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CMC SERIES
COORDINATED MOTION CONTROLLERS
USER'S MANUAL ADDENDUM (127/2)
MODELS
CMC-31CX-2-B & CMC-31PX-2-B

Price $10.00
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Operation Manual for CMC-31CX and CMC-31PX

1. Front Panel Display

The controller has a two digit alphanumeric display located near the top center of the front panel. This display is used to indicate faults and to view/modify parameters.

All existing faults are displayed on a "round robin" basis. If no faults exist, then the display will show the axis address assignment which will be either AX, AY, AW, or AZ. If there is only one fault, then the code for that fault is displayed. If there are two faults, then the display will alternate between the codes for the two faults. If there are three faults, then the display will cycle through the codes for the three faults, and so on.

Pressing the "P" (parameter) pushbutton causes the display to switch to displaying parameter mnemonics. After four seconds of no further pushbutton activity, the display will switch back to displaying faults. When parameter mnemonics are displayed, pressing the up arrow pushbutton or down arrow pushbutton causes the display to move up or down through the list of parameter mnemonics.

When the desired parameter mnemonic is displayed, pressing the "V" (value) pushbutton causes the display to switch to displaying the current value of the selected parameter. After four seconds of no further pushbutton activity, the display will switch back to displaying the mnemonic of the selected parameter. When the selected parameter value is displayed, pressing the up arrow pushbutton or down arrow pushbutton increases or decreases the current value of the selected parameter. Pressing the "P" pushbutton forces the display to immediately switch back to displaying the mnemonic of the selected parameter.

2. Fault Codes

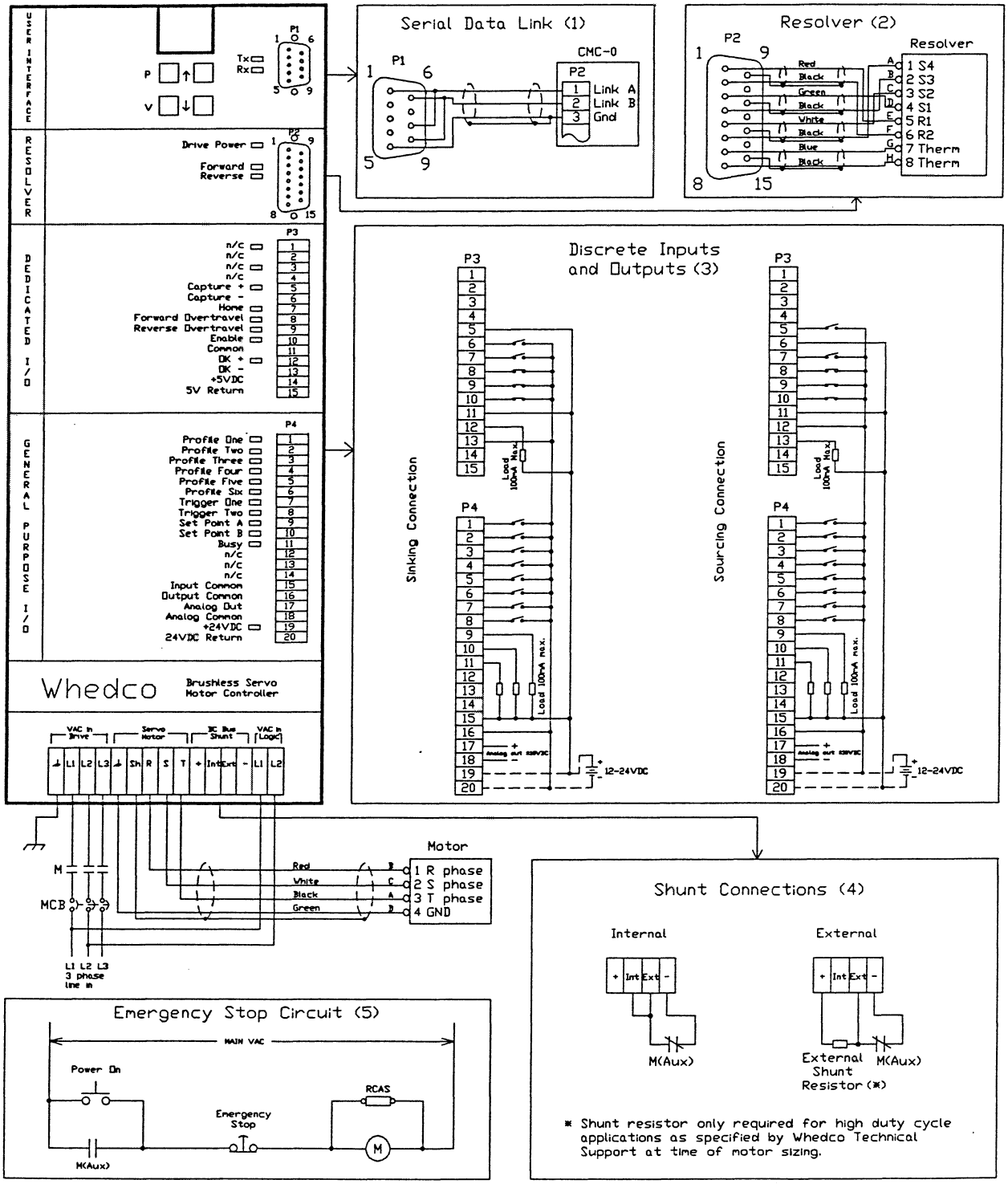
The controller has 14 different fault conditions which it checks for. Once a fault is detected, it is added to the list of existing faults. The controller displays the list of existing faults in a "round robin" fashion as discussed in section 1. The list of existing faults is maintained until the system is "warm booted". At this time, the list is cleared and if no faults are currently active, the controller will be able to run and will turn on its ok output and display the axis address assignment in its front panel display. If a fault still exists when the system is "warm booted", then the fault will be added to the new current list of faults and the controller will remain unable to run.

The faults which the controller detects and their mnemonics are detailed in the following list:

PF (Power Failure) - The controller detected a loss of logic power. Every time the controller loses logic power, the system must be "warm booted" to allow the controller to run.

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CMC-31CX-2-B and CMC-31PX-2-B USER CONNECTIONS AND SWITCH SETTINGS



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FE (Following Error) - The difference between the command position and the actual position of the motor became more than the line density constant.

CE (Communication Error) - The communication link between the controller and the master did not function properly and should be checked for loose connections or wiring errors.

PO (Position register Overflow) - The position of the motor became more than the position register could represent. This causes loss of absolute position reference. The maximum range of the position register is +/- 8,388,607.

SF (Software Fault) - The command which faults the axes was executed.

ME (Memory Error) - The memory which stores the front panel parameters did not checksum correctly. This fault causes the controller to set the parameters to their default values.

LE (Lost Enable) - The enable input is inactive.

UV (Under-Voltage) - The bus voltage for the motor drive became less than 250 volts.

OV (Over-Voltage) - The bus voltage for the motor drive became more than 470 volts.

DT (Drive over-Temperature) - The motor drive heatsink temperature became more than 85 degrees Celsius.

MT (Motor over-Temperature) - The temperature sensor in the motor indicated that the motor was too hot.

DC (Drive over-Current) - The motor drive detected excessive or improper current flow from the motor terminals.

EC (Excessive Clamp) - The duty cycle of the internal clamp resistor became more than 1.5%. If this fault occurs, an external clamp resistor will be needed.

CC (over-Current Clamp) - The clamp circuit detected excessive current flow in the clamp transistor. If this fault occurs, the external clamp resistor has too little resistance.

3. Front Panel Parameters

The controller has 17 parameters which can be set from the front panel. The parameters are accessed by moving up and down through a list as discussed in section 1. The parameters and their mnemonics are detailed in the following list:

AA (Axis Assignment) - This parameter assigns the axis address to the controller. The controller can be assigned to the X axis (AX), Y axis (AY), W axis (AW), or Z axis (AZ).

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PA (Profile Assignment) - This parameter sets whether the profile lines are dedicated (DE) or encoded (EN). For an explaination of the two schemes, see the CMC manual.

AO (Analog Output) - This parameter determines the signal which is sent to the analog output port. The setting can be one of the following:

VL (VeLocity) - This setting puts the motor velocity out the port. The scaling is 0.5 volts per 1000 revolutions per minute.

CC (Current) - This setting puts the motor current out the port. The scaling is 1 volt equals 2.4 amps rms.

FE (Following Error) - This setting puts the following error of the motor out the port. The scaling is 1 volt equals 204.8 counts of following error.

CC (Continuous Current) - This parameter determines the maximum continuous current the drive will feed to the motor. It is entered in percent of maximum available current. The range of values is 0 to FL where FL is 100 percent of available current. For this unit, the maximum available continuous current is 12 amps rms.

PC (Peak Current) - This parameter determines the maximum peak current the drive will feed to the motor. It is entered in percent of maximum available current. The range of values is 0 to FL where FL is 100 percent of available current. For this unit, the maximum available peak current is 24 amps rms. The minimum value allowed is the continuous current setting.

MD (Motor Direction) - This parameter determines the direction of rotation of the motor viewed from its output shaft when the axis is commanded to move in the forward direction. The setting is either clockwise (CW) or counter-clockwise (CC).

FR (Feedback Resolution) - This parameter sets the type of position feedback the axis is using. The settings available are single speed resolver (R1) or two speed resolver (R2).

MS (Motor Setup) - This parameter controls the setting of the motor setup parameters which are amplitude of resolver excitation (AR), poles ratio (PR), and communtation angle offset (CO). The parameter has three settings which are detailed below.

DF (DeFault) - When the motor setup parameter is set to DF, the three motor setup parameters are set to their default values and they are not available in the parameter list. The default values work for most Whedco supplied motors.

MN (MaNual) - When the motor setup parameter is set to MN, the three motor setup parameters are made available in the parameter list to be viewed or altered. If the motor setup parameter is set to manual from the default or automatic settings, then the values assigned to the three motor setup parameters by those respective settings will be the initial values of the three motor setup parameters.

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AT (AuTomatic) - When the motor setup parameter is set to AT, the axis automatically finds the correct settings for the three motor setup parameters and makes the parameters unavailable in the parameter list. The motor setup parameter can only be set to AT when the enable input of the axis is inactive. After being set to AT, the axis waits for both the enable input being set active and the axis being "warm booted". At this point, the axis will move the motor to allow it to find the appropriate settings for the three motor setup parameters. When this is being done, the motor should not be connected to the load and should be able to move freely. When the axis is done setting the parameters, the display will switch back to displaying MS.

During automatic setup, the axis can detect four different failures. When a failure is detected, the axis faults and displays the code for that failure. To reset the axis, drop the enable input. The failures and their codes are listed next:

SW (SWitch) - If this code appears, two of the three motor wires will need to be switched. Power down the axis, switch two of the motor wires and try the automatic setup again.

BR (Bad Ratio) - This code indicates that the calculated poles ratio parameter is out of allowed limits. This could be caused by the motor not begin able to move freely, the continuous current not being set correctly, or the resolver not being properly connected.

OP (Out of Position) - This code indicates the axis could not get the resolver to read zero. This could be caused by the motor not being able to move freely, the continuous current not being set correctly, or the resolver not being properly connected.

BA (Bad Amplitude) - This code indicates the amplitude of the resolver excitation could not be properly set. This could be caused by the resolver not being properly connected.

AR (Amplitude of Resolver excitation) - This parameter sets the amplitude of the excitation signal feed to the resolver rotor. The range of allowed values is 1 to FF hexidecimal.

PR (Poles Ratio) - This parameter is the ratio between the number of motor poles and the number of resolver poles. The range of allowed values is 1 to 10 hexidecimal.

CO (Communtation angle Offset) - This parameter sets the communtation angle offset for communtating the three phase brushless motor. The range of allowed values is 0 to FF hexidecimal.

CS (Control Setup) - This parameter controls the setting of the control parameters which are gain (GN), integration band (IB), zero (ZR), acceleration feedforward, (FF), and pole (PL). The parameter has three settings which are detailed below.

DF (DeFault) - When the control setup parameter is set to DF, the five control parameters are set to their default values and they are

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not available in the parameter list. The default values are the supplied by the CMC-0.

MN (MaNual) - When the control setup parameter is set to MN, the five control parameters are made available in the parameter list to be viewed or altered. If the control setup parameter is set to manual from the automatic setting, then the values assigned to the five control parameters by the automatic mode will be the initial values of the five control parameters.

AT (AuTomatic) - When the control setup parameter is set to AT, the axis automatically finds the correct settings for the five control parameters and makes the parameters unavailable in the parameter list. The control setup parameter can only be set to AT when the enable input of the axis is inactive. After being set to AT, the axis waits for both the enable input being set active and the axis being "warm booted". At this point, the axis will move the motor no more than one motor revolution to allow it to find the appropriate settings for the five control parameters. When this is being done, the motor should be connected to the load and should be able to freely move at least one motor revolution. When the axis is done setting the parameters, the display will switch back to displaying CS.

During automatic setup, the axis can detect four different failures. When a failure is detected, the axis faults and displays the code for that failure. To reset the axis, drop the enable input. The failures and their codes are listed next:

TL (Torque-to-inertia ratio too Low) - This code indicates the calculated torque-to-inertia ratio is too low for proper control. Check that the motor and load can freely move, and that the motor is correctly sized.

TH (Torque-to-inertia ratio too High) - This code indicates the calculated torque-to-inertia ratio is too high for proper control.

OP (Out of Position) - This code indicates the axis could not move the motor back to its starting position. This could be caused by the motor not being able to move freely, or the continuous current not being set correctly.

BT (Bad Torque-to-inertia calculation) - This code indicates that the automatic mode can not properly calculate the torque-to-inertia ratio.

GN (GaiN) - This parameter sets the position loop gain which is proportional to the following error. The range of allowed values is 0 to FF hexidecimal.

IB (Integration Band) - This parameter sets the position loop gain which multiplies the integral of the following error. The range of allowed values is 0 to FF hexidecimal.

ZR (ZeRo) - This parameter sets the position loop gain which multiplies the derivative of the following error. The range of allowed values is 0 to FF

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hexidecimal.

FF (FeedForward) - This parameter sets the amount of acceleration feed-forward to apply to the control loop. The range of allowed values is 0 to FF hexidecimal.

PL (PoLe) - This parameter sets the time constant of the velocity filter used when the position loop is maintaining a set position. The range of allowed values is 0 to 5.

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