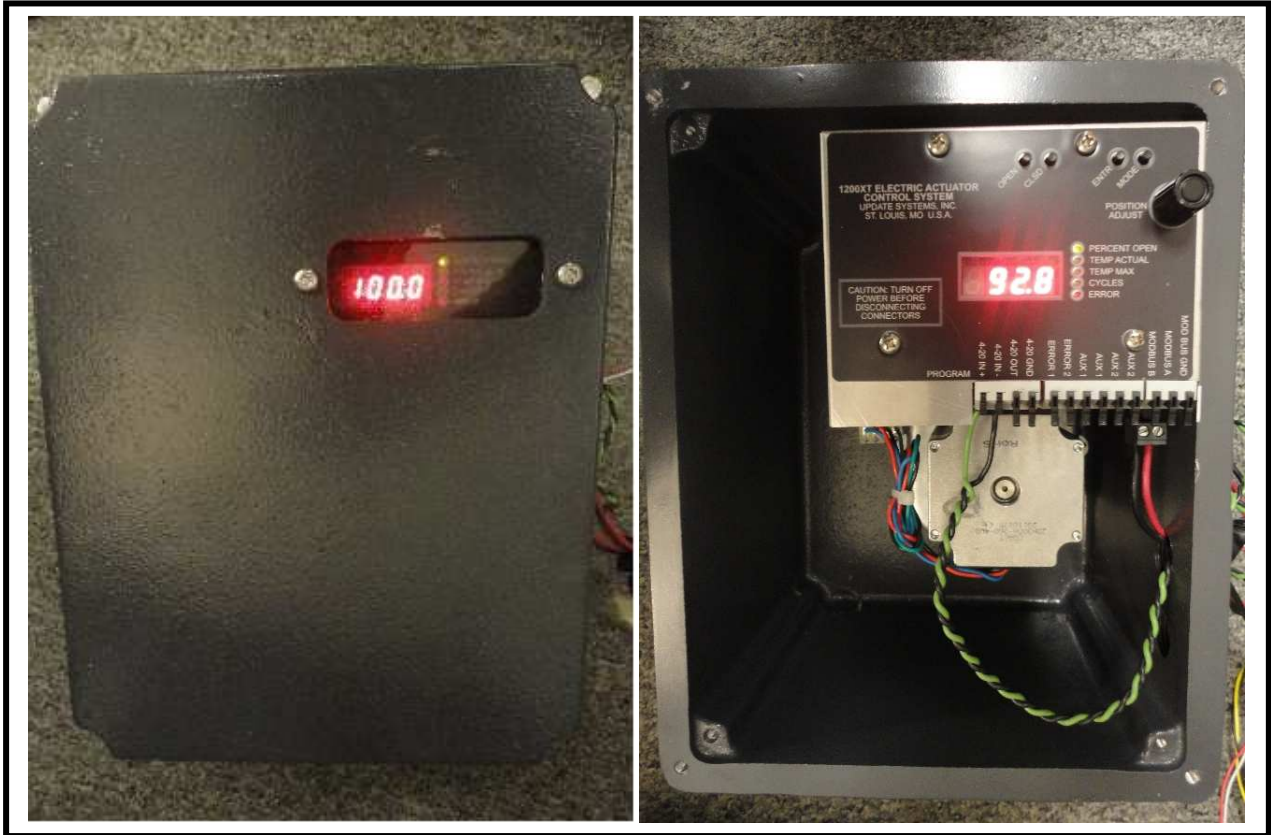


Nibsc Automation

1200XTNA Users Guide



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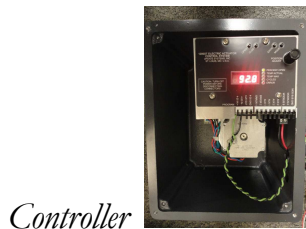
This document describes the setup and operation of the 1200XT Electric Actuator Control System. The system provides reliable control and feedback to actuate valves and vanes. The 1200XT is fully calibratable for 4-20 input and valve position ranges up to 179 degrees.

The manual is divided into three chapters. Chapter 1 gives an overview of the system modules and setup. Chapter 2 gives detailed instruction on navigating the operational modes of the controller. Chapter 3 provides instructions for reprogramming the controller. Carefully read the chapters Setup and Modes of Operation before running and testing the actuator.

<i>Chapter 1 – Setup</i> _____	2
<i>Chapter 2 - Modes of Operation</i> _____	5
<i>Chapter 3 – Programming</i> _____	21



MODULE OVERVIEW



Controller

The controller consists of seven connection ports listed as follows: PWR, MOTOR, 4-20IN/OUT, MODBUS*, RELAYS, and PROG. These ports are described in Table 1. The controller user interface is comprised of four buttons, one turn knob, a four-digit display, and five LED indicators. The buttons are used for navigating menus, selecting options, viewing/clearing errors, and calibrating the unit. The knob is used for manual valve positioning during calibration and other miscellaneous tasks as described in this manual. The LED indicators are used in automatic mode to show the type of information displayed. See Table 1.



Actuator Assembly

The actuator assembly consists of the motor, gear box, sensor board encased in an aluminum housing, power supply¹, and backup power supply². **Any openings must be filled with a device of Type 4 or equivalent environmental rating that is tightened to 15 in. lbs. (UL)**

¹ Available 48VDC power supply option.

² Available emergency power backup supply option.

1200XTNA VALVE ACTUATOR

PORT	PIN	DESCRIPTION
PWR (POWER)	1 (GND)	Input power ground
	2 (+48V)	48VDC input power. The input is reverse voltage protected and fused. This input is suitable for an input circuit capable of delivering not more than 5,000 rms symmetrical amperes, 240 volts maximum when protected by fuses or breakers sized in accordance with the NEC. (UL)
MOTOR	1-4	Pre-assembled 4 pin, 1 row connector supplying the stepper motor drive current.
4-20IN/OUT	1 (IN +)	“Positive” input for 4-20mA current loop. This input is over voltage protected and designed to operate for reverse polarization (i.e. +IN and –IN are swapped). This input is calibrated to control the valve position in [AUTO]matic mode.
	2 (IN -)	“Negative” input for 4-20mA current loop. (see above)
	3 (OUT)	Single ended output for 4-20mA current feedback. This output is proportional to valve percent open (i.e. 4mA = 0% open and 20mA = 100% open). It directly corresponds to the current state of the valve.
	4 (GND)	Ground for 4-20mA output.
MODBUS*	1 (B)	MODBUS communication port for system control. Offers increased valve resolution because of immunity to induced system noise and ability for remote monitoring.
	2 (A)	See above.
RELAYS (60V _p , 600mA max)	(ERROR 1)	Normally-closed, non-polarized relay output for system error indication. An error will cause the relay to open. See section on Error codes for more detail.
	(ERROR 2)	See above.
	(AUX 1)	Normally-closed, non-polarized relay output for valve status indication. Relay will OPEN when valve is fully OPEN. Software reconfigurable to Normally-open.
	(AUX 1)	See above.
	(AUX 2)	Normally-closed, non-polarized relay output for valve status indication. Relay will OPEN when valve is fully CLOSED. Software reconfigurable to Normally-open.
	(AUX 2)	See above.
PROG	1-6	Input port for 1200XT Programmer. Programmer is used in conjunction with the Flash Magic boot-loader software to update the controller firmware.

* MODBUS software has not yet been implemented and tested.

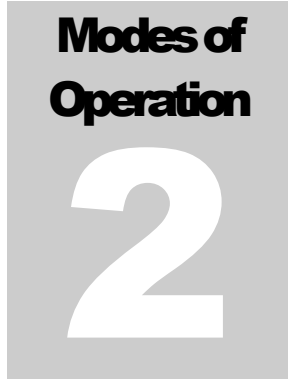
Table 1
1200XT Controller Port Description

1200XTNA VALVE ACTUATOR

Programmer



The programmer is used to update the firmware of the controller. It requires a USB connection to a computer with Flash Magic boot-loader software installed. More information about updating the controller can be found in the programming section.



Overview

The 1200XT has six normal modes of operation and one special mode. The normal modes are Passcode [PASS] mode, Manual [USEr] mode, 4-20 [AUto] mode, Calibration [CAL] mode, Backup Sensor Calibration [bCAL] mode, and Configuration [CnFg]. The special modes are Error [Err] mode mode. The normal modes, Passcode and 4-20mA, may be selected at any time during normal operation. A valid passcode must be entered to access all other normal modes. The Error mode is only accessible if a system error is present.

Press the **MODE** button next to the turn knob to cycle through all available modes. Cycling through the modes with the **MODE** button does not change to that mode. A decimal in the right most corner of the display is lit for all modes available to enter. The right most decimal is not lit for the current mode. When the desired mode is displayed, press the **ENTR** button. The decimal indicator turns off to indicate that the mode has been changed. The display will revert to the submenu of the selected mode one second after it is changed. If the **ENTR** button is not pressed within two seconds the display will flash the current mode for one second and return to its submenu. The current mode of operation is active until a new mode is entered. The following sections describe each mode in more detail.

PASSCODE [PASS] MODE

A valid passcode must be entered to gain access to any normal mode other than 4-20mA Mode [AUto]. The passcode prevents accidental recalibration or mode changes. The user passcode is **3282**. The following paragraph explains how to enter the passcode.

Toggle the **MODE** button until the display reads [PASS.] (Figure 1), and then press the **ENTR** button to



Figure 1



Figure 2

1200XTNA VALVE ACTUATOR

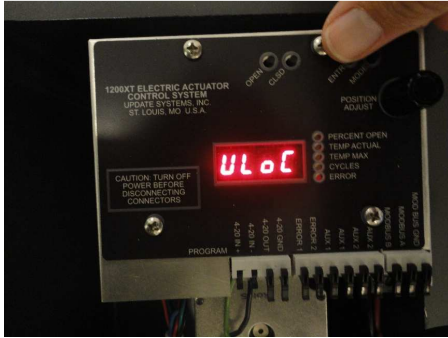


Figure 3

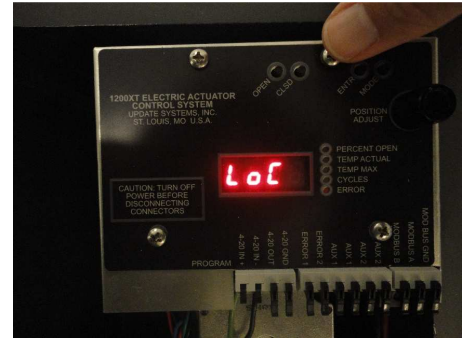


Figure 4

enter passcode mode. After the **ENTR** button is toggled, the display reads **[PASS]** for one second and then shows four zeros; the first one is blinking. Use the knob to scroll the number up or down. When the desired number is displayed, press the **ENTR** button. The next number will now blink. Continue this process until all the numbers are entered (Figure 2). When a valid passcode is entered the display will read unlock **[ULoC]** (Figure 3) or error lock **[ELoC]**. **[ULoC]** indicates that all other normal modes are now available for selection. **[ELoC]** indicates that additional modes are not available due to error conditions. This typically happens when both the primary and secondary (backup) valve position sensors have failed.

In order to relock the unit, enter **[PASS]** mode as previously described and then press the **ENTR** button four times. **[LoC]** is displayed to indicate the additional normal modes are dislocked out (Figure 4). Any incorrect passcode will lock the unit.

MANUAL [USER] MODE

As shown Figure 5, toggle the **MODE** button until the display reads **[USEr.]**, and then press the **ENTR** button to enter manual mode. After the **ENTR** button is toggled, the display will read **[USEr]** for one second and then show a number as in Figure 6. The number is the raw degrees as seen by the shaft position sensor.



Figure 5



Figure 6

The raw shaft position number can be used to verify the delta between two position points. Please note that manual mode allows 360 degree turning of the shaft. Once the unit is calibrated, the user cannot move the valve beyond its calibrated limits. To move the shaft in **[USEr]** mode, simply turn the **POSITION ADJUST** knob. As the motor runs, the right most decimal indicator blinks. The rate of the blink corresponds to the relative speed of the motor (i.e. faster rate of blinking during acceleration).

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4-20 [AUTO] MODE

During normal operation, the actuator will be in the 4-20 mode. This mode requires an input in the 4-20 IN/OUT port (Pins 1 and 2) as shown in Figure 7. The input is a non-polarized differential input, but the

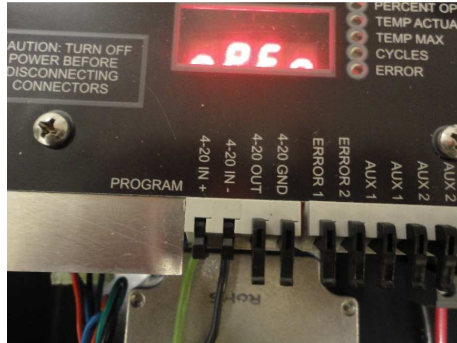


Figure 7

standard connection is shown on the unit. The output pins 3 and 4 of the 4-20 port provide a current signal that is proportional to the percentage that the valve is open. For example, the output will drive 20mA for a fully open valve (100% open), 12mA for a half open valve (50% open), and 4mA for a fully closed valve (0% open). The 4-20 input should be calibrated to the actual input for maximum accuracy. The calibration procedure is described in detail in the next section.

To enter 4-20 mode press the **MODE** button until the display reads [AUto.] (Figure 8), and then press the **ENTR** button (Figure 9). In this mode, the valve will respond to the input 4-20 current source. The [AUto] mode can display the status of four items: *Percent Open*, *Temp Actual*, *Temp Max*, and *Cycles* (see Table 2). Press the **ENTR** button to cycle through the status options. The Temp Actual and Temp Max options may be viewed in Fahrenheit or Celsius by turning the **POSITION ADJUST** knob.

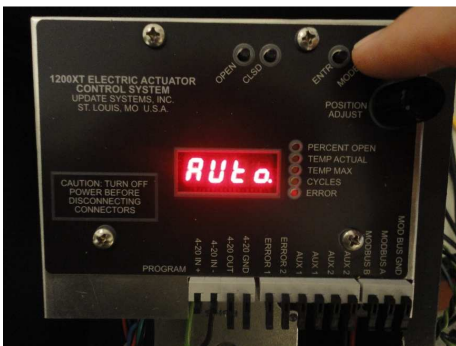


Figure 8

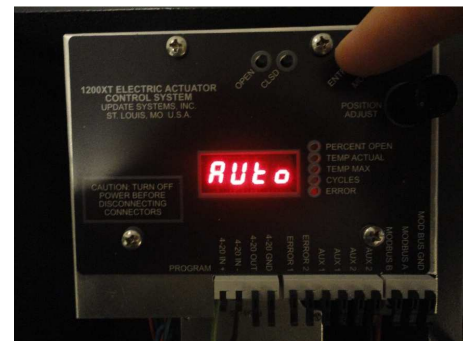


Figure 9

1200XTNA VALVE ACTUATOR

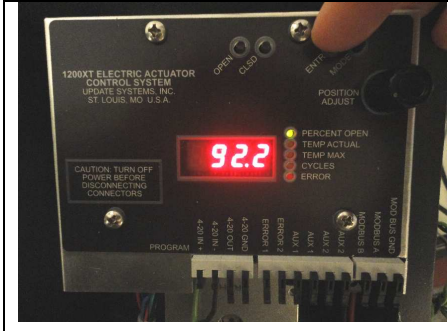

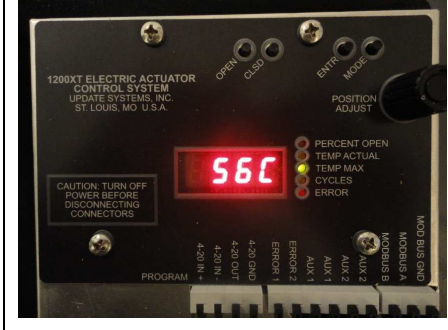
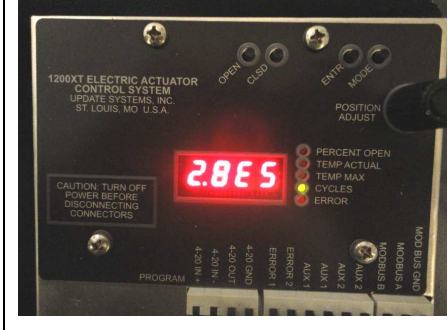
 <p>The image shows the control panel of a 1200XT Electric Actuator. The red LED display shows the number '92.2'. The panel includes a 'POSITION ADJUST' knob, a 'CAUTION: TURN OFF POWER BEFORE DISCONNECTING CONNECTORS' warning, and various terminal labels like 'OPEN', 'CLOSE', 'ENTR', 'MODE', 'MODE B', 'MODE A', 'MODE B GND', 'MODE A GND', 'AUX 2', 'AUX 1', 'ERROR 2', 'ERROR 1', '4-20 IN+', '4-20 OUT+', '4-20 GND', and 'PROGRAM'.</p>	<p>Percent Open</p>	<p>Indicates percentage that valve is open. It directly reflects the current state of the valve base on the main shaft sensor. The 4-20 output is related to this value with 4mA meaning 0% open and 20mA meaning 100% open.</p>
 <p>The image shows the control panel of a 1200XT Electric Actuator. The red LED display shows the number '31.0'. The panel includes a 'POSITION ADJUST' knob, a 'CAUTION: TURN OFF POWER BEFORE DISCONNECTING CONNECTORS' warning, and various terminal labels like 'OPEN', 'CLOSE', 'ENTR', 'MODE', 'MODE B', 'MODE A', 'MODE B GND', 'MODE A GND', 'AUX 2', 'AUX 1', 'ERROR 2', 'ERROR 1', '4-20 IN+', '4-20 OUT+', '4-20 GND', and 'PROGRAM'.</p>	<p>Temp Actual</p>	<p>Indicates the current internal temperature of the actuator. This reading is updated every second. The default format is Celsius. The temperature may be viewed in Fahrenheit by turning the POSITION ADJUST knob.</p>
 <p>The image shows the control panel of a 1200XT Electric Actuator. The red LED display shows the number '56.0'. The panel includes a 'POSITION ADJUST' knob, a 'CAUTION: TURN OFF POWER BEFORE DISCONNECTING CONNECTORS' warning, and various terminal labels like 'OPEN', 'CLOSE', 'ENTR', 'MODE', 'MODE B', 'MODE A', 'MODE B GND', 'MODE A GND', 'AUX 2', 'AUX 1', 'ERROR 2', 'ERROR 1', '4-20 IN+', '4-20 OUT+', '4-20 GND', and 'PROGRAM'.</p>	<p>Temp Max</p>	<p>Indicates the maximum internal temperature that the actuator has ever reached. The default format is Celsius. The temperature may be viewed in Fahrenheit by turning the POSITION ADJUST knob.</p>
 <p>The image shows the control panel of a 1200XT Electric Actuator. The red LED display shows the number '2.8E5'. The panel includes a 'POSITION ADJUST' knob, a 'CAUTION: TURN OFF POWER BEFORE DISCONNECTING CONNECTORS' warning, and various terminal labels like 'OPEN', 'CLOSE', 'ENTR', 'MODE', 'MODE B', 'MODE A', 'MODE B GND', 'MODE A GND', 'AUX 2', 'AUX 1', 'ERROR 2', 'ERROR 1', '4-20 IN+', '4-20 OUT+', '4-20 GND', and 'PROGRAM'.</p>	<p>Cycles</p>	<p>Indicates the total number of actuator start cycles. The number is displayed in scientific notation, where E_n represents 10^n. For example, the number displayed in the adjoining figure (2.8E5) is equal to 280,000 cycles.</p>

Table 2
Description of Status Indicators

1200XTNA VALVE ACTUATOR

CALIBRATION [CAL] MODE

The 1200XT is designed to easily calibrate valve range, valve direction, and 4-20 input. The unit requires BOTH 4-20 input and physical position calibration. Three calibration menu options are available, full calibration [FCAL], position only [pCAL], and 4-20mA input only [iCAL]. Once calibrated, the actuator simply returns the percentage open (0% - 100%) when placed in [AUto] mode. The current output will linearly supply a range starting at 4mA for valve zero percent open through 20mA for valve one hundred percent open. The step-by-step procedure to calibrate the unit is given below. The controller is designed to calibrate the 4-20 input and position with a single step. Remote calibration, covered in the next section, can be used to calibrate physical position only.

Step 1: To enter calibration [CAL] mode, toggle the **MODE** button until [CAL.] is displayed (Figure 10), then press the **ENTR** button.

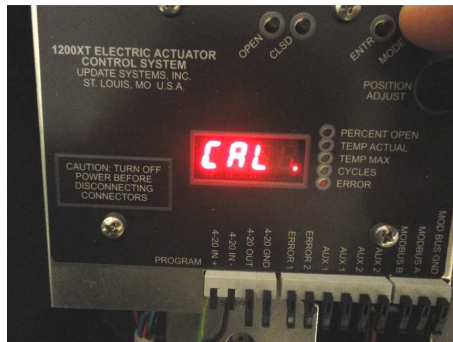


Figure 10

Step 2: After entering [CAL] mode, the display will read [FCAL] as shown in Figure 11. Press the **ENTR** button to enter this cal mode. The display will read [oPEn]. If desired, turn the knob to select the position [pCAL] or 4-20 only calibration modes [iCAL] (see the corresponding next two sections). The unit may now be calibrated for the valve-open 4-20 input and the desired valve-open position. Apply the desired current input signal on the 4-20 IN/OUT port pins 1 and 2 to be associated with valve open (e.g. Figure 12). The main machine controller (e.g. a PLC) normally provides the reference input. The 1200XT will calibrate to an input ranging from 3mA to 23mA.

Step 3: If position is to be calibrated with the controller, follow this step; otherwise, skip to step 4.* Next, use the **POSITION ADJUST knob to place the valve at the desired open position. As the knob is turned, the unit will display the raw feedback from the shaft sensor in degrees (Figure 13).



Figure 11



Figure 12

1200XTNA VALVE ACTUATOR

PLEASE NOTE: Turning the knob will move the valve one degree for each detent (**course adjust**). If the **OPEN** button is held down while the knob is turned, the valve position will attempt to adjust by a tenth of a degree for each detent (**fine adjust**). The actual resolution taking into account hysteresis for manual adjustment is two-tenths of a degree. Once the **OPEN** button is released, the current 4-20 input and position will be stored.

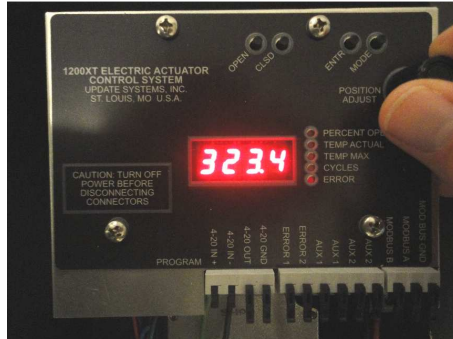


Figure 13

Step 4: To preserve a previous Open calibration, press **ENTR** to skip (the current raw position will flash on display); otherwise, press and release the **OPEN** button to store the input reference [and position]. If fine adjust was used as described in Step 3, then simply release the **OPEN** button. If Step 3 was skipped, Remote calibration may be used to set the position. The unit will display [**SEt**] to indicate that the calibration parameters have been saved for open position as shown in Figure 14.

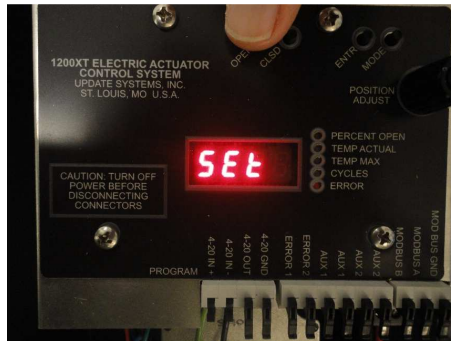


Figure 14

Step 5: When the display reads [**CLoS**], the unit is ready to calibrate valve closed. Apply the desired 4-20 input as described in Step 2.

***Step 6:** *If position is to be calibrated with the controller, follow this step; otherwise, skip to step 7.* Next, use the **POSITION ADJUST** knob to place the valve at the desired closed position (Figure 15 and 16), as

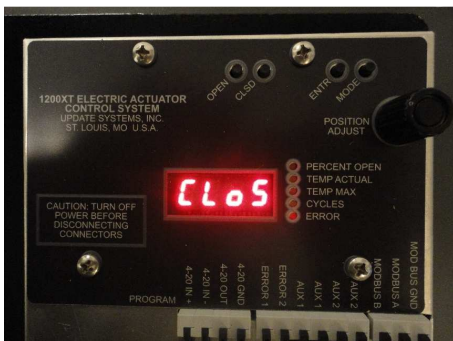


Figure 15



Figure 16

1200XTNA VALVE ACTUATOR

described in Step 3.

Step 7: To preserve a previous Closed calibration, press **ENTR** to skip (the current raw position will flash on display); otherwise, press and release the **CLSD** button to store the input reference [and position]. If fine adjust was used as described in Step 6, then simply release the **CLSD** button. The unit will display [**SEt**] to indicate that the calibration parameters have been saved for closed position as shown in Figure 17.

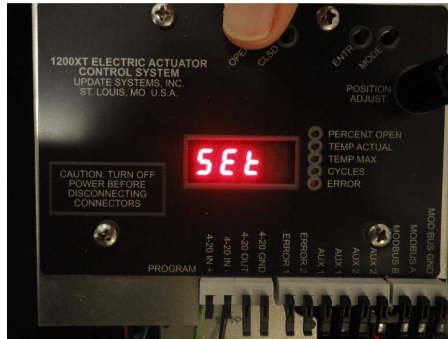


Figure 17

Step 8: When the display reads [**dFLt**], the unit is ready to calibrate valve default safe position in the event of an error event (e.g. undervoltage, or power failure). Press and release the OPEN button to set the default safe position to valve fully open. Press and release the **CLSD** button to set the default safe position to fully closed. Alternatively, turn the **POSITION ADJUST** knob to a desired position and press **ENTR**. Once, the **OPEN**, **CLSD**, or **ENTR** button is toggled, the unit will automatically calibrate the backup sensor. See *Backup Calibration Mode for more detail*. Once calibration is complete, and the display will show [**donE**] (Figure 19) and then revert back to [**FCAL**] after two seconds. The unit may be recalibrated at any time. See next page for FULL CALIBRATION Flowchart.

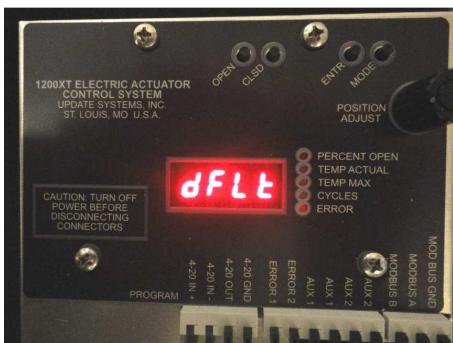


Figure 18

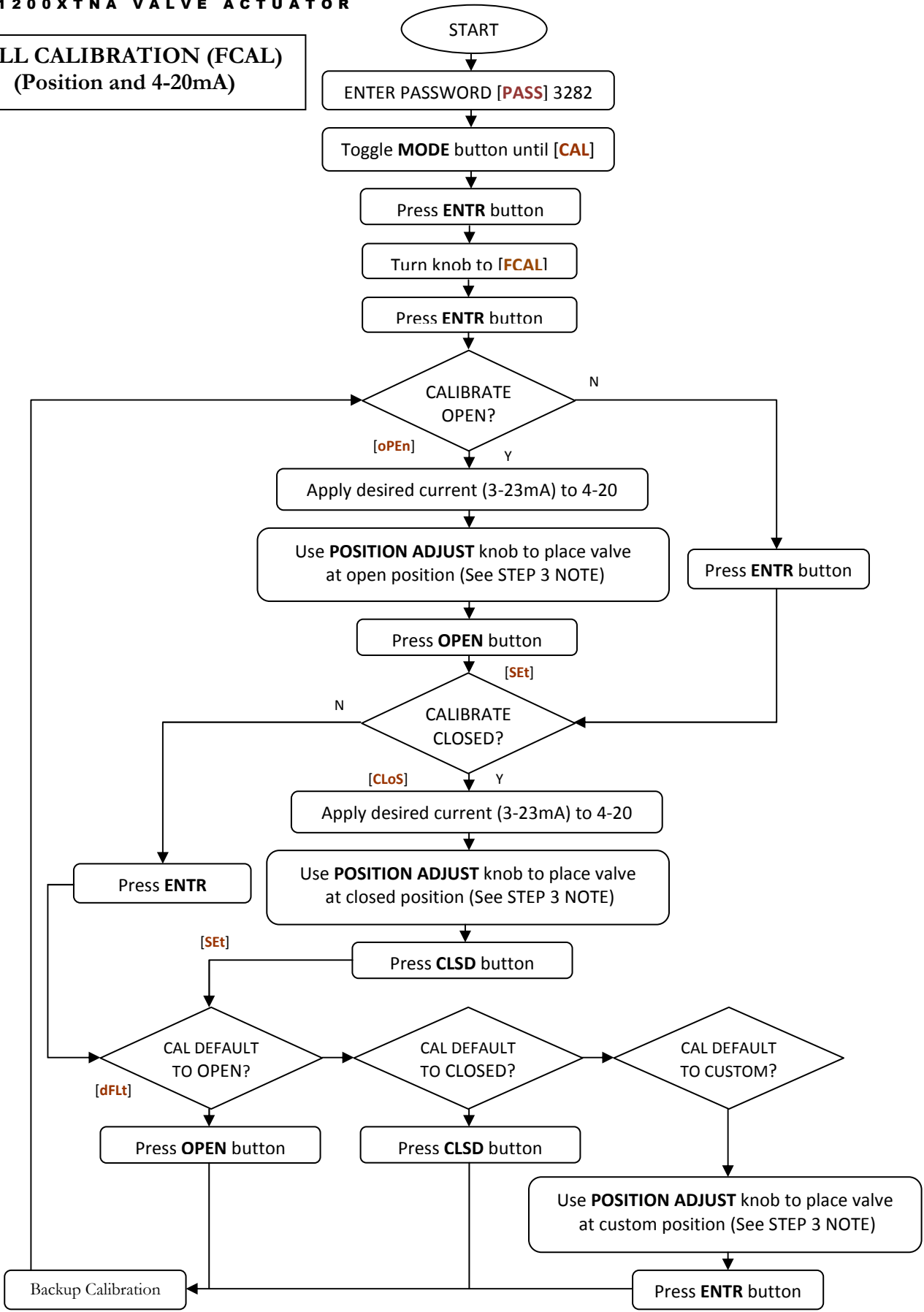


Figure 19

***Note:** If the full open and full closed positions are equivalent, the valve will not move as the 4-20 input signal is swept across its range.

1200XTNA VALVE ACTUATOR

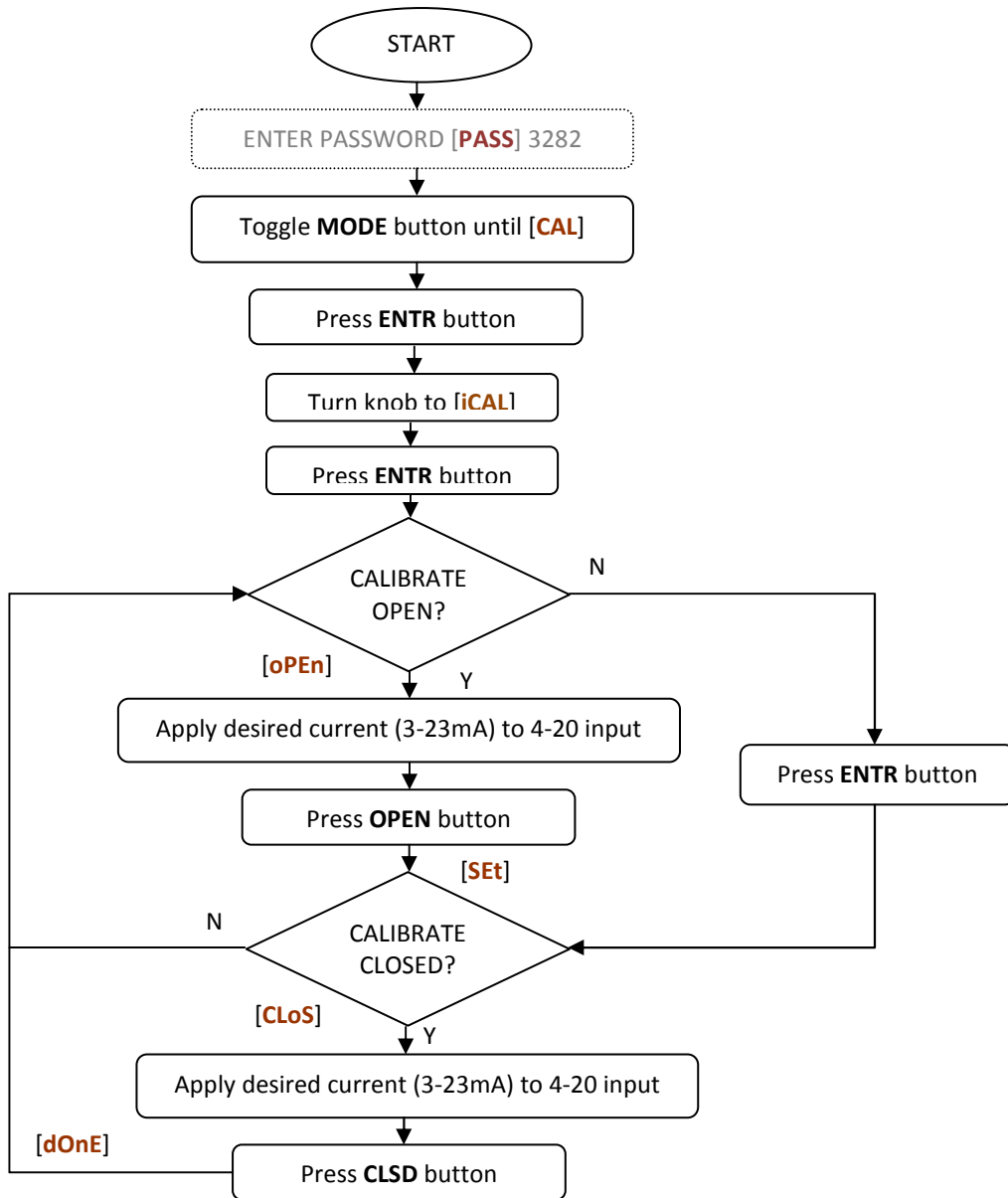
**FULL CALIBRATION (FCAL)
(Position and 4-20mA)**



1200XTNA VALVE ACTUATOR

4-20mA CALIBRATION ONLY [iCAL] MODE

This mode of calibration is identical to the previous method EXCEPT that the valve POSITION calibration is NOT affected. [iCAL] mode is useful if the 4-20mA signal needs to be calibrated (or recalibrated), but the user does not want to affect the physical position calibration. No backup sensor calibration is necessary. See Flow Chart below.

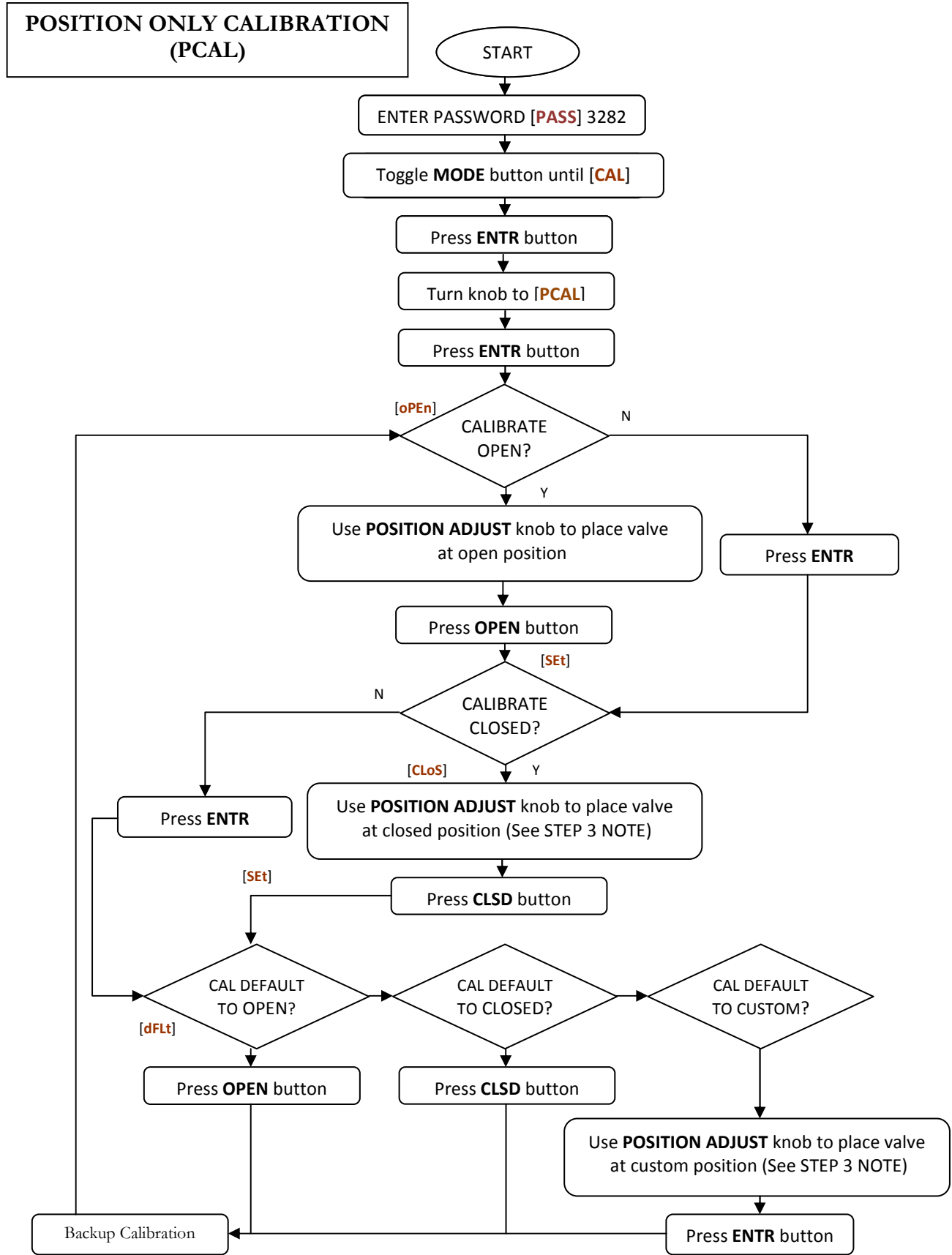


1200XTNA VALVE ACTUATOR

POSITION CALIBRATION ONLY [PCAL] MODE

This mode of calibration is identical to the previous method EXCEPT that only the valve POSITION calibration is affected. **[PCAL]** mode is useful if only the position needs to be calibrated (or recalibrated), but the user does not want to affect the 4-20 mA calibration. Backup sensor will automatically recalibrate. See Flow Chart below.

1200XTNA VALVE ACTUATOR



1200XTNA VALVE ACTUATOR BACKUP CALIBRATION [bCAL] MODE

The backup shaft position sensor maintains valve operation in the event of main sensor failure. This allows machine operation to continue until the unit is repaired. The backup sensor is specifically designed for ninety degree valve. If backup calibration fails, unit will still operate with main encoder and no error will display. **If main position encoder failure, unit will attempt to run in backup mode. The ERROR lamp will blink steadily indicating that the unit is in backup mode. The ERROR lamp will double blink if the main and backup encoder have both failed, indicating the unit is operating using saved step counts with no feedback. In either case, the unit will continue to run but should receive maintenance as soon as possible.**

Backup calibration is automatically engaged after a successful position calibration through a full calibration [FCAL], or position only calibration [pCAL]. The valve will first initialize to the closed position [brSt]. The valve will then turn back and forth through the whole previously calibrated range. During the calibration, the controller is searching for four magnetic transitions. The count is displayed as -b # and b-#. Once the backup sensor is successfully calibrated, the display will read [donE]. If the backup calibration is unsuccessful, the display will read [bErr].

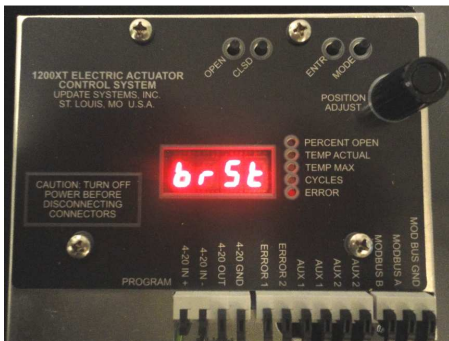


Figure 20



Figure 21

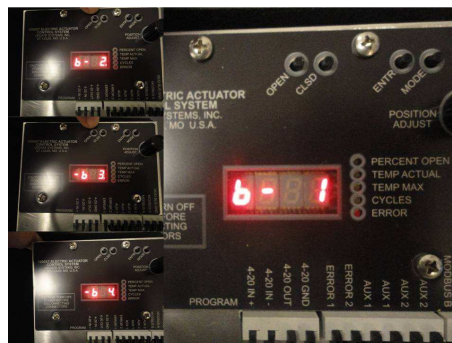


Figure 22

Backup calibration may be manually initiated by toggling the MODE button and entering [bCAL]. Once [bCAL] is selected, the display reads [Strt]. Press ENTR to begin calibration. As described previously, the display will read [donE] upon successful calibration; otherwise [bErr].

1200XTNA VALVE ACTUATOR

ERROR [Err] MODE

An Error mode is available for menu selection when a system error is present. Currently, the 1200XT has four standard error codes. A description of these codes is given in Table 3.

CODE	NAME	DESCRIPTION
E-01	Motor Voltage Is Too Low	The supply voltage has fallen below 40.0V DC.
E-02	Input 4-20 Is Invalid	The 4-20 current input is invalid. This fault can occur due to an open or shorted input.
E-03	Main Encoder Is Not Working	No valid feedback from main shaft encoder. Fault can occur due to faulty or no connection of the MOTOR port, main shaft encoder failure, or blocked valve – i.e. required torque exceeds maximum output.
E-04	Motor Voltage Is Too High	Nominal supply voltage is above 51.0V

Table 3
Actuator Error Codes

Any of the listed errors will result in the, the ERROR indicator will light, and the Error relay will open (RELAYS port, pins 1 and 2, see Table 1.0). The Input 4-20 error will cause the valve to move to default safe position if possible. All errors will automatically clear when the fault is corrected, except for **E-03 Main Encoder Is Not Working**. Fault **E-03** must be manually cleared because of the possibility of the valve being physically stuck. In the case of complete actuator power failure, the ERROR relay will open.

To enter [Err] mode, toggle the **MODE** button until the display reads [Err.] and press **ENTR** (Figure 23). One or more error codes may be present (Figure 24). Use the **POSITION ADJUST** knob to scroll through



Figure 23

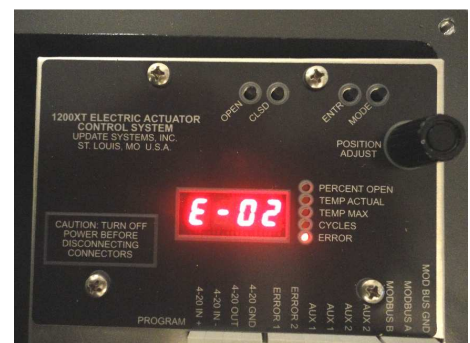


Figure 24

the current fault list. To manually clear all errors toggle the **ENTR** button. The display will read [ECLr] (Figure 25). Press and release the **ENTR** button again within one second and the error will clear. The controller will then display error codes that still exist or revert back to the previous mode if no other errors

1200XTNA VALVE ACTUATOR

are present. The actuator will attempt to move to the desired position and re-flag the error if there is still a problem.

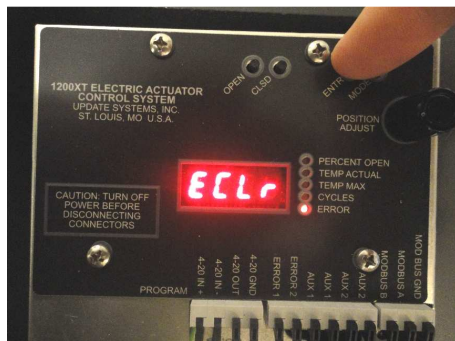


Figure 25

1200XTNA VALVE ACTUATOR CONFIGURATION [CnFg] MODE

This mode is used to configure the actuator motor speed and the default state of the relays (ERROR, AUX1, and AUX2).

Step 1: To enter Configuration [CnFg] mode, toggle the **MODE** button until [CnFg.] is displayed (Figure 26), then press the **ENTR** button.



Figure 26

Step 2: After entering [CnFg] mode, the display will read [Sr #] as shown in Figure 27. Turn the knob to desired speed setting and press the **ENTR** button (Figure 28). Refer to Table 4 for the Step Rate vs. speed. Press the **OPEN** or **CLSD** button to check current relay status (i.e. normally closed [nCLd], or normally open [noPn]) -Figure 29. While the current switch status is displayed, the default may be changed by pressing the **OPEN** or **CLSD** button for normally open [noPn] or normally closed [nCLd], respectively

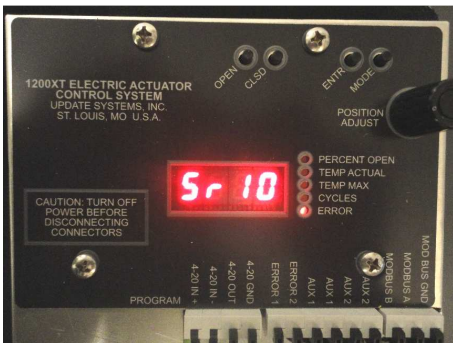


Figure 27



Figure 28

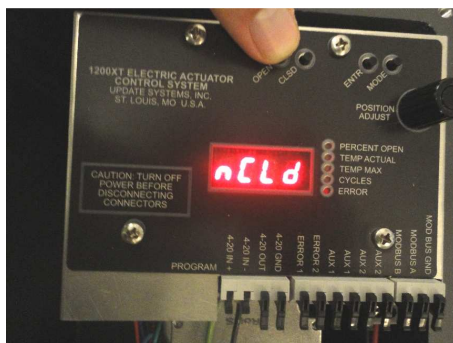


Figure 29

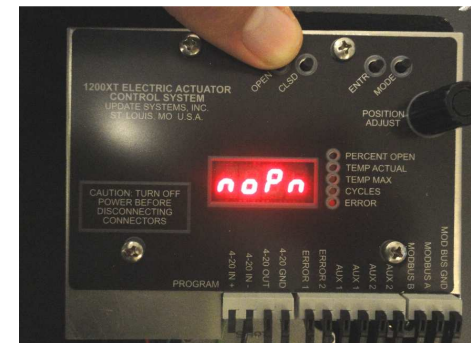
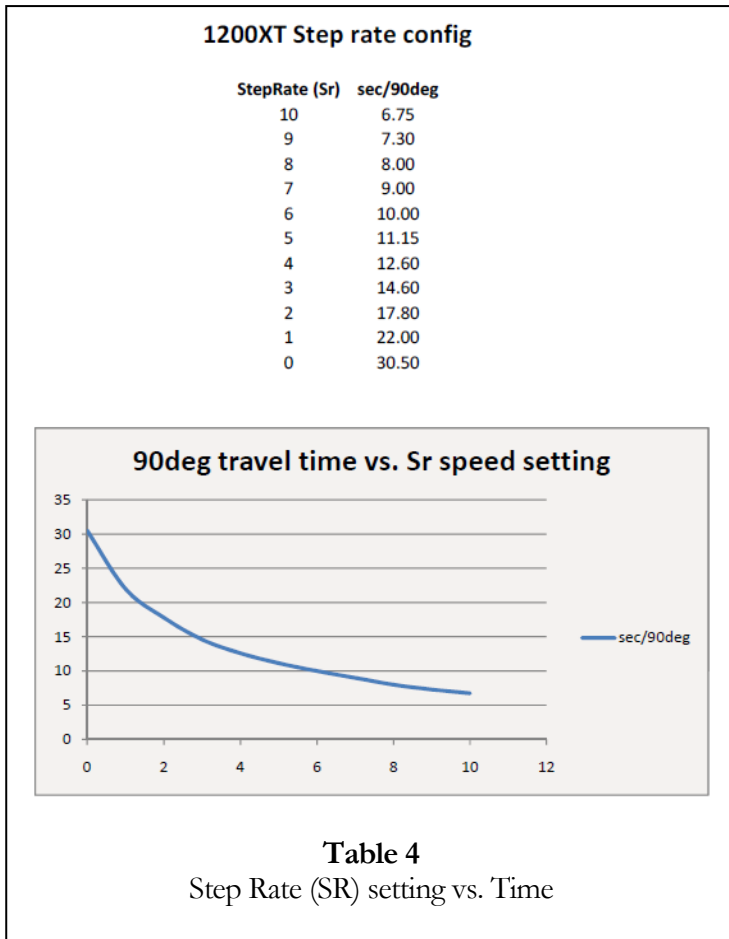


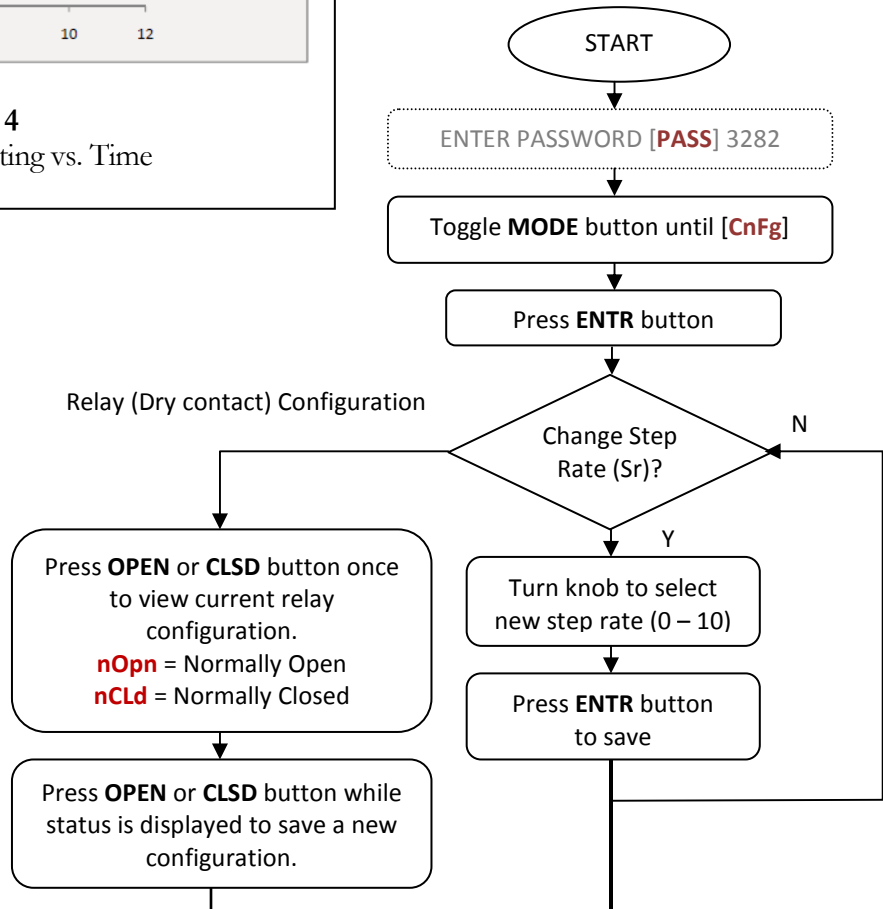
Figure 30

1200XTNA VALVE ACTUATOR

(Figure 30).



CONFIGURE (CnFg)



Overview

The 1200XT features an external programming port (PROG) to easily upgrade the firmware. Attaching the USB-driven 1200XT Programmer to the controller and running the Flash Magic boot-loader software included with this document package accomplish reprogramming the unit.

Boot-loader installation

Flash Magic boot-loader software must be installed on a PC with one available USB port. The installer program is provided in the document .zip package. It can also be downloaded from <http://www.flashmagictool.com/>. Double-click on the FlashMagic.exe file and follow the installation instructions.

Programming Procedure

Step1: Attach the 1200XT Programmer to the controller (Figure 32). The controller should be powered for reprogramming.

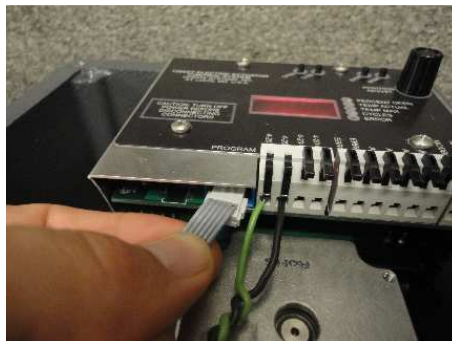


Figure 32

VS1200 VALVE ACTUATOR

Step 2: Using a standard USB cable, connect the 1200XT Programmer to a PC with Flash Magic installed.

Step 3: Open Flash Magic and configure as shown in Figure 33. Use Browse to select the .hex file (Version 0.01 is provided in the .zip document package). The 1200XT Programmer will create a COM port when the USB is attached to the PC. Be sure the correct COM port is selected in Flash Magic. The available COM ports may be viewed through the Control Panel -> System Devices or by typing the command MODE in a DOS prompt.

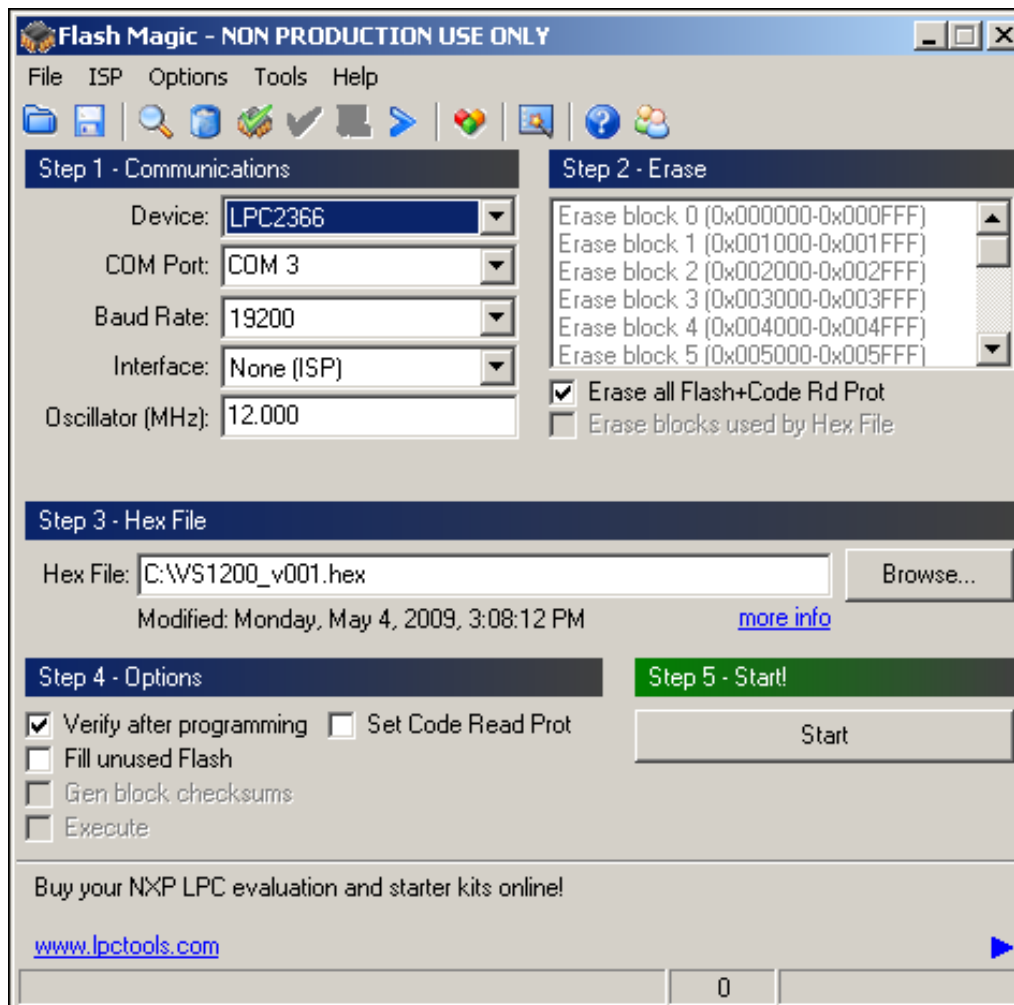


Figure 33

Step 4: Click Start and wait for programming and verification to complete.

Step 5: Unplug the 1200XT Programmer and cycle power to the controller. The firmware update is now complete.