value: 20
Default Value: 10.0	Units: Volts or Milliamps

CP-189 VAL@AO RB

Value at Analog Output Reference B (CP-189) scales the Auxiliary Board Analog Output from the units of the selected parameter to the units of the output, (generally measured in volts or milliampere). Enter the parameter value that corresponds to AO RB (CP-188).

Minimum Value: -9999999	Maximum Value: 9999999
Default Value: 2000	Units: Parameter Value

(Continued)

CP-190 SCFB EQ

Scaled Feedback Equation (CP-190) identifies the scaling format (see list below) for the Scaled Fb (MP-40).

4 = Inverse Follower
3 = Inverse Master
2 = Standard Follower
1 = Standard Master (default)

Minimum Value: 1	Maximum Value: 4
Default Value: 1	Units: Coded

CP-191 SCFB EU

Scaled Feedback EU (CP-191) is used to scale the Scaled Fb (MP-40) in conjunction with the Fb @ ScFb EU (CP-192) and the ScFb Eq (CP-190).

Minimum Value: 0	Maximum Value: 999999
Default Value: 1.0	Units: EU

CP-192 FB @ SCFB EU

Feedback@ Scaled Feedback EU (CP-192) is used to scale the Scaled Fb (MP-40) in conjunction with ScFb EU (CP-191) and ScFb Eq (CP-190).

Minimum Value: 0	Maximum Value: 999999
Default Value: 1	Units: Fb EU/Tm

CP-193 SC PARM

Use Scaled Parameter (CP-193) to select the Monitor Parameter that is used in the Scaled Parameter Equation (CP-194). The results of the equation are displayed in ScParm Val (MP-30).

Minimum Value: 1	Maximum Value: 49
Default Value: 7 (MP-07, FI2 RPM)	Units: Parameter Code

CP-194 SC PARM EQ

Scaled Parameter Equation (CP-194) identifies the scaling format equation (see list below) for ScParm Val (MP-30):

3 = Inverse2:	(M/x) + b
	where x = value of selected monitor parameter
2 = Inverse1:	1/(M x + b)
	M = SC Parm M (CP-195)
1 = Standard:	M x + b (default)
	b = SC Parm B (CP-196)

Minimum Value: 1	Maximum Value: 3
Default Value: 1	Units: Coded

(Continued)

CP-195 SC PARM M

Scaled Parameter M (CP-195) is the slope constant that multiplies the Sc Parm (CP-193) by “M” as specified by the Sc Parm Eq (CP-194).

Minimum Value: -999999	Maximum Value: 999999
Default Value: 1.00	Units: Constant

CP-196 SC PARM B

Scaled Parameter B is the y-intercept constant that is added to the product term as specified by the Sc Parm Eq (CP-194). The resolution of Scaled Parameter B (CP-196) dictates the resolution of the ScParm Val (MP-30).

Minimum Value: -999999	Maximum Value: 999999
Default Value: 0	Units: Constant

CP-199 LG NUMBER UNITS

Use Large Number Units (CP-199) to select the EU text that displays immediately below the Large Number Display on the Status screen (refer to the status screen in *Operation: Screen Operation*). Enter a numeric code that identifies the EU for the Control Parameter displayed in the Large Number Parameter (CP-340). Refer to the numeric code list below. The Help screen for CP-199 also contains a partial list of numeric code options. In addition, you can also scroll through the numeric code options by accessing CP-199 with the Code key while you are in the in the Status screen.

0 = <BLANK>	27 = Sec/unit	54 = EU/Tm
1 = RPM (default)	28 = Sec/inch	55 = EU/Tm/sec
2 = Hertz	29 = Sec/foot	56 = Units
3 = KHtz	30 = Sec/CM	57 = Inches
4 = EU/sec	31 = Sec/gal	58 = Feet
5 = EU/min	32 = Sec/liter	59 = Yards
6 = EU/hr	33 = Min/unit	60 = Centimeters
7 = Units/sec	34 = Min/inch	61 = Meters
8 = Units/min	35 = Min/foot	62 = Gallons
9 = Units/hr	36 = Min/yard	63 = Liters
10 = Inches/sec	37 = Min/CM	64 = lb
11 = Inches/min	38 = Min/meter	65 = Counts
12 = Feet/sec	39 = Min/gal	66 = Pulses
13 = Feet/min	40 = Min/liter	67 = Lines
14 = Feet/hr	41 = Hr/unit	68 = Revs
15 = Yards/min	42 = Hr/foot	69 = Degrees
16 = Yards/hr	43 = Hr/yard	70 = Pulses/Rev
17 = CM/sec	44 = Hr/meter	71 = Pulses/EU
18 = CM/min	45 = Hr/gal	72 = Volts
19 = Meters/min	46 = Hr/liter	73 = Milliamps
20 = Meters/hr	47 = Feet/foot	74 = Bits
21 = Gal/sec	48 = Ratio	75 = Bits/sec
22 = Gal/min	49 = Percent (%)	76 = Volts/kiloEU
23 = Gal/hr	50 = Seconds	77 = oz
24 = Liters/sec	51 = Minutes	78 = psi
25 = Liters/min	52 = Hours	79 = newton
26 = Liters/hr	53 = EU	80 = Custom (user defined through he serial com)

Minimum Value: 0	Maximum Value: 80
Default Value: 1	Units: Coded

(Continued)

CP-200 REF RUN RMP

The acceleration rate for the Master Mode, the Follower Mode and the Custom Setpoint Mode are determined by the Acl Tm RUN (CP-201) and the Reference Run Ramp (CP-200) The deceleration rate (from a faster speed to a slower speed) for the Master Mode, the Follower Mode and the Custom Setpoint Mode, are determined by the Dcl Tm RUN (CP-203) and the Reference Run Ramp (CP-200).

Minimum Value: 0.001	Maximum Value: 10000
Default Value: 1000	Units: EU/Tm

CP-201 ACL TM RUN

Acceleration Time Run (CP-201) is the time, in seconds, that it takes to accelerate from 0 to the Ref RUN Ramp (CP-200), while operating in the Master, Follower or Custom Setpoint Equation modes.

Minimum Value: 0	Maximum Value: 3600
Default Value: 1.000	Units: Seconds

CP-202 ACL RT RUN

Acceleration Rate Run (CP-202) is the acceleration rate that is used (while in Run) for the Master, Follower and Custom Setpoints when the magnitude of the Scaled Reference increases.

Minimum Value: 0	Maximum Value: 9999999
Default Value: 1000	Units: EU/Tm/sec

CP-203 DCL TM RUN

Deceleration Time Run (CP-203) is the time in seconds, that it takes to decelerate from Ref RUN Ramp (CP-200) speed to 0, while operating in the Master, Follower or Custom Setpoint Equation modes.

Minimum Value: 0	Maximum Value: 3600
Default Value: 1.000	Units: Seconds

CP-204 DCL RT RUN

Deceleration Rate Run (CP-204) is the deceleration rate that is used (while in Run) for the Master, Follower and Custom Setpoints when the magnitude of the Scaled Reference decreases.

Minimum Value: 0	Maximum Value: 9999999
Default Value: 1000	Units: EU/Tm/sec

(Continued)

CP-205 REF DRCT RMP

The acceleration rate for the Direct Mode is determined by the Reference Direct Ramp (CP-205) and the Accel Time Direct (CP-206). The deceleration rate for the Direct Mode, as well as for H-Stop (while operating in the Direct Mode) is determined by Decel Time Direct (CP-208) and Ref Dirct Rmp (CP-205).

Minimum Value: 0	Maximum Value: 15
Default Value: 10.0	Units: Volts

CP-206 ACL TM DRCT

Acceleration Time Direct (CP-206) is the time, in seconds, that it takes to accelerate from 0 to the Ref Direct Ramp (CP-205) voltage, while operating in the Direct Mode.

Minimum Value: 0	Maximum Value: 3600
Default Value: 1.000	Units: Seconds

CP-208 DCL TM DRCT

Deceleration Time Direct (CP-208) is time, in seconds, that it takes to decelerate from the Ref DRCT Ramp (CP-205) voltage to 0 volts, while operating in the Direct Mode.

Minimum Value: 0	Maximum Value: 3600
Default Value: 1.000	Units: Seconds

CP-210 REF STOP RMP

The deceleration rate that is used for R-Stop (Master Mode, Follower Mode or Custom Setpoint Mode), is determined by the Dcl Tm RStp (CP-211) and the Reference Stop Ramp (CP-210). The deceleration rate that is used for H-Stop (Master Mode, Follower Mode or Custom Setpoint Mode), is determined by the Dcl Tm HStp (CP-213) and the Reference Stop Ramp (CP-210).

Minimum Value: 0.001	Maximum Value: 10000
Default Value: 1000	Units: Fb EU/Tm

CP-211 DCL TM RSTP

Deceleration Time R-Stop (CP-211) is the time, in seconds, that it takes to decelerate from the Ref STOP Ramp (CP-210) speed to 0, during R-Stop, while operating in Jog, or the Master Mode, the Follower Mode or the Custom Setpoint Equation Mode.

Minimum Value: 0	Maximum Value: 3600
Default Value: 1.000	Units: Seconds

CP-212 DCL RT RSTP

Deceleration Rate R-Stop (CP-212) is the deceleration rate that is used for R-Stop, while operating in Jog, or the Master Mode, the Follower Mode or the Custom Setpoint Equation Mode.

Minimum Value: 0	Maximum Value: 9999999
Default Value: 1000	Units: EU/Tm/sec

(Continued)

CP-213 DEC TM HSTP

Deceleration Time H-Stop (CP-213) is the time, in seconds, that it takes to decelerate from the Ref StopRmp (CP-210) speed to 0, during H-Stop, while operating in Jog, or the Master Mode, the Follower Mode or the Custom Setpoint Equation Mode.

Minimum Value: 0	Maximum Value: 3600
Default Value: 1.000	Units: Seconds

CP-214 DCL RT HSTP

Deceleration Rate H-Stop (CP-214) is the deceleration rate that is used for H-Stop, while operating in Jog, or the Master Mode, the Follower Mode or the Custom Setpoint Equation Mode.

Minimum Value: 0	Maximum Value: 9999999
Default Value: 1000	Units: EU/Tm/sec

CP-215 JOG SP

The Jog Setpoint (CP-215) is the speed, in EU/Tm, at which Jog ramps when it is activated. The Jog ramp rates are referenced to this speed.

Minimum Value: 0	Maximum Value: 10000
Default Value: 250	Units: EU/Tm

CP-216 ACL TM JOG

Acceleration Time Jog (CP-216) is the time, in seconds, that it takes to accelerate from 0 to the Jog SP (CP-215).

Minimum Value: 0	Maximum Value: 3600
Default Value: 1.000	Units: Seconds

CP-217 ACL RT JOG

Acceleration Rate Jog (CP-217) is the rate, in EU/Tm per second, that it takes to accelerate when Jog is activated.

Minimum Value: 0	Maximum Value: 9999999
Default Value: 250	Units: EU/Tm/sec

CP-218 DCL TM JOG

Deceleration Time Jog (CP-218) is the time, in seconds, that it takes to decelerate from Jog SP (CP-215) to 0, when the Jog Input is deactivated or when switching between “Jog Fwd” and “Jog Rvs”.

Minimum Value: 0	Maximum Value: 3600
Default Value: 1.000	Units: Seconds

(Continued)

CP-219 DCL RT JOG

Deceleration Rate Jog (CP-219) is the rate, in EU/Tm per second, that is used when the Jog input is deactivated or when switching between "Jog Fwd" and "Jog Rvs".

Minimum Value: 0	Maximum Value: 9999999
Default Value: 250	Units: EU/Tm/sec

CP-220 RUN LOOP MODE

RUN Loop Mode (CP-220) identifies the type of control loop (see list below) that is used during Run.

3=Position Loop
2=ZE Loop (Psn + Vel)
1=Velocity Loop *
0=Open Loop

Minimum Value: 0	Maximum Value: 3
Default Value: 1	Units: Coded

CP-221 JOG LOOP MODE

Jog Loop Mode (CP-221) identifies the type of control loop (see list below) that is used during Jog.

1=Velocity Loop *
0=Open Loop

Minimum Value: 0	Maximum Value: 1
Default Value: 1	Units: Coded

CP-222 DRIVE TYPE

Drive Type (CP-222) allows you to choose either the torque or the velocity type (see list below) for the drive so you can give meaning to the CO_SIG. The velocity feedforward is disabled for the "Torque Type" (2) drives.

2=Torque Type
1=Velocity Type *

Minimum Value: 1	Maximum Value: 2
Default Value: 1	Units: Coded

CP-224 KFF

Kff (CP-224) scales the velocity feedforward that is selected in Ff Source (CP-106) to the CO_SIG Analog Output (J3, pin 1). Use Kff when operating in closed loop with velocity mode drives. You can either enter a value or you can have the CX-1010 calculate a value for you. The CX-1010 will automatically calculate a value for Kff (CP-224) at periodic intervals (which is based on KffAdjUpdt, CP-242), if you enable Kff Auto En (CP-244) when your system is in "Run".

Minimum Value: 0	Maximum Value: 9999999
Default Value: 5.0	Units: Volts/kiloEU/Tm

(Continued)

CP-225 KP VL

Kp Velocity Loop (CP-225) is the proportional gain constant for the PID velocity loop. An increase in Kp VL (CP-225) creates a quicker response and a smaller error. However, a value that is too large will cause instability. If the integral term is used, (i.e., Ki VL not equal to zero) then a nonzero Kp VL can actually improve the loop response and decrease the overshoot to some extent.

Minimum Value: 0	Maximum Value: 200
Default Value: 100	Units: Constant

CP-226 KI VL

Ki Velocity Loop (CP-226) is the Integral constant for the PID velocity loop. Integral action provides for zero steady state error. Increase Ki VL (CP-226) for a faster convergence to zero error. However, a value that is too large will cause instability.

Minimum Value: 0	Maximum Value: 200
Default Value: 100	Units: Constant

CP-227 KD VL

Kd Velocity Loop (CP-227) is the derivative constant for the PID velocity loop. Derivative action attempts to damp out overshoot. Its effect is highly dependent on Kp VL and Ki VL, but, generally, too large a value causes instability.

Minimum Value: 0	Maximum Value: 200
Default Value: 0	Units: Constant

CP-228 DERIV THD VL

Derivative Threshold Velocity Loop (CP-228) is the minimum speed error that is required before the derivative term in the PID velocity algorithm gains influence. Increase the derivative threshold to prevent the derivative term from acting on signal noise from the lead.

Minimum Value: 0	Maximum Value: 99999
Default Value: 0	Units: Constant

CP-229 KP ZE

Kp ZE (CP-229) is the proportional gain constant that is used for the zero error loop. Increase the value to reduce the time that is required to converge to zero position error. A large value can cause instability.

Minimum Value: 0	Maximum Value: 200
Default Value: 100	Units: Constant

(Continued)

CP-230 HSTP LOOPMODE

Use H-Stop Loopmode (CP-230) to select the control-loop type that will be used after coming to a stop in H-Stop.

3 = Position Loop
2 = Zero Error (ZE) Loop
1 = Velocity Mode Loop (default)
0 = Open Loop

Minimum Value: 1	Maximum Value: 2
Default Value: 1	Units: Coded

CP-233 MAX FB

Maximum Feedback (CP-233) and CO Max Volts (CP-181) are used to calculate a rough approximation for Kff (CP-224). When a new Maximum Feedback (CP-233) value is entered, then Kff reflects a new value also .

Minimum Value: 0	Maximum Value: 999999
Default Value: 2000	Units: EU/Tm

CP-235 KP PL

KP PL (CP-235) is the proportional gain constant for the PID position loop. Increasing KP PL (CP-235) will have a quicker the response and a smaller position error. However, a value that is too large could result in overshoot and instability. You can eliminate most or all of the error in the position loop with the proportional term (KP PL). Use an integral only if KP PL (CP-235) alone can not eliminate the error to your specification.

Minimum Value: 0	Maximum Value: 200
Default Value: 100	Units: Constant

CP-236 KI PL

Ki PL (CP-236) is the integral constant for the PID position loop. Integral action provides for zero steady state error. Increase Ki PL (CP-236) for a faster convergence to zero error.   However, a value that is too large will cause instability. Use Ki PL (CP-236) first to eliminate the error to your specification. If this produces unacceptable results, then decrease KP PL (CP-235) and introduce the integral by gradually increasing Ki PL (CP-236).

Minimum Value: 0	Maximum Value: 200
Default Value: 0	Units: Constant

(Continued)

CP-237 KD PL

Kd PL (CP-237) is the derivative constant for the PID position loop. Derivative action damps out overshoots, however, its effect is limited and is highly dependent on KP PL (CP- 235), Ki PL (CP- 236) and the given process dynamics.   A value that is too large can cause instability.

Minimum Value: 0   Maximum Value: 200
Default Value: 0   Units: Constant

CP-238 DERIV THD PL

Derivative Threshold Position Loop (CP-238) is the minimum amount of position error that is needed for the derivative term of the position loop. You can increase the value to prevent the derivative from acting on noise from the lead.

Minimum Value: 0   Maximum Value: 9999
Default Value: 100   Units: Constant

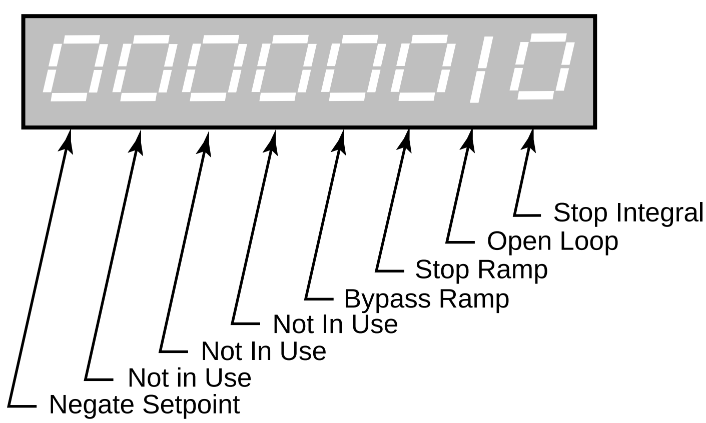
CP-239 PPR MTR

PPR Mtr (CP-239) is the pulses per motor revolution for the FI2 signal. Use PPR Mtr to scale the PID parameters of the position loop: Kp, PL, Ki PL, Kd PL and Kp ZE.

Minimum Value: 1   Maximum Value: 60000
Default Value: 60   Units: Pulses per Rev

CP-240 CNTRL LATCH

Control Latch (CP-240) allows you to set or "latch in" certain operating conditions that are specific to the CX-1010. Enter "1" in the bit that corresponds to the control condition(s) that you want active (see graphic below). The condition(s) will remain active till the bit is reset to 0. These requests are logically OR'd with the PLC bits that set the same condition. In the sample below, "Open Loop" is active:



Minimum Value: 00000000   Maximum Value: 10001111
Default Value: 00000000   Units: Coded

(Continued)

CP-241 LOOP UPDATE

Loop Update (CP-241) is the time interval between the CO_SIG output calculations. This interval sets the sampling rate of the PID control loop.

3 = 100 Msec Update
2 = 10 Msec Update
1 = 1 Msec Update (default)

Minimum Value: 1	Maximum Value: 3
Default Value: 1	Units: Coded

CP-242 KFFADJUPDT

Kff Adjust Update (CP-242) sets the sampling period for the Kff calculation when it is enabled. KffAdjUpdt (CP-242) is the time interval between each new Kff calculation and the automatic store to the Kff parameters depending on whether Kff Auto En (CP-244) is enabled.

5 = 10 Min Update
4 = 1 Min Update
3 = 10 Sec Update
2 = 1 Sec Update (default)
1 = 250 Msec Update

Minimum Value: 1	Maximum Value: 5
Default Value: 2	Units: Coded

CP-244 KFF AUTO EN

Kff Automatic Enable (CP-244) enables the CX-1010 automatic adjustment of Kff (CP-224) at the specified KffAdjUpdt interval (CP-242) in RUN or JOG with the loop closed.

1 = ON = Enabled
0 = OFF = Disabled (default)

Minimum Value: 0	Maximum Value: 1
Default Value:	Units: Coded

(Continued)

CP-248 SIGNAL FLTR SEL

Signal Filter Select (CP-248) selects the signal to route through a low pass filter. The effect is visible on the speed value.

4 = Analog In 2
3 = Frequency In 2
2 = Analog In 1
1 = Frequency In 1
0 = Not Used (default)

Minimum Value: 0	Maximum Value: 4
Default Value: 0	Units: Coded

CP-249 SIGNAL FLTR TAU

Signal Fltr Tau sets the time constant in milliseconds for the signal filter.

Minimum Value: 5	Maximum Value: 50
Default Value: 10	Units: Milliseconds

CP-250 MAX SPD LMT

The Scaled Reference (CP-41) is limited to the positive and negative Maximum Speed Limit (CP-250) while operating in "Run".

Minimum Value: 0	Maximum Value: 999999
Default Value: 2000	Units: EU/Tm

CP-251 MIN SPD LMT

The Scaled Reference (CP-41) is limited to the positive and negative Minimum Speed Limit (CP-251) while operating in "Run". The ramp accelerates to the Minimum Speed Limit (CP-251) if the reference speed is less than the Minimum Speed Limit .

Minimum Value: 0	Maximum Value: 999999
Default Value: 0	Units: EU/Tm

(Continued)

CP-253 ZE LIMIT

ZE Limit (CP-253) is the maximum authority for the zero error term. The excess speed that is required to recover large position errors is limited to this value. Enter the EU's that are required to recover the Time Base (CP-109).

Minimum Value: 1 Maximum Value: 99999
Default Value: 2000

CP-255 RAMP THD

When the difference between the Scaled Reference Speed (MP-41) and the Ramped Reference Speed (MP-42) is greater than Ramp Threshold (CP-255), the ramp will work normally. When the difference between the Scaled Reference Speed (MP-41) and the Ramped Reference Speed (MP-42) is less than or equal to Ramp Threshold (CP-255), the ramp will be bypassed. This avoids ramp delays for small lead changes but still allows a ramp for large lead or for large Master Setpoint changes.

Minimum Value: 0 Maximum Value: 999999
Default Value: 10.0 Units: EU/Tm

CP-258 TRIM AUTHORITY

The trim contribution to the DAC output is limited to positive and negative Trim Authority (CP-258).

Minimum Value: 1 Maximum Value: 32767
Default Value: 16383 Units: Bits

CP-259 INTEGRAL LIMIT

The integral contribution to the trim term is limited to the positive and negative Integral Limit (CP-259). Integral Limit (CP-259) can decrease the effects of integral windup or it can limit the maximum effect of the integral term.

Minimum Value: 1 Maximum Value: 32767
Default Value: 16383 Units: Bits

(Continued)

CP-260 PSNERR +

The maximum positive value of the accumulated position error is limited to Positive Position Error (CP-260). Use Positive Position Error (CP-260) when the lead is in motion, but the follower is stopped since the follower does not have to recover its former position relative to the lead, the Positive Position Error (CP-260) can be used to limit the amount of position error that accumulates while the lead continues to move. In Positive Position Error (CP-260), the follower lags behind the lead when both are moving in the positive direction.

Minimum Value: 0	Maximum Value: 10000000
Default Value: 10000	Units: EU (FI2 position EU)

CP-261 PSNERR-

The maximum negative value of the accumulated position error is limited to Negative Position Error (CP-261). In Negative Position Error (CP-261), the follower is ahead of the lead when both are moving in the positive direction. If both are moving in the negative direction in Negative Position Error (CP-261), the follower lags behind the lead.

Minimum Value: 0	Maximum Value: 10000000
Default Value: 10000	Units: EU (FI2 position EU)

CP-262 PSN OFFSET

Add Position Offset (CP-262) to the PsnErr (MP-34) to offset the feedback position by the amount of EU's that are specified in Psn Offset (CP-262). The position loop or zero error loop must be active for the offset to occur.

Minimum Value: -8000000	Maximum Value: 8000000
Default Value: 0	Units: EU (FI2 position EU)

CP-266 FI1PSNPRST

When the RstFI1Pos bit (149) of the PLC is active (1) the value of FI1Position Prst (CP-266) is automatically inserted into FI1Position (MP-05). If a transition preset is required, either create a one-shot with PLC logic or use a digital input that is configured as a one-shot input by the DI 1 Shot (CP-302) mask.

Minimum Value: -99999999	Maximum Value: 99999999
Default Value: 0	Units: EU (FI1 position EU)

CP-267 FI2PSNPRST

When the RstFI2Pos bit (150) of the PLC is active (1) the value of FI2 Position Prst (CP-267) is automatically inserted into FI2Position (MP-10). If a transition preset is required, either create a one-shot with PLC logic or use a digital input that is configured as a one-shot input by the DI 1 Shot (CP-302) mask.

Minimum Value: -99999999	Maximum Value: 99999999
Default Value: 0	Units: EU (FI2 position EU)

(Continued)

CP-268 FI1PSNRO

When the FI1 position (MP-05) is equal to or greater than a positive FI1Position Roll Over (CP-268), or equal to or less than a negative FI1Position Roll Over, then the FI1PsnRO bit (38) in the PLC is set to “1” (for 1 PLC scan or one-shot). The FI1 position (MP-05) resets to 0 plus the difference between FI1 position and FI1PsnRO (the difference is not discarded).

Minimum Value: 0	Maximum Value: 99999999
Default Value: 100000	Units: EU (FI1 position EU)

CP-269 FI2PSNRO

When the FI2 Position (MP-10) is equal to or greater than a positive FI2 Position Roll Over (CP-269), or equal to or less than a negative FI2 Position Roll Over, then the FI2Psn RO bit (39) in the PLC is set to “1” (for 1 PLC scan or one-shot). The FI2 Position (MP-10) resets to 0 plus the difference between FI2 position and FI2PsnRO (the difference is not discarded).

Minimum Value: 0	Maximum Value: 99999999
Default Value: 100000	Units: EU (FI2 position EU)

CP-270 ZERO SPEED

When the magnitude of the Fb EU/Tm (MP-39) is less than or equal to Zero Speed (CP-270), the Fb @ 0Spd bit (44) in the PLC is set to “1”. This value, as well as the PLC Fb @ 0Spd bit condition, is used in other transparent internal calculations that are based on feedback information.

Minimum Value: 0	Maximum Value: 100000
Default Value: 1.00	Units: EU/Tm

CP-271 MAX FB ALM

Maximum Feedback Alarm (CP-271) signals an over-speed condition. When the magnitude of the Fb EU/Tm (MP-39) is greater than or equal to Maximum Feedback Alarm (CP-271), then the MaxFb Spd bit (48) in the PLC is set to “1”. You can output this alarm for indication or action, or you can use the alarm logically in the PLC.

Minimum Value: 0	Maximum Value: 999999
Default Value: 10000	Units: EU/Tm

CP-272 MAX ACL/DCL

When either the feedback acceleration or the deceleration is greater than or equal to Max Acl/Dcl (CP-272), then the MacAclDcl bit (49) in the PLC is set to “1” . You can output this alarm for indication or action, or you can use the alarm logically in the PLC.

Minimum Value: 0	Maximum Value: 9999999
Default Value: 10000	Units: EU/Tm/sec

(Continued)

CP-273 NO RESP TIME

When the CO Signal output signal is greater than 1/16 Co Max Volts (CP-181) and the Fb EU/Tm (MP-39) is less than Zero Spd (CP-270) for longer than the No Resp Time (CP-273), then the MtrNResp bit (50) is set to "1". If this scenario occurs, it is generally an indication that the feedback has been lost. It can also indicate that the drive is not enabled (or faulted out), that the CO_SIG Output signal is not getting to the drive or that there may be a physical obstruction preventing motion.

Minimum Value: 0.010 Maximum Value: 600
Default Value: 1.000 Units: Seconds

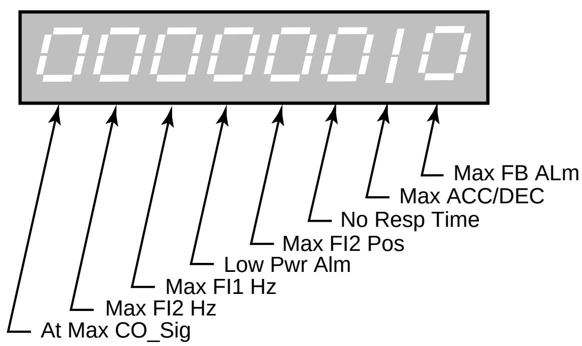
CP-274 MAX FI2 PSN

Maximum FI2 Position (CP-274) signals an over-travel condition. When the FI2 Position (MP-10) is greater than or equal to a positive Max FI2 Psn (CP-274) or less than or equal to a negative Max FI2 Psn, then the MaxFI2Psn bit (51) in the PLC is set to "1" .

Minimum Value: 0 Maximum Value: 99999999
Default Value: 100000 Units: EU

CP-278 STD ALM MSK

The Standard Alarm Mask (CP-278) allows you to mask out specific alarms so that they will not cause the 'Alm' indicator to flash (in the lower left-hand corner of the CX-1010 screen) by entering a "0" in the corresponding bit position (see figure below). You can also activate any of these alarm conditions by entering a "1" in the corresponding bit position.

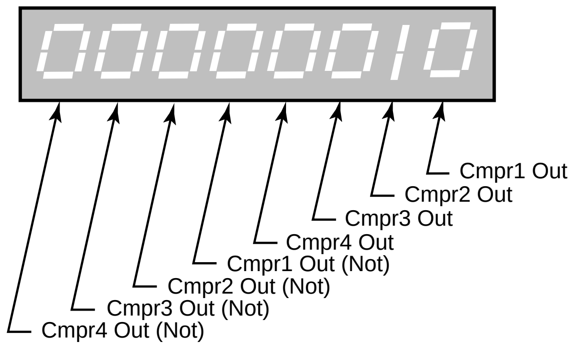


Minimum Value: 00000000 Maximum Value: 11111111
Default Value: 00000000 Units: Coded

(Continued)

CP-279 CUSTALM MSK

Custom Alarm Mask (CP-279) allows you to mask out the compare results so that they will not cause the 'Alm' indicator to flash (in the lower left-hand corner of the CX-1010 screen) by entering a "0" in the corresponding bit position (see figure below). You can also activate any of these compare conditions by entering a "1" in the corresponding bit position.



Minimum Value: 00000000	Maximum Value: 11111111
Default Value: 00000000	Units: Coded

CP-280 CMPR1 PARM

Enter a Monitor Parameter code in Compare 1 Parameter (CP-280) that will act on the value in Cmpr1 Val (CP-292), by using the comparison type that you entered in Cmp1 Type (CP-286). If the comparison that is established by these three parameters is "true", then the PLC sets the Cmpr1 Out bit (56) in the PLC to "1", which can be used to trigger a user defined indicator.

Minimum Value: 1	Maximum Value: 85
Default Value: 39 (Fb EU/Tm)	Units: Parameter Code

NOTE: The following Monitor Parameters are not available for the Compare1 Parameter (CP-280), Compare 2 Parameter (CP-281), Compare 3 Parameter (CP-282) or Compare 4 Parameter (CP-283):

MP-17 ..... AnlgCal Ref A
MP-18 ..... AnlgCal Ref B
MP-22 ....CO Max Bits
MP-23 ... CO DAC Range
MP-29 .. KeyPad Lockout
MP-30 .... ScParm Val
MP-38 ....Ld EU/Tm
MP-40 .... Scaled Fb
MP-45 .... Cntrl Loop
MP-49 .... EstMaxFb
MP-52 .... InvalidBlks
MP-53 .... Misc Status
MP-54 .... Std Alarms
MP-55 .... Custom Alms
MP-58 .... PLC Mon 1 Val

(Continued)

MP-59 .... PLC Mon 2 Val
MP-60 .... PLC 15- 8
MP-61 .... PLC 23- 16
MP-62 .... PLC 31- 24
MP-63 .... PLC 39- 32
MP-64 .... PLC 47- 40
MP-65 .... PLC 55- 48
MP-66 .... PLC 63- 56
MP-67 .... PLC 71- 64
MP-68 .... PLC 79- 72
MP-69 .... PLC 87- 80
MP-70 .... PLC 95- 88
MP-71 .... PLC 107-100
MP-72 .... PLC 115-108
MP-73 .... PLC 123-116
MP-74 .... PLC 131-124
MP-75 .... PLC 139-132
MP-76 .... PLC 147-140
MP-77 .... PLC 155-148
MP-78 .... PLC 163-156
MP-79 .... PLC 171-164
MP-80 .... Last Reset
MP-81 ....Misc Intrpts
MP-82 .... Device Alms
MP-83 .... PC at Intrpt

CP-281 CMPR2 PARM

Enter a Monitor Parameter code in Compare 2 Parameter (CP-281) that will act on the value in Cmpr2 Val (CP-293), by using the comparison type that you entered in Cmp2 Type (CP-287). If the comparison that is established by these three parameters is “true”, then the PLC sets the Cmpr2 Out bit (57) in the PLC to “1”, which can be used to trigger a user defined indicator.

Minimum Value: 1	Maximum Value: 85
Default Value: 39 (Fb EU/Tm)	Units: Parameter Code

NOTE: Refer to the "NOTE" in CP-280.

(Continued)

CP-282 CMPR3 PARM

Enter a Monitor Parameter in Compare 3 Parameter (CP-282) that will act on the value in Cmpr3 Val (CP-294), by using the comparison type that you entered in Cmp3 Type (CP-288). If the comparison that is established by these three parameters is “true”, then the PLC sets the Cmpr3 Out bit (58) in the PLC to “1” , which can be used to trigger a user defined indicator.

Minimum Value: 1	Maximum Value: 85
Default Value: 44 (RR Error)	Units: Parameter Code

NOTE: Refer to the "NOTE" in CP-280.

CP-283 CMPR4 PARM

Enter a Monitor Parameter in Compare 4 Parameter (CP-282) that will act on the value in Cmpr4 Val (CP-295), by using the comparison type that you entered in Cmpr4 Type (CP-289). If the comparison that is established by these three parameters is “true”, then the PLC sets the Cmpr4 Out bit (59) in the PLC Programming screen to “1”, which can be used to trigger a user defined indicator.

Minimum Value: 1	Maximum Value: 85
Default Value: 43 (SR Error)	Units: Parameter Code

NOTE: Refer to the "NOTE" in CP-280.

CP-286 CMPR1 TYPE

Use Cmpr1 Type (CP-286) to establish the type of comparison (see list below) that will compare the Monitor Parameter that you entered in Cmpr1 Parm (CP-280) to the value that you entered in Cmpr1 Val (CP-292). If you require a comparison that is not listed, then set the Cmpr1 Out bit in the PLC to “Ld Not”. This programs the comparison type to become a “Not” statement For example, to program “Magnitude Less Than” (<) use “NOT” Magnitude greater than or equal to (>=).

6 = ‘mag =’	if Magnitude of parm selected by Cmpr1 Parm = Cmpr1 Val, Cmpr1 Out = 1
5 = ‘mag >=’	if Magnitude of parm selected by Cmpr1 Parm >= Cmpr1 Val, Cmpr1 Out = 1
4 = ‘mag >’	if Magnitude of parm selected by Cmpr1 Parm > Cmpr1 Val, Cmpr1 Out = 1
3 = ‘=’	if value of parm selected by Cmpr1 Parm = Cmpr1 Val, Cmpr1 Out = 1
2 = ‘>=’	if value of parm selected by Cmpr1 Parm >= Cmpr1 Val, Cmpr1 Out = 1
1 = ‘>’	if value of parm selected by Cmpr1 Parm > Cmpr1 Val, Cmpr1 Out = 1

Minimum Value: 1	Maximum Value: 6
Default Value: 4	Units: Coded

(Continued)

CP-287 CMPR2 TYPE

Use Cmpr2 Type (CP-287) to establish the type of comparison (see list below) that will compare the Monitor Parameter that you entered in Cmpr2 Parm, (CP-281) to the value that you entered in Cmpr2 Val (CP-293). If you require a comparison that is not listed, then set the Cmpr2 Out bit in the PLC to "Ld Not". This programs the comparison type to become a "Not" statement For example, to program "Magnitude Less Than " (<) use "NOT " Magnitude greater than or equal to (>=).

6 = 'mag =' if Magnitude of parm selected by Cmpr2 Parm) = Cmpr2 Val, Cmpr2 Out = 1
5 = 'mag >=' if Magnitude of parm selected by Cmpr2 Parm) >= Cmpr2 Val, Cmpr2 Out = 1
4 = 'mag >' if Magnitude of parm selected by Cmpr2 Parm) > Cmpr2 Val, Cmpr2 Out = 1
3 = '=' if value of parm selected by Cmpr2 Parm) = Cmpr2 Val, Cmpr2 Out = 1
2 = '>=' if value of parm selected by Cmpr2 Parm) >= Cmpr2 Val, Cmpr2 Out = 1
1 = '>' if value of parm selected by Cmpr2 Parm) > Cmpr2 Val, Cmpr2 Out = 1

Minimum Value: 1 Maximum Value: 6
Default Value: 5 Units: Coded

CP-288 CMPR3 TYPE

Use Cmpr3 Type (CP-288) to establish the type of comparison (see list below) that will compare the Monitor Parameter that you entered in Cmpr3 Parm (CP-282) to the value that you entered in Cmpr3 Val (CP-294). If you require a comparison that is not listed, then set the Cmpr3 Out bit in the PLC to "Ld Not". This programs the comparison type to become a "Not" statement For example, to program "Magnitude Less Than" (<) use "NOT" Magnitude greater than or equal to(>=).

6 = 'mag =' if Magnitude of parm selected by Cmpr3 Parm) = Cmpr3 Val, Cmpr3 Out = 1
5 = 'mag >=' if Magnitude of parm selected by Cmpr3 Parm) >= Cmpr3 Val, Cmpr3 Out = 1
4 = 'mag >' if Magnitude of parm selected by Cmpr3 Parm) > Cmpr3 Val, Cmpr3 Out = 1
3 = '=' if value of parm selected by Cmpr3 Parm) = Cmpr3 Val, Cmpr3 Out = 1
2 = '>=' if value of parm selected by Cmpr3 Parm) >= Cmpr3 Val, Cmpr3 Out = 1
1 = '>' if value of parm selected by Cmpr3 Parm) > Cmpr3 Val, Cmpr3 Out = 1

Minimum Value: 1 Maximum Value: 6
Default Value: 4 Units: Coded

CP-289 CMPR4 TYPE

Use Cmpr4 ype (CP-288) to establish the type of comparison (see list below) that will compare the Monitor Parameter that you entered in Cmpr4 Parm (CP-283) to the value that you entered in Cmpr4 Val (CP-295). If you require a comparison that is not listed, then set the Cmpr4 Out bit in the PLC to "Ld Not". This programs the comparison type to become a "Not" statement For example, to program "Magnitude Less Then " (<) use "NOT " Magnitude greater than or equal to (>=).

6 = 'mag =' if Magnitude of parm selected by Cmpr4 Parm) = Cmpr4 Val, Cmpr4 Out = 1
5 = 'mag >=' if Magnitude of parm selected by Cmpr4 Parm) >= Cmpr4 Val, Cmpr4 Out = 1
4 = 'mag >' if Magnitude of parm selected by Cmpr4 Parm) > Cmpr4 Val, Cmpr4 Out = 1
3 = '=' if value of parm selected by Cmpr4 Parm) = Cmpr4 Val, Cmpr4 Out = 1
2 = '>=' if value of parm selected by Cmpr4 Parm) >= Cmpr4 Val, Cmpr4 Out = 1
1 = '>' if value of parm selected by Cmpr4 Parm) > Cmpr4 Val, Cmpr4 Out = 1

Minimum Value: 1 Maximum Value: 6
Default Value: 4 Units: Coded

(Continued)

CP-292 CMPR1 VAL

Enter a value in Cmpr1 Val (CP-292) that will be compared to the Monitor Parameter in Cmpr1 Parm (CP-280), using the comparison type that you entered in Cmpr1 Type (CP-286). If the comparison that is established by these three parameters is “true”, then the PLC sets the Cmpr1 Out bit (56) in the PLC to “1” .

Minimum Value: -9999999	Maximum Value: 9999999
Default Value: 2000	Units: same as the selected MP

CP-293 CMPR2 VAL

Enter a value in Cmpr2 Val (CP-293) that will compared to the Monitor Parameter in Cmpr2 Parm (CP-281), using the comparison type that you entered in Cmpr2 Type (CP-287). If the comparison that is established by these three parameters is “true”, then the PLC sets the Cmpr2 Out bit (57) in the PLC screen to “1”.

Minimum Value: -9999999	Maximum Value: 9999999
Default Value: 0	Units: same as the selected MP

CP-294 CMPR3 VAL

Enter a value in Cmpr3 Val (CP-294) that will be compared to the Monitor Parameter in Cmpr3 Parm (CP-282), using the comparison type that you entered in Cmpr3 Type (CP-288). If the comparison that is established by these three parameters is “true”, then the PLC sets the Cmpr3 Out bit (58) in the PLC to “1”.

Minimum Value: -9999999	Maximum Value: 9999999
Default Value: 10	Units: same as the selected MP

CP-295 CMPR4 VAL

Enter a value in Cmpr4 Val (CP-295) that will be compared to the Monitor Parameter in Cmpr4 Parm (CP-283), using the boundary type that you entered in Cmpr4 Type (CP-289). If the comparison that is established by these three parameters is “true”, then the PLC sets the Cmpr4 Out bit (59) in the PLC to “1” .

Minimum Value: -9999999	Maximum Value: 9999999
Default Value: 5	Units: same as the selected Monitor Parameter

CP-296 COPY SOURCE 1

Copy Source 1 (CP-296) identifies the CP or MP whose value is copied to Copy Dest 1 when a 0 to 1 transition occurs in the DataCopy 1 PLC bit.

CP-297 COPY DEST 1

Copy Dest 1 (CP-297) identifies the CP that takes on the value of the CP or MP identified by Copy Source 1 when a 0 to 1 transition occurs in the DataCopy 1 PLC bit.

(Continued)

CP-298 COPY SOURCE 2

Copy Source 2 (CP-298) identifies the CP or MP whose value is copied to Copy Dest 2 when a 0 to 1 transition occurs in the DataCopy 2 PLC bit.

CP-299 COPY DEST 2

Copy Dest 2 (CP-299) identifies the CP that takes on the value of the CP or MP identified by Copy Source 2 when a 0 to 1 transition occurs in the DataCopy 2 PLC bit.

CP-300 REMOTE SCROLL

In Remote Scroll (CP-300), enter the number of the Control Parameter that you want the Remote Scroll Up PLC Bit (168) or the Remote Scroll Dn PLC bit (169) to increment or decrement by 1 least significant digit, at the Scroll Rate (CP-301). To disable the function, set Remote Scroll (CP-300) to “0” .

Minimum Value: 0	Maximum Value: 349
Default Value: 101	Units: Parameter Code

CP-301 RMT SCROLL RATE

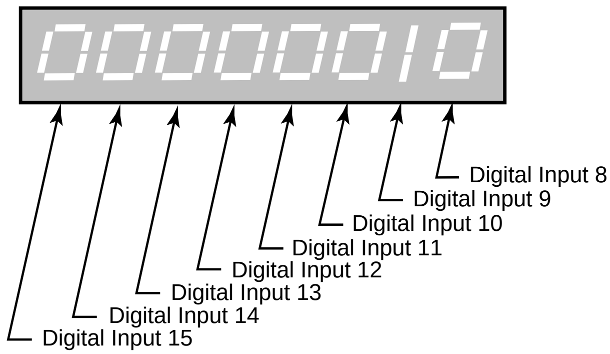
Remote Scroll Rate (CP-301) is the number of times per second, that the Control Parameter that you entered in Remote Scroll (CP-300) is either incremented or decremented by 1 least significant digit , when the Remote Scroll Up PLC Bit (168) or the Remote Scroll Dn PLC bit (169) is active.

Minimum Value: 1	Maximum Value: 100	Default Value: 10
Units: Increments/Decrements		

(Continued)

CP-302 DI 1 SHOT

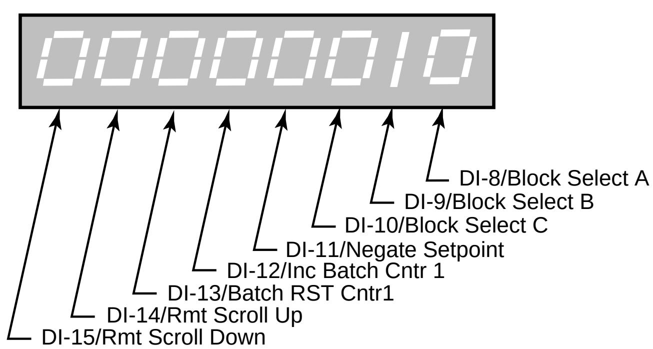
Use the Digital Input 1 Shot (CP-302) to create a one scan pulse (one-shot) as the result of a high-to-low (open-to-closed) transition on any or all of the PLC dedicated inputs. To generate a 1- scan pulse for an inactive high to an active low transition, enter a “1” in the bit location of corresponding digital input. In the example below, the “1” has been entered in digital input 9.



Minimum Value: 00000000	Maximum Value: 11111111
Default Value: 00000000	Units: Coded

CP-303 DI SET

Digital Input Set (CP-303) simulates an “ACTIVE” condition on any or all of the PLC dedicated Digital Inputs (DI 15-8). Digital Input Set (CP-303) is logically OR’ed with the actual DI 15..8 (MP-27) bits to form the PLC 15- 8 (MP-60) bits. The PLC 15- 8 (MP-60) bits are used by the PLC logic. The value of DI Set (CP-303) will not effect the actual DI 15..8 (MP-27) value, rather, DI 15..8 (MP-27) reflects the present status of the actual inputs. Enter a “1” in a bit location to simulate an active condition on the corresponding input. DI..15 to DI..8 get mapped into Bit 7 to Bit 0. Refer to the graphic below.



Minimum Value: 00000000	Maximum Value: 11111111
Default Value: 00000000	Units: Coded

(Continued)

CP-305 PLC MONITOR 1

PLC Monitor 1 (CP-305) determines which PLC bit will be monitored in PLC Mon 1 Val (MP-58). The PLC Mon 1 Val (MP-58) displays the name of the bit rather than "PLC Mon 1 Val". To select a PLC bit to monitor, enter the number of the bit or by use the Scroll keys (^ or v) to scroll through the list. This bit can be monitored in any screen when the code select line set to PLC Mon 1 Val (MP-58).

Minimum Value: 0	Maximum Value: 171	Default Value: 8
Units: Bits		

CP-306 PLC MONITOR 2

PLC Monitor 2 (CP-306) determines which PLC bit will be monitored in PLC Mon 2 Val (MP-59). The PLC Mon 2 Val (MP-59) displays the name of the bit rather than "PLC Mon 2 Val". To select a PLC bit to monitor, enter the number of the bit or by use the Scroll keys (^ or v) to scroll through the list. This bit can be monitored in any screen when the code select line set to PLC Mon 2 Val (CP-590).

Minimum Value: 0	Maximum Value: 171	Default Value: 8
Units: Bits		

CP-307 PLC BIT SET

PLC Bit Set (CP-307) forces a PLC bit to be set to "1". Enter the number of the bit that you want to set to "1". PLC Bit Set (CP-307) tests your PLC program rather than commanding a direct operation. The bit is set prior to the PLC program execution but after all the inputs, comparisons, timers and counters have had their status bits set up. However, the PLC could clear this bit and unpredictable results can occur. Do not attempt to set a PLC bit that is controlled by an OUT instruction in the PLC program. If you need to force an output, use Diag DO in the diagnostics screen.

Minimum Value: 0	Maximum Value: 171	Default Value: 3
Units: Bits		

CP-308 PLC BIT CLEAR

PLC Bit Clear (CP-308) forces a PLC bit to be reset to "0". Enter the number of the bit that you want to clear. PLC Bit Clear (CP-308) tests your PLC program rather than commanding a direct operation. The bit is cleared prior to the PLC program execution but after all the inputs, comparisons, timers and counters have set up their status bits. However, the PLC could set this bit and unpredictable results can occur. Do not attempt to clear a PLC bit that is controlled by an OUT instruction in the PLC program. If you need to force an output, use Diag DO in the DIG I/O Test diagnostics screen.

Minimum Value: 0	Maximum Value: 171	Default Value: 2
Units: Bits		

CP-310 TMR1 DELAY

Timer 1 Delay (CP-310) is the time, in seconds, from which Timer 1 becomes enabled (Tmr1 En bit going from 0 to 1) until the Tmr1 Out bit (24) in the PLC is activated = 1. When the Tmr1 En bit (124) returns to "0", the Tmr1 Out bit (24) is reset to "0" and the delay-time is reset to "0".

Minimum Value: 0	Maximum Value: 86400	Default Value: 1.000
Units: Seconds		

(Continued)

CP-311 TMR1 ON TM

Timer 1 on Time (CP-311) is the time, in seconds, from which Tmr 1 Out is activated (= 1) until Tmr1 Out is deactivated (back to 0). When the Tmr1 En bit (124) returns to “0”, the Tmr1 Out bit (24) is reset = 0 and the on- time is reset to “0”. If you want Timer 1 on-time to be infinite (“On” until Tmr1 is disabled with Tmr1 En = 0), then enter a value of -1 into Tmr1 on Tm (CP-311).

Minimum Value: -1 Maximum Value: 86400
Default Value: -1 Units: Seconds

CP-312 TMR2 DELAY

Timer 2 Delay (CP-312) is the time in seconds from which Timer 2 becomes enabled (Tmr2 En bit going from 0 to 1) until the Tmr2 Out bit (25) in the PLC activated = 1. When the Tmr2 En bit (125) returns to “0”, the Tmr2 Out bit (25) is reset to “0” and the delay-time is reset to “0”.

Minimum Value: 0 Maximum Value: 86400 Default Value: 1.000
Units: Seconds

CP-313 TMR2 ON TM

Timer 2 on Time (CP-313) is the time, in seconds, from which Tmr 2 Out is activated (= 1) until Tmr2 Out is de-activated (back to 0). When the Tmr2 En bit (125) returns to “0”, the Tmr2 Out bit (25) is reset = 0 and the on- time is reset to “0”. If you want Tmr2 on-time to be infinite (“On” until Tmr2 is disabled with Tmr2 En = 0), then enter a value of -1 into Tmr2 on Tm (CP-313).

Minimum Value: -1 Maximum Value: 86400
Default Value: -1 Units: Seconds

CP-314 TMR3 DELAY

Timer 3 Delay (CP-314) is the time, in seconds, from which Timer 3 becomes enabled (Tmr3 En bit going from 0 to 1) until the Tmr3 Out bit (26) in the PLC is activated = 1. When the Tmr3 En bit (126) returns to “0”, the Tmr3 Out bit (26) is reset to “0” and the delay-time is reset to “0”.

Minimum Value: 0 Maximum Value: 86400
Default Value: 1.000 Units: Seconds

CP-315 TMR3 ON TM

Timer 3 on Time (CP-315) is the time, in seconds, from which Tmr3 Out is activated (= 1) until Tmr3 Out is deactivated (back to 0). When the Tmr3 En bit (126) returns to “0”, the Tmr3 Out bit (24) is reset = 0 and the on- time is reset to “0”. If you want Timer 3 on-time to be infinite (“On” until Tmr3 is disabled with Tmr3 En = 0), then enter a value of -1 into Timer 3 on Time (CP-315).

Minimum Value: -1 Maximum Value: 86400
Default Value: -1 Units: Seconds

(Continued)

CP-316 TMR4 DELAY

Timer 4 Delay (CP-316) is the time, in seconds, from Timer 4 becoming enabled (Tmr4 En bit going from “0” to “1”) toTmr4 Out bit (27) in the PLC going active = 1. If Tmr4 becomes disabled, the delay-time is retained so the timing can continue when Tmr4 is re-enabled. The Tmr4Rst bit (128) in the PLC must be used to reset the delay time to “0”.

Minimum Value: 0	Maximum Value: 86400
Default Value: 1.000	Units: Seconds

CP-317 TMR4 ON TM

Timer 4 on Tm (CP-317) is the time, in seconds, from Tmr4 Out going active (= 1) until Tmr4 Out going inactive (back to “0”). When Tmr4 becomes disabled, the on-time is retained so the timing can continue when Tmr4 is re-enabled. The Tmr4 Rst bit (128) in the PLC must be used to reset the on-time to “0”. If you want Tmr4 on-time to be infinite (“On” until Tmr4 is reset with Tmr4 Rst = 1), then enter a value of “-1” in Tmr4 on Tm (CP-317).

Minimum Value: -1	Maximum Value: 86400
Default Value: -1	Units: Seconds

CP-320 CNTR1 TRIG

When the Counter 1 Count (CP-321) is greater than or equal to Counter 1 Trigger (CP-320), then the Cntr1 Out bit (32) in the PLC is set to “1”. If the count is less than Counter 1 Trigger, then Cntr1 Out bit (32) will be “0”.

Minimum Value: 0	Maximum Value: 10000000
Default Value: 10	Units: Counts

CP-321 CNTR1 CNT

Counter 1 Count (CP-321) is the current count for “Counter 1”.   The CX-1010 automatically increments it one count for every “0” to “1” transition of the Cntr1 Inc bit (130). Counter 1 Count is the default batch counter. Either use the Scroll keys or enter a new number to change this value.   When the PLC program sets Cntr1 Rst bit (135) to “1”, then the Counter 1 Count (CP-321)   resets to “0” .

Minimum Value: 0	Maximum Value: 10000000
Default Value: 0	Units: Counts

CP-322 CNTR2 TRIG

When the Counter 2 Count (CP-323) is greater than or equal to Counter 2 Trigger (CP-322), then the Cntr2 Out bit (33) in the PLC is set to “1”. If the count is less than, the Counter 2 Trigger, the Cntr2 Out bit (33) will be “0”.

Minimum Value: 0	Maximum Value: 10000000
Default Value: 10	Units: Counts

CP-323 CNTR2 CNT

Counter 2 Count (CP-323) is the current count for “Counter 2”. The CX-1010 automatically increments it one count for every “0” to “1” transition of the Cntr2 Inc bit (131). Either use the Scroll keys or enter a new number to change this value. When the PLC program sets Cntr2 Rst bit (136) to “1”, then the Counter 2 Count (CP-323) resets to “0” .

Minimum Value: 0	Maximum Value: 10000000
Default Value: 0	Units: Counts

(Continued)

CP-324 CNTR3 TRIG

When the Counter 3 Count (CP-325) is greater than or equal to Counter 3 Trigger (CP-324), then the Cntr3 Out bit (34) in the PLC is set to “1”. If the count is less than, the Counter 3 Trigger, the Cntr3 Out bit (34) will be “0”.

Minimum Value: 0	Maximum Value: 10000000
Default Value: 10	Units: Counts

CP-325 CNTR3 CNT

Counter 3 Count (CP-325) is the current count for “Counter 3”. The CX-1010 automatically increments it one count for every “0” to “1” transition of the Cntr3 Inc bit (132). Either use the Scroll keys or enter a new number to change this value. When the PLC program sets Cntr3 Rst bit (137) to “1”, then the Counter 3 Count (CP-325) resets to “0” .

Minimum Value: 0	Maximum Value: 10000000
Default Value: 0	Units: Counts

CP-326 CNTR4TRIGUP

When Counter 4 Count (CP-327) is greater than or equal to Counter 4 Trigger Up (CP-326), then the Cntr4 UpOut bit (35) in the PLC is set to “1”. If the count is less than, the Counter 4 Trigger Up, the Cntr4UpO bit (35) will be “0”.

Minimum Value: 0	Maximum Value: 10000000
Default Value: 10	Units: Counts

CP-327 CNTR4CNT

Counter 4 Count (CP-327) is the current count for “Counter 4”. The CX-1010 automatically increments it one count for every “0” to “1” transition of the Cntr4 Inc bit (133). The CX-1010 automatically decrements it one count for every “0” to “1” transition of the Cntr Dec bit (134). Either use the Scroll keys or enter a new number to change this value. When the PLC program sets Cntr4 Rst bit (138) to “1”, then the Counter 4 Count (CP-327) resets to the value of CNTR4PRESET, CP-329.

Minimum Value: 0	Maximum Value: 10000000
Default Value: 0	Units: Counts

CP-328 CNTR4TRIGDN

When Counter 4 Count (CP-327) is less than or equal to Counter 4 Trigger Down (CP-328), then the Cntr4DnO bit (36) in the PLC is set to “1”. If the count is less than, the Counter 4 Trigger Down, the Cntr4 DnO bit (36) will be “0”.

Minimum Value: 0	Maximum Value: 10000000
Default Value: 0	Units: Counts

CP-329 CNTR4PRESET

When the Cntr4 Rst bit in the PLC Programming screen is set to “ 1”, then Cntr4 Cnt (CP-227) is set to and held at the Counter 4 Preset (CP-329) value. If you need a transition preset , then create a one-shot or, when possible, use the DI 1 Shot (CP-302) mask.

Minimum Value: 0	Maximum Value: 10000000
Default Value: 0	Units: Counts

(Continued)

CP-330 DN WRITE PARM 1
Enter the number of a Control Parameter to be written to with the DeviceNet poll command in the I/O Assembly Queue.

CP-331 DN WRITE PARM 2
Enter the number of a Control Parameter to be written to with the DeviceNet poll command in the I/O Assembly Queue.

CP-332 DN WRITE PARM 3
Enter the number of a Control Parameter to be written to with the DeviceNet poll command in the I/O Assembly Queue.

CP-333 DN WRITE PARM 4
Enter the number of a Control Parameter to be written to with the DeviceNet poll command in the I/O Assembly Queue.

CP-334 DN READ PARM 1
Enter the number of a Control Parameter or Monitor Parameter to be read with the DeviceNet poll command in the I/O Assembly Queue.

CP-335 DN READ PARM 2
Enter the number of a Control Parameter or Monitor Parameter to be read with the DeviceNet poll command in the I/O Assembly Queue.

CP-336 DN READ PARM 3
Enter the number of a Control Parameter or Monitor Parameter to be read with the DeviceNet poll command in the I/O Assembly Queue.

CP-337 DN READ PARM 4
Enter the number of a Control Parameter or Monitor Parameter to be read with the DeviceNet poll Command in the I/O Assembly Queue.

(Continued)

CP-340 LG NUMBER PARM

Use Large Number Parameter (CP-340) to select the parameter that displays in the large number display in the Status screen (refer to the status screen in *Operation: Screen Operation*). You can also use the Code key to access and change CP-340 in the Status screen.

Minimum Value: 1 Maximum Value: 567 (restricted) Default Value: 40
Units: Parameter Code

CP-341 STATUS LINE 1

Use Status Line 1 (CP-341) to select the parameter that displays on the first line (under the Large Number Display) of the Status screen (refer to the status screen in *Operation: Screen Operation*). You can also use the Code key to access and change CP-341 in the Status screen.

Minimum Value: 1 Maximum Value: 567 Default Value: 101
Units: Parameter Code

CP-342 STATUS LINE 2

Use Status Line 2 (CP-342) to select the parameter that displays on the second line (under the Large Number Display) of the Status screen (refer to the status screen in *Operation: Screen Operation*). If you want this line to remain blank, enter a “0” in CP-342. You can also use the Code key to access and change CP-342 in the Status screen.

Minimum Value: 0 Maximum Value: 567 Default Value: 39
Units: Parameter Code

CP-343 STATUS LINE 3

Use Status Line 3 (CP-343) to select the parameter that displays on the third line (under the Large Number Display) of the Status screen (refer to the status screen in *Operation: Screen Operation*). If you want this line to remain blank, enter a “0” in CP- 343. You can also use the Code key to access and change CP-343 in the Status screen.

Minimum Value: 0 Maximum Value: 567
Default Value: 50 Units: Parameter Code

CP-344 STATUS LINE 4

Use Status Line 4 (CP-344) to select the parameter that displays on the fourth line (under the Large Number Display) of the Status screen (refer to the status screen in *Operation: Screen Operation*). If you want this line to remain blank, enter a “0” in CP-344. You can also use the Code key to access and change CP-344 in the Status screen.

Minimum Value: 0 Maximum Value: 567 Default Value: 51
Units: Parameter Code

CP-345 STATUS LINE 5

Use Status Line 5 (CP-345) to select the parameter that displays on the fifth line (under the Large Number Display) of the Status screen (refer to the status screen in *Operation: Screen Operation*). If you want this line to remain blank, enter a “0” in CP-345. You can also use the Code key to access and change CP-345 in the Status screen.

Minimum Value: 0 Maximum Value: 567 Default Value: 53
Units: Parameter Code

(Continued)

CP-346 STATUS LINE 6

Use Status Line 6 (CP-346) to select the parameter that displays sixth line (under the Large Number Display) of the Status screen (refer to the status screen in *Operation: Screen Operation*). If you want this line to remain blank, enter a "0" in CP-346. You can also use the Code key to access and change CP-346 in the Status screen.

Minimum Value: 0 Maximum Value: 567 Default Value: 54
Units: Parameter Code

CP-350 DIAGNOSTICS EN

When Diagnostics Enable (CP-350) is set to "1" (On or enabled), the digital inputs will not recognize their normal function and the digital outputs can be controlled by Diag DO (CP-352). In addition, the CO_SIG analog output can be tested. When you enter diagnostics, Diag DO (CP-352) is forced equal to the current DO 7..0 (MP-28) so that there is no unexpected change in the outputs. Change the outputs through Diag DO (CP-352) while performing the diagnostics.

Warning: The actuator may energize if you change Diag DO (CP-352). Stand clear of the system.

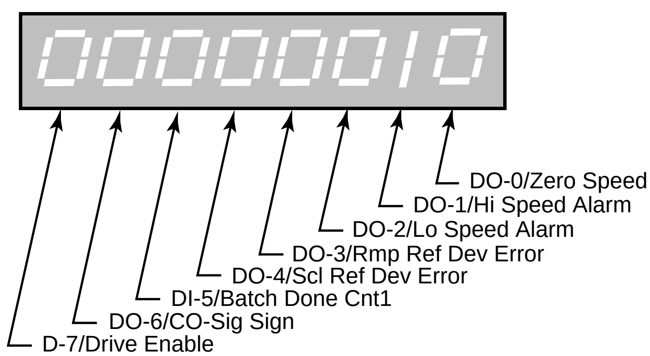
1 = ON = Enabled
0 = OFF (default)

Minimum Value: 0 Maximum Value: 1
Default Value: 0 Units: Coded

CP-352 DIAG DO

Diagnostic Digital Out (CP-352) controls the digital outputs when Diagnostics En (CP-350) is set to "1" (On or enabled) during diagnostics. It is an 8 Bit Binary number with 1 bit per output. If the bit is a "1", then the corresponding output is pulled "low". When you enter diagnostics, Diag DO (CP-352) is forced equal to the current DO 7 ..0 (MP-28) so that there is no unexpected change in the outputs. Change the outputs through Diag DO (CP-352) while performing the diagnostics.

Warning: The actuator may energize if you change Diag DO (CP-352). Stand clear of the system.



Minimum Value: 00000000 Maximum Value: 11111111
Default Value: 00000000 Units: Coded

(Continued)

CP-353 DIAG DAC TEST

Diagnostic DAC Test (CP-353) selects and enables the type of output control that is used for the diagnostic CO_SIG DAC test.

4 = High Frequency Oscillation Output
3 = Continuous Ramp
2 = Ramp to DAC & Hold
1 = Immediate Output
0 = Disabled (default)

Minimum Value: 0   Maximum Value: 4
Default Value: 0   Units: Coded

CP-354 DIAG DAC VOLTS

Diagnostic DAC Volts (CP-354) is the maximum voltage output (either positive or negative) at the CO_SIG DAC during a non zero diagnostic DAC test . The voltage corresponds to Diag DAC Bits (CP-355).

Minimum Value: -15   Maximum Value: 15
Default Value: 0   Units: Volts

CP-355 DIAG DAC BITS

Diagnostic DAC Bits (CP-355) is the maximum value in bits written (either positive or negative) to the CO_SIG DAC during a non zero diagnostic DAC test (CP-353) and when Diagnostics En (CP-350) is set to “1” (On or enabled). The value corresponds to Diag DAC Volts (CP-354).

Minimum Value: -32768   Maximum Value: 32767
Default Value: 0   Units: Bits

CP-356 DIAG RMP TM

Diagnostic Ramp Time (CP-356) is the time, in seconds, from 0 volts to either positive or negative Diag DAC Volts (CP-354) during a diagnostic DAC test with a ramp.

Minimum Value: 0   Maximum Value: 600   Default Value: 10.000
Units: Seconds

CP-360 ANALOG CAL EN

Analog Calibration Enable (CP-356) enables the calibration process for the auxiliary analog board. When Analog Calibration En (CP-360) is set to “1” (On), the signal that is selected in Analog Cal Select (CP-361) will be calibrated.

1 = Enabled
0 = Disabled (default)

Minimum Value: 0   Maximum Value: 1
Default Value: 0   Units: Coded

(Continued)

CP-361 ANALOG CAL SEL

Analog Calibration Select (CP-361) selects the signal (AI1, AI2, AO) on the auxiliary analog board for calibration.

3 = Analog Out
2 = Analog In 2
1 = Analog In 1 (default)

Minimum Value: 1	Maximum Value: 3
Default Value: 1	Units: Coded

CP-362 ANALOG CAL REF

Analog Calibration Reference (CP-362) determines which of the two calibration reference points (see list below) are to be calibrated.

2 = point B
1 = point A (default)

Minimum Value: 1	Maximum Value: 2
Default Value: 1	Units: Coded

CP-363 ANALOG REF VAL

Analog Reference Value (CP-363) is the value of measured data for the signal at the specified reference point (Analog Cal Ref, CP-362). Use a voltmeter for voltage mode operation (or a current meter for current mode of operation) to measure the voltage (or current) on the analog signal selected for calibration at the specified reference point. Enter the measured value in the Analog Reference Value (CP-363).

Minimum Value: -15.0	Maximum Value: 25
Default Value: 0	Units: Volts or Milliamps

CP-364 AO BIT SET

Analog Out Bit Set (CP-364) sets the output value in bits that are used to calibrate the Auxiliary Analog Board's analog output. Change (tune) this value until the actual output matches the value that you entered for Analog Ref Val (CP-363), for the selected point.

Minimum Value: -32768	Maximum Value: 32767
Default Value: 0	Units: Bits

CP-365 AO DIRECT

Analog Out Direct (CP-365) is the value output (in volts or milliamps) at the Auxiliary Analog Board's analog output when the AO Parameter (CP-184) is set to a “0”.

Minimum Value: -15.0	Maximum Value: 20
Default Value: 0.0	Units: Volts or Milliamps

(Continued)

CP-366 CO OFFSET

Control Output Offset (CP-366) is the value (in volts) that is added to the CO_SIG Analog Output (J3, pin 1) signal. Control Output Offset (CP-366) can eliminate any voltage offset present on the DAC output circuitry or it can offset a motor-creep problem (i.e., a digital balance pot). CO Offset (CP-366) is set at the factory, but can also be verified with a voltmeter for a "0" volt output. If you change the value, make sure that it gets into the parameter backup.

Minimum Value: -1.00	Maximum Value: 1
Default Value: 0	Units: Volts

CP-368 CRC ENABLE

If CRC Enable (CP-368) is set to "ON" (1), you must append a CRC value to all serial communications messages that are received by the CX-1010 (See *Serial Communications: Using Serial Communications*). The CX-1010 checks the CRC value against the the message contents (excluding the "STX"), then calculates a CRC value and appends it to all serial communications responses. If CRC Enable (CP-368) is set to "OFF" (0), the CX-1010 will ignore any CRC value that is appended to a message and will not append a CRC value to any serial communications responses.

1 = On (Enabled)   0 = Off (Disabled)

Minimum Value: 0	Maximum Value: 1
Default Value: 1	Units: None

CP-369 RECORD FORMAT

Record Format (CP-369) determines which type of data format (see list below) will be used for the serial communication.

3 = ASCII2   2 = ASCII   1 = BINARY

Minimum Value: 1	Maximum Value: 2
Default Value: 1	Units: Coded

CP-370 DEVICE ADDRESS

Device Address (CP-370) assigns a serial communications address to the CX-1010. This number should be different from any other units that are on the serial link.

Minimum Value: 1	Maximum Value: 99
Default Value: 1	Units: Address

(Continued)

CP-371 BAUD RATE

The Baud Rate (CP-371) determines the serial communications data transfer rate (see list below) in Bits/sec. With a 10 bit frame length, the number of frame/sec would be 1/10 the Baud Rate.

1 = 300 bps = 300 Baud
2 = 600 bps = 600 Baud
3 = 1200 bps = 1200 Baud
4 = 2400 bps = 2400 Baud
5 = 4800 bps = 4800 Baud
6 = 9600 bps = 9600 Baud (default)
7 = 19200 bps = 19.2 Kbaud

Minimum Value: 1	Maximum Value: 7
Default Value: 6	Units: Coded

CP-372 FRAME FORMAT

Frame Format (CP-372) determines the parity, the number of data bits, and the number of stop bits for the serial communications.

1 = N,8,1 = No Parity, 8 data bits, 1 stop bit (10 bit frame - ASCII or Binary)
2 = E,7,1 = Even Parity, 7 data bits, 1 stop bit (10 bit frame-ASCII only)

Minimum Value: 1	Maximum Value: 2
Default Value: 1	Units: Coded

CP-373 SERCOM CHAR OUT

When a new value is entered in SerCom Char Out (CP-373), it is transmitted out the RS-485 serial port at the Baud Rate (CP-371) and the Frame Format (CP-372). SerCom Char Out (CP-373) is a decimal number.

Minimum Value: 0	Maximum Value: 255
Default Value: 0	Units: Decimal Character

CP-374 VIDEO MODE

Video Mode (CP-374) determines how the LCD Screen Display will be dispalyed, per the list below:

3 = Standard Video w/Border
2 = Reverse Video
1 = Standard Video(default)

Minimum Value: 1	Maximum Value: 3
Default Value: 1	Units: Coded

CP-375 CONTRAST VALUE

Contrast Value (CP-375) determines the contrast for the LCD Screen Display. The higher values darken the pixels and lower values lighten the pixels.

Minimum Value: 8	Maximum Value: 32
Default Value: 18	Units: Contrast Integer

(Continued)

CP-376 DN MAC ID

DN MAC ID is the DeviceNet Media Access Control Identifier. The MAC ID is used to assign a uniqe identifier or address to each node on the network. Assign a different MAC ID to each CX-1010 device on the network from 0 to 63.

CP-377 DN BAUD RATE

The DN Baud Rate is the network data or transfer rate. Enter the number from the listing below that corresponds to the desired baud rate:

1 = 125 Kbps
2 = 250 Kbps
3 = 500 Kbps

CP-378 BLK SEL SOURCE

Block Select Source (CP-378) determines whether the active block will be selected by the digital inputs and PLC, by Keypad Blk Sel (CP-379) or by Cntr4 Cnt.

3 = Cntr4 Cnt
2 = KyPd = Keypad Blk Sel
1 = DgIn = Digital Inputs/PLC (default)

Minimum Value: 1	Maximum Value: 2
Default Value: 1	Units: Coded

CP-379 KEYPAD BLK SEL

The Keypad Block Select (CP-379) determines which block will be active when Blk Sel Source (CP-378) is set to “2” (KyPd).

Minimum Value: 0	Maximum Value: 7
Default Value: 0	Units: Parameter Code

CP-380 KYPDLK MASK

Key Pad Lock Mask (CP-380) sets the level of keypad lockout when the Keypad Lockout input is active (low). Each level allows certain Control Parameters to be changed (or masked out from the lockout) even though keypad lockout is active. A value of “1” or higher allows the Control Parameters that are selected by Unlock CP A-H (CP-381 to CP-388) to be changed, with the keypad lockout active. When set to “3” (Blk Vals), the block values can be changed as well as the Main LIst Block Parameter Values and the unlocked Control Parameters. When set to “4” (UnLckBlk), the block values of the block selected by Unlock Block (CP-389) can be changed as well as the main list block parameter values and the unlocked Control Parameters, when the selected block is active.

4 = UnLckBlk = Block Values of the Block Selected by Unlock Block (CP-389) and the Unlocked CP’s.
3 = Blk Vals = All BlockValues (CP-440-567) and the Unlocked CP’s are allowed to change.
2 = Setpnts = Setpoints (CP-110, 120, 130, 140) and the Unlocked CP’s are allowed to change.
1 = UnlckCP = CP’s selected by the Unlock CP A - F are allowed to changed.
0 = Total Lockout (default).

Minimum Value: 0	Maximum Value: 4
Default Value: 0	Units: Coded

(Continued)

CP-381 UNLOCK CP A

Unlock Control Parameter A (CP-381) determines which Control Parameter can change, even when the keypad lockout is active. For the Unlock Control Parameter A (CP-381) to function, KyPdLk Mask (CP-380) must be set to something other than “0” (All Lock). Enter “0” in Unlock Control Parameter A (CP-381) to disable it from selecting any Control Parameter.

Minimum Value: 0	Maximum Value: 567
Default Value: 0	Units: Parameter Code

CP-382 UNLOCK CP B

Unlock Control Parameter B (CP-382) determines which Control Parameter can change, even when the keypad lockout is active. For the Unlock Control Parameter B (CP-382) to function, KyPdLk Mask (CP-380) must be set to something other than “0” (All Lock). Enter “0” in Unlock Control Parameter B (CP-382) to disable it from selecting any Control Parameter.

Minimum Value: 0	Maximum Value: 567
Default Value: 0	Units: Parameter Code

CP-383 UNLOCK CP C

Unlock Control Parameter C (CP-383) determines which Control Parameter can change, even when the keypad lockout is active. For the Unlock Control Parameter C (CP-383) to function, KyPdLk Mask (CP-380) must be set to something other than “0” (All Lock). Enter “0” in Unlock Control Parameter C (CP-383) to disable it from selecting any Control Parameter.

Minimum Value: 0	Maximum Value: 567
Default Value: 0	Units: Parameter Code

CP-384 UNLOCK CP D

Unlock Control Parameter D (CP-384) determines which Control Parameter can change, even when the keypad lockout is active. For the Unlock Control Parameter D (CP-384) to function, KyPdLk Mask (CP-380) must be set to something other than “0” (All Lock). Enter “0” in Unlock Control Parameter D (CP-384) to disable it from selecting any Control Parameter.

Minimum Value: 0	Maximum Value: 567
Default Value: 0	Units: Parameter Code

CP-385 UNLOCK CP E

Unlock Control Parameter E (CP-385) determines which Control Parameter can change, even when the keypad lockout is active. For the Unlock Control Parameter E (CP-385) to function, KyPdLk Mask (CP-380) must be set to something other than “0” (All Lock). Enter “0” in Unlock Control Parameter E (CP-385) to disable it from selecting any Control Parameter.

Minimum Value: 0	Maximum Value: 567
Default Value: 0	Units: Parameter Code

(Continued)

CP-386 UNLOCK CP F

Unlock Control Parameter F (CP-386) determines which Control Parameter can change, even when the keypad lockout is active. For the Unlock Control Parameter F (CP-386) to function, KyPdLk Mask (CP-380) must be set to something other than “0” (All Lock). Enter “0” in Unlock Control Parameter F (CP-386) to disable it from selecting any Control Parameter.

Minimum Value: 0	Maximum Value: 567
Default Value: 0	Units: Parameter Code

CP-387 UNLOCK CP G

Unlock Control Parameter G (CP-387) determines which Control Parameter can change, even when the keypad lockout is active. For the Unlock Control Parameter G (CP-387) to function, KyPdLk Mask (CP-380) must be set to something other than “0” (All Lock). Enter “0” in Unlock Control Parameter G (CP-387) to disable it from selecting any Control Parameter.

Minimum Value: 0	Maximum Value: 567
Default Value: 0	Units: Parameter Code

CP-388 UNLOCK CP H

Unlock Control Parameter H (CP-388) determines which Control Parameter can change, even when the keypad lockout is active. For the Unlock Control Parameter H (CP-388) to function, KyPdLk Mask (CP-380) must be set to something other than “0” (All Lock). Enter “0” in Unlock Control Parameter H (CP-388) to disable it from selecting any Control Parameter.

Minimum Value: 0	Maximum Value: 567
Default Value: 0	Units: Parameter Code

CP-389 UNLOCK BLOCK

Unlock Block (CP-389) determines which block of Control Parameters can change values, even though keypad lockout is active. The main list block parameter values are also allowed to be changed when the selected Unlock Block is active and KyPdLk Mask (CP-380) is set to ‘UnlckBlk’ (4). For the Unlock Block (CP-389) to function, KyPdLk Mask (CP-380) must be set to “4”

Minimum Value: 0	Maximum Value: 7
Default Value: 7	Units: Block Number

(Continued)

CP-390 MEMORY TEST

To test the physical memory, either enter the number associated with the test (see list below) in Memory Test (CP-390) or go to the Help screen for Memory Test (CP-390) and choose the test. The test result will flash in the error and message status bar at the bottom of the screen and is also summarized in the Diagnostics/Device Tests Memory screen. The test results are also available through Monitor Parameters MP-94, MP-95, MP-96.

4 = Test ALL MEMORY
3 = Test NVRAM
2 = Test SRAM
1 = Test ROM
0 = Test Done *

Minimum Value: 0	Maximum Value: 4
Default Value: 0	Units: Coded

CP-391 CLR FAULT CNTRS

To reset all the system-fault counters except Norm- Pwr-Ups (MP-84), enter a “1” in Clear Fault Counters (CP-391). The error and message status bar at the bottom of the screen will flash “Flts Cleared” and the value will return to “0”.

Minimum Value: 0	Maximum Value: 1
Default Value: 0	Units: Coded

CP-392 VIDEO TEST

To start the Video Test, enter “1” in Video Test (CP-392). Then use the page up/down keys to page through tests. Press the Menu key to exit the tests and return to the previous screen.

Minimum Value: 0	Maximum Value: 1
Default Value: 0	Units: Coded

CP-395 SERIAL NUMBER

Serial Number is the serial number from the DeviceNet card in this CX-1010 controller. If the card was factory installed, the Serial Number should already be entered. If the card is being field installed, enter the Serial Number from the label on the card or recorded in the DeviceNet Card Technical Manual.

CP-396 LOAD PARMS

Use Load Parameters (CP-396) to retrieve (load) parameter values from either the factory or the default backup list. You can specify which parameter values to load form the back up, per the list below. It is easier to select the Load Parameters values through the “Help” screen, however, you can enter the corresponding number directly into the Load Parameters (CP-396). A message will flash in the error and message status bar at the bottom of the screen to indicate the completion of the operation . The Load Parameters operation will not function while the CX-1010 is in “RUN”.

6 = Load Dflts BlockCP	Load Factory Defaults into CP-400 through CP-567
5 = Load Dflts Main CP	Load Factory Defaults into CP-101 through CP-394
4 = Load Dflts All Cp	Load Factory Defaults into CP-101 through CP-567
3 = Load Backup BlockCP	Load Backup into CP-400 through CP-567
2 = Load Backup Main CP	Load Backup into CP-101 through CP-394
1 = Load Backup All Cps	Load Backup into CP-101 through CP-567
0 = No Change	

Minimum Value: 0	Maximum Value: 6
Default Value: 0	Units: Coded

(Continued)

CP-397 LOAD PLC PRGM

Use Load PLC Program (CP-397) to retrieve (load) either the backup for the PLC program which you have saved or the factory default PLC program. Enter “1” to load the backup PLC program or enter “2 ” to load the factory default PLC program. You can also select the one of the two values through the Help screen. The loaded program is compiled and a message will flash in the error and message status bar at the bottom of the screen to indicate the completion of the operation. The Load PLC Program operation will not function while the CX-1010 is in “RUN”.

2 = Load Dflt PLC Prg	Load Factory Default PLC program
1 = Load Backup PLC Prg	Load Backup PLC program
0 = No Change	

Minimum Value: 0	Maximum Value: 2
Default Value: 0	Units: Coded

CP-398 SAVE PARMS

Use Save Parameters (CP-398) to save the current parameter values to the backup. You can specify which parameter values to save as back up, per the list below Either enter the corresponding number directly into the Save Parameters (see list below) or select the Save Parameters values through the Help screen. A message (Saved2 BkUp) will flash in the error and message status bar at the bottom of the screen to indicate the completion of the operation.

3 = Save Block CP’s	Save CP-400 through CP-567 to Backup
2 = Save Main CP’s	Save CP-101 through CP-394 to Backup
1 = Save All CP’s	Save CP-101 through CP-567 to Backup
0 = No Change	

Minimum Value: 0	Maximum Value: 3
Default Value: 0	Units: Coded

CP-399 SAVE PLC PRGM

Enter a “1” in Save PLC Program (CP-399) to save the current PLC program to the backup. A message (Saved2 BkUp) will flash in the error and message status bar at the bottom of the screen to indicate the completion of the operation.

1 = Save PLC Program to Backup
0 = No Change

Minimum Value: 0	Maximum Value: 1
Default Value: 0	Units: Coded

CP-400 TO CP-415 BLOCK PARM 1 - BLOCK PARM 16

Use the Block Parameters 1-16 (CP-400 to CP-415) to select the Control Parameters that will be controlled by the BLK0 Val1 - BLK7 Val 16 values (CP-440 to CP-567). When you enter a new parameter number in a block parameter, the text that appears immediately below the block parameter will change accordingly. Enter a “0” to clear the block parameters that are not in use. There are eight blocks; each contains up to sixteen Control Parameters.

Minimum Value: 0	Maximum Value: 349
Default Value: 110	Units: Parameter Code

(Continued)

CP-440 TO CP-567 BLK0 VAL 1 - BLK7 VAL 16

Use the Block Values (CP-440 to CP-567) to define or change the values of the Control Parameters that you assigned to the Block Parameters (CP-400 to CP-415). This allows you to assign up to eight different values to a single parameter, which you can select. The active Block Value is selected by the PLC and monitored by Active Block (CP-51).

Minimum Value: -99999999	Maximum Value: 99999999
Default Value: 0	Units: Parameter Value

(Continued)

APPENDIX D: CONTROL PARAMETER REFERENCE

CODE	DESCRIPTION	MIN	MAX	DEFAULT	USER RECORD	UNITS
CP-101	Setpoint x	-999999	999999	0		EU/Tm
CP-102	Setpoint Mode	1	4	1		Coded
CP-103	Fb Source	1	4	1		Coded
CP-104	Ld Source	1	4	1		Coded
CP-105	Ofs Source	1	6	4		Coded
CP-106	Ff Source	0	2	0		Coded
CP-108	EU/Tm Range	1	4	2		EU/Tm
CP-109	Time Base	0	3	2		Coded
CP-110	Master SP	-999999	999999	0		EU/Tm
CP-111	Max SP Mstr	0	999999	999999		EU/Tm
CP-112	Min SP Mstr	0	999999	0		EU/Tm
CP-113	Master Equation	1	3	1		Coded
CP-114	Inv M Norm	-999999	999999	0		EU
CP-120	Follower SP	-999999	999999	1.000		Ratio
CP-121	Max SP Fol	0	999999	999999		Ratio
CP-122	Min SP Fol	0	999999	0		Ratio
CP-123	Ratio Norm	0	999999	1.000		Ratio
CP-124	Ratio	-1000	1000	1.000		Ratio
CP-125	Fol Equation	1	3	1		Coded
CP-130	Direct SP	-15	15	0.0		Volts
CP-131	Max SP Drct	0	15	15.0		Volts
CP-132	Min SP Drct	0	15	0.0		Volts
CP-140	Custom SP	-999999	999999	0.0		EU/Tm
CP-141	Constant 1	-999999	999999	0		Constant
CP-142	Constant 2	-999999	999999	1.0		Constant
CP-143	Constant 3	-999999	999999	0		Constant
CP-144	Constant 4	-999999	999999	1.0		Constant
CP-146	Max SP Cust	-999999	999999	130000		EU/Tm
CP-147	Min SP Cust	-999999	999999	0		EU/Tm
CP-150	V1 Source	0	6	3		Coded

(Continued)

Appendix D: Control Parameter Reference (continued)

CODE	DESCRIPTION	MIN	MAX	DEFAULT	USER RECORD	UNITS
CP-151	V2 Source	0	6	4		Coded
CP-152	V3 Source	0	6	4		Coded
CP-153	V4 Source	0	6	4		Coded
CP-154	M1	-32768	32767	1.0		Constant
CP-155	B1	-999999	999999	0		Constant
CP-156	M2	-32768	32767	1.0		Constant
CP-157	B2	-999999	999999	0		Constant
CP-158	M3	-32768	32767	1.0		Constant
CP-159	B3	-999999	999999	0		Constant
CP-160	Cnt Mode FI1	1	2	1		Coded
CP-161	PPR FI1	1	60000	60		Pls/Rev
CP-162	FI1 Pulses	0	999999	60		Pulses
CP-163	EU FI1	0.0	999999	1.0		EU
CP-165	Cnt Mode FI2	1	2	1		Coded
CP-166	PPR FI2	1	60000	60		Pls/Rev
CP-167	FI2 Pulses	0	999999	60		Pulses
CP-168	EU FI2	0.0	999999	1.0		EU
CP-170	AI1 Mode	1	2	1		Coded
CP-171	AI1 RA	-15.0	25	0.0		V or ma
CP-172	EU@AI1 RA	-9999999	9999999	0.0		EU/Tm
CP-173	AI1 RB	-15.0	25	10.0		V or ma
CP-174	EU@AI1 RB	-9999999	9999999	100.0		EU/Tm
CP-175	AI2 Mode	1	2	1		Coded
CP-176	AI2 RA	-15.0	25	0.0		V or ma
CP-177	EU@AI2 RA	-9999999	9999999	0.0		EU/Tm
CP-178	AI2 RB	-15.0	25	10.0		V or ma
CP-179	EU@AI2 RB	-9999999	9999999	100.0		EU/Tm
CP-180	CO Mode	1	4	1		Coded
CP-181	CO Max Volts	0.1	15	10.0		Volts
CP-182	CO Polarity	1	2	1		Coded

(Continued)

Appendix D: Control Parameter Reference (continued)

CODE	DESCRIPTION	MIN	MAX	DEFAULT	USER RECORD	UNITS
CP-184	AO Parameter	0	567	7		MP/CP
CP-185	AO Mode	1	2	1		Coded
CP-186	AO RA	-15.0	20	-10.0		V or ma
CP-187	Val@AO RA	-9999999	9999999	-2000		Parm Val
CP-188	AO RB	-15.0	20	10.0		V or ma
CP-189	Val@AO RB	-9999999	9999999	2000		Parm Val
CP-190	ScFb Eq	1	4	1		Coded
CP-191	ScFb EU	0	999999	1.0		EU
CP-192	Fb @ ScFb EU	0	999999	1		Fb EU/Tm
CP-193	Sc Parm	1	99	7		MP
CP-194	Sc Parm Eq	1	3	1		Coded
CP-195	Sc Parm M	-999999	999999	1.0		Constant
CP-196	Sc Parm B	-999999	999999	0.0		Constant
CP-199	Lg Number Units	0	80	1		Coded
CP-200	Ref RUN Rmp	0.001	999999	1000		EU/Tm
CP-201	Acl Tm RUN	0	3600	1.000		Seconds
CP-202	Acl Rt RUN	0	9999999	1000		EU/Tm/S
CP-203	Dcl Tm RUN	0	3600	1.000		Seconds
CP-204	Dcl Rt RUN	0	9999999	1000		EU/Tm/S
CP-205	Ref Drct Rmp	0	15	10.0		Volts
CP-206	Acl Tm Drct	0	3600	1.000		Seconds
CP-208	Dcl Tm Drct	0	3600	1.000		Seconds
CP-210	Ref StopRmp	0.001	999999	1000		EU/Tm
CP-211	Dcl Tm Rstp	0	3600	1.000		Seconds
CP-212	Dcl Rt RStp	0	9999999	1000		EU/Tm/S
CP-213	Dcl Tm HStp	0	3600	1.000		Seconds
CP-214	Dcl Rt HStp	0	9999999	1000		EU/Tm/S
CP-215	Jog SP	0	999999	250		EU/Tm
CP-216	Acl Tm Jog	0	3600	1.000		Seconds
CP-217	Acl Rt Jog	0	9999999	250		EU/Tm/S

(Continued)

Appendix D: Control Parameter Reference (continued)

CODE	DESCRIPTION	MIN	MAX	DEFAULT	USER RECORD	UNITS
CP-218	Dcl Tm Jog	0	3600	1.000		Seconds
CP-219	Dcl Rt Jog	0	9999999	250		EU/Tm/S
CP-220	RUN Loop Mode	0	3	1		Coded
CP-221	Jog Loop Mode	0	1	1		Coded
CP-222	Drive Type	1	2	1		Coded
CP-224	Kff	–9999999	9999999	5.0		V/kiloEU
CP-225	Kp VL	0	200	100		Constant
CP-226	Ki VL	0	200	100		Constant
CP-227	Kd VL	0	200	0		Constant
CP-228	Deriv Thd VL	0	99999	0		Constant
CP-229	Kp ZE	0	200	100		Constant
CP-230	HStp LoopMode	0	3	1		Coded
CP-233	Max Fb	0	999999	2000		EU/Tm
CP-235	KP PL	0	200	100		Constant
CP-236	Ki PL	0	200	0		Constant
CP-237	Kd PL	0	200	0		Constant
CP-238	Deriv Thd PL	0	9999	1		Constant
CP-239	PPR Mtr	1	60000	60		Pls/Rev
CP-240	Cntrl Latch	00000000	11111111	00000000		Coded
CP-241	Loop Update	1	3	1		Coded
CP-242	KffAdjUpdt	1	5	2		Coded
CP-244	Kff Auto En	0	1	0		Coded
CP-248	Signal Fltr Sel	0	4	0		Coded
CP-249	Signal Fltr Tau	5	50	10		Msec
CP-250	Max Spd Lmt	0	999999	2000		EU/Tm
CP-251	Min Spd Lmt	0	999999	0		EU/Tm
CP-253	ZE Limit	0	99999	2000		EU/Tm
CP-255	Ramp Thd	0	999999	10.0		EU/Tm
CP-258	Trim Ath	1	32767	16383		Bits
CP-259	Intgrl Lmt	1	32767	16383		Bits

(Continued)

Appendix D: Control Parameter Reference (continued)

CODE	DESCRIPTION	MIN	MAX	DEFAULT	USER RECORD	UNITS
CP-260	PsnErr+	0	10000000	1.0		EU
CP-261	PsnErr-	0	10000000	1.0		EU
CP-262	Psn Offset	-8000000	8000000	0		EU
CP-266	FI1PsnPrst	-99999999	99999999	0		EU
CP-267	FI2PsnPrst	-99999999	99999999	0		EU
CP-268	FI1PsnRO	0	99999999	10		EU
CP-269	FI2PsnRO	0	99999999	10		EU
CP-270	Zero Speed	0	100000	10.0		EU/Tm
CP-271	Max Fb Alm	0	999999	2000		EU/Tm
CP-272	Max Acl/Dcl	0	9999999	2000		EU/Tm/S
CP-273	NO Resp Time	0.010	600	1.000		Seconds
CP-274	Max FI2 Psn	0	99999999	10		EU
CP-278	Std Alm Msk	00000000	11111111	00000000		Coded
CP-279	CustAlm Msk	00000000	11111111	00000000		Coded
CP-280	Cmpr1 Parm	1	99	39		MP
CP-281	Cmpr2 Parm	1	99	39		MP
CP-282	Cmpr3 Parm	1	99	44		MP
CP-283	Cmpr4 Parm	1	99	43		MP
CP-286	Cmpr1 Type	1	6	4		Coded
CP-287	Cmpr2 Type	1	6	5		Coded
CP-288	Cmpr3 Type	1	6	4		Coded
CP-289	Cmpr4 Type	1	6	4		Coded
CP-292	Cmpr1 Val	-9999999	9999999	2000		Parm Val
CP-293	Cmpr2 Val	-9999999	9999999	0		Parm Val
CP-294	Cmpr3 Val	-9999999	9999999	20		Parm Val
CP-295	Cmpr4 Val	-9999999	9999999	10		Parm Val
CP-296	Copy Source 1	1	567	143		CP or MP
CP-297	Copy Dest 1	101	567	143		CP or MP
CP-298	Copy Source 2	1	567	144		CP or MP
CP-299	Copy Dest 2	101	567	144		CP or MP

(Continued)

CODE	DESCRIPTION	MIN	MAX	DEFAULT	USER RECORD	UNITS
CP-300	Remote Scroll	0	349	101		CP
CP-301	Rmt Scroll Rate	1	100	10		Inc/Sec
CP-302	DI 1 Shot	00000000	11111111	00000000		Coded
CP-303	DI Set	00000000	11111111	00000000		Coded
CP-305	PLC Monitor 1	0	171	8		Bit
CP-306	PLC Monitor 2	0	171	9		Bit
CP-307	PLC Bit Set	0	171	3		Bit
CP-308	PLC Bit Clear	0	171	2		Bit
CP-310	Tmr1 Delay	0	86400	1.000		Seconds
CP-311	Tmr1 on Tm	-1	86400	-1		Seconds
CP-312	Tmr2 Delay	0	86400	1.000		Seconds
CP-313	Tmr2 on Tm	-1	86400	-1		Seconds
CP-314	Tmr3 Delay	0	86400	1.000		Seconds
CP-315	Tmr3 on Tm	-1	86400	-1		Seconds
CP-316	Tmr4 Delay	0	86400	1.000		Seconds
CP-317	Tmr4 on Tm	-1	86400	-1		Seconds
CP-320	Cntr1 Trig	0	10000000	10		Counts
CP-321	Cntr1 Cnt	0	10000000	0		Counts
CP-322	Cntr2 Trig	0	10000000	10		Counts
CP-323	Cntr2 Cnt	0	10000000	0		Counts
CP-324	Cntr3 Trig	0	10000000	10		Counts
CP-325	Cntr3 Cnt	0	10000000	0		Counts
CP-326	Cntr4 TrigUp	0	10000000	10		Counts
CP-327	Cntr4 Cnt	0	10000000	0		Counts
CP-328	Cntr4 TrigDn	0	10000000	0		Counts
CP-329	Cntr4 Preset	0	10000000	0		Counts
CP-330	DN Write Parm 1	0	567	0		CP
CP-331	DN Write Parm 2	0	567	0		CP
CP-332	DN Write Parm 3	0	567	0		CP
CP-333	DN Write Parm 4	0	567	0		CP

(Continued)

CODE	DESCRIPTION	MIN	MAX	DEFAULT	USER RECORD	UNITS
CP-334	DN Read Parm 1	0	567	0		CP or MP
CP-335	DN Read Parm 2	0	567	0		CP or MP
CP-336	DN Read Parm 3	0	567	0		CP or MP
CP-337	DN Read Parm 4	0	567	0		CP or MP
CP-340	Lg Number Parm	1	567	40		CP or MP
CP-341	Status Line 1	1	567	101		CP or MP
CP-342	Status Line 2	0	567	39		CP or MP
CP-343	Status Line 3	0	567	50		CP or MP
CP-344	Status Line 4	0	567	51		CP or MP
CP-345	Status Line 5	0	567	53		CP or MP
CP-346	Status Line 6	0	567	54		CP or MP
CP-350	Diagnostics En	0	1	0		Coded
CP-352	Diag DO	00000000	11111111	00000000		Coded
CP-353	Diag DAC Test	0	4	0		Coded
CP-354	Diag DAC Volts	-15	15	0		Volts
CP-355	Diag DAC Bits	-32768	32767	0		Bits
CP-356	Diag Rmp Tm	0	600	10.000		Seconds
CP-360	Analog Cal En	0	1	0		Coded
CP-361	Analog Cal Sel	1	3	1		Coded
CP-362	Analog Cal Ref	1	2	1		Coded
CP-363	AnalogRef Val	-15.0	25	0		V or ma
CP-364	AO Bit Set	-32768	32767	0		Bits
CP-365	AO Direct	-15.0	20	0.0		V or ma
CP-366	CO Offset	-1.00	1	0		Volts
CP-368	CRC Enable	0	1	1		Coded
CP-369	Record Format	1	2	1		Coded
CP-370	Device Address	1	99	1		Address
CP-371	Baud Rate	1	7	6		Coded
CP-372	Frame Format	1	2	1		Coded
CP-373	SerCom Char Out	0	255	0		Decimal

(Continued)

Appendix D: Control Parameter Reference (continued)

CODE	DESCRIPTION	MIN	MAX	DEFAULT	USER RECORD	UNITS
CP-374	Video Mode	1	3	1		Coded
CP-375	Contrast Value	8	32	18		Contrast
CP-376	DN MAC ID	0	63	63		ID
CP-377	DN Buad Rate	1	3	1		Coded
CP-378	Blk Sel Source	1	3	1		Coded
CP-379	Keypad Blk Sel	0	7	0		Coded
CP-380	KyPdLk Mask	0	4	0		Coded
CP-381	Unlock CP A	0	567	0		CP
CP-382	Unlock CP B	0	567	0		CP
CP-383	Unlock CP C	0	567	0		CP
CP-384	Unlock CP D	0	567	0		CP
CP-385	Unlock CP E	0	567	0		CP
CP-386	Unlock CP F	0	567	0		CP
CP-387	Unlock CP G	0	567	0		CP
CP-388	Unlock CP H	0	567	0		CP
CP-389	Unlock Block	0	7	7		Block #
CP-390	Memory Test	0	4	0		Coded
CP-391	Clr Fault Cntrs	0	1	0		Coded
CP-392	Video Test	0	1	0		Coded
CP-395	Serial Number	0	999999	0		Serial #
CP-396	Load Parms	0	6	0		Coded
CP-397	Load PLC Prgm	0	2	0		Coded
CP-398	Save Parms	0	3	0		Coded
CP-399	Save PLC Prgm	0	1	0		Coded
CP-400	Block Parm 1	0	349	110		CP
CP-401	Block Parm 2	0	349	0		CP
CP-402	Block Parm 3	0	349	0		CP
CP-403	Block Parm 4	0	349	0		CP
CP-404	Block Parm 5	0	349	0		CP
CP-405	Block Parm 6	0	349	0		CP

(Continued)

CODE	DESCRIPTION	MIN	MAX	DEFAULT	USER RECORD	UNITS
CP-406	Block Parm 7	0	349	0		CP
CP-407	Block Parm 8	0	349	0		CP
CP-408	Block Parm 9	0	349	0		CP
CP-409	Block Parm 10	0	349	0		CP
CP-410	Block Parm 11	0	349	0		CP
CP-411	Block Parm 12	0	349	0		CP
CP-412	Block Parm 13	0	349	0		CP
CP-413	Block Parm 14	0	349	0		CP
CP-414	Block Parm 15	0	349	0		CP
CP-415	Block Parm 16	0	349	0		CP
CP-440	Blk0 Val 1	-99999999	99999999	0		Parm Val
CP-441	Blk0 Val 2	-99999999	99999999	0		Parm Val
CP-442	Blk0 Val 3	-99999999	99999999	0		Parm Val
CP-443	Blk0 Val 4	-99999999	99999999	0		Parm Val
CP-444	Blk0 Val 5	-99999999	99999999	0		Parm Val
CP-445	Blk0 Val 6	-99999999	99999999	0		Parm Val
CP-446	Blk0 Val 7	-99999999	99999999	0		Parm Val
CP-447	Blk0 Val 8	-99999999	99999999	0		Parm Val
CP-448	Blk0 Val 9	-99999999	99999999	0		Parm Val
CP-449	Blk0 Val10	-99999999	99999999	0		Parm Val
CP-450	Blk0 Val11	-99999999	99999999	0		Parm Val
CP-451	Blk0 Val12	-99999999	99999999	0		Parm Val
CP-452	Blk0 Val13	-99999999	99999999	0		Parm Val
CP-453	Blk0 Val14	-99999999	99999999	0		Parm Val
CP-454	Blk0 Val15	-99999999	99999999	0		Parm Val
CP-455	Blk0 Val16	-99999999	99999999	0		Parm Val
CP-456	Blk1 Val 1	-99999999	99999999	0		Parm Val
CP-457	Blk1 Val 2	-99999999	99999999	0		Parm Val
CP-458	Blk1 Val 3	-99999999	99999999	0		Parm Val
CP-459	Blk1 Val 4	-99999999	99999999	0		Parm Val

(Continued)

Appendix D: Control Parameter Reference (continued)

CODE	DESCRIPTION	MIN	MAX	DEFAULT	USER RECORD	UNITS
CP-460	Blk1 Val 5	-99999999	99999999	0		Parm Val
CP-461	Blk1 Val 6	-99999999	99999999	0		Parm Val
CP-462	Blk1 Val 7	-99999999	99999999	0		Parm Val
CP-463	Blk1 Val 8	-99999999	99999999	0		Parm Val
CP-464	Blk1 Val 9	-99999999	99999999	0		Parm Val
CP-465	Blk1 Val10	-99999999	99999999	0		Parm Val
CP-466	Blk1 Val11	-99999999	99999999	0		Parm Val
CP-467	Blk1 Val12	-99999999	99999999	0		Parm Val
CP-468	Blk1 Val13	-99999999	99999999	0		Parm Val
CP-469	Blk1 Val14	-99999999	99999999	0		Parm Val
CP-470	Blk1 Val15	-99999999	99999999	0		Parm Val
CP-471	Blk1 Val16	-99999999	99999999	0		Parm Val
CP-472	Blk2 Val 1	-99999999	99999999	0		Parm Val
CP-473	Blk2 Val 2	-99999999	99999999	0		Parm Val
CP-474	Blk2 Val 3	-99999999	99999999	0		Parm Val
CP-475	Blk2 Val 4	-99999999	99999999	0		Parm Val
CP-476	Blk2 Val 5	-99999999	99999999	0		Parm Val
CP-477	Blk2 Val 6	-99999999	99999999	0		Parm Val
CP-478	Blk2 Val 7	-99999999	99999999	0		Parm Val
CP-479	Blk2 Val 8	-99999999	99999999	0		Parm Val
CP-480	Blk2 Val 9	-99999999	99999999	0		Parm Val
CP-481	Blk2 Val10	-99999999	99999999	0		Parm Val
CP-482	Blk2 Val11	-99999999	99999999	0		Parm Val
CP-483	Blk2 Val12	-99999999	99999999	0		Parm Val
CP-484	Blk2 Val13	-99999999	99999999	0		Parm Val
CP-485	Blk2 Val14	-99999999	99999999	0		Parm Val
CP-486	Blk2 Val15	-99999999	99999999	0		Parm Val
CP-487	Blk2 Val16	-99999999	99999999	0		Parm Val
CP-488	Blk3 Val 1	-99999999	99999999	0		Parm Val
CP-489	Blk3 Val 2	-99999999	99999999	0		Parm Val

(Continued)

CODE	DESCRIPTION	MIN	MAX	DEFAULT	USER RECORD	UNITS
CP-490	Blk3 Val 3	-99999999	99999999	0		Parm Val
CP-491	Blk3 Val 4	-99999999	99999999	0		Parm Val
CP-492	Blk3 Val 5	-99999999	99999999	0		Parm Val
CP-493	Blk3 Val 6	-99999999	99999999	0		Parm Val
CP-494	Blk3 Val 7	-99999999	99999999	0		Parm Val
CP-495	Blk3 Val 8	-99999999	99999999	0		Parm Val
CP-496	Blk3 Val 9	-99999999	99999999	0		Parm Val
CP-497	Blk3 Val10	-99999999	99999999	0		Parm Val
CP-498	Blk3 Val11	-99999999	99999999	0		Parm Val
CP-499	Blk3 Val12	-99999999	99999999	0		Parm Val
CP-500	Blk3 Val13	-99999999	99999999	0		Parm Val
CP-501	Blk3 Val14	-99999999	99999999	0		Parm Val
CP-502	Blk3 Val15	-99999999	99999999	0		Parm Val
CP-503	Blk3 Val16	-99999999	99999999	0		Parm Val
CP-504	Blk4 Val 1	-99999999	99999999	0		Parm Val
CP-505	Blk4 Val 2	-99999999	99999999	0		Parm Val
CP-506	Blk4 Val 3	-99999999	99999999	0		Parm Val
CP-507	Blk4 Val 4	-99999999	99999999	0		Parm Val
CP-508	Blk4 Val 5	-99999999	99999999	0		Parm Val
CP-509	Blk4 Val 6	-99999999	99999999	0		Parm Val
CP-510	Blk4 Val 7	-99999999	99999999	0		Parm Val
CP-511	Blk4 Val 8	-99999999	99999999	0		Parm Val
CP-512	Blk4 Val 9	-99999999	99999999	0		Parm Val
CP-513	Blk4 Val10	-99999999	99999999	0		Parm Val
CP-514	Blk4 Val11	-99999999	99999999	0		Parm Vall
CP-515	Blk4 Val12	-99999999	99999999	0		Parm Val
CP-516	Blk4 Val13	-99999999	99999999	0		Parm Val
CP-517	Blk4 Val14	-99999999	99999999	0		Parm Val
CP-518	Blk4 Val15	-99999999	99999999	0		Parm Val
CP-519	Blk4 Val16	-99999999	99999999	0		Parm Val

(Continued)

Appendix D: Control Parameter Reference (continued)

CODE	DESCRIPTION	MIN	MAX	DEFAULT	USER RECORD	UNITS
CP-520	Blk5 Val 1	-99999999	99999999	0		Parm Val
CP-521	Blk5 Val 2	-99999999	99999999	0		Parm Val
CP-522	Blk5 Val 3	-99999999	99999999	0		Parm Val
CP-523	Blk5 Val 4	-99999999	99999999	0		Parm Val
CP-524	Blk5 Val 5	-99999999	99999999	0		Parm Val
CP-525	Blk5 Val 6	-99999999	99999999	0		Parm Val
CP-526	Blk5 Val 7	-99999999	99999999	0		Parm Val
CP-527	Blk5 Val 8	-99999999	99999999	0		Parm Val
CP-528	Blk5 Val 9	-99999999	99999999	0		Parm Val
CP-529	Blk5 Val10	-99999999	99999999	0		Parm Val
CP-530	Blk5 Val11	-99999999	99999999	0		Parm Val
CP-531	Blk5 Val12	-99999999	99999999	0		Parm Val
CP-532	Blk5 Val13	-99999999	99999999	0		Parm Val
CP-533	Blk5 Val14	-99999999	99999999	0		Parm Val
CP-534	Blk5 Val15	-99999999	99999999	0		Parm Val
CP-535	Blk5 Val16	-99999999	99999999	0		Parm Val
CP-536	Blk6 Val 1	-99999999	99999999	0		Parm Val
CP-537	Blk6 Val 2	-99999999	99999999	0		Parm Val
CP-538	Blk6 Val 3	-99999999	99999999	0		Parm Val
CP-539	Blk6 Val 4	-99999999	99999999	0		Parm Val
CP-540	Blk6 Val 5	-99999999	99999999	0		Parm Val
CP-541	Blk6 Val 6	-99999999	99999999	0		Parm Val
CP-542	Blk6 Val 7	-99999999	99999999	0		Parm Val
CP-543	Blk6 Val 8	-99999999	99999999	0		Parm Val
CP-544	Blk6 Val 9	-99999999	99999999	0		Parm Val
CP-545	Blk6 Val10	-99999999	99999999	0		Parm Val
CP-546	Blk6 Val11	-99999999	99999999	0		Parm Val
CP-547	Blk6 Val12	-99999999	99999999	0		Parm Val
CP-548	Blk6 Val13	-99999999	99999999	0		Parm Val
CP-549	Blk6 Val14	-99999999	99999999	0		Parm Val

(Continued)

Appendix D: Control Parameter Reference (continued)

CODE	DESCRIPTION	MIN	MAX	DEFAULT	USER RECORD	UNITS
CP-550	Blk6 Val15	-99999999	99999999	0		Parm Val
CP-551	Blk6 Val16	-99999999	99999999	0		Parm Val
CP-552	Blk7 Val 1	-99999999	99999999	0		Parm Val
CP-553	Blk7 Val 2	-99999999	99999999	0		Parm Val
CP-554	Blk7 Val 3	-99999999	99999999	0		Parm Val
CP-555	Blk7 Val 4	-99999999	99999999	0		Parm Val
CP-556	Blk7 Val 5	-99999999	99999999	0		Parm Val
CP-557	Blk7 Val 6	-99999999	99999999	0		Parm Val
CP-558	Blk7 Val 7	-99999999	99999999	0		Parm Val
CP-559	Blk7 Val 8	-99999999	99999999	0		Parm Val
CP-560	Blk7 Val 9	-99999999	99999999	0		Parm Val
CP-561	Blk7 Val10	-99999999	99999999	0		Parm Val
CP-562	Blk7 Val11	-99999999	99999999	0		Parm Val
CP-563	Blk7 Val12	-99999999	99999999	0		Parm Val
CP-564	Blk7 Val13	-99999999	99999999	0		Parm Val
CP-565	Blk7 Val14	-99999999	99999999	0		Parm Val
CP-566	Blk7 Val15	-99999999	99999999	0		Parm Val
CP-567	Blk7 Val16	-99999999	99999999	0		Parm Val

—NOTES—

APPENDIX E: MONITOR PARAMETER REFERENCE

CODE	DESCRIPTION	MIN	MAX	UNITS
MP-01	FI1 Hz	–120000	120000	Hertz
MP-02	FI1 RPM	–99999	99999	RPM
MP-03	FI1 EU/Tm	–999999	999999	EU/Tm
MP-04	FI1 Cnts	–9999999	99999999	Counts
MP-05	FI1 Psn	–9999999	99999999	EU
MP-06	FI2 Hz	–120000	120000	Hertz
MP-07	FI2 RPM	–99999	99999	RPM
MP-08	FI2 EU/Tm	–999999	999999	EU/Tm
MP-09	FI2 Cnts	–9999999	99999999	Counts
MP-10	FI2 Psn	–9999999	99999999	EU
MP-11	AI1 Bits	–8192	8192	Bits
MP-12	AI1 Signal	–12.0	20	V or ma
MP-13	AI1 Eu/Tm	–999999	999999	EU/Tm
MP-14	AI2 Bits	–8192	8191	Bits
MP-15	AI2 Signal	–12.0	20	V or ma
MP-16	AI2 EU/Tm	–999999	999999	EU/Tm
MP-17	AnlgCal Ref A	–15.0	25	V or ma
MP-18	AnlgCal Ref B	–15.0	25	V or ma
MP-20	CO Bits	–32768	32767	Bits
MP-21	CO Volts	–15.0	15	Volts
MP-22	CO Max Bits	0	32767	Bits
MP-24	AO Bits	–32768	32767	Bits
MP-25	AO Signal	–12.0	20	V or ma
MP-26	DI 7..0	00000000	01111111	Coded
MP-27	DI 15..8	00000000	11111111	Coded
MP-28	DO 7..0	00000000	11111111	Coded
MP-29	KeyPad Lockout	0	1	Coded
MP-30	ScParm Val	–9999999	99999999	User
MP-34	PsnErr	–9999999	99999999	EU
MP-35	PsnErrCnt	–9999999	99999999	Counts

(Continued)

CODE	DESCRIPTION	MIN	MAX	UNITS
MP-38	Ld EU/Tm	–999999	999999	EU/Tm
MP-39	Fb EU/Tm	–999999	999999	EU/Tm
MP-40	Scaled Fb	–9999999	99999999	User
MP-41	Scaled Ref	–999999	999999	EU/Tm
MP-42	Ramped Ref	–999999	999999	EU/Tm
MP-43	SR Error	–999999	999999	EU/Tm
MP-44	RR Error	–999999	999999	EU/Tm
MP-45	Cntrl Loop	0	5	Coded
MP-46	Feedforward	–32768	32767	Bits
MP-47	Trim Out	–32768	32767	Bits
MP-48	Integral	–32768	32767	Bits
MP-49	EstMaxFb	00000000	999999	EU/Tm
MP-50	State	00000000	10000000	Coded
MP-51	Active Block	00000000	00000111	Coded
MP-52	InvalidBlks	00000000	11111111	Coded
MP-53	Misc Status	00000000	11011111	Coded
MP-54	Std Alarms	00000000	11111111	Coded
MP-55	Custom Alms	00000000	11111111	Coded
MP-57	Tmr4 Time	0	86400	Seconds
MP-58	PLC Mon 1 Val	0	1	Coded
MP-59	PLC Mon 2 Val	0	1	Coded
MP-60	PLC 15- 8	00000000	11111111	Coded
MP-61	PLC 23- 16	00000000	00001111	Coded
MP-62	PLC 31- 24	00000000	00001111	Coded
MP-63	PLC 39- 32	00000000	11011111	Coded
MP-64	PLC 47- 40	00000000	11011111	Coded
MP-65	PLC 55- 48	00000000	11111111	Coded
MP-66	PLC 63- 56	00000000	00001111	Coded
MP-67	PLC 71- 64	00000000	11111111	Coded
MP-68	PLC 79- 72	00000000	10111111	Coded

(Continued)

CODE	DESCRIPTION	MIN	MAX	UNITS
MP-69	PLC 87- 80	00000000	11111111	Coded
MP-70	PLC 95- 88	00000000	00000000	Coded
MP-71	PLC 107-100	00000000	11111111	Coded
MP-72	PLC 115-108	00000000	11111111	Coded
MP-73	PLC 123-116	00000000	11111111	Coded
MP-74	PLC 131-124	00000000	11011111	Coded
MP-75	PLC 139-132	00000000	01111111	Coded
MP-76	PLC 147-140	00000000	00000111	Coded
MP-77	PLC 155-148	00000000	11111111	Coded
MP-78	PLC 163-156	00000000	00001100	Coded
MP-79	PLC 171-164	00000000	10110000	Coded
MP-80	Last Reset	00000000	11110111	Coded
MP-81	Misc Intrpts	00000000	00111111	Coded
MP-82	Device Alms	00000000	00001111	Coded
MP-83	PC at Intrpt	2560	1677215	Address
MP-84	Norm Pwr Ups	1	65535	Counts
MP-85	Low Pwr Cntr	0	65535	Counts
MP-86	Mem Err Cntr	0	65535	Counts
MP-87	WatchDogCntr	0	65535	Counts
MP-88	MiscIntrptCntr	0	65535	Counts
MP-90	SerCom Char In	0	255	Binary
MP-91	SerCom Errs	00000000	11111111	Coded
MP-94	ROM Test	0	1	Coded
MP-95	SRAM Test	0	1	Coded
MP-96	NV RAM Test	0	1	Coded
MP-97	MODEL	1000	6000	Model #
MP-98	RELEASE DATE	090396	123199	Date
MP-99	REVISION	0.5	99.99	Rev Level

—NOTES—

APPENDIX F: CONTROL PARAMETER SCREEN LOCATOR

CP#	CP Name	Screen
CP-101	Setpoint x	System Monitor\Run Monitor\pg 1
	....	System Monitor\Run Monitor\pg 2
	....	System Monitor\Run Monitor\pg 3
CP-102	Setpoint Mode	Setpoints\Run Modes\pg 1
CP-103	Fb Source	Setpoints\Master\pg 2
	....	Setpoints\Follower\pg 2
	....	Setpoints\Custom\pg 2
	....	Setpoints\Direct\pg 1
CP-104	Ld Source	Setpoints\Follower\pg 2
CP-105	Ofs Source	Setpoints\Master\pg 2
	....	Setpoints\Follower\pg 2
CP-106	Ff Source	Tuning\Feedforward\pg 1
	....	Tuning\Feedforward\pg 1
CP-108	EU/Tm Range	Scaling\Standard Signals\pg 2
CP-109	Time Base	Scaling\Standard Signals\pg 2
	....	Scaling\Aux Analog Signals\pg 2
CP-110	Master SP	Setpoints\Master\pg 1
	....	Setpoints\Master\pg 2
CP-111	Max SP Mstr	Setpoints\Master\pg 1
CP-112	Min SP Mstr	Setpoints\Master\pg 1
CP-113	Master Equation	Setpoints\Master\pg 2
CP-114	Inv M Norm	Setpoints\Master\pg 2
CP-120	Follower SP	Setpoints\Follower\pg 1
	....	Setpoints\Follower\pg 2
CP-121	Max SP Fol	Setpoints\Follower\pg 1
CP-122	Min SP Fol	Setpoints\Follower\pg 1
CP-123	Ratio Norm	Setpoints\Follower\pg 2
CP-124	Ratio	Setpoints\Follower\pg 2
CP-125	Fol Equation	Setpoints\Follower\pg 2
CP-130	Direct SP	Setpoints\Direct\pg 1

(Continued)

Appendix F: Control Parameter Screen Locator (continued)

CP#	CP Name	Screen
CP-131	Max SP Drct	Setpoints\Direct\pg 1
CP-132	Min SP Drct	Setpoints\Direct\pg 1
CP-140	Custom SP	Setpoints\Custom\pg 1
CP-141	Constant 1	Setpoints\Custom\pg 2
CP-142	Constant 2	Setpoints\Custom\pg 2
CP-143	Constant 3	Setpoints\Custom\pg 2
CP-144	Constant 4	Setpoints\Custom\pg 2
CP-146	Max SP Cust	Setpoints\Custom\pg 1
CP-147	Min SP Cust	Setpoints\Custom\pg 1
CP-150	V1 Source	Setpoints\Custom\pg 2
CP-151	V2 Source	Setpoints\Custom\pg 2
CP-152	V3 Source	Setpoints\Custom\pg 2
CP-153	V4 Source	Setpoints\Custom\pg 2
CP-154	M1	Setpoints\Custom\pg 3
CP-155	B1	Setpoints\Custom\pg 3
CP-156	M2	Setpoints\Custom\pg 3
CP-157	B2	Setpoints\Custom\pg 3
CP-158	M3	Setpoints\Custom\pg 3
CP-159	B3	Setpoints\Custom\pg 3
CP-160	Cnt Mode FI1	Scaling\Standard Signals\pg 1
CP-161	PPR FI1	Scaling\Standard Signals Monitor\pg 1
CP-162	FI1 Pulses	Scaling\Standard Signals\pg 1
CP-163	EU FI1	Scaling\Standard Signals\pg 1
CP-165	Cnt Mode FI2	Scaling\Standard Signals\pg 2
CP-166	PPR FI2	Scaling\Standard Signals Monitor\pg 2
CP-167	FI2 Pulses	Scaling\Standard Signals\pg 2
CP-168	EU FI2	Scaling\Standard Signals\pg 2
CP-170	AI1 Mode	Scaling\Aux Analog Signals\pg 1
		Device Tests\Aux Analog Tests\pg 1
		Device Tests\Aux Analog Tests\pg 3
		System Monitor\Aux Analog Monitor\pg 1
CP-171	AI1 RA	Scaling\Aux Analog Signals\pg 1

(Continued)

Appendix F: Control Parameter Screen Locator (continued)

CP#	CP Name	Screen
CP-172	EU@AI1 RA	Scaling\Aux Analog Signals\pg 1
CP-173	AI1 RB	Scaling\Aux Analog Signals\pg 1
CP-174	EU@AI1 RB	Scaling\Aux Analog Signals\pg 1
CP-175	AI2 Mode	Scaling\Aux Analog Signals\pg 2
		Device Tests\Aux Analog Tests\pg 1
		Device Tests\Aux Analog Tests\pg 3
		System Monitor\Aux Analog Monitor\pg 1
CP-176	AI2 RA	Scaling\Aux Analog Signals\pg 2
CP-177	EU@AI2 RA	Scaling\Aux Analog Signals\pg 2
CP-178	AI2 RB	Scaling\Aux Analog Signals\pg 2
CP-179	EU@AI2 RB	Scaling\Aux Analog Signals\pg 2
CP-180	CO Mode	Scaling\Standard Signals\pg 3
CP-181	CO Max Volts	Scaling\Standard Signals\pg 3
CP-182	CO Polarity	Scaling\Standard Signals\pg 3
CP-184	AO Parameter	Scaling\Aux Analog Signals\pg 3
		Device Tests\Aux Analog Tests\pg 2
CP-185	AO Mode	Scaling\Aux Analog Signals\pg 3
		Device Tests\Aux Analog Tests\pg 2
		Device Tests\Aux Analog Tests\pg 3
		System Monitor\Aux Analog Monitor\pg 2
CP-186	AO RA	Scaling\Aux Analog Signals\pg 3
CP-187	Val@AO RA	Scaling\Aux Analog Signals\pg 3
CP-188	AO RB	Scaling\Aux Analog Signals\pg 3
CP-189	Val@AO RB	Scaling\Aux Analog Signals\pg 3
CP-190	ScFb Eq	Scaling\Monitor Parameters\pg 1
CP-191	ScFb EU	Scaling\Monitor Parameters\pg 1
CP-192	Fb @ ScFb EU	Scaling\Monitor Parameters\pg 1
CP-193	Sc Parm	Scaling\Monitor Parameters\pg 2
CP-194	Sc Parm Eq	Scaling\Monitor Parameters\pg 2
CP-195	Sc Parm M	Scaling\Monitor Parameters\pg 2
CP-196	Sc Parm B	Scaling\Monitor Parameters\pg 2
CP-199	Lg Number Units	Device Configure\Status Screen Setup\pg 1

(Continued)

CP#	CP Name	Screen
CP-200	Ref RUN Rmp	Alarms Ramps Limits\Run Ramps\pg 1
CP-201	Acl Tm RUN...........	Alarms Ramps Limits\Run Ramps\pg 1
CP-202	Acl Rt RUN	Alarms Ramps Limits\Run Ramps\pg 1
CP-203	Dcl Tm RUN...........	Alarms Ramps Limits\Run Ramps\pg 1
CP-204	Dcl Rt RUN	Alarms Ramps Limits\Run Ramps\pg 1
CP-205	Ref Drct Rmp..........	Alarms Ramps Limits\Direct SP Ramps\pg 1
CP-206	Acl Tm Drct	Alarms Ramps Limits\Direct SP Ramps\pg 1
CP-208	Dcl Tm Drct	Alarms Ramps Limits\Direct SP Ramps\pg 1
CP-210	Ref StopRmp...........	Alarms Ramps Limits\R-Stop/H-Stop Setup\pg 1
CP-211	Dcl Tm RStp	Alarms Ramps Limits\R-Stop/H-Stop Setup\pg 1
CP-212	Dcl Rt RStp	Alarms Ramps Limits\R-Stop/H-Stop Setup\pg 1
CP-213	Dcl Tm HStp	Alarms Ramps Limits\R-Stop/H-Stop Setup\pg 1
CP-214	Dcl Rt HStp.............	Alarms Ramps Limits\R-Stop/H-Stop Setup\pg 1
CP-215	Jog SP......................	Alarms Ramps Limits\Jog Setup\pg 1
CP-216	Acl Tm Jog..............	Alarms Ramps Limits\Jog Setup\pg 1
CP-217	Acl Rt Jog	Alarms Ramps Limits\Jog Setup\pg 1
CP-218	Dcl Tm Jog..............	Alarms Ramps Limits\Jog Setup\pg 1
CP-219	Dcl Rt Jog	Alarms Ramps Limits\Jog Setup\pg 1
CP-220	RUN Loop Mode	Tuning\Velocity Loop\pg 2
	....	Tuning\Velocity Loop/ZE\pg 2
	....	Tuning\Position Loop\pg 2
	....	Setpoints\Run Modes\pg 1
CP-221	Jog Loop Mode	Alarms Ramps Limits\Jog Setup\pg 1
CP-222	Drive Type	Tuning\Related Items\pg 1
CP-224	Kff	Tuning\Feedforward\pg 1
CP-225	Kp VL	Tuning\Velocity Loop\pg 1
	....	Tuning\Velocity Loop/ZE\pg 1
CP-226	Ki VL	Tuning\Velocity Loop\pg 1
	....	Tuning\Velocity Loop/ZE\pg 1
CP-227	Kd VL	Tuning\Velocity Loop\pg 1
	....	Tuning\Velocity Loop/ZE\pg 1
CP-228	Deriv Thd VL..........	Tuning\Velocity Loop\pg 2

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Appendix F: Control Parameter Screen Locator (continued)

CP#	CP Name	Screen
CP-228	(continued)	Tuning\Velocity Loop/ZE\pg 2
	....	Tuning\Position Loop\pg 2
CP-229	Kp ZE	Tuning\Velocity Loop/ZE\pg 1
CP-230	HStp LoopMode	Alarms Ramps Limits\R-Stop/H-Stop Setup\pg 1
CP-233	Max Fb	Tuning\Feedforward\pg 1
CP-235	Kp PL	Tuning\Position Loop\pg 1
CP-236	Ki PL	Tuning\Position Loop\pg 1
CP-237	Kd PL	Tuning\Position Loop\pg 1
CP-238	Deriv Thd PL	Tuning\Position Loop\pg 2
CP-239	PPR Mtr	Tuning\Position Loop\pg 1
CP-240	Cntrl Latch	Available through the Code key
CP-241	Loop Update	Tuning\Related Items\pg 1
CP-242	KffAdjUpdt	Tuning\Feedforward\pg 1
CP-244	Kff Auto En	Tuning\Velocity Loop\pg 2
	....	Tuning\Velocity Loop/ZE\pg 2
	....	Tuning\Position Loop\pg 2
	....	Tuning\Feedforward\pg 1
CP-248	Signal Fltr Sel	Tuning\Related Items\pg 1
CP-249	Signal Fltr Tau.........	Tuning\Related Items\pg 1
CP-250	Max Spd Lmt	Alarms Ramps Limits\Limits\pg 1
CP-251	Min Spd Lmt	Alarms Ramps Limits\Limits\pg 1
CP-253	ZE Limit	Tuning\Velocity Loop/ZE\pg 2
	....	Alarms Ramps Limits\Limits\pg 1
CP-255	Ramp Thd................	Alarms Ramps Limits\Run Ramps\pg 1
CP-258	Trim Authority	Tuning\Velocity Loop\pg 2
	....	Tuning\Velocity Loop/ZE\pg 2
	....	Tuning\Position Loop\pg 2
	....	Alarms Ramps Limits\Limits\pg 1
CP-259	Integral Limit	Tuning\Velocity Loop\pg 2
	....	Tuning\Velocity Loop/ZE\pg 2
	....	Tuning\Position Loop\pg 2
	....	Alarms Ramps Limits\Limits\pg 1

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Appendix F: Control Parameter Screen Locator (continued)

CP#	CP Name	Screen
CP-260	PsnErr+	Tuning\Position Loop\pg 2
		Alarms Ramps Limits\Limits\pg 1
CP-261	PsnErr-	Tuning\Position Loop\pg 2
		Alarms Ramps Limits\Limits\pg 1
CP-262	Psn Offset	Tuning\Position Loop\pg 2
CP-266	FI1PsnPrst	PLC\PLC Position Cntrs\pg 1
CP-267	FI2PsnPrst	PLC\PLC Position Cntrs\pg 1
CP-268	FI1PsnRO	PLC\PLC Position Cntrs\pg 1
CP-269	FI2PsnRO	PLC\PLC Position Cntrs\pg 1
CP-270	Zero Speed	Alarms Ramps Limits\Alarms\pg 1
		Alarms Ramps Limits\Limits\pg 1
CP-271	Max Fb Alm	Alarms Ramps Limits\Alarms\pg 1
CP-272	Max Acl/Dcl	Alarms Ramps Limits\Alarms\pg 1
CP-273	NO Resp Time	Alarms Ramps Limits\Alarms\pg 1
CP-274	Max FI2 Psn	Alarms Ramps Limits\Alarms\pg 1
CP-278	Std Alm Msk	Device Configure\Alm Indicator Mask\pg 1
CP-279	CustAlm Msk	Device Configure\Alm Indicator Mask\pg 1
CP-280	Cmpr1 Parm	Alarms Ramps Limits\Alarms\pg 2
CP-281	Cmpr2 Parm	Alarms Ramps Limits\Alarms\pg 2
CP-282	Cmpr3 Parm	Alarms Ramps Limits\Alarms\pg 3
CP-283	Cmpr4 Parm	Alarms Ramps Limits\Alarms\pg 3
CP-286	Cmpr1 Type	Alarms Ramps Limits\Alarms\pg 2
CP-287	Cmpr2 Type	Alarms Ramps Limits\Alarms\pg 2
CP-288	Cmpr3 Type	Alarms Ramps Limits\Alarms\pg 3
CP-289	Cmpr4 Type	Alarms Ramps Limits\Alarms\pg 3
CP-292	Cmpr1 Val	Alarms Ramps Limits\Alarms\pg 2
CP-293	Cmpr2 Val	Alarms Ramps Limits\Alarms\pg 2
CP-294	Cmpr3 Val	Alarms Ramps Limits\Alarms\pg 3
CP-295	Cmpr4 Val	Alarms Ramps Limits\Alarms\pg 3
CP-296	Copy Source 1	PLC\PLC Data Copy\pg 1
CP-297	Copy Dest 1	PLC\PLC Data Copy\pg 1
CP-298	Copy Source 2	PLC\PLC Data Copy\pg 1

(Continued)

Appendix F: Control Parameter Screen Locator (continued)

CP#	CP Name	Screen
CP-299	Copy Dest 2	PLC\PLC Data Copy\pg 1
CP-300	Remote Scroll	PLC\Digital I/O\pg 1
CP-301	Rmt Scroll Rate	PLC\Digital I/O\pg 1
CP-302	DI 1 Shot	PLC\Digital I/O\pg 1
CP-303	DI Set	PLC\PLC Monitor\pg 1
CP-305	PLC Monitor 1	PLC\PLC Monitor\pg 1
CP-306	PLC Monitor 2	PLC\PLC Monitor\pg 1
CP-307	PLC Bit Set	PLC\PLC Monitor\pg 1
CP-308	PLC Bit Clear	PLC\PLC Monitor\pg 1
CP-310	Tmr1 Delay	PLC\PLC Timers\pg 1
CP-311	Tmr1 on Tm	PLC\PLC Timers\pg 1
CP-312	Tmr2 Delay	PLC\PLC Timers\pg 1
CP-313	Tmr2 on Tm	PLC\PLC Timers\pg 1
CP-314	Tmr3 Delay	PLC\PLC Timers\pg 1
CP-315	Tmr3 on Tm	PLC\PLC Timers\pg 1
CP-316	Tmr4 Delay	PLC\PLC Timers\pg 1
CP-317	Tmr4 on Tm	PLC\PLC Timers\pg 1
CP-320	Cntr1 Trig	PLC\PLC Event Cntrs\pg 1
CP-321	Cntr1 Cnt	PLC\PLC Event Cntrs\pg 1
CP-322	Cntr2 Trig	PLC\PLC Event Cntrs\pg 1
CP-323	Cntr2 Cnt	PLC\PLC Event Cntrs\pg 1
CP-324	Cntr3 Trig	PLC\PLC Event Cntrs\pg 1
CP-325	Cntr3 Cnt	PLC\PLC Event Cntrs\pg 1
CP-326	Cntr4TrigUp	PLC\PLC Event Cntrs\pg 1
CP-327	Cntr4 Cnt	PLC\PLC Event Cntrs\pg 1
CP-328	Cntr4TrigDn	PLC\PLC Event Cntrs\pg 1
CP-329	Cntr4Preset	PLC\PLC Event Cntrs\pg 1
CP-330	DN Write Parm 1	Device Configure\DeviceNet Setup\pg 2
CP-331	DN Write Parm 2	Device Configure\DeviceNet Setup\pg 2
CP-332	DN Write Parm 3	Device Configure\DeviceNet Setup\pg 2
CP-333	DN Write Parm 4	Device Configure\DeviceNet Setup\pg 2
CP-334	DN Read Parm 1	Device Configure\DeviceNet Setup\pg 2

(Continued)

CP#	CP Name	Screen
CP-335	DN Read Parm 2	Device Configure\DeviceNet Setup\pg 2
Control Parameters		
CP-336	DN Read Parm 3	Device Configure\DeviceNet Setup\pg 2
CP-337	DN Read Parm 4	Device Configure\DeviceNet Setup\pg 2
CP-340	Lg Number Parm	Device Configure\Status Screen Setup\pg 1
CP-341	Status Line 1	Device Configure\Status Screen Setup\pg 1
CP-342	Status Line 2	Device Configure\Status Screen Setup\pg 1
CP-343	Status Line 3	Device Configure\Status Screen Setup\pg 1
CP-344	Status Line 4	Device Configure\Status Screen Setup\pg 1
CP-345	Status Line 5	Device Configure\Status Screen Setup\pg 1
CP-346	Status Line 6	Device Configure\Status Screen Setup\pg 1
CP-350	Diagnostics En	Device Tests\Std Signals Tests\pg 2
	....	Device Tests\Digital I/O Test\pg 1
CP-352	Diag DO	Device Tests\Digital I/O Test\pg 1
CP-353	Diag DAC Test	Device Tests\Std Signals Tests\pg 2
CP-354	Diag DAC Volts	Device Tests\Std Signals Tests\pg 2
CP-355	Diag DAC Bits	Device Tests\Std Signals Tests\pg 2
CP-356	Diag Rmp Tm	Device Tests\Std Signals Tests\pg 2
CP-360	Analog Cal En	Device Tests\Aux Analog Tests\pg 3
CP-361	Analog Cal Sel	Device Tests\Aux Analog Tests\pg 3
CP-362	Analog Cal Ref	Device Tests\Aux Analog Tests\pg 3
CP-363	AnalogRef Val	Device Tests\Aux Analog Tests\pg 3
CP-364	AO Bit Set	Device Tests\Aux Analog Tests\pg 3
CP-365	AO Direct	Scaling\Aux Analog Signals\pg 3
	....	Device Tests\Aux Analog Tests\pg 2
CP-366	CO Offset	Scaling\Standard Signals\pg 3
	....	Device Tests\Std Signals Tests\pg 2
CP-368	CRC Enable	Device Configure\Serial Comm Setup\pg 1
	....	Device Tests\Serial Comm Test\pg 1
CP-369	Record Format	Device Configure\Serial Comm Setup\pg 1
	....	Device Tests\Serial Comm Test\pg 1
CP-370	Device Address	Device Configure\Serial Comm Setup\pg 1

(Continued)

Appendix F: Control Parameter Screen Locator (continued)

CP#	CP Name	Screen
		Device Tests\Serial Comm Test\pg 1
CP-371	Baud Rate	Device Configure\Serial Comm Setup\pg 1
		Device Tests\Serial Comm Test\pg 1
CP-372	Frame Format	Device Configure\Serial Comm Setup\pg 1
		Device Tests\Serial Comm Test\pg 1
CP-373	SerCom Char Out	Device Tests\Serial Comm Test\pg 1
CP-374	Video Mode	Device Configure\Video Setup\pg 1
CP-374	(continued)	Device Tests\Hardware Tests\pg 3
CP-375	Contrast Value	Device Configure\Video Setup\pg 1
		Device Tests\Hardware Tests\pg 3
CP-376	DN MAC ID	Device Configure\DeviceNet Setup\pg 1
CP-377	DN Baud Rate	Device Configure\DeviceNet Setup\pg 1
CP-378	Blk Sel Source	System Monitor\Control Overrides\pg 1
CP-379	Keypad Blk Sel	System Monitor\Control Overrides\pg 1
CP-380	KyPdLk Mask	Device Configure\Keypad Lock Setup\pg 1
		Device Configure\Keypad Lock Setup\pg 2
CP-381	Unlock CP A	Device Configure\Keypad Lock Setup\pg 1
CP-382	Unlock CP B	Device Configure\Keypad Lock Setup\pg 1
CP-383	Unlock CP C	Device Configure\Keypad Lock Setup\pg 1
CP-384	Unlock CP D	Device Configure\Keypad Lock Setup\pg 1
CP-385	Unlock CP E	Device Configure\Keypad Lock Setup\pg 1
CP-386	Unlock CP F	Device Configure\Keypad Lock Setup\pg 1
CP-387	Unlock CP G	Device Configure\Keypad Lock Setup\pg 1
CP-388	Unlock CP H	Device Configure\Keypad Lock Setup\pg 1
CP-389	Unlock Block	Device Configure\Keypad Lock Setup\pg 2
CP-390	Memory Test	Device Tests\Hardware Tests\pg 1
CP-391	Clr Fault Cntrs	Device Tests\Device Status\pg 1
		Device Tests\Device Status\pg 2
CP-392	Video Test	Device Tests\Hardware Tests\pg 3
CP-395	Serial Number	Device Configure\DeviceNet Setup\pg 1
CP-396	Load Parms	Device Configure\Load & Save Parms\pg 1
CP-397	Load PLC Prgm	Device Configure\Load & Save Parms\pg 1

(Continued)

Appendix F: Control Parameter Screen Locator (continued)

CP#	CP Name	Screen
CP-398	Save Parms	Device Configure\Load & Save Parms\pg 1
CP-399	Save PLC Prgm	Device Configure\Load & Save Parms\pg 1
CP-400	Block Parm 1	Block Setup\Edit Block Parms\pg 1
CP-401	Block Parm 2	Block Setup\Edit Block Parms\pg 1
CP-402	Block Parm 3	Block Setup\Edit Block Parms\pg 1
CP-403	Block Parm 4	Block Setup\Edit Block Parms\pg 1
CP-404	Block Parm 5	Block Setup\Edit Block Parms\pg 2
CP-405	Block Parm 6	Block Setup\Edit Block Parms\pg 2
CP-406	Block Parm 7	Block Setup\Edit Block Parms\pg 2
CP-407	Block Parm 8	Block Setup\Edit Block Parms\pg 2
CP-408	Block Parm 9	Block Setup\Edit Block Parms\pg 3
CP-409	Block Parm 10	Block Setup\Edit Block Parms\pg 3
CP-410	Block Parm 11	Block Setup\Edit Block Parms\pg 3
CP-411	Block Parm 12	Block Setup\Edit Block Parms\pg 3
CP-412	Block Parm 13	Block Setup\Edit Block Parms\pg 4
CP-413	Block Parm 14	Block Setup\Edit Block Parms\pg 4
CP-414	Block Parm 15	Block Setup\Edit Block Parms\pg 4
CP-415	Block Parm 16	Block Setup\Edit Block Parms\pg 4
CP-440	Blk0 Val 1	Block Setup\Edit Block 0\pg 1
CP-441	Blk0 Val 2	Block Setup\Edit Block 0\pg 1
CP-442	Blk0 Val 3	Block Setup\Edit Block 0\pg 1
CP-443	Blk0 Val 4	Block Setup\Edit Block 0\pg 1
CP-444	Blk0 Val 5	Block Setup\Edit Block 0\pg 2
CP-445	Blk0 Val 6	Block Setup\Edit Block 0\pg 2
CP-446	Blk0 Val 7	Block Setup\Edit Block 0\pg 2
CP-447	Blk0 Val 8	Block Setup\Edit Block 0\pg 2
CP-448	Blk0 Val 9	Block Setup\Edit Block 0\pg 3
CP-449	Blk0 Val10	Block Setup\Edit Block 0\pg 3
CP-450	Blk0 Val11	Block Setup\Edit Block 0\pg 3
CP-451	Blk0 Val12	Block Setup\Edit Block 0\pg 3
CP-452	Blk0 Val13	Block Setup\Edit Block 0\pg 4
CP-453	Blk0 Val14	Block Setup\Edit Block 0\pg 4

(Continued)

CP#	CP Name	Screen
CP-454	Blk0 Val15	Block Setup\Edit Block 0\pg 4
CP-455	Blk0 Val16	Block Setup\Edit Block 0\pg 4
CP-456	Blk1 Val 1	Block Setup\Edit Block 1\pg 1
CP-457	Blk1 Val 2	Block Setup\Edit Block 1\pg 1
CP-458	Blk1 Val 3	Block Setup\Edit Block 1\pg 1
CP-459	Blk1 Val 4	Block Setup\Edit Block 1\pg 1
CP-460	Blk1 Val 5	Block Setup\Edit Block 1\pg 2
CP-461	Blk1 Val 6	Block Setup\Edit Block 1\pg 2
CP-462	Blk1 Val 7	Block Setup\Edit Block 1\pg 2
CP-463	Blk1 Val 8	Block Setup\Edit Block 1\pg 2
CP-464	Blk1 Val 9	Block Setup\Edit Block 1\pg 3
CP-465	Blk1 Val10	Block Setup\Edit Block 1\pg 3
CP-466	Blk1 Val11	Block Setup\Edit Block 1\pg 3
CP-467	Blk1 Val12	Block Setup\Edit Block 1\pg 3
CP-468	Blk1 Val13	Block Setup\Edit Block 1\pg 4
CP-469	Blk1 Val14	Block Setup\Edit Block 1\pg 4
CP-470	Blk1 Val15	Block Setup\Edit Block 1\pg 4
CP-471	Blk1 Val16	Block Setup\Edit Block 1\pg 4
CP-472	Blk2 Val 1	Block Setup\Edit Block 2\pg 1
CP-473	Blk2 Val 2	Block Setup\Edit Block 2\pg 1
CP-474	Blk2 Val 3	Block Setup\Edit Block 2\pg 1
CP-475	Blk2 Val 4	Block Setup\Edit Block 2\pg 1
CP-476	Blk2 Val 5	Block Setup\Edit Block 2\pg 2
CP-477	Blk2 Val 6	Block Setup\Edit Block 2\pg 2
CP-478	Blk2 Val 7	Block Setup\Edit Block 2\pg 2
CP-479	Blk2 Val 8	Block Setup\Edit Block 2\pg 2
CP-480	Blk2 Val 9	Block Setup\Edit Block 2\pg 3
CP-481	Blk2 Val10	Block Setup\Edit Block 2\pg 3
CP-482	Blk2 Val11	Block Setup\Edit Block 2\pg 3
CP-483	Blk2 Val12	Block Setup\Edit Block 2\pg 3
CP-484	Blk2 Val13	Block Setup\Edit Block 2\pg 4
CP-485	Blk2 Val14	Block Setup\Edit Block 2\pg 4

(Continued)

CP#	CP Name	Screen
CP-486	Blk2 Val15	Block Setup\Edit Block 2\pg 4
CP-487	Blk2 Val16	Block Setup\Edit Block 2\pg 4
CP-488	Blk3 Val 1	Block Setup\Edit Block 3\pg 1
CP-489	Blk3 Val 2	Block Setup\Edit Block 3\pg 1
CP-490	Blk3 Val 3	Block Setup\Edit Block 3\pg 1
CP-491	Blk3 Val 4	Block Setup\Edit Block 3\pg 1
CP-492	Blk3 Val 5	Block Setup\Edit Block 3\pg 2
CP-493	Blk3 Val 6	Block Setup\Edit Block 3\pg 2
CP-494	Blk3 Val 7	Block Setup\Edit Block 3\pg 2
CP-495	Blk3 Val 8	Block Setup\Edit Block 3\pg 2
CP-496	Blk3 Val 9	Block Setup\Edit Block 3\pg 3
CP-497	Blk3 Val10	Block Setup\Edit Block 3\pg 3
CP-498	Blk3 Val11...............	Block Setup\Edit Block 3\pg 3
CP-499	Blk3 Val12	Block Setup\Edit Block 3\pg 3
CP-500	Blk3 Val13	Block Setup\Edit Block 3\pg 4
CP-501	Blk3 Val14	Block Setup\Edit Block 3\pg 4
CP-502	Blk3 Val15	Block Setup\Edit Block 3\pg 4
CP-503	Blk3 Val16	Block Setup\Edit Block 3\pg 4
CP-504	Blk4 Val 1	Block Setup\Edit Block 4\pg 1
CP-505	Blk4 Val 2	Block Setup\Edit Block 4\pg 1
CP-506	Blk4 Val 3	Block Setup\Edit Block 4\pg 1
CP-507	Blk4 Val 4	Block Setup\Edit Block 4\pg 1
CP-508	Blk4 Val 5	Block Setup\Edit Block 4\pg 2
CP-509	Blk4 Val 6	Block Setup\Edit Block 4\pg 2
CP-510	Blk4 Val 7	Block Setup\Edit Block 4\pg 2
CP-511	Blk4 Val 8	Block Setup\Edit Block 4\pg 2
CP-512	Blk4 Val 9	Block Setup\Edit Block 4\pg 3
CP-513	Blk4 Val10	Block Setup\Edit Block 4\pg 3
CP-514	Blk4 Val11...............	Block Setup\Edit Block 4\pg 3
CP-515	Blk4 Val12	Block Setup\Edit Block 4\pg 3
CP-516	Blk4 Val13	Block Setup\Edit Block 4\pg 4
CP-517	Blk4 Val14	Block Setup\Edit Block 4\pg 4

(Continued)

CP#	CP Name	Screen
CP-518	Blk4 Val15	Block Setup\Edit Block 4\pg 4
CP-519	Blk4 Val16	Block Setup\Edit Block 4\pg 4
CP-520	Blk5 Val 1	Block Setup\Edit Block 5\pg 1
CP-521	Blk5 Val 2	Block Setup\Edit Block 5\pg 1
CP-522	Blk5 Val 3	Block Setup\Edit Block 5\pg 1
CP-523	Blk5 Val 4	Block Setup\Edit Block 5\pg 1
CP-524	Blk5 Val 5	Block Setup\Edit Block 5\pg 2
CP-525	Blk5 Val 6	Block Setup\Edit Block 5\pg 2
CP-526	Blk5 Val 7	Block Setup\Edit Block 5\pg 2
CP-527	Blk5 Val 8	Block Setup\Edit Block 5\pg 2
CP-528	Blk5 Val 9	Block Setup\Edit Block 5\pg 3
CP-529	Blk5 Val10	Block Setup\Edit Block 5\pg 3
CP-530	Blk5 Val11	Block Setup\Edit Block 5\pg 3
CP-531	Blk5 Val12	Block Setup\Edit Block 5\pg 3
CP-532	Blk5 Val13	Block Setup\Edit Block 5\pg 4
CP-533	Blk5 Val14	Block Setup\Edit Block 5\pg 4
CP-534	Blk5 Val15	Block Setup\Edit Block 5\pg 4
CP-535	Blk5 Val16	Block Setup\Edit Block 5\pg 4
CP-536	Blk6 Val 1	Block Setup\Edit Block 6\pg 1
CP-537	Blk6 Val 2	Block Setup\Edit Block 6\pg 1
CP-538	Blk6 Val 3	Block Setup\Edit Block 6\pg 1
CP-539	Blk6 Val 4	Block Setup\Edit Block 6\pg 1
CP-540	Blk6 Val 5	Block Setup\Edit Block 6\pg 2
CP-541	Blk6 Val 6	Block Setup\Edit Block 6\pg 2
CP-542	Blk6 Val 7	Block Setup\Edit Block 6\pg 2
CP-543	Blk6 Val 8	Block Setup\Edit Block 6\pg 2
CP-544	Blk6 Val 9	Block Setup\Edit Block 6\pg 3
CP-545	Blk6 Val10	Block Setup\Edit Block 6\pg 3
CP-546	Blk6 Val11	Block Setup\Edit Block 6\pg 3
CP-547	Blk6 Val12	Block Setup\Edit Block 6\pg 3
CP-548	Blk6 Val13	Block Setup\Edit Block 6\pg 4
CP-549	Blk6 Val14	Block Setup\Edit Block 6\pg 4

(Continued)

Appendix F: Control Parameter Screen Locator (continued)

CP#	CP Name	Screen
CP-550	Blk6 Val15	Block Setup\Edit Block 6\pg 4
CP-551	Blk6 Val16	Block Setup\Edit Block 6\pg 4
CP-552	Blk7 Val 1	Block Setup\Edit Block 7\pg 1
CP-553	Blk7 Val 2	Block Setup\Edit Block 7\pg 1
CP-554	Blk7 Val 3	Block Setup\Edit Block 7\pg 1
CP-555	Blk7 Val 4	Block Setup\Edit Block 7\pg 1
CP-556	Blk7 Val 5	Block Setup\Edit Block 7\pg 2
CP-557	Blk7 Val 6	Block Setup\Edit Block 7\pg 2
CP-558	Blk7 Val 7	Block Setup\Edit Block 7\pg 2
CP-559	Blk7 Val 8	Block Setup\Edit Block 7\pg 2
CP-560	Blk7 Val 9	Block Setup\Edit Block 7\pg 3
CP-561	Blk7 Val10	Block Setup\Edit Block 7\pg 3
CP-562	Blk7 Val11...............	Block Setup\Edit Block 7\pg 3
CP-563	Blk7 Val12	Block Setup\Edit Block 7\pg 3
CP-564	Blk7 Val13	Block Setup\Edit Block 7\pg 4
CP-565	Blk7 Val14	Block Setup\Edit Block 7\pg 4
CP-566	Blk7 Val15	Block Setup\Edit Block 7\pg 4
CP-567	Blk7 Val16	Block Setup\Edit Block 7\pg 4

APPENDIX G: MONITOR PARAMETER SCREEN LOCATOR

MP#	MP Name	Screen
MP-01	FI1 Hz	Scaling\Standard Signals\pg 1
		Device Tests\Std Signals Tests\pg 1
		System Monitor\Run Monitor\pg 2
		System Monitor\Std Signals Monitor\pg 1
MP-02	FI1 RPM	Device Tests\Std Signals Tests\pg 1
		System Monitor\Std Signals Monitor\pg 1
MP-03	FI1 EU/Tm	Scaling\Standard Signals\pg 1
		System Monitor\Std Signals Monitor\pg 1
MP-04	FI1 Cnts	Device Tests\Std Signals Tests\pg 1
		System Monitor\Std Signals Monitor\pg 1
MP-05	FI1 Psn	PLC\PLC Position Cntrs\pg 1
		System Monitor\Std Signals Monitor\pg 1
MP-06	FI2 Hz	Setpoints\Direct\pg 1
		Scaling\Standard Signals\pg 2
		Device Tests\Std Signals Tests\pg 1
		System Monitor\Run Monitor\pg 2
		System Monitor\Std Signals Monitor\pg 2
MP-07	FI2 RPM	Device Tests\Std Signals Tests\pg 1
		System Monitor\Std Signals Monitor\pg 2
MP-08	FI2 EU/Tm	Scaling\Standard Signals\pg 2
		System Monitor\Std Signals Monitor\pg 2
MP-09	FI2 Cnts	Device Tests\Std Signals Tests\pg 1
		System Monitor\Std Signals Monitor\pg 2
MP-10	FI2 Psn	PLC\PLC Position Cntrs\pg 1
		System Monitor\Std Signals Monitor\pg 2
MP-11	AI1 Bits	Scaling\Aux Analog Signals\pg 1
		Device Tests\Aux Analog Tests\pg 1
		System Monitor\Aux Analog Monitor\pg 1
MP-12	AI1 Signal	Scaling\Aux Analog Signals\pg 1
		Device Tests\Aux Analog Tests\pg 1
		System Monitor\Aux Analog Monitor\pg 1

(Continued)

MP#	MP Name	Screen
MP-13	AI1 EU/Tm	Scaling\Aux Analog Signals\pg 1
		System Monitor\Aux Analog Monitor\pg 1
MP-14	AI2 Bits	Scaling\Aux Analog Signals\pg 2
		Device Tests\Aux Analog Tests\pg 1
		System Monitor\Aux Analog Monitor\pg 1
MP-15	AI2 Signal	Scaling\Aux Analog Signals\pg 2
		Device Tests\Aux Analog Tests\pg 1
		System Monitor\Aux Analog Monitor\pg 1
MP-16	AI2 EU/Tm	Scaling\Aux Analog Signals\pg 2
		System Monitor\Aux Analog Monitor\pg 1
MP-17	AnlgCal Ref A	Device Tests\Aux Analog Tests\pg 3
MP-18	AnlgCal Ref B	Device Tests\Aux Analog Tests\pg 3
MP-20	CO Bits	Tuning\Velocity Loop\pg 1
		Tuning\Velocity Loop/ZE\pg 1
		Tuning\Position Loop\pg 1
		Scaling\Standard Signals\pg 3
		System Monitor\Run Monitor\pg 2
		System Monitor\Std Signals Monitor\pg 3
MP-21	CO Volts	Setpoints\Direct\pg 1
		Scaling\Standard Signals\pg 3
		Device Tests\Std Signals Tests\pg 2
		System Monitor\Run Monitor\pg 1
		System Monitor\Std Signals Monitor\pg 3
MP-22	CO Max Bits	Scaling\Standard Signals\pg 3
		System Monitor\Std Signals Monitor\pg 3
MP-24	AO Bits	Scaling\Aux Analog Signals\pg 3
		Device Tests\Aux Analog Tests\pg 2
		System Monitor\Aux Analog Monitor\pg 2
MP-25	AO Signal	Scaling\Aux Analog Signals\pg 3
		Device Tests\Aux Analog Tests\pg 2

(Continued)

Appendix G: Monitor Parameter Screen Locator (continued)

MP#	MP Name	Screen
		.... System Monitor\Aux Analog Monitor\pg 2
MP-26	DI 7..0	.... PLC\Digital I/O\pg 1
		.... Device Tests\Digital I/O Test\pg 1
		.... System Monitor\Dig I/O Monitor\pg 1
MP-27	DI 15..8	.... PLC\Digital I/O\pg 1
		.... Device Tests\Digital I/O Test\pg 1
		.... System Monitor\Dig I/O Monitor\pg 1
MP-28	DO 7..0	.... PLC\Digital I/O\pg 1
		.... Device Tests\Digital I/O Test\pg 1
		.... System Monitor\Limits & Alarms\pg 2
		.... System Monitor\Dig I/O Monitor\pg 1
MP-29	KeyPad Lockout	..... Device Configure\Keypad Lock Setup\pg 1
		.... Device Configure\Keypad Lock Setup\pg 2
		.... Device Tests\Hardware Tests\pg 2
MP-30	ScParm Val	.... Scaling\Monitor Parameters\pg 2
MP-34	PsnErr	.... Tuning\Velocity Loop/ZE\pg 1
		.... Tuning\Position Loop\pg 1
		.... System Monitor\Run Monitor\pg 3
MP-35	PsnErrCnt	.... System Monitor\Run Monitor\pg 3
		.... System Monitor\Std Signals Monitor\pg 1
		.... System Monitor\Std Signals Monitor\pg 2
MP-38	Ld EU/Tm	.... Scaling\Monitor Parameters\pg 1
MP-39	Fb EU/Tm	.... Setpoints\Direct\pg 1
		.... Scaling\Monitor Parameters\pg 1
MP-40	Scaled Fb	.... Scaling\Monitor Parameters\pg 1
		.... System Monitor\Run Monitor\pg 3
MP-41	Scaled Ref	.... System Monitor\Run Monitor\pg 1
MP-42	Ramped Ref	.... Tuning\Velocity Loop\pg 1
		.... Tuning\Velocity Loop/ZE\pg 1

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Appendix G: Monitor Parameter Screen Locator (continued)

MP#	MP Name	Screen
	....	Tuning\Position Loop\pg 1
	....	System Monitor\Run Monitor\pg 1
MP-43	SR Error	System Monitor\Run Monitor\pg 3
MP-44	RR Error	Tuning\Velocity Loop\pg 1
	....	Tuning\Velocity Loop/ZE\pg 1
	....	System Monitor\Run Monitor\pg 1
	....	System Monitor\Run Monitor\pg 3
MP-45	Cntrl Loop	Tuning\Velocity Loop\pg 1
	....	Tuning\Velocity Loop/ZE\pg 1
	....	Tuning\Position Loop\pg 1
	....	Tuning\Feedforward\pg 1
	....	System Monitor\Run Monitor\pg 1
	....	System Monitor\Control Overrides\pg 1
MP-46	Feedforward	Tuning\Feedforward\pg 1
	....	System Monitor\Run Monitor\pg 2
MP-47	Trim Out	Tuning\Velocity Loop\pg 1
	....	Tuning\Velocity Loop/ZE\pg 1
	....	Tuning\Position Loop\pg 1
	....	Tuning\Feedforward\pg 1
	....	System Monitor\Run Monitor\pg 2
MP-48	Integral	System Monitor\Run Monitor\pg 2
MP-49	EstMaxFb	Tuning\Feedforward\pg 1
	....	Alarms Ramps Limits\Alarms\pg 1
MP-50	State	Setpoints\Direct\pg 1
	....	Device Tests\Std Signals Tests\pg 2
	....	Device Tests\Digital I/O Test\pg 1
MP-50	(continued)	System Monitor\Run Monitor\pg 1
	....	System Monitor\Run Monitor\pg 2
	....	System Monitor\Run Monitor\pg 3
	....	System Monitor\Control Overrides\pg 1
MP-51	Active Block	System Monitor\Limits & Alarms\pg 2
	....	System Monitor\Control Overrides\pg 1

(Continued)

Appendix G: Monitor Parameter Screen Locator (continued)

MP#	MP Name	Screen
MP-52	InvalidBlks	System Monitor\Limits & Alarms\pg 2
MP-53	Misc Status	System Monitor\Limits & Alarms\pg 2
MP-54	Std Alarms	System Monitor\Limits & Alarms\pg 2
MP-55	Custom Alms	System Monitor\Limits & Alarms\pg 2
MP-57	Tmr4 Time	PLC\PLC Timers\pg 1
MP-58	PLC Mon 1 Val	PLC\PLC Monitor\pg 1
MP-59	PLC Mon 2 Val	PLC\PLC Monitor\pg 1
MP-60	PLC 15- 8	PLC\PLC Monitor\pg 1
		PLC\PLC Monitor\pg 2
MP-61	PLC 23- 16	PLC\PLC Monitor\pg 2
MP-62	PLC 31- 24	PLC\PLC Monitor\pg 2
MP-63	PLC 39- 32	PLC\PLC Monitor\pg 2
MP-64	PLC 47- 40	PLC\PLC Monitor\pg 2
MP-65	PLC 55- 48	PLC\PLC Monitor\pg 2
MP-66	PLC 63- 56	PLC\PLC Monitor\pg 2
MP-67	PLC 71- 64	PLC\PLC Monitor\pg 2
MP-68	PLC 79- 72	PLC\PLC Monitor\pg 2
MP-69	PLC 87- 80	PLC\PLC Monitor\pg 2
MP-70	PLC 95- 88	PLC\PLC Monitor\pg 3
MP-71	PLC 107-100	PLC\PLC Monitor\pg 3
MP-72	PLC 115-108	PLC\PLC Monitor\pg 3
MP-73	PLC 123-116	PLC\PLC Monitor\pg 3
MP-74	PLC 131-124	PLC\PLC Monitor\pg 3
MP-75	PLC 139-132	PLC\PLC Monitor\pg 3
MP-76	PLC 147-140	PLC\PLC Monitor\pg 3
MP-77	PLC 155-148	PLC\PLC Monitor\pg 3
MP-78	PLC 163-156	PLC\PLC Monitor\pg 3
MP-79	PLC 171-164	PLC\PLC Monitor\pg 3
MP-80	Last Reset	Device Tests\Device Status\pg 1
		Device Tests\Device Status\pg 2
MP-81	Misc Intrpt	Device Tests\Device Status\pg 1

(Continued)

Appendix G: Monitor Parameter Screen Locator (continued)

MP#	MP Name	Screen
	....	Device Tests\Device Status\pg 2
MP-82	Device Alms	Device Tests\Device Status\pg 1
	....	System Monitor\Limits & Alarms\pg 2
MP-83	PC at Intrpt	Device Tests\Device Status\pg 2
MP-84	Norm Pwr Ups	Device Tests\Device Status\pg 1
MP-85	Low Pwr Cntr	Device Tests\Device Status\pg 1
MP-86	Mem Err Cntr	Device Tests\Device Status\pg 1
MP-87	WatchDogCntr	Device Tests\Device Status\pg 1
MP-88	MiscIntrptCntr	Device Tests\Device Status\pg 2
MP-90	SerCom Char In	Device Tests\Serial Comm Test\pg 1
MP-91	SerCom Errs	Device Tests\Serial Comm Test\pg 1
MP-94	ROM Test	Device Tests\Hardware Tests\pg 1
MP-95	SRAM Test	Device Tests\Hardware Tests\pg 1
MP-96	NV RAM Test	Device Tests\Hardware Tests\pg 1
MP-97	Model #	Device Tests\Device Model & Rev\pg1
MP-98	Release Date	Device Tests\Device Model & Rev\pg1
MP-99	Revision	Device Tests\Device Model & Rev\pg1

APPENDIX H: ALPHA TO NUMERIC QUICK REFERENCE

Code Parameter Name	Code Parameter
Acl Rt Jog	CP-217
Acl Rt RUN	CP-202
Acl Tm Drct	CP-206
Acl Tm Jog	CP-216
Acl Tm RUN	CP-201
Active Block	MP-51
AI1 Bits	MP-11
AI1 EU/Tm	MP-13
AI1 Mode	CP-170
AI1 RA	CP-171
AI1 RB	CP-173
AI1 Signal	MP-12
AI2 Bits	MP-14
AI2 EU/Tm	MP-16
AI2 Mode	CP-175
AI2 RA	CP-176
AI2 RB	CP-178
AI2 Signal	MP-15
Analog Cal En	CP-360
Analog Cal Ref	CP-362
Analog Cal Sel	CP-361
AnalogRef Val	CP-363
AnlgCal Ref A	MP-17
AnlgCal Ref B	MP-18
AO Bit Set	CP-364
AO Bits	MP-24
AO Direct	CP-365
AO Mode	CP-185
AO Parameter	CP-184

(Continued)

Code Parameter Name	Code Parameter
AO RA	CP-186
AO RB	CP-188
AO Signal	MP-25
B1	CP-155
B2	CP-157
B3	CP-159
Baud Rate	CP-371
Blk Sel Source	CP-378
Blk0 Val 1	CP-440
Blk0 Val 2	CP-441
Blk0 Val 3	CP-442
Blk0 Val 4	CP-443
Blk0 Val 5	CP-444
Blk0 Val 6	CP-445
Blk0 Val 7	CP-446
Blk0 Val 8	CP-447
Blk0 Val 9	CP-448
Blk0 Val10	CP-449
Blk0 Val11	CP-450
Blk0 Val12	CP-451
Blk0 Val13	CP-452
Blk0 Val14	CP-453
Blk0 Val15	CP-454
Blk0 Val16	CP-455
Blk1 Val 1	CP-456
Blk1 Val 2	CP-457
Blk1 Val 3	CP-458
Blk1 Val 4	CP-459
Blk1 Val 5	CP-460

(Continued)

Appendix H: Alpha to Numeric Quick Reference (continued)

Code Parameter Name	Code Parameter
Blk1 Val 6	CP-461
Blk1 Val 7	CP-462
Blk1 Val 8	CP-463
Blk1 Val 9	CP-464
Blk1 Val10	CP-465
Blk1 Val11	CP-466
Blk1 Val12	CP-467
Blk1 Val13	CP-468
Blk1 Val14	CP-469
Blk1 Val15	CP-470
Blk1 Val16	CP-471
Blk2 Val 1	CP-472
Blk2 Val 2	CP-473
Blk2 Val 3	CP-474
Blk2 Val 4	CP-475
Blk2 Val 5	CP-476
Blk2 Val 6	CP-477
Blk2 Val 7	CP-478
Blk2 Val 8	CP-479
Blk2 Val 9	CP-480
Blk2 Val10	CP-481
Blk2 Val11	CP-482
Blk2 Val12	CP-483
Blk2 Val13	CP-484
Blk2 Val14	CP-485
Blk2 Val15	CP-486
Blk2 Val16	CP-487
Blk3 Val 1	CP-488
Blk3 Val 2	CP-489

(Continued)

Appendix H: Alpha to Numeric Quick Reference (continued)

Code Parameter Name	Code Parameter
Blk3 Val 3	CP-490
Blk3 Val 4	CP-491
Blk3 Val 5	CP-492
Blk3 Val 6	CP-493
Blk3 Val 7	CP-494
Blk3 Val 8	CP-495
Blk3 Val 9	CP-496
Blk3 Val10	CP-497
Blk3 Val11	CP-498
Blk3 Val12	CP-499
Blk3 Val13	CP-500
Blk3 Val14	CP-501
Blk3 Val15	CP-502
Blk3 Val16	CP-503
Blk4 Val 1	CP-504
Blk4 Val 2	CP-505
Blk4 Val 3	CP-506
Blk4 Val 4	CP-507
Blk4 Val 5	CP-508
Blk4 Val 6	CP-509
Blk4 Val 7	CP-510
Blk4 Val 8	CP-511
Blk4 Val 9	CP-512
Blk4 Val10	CP-513
Blk4 Val11	CP-514
Blk4 Val12	CP-515
Blk4 Val13	CP-516
Blk4 Val14	CP-517
Blk4 Val15	CP-518

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Appendix H: Alpha to Numeric Quick Reference (continued)

Code Parameter Name	Code Parameter
Blk4 Val16	CP-519
Blk5 Val 1	CP-520
Blk5 Val 2	CP-521
Blk5 Val 3	CP-522
Blk5 Val 4	CP-523
Blk5 Val 5	CP-524
Blk5 Val 6	CP-525
Blk5 Val 7	CP-526
Blk5 Val 8	CP-527
Blk5 Val 9	CP-528
Blk5 Val10	CP-529
Blk5 Val11	CP-530
Blk5 Val12	CP-531
Blk5 Val13	CP-532
Blk5 Val14	CP-533
Blk5 Val15	CP-534
Blk5 Val16	CP-535
Blk6 Val 1	CP-536
Blk6 Val 2	CP-537
Blk6 Val 3	CP-538
Blk6 Val 4	CP-539
Blk6 Val 5	CP-540
Blk6 Val 6	CP-541
Blk6 Val 7	CP-542
Blk6 Val 8	CP-543
Blk6 Val 9	CP-544
Blk6 Val10	CP-545
Blk6 Val11	CP-546
Blk6 Val12	CP-547

(Continued)

Appendix H: Alpha to Numeric Quick Reference (continued)

Code Parameter Name	Code Parameter
Blk6 Val13	CP-548
Blk6 Val14	CP-549
Blk6 Val15	CP-550
Blk6 Val16	CP-551
Blk7 Val 1	CP-552
Blk7 Val 2	CP-553
Blk7 Val 3	CP-554
Blk7 Val 4	CP-555
Blk7 Val 5	CP-556
Blk7 Val 6	CP-557
Blk7 Val 7	CP-558
Blk7 Val 8	CP-559
Blk7 Val 9	CP-560
Blk7 Val10	CP-561
Blk7 Val11	CP-562
Blk7 Val12	CP-563
Blk7 Val13	CP-564
Blk7 Val14	CP-565
Blk7 Val15	CP-566
Blk7 Val16	CP-567
Block Parm 1	CP-400
Block Parm 2	CP-401
Block Parm 3	CP-402
Block Parm 4	CP-403
Block Parm 5	CP-404
Block Parm 6	CP-405
Block Parm 7	CP-406
Block Parm 8	CP-407
Block Parm 9	CP-408

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Code Parameter Name	Code Parameter
Block Parm 10	CP-409
Block Parm 11	CP-410
Block Parm 12	CP-411
Block Parm 13	CP-412
Block Parm 14	CP-413
Block Parm 15	CP-414
Block Parm 16	CP-415
Clr Fault Cntrs	CP-391
Cmpr1 Parm	CP-280
Cmpr1 Type	CP-286
Cmpr1 Val	CP-292
Cmpr2 Parm	CP-281
Cmpr2 Type	CP-287
Cmpr2 Val	CP-293
Cmpr3 Parm	CP-282
Cmpr3 Type	CP-288
Cmpr3 Val	CP-294
Cmpr4 Parm	CP-283
Cmpr4 Type	CP-289
Cmpr4 Val	CP-295
Cnt Mode FI1	CP-160
Cnt Mode FI2	CP-165
Cntr1 Cnt	CP-321
Cntr1 Trig	CP-320
Cntr2 Cnt	CP-323
Cntr2 Trig	CP-322
Cntr3 Cnt	CP-325
Cntr3 Trig	CP-324
Cntr4 Cnt	CP-327

(Continued)

Code Parameter Name	Code Parameter
Cntr4Preset	CP-329
Cntr4TrigDn	CP-328
Cntr4TrigUp	CP-326
Cntrl Latch	CP-240
Cntrl Loop	MP-45
CO Bits	MP-20
CO Max Bits	MP-22
CO Max Volts	CP-181
CO Mode	CP-180
CO Offset	CP-366
CO Polarity	CP-182
CO Volts	MP-21
Constant 1	CP-141
Constant 2	CP-142
Constant 3	CP-143
Constant 4	CP-144
Contrast Value	CP-375
Copy Dest 1	CP-297
Copy Dest 2	CP-299
Copy Source 1	CP-296
Copy Source 2	CP-298
CRC Enable	CP-368
CustAlm Msk	CP-279
Custom Alms	MP-55
Custom SP	CP-140
Dcl Rt HStp	CP-214
Dcl Rt Jog	CP-219
Dcl Rt RStp	CP-212
Dcl Rt RUN	CP-204

(Continued)

Code Parameter Name	Code Parameter
Dcl Tm Drct	CP-208
Dcl Tm HStp	CP-213
Dcl Tm Jog	CP-218
Dcl Tm RStp	CP-211
Dcl Tm RUN	CP-203
Deriv Thd PL	CP-238
Deriv Thd VL	CP-228
Device Address	CP-370
Device Alms	MP-82
DI 7..0	MP-26
DI 1 Shot	CP-302
DI 15..8	MP-27
DI Set	CP-303
Diag DAC Bits	CP-355
Diag DAC Test	CP-353
Diag DAC Volts	CP-354
Diag DO	CP-352
Diag Rmp Tm	CP-356
Diagnostics En	CP-350
Direct SP	CP-130
DN Baud Rate	CP-377
DN MAC ID	CP-376
DN Read Parm 1	CP-334
DN Read Parm 2	CP-335
DN Read Parm 3	CP-336
DN Read Parm 4	CP-337
DN Write Parm 1	CP-330
DN Write Parm 2	CP-331
DN Write Parm 3	CP-332

(Continued)

Appendix H: Alpha to Numeric Quick Reference (continued)

Code Parameter Name	Code Parameter
DN Write Parm 4	CP-333
DO 7..0	MP-28
Drive Type	CP-222
EstMaxFb	MP-49
EU FI1	CP-163
EU FI2	CP-168
EU/Tm Range	CP-108
EU@AI1 RA	CP-172
EU@AI1 RB	CP-174
EU@AI2 RA	CP-177
EU@AI2 RB	CP-179
Fb @ ScFb EU	CP-192
Fb EU/Tm	MP-39
Fb Source	CP-103
Feedforward	MP-46
Ff Source	CP-106
FI1 Cnts	MP-04
FI1 EU/Tm	MP-03
FI1 Hz	MP-01
FI1 Psn	MP-05
FI1 Pulses	CP-162
FI1 RPM	MP-02
FI1PsnPrst	CP-266
FI1PsnRO	CP-268
FI2 Cnts	MP-09
FI2 EU/Tm	MP-08
FI2 Hz	MP-06
FI2 Psn	MP-10
FI2 Pulses	CP-167

(Continued)

Appendix H: Alpha to Numeric Quick Reference (continued)

Code Parameter Name	Code Parameter
FI2 RPM	MP-07
FI2PsnPrst	CP-267
FI2PsnRO	CP-269
Fol Equation	CP-125
Follower SP	CP-120
Frame Format	CP-372
HStp LoopMode	CP-230
Integral	MP-48
Integral Limit	CP-259
Inv M Norm	CP-114
InvalidBlks	MP-52
Jog Loop Mode	CP-221
Jog SP	CP-215
Kd VL	CP-227
Kd PL	CP-237
Keypad Blk Sel	CP-379
KeyPad Lockout	MP-29
Kff	CP-224
Kff Auto En	CP-244
KffAdjUpdt	CP-242
Ki VL	CP-226
Ki PL	CP-236
Kp VL	CP-225
Kp PL	CP-235
Kp ZE	CP-229
KyPdLk Mask	CP-380
Last Reset	MP-80
Ld EU/Tm	MP-38
Ld Source	CP-104

(Continued)

Code Parameter Name	Code Parameter
Lg Number Parm	CP-340
Lg Number Units	CP-199
Load Parms	CP-396
Load PLC Prgm	CP-397
Loop Update	CP-241
Low Pwr Cntr	MP-85
M1	CP-154
M2	CP-156
M3	CP-158
Master Equation	CP-113
Master SP	CP-110
Max Acl/Dcl	CP-272
Max Fb	CP-233
Max Fb Alm	CP-271
Max FI2 Psn	CP-274
Max SP Cust	CP-146
Max SP Drct	CP-131
Max SP Fol	CP-121
Max SP Mstr	CP-111
Max Spd Lmt	CP-250
Mem Err Cntr	MP-86
Memory Test	CP-390
Min SP Cust	CP-147
Min SP Drct	CP-132
Min SP Fol	CP-122
Min SP Mstr	CP-112
Min Spd Lmt	CP-251
Misc Intrpt	MP-81
Misc Status	MP-53

(Continued)

Appendix H: Alpha to Numeric Quick Reference (continued)

Code Parameter Name	Code Parameter
MiscIntrptCntr	MP-88
Model #	MP-97
NO Resp Time	CP-273
Norm Pwr Ups	MP-84
NV RAM Test	MP-96
Ofs Source	CP-105
PC at Intrpt	MP-83
PLC 15- 8	MP-60
PLC 23- 16	MP-61
PLC 31- 24	MP-62
PLC 39- 32	MP-63
PLC 47- 40	MP-64
PLC 55- 48	MP-65
PLC 63- 56	MP-66
PLC 71- 64	MP-67
PLC 79- 72	MP-68
PLC 87- 80	MP-69
PLC 95- 88	MP-70
PLC 107-100	MP-71
PLC 115-108	MP-72
PLC 123-116	MP-73
PLC 131-124	MP-74
PLC 139-132	MP-75
PLC 147-140	MP-76
PLC 155-148	MP-77
PLC 163-156	MP-78
PLC 171-164	MP-79
PLC Bit Clear	CP-308
PLC Bit Set	CP-307

(Continued)

Code Parameter Name	Code Parameter
PLC Mon 1 Val	MP-58
PLC Mon 2 Val	MP-59
PLC Monitor 1	CP-305
PLC Monitor 2	CP-306
PPR FI1	CP-161
PPR FI2	CP-166
PPR Mtr	CP-239
Psn Offset	CP-262
PsnErr	MP-34
PsnErr-	CP-261
PsnErr+	CP-260
PsnErrCnt	MP-35
Ramped Ref	MP-42
Ratio	CP-124
Ratio Norm	CP-123
Record Format	CP-369
Ref Drct Rmp	CP-205
Ref RUN Rmp	CP-200
Ref StopRmp	CP-210
Release Date	MP-98
Remote Scroll	CP-300
Revision	MP-99
Rmt Scroll Rate	CP-301
ROM Test	MP-94
RR Error	MP-44
RUN Loop Mode	CP-220
Save Parms	CP-398
Save PLC Prgm	CP-399
Sc Parm	CP-193

(Continued)

Code Parameter Name	Code Parameter
Sc Parm B	CP-196
Sc Parm Eq	CP-194
Sc Parm M	CP-195
Scaled Fb	MP-40
Scaled Ref	MP-41
ScFb Eq	CP-190
ScFb EU	CP-191
ScParm Val	MP-30
SerCom Char In	MP-90
SerCom Char Out	CP-373
SerCom Errs	MP-91
Serial Number	CP-395
Setpoint Mode	CP-102
Setpoint x	CP-101
Signal Fltr Sel	CP-248
Signal Fltr Tau	CP-249
SR Error	MP-43
SRAM Test	MP-95
State	MP-50
Status Line 1	CP-341
Status Line 2	CP-342
Status Line 3	CP-343
Status Line 4	CP-344
Status Line 5	CP-345
Status Line 6	CP-346
Std Alarms	MP-54
Std Alm Msk	CP-278
Time Base	CP-109
Tmr1 Delay	CP-310

(Continued)

Code Parameter Name	Code Parameter
Tmr1 on Tm	CP-311
Tmr2 Delay	CP-312
Tmr2 on Tm	CP-313
Tmr3 Delay	CP-314
Tmr3 on Tm	CP-315
Tmr4 Delay	CP-316
Tmr4 on Tm	CP-317
Tmr4 Time	CP-57
Trim Authority	CP-258
Trim Out	MP-47
Unlock Block	CP-389
Unlock CP A	CP-381
Unlock CP B	CP-382
Unlock CP C	CP-383
Unlock CP D	CP-384
Unlock CP E	CP-385
Unlock CP F	CP-386
Unlock CP G	CP-387
Unlock CP H	CP-388
V1 Source	CP-150
V2 Source	CP-151
V3 Source	CP-152
V4 Source	CP-153
Val@A0 RB	CP-189
Val@AO RA	CP-187
Video Mode	CP-374
Video Test	CP-392
WatchDogCntr	MP-87
ZE Limit	CP-253

(Continued)

Appendix H: Alpha to Numeric Quick Reference (continued)

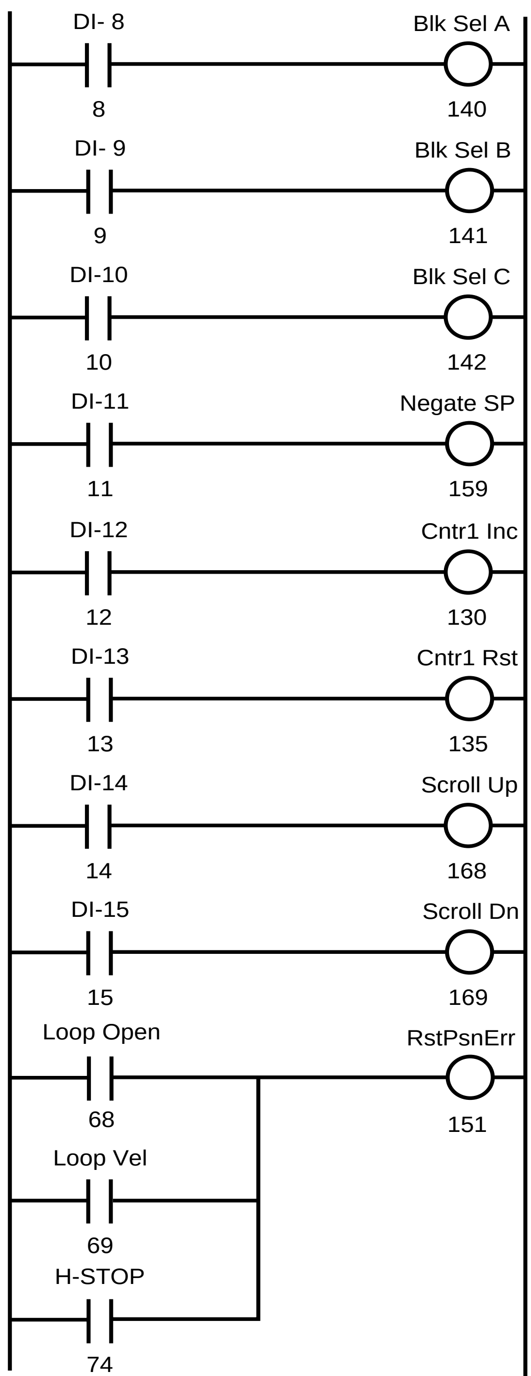
Code Parameter Name	Code Parameter
Zero Speed	CP-270

—NOTES—

APPENDIX I: DEFAULT PLC PROGRAM LOGIC

PLC Command | **Equivalent Logic Ladder**

PLC Command		
LOAD	8	DI_8
OUT	140	Blk Sel A
LOAD	9	DI_9
OUT	141	Blk Sel B
LOAD	10	DI_10
OUT	142	Blk Sel C
LOAD	11	DI_11
OUT	159	Negate SP
LOAD	12	DI_12
OUT	130	Cntr1 Inc
LOAD	13	DI_13
OUT	135	Cntr1 Rst
LOAD	14	DI_14
OUT	168	Scroll Up
LOAD	15	DI_15
OUT	169	Scroll Dn
LOAD	68	Loop Open
OR	69	Loop Vel
OR	74	H-STOP
OUT	151	RstPsnErr

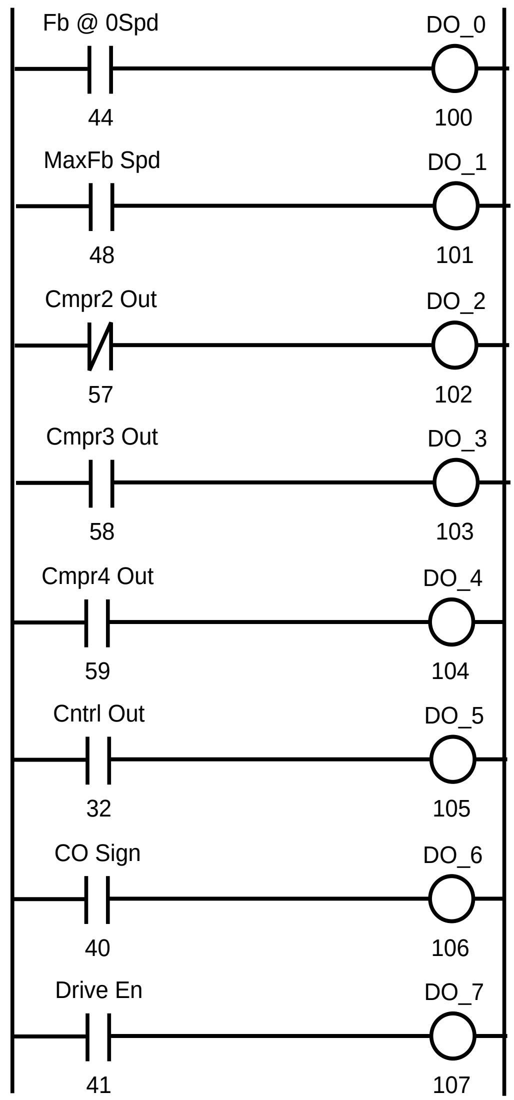


(Continued)

Appendix I: Default PLC Program Logic (continued)

PLC Command | **Equivalent Logic Ladder**

	LOAD	44	Fb @ Spd
	OUT	100	DO_0
	LOAD	48	MaxFb Spd
	OUT	101	DO_1
*	LD NOT	57	Cmpr2 Out
	OUT	102	DO_2
**	LOAD	58	Cmpr3 Out
	OUT	103	DO_3
***	LOAD	59	Cmpr4 Out
	OUT	104	DO_4
	LOAD	32	Cntrl Out
	OUT	105	DO_5
	LOAD	40	CO Sign
	OUT	106	DO_6
	LOAD	41	Drive En
	OUT	107	DO_7



* Cmpr2 is setup as a L0 Speed Alarm (Fb EU/Tm <Cmpr2 Val)
** Cmpr3 is setup as a Deviation Alarm 1 (RR-FB <Cmpr3 Val)
*** Cmpr2 is setup as a Deviation Alarm 2 (SR-FB <Cmpr4 Val)

APPENDIX J: PLC BIT-MAP REFERENCE

Bit	Name	Related CP
0	S0	
1	S1	
2	ZERO = 0, off state	
3	ONE = 1, on state	
4	Pwr-Up 1 (on) for 1st PLC Scan	
5	Reserved	
6	Reserved	
7	Reserved	
8	DI_8, Digital Input 8	
9	DI_9, Digital Input 9	
10	DI_10, Digital Input 10	
11	DI_11, Digital Input 11	
12	DI_12, Digital Input 12	
13	DI_13, Digital Input 13	
14	DI_14, Digital Input 14	
15	DI_15, Digital Input 15	
16	Lch1 Out, Latch 1 Output	
17	Lch2 Out, Latch 2 Output	
18	Lch3 Out, Latch 3 Output	
19	Lch4 Out, Latch 4 Output	
20	Reserved	
21	Reserved	
22	Reserved	
23	Reserved	
24	Tmr1 Out, Timer 1 Output	CP-310,CP-311
25	Tmr2 Out, Timer 2 Output	CP-312,CP-313
26	Tmr3 Out, Timer 3 Output	CP-314,CP-315
27	Tmr4 Out, Timer 4 Output	CP-316,CP-317
28	Reserved	
29	Reserved	

(Continued)

Appendix J: PLC Bit-map Reference (continued)

Bit	Name	Related CP
30	Reserved	
31	Reserved	
32	Cntr1 Out, Counter 1 Output	CP-320,CP-321
33	Cntr2 Out, Counter 2 Output	CP-322,CP-323
34	Cntr3 Out, Counter 3 Output	CP-324,CP-325
35	Cntr4UpO, Counter 4 Up Counter Output	CP-326,CP-327
36	Cntr4DnO, Counter 4 Down Counter Output	CP-328,CP-327
37	Reserved	
38	FI1Psn RO, FI1 Position >= FI1PsnRO	CP-268
39	FI2Psn RO, FI2 Position >= FI2PsnRO	CP-269
40	CO Sign, Control Output Signal Sign (1 = Negative)	
41	Drive En, Drive Enable	
42	Ramp Actv, Ramp Active	
43	RR @ 0Spd, Ramped Reference at ‘0’ Speed	CP-270
44	Fb @ 0 Spd, Feedback at ‘0’ Speed	CP-270
45	Reserved	
46	MinSpdLmt, Scaled Ref Speed < Min Spd Lmt	CP-251
47	MaxSpdLmt, Scaled Ref Speed > Max Spd Lmt	CP-250
48	MaxFb Spd, Fb EU/Tm > Max Fb Alm EU/T	CP-271
49	MaxAclDcl, Fb Accel/Decel > Max Acl/Dcl	CP-272
50	MtrNResp, Motor/Drive NOT responding	CP-273
51	MaxFI2Psn, /FI2 Position/ >= Max FI2Psn	CP-274
52	LoPwr Alm, Low Power Alarm	
53	Max FI1Hz, FI1 Hz > Max Hz (120 Khz)	
54	Max FI2Hz, FI2 Hz > Max Hz (120 KHz)	
55	At Max CO, CO SIG Railed at Max Volts	CP-181,MP-22
56	Cmpr1 Out, Numerical Comparator 1 result	CP-280,286,292
57	Cmpr2 Out, Numerical Comparator 2 result	CP-281,287,293
58	Cmpr3 Out, Numerical Comparator 3 result	CP-282,288,294
59	Cmpr4 Out, Numerical Comparator 4 result	CP-283,289,295

(Continued)

Bit	Name	Related CP
60	Reserved	
61	Reserved	
62	Reserved	
63	Reserved	
64	Master (Monitor Only)	
65	Follower (Monitor Only)	
66	Direct (Monitor Only)	
67	Custom SP (Monitor Only)	
68	Loop Open (Monitor Only)	
69	Loop Vel (Monitor Only)	
70	Loop ZE (Monitor Only)	
71	Loop Psn (Monitor Only)	
72	F-STOP, F-Stop State (Monitor Only)	
73	R-STOP, R-Stop State (Monitor Only)	
74	H-STOP, H-Stop State (Monitor Only)	
75	RUN, RUN State (Monitor Only)	
76	Jog Fwd, JOG Forward State (Monitor Only)	
77	Jog Rvs, JOG Reverse State (Monitor Only)	
78	Reserved	
79	Diag St, Diagnostics State (Monitor Only)	
80	Blk Sel 0, Block 0 Selected (Active) - Monitor Only	
81	Blk Sel 1, Block 1 Selected (Active)	
82	Blk Sel 2, Block 2 Selected (Active)	
83	Blk Sel 3, Block 3 Selected (Active)	
84	Blk Sel 4, Block 4 Selected (Active)	
85	Blk Sel 5, Block 5 Selected (Active)	
86	Blk Sel 6, Block 6 Selected (Active)	
87	Bkl Sel 7, Block 7 Selected (Active)	
88	Reserved	
89	Reserved	

(Continued)

Appendix J: PLC Bit-map Reference (continued)

Bit	Name	Related CP
90	Reserved	
91	Reserved	
92	Reserved	
93	Reserved	
94	Reserved	
95	Reserved	
96	Reserved (Not accessible)	
97	Reserved (Not accessible)	
98	Reserved (Not accessible)	
99	Reserved (Not accessible)	
100	DO-0, Digital Output 0	
101	DO-1, Digital Output 1	
102	DO-2, Digital Output 2	
103	DO-3, Digital Output 3	
104	DO-4, Digital Output 4	
105	DO-5, Digital Output 5	
106	DO-6, Digital Output 6	
107	DO-7, Digital Output 7	
108	Tmp1, Temporary Control Relay 1, CR1	
109	Tmp2, Temporary Control Relay 2, CR2	
110	Tmp3, Temporary Control Relay 3, CR3	
111	Tmp4, Temporary Control Relay 4, CR4	
112	Tmp5, Temporary Control Relay 5, CR5	
113	Tmp6, Temporary Control Relay 6, CR6	
114	Tmp7, Temporary Control Relay 7, CR7	
115	Tmp8, Temporary Control Relay 8, CR8	
116	Lch1 Set, Latch 1 Set	
117	Lch2 Set, Latch 2 Set	
118	Lch3 Set, Latch 3 Set	
119	Lch4 Set, Latch 4 Set	

(Continued)

Bit	Name	Related CP
120	Lch1 Rst, Latch 1 Reset	
121	Lch2 Rst, Latch 2 Reset	
122	Lch3 Rst, Latch 3 Reset	
123	Lch4 Rst, Latch 4 Reset	
124	Tmr1 En, Timer 1 Enable	CP-310,CP-311
125	Tmr2 En, Timer 2 Enable	CP-312,CP-313
126	Tmr3 En, Timer 3 Enable	CP-314,CP-315
127	Tmr4 En, Timer 4 Enable	CP-316,CP-317
128	Tmr4 Rst, Timer 4 Reset	CP-316,CP-317
129	Reserved	
130	Cntr1 Inc, Counter 1 Increment	CP-320,CP-321
131	Cntr2 Inc, Counter 2 Increment	CP-322,CP-323
132	Cntr3 Inc, Counter 3 Increment	CP-324,CP-325
133	Cntr4 Inc, Counter 4 Increment	CP-326,CP-327
134	Cntr4 Dec, Counter 4 Decrement	CP-328,CP-327
135	Cntr1 Rst, Counter 1 Reset	CP-321
136	Cntr2 Rst, Counter 2 Reset	CP-323
137	Cntr3 Rst, Counter 3 Reset	CP-325
138	Cntr4 Rst,, Counter 4 Reset	CP-329,CP-327
139	Reserved	
140	Blk Sel A, Block Select A	CP-378,MP-51
141	Blk Sel B, Block Select B	CP-378,MP-51
142	Blk Sel C, Block Select C	CP-378,MP-51
143	Reserved	
144	Reserved	
145	Reserved	
146	Reserved	
147	Reserved	
148	RstIntgrl, Reset Integral	MP-48
149	RstFI1Psn, Reset FI1 Position to FI1PsnPrst	CP-266

(Continued)

Bit	Name	Related CP
150	RstFI2Psn, Reset FI2 Position to FI2PsnPrst	CP-267
151	RstPsnErr, Reset Position Error to 0	MP-34, MP-35
152	FrzIntgrl, Stop Integral (Freeze at Current Value)	
153	OPEN LOOP, Open Loop (Vel or Position)	CP-220,CP-221
154	Frz Ramp, Stop Ramp (Freeze Ramped Reference speed)	MP-42
155	BypRmp, Bypass Ramp (No Ramp)	
156	Reserved	
157	Reserved	
158	Negate CO, Negate CO-SIG Output	
159	Negate SR, Negate SetPoint (Scaled-Reference)	
160	Data Copy 1	
161	Data Copy 2	
162	Reserved	
163	Reserved	
164	Reserved	
165	Reserved	
166	Reserved	
167	Reserved	
168	Scroll Up, Remote Scroll Up	CP-300,CP-301
169	Scroll Dn, Remote Scroll Down	CP-300,CP-301
170	Reserved	
171	No Opnd, Nop Operand	

APPENDIX K: ERROR CODE DEFINITIONS

Error	Definition
Acl Tm High	Acceleration time is too high.
Acl too Hi	Acceleration rate is too high.
Adrs Error	Address Error, there is an internal address conflict with the CPU.
Bad Blk Calc	During calculations for one of the parameter blocks, an error was encountered causing the block to be marked as bad. The block parameter value(s) in error should be corrected.
Bad Blk Sel	An attempt was made to switch to a bad parameter block.
Binary Only	The number is Binary, only “1’s” and “0’s” may be entered.
BkUp Loaded	Prompt which displays on completion of loading a code parameter backup into main CP list.
Blk Parm Err	An error was encountered in the block parameters.
Blk Val Err	An error was encountered in the block values of a block.
Buss Error	There is an internal buss conflict with the CPU.
ChkSm Error	Checksum Error, the checksum calculated for memory data is not correct.
Dcl Tm High	Deceleration time is too high.
Default Set	Prompt after resetting a parameter back to its default value.
Defaults Set	Prompt after resetting all parameters back to their default values.
Divide By 0	Math error has occurred internal resulting in divide by zero.
DP Present	Decimal point already present in the number you are entering.
Dspl Error	Display Error, an error has occurred when attempting to display a parameter (e.g., the parameter does not exist).
EstMax<MaxFb	Estimated maximum feedback value (MP-49) less than maximum feedback entry (CP-233).
Field Full	The maximum number of characters (digits, decimal point, negative sign) allowed for parameter entry has been reached while entering a number via the keypad. You tried to enter more numbers/characters than will fit into the space allotted for the parameter value entry.

(Continued)

Appendix K: Error Code Definitions (continued)

Error	Definition
Flts Cleared	Prompt to indicate that the faults have been cleared, as a result of entering a 1 into Clr Fault Cntrs (CP-391)
Gen Intrpt	Some error occurred during the controls program execution to cause a General Interrupt.
Halt Monitor	Reset caused by microprocessor or double bus fault.
Illegal Inst	Illegal Instruction.
Invalid Cmd	An invalid command was encountered during compilation of the PLC program.
Invalid Opnd	An invalid operand was encountered during compilation of the PLC program.
Invalid Parm	The parameter requested is not defined and therefore is invalid.
KyPd Lockout	The keypad is locked out, disallowing entry for this parameter through the keypad.
LgWd Ovfl	There was a Long Word Overflow as a result of some internal calculation.
LossOf Clock	There is no clock signal. Last reset caused by the detection of no clock signal.
Low Power	The device's AC input voltage level is low (below the required specification).
Max Error	The parameter value just entered is above the maximum allowed for the parameter.
Max Res Met	The maximum number of digits to the right of the decimal point for the parameter being entered has already been met (an attempt was made to exceed this limit).
Max SP error	The value just entered for the setpoint exceeds the value set in its corresponding Max SP (111,121,131,146).
Memory Fail	Indicates that a memory test has failed.
Memory Pass	Indicates that the memory test has passed.
Memory Error	An internal memory error was encountered.

(Continued)

Error	Definition
Min Error	The parameter value last entered exceeded the minimum value allowed for the parameter.
Min SP error	The value just entered for the setpoint exceeds the value set in its corresponding Min SP (112,122,132,147).
Minus First	When entering the value for this parameter the minus sign (-) must be entered first.
No <END>	During compilation of the PLC program, no END command was found.
No Cmpr Parm	Invalid comparison parameter entered.
Not Allowed	The last action attempted is not allowed.
Not Processd	The request for a parameter value change was not processed due to a “combo” check error that occurred as a result of some calculation for a related parameter value or a parameter in a block of parameters. May be the result of a block parameter transfer to the control via serial communications.
Not Ready	The control was “not ready” to process the last request.
NVRAM Failed	The memory test for the nonvolatile RAM has failed.
NVRAM Passed	The memory test for the nonvolatile RAM has passed.
Only 1 Page	Occurs when the page up or page down key is pressed and there is only one page to display.
Parm Mem Lmt	Indicates that the internal memory limit for parameters in block parameters has been exceeded, and therefore the number of parameters defined in block parameters must be reduced.
PLC BkUp set	Prompt to indicate that the PLC program has been changed to be the same as the backup PLC program that was saved to backup.
PLC Dflt set	Prompt to indicate that the PLC program has been changed to be the same as the default PLC program.

(Continued)

Appendix K: Error Code Definitions (continued)

Error	Definition
PLC Mem Lmt	During compilation of the PLC program, the internal memory limit set for the PLC program has been exceeded. The PLC program should be reduced.
Power Loss	Indicates that a momentary loss of AC power was detected.
Psn too Hi	The position is too high.
Ratio too Hi	The ratio is too high.
Res Error	The resolution for the last parameter value exceeded the limits for that parameter (result of a parameter value change using serial communications).
ROM Failed	Indicates that the memory test for the internal ROM part has failed.
ROM Passed	Indicates that the memory test for the internal ROM part has passed.
RUN Lockout	Indicates that the parameter entry is locked out during run. An attempt was made to enter a parameter value into a parameter that is locked out during run while the control is in run.
Saved 2 BkUp	Prompt to indicate that the data has been saved to backup storage for later use.
SP too High	The setpoint is too high.
SP too Low	The setpoint is too low.
Speed too Hi	The speed is too high.
SRAM Failed	Indicates that the memory test for the internal RAM part has failed.
SRAM Passed	Indicates that the memory test for the internal RAM part has passed.
Test Module	Reset caused by microprocessor's test sub-module.
UImpd Intrpt	An error has occurred while the CPU was processing to cause an unimplemented interrupt.
Watch Dog	The internal CPU watch dog timer has timed out. CPU is out of time and is not able to function correctly.

–NOTES—

APPENDIX L: SERIAL COMMUNICATIONS ERROR CODE DEFINITIONS

#	Name	Definition
0	OK	Request processed
1	General Data Error	A non-specified error occurred as a result of the last serial communications transmission. Check the contents of the last message transmission against the protocol definition.
2	Res Error	The resolution for the Control Parameter value exceeds the minimum or maximum that is allowed.
3	Invalid Parm	The requested parameter does not exist.
4	String too long	The custom engineering units string that was sent exceeds the 15 character limit and was truncated to 15 characters.
5	Out of Range	The parameter requested is above or below the available number of parameters, or the address requested for a memory read is not within the memory address range.
6	Not Allowed	The request is not allowed.
7	Lockout During RUN	An attempt was made to change a parameter value for a parameter that is locked out during run, while the control is in run (state).
8	Not Ready	The CX-1010 was “not ready” to receive the last request.
9	Block Parm Error	An error was encountered while processing a block parameter request.
10	Block Value Error	An error was encountered while processing a block value request.
11	Parm Memory Limit	The internal memory limit for block parameters was exceeded during processing of a block parameter change.
12	MIN Error	There was an attempt to exceed the minimum value allowed for a parameter value.

(Continued)

#	Name	Definition
13	Max Error	There was an attempt to exceed the maximum value allowed for a parameter value.
14	Invalid Command PLC	An invalid command was encountered during compilation of the PLC program.
15	Invalid Operand PLC	An invalid operand was encountered during compilation of the PLC program.
16	No <END> PLC	No END command was found during compilation of the PLC program.
17	PLC Memory Limit	The internal memory limit for the PLC program was reached while compiling the PLC program. The PLC program should be reduced in size.
18	Defaults Loaded	The default parameter values have been loaded into the Control Parameters.
19	Backup Loaded	The backup parameter values have been loaded into the Control Parameters.
20	Backup Saved	The Control Parameter values have been saved to backup storage.
21	Checksum Error	A checksum calculation error has occurred as a result of the last request.
22	Faults Cleared	The fault counters have been cleared.
23	Passed	The requested memory test passed.
24	Failed	The requested memory test failed.
25	No Compare Parm	No compare parameter.
26	Divide by Zero	The last request caused a “divide by zero” in an internal calculation.
27	Long Word Overflow	The last request caused a “long word overflow” in an internal calculation.
28	Parm Transfer Limit Error	An attempt was made to exceed the maximum number of parameters allowed for a request.

(Continued)

#	Name	Definition
29	Memory Read too Long	An attempt was made to read too many bytes of memory at one time.
30	Data Length Error	The “data field” length did not match the length expected for the specific serial communications function request.
31	Not Processed Msg	The last serial communications function request was not processed due to a combinational check error. One or more of the parameters in the block of parameters sent caused an error.
32	Invalid Serial Comm	The serial communications function that was requested, is not defined in the list of allowed functions. Check the protocol definition.

–NOTES—

APPENDIX M: PLC PROGRAM COMMANDS / SERIAL COMMUNICATIONS

Command Description	Decimal:	Hexidecimal:
END Command	224	E0
LOAD Command	225	E1
AND Command	226	E2
OR Command	228	E4
Exclusive OR Command (XOR)	229	E5
NOT Command	232	E8
LOAD NOT Command	233	E9
AND NOT Command	234	EA
OR NOT Command	236	EC
Exclusive OR NOT Command	237	ED
OUT Command	240	F0
NOP Command	255	FF

—NOTES—

APPENDIX N: PLC PROGRAM OPERANDS / SERIAL COMMUNICATIONS

Operand:	0	1	2	3	4	5	6	7
DESC:	S0	S1	Zero	ONE	Pwr-up	Reserved	Reserved	Trace Done
Operand:	8	9	10	11	12	13	14	15
DESC:	DI_8	DI_9	DI_10	DI_11	DI_12	DI_13	DI_14	DI_16
Operand:	16	17	18	19	20	21	22	23
DESC:	Lch1 Out	Lch2 Out	Lch3 Out	Lch4 Out	Reserved	Reserved	Reserved	Reserved
Operand:	24	25	26	27	28	29	30	31
DESC:	Tmr1 Out	Tmr2 Out	Tmr3 Out	Tmr4 Out	Reserved	Reserved	Reserved	Reserved
Operand:	32	33	34	35	36	37	38	39
DESC:	Cntr1 Out	Cntr2 Out	Cntr3 Out	Cntr4 Out	Cntr5 Out	Cntr6 Out	Cntr7 Out	Cntr8 Out
Operand:	40	41	42	43	44	45	46	47
DESC:	CO Sign	Drive En	Ramp Actv	RR@0Spd	Fb@0Spd	Reserved	MinSpdLmt	MaxSpdLmt
Operand:	48	49	50	51	52	53	54	55
DESC:	MaxFbSpd	MaxAclDcl	MtrNResp	MaxF12Psn	LoPwrAlm	MaxFI1Hz	Max FI2Hz	At Max Co
Operand:	56	57	58	59	60	61	62	63
DESC:	Cmpr1 Out	Cmpr2 Out	Cmpr3 Out	Cmpr4 Out	Reserved	Reserved	Reserved	Reserved
Operand:	64	65	66	67	68	69	70	71
DESC:	Master	Follower	Direct	Custom SP	Loop Open	Loop Vel	Loop ZE	Loop Psn
Operand:	72	73	74	75	76	77	78	79
DESC:	F-STOP	R-STOP	H-STOP	RUN	Jog Fwd	Jog Rvs	Reserved	Diag St
Operand:	80	81	82	83	84	85	86	87
DESC:	Blk Sel 0	Blk Sel 1	Blk Sel 2	Blk Sel 3	Blk Sel 4	Blk Sel 5	Blk Sel 6	Blk Sel 7
Operand:	88	89	90	91	92	93	94	95
DESC:	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Operand:	96	97	98	99	100	101	102	103
DESC:	Reserved	Reserved	Reserved	Reserved	DO_0	DO_1	DO_2	DO_3
Operand:	104	105	106	107	108	109	110	111
DESC:	DO_4	DO_5	DO_6	DO_7	Tmp1	Tmp2	Tmp3	Tmp4
Operand:	112	113	114	115	116	117	118	119
DESC:	Tmp5	Tmp6	Tmp7	Tmp8	Lch 1 Set	Lch 2 Set	Lch 3 Set	Lch 4 Set
Operand:	120	121	122	123	124	125	126	127
DESC:	Lch 1 Rst	Lch 2 Rst	Lch 3 Rst	Lch 4 Rst	Tmr1 En	Tmr2 En	Tmr3 En	Tmr4 En
Operand:	128	129	130	131	132	133	134	135
DESC:	Tmr4 Rst	Reserved	Cntr1 Inc	Cntr2 Inc	Cntr3 Inc	Cntr4 Inc	Cntr4 Dec	Cntr1 Rst
Operand:	136	137	138	139	140	141	142	143
DESC:	Cntr2 Rst	Cntr3 Rst	Cntr4 Rst	Reserved	Blk Sel A	Blk Sel B	Blk Sel C	Reserved
Operand:	144	145	146	147	148	149	150	151
DESC:	Reserved	Reserved	Reserved	Reserved	RstIngrl	RstFI1Psn	RstFI2Psn	RstPsn Err
Operand:	152	153	154	155	156	157	158	159
DESC:	FrzIntgrl	Open Loop	Frz Ramp	BypRmp	Reserved	Reserved	Negate CO	Negate SR
Operand:	160	161	162	163	164	165	166	167
DESC:	DataCopy1	DataCopy2	Reserved	Reserved	Reserved	Reserved	Reserved	StrtTrace
Operand:	168	169	170	171				
DESC:	Scroll Up	Scroll Dn	Reserved	No Opnd				

—NOTES—

APPENDIX O: WIRING DIAGRAM EXAMPLES

DANGER

THIS DIAGRAM IS FOR CONCEPTUAL PURPOSES ONLY !
USE SAFETY EQUIPMENT.
MAKE WIRING CONNECTIONS CAREFULLY.
INCORRECT USE OF EQUIPMENT OR CONNECTIONS CAN CAUSE INJURY OR DEATH.

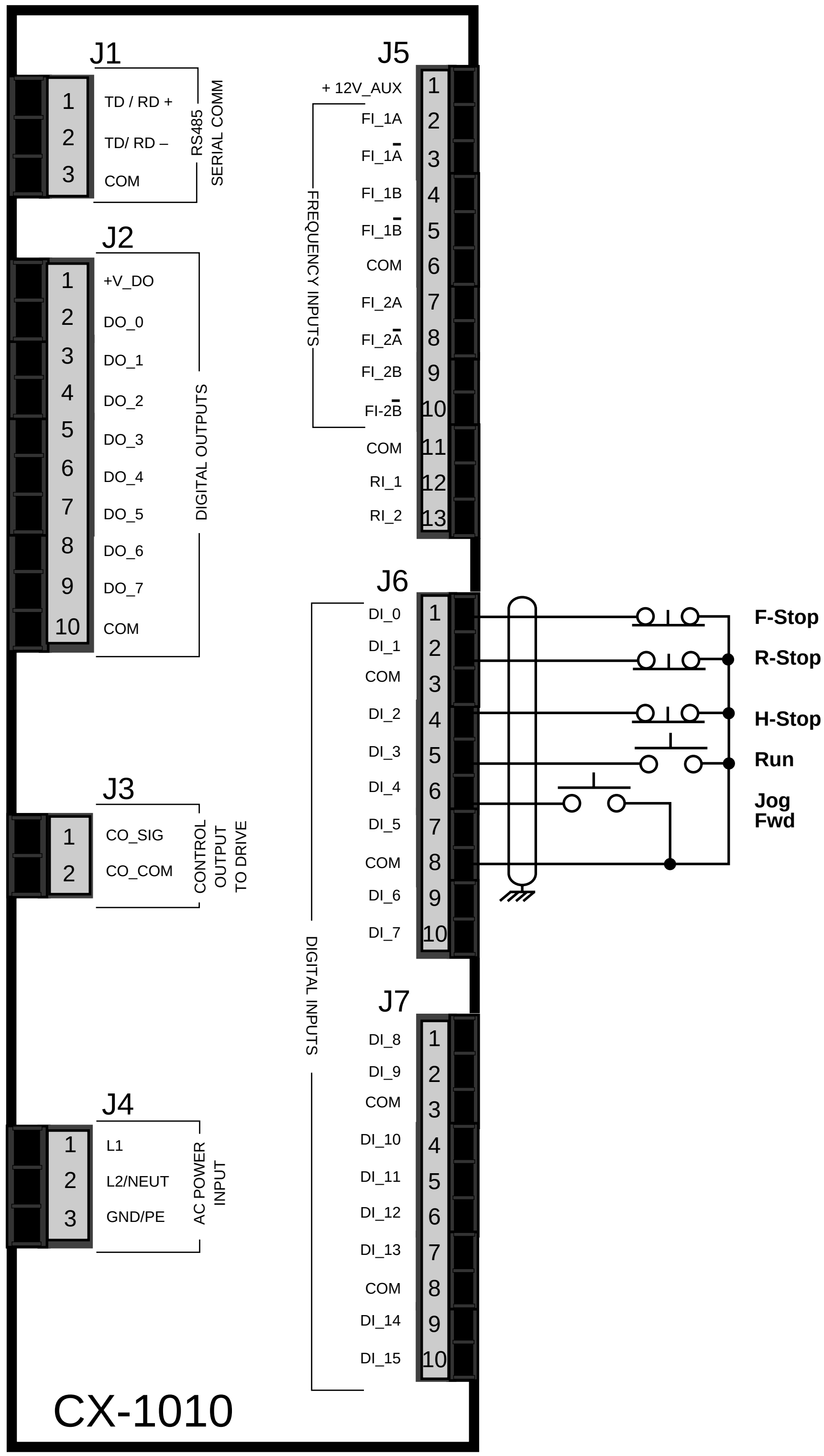


Figure O-1 CX-1010 Wiring Connections without Relays

DANGER

THIS DIAGRAM IS FOR CONCEPTUAL PURPOSES ONLY !
USE SAFETY EQUIPMENT.
MAKE WIRING CONNECTIONS CAREFULLY.
INCORRECT USE OF EQUIPMENT OR CONNECTIONS CAN CAUSE INJURY OR DEATH.

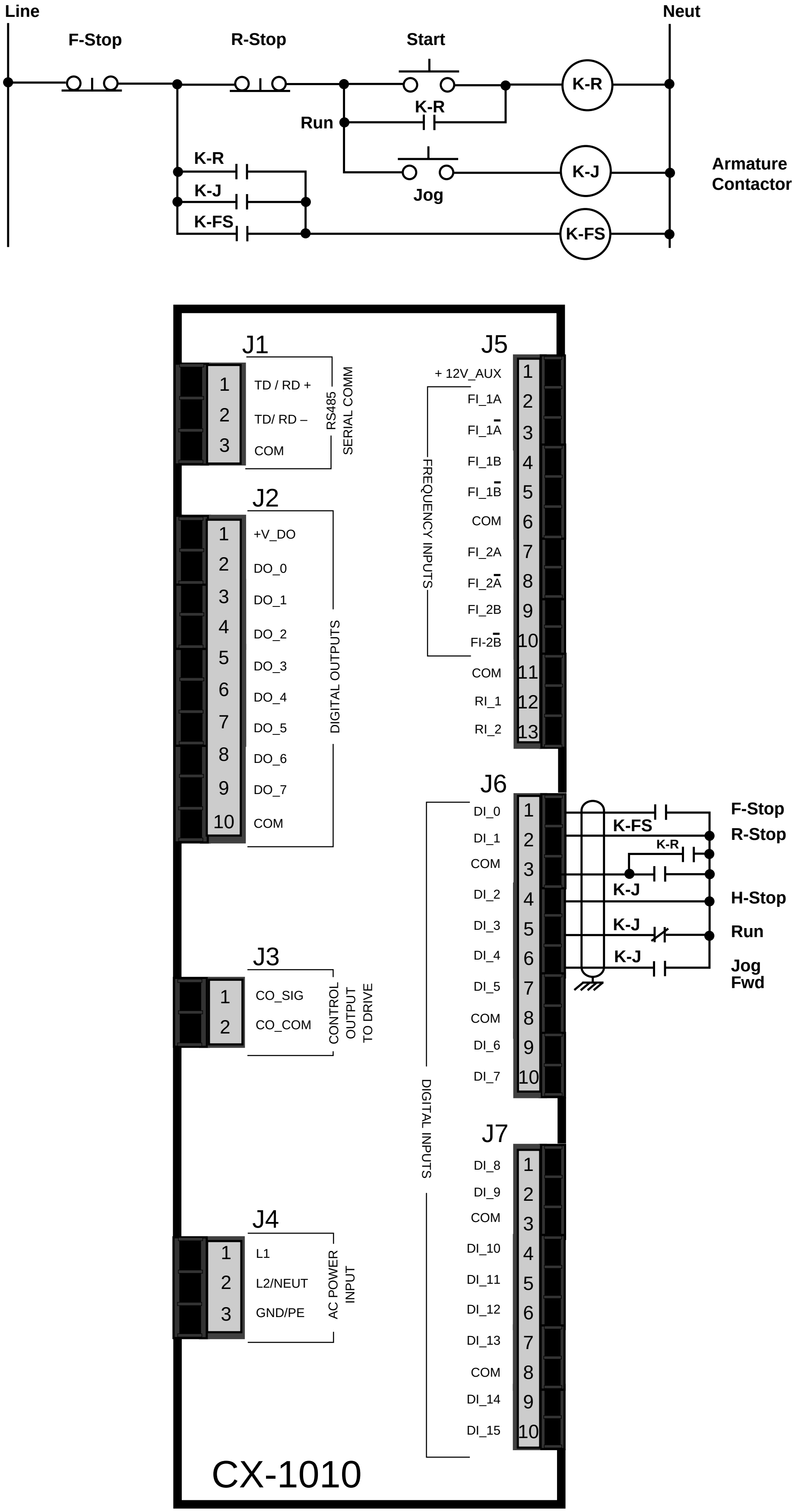
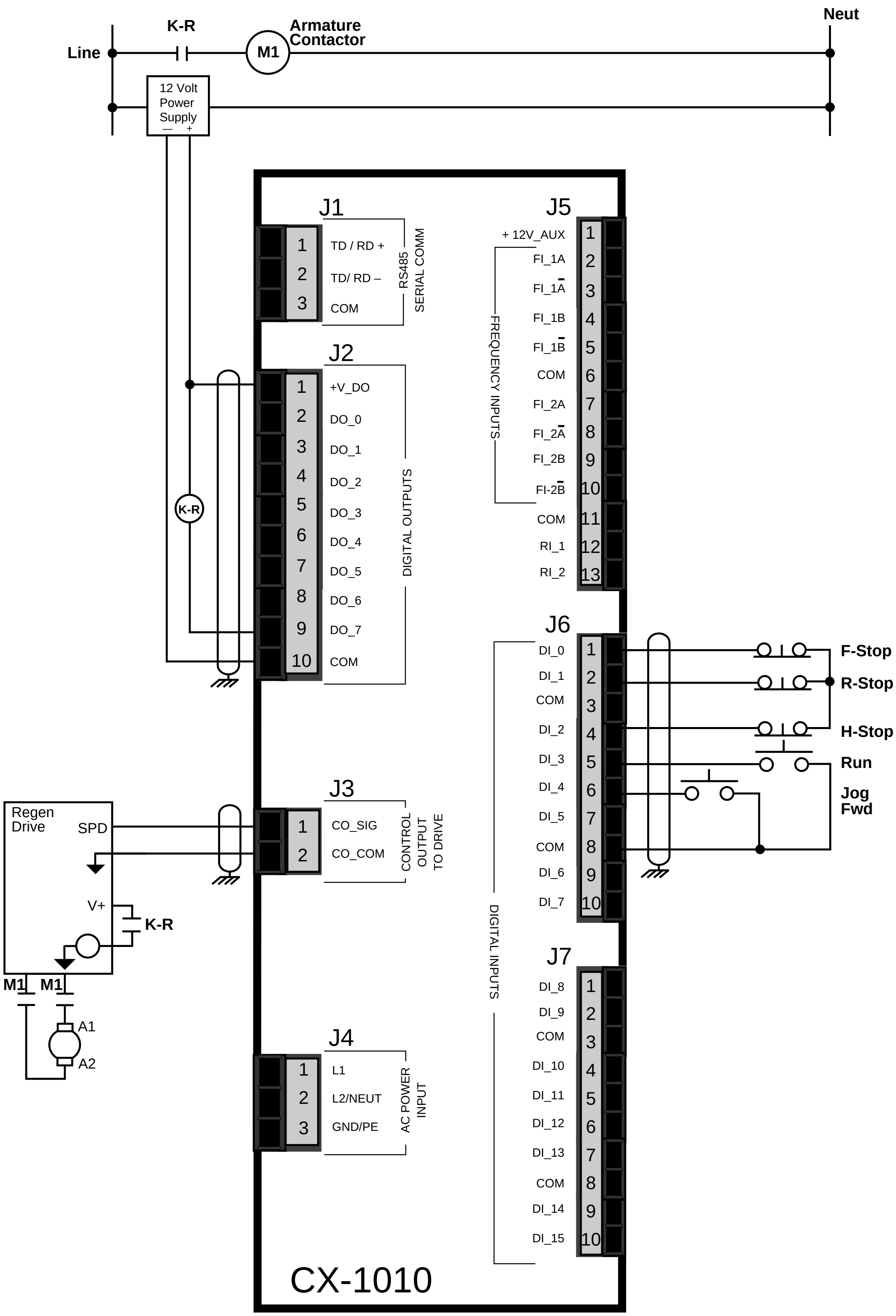


Figure O-2 Relay Start/Stop Wiring Connections



DANGER

THIS DIAGRAM IS FOR CONCEPTUAL PURPOSES ONLY !
USE SAFETY EQUIPMENT.
MAKE WIRING CONNECTIONS CAREFULLY.
INCORRECT USE OF EQUIPMENT OR CONNECTIONS CAN CAUSE INJURY OR DEATH.

Figure O-3 Start/Stop for Regen with Armature Contactor

—NOTES—

APPENDIX P: FAX COVER SHEET

Date: ______________________

Atten: **Contrex Technical Support**

From:
Name_____________________________ Company Name _____________________________________

Telephone # _______________________ Ext # _______________________ Fax # _________________

We have ______ CX-1010(s) that are used for:____

____

____

____

____

____

Serial Communication Hookup: _____Yes _____No

Brief Description of the Problem: ____

____

____

____

____

____

____

Contrex Fax # = (763) 424-8734

We are transmitting _____ pages, including:
This Cover Sheet,
A copy of Appendix D w/ the User Record completed,

—NOTES—

APPENDIX Q: REVISION LOG

Manual Revision	ECO Number	Revision Date	Corresponding * Software Rev.	Pages Changed
A	—	03/01	1000-8005 Rev. 1.0	New Manual Release

* Software revisions may not mandate manual changes. If your software revision is more recent than what is reflected here, use the the most current revision of the manual.

—NOTES—

Warranty/Service

SERVICE POLICY

Contrex, Inc., recognizes that with each sale of its product there are certain product obligations. This document defines the limits of such obligations and provides guidelines for the performance of related services.

Applicability

This Service Policy shall apply to all product sales of Contrex, Inc. However, it may be modified by mutual consent. Thus, whenever an accepted proposal contains wording inconsistent with this policy, the proposal will prevail with respect to specific sale or series of sales involved. Applicability of this policy is also somewhat limited in cases where products are sold to an OEM for resale to user. See paragraph below entitled *OEM Service.*

Service Personnel

Contrex, Inc., has a staff whose primary responsibility is service - both factory service and field (on-site) service. Personnel of this department are usually available for service on a 24 hour notice. To facilitate quicker handling of service requests, either written or by phone, such requests should be directed to the Contrex, Inc., Technical Services Department.

Service Charges

Contrex, Inc., reserves the right to charge for all services performed at the customers request with the exception of factory service performed under warranty. All on-site service is charged at flat-rate per diem rates plus expenses. Any Contrex, Inc., product developing defects as defined in the warranty during its effective period will be repaired or replaced without charge, providing it is shipped, prepaid, to Contrex, Inc., 8900 Zachary Lane North, Maple Grove, Minnesota 55369.

Spare Parts

Contrex, Inc., will usually have an adequate inventory of spare parts and circuit boards for all standard products. However, purchasers are encouraged to maintain a nominal supply of spare parts to insure immediate on-site accessibility.

Instruction Manuals

Instructions for installation, maintenance and troubleshooting are included in manuals that are provided with the equipment. Repairs may be performed in the field by competent customer personnel; but in order to not invalidate the warranty they must be made in strict accordance with published instructions, and ONLY AFTER obtaining approval of the Technical Service Department (such repairs are usually limited to the replacement of circuit boards and major subassemblies, not the repair of these items).

OEM Service

In many instances Contrex, Inc., products are sold to the original equipment manufactures or integrators for inclusion in larger systems. In such cases the obligations of Contrex, Inc., extend only to that original purchaser. It is the latter's responsibility to handle any service required by his customer, the end user. Such problems can usually be solved by field replacement of complete units. OEM's are encouraged to buy and maintain a supply of “loaners” for this purpose. Contrex, Inc., will provide factory overhaul service at nominal charges to support that OEM. Users of Contrex, Inc., products that were acquired as components of larger systems may buy service or spare parts directly from Contrex, Inc., at standard prices, but they must appeal through the OEM for warranty service.

If Contrex, Inc., encounters trouble in the field which appears to be the result of fault or inadequacy of the system, Contrex, Inc., reserves the right to recover service charges from the party that authorized the service activity.

WARRANTY

Contrex, Inc., guarantees this device against defects in workmanship and materials for a period of one (1) year from the date of purchase. Any parts or components that fail during the warranty period will be replaced or repaired without charge. This guarantee is void if the device has been damaged by improper installation or operation, tampering, careless handling or accident.

When a device fails to function in accordance with standards set forth in the instruction manual, the purchaser should contact an authorized representative of Contrex, Inc., 8900 Zachary Lane North, Maple Grove, Minnesota 55369. Whether repairs will take place in the field or at the factory will be solely the prerogative of Contrex, Inc.

If inspection reveals defects that are caused by faulty materials or workmanship, Contrex, Inc., reserves the right to either replace the device or rebuild the device using new or refurbished warranted parts and components. In either instance, the device that is returned to the purchaser meets full factory standards for new device performance. If there is less than 90 days remaining on the warranty period at the time of the repair, the warranty will extend to 90 days after the repair.

Parts and services outside the scope of this warranty will be available at Contrex, Inc., current market price.

Contrex's liability for a device or it's use, whether in warranty or not, shall not in any instance exceed the cost of correcting the defects of the device. Contrex, Inc., assumes no responsibility for damage to property or injuries to persons from improper use of this device.

No express warranties and no implied warranties whether of merchantability or otherwise (except as to title), other than those set forth above , which are expressly made in lieu of all other warranties, shall apply to any devise sold by Contrex, Inc.

Contrex, Inc., reserves the right to change or improve its devices without imposing any obligation upon Contrex, Inc., to make changes or improvements in previously manufactured devices.

This warranty statement is a summary of Contrex, Inc's policy. Further limits of liability are contained in the Contrex, Inc's purchase order acknowledgments and invoices.

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