

CONTREX®

SK1657 RevA



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CX-1010 Start Up Guide

Introduction

The CX-1010 motion controller is used in conjunction with various types of motor drives for precision control of motors in industrial applications. In most applications, its signal voltage output is used as a speed command input by the motor drive. It requires a feedback input signal, usually a frequency, indicating motor or process speed. Based on the setpoint and feedback inputs, the CX-1010 adjusts the speed command output to maintain the required motor RPM. This simple form of control is called *master* mode.

Often, a second frequency, usually coming from another motor, is fed to the CX-1010 to serve as a pacing or lead signal. In this case, the CX-1010 maintains a ratio of speeds between the lead motor and the motor it is controlling. This form of control is called *follower* mode.

This guide is intended to assist with the start up of elementary master and follower systems. More involved applications should be implemented only after the system is working as herein described. Refer to the *CX-1010 Technical Reference Manual* for a more comprehensive and detailed explanation of the CX-1010's features and operations.

The CX-1010 start-up procedure consists of:

- Basic wiring
- Motor drive set up
- Speed command output scaling
- Signal polarity verification
- Master mode and feedforward scaling
- Follower mode scaling

The following assumptions are made:

- The CX-1010 will control velocity (master) or a ratio of velocities (follower).
- Speed sensors for feedback and lead will be digital (frequencies).
- Except for the changes required here, the CX-1010, including its PLC, will be programmed as factory default.
- The default tuning for the CX-1010 should be stable for most applications and will not be discussed here.
- Quadrature sensors are required for bipolar applications.

Basic Wiring

WARNING

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

The CX-1010 General Wiring Diagram illustrates the complete power and signal wiring for the CX-1010 control. Not all of the connections will be required for your application. Refer to the *CX-1010 Technical Reference Manual* for complete installation and wiring instructions.

The following instructions describe the basic wiring required for the master and follower modes of operation:

Power (J4 pins 1,2,3)

Position the power selector switch on the back of the CX-1010 to configure the power supply for 115 or 230 VAC. Wire the power as shown in the diagram for 115 or 230 VAC.

WARNING

Applying 230 VAC power with the power selector switch in the 115 position will result in damage to the CX-1010 controller.

Run/Stop Logic (J6 pins 1,2,3,4,5)

In order to put the CX-1010 into "Run", the F-Stop, R-Stop and H-Stop inputs must be shorted to common, usually through a normally closed pushbutton. The Run input must then be temporarily shorted to common, usually through a normally open pushbutton. Thereafter, opening any of the Stop inputs will cause the CX-1010 to stop.

Speed Command (J3 pins 1,2)

The speed command is a two wire connection between the CX-1010 and the motor drive. Insure that the isolated common (J3 pin 2) is not used elsewhere.

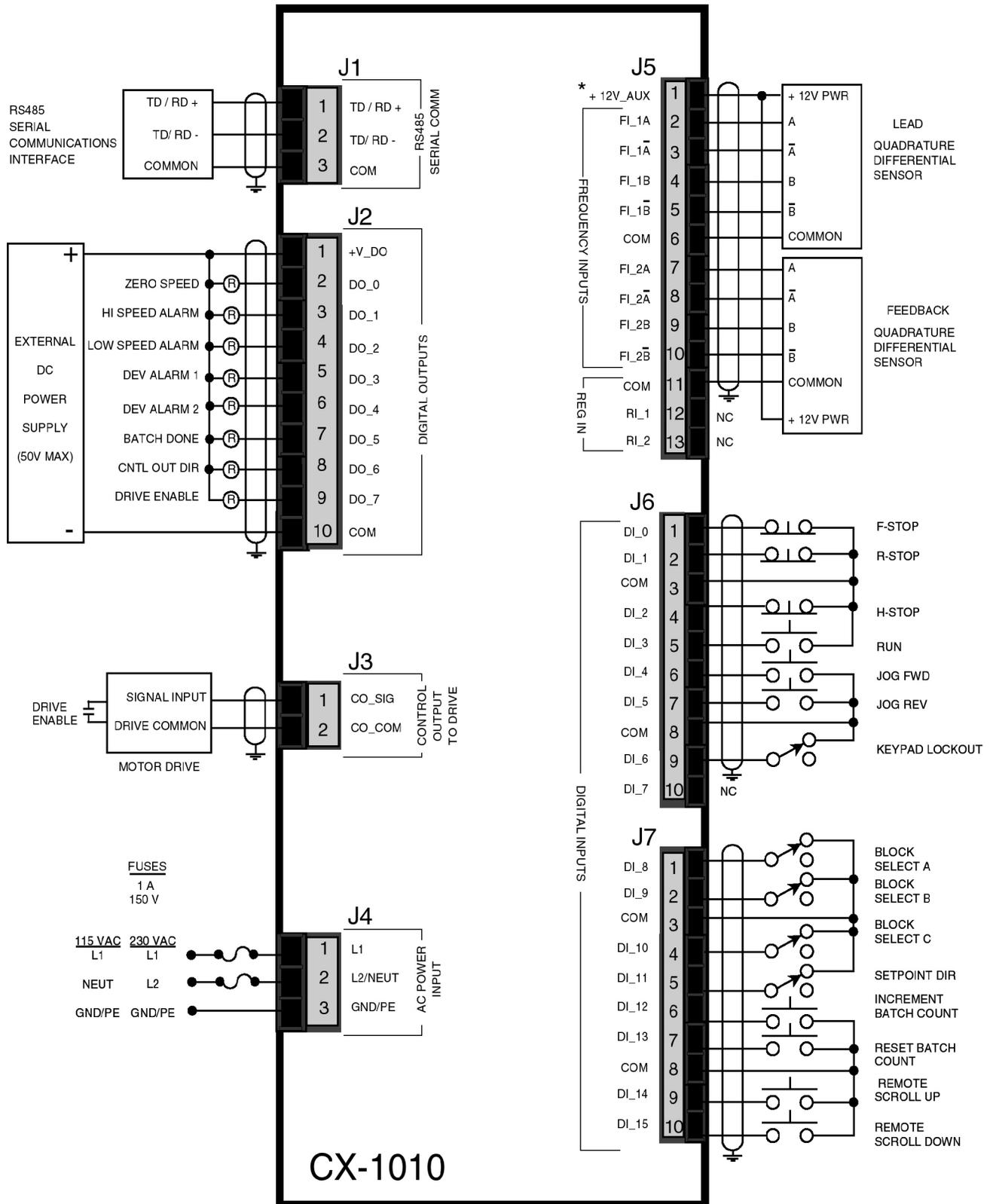
Drive Enable (J2 pins 1,9,10)

When this digital output of the CX-1010 is wired to the appropriate control input of the subject drive, it allows the CX-1010 to enable and disable the drive as required. A low voltage pilot relay is usually required.

Frequency Inputs (J5 pins 1 thru 11)

Both the master and follower modes of operation require the feedback frequency input for closed loop control. The follower mode also requires the lead frequency input connection. When using nondifferential (single-ended) quadrature sensors, connect phase A to pin 2 (7), phase B to pin 4 (9) and common to pin 6 (11). Refer to the *CX-1010 Technical Reference Manual* for detailed diagrams illustrating connections for various types of frequency sensors.

CX-1010 General Wiring Diagram



* Power for frequency input sensors may be supplied by J5, pin 1.
 Total current should not exceed 150 mA.

Motor Drive Set Up

In order to achieve desired system performance, the motor drive connected to the CX-1010's speed command output must be properly set up. Refer to your motor drive manual to assist you in making the following four motor drive adjustments:

- Set the maximum speed adjustment on the drive to deliver 10% more speed than the expected maximum speed required for your application.
- Set the acceleration and deceleration times to their fastest settings.
- Set the IR compensation to its minimum setting.
- Set the zero speed (balance) adjustment for zero creep.

Operator Interface Primer

The remainder of the CX-1010 set up procedures involve setting *control parameter* values through the operator interface, and then verifying system behavior using *monitor parameters*. The basic procedure for changing a control parameter is first to locate the relevant parameter using the *Menu*, *Page Up/Down* and *Parameter Up/Down* keys, and then to modify the parameter value using the *Numeric* or *Scroll Up/Down* keys.

The sequence for locating a control or monitor parameter using the menu driven interface is:

- Press the *Menu* key repeatedly until the Main Menu is displayed.
- Press the *Parameter Up/Down* keys to select the sub menu.
- Press the *Enter* key.
- Press the *Parameter Up/Down* keys to select the parameter category.
- Press the *Enter* key.
- Press the *Page Up/Down* keys, if necessary, to select the page.
- Press the *Parameter Up/Down* keys to select the parameter.

An alternative method for locating a parameter is through the code select procedure:

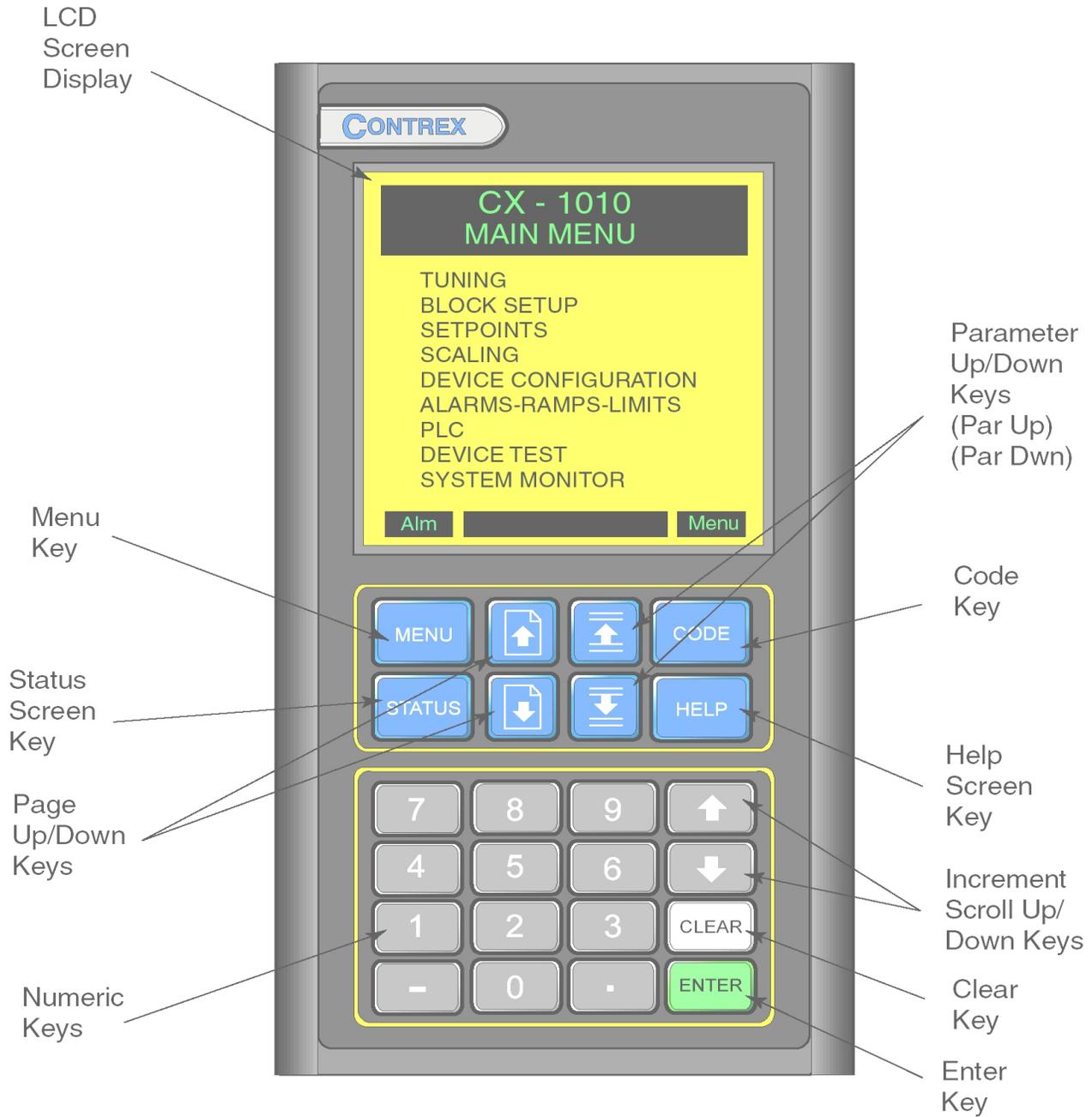
- Press the *Status* key to display the Status screen.
- Press the *Code* key to activate the code select line.
- Enter the numeric parameter code.
- Press the *Enter* key.
- The selected parameter is now displayed on the Status screen.

For each control parameter (CP) and monitor parameter (MP) required, the menu path will be shown as:

Go to **MAIN MENU\SETPOINTS\RUN MODES**
Enter **Setpoint Mode {CP 102} = Drct.**

The menu selections are separated by back slashes, "\". The parameter code is shown in the brackets, {}.

CX-1010 Operator Interface



Speed Command Output Scaling

In this section, the speed command mode, maximum signal voltage to the motor drive and voltage polarity will be set up.

Set the output control mode for bipolar or unipolar operation:

1. If your application runs in one direction only, skip to step 4.
2. Go to **MAIN MENU\SCALING\STANDARD SIGNALS\P3**.
Enter **CO Mode {CP 180} = Bipolar**.
3. Skip to step 5.
4. Go to **MAIN MENU\SCALING\STANDARD SIGNALS\P3**.
Enter **CO Mode {CP 180} = Unipolar**.

Set the maximum speed command voltage to the motor drive:

5. Enter **CO Max Volts {CP 181} = Maximum drive speed command voltage**.

Set the voltage polarity of the speed command signal for motor direction:

6. If a negative speed command voltage is forward direction, skip to step 9.
7. Enter **CO Polarity {CP 182} = Norm**.
8. Skip step 9.
9. Enter **CO Polarity {CP 182} = Neg**.

Procedure complete.

Signal Polarity Verification

In this section the polarities of the speed command and the speed sensor signals will be verified.

Forward

Enter in a direct mode setpoint for the forward direction:

1. Go to **MAIN MENU\SETPOINTS\RUN MODES**.
Enter **Setpoint Mode {CP 102} = Drct**.
2. If CO Polarity was set to Neg (step 9 above), skip to step 5.
3. Go to **STATUS**.
Enter **Direct SPx= + 2.0 volts**.
4. Skip to step 6.
5. Go to **STATUS**.
Enter **Direct SPx= - 2.0 volts**.

WARNING

Prepare the machine for motion.
Alert everyone present

6. Place the control into “Run”.

Verify forward motor direction:

7. If motor is running in the forward direction, skip to step 9.
8. Rewire the motor leads for forward direction.

Verify forward sensor polarity:

9. Go to **MAIN MENU\SYSTEM MONITOR\STD SIGNALS MONITOR\P2**
10. If **FI2 Hz {MP 6}** is a positive number, skip to step 12.
11. Rewire the feedback sensor polarity.
12. If your application is unipolar only, skip to step 24.
13. Place the control into “F-Stop”.

Reverse

Enter a direct mode setpoint for the reverse direction:

14. If CO Polarity was set to Neg, skip to step 17.
15. Go to **STATUS**
Enter **Direct SPx= - 2.0** volts.
16. Skip to step 18.
17. Go to **STATUS**
Enter **Direct SPx= +2.0** volts.

WARNING

Prepare the machine for motion.
Alert everyone present

18. Place the control into “Run”.

Verify reverse motor direction:

19. If the motor is running in the reverse direction, skip to step 21.
20. Rewire the motor leads for reverse direction, verify the motor drive is bipolar and then recheck forward direction by returning to step 2.

Verify reverse sensor polarity:

21. Go to **MAIN MENU\SYSTEM MONITOR\STD SIGNALS MONITOR\P2**
22. If **FI2 Hz {MP 6}** is a negative number, skip to step 24.
23. Rewire the feedback sensor polarity and then verify the sensor polarity in the forward direction by returning to step 2.
24. Place the control into “F-Stop”.

Procedure complete.

Master Mode and Feedforward Scaling

In this section, the master mode is scaled for engineering units. The feedforward is also scaled using the auto feedforward feature. Master mode scaling should be completed even if your end application is not master mode.

The CX 1010 must convert the feedback frequency into engineering units (RPM, Feet/min, etc.). To do this, it must "know" the ratio between encoder lines and these units. This ratio is entered in two parts on page two of the STANDARD SIGNALS screen. The first part is FI2 Pulses and the second part is EU FI2 (Engineering Units for Frequency Input Number Two). For example, if feedback is coming from a one foot circumference metering wheel driving a 1000 line encoder and engineering units will be inches, then:

1. Go to **MAIN MENU\SETPOINTS\RUN MODES**.
Enter **Setpoint Mode {CP 102} = Mstr.**
2. Go to **MAIN MENU\SCALING\STANDARD SIGNALS\P2**.
Enter **FI2 Pulses {CP 167} = 1000.**
3. Enter **EU FI2 {CP 168} = 12.0.**

Enter the desired master mode setpoint in engineering units:

4. Go to **STATUS**.
Enter **Master SPx = Desired speed.**

Verify master mode scaling:

WARNING

Prepare the machine for motion.
Alert everyone present

5. Place the CX-1010 control into "Run".
6. If the motor speed does not agree with Master SPx, then recalculate your scaling terms and return to step 2.

Scale the feedforward:

7. Go to **MAIN MENU\TUNING\FEEDFORWARD**.
Enter **MaxFb {CP 233} = Maximum feedback engineering units.**
8. Enter **Kff Auto En {CP 244} = ON.**
9. Wait several seconds.
10. Enter **Kff Auto En {CP 244} = OFF.**
11. Place the control into "F-Stop".

Procedure complete.

Follower Mode Scaling

In this section, the follower mode is scaled for engineering units. Master mode scaling should be completed before proceeding with the follower mode scaling procedure.

If it is in follower mode, the CX-1010 must convert the lead frequency into engineering units (RPM, Feet/min, etc.). To do this, it must "know" the ratio between encoder lines and these units. This ratio is entered in two parts on page one of the STANDARD SIGNALS screen. The first part is FII Pulses and the second part is EU FII (Engineering Units for Frequency Input Number One). For example, if the lead is coming from 60 tooth Quad Ring Kit on a motor armature driving a conveyor with a 2 foot diameter roll through a 30:1 reduction and engineering units are feet, then:

1. Go to **MAIN MENU\SETPOINTS\RUN MODES**.
Enter **Setpoint Mode {CP 102} = Fol.**
2. Go to **MAIN MENU\SCALING\STANDARD SIGNALS\P1**.
Enter **FII Pulses {CP 162} = 1800.** (60*30)
3. Enter **EU FII {CP 163} = 6.283.** (2*3.14...)

Set the Tach display for ratio:

4. Go to **MAIN MENU\SCALING\MONITOR PARAMETERS\P1**.
Enter **ScFb Eq {CP 190} = Fol.**
5. Enter **ScFb EU {CP 191} = 1.000.**
6. Go to **MAIN MENU\DEVICE CONFIGURE\STATUS SCREEN SETUP**.
Enter **Lg Number Units {CP 199} = 48.** (Ratio)

In follower setpoint mode, the setpoint expresses the ratio between the follower and lead engineering units. For example if the lead is in centimeters, the follower is in milliliters and the setpoint is 1.25, then the follower will produce 1.25 ml per cm. Enter the follower setpoint as the ratio of follower to lead engineering units:

7. Go to **STATUS**.
Enter **Follower SPx = 1.000.**

Verify the Follower Mode Scaling:

WARNING

Prepare the machine for motion.
Alert everyone present

8. Place the CX-1010 control into "Run".
9. If the motor speed does not agree with Follower SPx, then recalculate your scaling terms and return to step 2.
10. Place the CX-1010 control into "F-Stop".

Procedure complete