

Tension Control System XCTRL & XCTRL-2DRV

Installation and Operation Manual

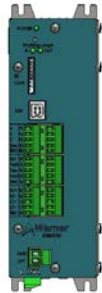



P-2097-WE-A4



I. XCTRL FAMILY PART LIST	4
II. INTRODUCTION	5
III. GENERAL INFORMATION	6
IV. XCTRL BLOCK DIAGRAM	6
V. HARDWARE PIN OUT	7
VI. XCTRL-2DRV	8
VII. SYSTEM WIRING AND SETTING.....	8
1. TYPICAL WIRING	8
2. OPERATION PRINCIPLE	8
3. DANCER ARM WIRING	9
4. LOAD CELL WIRING	10
5. POWER SUPPLY WIRING	10
6. WIRING WITH AN X2DRV	10
7. BRAKE WIRING	11
8. (OPTIONAL) AUXILIARY ANALOG SENSOR WIRING	11
9. DOWNLOAD THE XCTRL CONFIGURATION APPLICATION	12
10. HOW TO INSTALL THE XCTRL CONFIGURATION APPLICATION	13
11. SOFTWARE INSTALLATION AND SETTING	13
12. (OPTIONAL) MANUAL CALIBRATION	14
13. (OPTIONAL) TOUCH SCREEN INSTALLATION AND SETTING	15
A. WIRING THE XPRO INTERFACE TO THE XCTRL	15
VIII. XCTRL CONFIGURATION	16
1. XCTRL CONFIGURATOR LANGUAGE SELECTION	16
2. IS THE XCTRL CONFIGURATOR CONNECTED?	16
3. ENABLE WRITING	16
4. PARTITION SETTING	17
• READ/WRITE PARTITION	18
• IMPORT/EXPORT PARTITION	19
• FACTORY DEFAULT	20
• SD CARD	21
5. INPUT SELECTION AND SETTING	22
• CELLS / DANCER INPUT	22
• CALIBRATION	22
• LOAD CELL RANGE DEFINITION	23
6. PID SETTING	24
• SELECT THE INPUT	24
• SET UP THE SETPOINT	25
• ENTER THE GAINS	25
• COMPENSATION	25
• STOP INTEGRAL (STPINT)	26
7. SPLICE SELECTION AND HOLD OUT CONFIGURATION	26
• SPLICE SELECTION	27
• HOLD OUT / MAX OUT	28
8. INPUT/OUTPUT CONFIGURATION	29
• DIGITAL INPUT SETTINGS	29

• SYNC INPUT ACTIVATION	30
• DIGITAL OUTPUT (ERRS1, ERRS2) SETTINGS	30
• THE ANALOG OUTPUT (OUT1, OUT2) SETTINGS	30
9. AUXILIARY SENSOR SETTING (ANA INPUT).....	30
• AUXILIARY ANALOG INPUT TYPE.....	31
• AUXILIARY SENSOR CALIBRATION	31
10. OPEN LOOP CONFIGURATION	32
• LINEAR CURVE	32
• X FACTOR.....	32
11. DIAGNOSTIC TOOLS	33
• REAL TIME INFORMATION' WINDOW	34
• INPUT/OUTPUT' WINDOW	35
12. XCTRL FIRMWARE UPDATE	35
IX. SYSTEM AND SETTING NOTATIONS.....	36
X. TROUBLESHOOTING COMMON ISSUES.....	37

I. XCTRL FAMILY PART LIST:

Part Number	Designation	Description	
BXCTRL US: 6910-448-306	XCTRL	PID Control. Double controller for Dancer arms and load cells application.	
BX2DRV US: 6910-448-305	X2DRV	Double Channel 24Vdc Driver. 4A. 0-10VDC or 4-20mA inputs.	
BXCTRL-2DRV US: 6910-448-307	XCTRL-2DRV	PID Control + Double Driver.	
BXPRO US: 6910-448-308	XPro	Touch Screen Interface for XCTRL	

II. INTRODUCTION:

- The XCTRL control family consists of several possible configurations.
- The XCTRL/X2DRV (6910-448-307) is a combination of control and 24 volt driver in a single housing.
- The XCTRL (6910-448-306) is the control alone which can then be used with the stand alone X2DRV (6910-448-305) or with a driver of customer's choice.
- The XPRO (6910-448-308) is a touch screen interface for use with XCTRL commonly for setting of set point when used with load cells only.
- The X2DRV is for use with Warner Electric TB, ATTC/ATTB, all MPB brakes through size 240 and PTB, POB and PRB-H magnetic particle brakes up to size 10.
- For MTB brake applications and for PTB, POB and PRB-H magnetic particle brakes to size 20 the MCS2000-DRV2 (6910-448-109) is recommended.

This control is a solid state electronic control that receives signal from a Dancer pivot point sensor or 2 Load cells and transmits internally the appropriate signals to the brake power driver to regulate a stable tension.

It integrates 2 separate Digital PID controllers and 2 separate Open Loop control. Based on a double board architecture, it can integrate a Driver board to control our electromagnetic brakes range. In that particular case, all communication, Input/Output and power signal of the driver board will be made thru an internal connector.

All parameters could be saved to an integrated memory and to an SD Card, but can also be uploaded or downloaded thanks to its external communication bus (USB).

In case of Load Cell application, when the setpoint needs to be modified, an optional handset is available. In the case of a Load Cell application, to modify the set point, the use of XPRO is required.

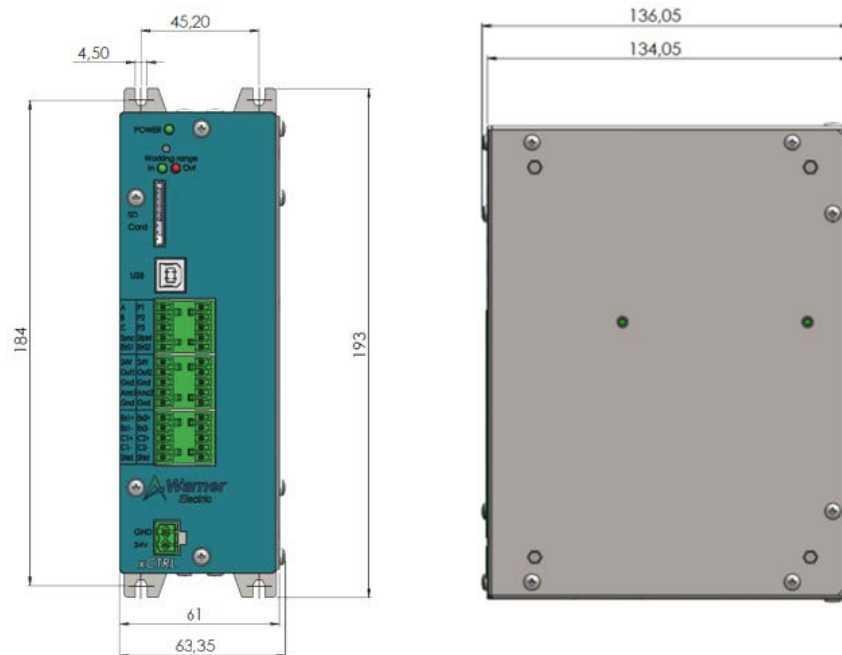





Figure 1: XCTRL Housing Dimensions

III. GENERAL INFORMATION

Control chassis should be kept clear of all areas where foreign material, dust, grease, or all might affect the operation of the control. Installation must be made in accordance with the instructions found in this manual. Failure to do so may damage the Controller. Throughout this manual the PID board will be called the XCTRL board and the Driver board will be called the X2DRV board.

Ratings

Main supply Voltage (V)	24V DC +/- 5%
Output	0-10V and/or 4-20mA
Operating T°C	0°C to 50°C no condensation
Compliance	  

IV. XCTRL BLOCK DIAGRAM

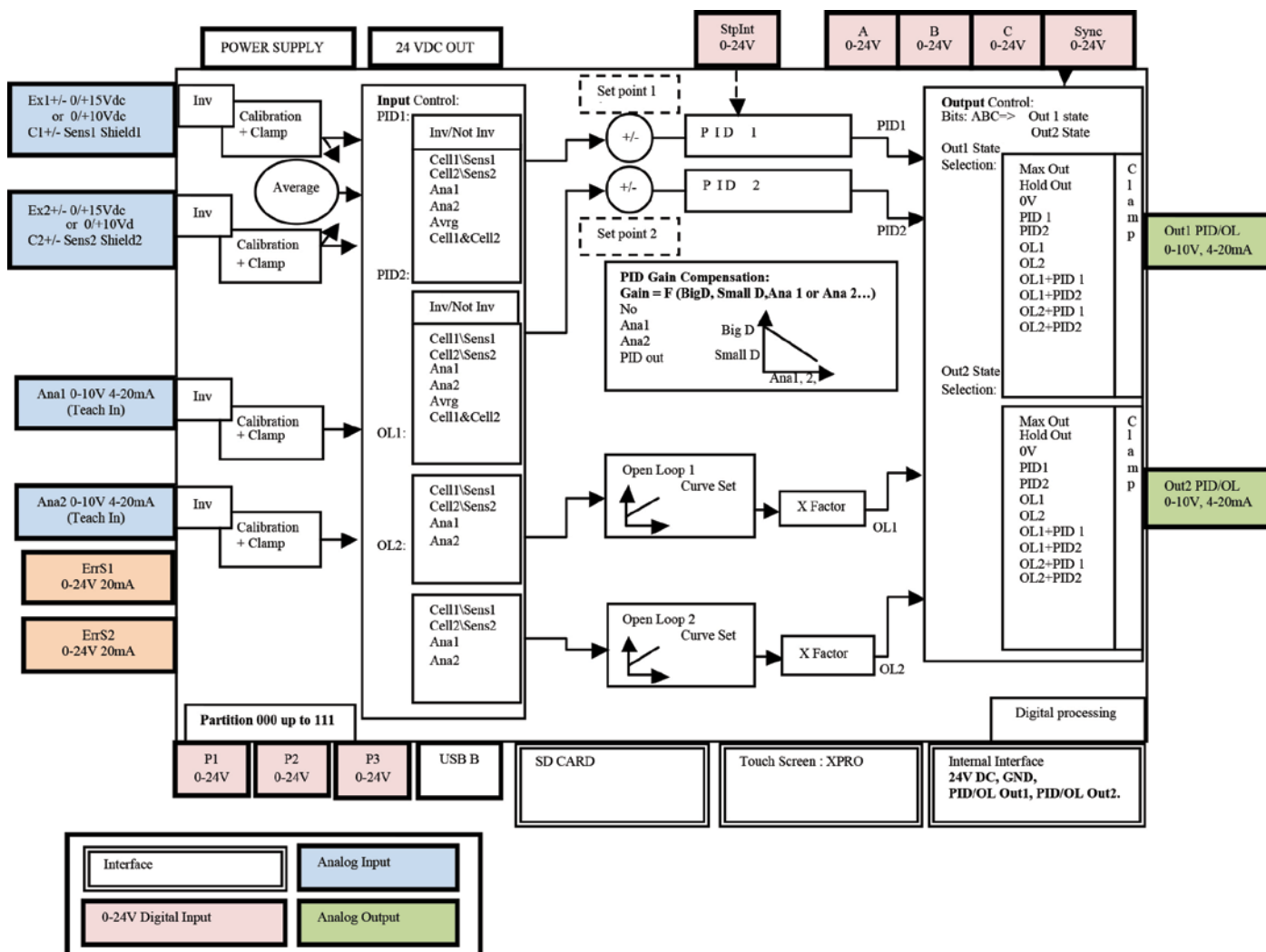


Figure 2: XCTRL Block Diagram

V. HARDWARE PIN OUT

1	SD Card	External interface	Parameters Savings. Possibility to save up to 8 partitions.
2	USB	External interface	Use to setup the controller (Input/Output, PID, splice parameters) and to upload and download all parameters to a setup partition.
3	A	Digital IN	Splice selection inputs. Depending on the A, B, C bit state, select a configuration of OUT1, OUT2, between a logical menu of 11 possibilities and select PID1&2 compensation input NPN, PNP input type Selectable.
4	B	Digital IN	
5	C	Digital IN	
6	Sync	Digital IN	Logical input which activate the changes of the A, B, C inputs. Depending on logical setting, it could be activate on edge or on state. NPN, PNP input type Selectable.
7	ErrS1	Digital Out	Error signal output to inform that Sensor1/Cell1 is out of range. Working range can be programmed in %, Kg, Nm... 0-24VDC
8	P1	Digital IN	Parameters Partition signal input. Depending on the P1, P2, P3 bit state, it offers a selection to all parameters tables used to setup all Input/Output, PID and Open loop controllers NPN, PNP input type Selectable.
9	P2	Digital IN	
10	P3	Digital IN	
11	Stplnt	Digital IN	Stop or reset the integral calculation of the PID NPN, PNP input type Selectable.
12	ErrS2	Digital Out	Error signal output to inform that Sensor2/Cell2 is out of range. Working range can be programmed in %, Kg, Nm... 0-24VDC
13	24V	Power supply OUT	Auxiliary 24VDC Power supply, 100mA
14	Out1	Analog Output	Analog Output of PID1 or Open Loop 1 out depending on ABC selection. Selectable: 0/+10V DC or 4/20mA.
15	Gnd	Ground	
16	Ana1	Analog Input	Auxiliary Sensor Input: usually used to compensate the PID Gain versus the roll diameter Selectable: 0/+10V DC or 4/20mA.
17	Gnd	Ground	
18	24V	Power supply OUT	24VDC Power supply, 100 mA
19	Out2	Analog Output	Analog Output of PID2 or OL2 out depending on ABC selection. Selectable: 0/+10V DC or 4/20mA.
20	Gnd	Ground	
21	Ana2	Analog Input	Auxiliary Sensor Input: usually used to compensate the PID Gain versus the roll diameter Selectable: 0/+10V DC or 4/20mA.
22	Gnd	Ground	
23	Ex1+	Power Out	Sensor power supply & Load Cell excitation Selectable 0-10Vdc or 0-15Vdc, 100mA
24	Ex1-	Power Out	
25	C1+	Differential Analog Input	Load Cell and/or Dancer Arm sensor input 0-10Vdc, 0-40mVdc
26	C1-		
27	Shld	Shielding	Load Cell or Sensor shielding
28	Ex2+	Power Out	Sensor power supply & Load Cell excitation Selectable 0-10Vdc or 0-15Vdc, 100mA
29	Ex2-	Power Out	
30	C2+	Differential Analog Input	Load Cell and/or Dancer Arm sensor input 0-10V DC, 0-40mVdc
31	C2-		
32	Shld	Shielding	Load Cell or Sensor shielding

THIS INSTALLATION AND OPERATING MANUAL HAS BEEN ARRANGED FOR THE SYSTEMATIC INSTALLATION AND START-UP OF YOUR TENSION CONTROL SYSTEM. PLEASE CHECK OFF EACH STEP BEFORE PROCEEDING TO THE NEXT STEP.

VI. XCTRL-2DRV

When working with the XCTRL-2DRV, no wiring between the XCTRL and the X2DRV control board are needed. In fact, the power supply as well as the connections between the analog outputs (OUT1 & OUT2) of the XCTRL and the analog inputs of the X2DRV (InBK1 & InBK2) control boards are internally made.

For installations where the XCTRL is used with an independent X2DRV driver also consult manual P-2098-WE for wiring between the units.

For installations where the XCTRL is used with a MCS2000-DRV2 consult manual P-2010-6-WE for wiring between the units.

VII. SYSTEM WIRING AND SETTING

WARNING: Contact with electrical voltages present in the controller covered in this manual can cause injury. To avoid these consequences, make sure all power is off during installation.

These wiring precautions will help you properly install and wire a trouble-free system.

1. Use proper gauge wire for all pin:
 - Data input: 0,5mm² (20 AWG) or 0,75mm² (18 AWG)
 - Brakes wires: 0,75mm² (18 AWG) or 1mm² (17 AWG)
2. Shielded cable is recommended for all connections
3. Do not use this controller for purposes other than those intended. Such use could damage the controller

1. Typical Wiring

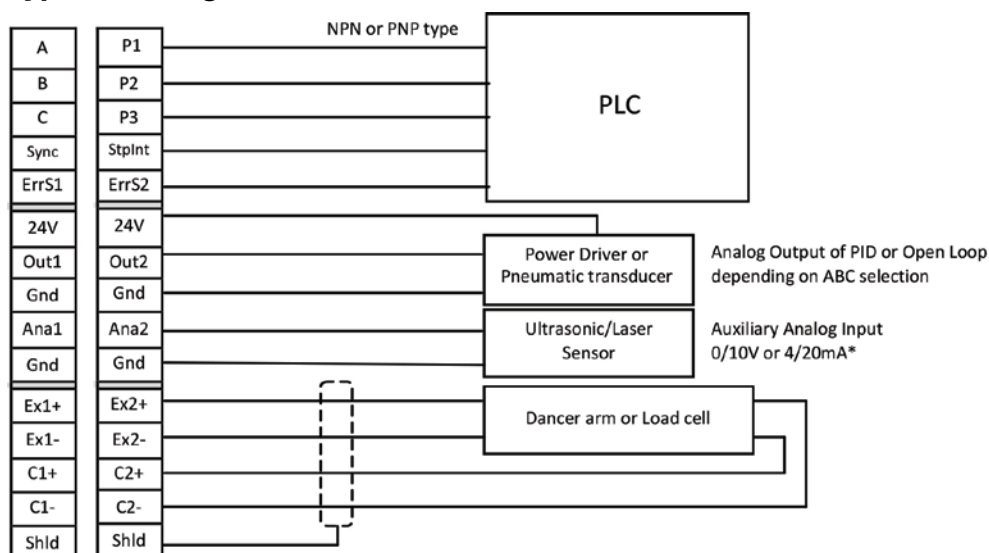


Figure 3: XCTRL Typical Wiring

2. Operation Principle

The closed loop controls are usually made with one of two types of sensor: the dancer arm or load cells. The XCTRL control can support either. The XCTRL controller supports both. These two sensors provide a voltage signal proportional to the web tension. This signal is interpreted and the web tension is adjusted accordingly by braking thru one of the integrated PID controller.

Load Cell Application:

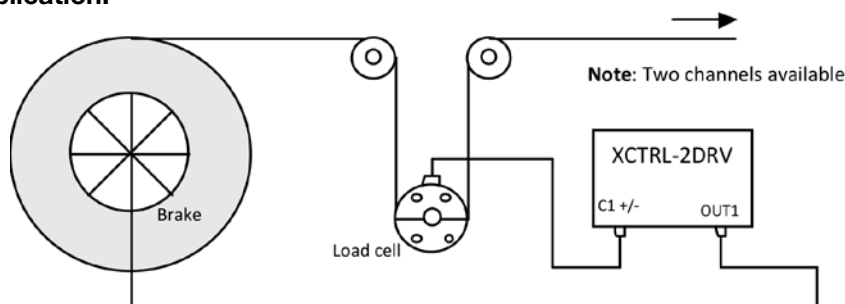


Figure 4: Load Cell Application

Dancer Arm Application:

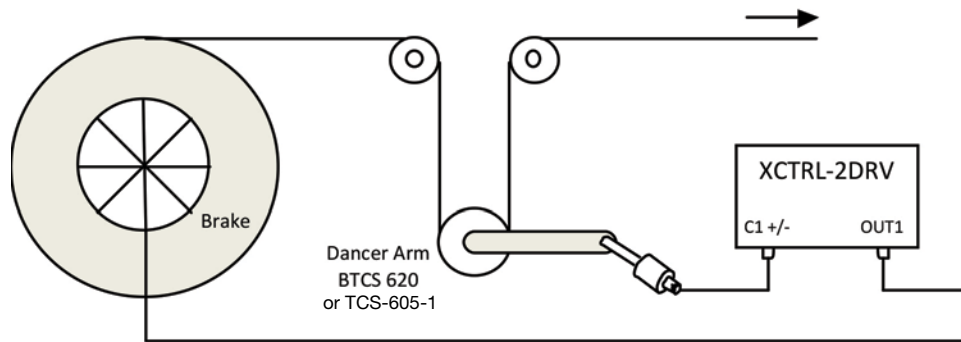


Figure 5: Dancer Arm Application

3. Dancer Arm Wiring

Wire Dancer Arm sensor BTCS605-E2, BTCS 620, TCS-605-1 to the controller as describe below. Either channel 1 (C1+/C1-) or channel 2 (C2+/C2-) can be used.

a) With a MCS605-E2 or a BTCS620

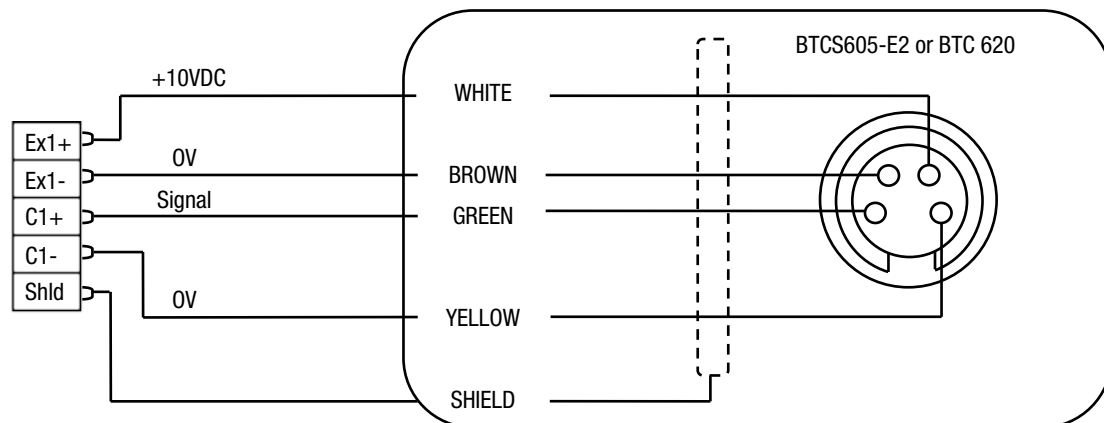


Figure 6a: Dancer Arm Wiring

b) With a TCS-605-1

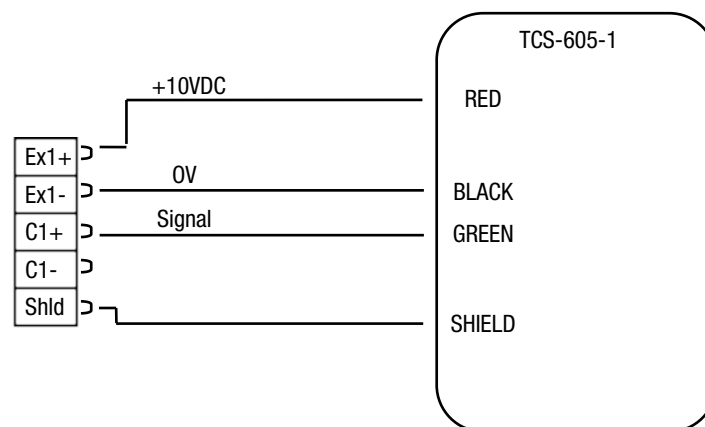


Figure 6b: Dancer Arm Wiring

4. Load Cell Wiring

Wire Load Cell (not amplified or amplified) to the controller as describe below, use channel 1 and/or 2. For all generalist wiring refer to figure 2 above.

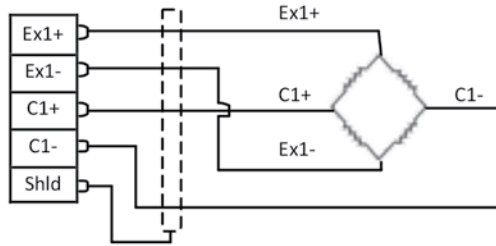


Figure 7: Not Amplified Load Cell Wiring

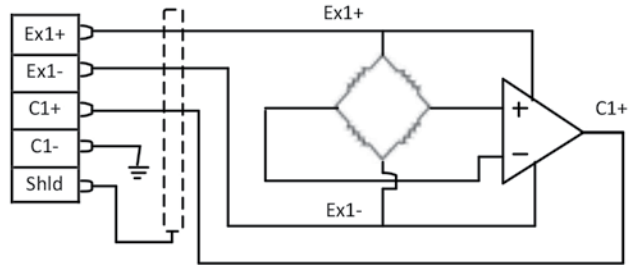


Figure 8: Amplified Load Cell Wiring

Note: For all load cell wiring please refer to the corresponding Datasheet

5. Power Supply Wiring

Wire 24VDC input power to pin 24V as shown below:



CAUTION: Improperly setting the 24VDC can damage the power supply and/or the controller

Figure 9: Power supply wiring

6. Wiring with an X2DRV

- a) Use of 2 separate controls: External wiring of the Inputs/Outputs needed
Wiring with MCS2000-DRV2 — Refer to manual P-2010-6-WE

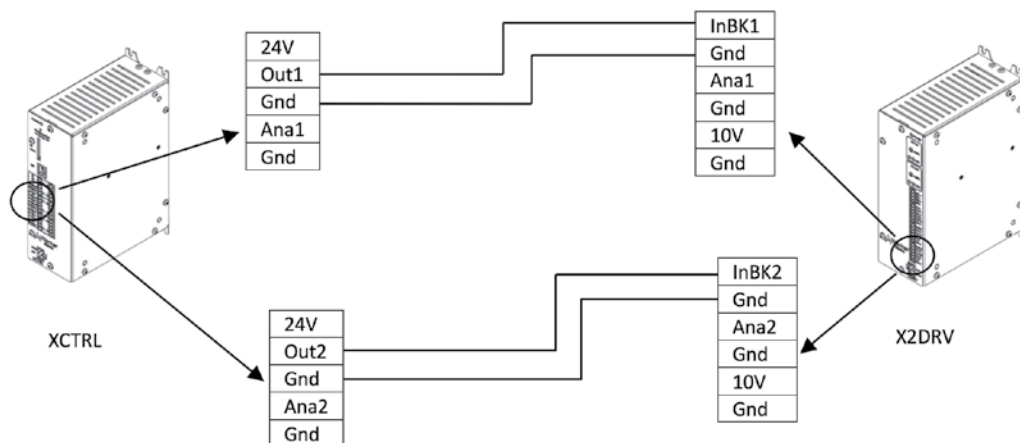


Figure 10: XCTRL & X2DRV wiring

Note: Wiring with MCS2000-DRV2 — Refer to manual P-2010-6-WE

- b) Use of an all in one XCTRL-2DRV control:
When the XCTRL is combined with an X2DRV (XCTRL-2DRV), power supply, input and communication are made by an internal connector. **No extra connection between the controller and the driver is needed.**

7. Brake Wiring

Brakes must be connected to the BK-/+ outputs of the X2DRV control board.

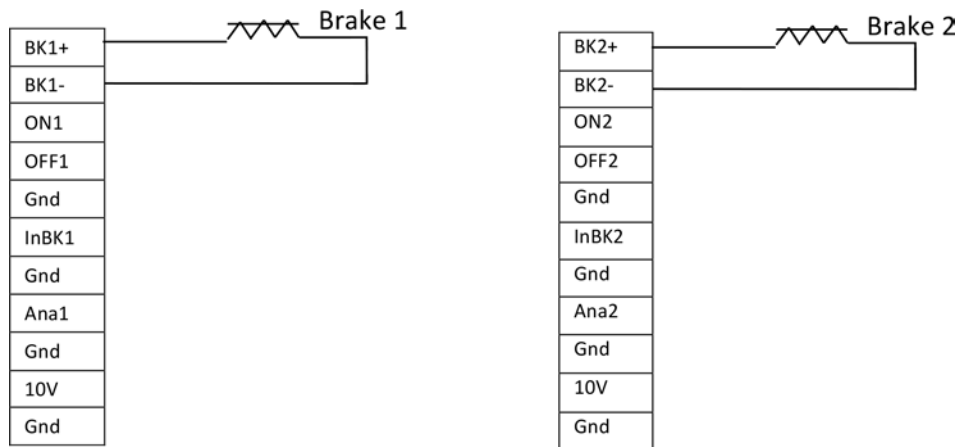


Figure 11: Brake wiring

8. (Optional) Auxiliary Analog Sensor Wiring

Two auxiliary sensor inputs are available. They can both be programmed in 0-10Vdc or 4-20mA type Inputs. They can also be used with the PID or the Open Loop Controllers input, refer to page 32. The most popular use is to have them coupled to a roll diameter sensor in order to compensate the PID Gain during unwinding

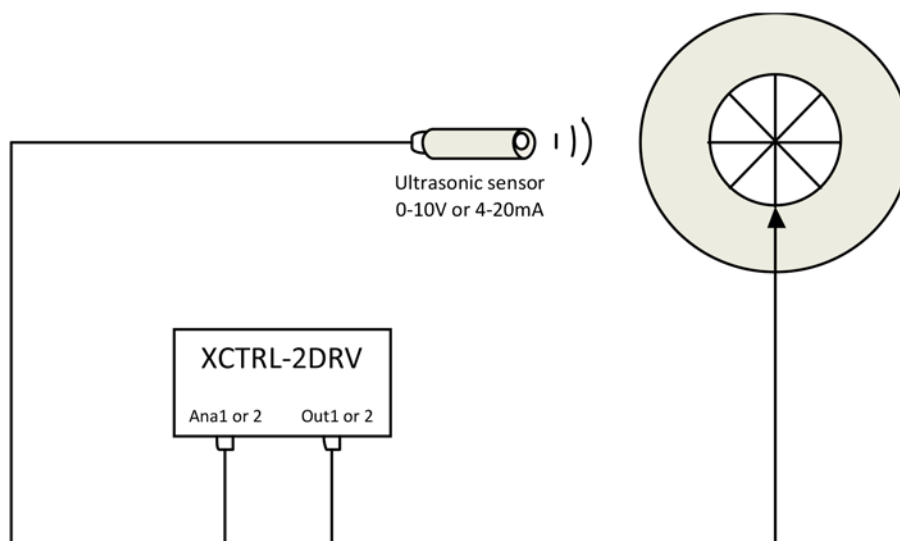


Figure 11: PID Gain Compensation in linear compensation mode

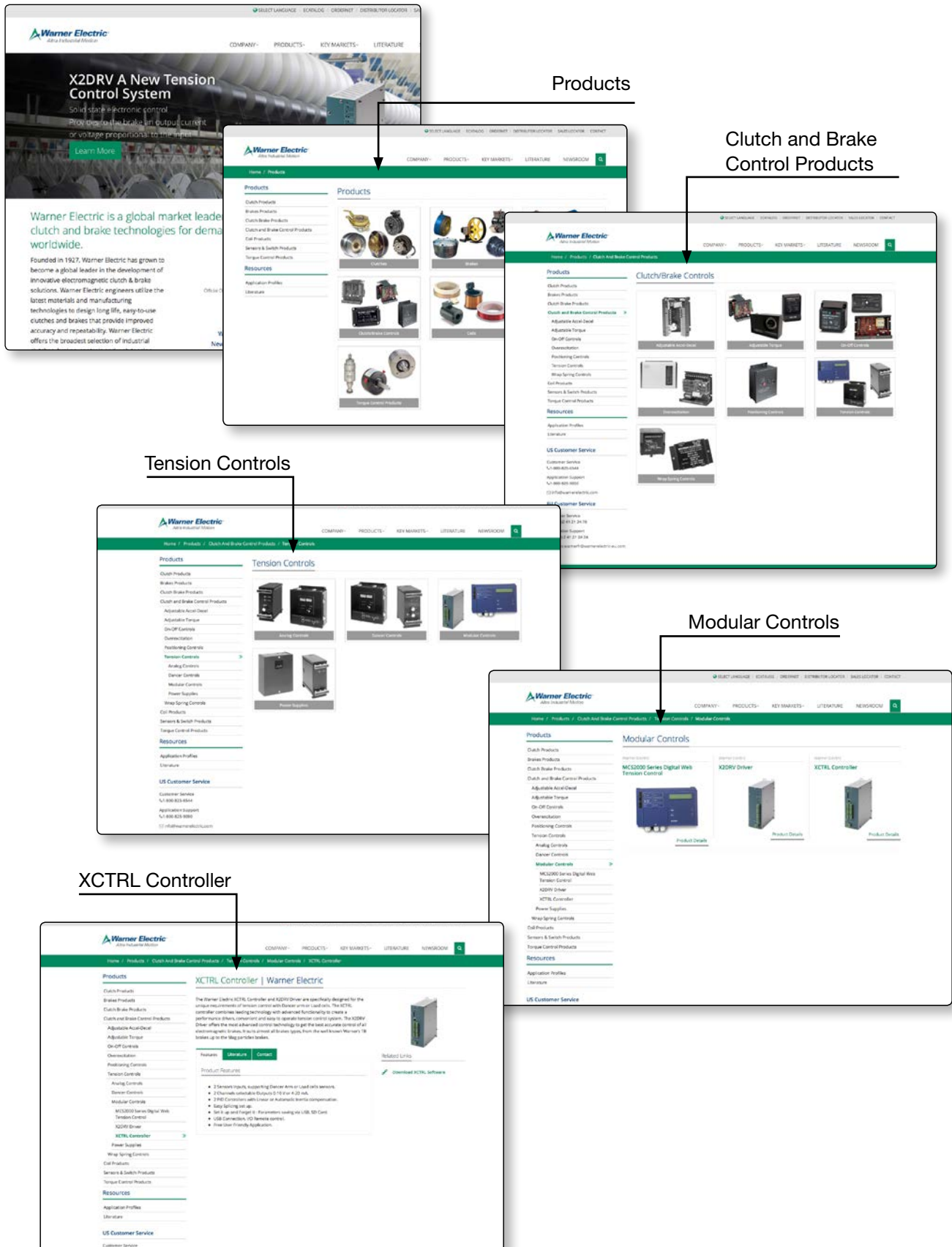
9. Download the XCTRL Configuration Application

Please use the following link to get it:

<http://www.warnerelectric.com/products/clutch-brake-control-products/tension-controls/modular-controls/xctrl-controller>

Or Follow the Path:

www.warnerelectric.com



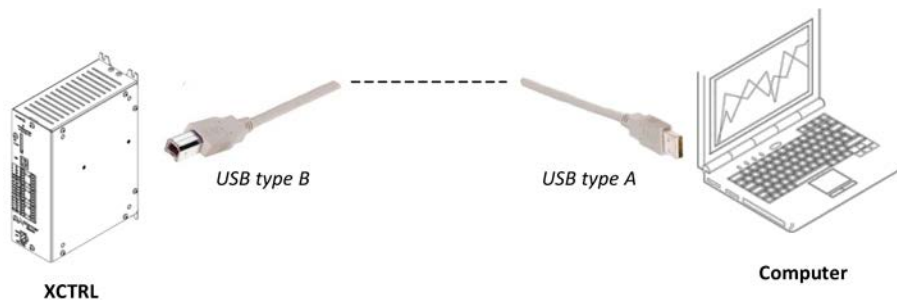
10. How to install the XCTRL Configurator Application

- a) Unzip the above file first in a directory (Desktop for instance).
- b) Launch the setup.exc file and follow the steps up to full completion.
- c) ***** When requested, please restart your computer**

11. Software Installation & Setting

Computer Wiring

To connect your computer to the XCTRL use an USB 2.0 cable type A to type B (not included) and wire it to the USB ports as shown below:

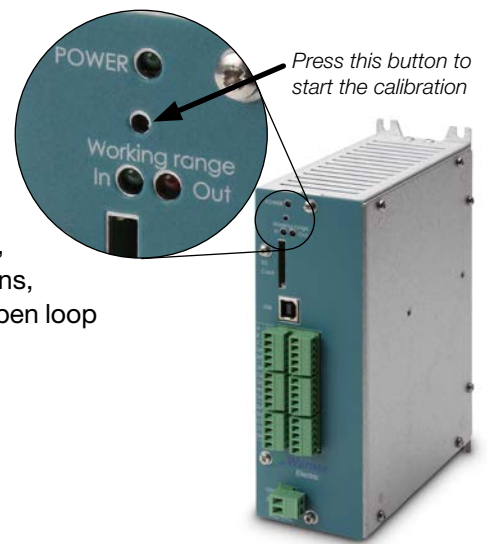


Note: To get a link between the computer and the XCTRL, the XCTRL need to be supplied. For this refer to section I/ System Wiring and Setting, item 3.

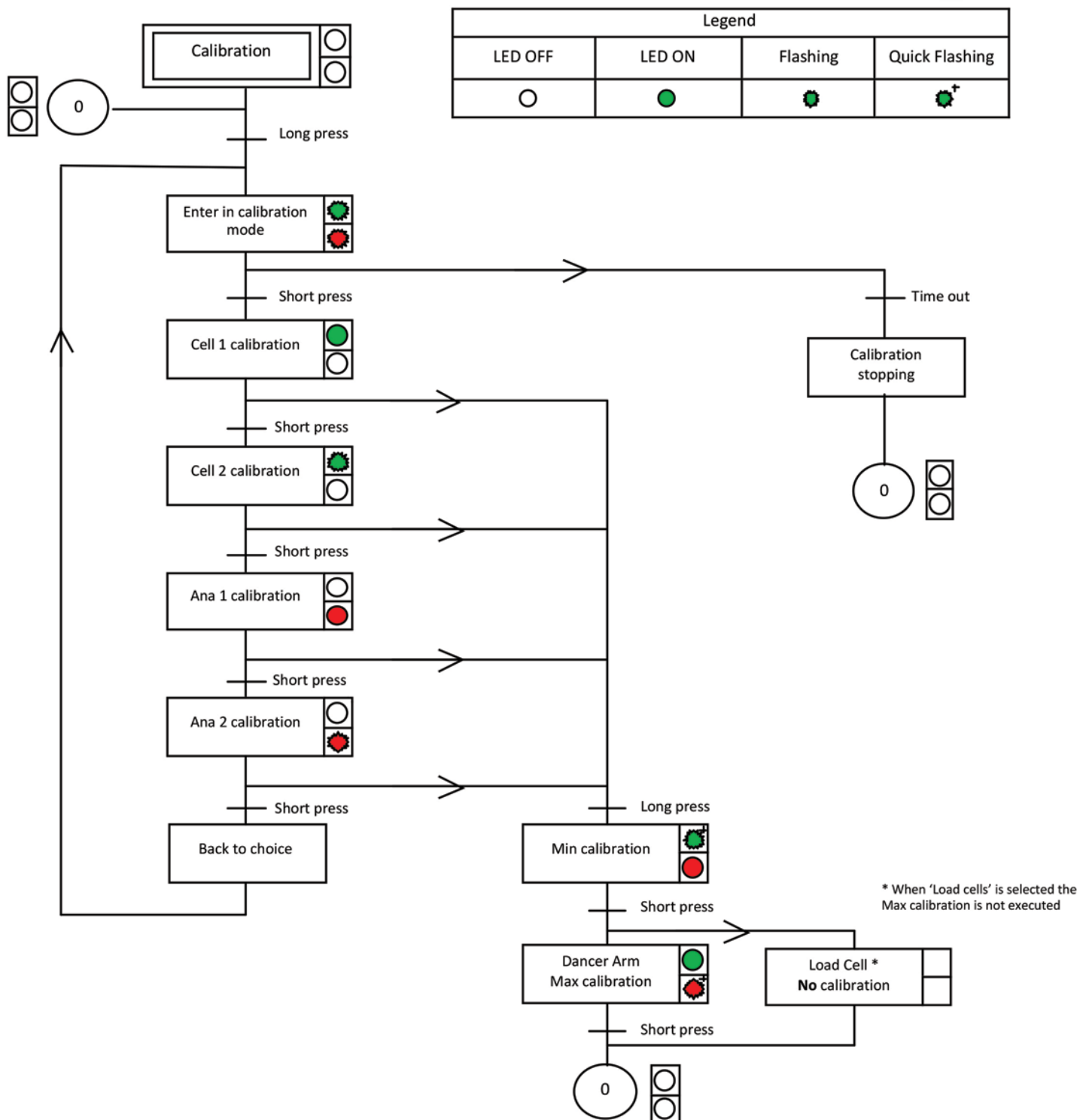
Please make reference to where the downloaded file is located on your computer:

12. (Optional) Manual Calibration for Open Loop Operation

When using an analog sensor or load cell input in open loop mode, it may be valuable to calibrate the XCTRL. For closed loop operations, calibration will be done further on in the programming. Calibration in open loop mode will scale the output to match the range of operation.



Procedure:



13. (Optional) Touch Screen Installation and Setting

The optional touch Screen (Xpro) allows you to modify the setpoint easily. It is generally necessary when Load cells are used to change the tension while running.

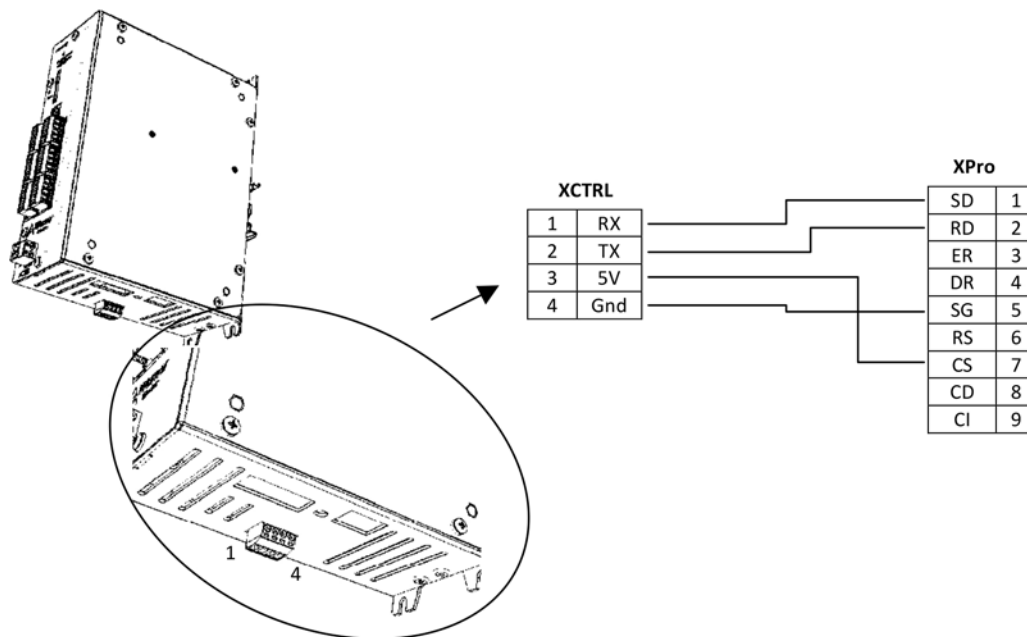
It's also offering to display some curves and values in real time.

See manual P-2099-WE for operating details.

If you want to use your own screen, a set of control code is described in the application note AN_XPRO_SetOfCommand.pdf.



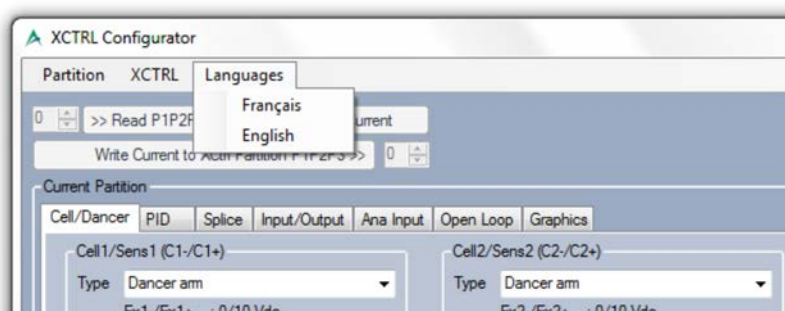
a. Wiring the XPro Interface to the XCTRL



VIII. XCTRL CONFIGURATION

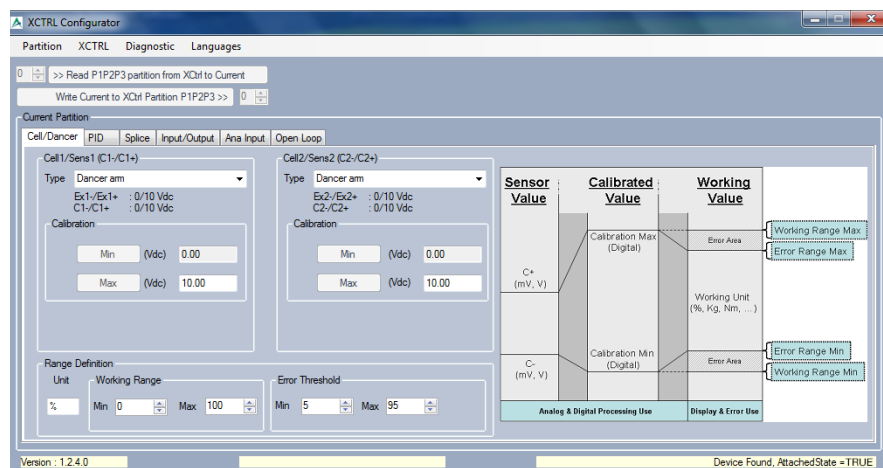
1. XCTRL Configurator Language Selection

Two languages are available: English and French. To select a language click on the main rolling menu and select the desired language. By default French is selected.



2. Is the XCTRL Configurator connected?

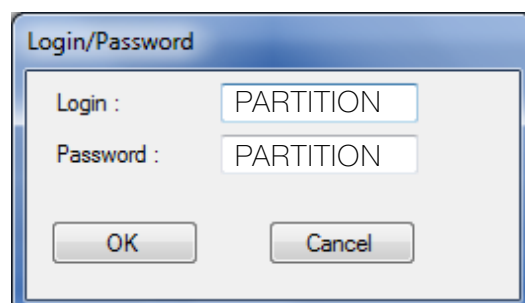
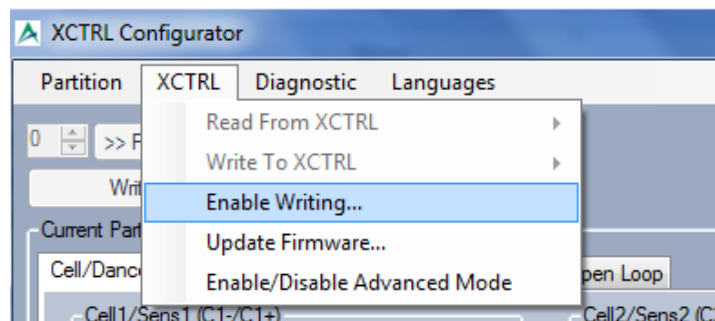
Make sure that the XCTRL control is connected to the XCTRL Configurator application:



When connected,
TRUE needs to be displayed

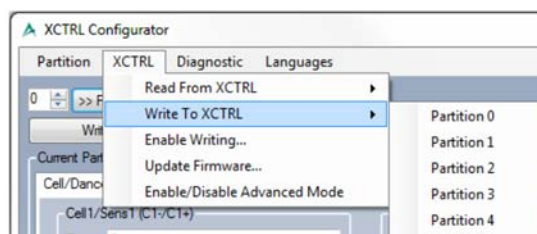
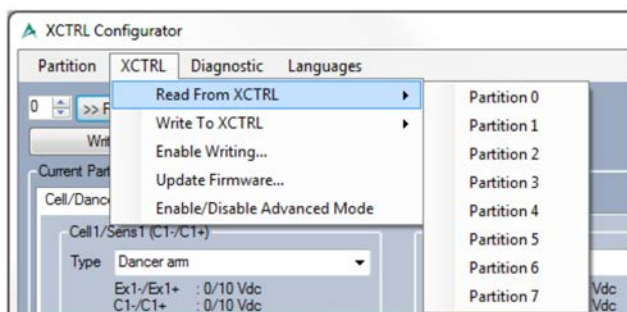
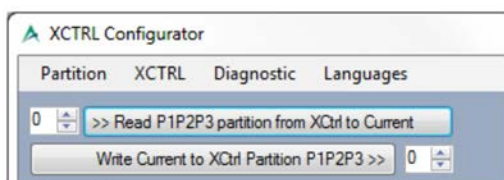
3. Enable Writing

Click on “Enable the Writing” in the XCTRL menu:



Please enter the following login and password: PARTITION, PARTITION. Both login and password are case sensitive. They need to be entered in Uppercase.

4. Partition Setting



The set of parameters is called a partition. With recording and writing a partition you can easily check and modify all parameters of the controller. With Saving or Opening a partition you are allowed to transfer all parameters from a computer or to a computer to backup or to email them for instance. The active partition can also be selected by using the P1, P2, P3 inputs.

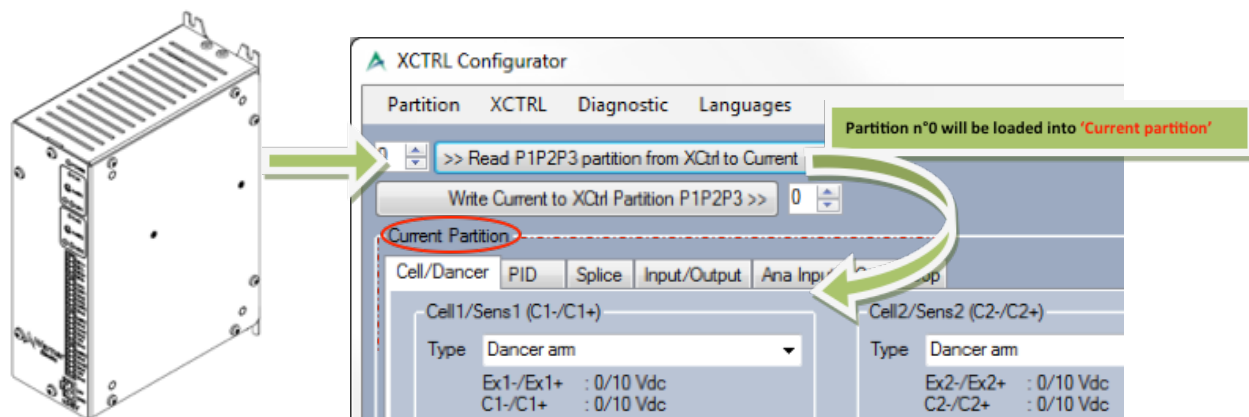
By default P1, P2, P3 are set to 0, giving then the partition 0 active when no wiring is made and thus independently of the NPN or PNP input mode selection.

- **Read/Write Partition**

This section allows you to Modify, to Check and to Save to the control all sets of parameters. You will find on the application a section named “Current partition” which represents the complete set of parameters (Cell/Dancer parameters, PID, Splice, Input/output, Optional Inputs, ...) of the partition selected by the number in the box placed before.

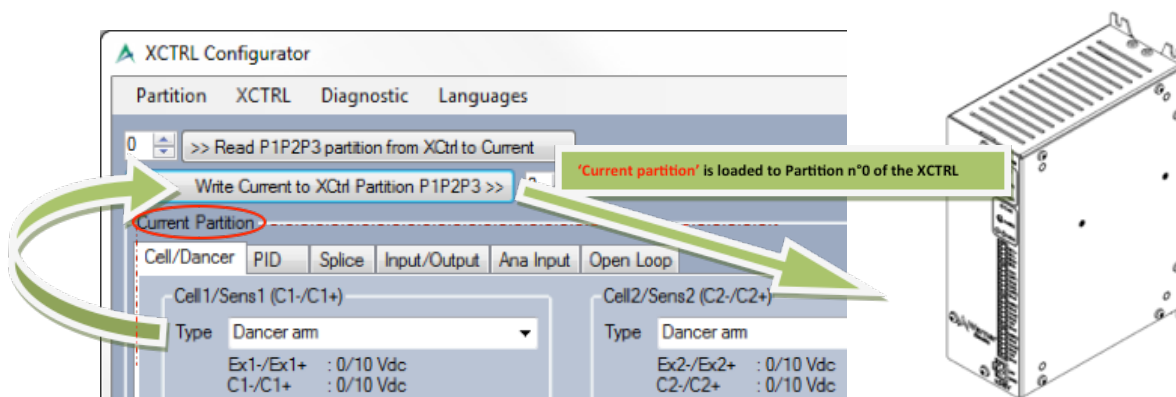
- **To read from XCTRL:**

- 1) Select number of partition (P1, P2, P3).
- 2) Click on Read from XCtrl. The parameters of the XCTRL, saved into the internal memory, are then loaded to the current partition, allowing you checking and modifying them.



- **To write to XCTRL:**

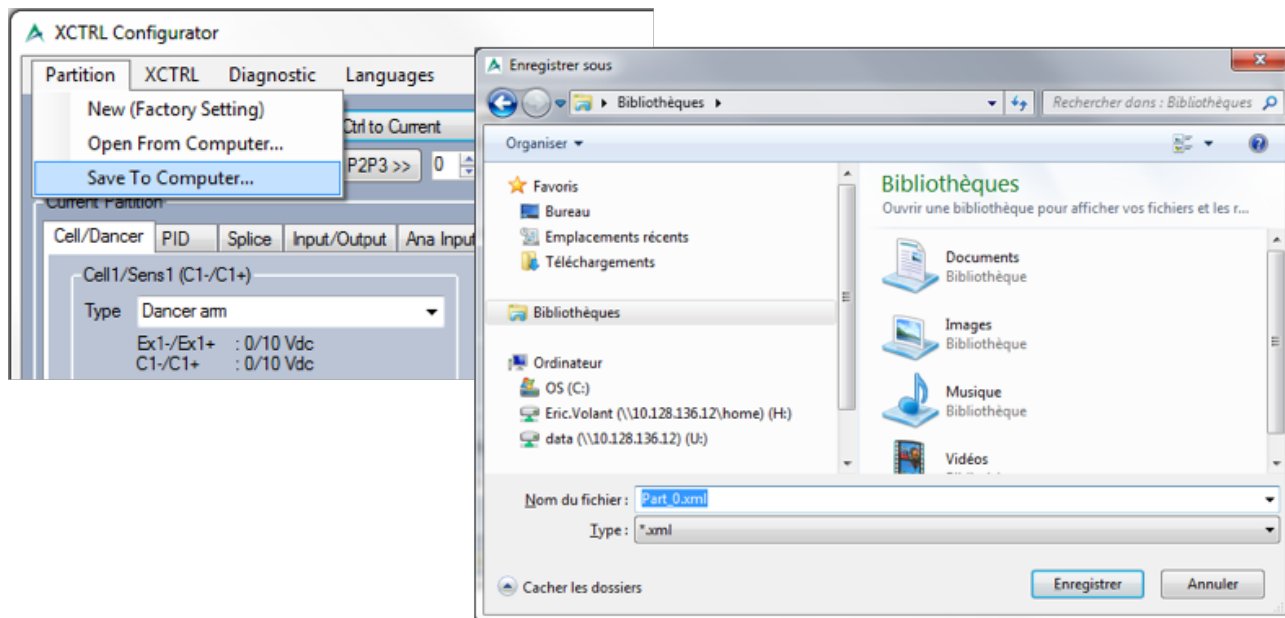
- 1) Select number of partition (P1, P2, P3).
- 2) Click on Write to XCtrl. All parameter of the current partition are then loaded to the XCTRL memory.



- **Import/Export Partition**

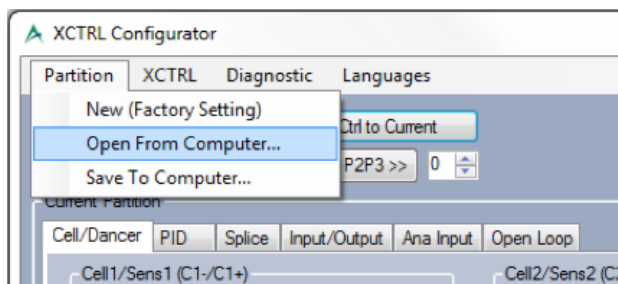
- **To export a partition:**

- 1) Choose the partition you want to save by selecting the correct number
- 2) Click on '**Read P1P2P3 partition from XCTRL to Current**' button to load it in the Current partition.
- 3) Click on '**Partition**' in the main menu, then on 'Save to Computer'.
- 4) A file explorer opens to allow you to select the directory in which the partition is going to be saved.
- 5) Click on '**Save**' button to save it.



- **To import a partition:**

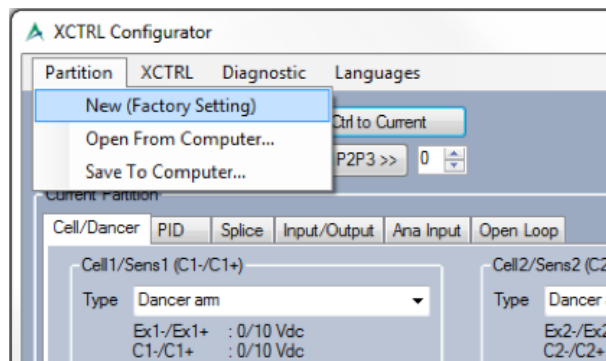
- 1) In the main menu, Click on 'Partition', then on 'Open from computer'
- 2) A file explorer opens to allow you to select the partition you want to import from your computer hard drive or from another drive
- 3) The partition is then loaded in the Current partition
- 4) Select the partition number in which you want it to be saved.
- 5) Click on 'Write Current to XCtrl Partition P1P2P3' button to save it to the desired partition



- **Factory Default**

In case of misuse or of doubt in a setting, it's very easy to recover the default setting set by default :

- 1) In the main menu, Click on 'Partition', then on 'New (Factory setting)'
- 2) All default parameters are then loaded in the Current partition.
- 4) Select the partition number in which you want it to be saved.
- 5) Click on 'Write Current to XCtrl Partition P1P2P3' button to save it to the desired partition.

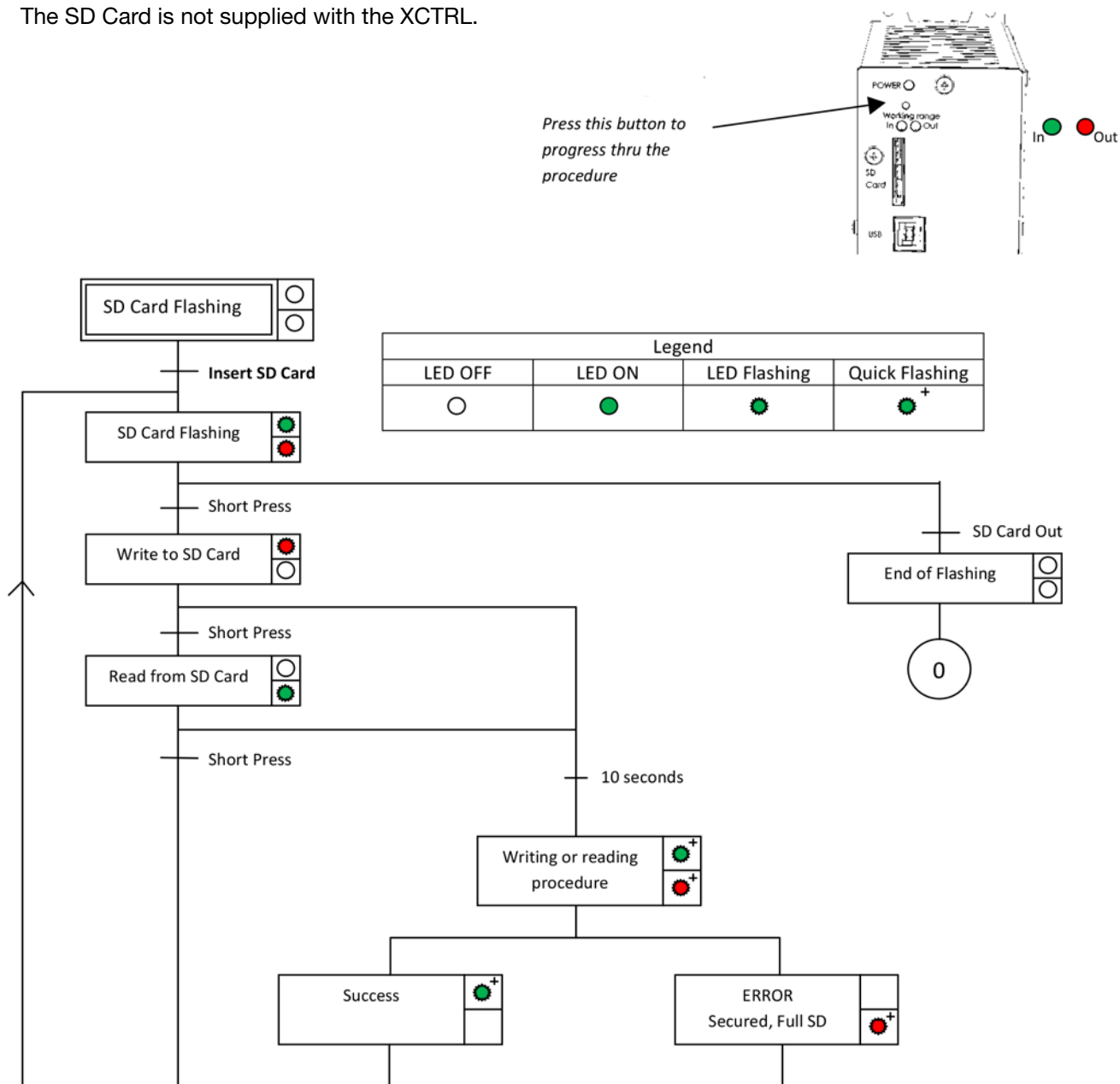


Note: On page 36 a chart is provided where system settings can be noted for future reference.

- **SD Card**

With an SD Card you can save partitions only or write to the XCTRL from the SD Card. To write or save the partitions follow the procedure below by using the button above the LED (In and Out).

The SD Card is not supplied with the XCTRL.

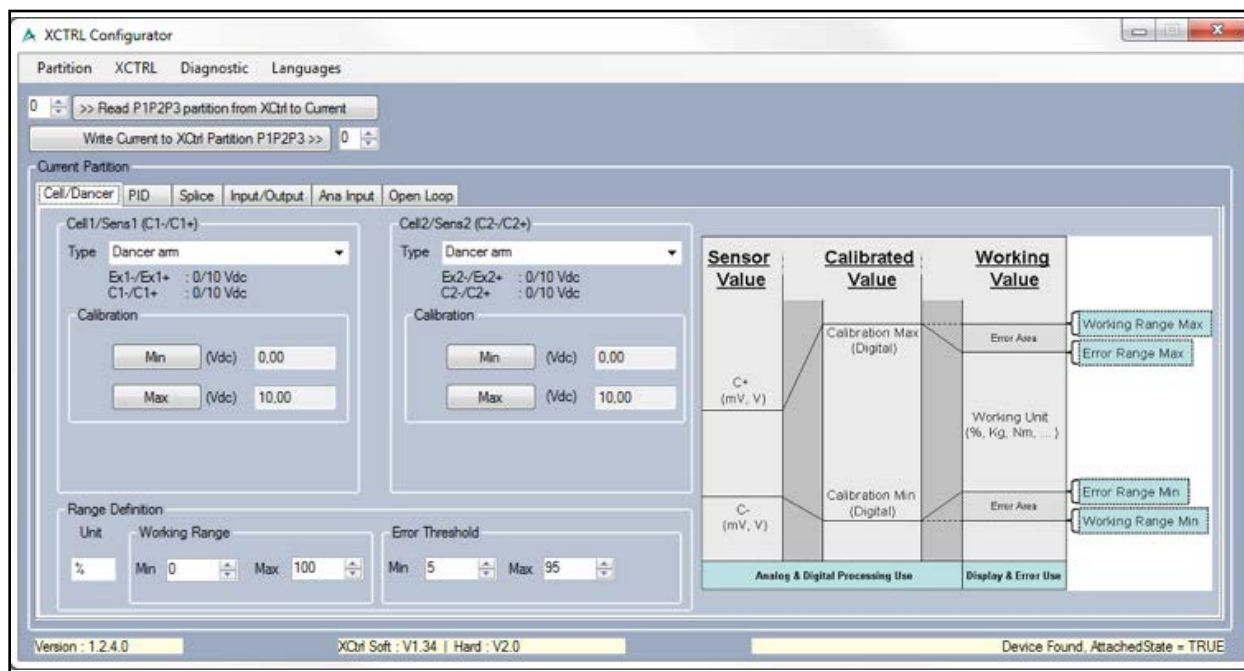


When reading from the SD Card, if only 1 partition has been saved on it, this one needs to have the number 0 and so named 'PART_0.XML'. After having copied this first partition, the application is searching for the next one. If none is found, the application is getting into Error.

When writing, if the SD Card is full or secured, then the application is going into error.

5. Input Selection and Setting

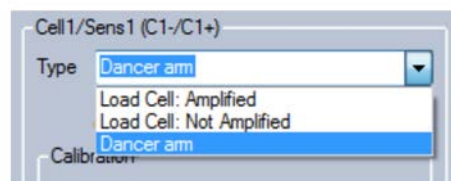
Click on 'Write Current to XCtrl Partition P1P2P3' button to store parameters into the integrated memory



• Cells / Dancer Input

In this tab you can select the active input and set-up it. Select your input with the drop down menu. Depending of the Input type the excitation and the input voltage will be changed

Two analog inputs are available. Each input can support either a dancer arm (BTCS620 or TCS-605-1) or a load cell. Both can be amplified or not.



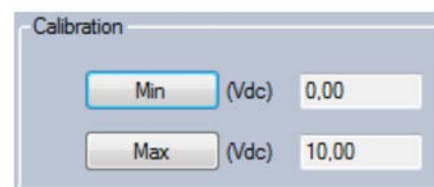
• Calibration

Once the input type selected, it's necessary to teach the Input voltage span with a calibration. The calibration differs from one type to another: In dancer arm type, Min and Max position needs to be taught when, in load cell type Min position is only taught and Max position voltage needs to be entered manually.

- Dancer arm calibration:

Dancer arm: Min position: Voltage corresponding to the Max braking forces (Longest Loop)
 Max position: Voltage corresponding to the Min braking forces (Shortest Loop)

- 1) Put the Dancer Arm to Min position, press Min on the software: Min is learnt automatically and displayed
- 2) Put the Dancer Arm to Max position, press Max on the software: Max is learnt automatically and displayed
- 3) Click on 'Write Current to XCtrl Partition P1P2P3' button to store these parameters into the integrated memory



- Load Cell (Amplified & Not Amplified) calibration:

In load cell Mode, the max voltage needs to be calculated depending of the load cell type, the mechanical integration into the customer application and the max resultant load put on the cell. To help you please ask the WARNER Electric the load cell calculation spreadsheet.

- 1) Put the Load Cell to Min, press Min on the software:
Min is learnt automatically and displayed
- 2) Set Max manually (according to the load cell)
- 3)) Click on 'Write Current to XCtrl Partition P1P2P3' button
to Save these parameters



The screenshot shows a 'Calibration' window with two input fields. The first field is labeled 'Min' with a unit of '(mV)' and a value of '0.06'. The second field is labeled 'Manual Max' with a unit of '(mV)' and a value of '20'.

- Filtering & inverting the input.

In case of noisy applications, the vibrations can cause the PID control to 'compensate' the noise. To avoid this behavior, it's possible to add an extra filtering which is going to reduce the noise processed by the controller.

To activate this filter :

- 1) Click on the 'XCTRL' button in the main menu and on 'Enable/Disable Advanced mode'. Two tick box are appearing below the calibration menu. The first allow you to invert the input and the second to filter it.
- 2) Tick the 'Active filter' box. A 'Duration tab' is appearing offering you the possibility to enter your desired filtering time.

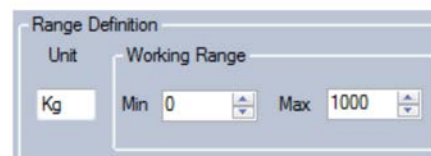
A 'Invert Input' button appears also, allowing you to invert the input if needed. **In case of inversion, the calibration of the input needs to be redone.**

• Load Cell Range Definition

To facilitate the value comprehension and the display, a logical range can be set-up, with selected its Unit, Min and Max range Span and its Error threshold.

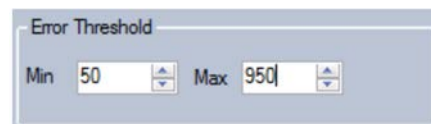
- Chose the working Unit (% , Kg, Nm ...): any kinds of characters are allowed. No conversion calculations are processed. This parameter is only for display purpose to facilitate the comprehension of the input.

- Working Range: this is the "logical range" in which the controller will process all its data. This has the advantage to facilitate the human interfacing, with having both human and controller talks the same "language", actually the same unit. Set-up is according to your application data.



The screenshot shows a 'Range Definition' window. It has a 'Unit' field with 'Kg' selected. Below it, there is a 'Working Range' section with 'Min' set to '0' and 'Max' set to '1000'.

- Error threshold: these Min and Max values are defining the error threshold out of which the controller is emitting an Error signal. Once the Sensor/load cell measured value is below or over these thresholds, the XCTRL is triggering the Error Sense signals (ErrS1 or ErrS2). ErrS1 is linked to the Cell/Dancer 1 Input when ErrS2 is linked to the Cell/Dancer 2 Input.



The screenshot shows an 'Error Threshold' window. It has two input fields: 'Min' set to '50' and 'Max' set to '950'.

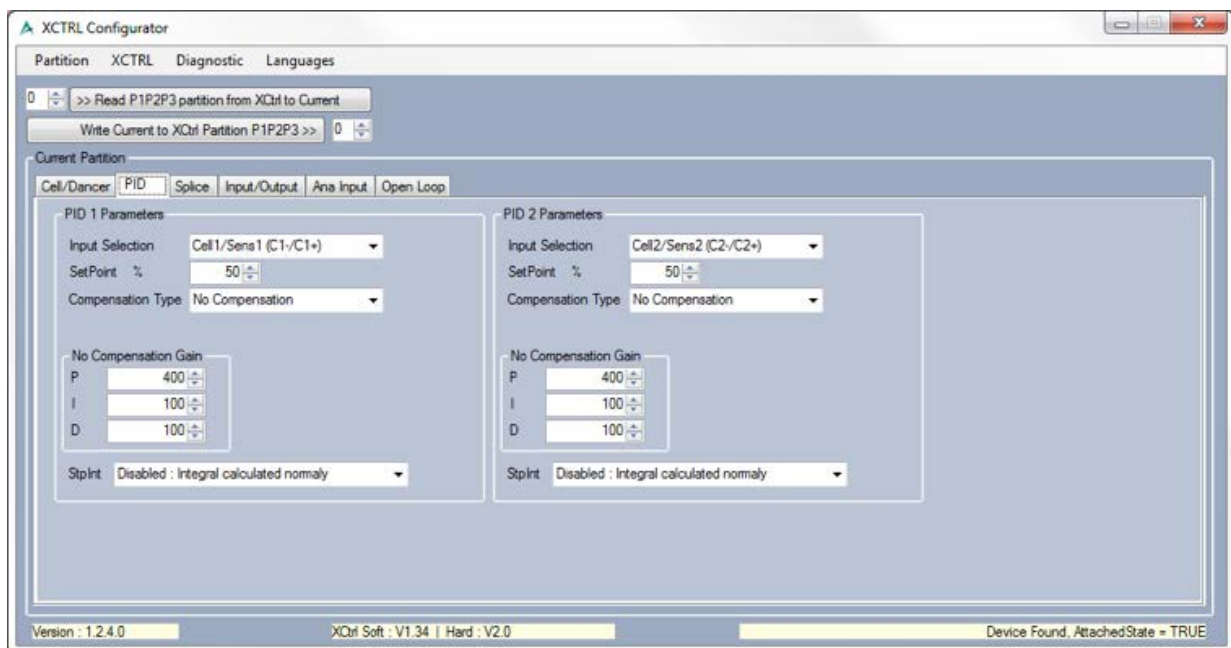
6. PID Setting

The PID system within the XCTRL provides a closed loop function when used with a properly designed dancer system.

The control will look at three variables in the dancer movement: The direction of change, the amount of change and the rate of change. In an ideal dancer system, the dancer arm is stable at the mid-point of its travel. When the dancer moves so that there is a shorter loop, this indicates that the machine is using material faster than the unwind is allowing to flow into the process. Therefore, the braking force at the roll will be reduced. Conversely if the dancer moves so that there is a longer loop, this indicates that the machine is using materials slower than the unwind is flowing into the process. In this state, the amount of brake force will be increased.

The free gain components, P, I and D, combine to control how responsive the system will be. The P-gain (proportional) increases / decreases the responsiveness of the system. Too much and the system will react rapidly to any change. Too little and the system will not react quickly enough. The D-gain (differential) dampens the reaction time for the system to react to change. Too much dampening will mean the system must change a great deal before the system will react, too little will mean that the system will react to any small change. The I-gain (integrator/integral) compensates for changes in roll diameter. Too much leads to a system that hunts or varies endlessly; too little and the dancer will droop over time. The integral will also determine the reaction time after the system has set idle for a period of time (during roll change or active system maintenance). Clearing the integrator on re-start is critical to proper dancer usage.

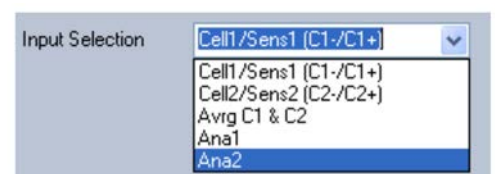
The three preset values in the XCTRL are intended as a starting point. You will likely need to increase or decrease each of the three values in order to achieve a system that performs in a stable manner for the material, line speed and tension you are using.



The PID tab is defining all PID controller parameters: PID Input selection, PID Automatic and linear compensation, PID gains. The setpoint as well as the Stop Integral (Stplnt) behavior can be also set-up in this menu.

- **Select the Input**

With the drop down menu, it could be a dancer arm, one load cell or two load cells. The input could be an auxiliary sensor wired on Ana 1 or 2.



- **Set up the Midpoint**

Depending of the unit previously programmed the midpoint unit changes.

- **Enter the Gains**

With the drop down menu, you can directly enter the gain value or increase it one by one. Gains are needed for the Proportional, Integral and Differential correction

- **Compensation (optional)**

Depending of the application it's sometimes useful to implement a PID Compensation. The compensation is usually needed when the difference between the maximum and the minimum diameter of the roller exceed a 10:1 ratio (for example a 3 inch core and 36 inch full roll diameter). Two compensation types are available: an automatic compensation and an external linear compensation.

- **Automatic compensation:** with the automatic compensation, no external sensor is needed. The PID controller is adjusting automatically its gain between the Big and Small roller diameter gains entered.

- **Linear compensation:** to adjust its gain between the Big and the Small roller diameter, an external sensor is needed. This sensor will measure the roller diameter and will need to be wired to the Ana1 or Ana2 Inputs. These Inputs will need to be calibrated before being selected and used as compensation.

In linear compensation the external compensation input (Ana1 or Ana2) will be selected through the Splice menu of "splice" tab. Due to the fact that in most of the applications the sensor is mechanically linked to the roller, it's obvious that the analog compensation input needs to be changed when splicing. Please refer to the splice menu for selecting the correct Input versus the splice selection.

Set the compensation type with the drop down menu.

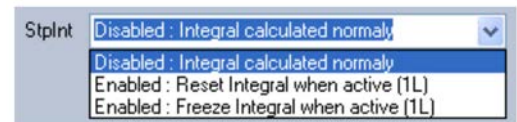
Gains Setup		
No compensation	Linear compensation	Auto. compensation
<p>Use the PID Gains</p>		
<p>Set the PID gain: Set P, I and D</p>	<p>Set with using the Ana1 or Ana2 sensor Input</p>	

- **Stop Integral (StpInt)**

On machine's stops, it's necessary to stop the integral calculation of the PID controller. The main advantage of doing so is a faster machine restart.

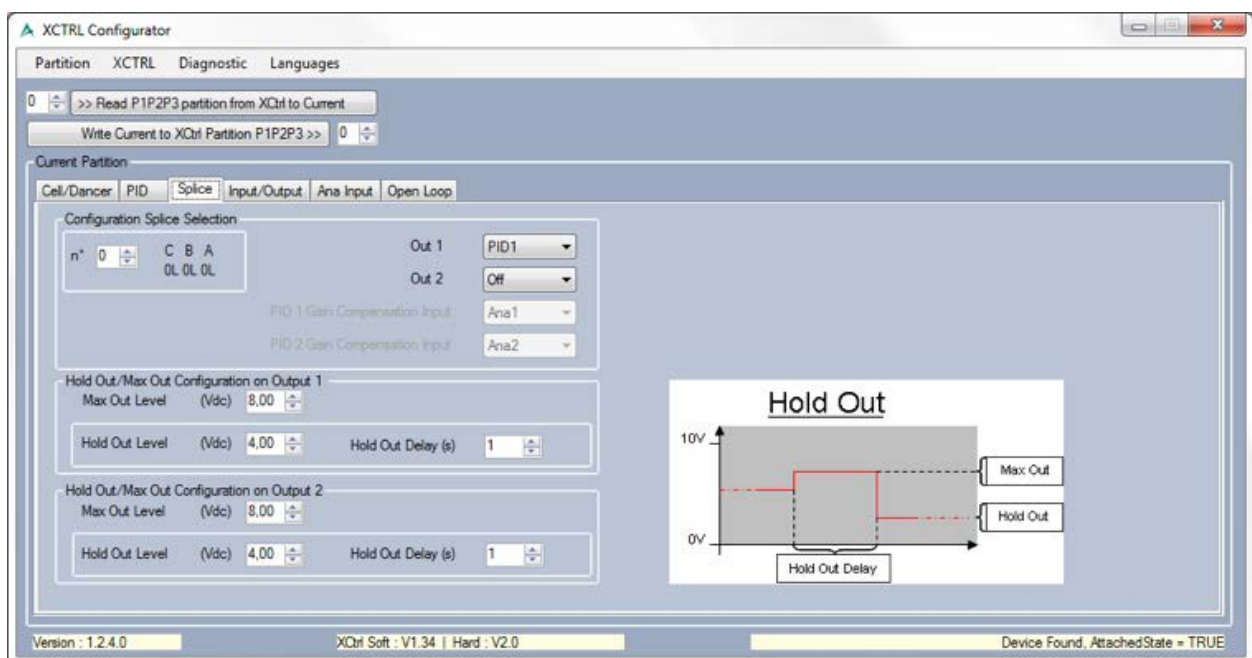
This function allows you to stop the integral calculation by two different ways: reset or freeze. A reset will force the integral to zero and a freeze will stop the integral to its current state.

The Stop Integral function is controlled by the **StpInt** Pin. As an input, its activation can be selected as NPN or PNP type in the **Input/Output** tab.

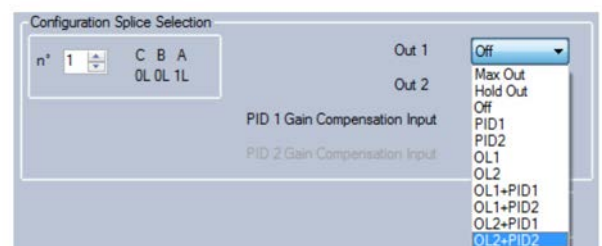


7. Splice Selection and Hold Out Configuration

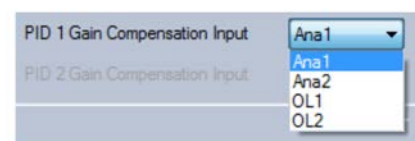
If splice function is not used, A, B, C values can be left unchanged.



This menu allows the user to set-up the roll's change/splice. Depending on the A, B, C, Sync Inputs state, a PID controller's output (an Open Loop or a defined level) can be directed to different outputs to control another driver channel, so another brake/roll. The splice activation is linked to the A B C Sync input setup. Their activation can differ depending on their type : NPN or PNP. Please refer to the **Input/Output Configuration** tab for more information.



When the PID is running in **Linear compensation mode**, a drop down menu is displayed to select the desired compensation input (Ana1, or Ana2).



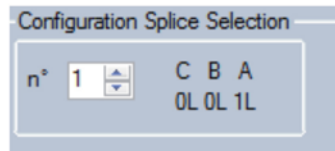
- **Splice Selection**

In this tab you can set up a configuration of OUT1, OUT2 between a logical menu of 11 possibilities. Please follow the below procedure :

1) Select a Splice number which correspond to different ABC input Level.

8 splices available :

A,B,C Logical State :							
Splice n°	C	B	A	Splice n°	C	B	A
0	0	0	0	4	1	0	0
1	0	0	1	5	1	0	1
2	0	1	0	6	1	1	0
3	0	1	1	7	1	1	1

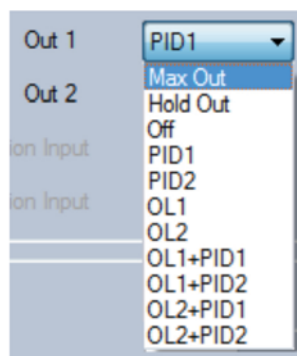


2) Once the splice number above is selected, select which level will drive the OUT1 and OUT2 outputs between the below possibilities.

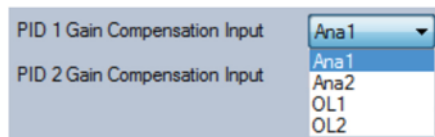
Out 1 & Out 2 Selection List :

Max Out	V Out = Max Out (Hold Out setting)
Hold Out	Cf Hold Out Configuration
Off	V Out = 0V
PID1	Closed Loop Control 1
PID2	Closed Loop Control 2
OL1	Open Loop Control 1
OL2	Open Loop Control 2
OL1+PID1	Open Loop Control 1 + Closed Loop Control 1
OL1+PID2	Open Loop Control 1 + Closed Loop Control 2
OL2+PID1	Open Loop Control 2 + Closed Loop Control 1
OL2+PID2	Open Loop Control 2 + Closed Loop Control 2

When the splice selection is getting active on ABCSync inputs changes, the level above selected is automatically applied on OUT1 or OUT2.



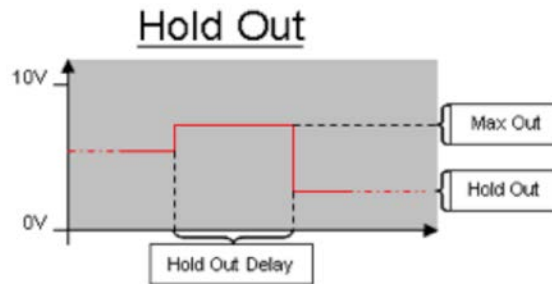
3) If the Linear Compensation Mode has been selected, please select which analog input is going to compensate the PID Gains.



- **Hold Out / Max out**

Some more configurations are available for the “Max out” and the “hold out” levels. “Max Out” allows you to set up the max voltage or current delivered by the Outputs.

The “hold out” feature is a procedure which is commonly used to stop a roll after splicing. This procedure applies the “Max out” level during a certain time and switches automatically to the “hold out” level when this time is over. Both “hold out level” and “Hold out delay” can be set with the application.



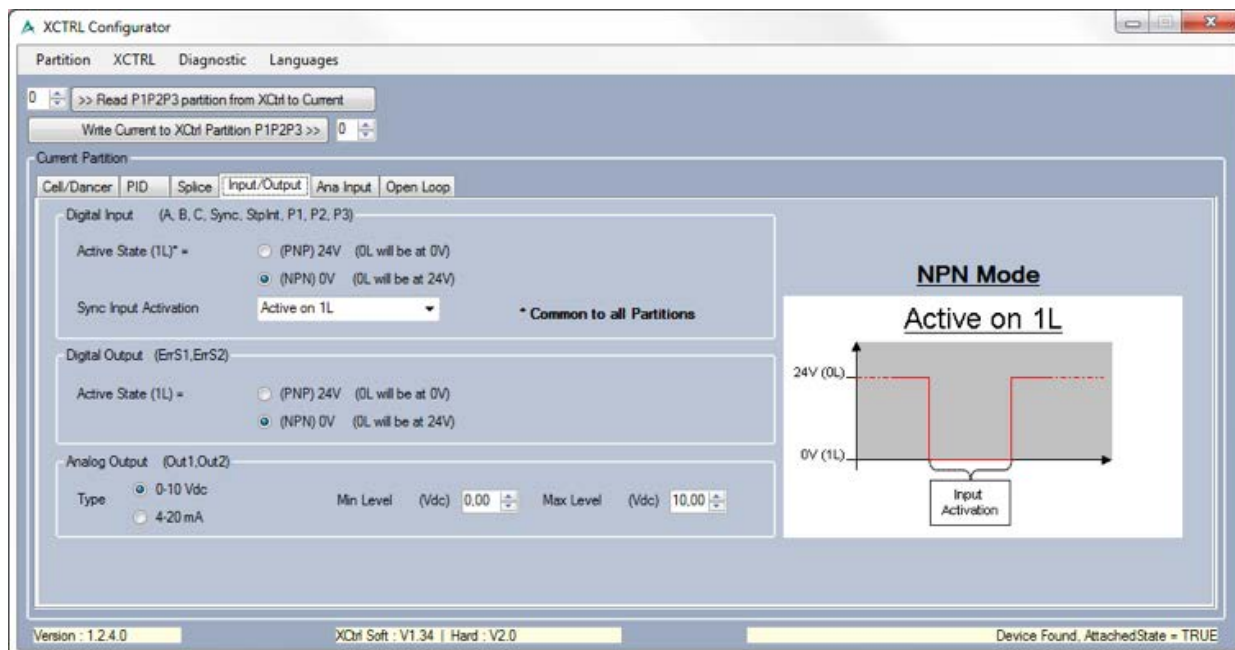
How to setup a Hold out? :

- 1) Enter “Max Out” Level
- 2) Enter “Hold Out” Level
- 3) Enter “Hold Out Delay”: Out1/2 will be set at “Max Out” Level during this delay

Hold Out/Max Out Configuration on Output 1

Max Out Level	(mA)	8.00
Hold Out Level	(mA)	4.00
Hold Out Delay (s)		1

8. Input/Output Configuration



The “Input/Output” tab allows you to set-up the XCTRL Input/Outputs depending of your application requirements. The XCTRL is able to handle two types of digital Input/Output : the NPN and the PNP type. This hardware set-up defines the activation level of the splice Inputs (A,B,C,Sync), of the partition inputs (P1, P2, P3), as well as the Digital (ErrS1, ErrS2) and Analog (Out1, Out2) outputs.



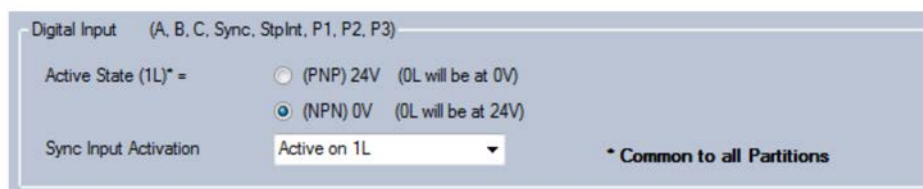
This configuration menu will affect the correct behavior of all Input/Output of the XCTRL. So care must be taken with it!

Note: All states of the inputs and outputs are displayed in the Real Time window and Input/Output window. Please refer to the Diagnostic tools tab for more information.

• Digital Input settings

Select in this tab the polarity type for A, B, C Stplnt and P1, P2, P3 inputs. Two kind of polarity (1L) are available: PNP (24V) and NPN (0V) :

- PNP: Logical active State : 1L = 24V. The low state 0L will be at 0V or GND.
- NPN: Logical active State : 1L = 0V. The low state 0L will be at 24V.

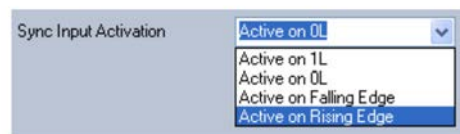


For all digital inputs, the polarity selection is common to all partitions. So any changes to a partition will be automatically copied and pasted to all other partitions.

The “Sync Input” drop down menu allows the selection of the “Latch mode” of the ABC Inputs. When “Sync Input” becomes active, the state of all ABC Inputs is transferred into the controller and processed.

- **Sync Input Activation**

Active on 1L, active on 0L, active on falling edge or active on rising edge. For each kind of activation a diagram is displayed on the software to explain its working.



- **Digital Output (ErrS1, ErrS2) Settings**

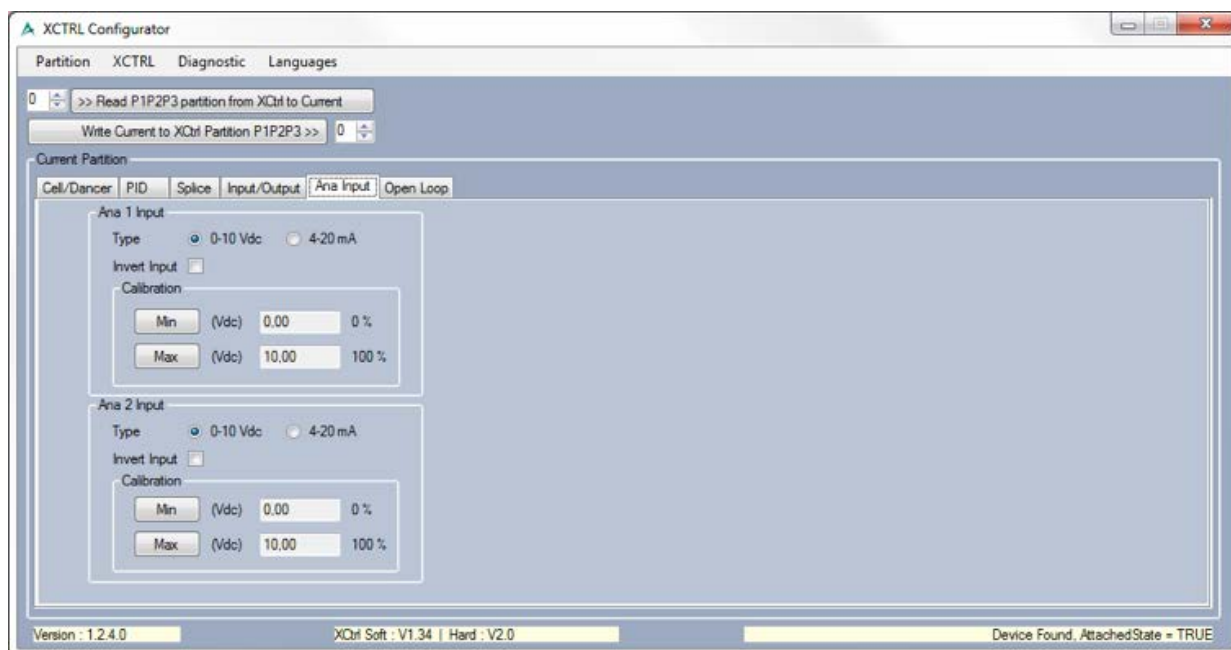
The ErrS1 and ErrS2 outputs are used to inform the external application (PLC, Computer,...) that the corresponding Cell/Dancer Input is out of range. The “Error Range” is defined in the tab “Cell/Dancer”. The polarity selection is like described above and can be chosen between NPN and PNP.

- **The Analog Output (Out1, Out2) Settings**

The Analog output (Out1, Out2) of the controller can be both controlled in voltage (0-10Vdc) or in current (4-20mA), the selection is straight forward (below picture). On top of that, some absolute voltage/current levels can be set. These levels will overdrive all logical levels which can be processed by the PID controller or others.

0-10Vdc	4-20mA
<div> <div>Analog Output (Out1,Out2)</div> <div>Type</div> <div> <input checked="" type="radio"/> 0-10 Vdc <input type="radio"/> 4-20 mA </div> </div>	<div> <div>Analog Output (Out1,Out2)</div> <div>Type</div> <div> <input type="radio"/> 0-10 Vdc <input checked="" type="radio"/> 4-20 mA </div> </div>
Set Min and Max Level (in Vdc)	Set Min and Max Level (in mA)
Min Level (Vdc) <input type="text" value="0,00"/> Max Level (Vdc) <input type="text" value="10,00"/>	Min Level (mA) <input type="text" value="4,00"/> Max Level (mA) <input type="text" value="20,00"/>

9. Auxiliary Sensor Setting (Ana Input)



This tab allows you to setup both auxiliary inputs: Ana1 or Ana2. Both inputs can be set in voltage (0-10Vdc) and in current (4-20mA).

- **Auxiliary Analog Input Type**

Select between 0-10Vdc or 4-20mA

Note: Check this box to invert the Analog Input

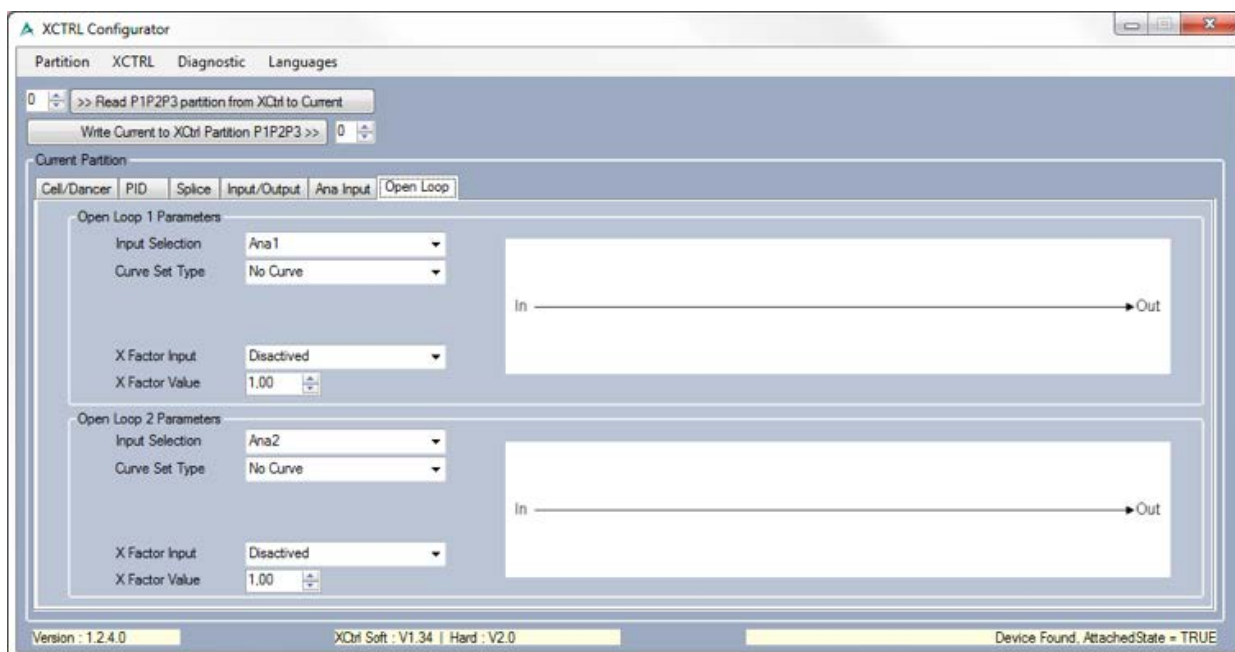
- **Auxiliary Sensor Calibration**

For a good behavior, it's a mandatory to calibrate the voltage/current span of these inputs. Please follow the below procedure to do so:

- 1) Put the Auxiliary sensor to Min, press Min on the software:
Min is learnt
- 2) Put the Auxiliary sensor to Max, press Max on the software:
Max is learnt

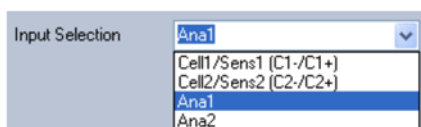
0-10Vdc Input				4-20mA Input			
Calibration				Calibration			
Min	(Vdc)	0,00	0 %	Min	(mA)	0,00	0 %
Max	(Vdc)	10,00	100 %	Max	(mA)	20,00	100 %

10. Open Loop Configuration



The XCTRL also integrates two open loop controls. The aim of these controls is to add a linear compensation curve and/or a simple gain factor. The Input can be a load cell, a dancer arm or other analog sensors (e.g. Ultrasonic Sensor).

- Select the Input



Note: For all information about control Pinout and Wiring please refer to the Typical Wiring section.

- Two types of correction are available: Linear curve and X Factor. Both can also be combined.

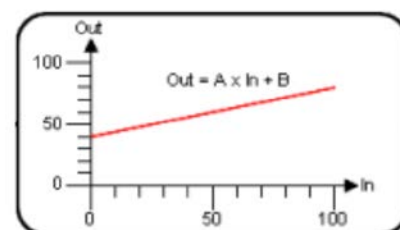
- **Linear Curve**

$$Out = A \times In + B$$

In = Input voltage selected above

A = Curve Gain (could be negative)

B = Offset

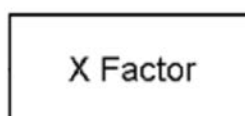


Note: The Out level will not exceed 100% of the span defined in the Input/Output tab.

- **X Factor**

$$Out = X \text{ Factor} \times In$$

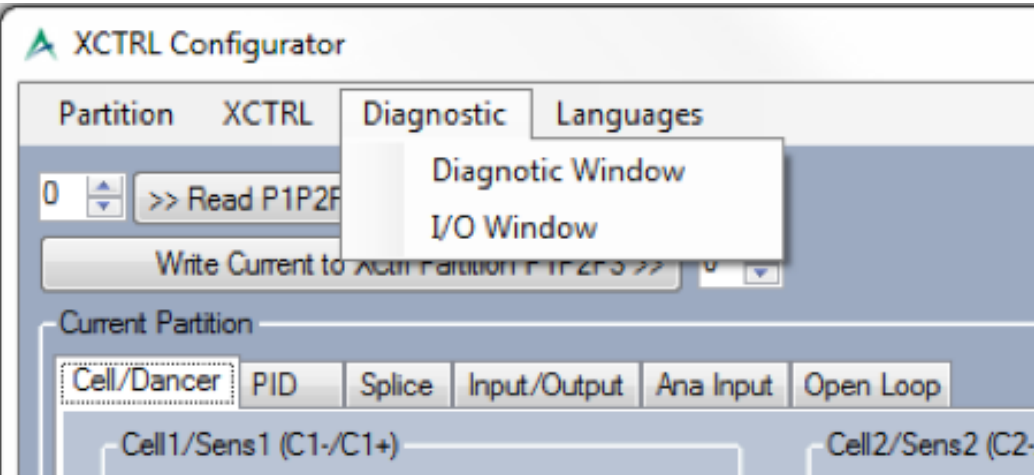
In = Input voltage selected above or $A \times In + B$



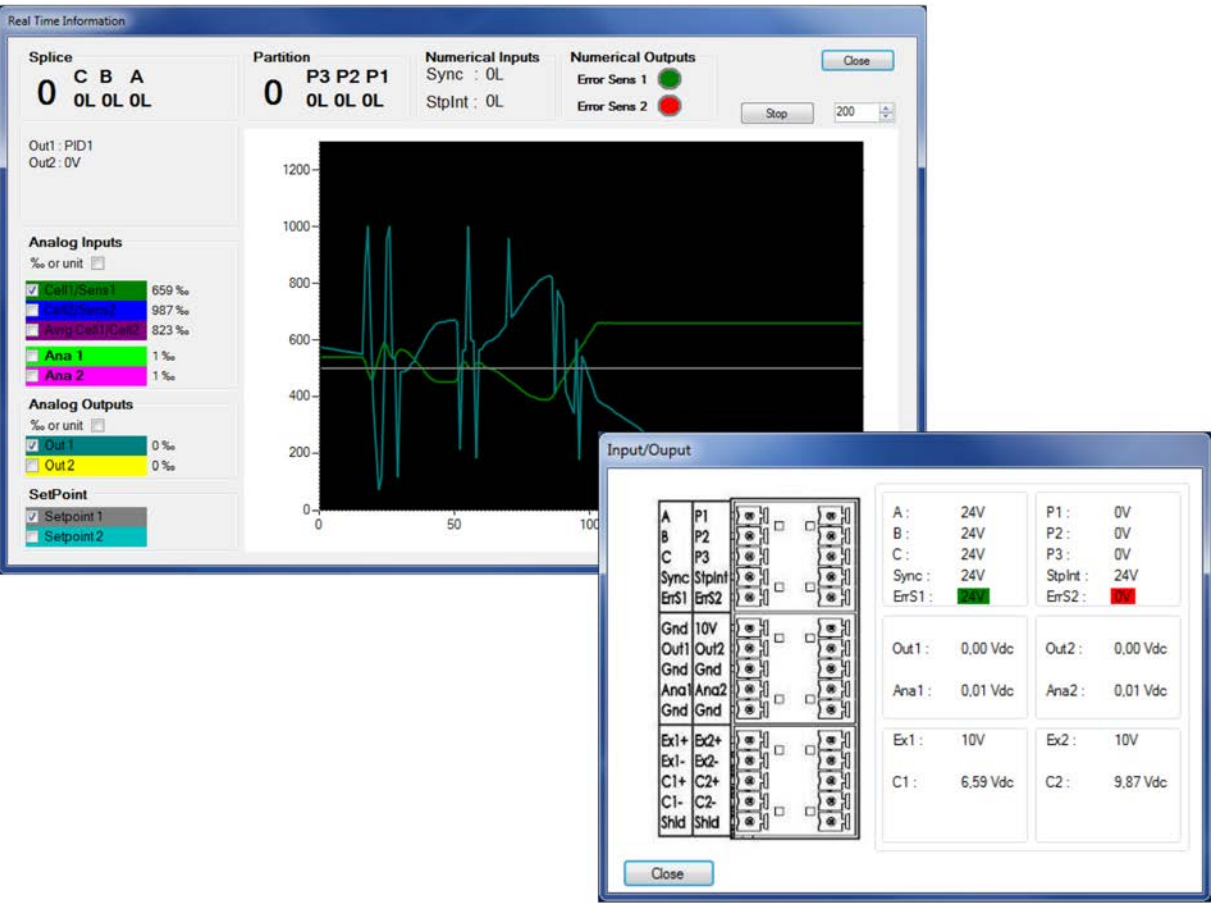
- How to Set Coefficients A & B and X Factor Value?

A & B Coefficient	X Factor
Curve Set Type: Linear Curve A coef %: 100 B coef %: 0	X Factor Input: Activated X Factor Value: 1.00

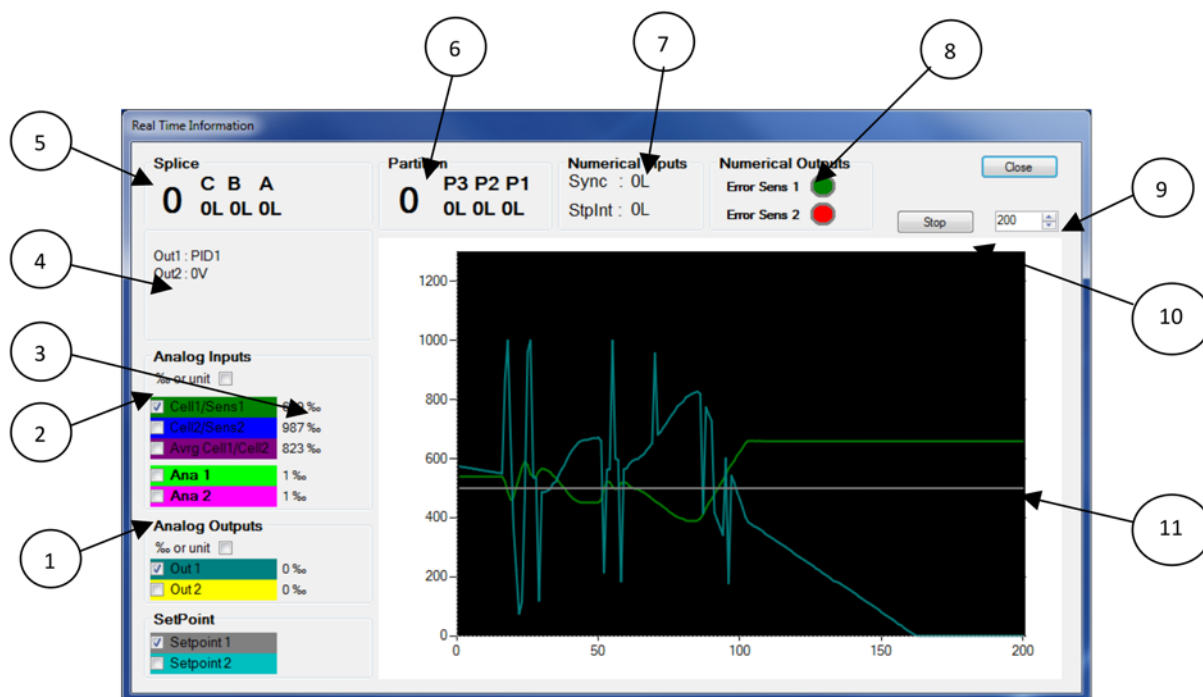
11. Diagnostic Tools



This tab is giving access to 2 diagnostic windows. The first one, named 'Real time information', gives an overview of all inputs and outputs state, including the splice selection (A, B, C, Sync), the Stop integral (StpInt), the partition selection (P1, P2, P3), the error state (ErrS1, ErrS2), and offers also a real time oscilloscope allowing to see all inputs, outputs variations. The second, named '**Input/output**' echoes back the voltage or current applied to all pins.

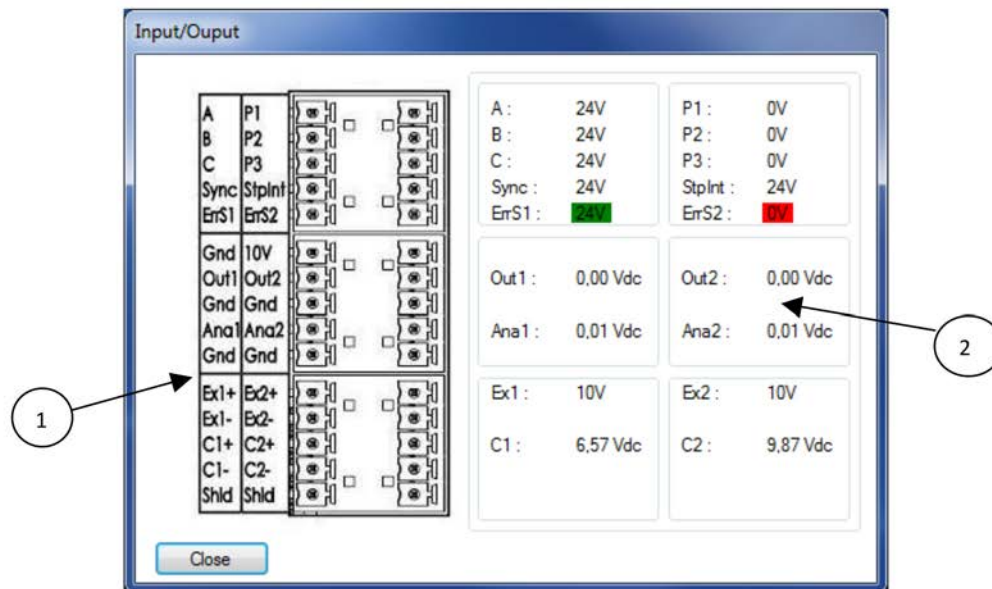


- ‘Real Time Information’ Window



1	Graph Selection: Check a box to display on the graph the output, input or setpoint for each channel
2	Information about Outputs: 2 Channels. By default Graphic unit is %, you can check the box Unit to change it and use the unit previously set section C. Input Section And Setting
3	Information about inputs: Load Cell and Dancer Arm Input cell1&2/Sens1&2, Average Cell1/Cell2 and Auxiliary Analog Input Ana1&2. By default Graphic unit is %, you can check the box Unit to change Y axis Unit and use the unit previously set section C. Input Section And Settings
4	Indicate the out configuration. If you selected Linear compensation PID Gain Compensation, the compensation Input will be displayed
5	Indicate the splice number and the associated logical state
6	Indicate the partition number and the associated logical state
7	Sync and StpInt status
8	Error Sens status: - Green ⇔ In range - Red ⇔ Out of range
9	Click here to set time scale
10	Click here to stop running
11	Graphic: Each Output, Input or Setpoint previously selected will be displayed on this graph. Y axis and X axis won't change even if you checked Unit Box.

- **Input/Output' Window**

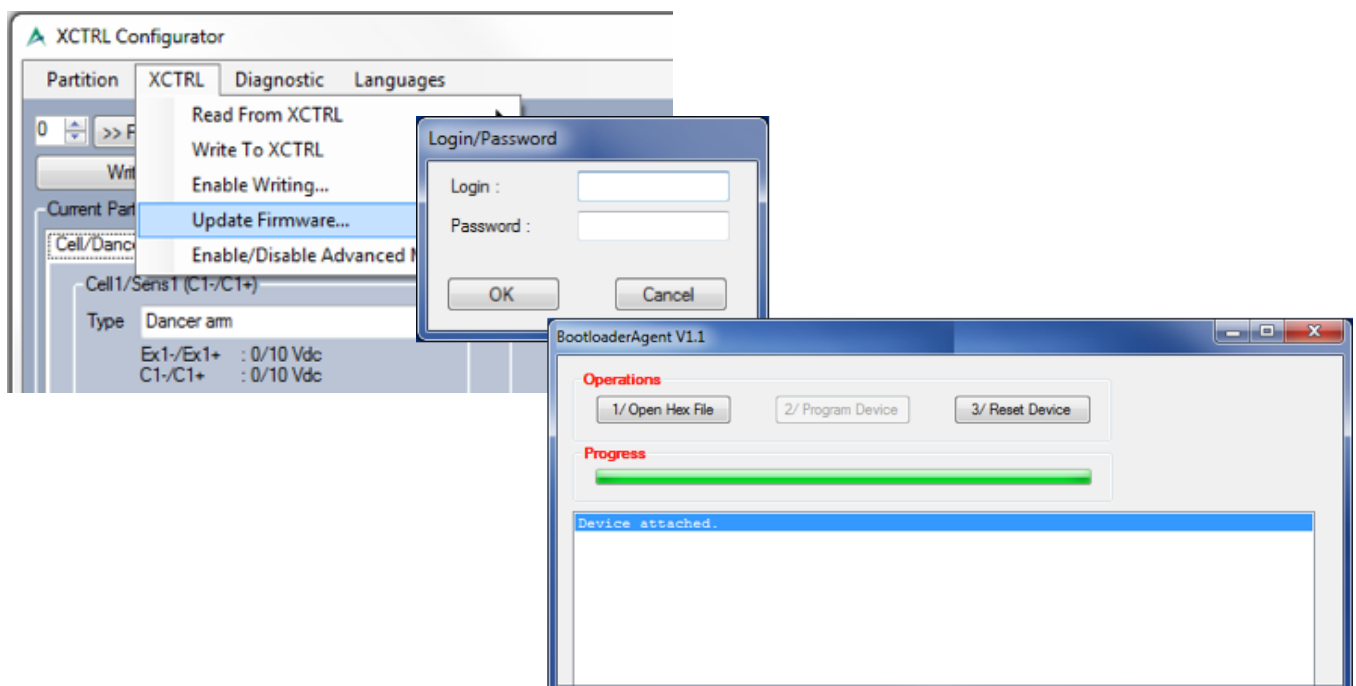


1	Inputs/outputs connectors. This represents the exact Pin out of the controller.
2	With keeping the same space repartition, the voltage or current value on the pin is displayed in real time.

12.XCTRL Firmware Update

When necessary , it's possible to update the firmware of the XCtrl controller with using the XCtrl configurator application. To do so, please follow the below steps:

- 1) Click on 'XCTRL' in the main menu, then on 'Update Firmware'.
- 2) A Login window pops up.
- 3) Please enter the following login and password:
Login: REFLASH Password: REFLASH
NOTE: Both login and password are case sensitive. They need to be entered in Uppercase.
- 4) Click on the 'OK' button. A Bootloader agent is starting.
- 5) Click on the 'Open Hex File' push button and select the new firmware file
- 6) Click on 'Program device' button
- 7) Reset the XCtrl by clicking on 'Reset Device' button



IX. SYSTEM AND SETTINGS NOTATIONS

System type:

Dancer	Load Cell	Analog input
BTC5 605-E2 _____	Amplified ____	Ultrasonic ____
BTC5620 _____	Not Amplified ____	Other _____
TCS 605-1 _____		

Brake: _____

Manual Calibration for Open Loop Operation (Page 14) Completed_____

Computer Re-booted after software download _____

Enable Writing Login and Password entered _____

Values:

	Partition 0	Partition 1	Partition 2	Partition 3	Partition 4
Load cell Dancer					
Dancer calibration Min					
Dancer calibration Max					
Load cell calibration Max					
Load cell calibration Min					
Range definition					
Working units set					
Working Range					
Min/Max					
PID Settings					
P					
I					
D					
Input selection					
Midpoint					
Compensation					
None					
Linear					
Auto					
Stop Integral					
Disabled					
Reset					
Freeze					
ABC Synchro					
PID 1 compensation					
PID 2 compensation					

Values:

	Partition 0	Partition 1	Partition 2	Partition 3	Partition 4
Hold Out Max	_____	_____	_____	_____	_____
Hold	_____	_____	_____	_____	_____
Hold out delay	_____	_____	_____	_____	_____
Input/Output config					
PNP 1L	_____	_____	_____	_____	_____
PNP 0L	_____	_____	_____	_____	_____
NPN 1L	_____	_____	_____	_____	_____
NPN 0L	_____	_____	_____	_____	_____
Analog output					
0-10volt	_____	_____	_____	_____	_____
4-20ma					
Min/Max					
Aux. Sensor Ana Input					
0-10volt	_____	_____	_____	_____	_____
4-20ma	_____	_____	_____	_____	_____
Min/Max	_____	_____	_____	_____	_____
Inverted					
Calibrated values	_____	_____	_____	_____	_____

Open Loop Configuration:

	Partition 0	Partition 1	Partition 2	Partition 3	Partition 4
Input selected	_____	_____	_____	_____	_____
Curve type					
A Coeff	_____	_____	_____	_____	_____
B Coeff	_____	_____	_____	_____	_____
X Factor input	_____	_____	_____	_____	_____
X Factor value	_____	_____	_____	_____	_____

X. TROUBLESHOOTING COMMON ISSUES

Computer re-boot after software download.....	Page 13
Partition Writing enabled	Page 16
Read from XCTRL/Write to XCTRL set properly	page 17
Reset to Factory Default values	Page 20
Dancer Sensor Calibration	Page 22
PID settings and adjustment	Page 24
Compensation Required?	Page 25
Stop Integration.....	Page 26
ABC Synchro logic	Page 27
Diagnostic tools	Page 33

Warranty

Warner Electric LLC warrants that it will repair or replace (whichever it deems advisable) any product manufactured and sold by it which proves to be defective in material or workmanship within a period of one (1) year from the date of original purchase for consumer, commercial or industrial use.

This warranty extends only to the original purchaser and is not transferable or assignable without Warner Electric LLC's prior consent.

Warranty service can be obtained in the U.S.A. by returning any defective product, transportation charges prepaid, to the appropriate Warner Electric LLC factory. Additional warranty information may be obtained by writing the Customer Satisfaction Department, Warner Electric LLC, 7 rue Champfleury, B.P. 20095, St Barthelemy d'Anjou - France, or by calling +33 (0)2 41 21 24 24.

A purchase receipt or other proof of original purchase will be required before warranty service is rendered. If found defective under the terms of this warranty, repair or replacement will be made, without charge, together with a refund for transportation costs. If found not to be defective, you will be notified and, with your consent, the item will be repaired or replaced and returned to you at your expense.

This warranty covers normal use and does not cover damage or defect which results from alteration, accident, neglect, or improper installation, operation, or maintenance.

Some states do not allow limitation on how long an implied warranty lasts, so the above limitation may not apply to you.

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