

CONTREX[®]

SK1710 Rev B

INTRODUCTION

The CX-1200 motion controller is used with various types of motor drives for precision control of synchronized applications. The typical application consists of a synchronizing a continuous moving process which can be of either two parts of a final product (e.g., bottles and bottle caps) or two parts of a machine (e.g., gear keyway to conveyor flight).

This guide is intended to assist with the start up of elementary systems. More involved applications should be implemented only after the system is working as herein described. Refer to the *CX-1200 Technical Reference Manual* for a comprehensive and detailed explanation of the CX-1200's features and operations.

The CX-1200 start-up procedure consists of:

- Basic Wiring
- Operator Interface Primer
- System Setup Procedure

The following assumptions are made:

- Except for the changes required here, the CX-1200, including its PLC, will be programmed as factory default.
- The default tuning for the CX-1200 should be stable for most applications and will not be discussed here.

This information is useful (but not essential) to complete setup.

- **Accel/Decel Rates:** Adjust the Accel/Decel rates in the motor drive (amplifier), to their fastest rates (shortest time), to allow the CX-1200 command signals to promptly generate a correct response from the motor.
- **Safety Stops/Inhibits/Enables:** The CX-1200 has a Drive Enable open collector output, to be used (via pilot relay if needed) to enable/disable the motor drive. This is important since there are situations where the CX-1200 is trying to hold a “live zero”, or “active stopped”, H-Stop state. At other times the drive enable is turned off (disabled). While the drive enable function could be part of some external process control scheme, it is best to let the CX-1200 control the drives as required by the internal control algorithms. Having said this, also consider SAFETY. The CX-1200 stop commands are solid state items. Overall system safety would require interlocked, external, pushbuttons, contacts, etc. to effect a disconnect type of safety stop. CX-1200's “live zero” may appear to be a stopped condition, but would NOT be safe to enter the machine for thread-up, jam clearing, etc.

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BASIC WIRING

WARNING
The CX-1200 should only be installed by a qualified electrician. Hazardous voltages may cause severe injury, death or equipment damage.

The CX-1200 General Wiring Diagram illustrates the complete power and signal wiring for the CX-1200 control. Not all of the connections will be required for your application. Refer to the *CX-1200 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-1200 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-1200 controller.

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

In order to put the CX-1200 into “Run”, the F-Stop, R-Stop and H-Stop inputs must be shorted to common, usually through a normally closed pushbutton. Short the Run input to common, usually through a normally open momentary pushbutton. Thereafter, opening any of the Stop inputs will cause the CX-1200 to stop.

Jog Fwd/Rvs (J6 pins 6,7,8)

Jog Fwd/Rvs is a maintained input. When it is closed, it sends a Control Output signal to the drive at the selected Jog Setpoint. As a maintained input, Jog Fwd/Rvs is only active when the operator device is closed.

Control Output (J3 pins 1,2)

The Control Output is a two wire connection between the CX-1200 and the Follower motor drive. Insure that the isolated common (J3 pin 2) is not used elsewhere.

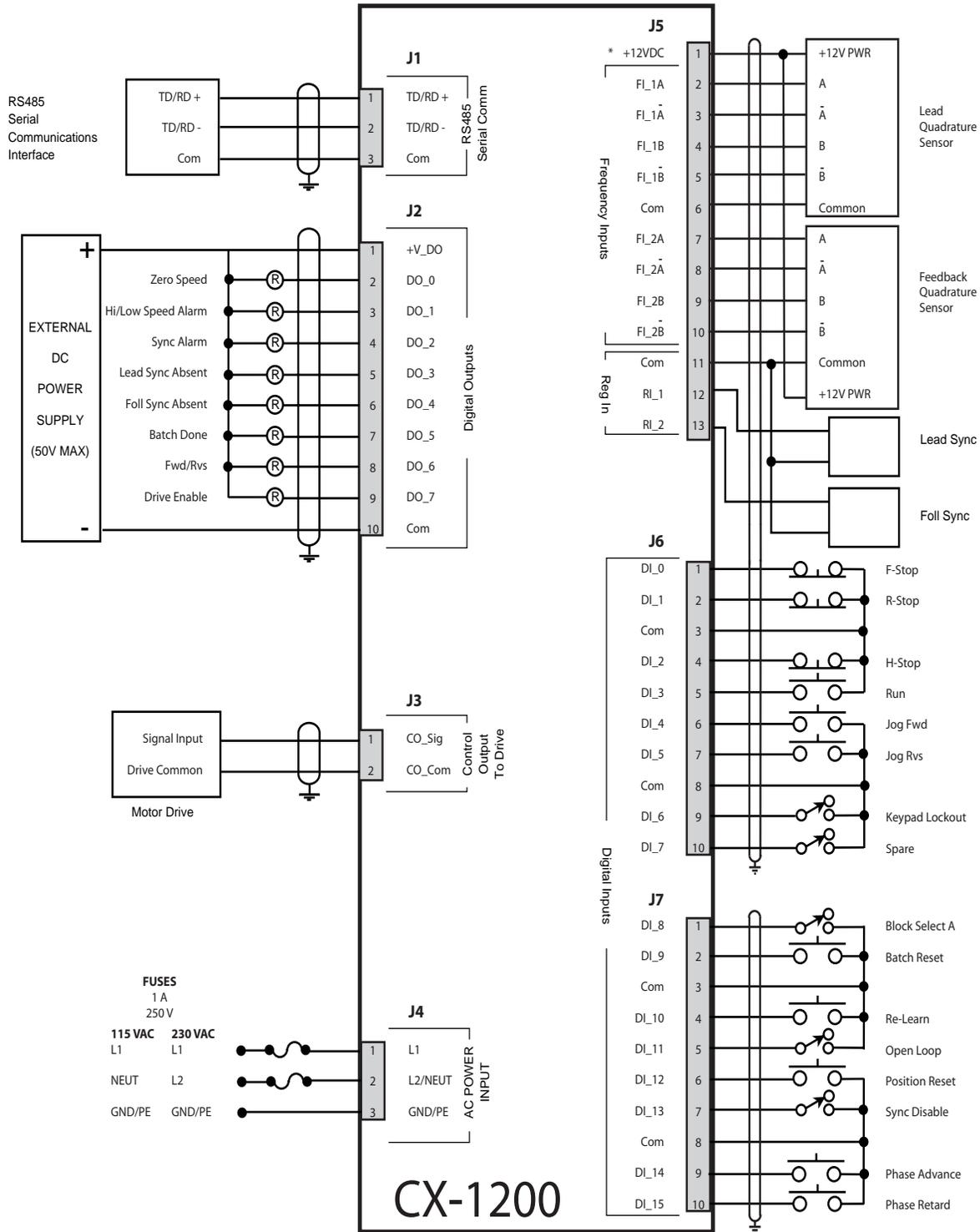
Drive Enable (J2 pins 1,9,10)

When this digital output is wired to the appropriate control input of the subject drive, it allows the CX-1200 to enable and disable the drive as required. A low voltage pilot relay is usually required.

Frequency Inputs (J5 pins 1 thru 11)

The CX-1200 requires incremental or quadrature encoders for the lead/follower frequency inputs. Refer to the *CX-1200 Technical Reference Manual* for detailed diagrams illustrating the connections for the frequency sensors.

CX-1200 General Wiring Diagram



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

OPERATOR INTERFACE PRIMER

The remainder of the CX-1200 setup procedure involves 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 *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\SETUP\SYSTEMSETUP\PAGE 2.**

Enter **RUN Mode {CP-202} = 1 = Direct Mode.**

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

NOTE: The Help key accesses the Help screen and gives you a brief description of the parameter or subject that is highlighted (active) on the screen. Press the Help key again to return to the previous screen.

CX-1200 Operator Interface



SYSTEM SETUP PROCEDURE

This procedure is a series of steps designed to verify the motor/drive/encoder wiring and polarity setup some of the basic parameters necessary for proper operation of the CX-1200.

Before you begin this procedure, the motor and drive must be wired and configured in accordance with the manufacturer's instructions. Refer to your drive manual to assist you in making the following 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 Integral compensation to its minimum setting.

The CX-1200 must be configured and installed in accordance with the installation procedures indicated in the *Installation* section of the *CX-1200 Technical Reference Manual* and the CX-1200, including its PLC, will be programmed as factory default.

NOTE: Sync Mode {CP-203} **MUST** have OFF selected. If the CX-1200 is not at **factory default**, then reference the *Operator Interface Primer, Keypad Operation, Code Select key and change Sync Mode {CP-203}*.

Setup consists of the following:

- Freq In 2 & CO Setup
- Motor/Encoder Signal Polarity Setup
- Master Mode and Feedforward Scaling
- Lead Scaling
- Follower Mode Scaling

	<p>DANGER</p> <p>Motion will occur in the calibration procedure. It is possible that 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.</p>	
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DANGER

Hazardous voltages.

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

**Make adjustments
with caution.**



Step 1 - Freq In 2 & CO Setup - Parameter Entry

Go to **System Setup Freq In**Page 1.

Configure the CP's on this screen as required.

State {MP-50}
Cnt Mode FI2 {CP-265}
PPR FI2 {CP-266}
CO Mode {CP-270}
CO Max Volts {CP-271}
Sync Mode {CP-203}

NOTE: *The Help key accesses the Help screen and gives you a brief description of the parameter or subject that is highlighted (active) on the screen. Press the Help key again to return to the previous screen.*

NOTE: Sync Mode {CP-203} **MUST** have OFF selected. If the CX-1200 is not at **factory default**, then reference the *Operator Interface Primer; Keypad Operation, Code Select key and change Sync Mode {CP-203}*.

Press the "Page Down" key to proceed to the next page.

Step 2 - Motor/Encoder Signal Polarity Setup - Parameter Entry

The CX-1200 will display **System Setup Signal Polarity**Page 2.

Configure the CP's on this screen as required.

State {MP-50}
RUN Mode {CP-202}
Direct SPx {CP-201}
CO Polarity {CP-272}
CO Offset {CP-273}
CO Volts {MP-37}
FI2 Hz {MP-03}

NOTE: *The Help key accesses the Help screen and gives you a brief description of the parameter or subject that is highlighted (active) on the screen. Press the Help key again to return to the previous screen.*

WARNING
Prepare the machine for motion.
Alert everyone present.

This test checks the Control Output polarity and the Encoder polarity, so a positive Control Output command causes positive Encoder feedback.

Forward:

1. Enter **RUN Mode {CP-202} = Direct**.
2. Enter **Direct SPx {CP-201} = +2.0 volts**.
3. Place the control into "Run".

Verify forward motor direction:

4. If motor is running in the forward direction , skip to step 6.
5. Rewire the motor leads for forward direction.

Verify forward sensor polarity:

6. If **FI2 Hz {MP-03}** is a positive number, skip to step 8.
7. Rewire the feedback sensor polarity.
8. Place the control into "F-Stop".

Reverse:

Enter a direct mode setpoint for the reverse direction:

9. If **CO Mode {CP-270} = Unipolar**, skip to step 16.
10. Enter **Direct SPx {CP-201} = -2.0 volts**.
11. Place the control into "Run".

Verify reverse motor direction:

12. If motor is running in the reverse direction , skip to step 14.
13. Rewire the motor leads for reverse direction, verify the motor drive is bipolar or unipolar reverseable and then recheck forward direction by returning to step 1.

Verify reverse sensor polarity:

14. If **FI2 Hz {MP-03}** is a negative number, skip to step 16.
15. Rewire the feedback sensor polarity, and then verify the sensor polarity in the forward direction by returning to step 1.
16. Place the control into "F-Stop".
17. Enter **Direct SPx {CP-201} = 0 volts**

Press the "Page Down" key to proceed to the next page.

Step 3 - Master Mode and Feedforward Scaling - Parameter Entry

The CX-1200 will display **System Setup Master Mode**Page 3.

Configure the CP's on this screen as required.

State {MP-50}
RUN Mode {CP-202}
Master SPx {CP-201}
Pulses FI2 {CP-267}
EU FI2 {CP-268}
Kff Auto En {CP-364}
Kff {MP-48}
FI2 Hz {MP-03}
FI2 RPM {MP-04}
Fb EU/Tm {MP-06}

NOTE: *The Help key accesses the Help screen and gives you a brief description of the parameter or subject that is highlighted (active) on the screen. Press the Help key again to return to the previous screen.*

WARNING
Prepare the machine for motion.
Alert everyone present.

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 1200 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, 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 EU FI2 {CP-268} = 12.0 and FI2 Pulses {CP-267} = 1000.

1. Enter **RUN Mode {CP-202} = Master**.
2. Enter *your* **FI2 Pulses {CP-267}**.
3. Enter *your* **EU FI2 {CP-268}**.

Enter the desired master mode setpoint in engineering units:

4. Enter **Master SPx {CP-201} = Desired speed**.

Verify master mode scaling:

5. Place the CX-1200 control into "Run".
6. If the Fb EU/Tm {MP-06} is not what you expect to see with the Master SP, then recalculate your scaling terms and return to step 2.

Scale the feedforward:

7. Enter **Kff Auto En {CP-364} = ON**.
8. Wait several seconds.
9. Enter **Kff Auto En {CP-364} = OFF**.
10. Place the control into "F-Stop".

Press the "Page Down" key to proceed to the next step.

Step 4 - Lead Scaling - Parameter Entry

The CX-1200 will display **System Setup Lead**Page 4.

Configure the CP's on this screen as required.

State {MP-50}
Cnt Mode FI1 {CP-260}
PPR FI1 {CP-261}
Pulses FI1 {CP-262}
EU FI1 {CP-263}
FI1 Hz {MP-01}
FI1 RPM {MP-02}
Ld EU/Tm {MP-05}

NOTE: *The Help key accesses the Help screen and gives you a brief description of the parameter or subject that is highlighted (active) on the screen. Press the Help key again to return to the previous screen.*

*When it is in follower mode, the CX-1200 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, the first part is FI1 Pulses and the second part is EU FI1 (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 **FI1 Pulses {CP 262}** = 1800 (60*30) and **EU FI1 {CP 263}** = 6.283 (2*3.14...).*

1. Enter your **FI1 Pulses {CP 262}**.
2. Enter your **EU FI1 {CP 263}**.

Verify the Lead Scaling:

3. Place the Lead control into "Run".
4. If the Ld EU/Tm {MP-05} does not agree with the lead engineering units expected, then recalculate your scaling terms and return to step 1.
5. Place the Lead control into "Stop".

Press the "Page Down" key to proceed to the next page.

Step 5 - Follower Mode Scaling

The CX-1200 will display **System Setup Follower Mode\Page 5**.

State {MP-50}
RUN Mode {CP-202}
Follower SPx {CP-201}
ScFbDisp EQU {CP-250}
Lg Number Units {CP-449}
Scaled Fb {MP-40}
Ld EU/Tm {MP-05}
Fb EU/Tm {MP-06}
Sync Mode {CP-203}

NOTE: *The Help key accesses the Help screen and gives you a brief description of the parameter or subject that is highlighted (active) on the screen. Press the Help key again to return to the previous screen.*

WARNING
Prepare the machine for motion.
Alert everyone present.

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

1. Enter **RUN Mode {CP 202} = Follower**.

Set the Scaled Feedback display for the desired units:

2. Enter **ScFbDisp EQU {CP 250} = Ratio**.

3. Enter **Lg Number Units {CP 449}**.

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:

4. Enter your **Follower SPx {CP-201}**.

Verify the Follower Mode Scaling:

5. Place the CX-1200 control into "Run" and also place the lead control into "Run"..

6. If the relationship between the Lead and Follower speeds are not what you expect, then recalculate your scaling terms and return to step 2.

7. Place the CX-1200 control into "F-Stop" and the lead control into "Stop".

Procedure complete.

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