

Practice 1 - Approach to PLC

Introduction

The integrated PLC in Brushless DC Trainer is the primary device of control and data processing used to manipulate the motors and the HMI, in this way, it is essential to understand its basic operations and become familiar with the functions you can perform.

There are basic concepts and functions that are used throughout all practices, these principles will be those that develop throughout this document.

Objectives

In this practice simple routines are programmed using the FBD language and then will be downloaded to the PLC, and the generated analog values are monitored in the test.

Prerequisites

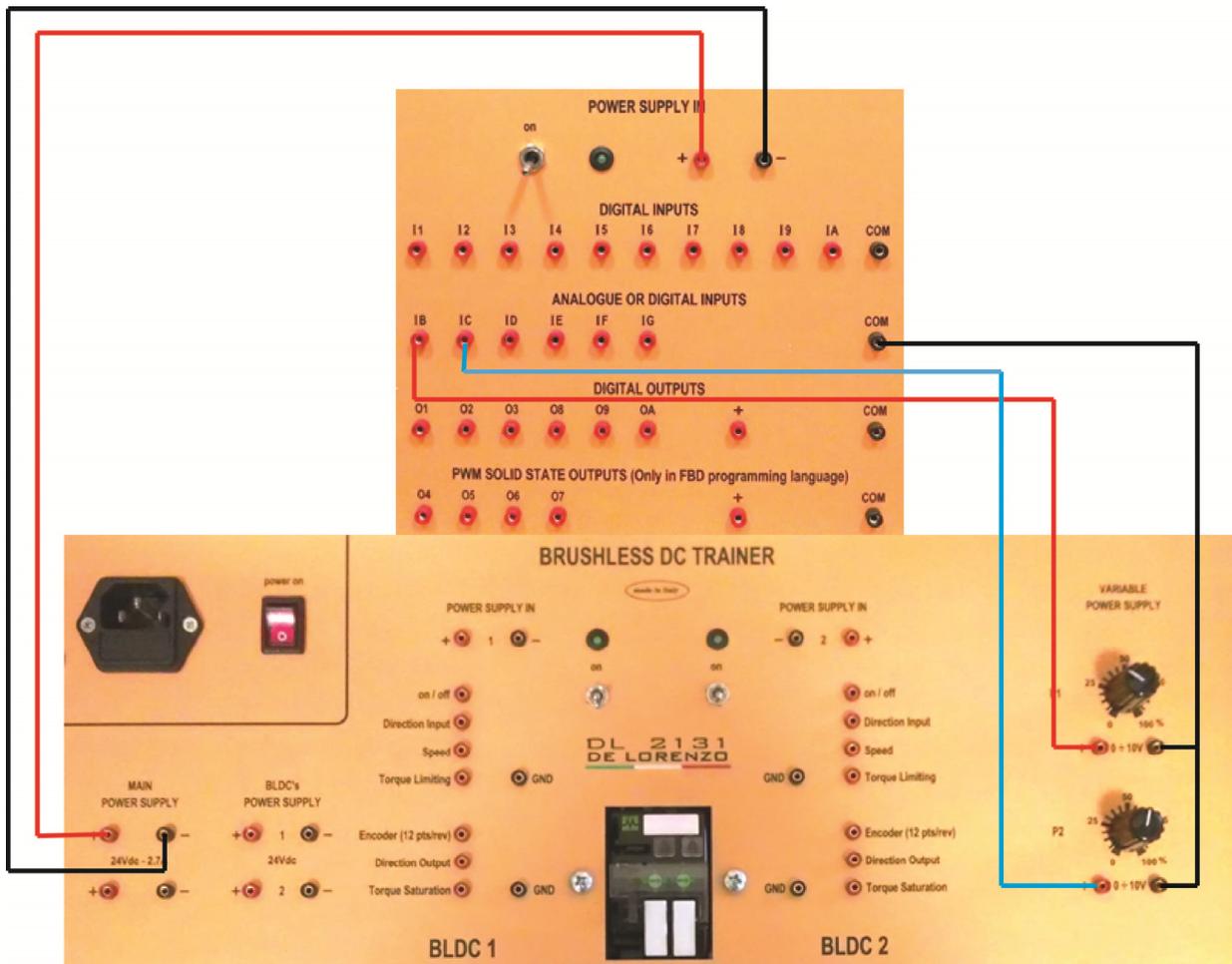
Hardware Requirements

1. Make sure you have suitable connections for the trainer.
2. Supply trainer using the AC cable.
3. Provide power to the PLC only.

Software Requirements

1. Open the Crouzet software *Millenium 3*.
2. Prepare a new project using the following data:
 - a. PLC: XD26S 24VDC ESSENTIAL – 88970162.
 - b. Modules: None.
 - c. Programming language: FBD.
3. Open File ⇨ Properties...
4. Update your authorship and comments (in Properties).
5. Set the basic cycle of the controller to 10ms (in Configuration: 5x2ms).
6. Set the WATCHDOG action to Alarm mode (in Configuration).

Connection Diagram



Development

You can use the buttons on the PLC as digital inputs to manipulate the program flow. From the programming point of view, digital inputs are only those provided in form of terminal blocks in the device, so that the buttons should not be added as a common digital input.

1. Select the HMI/COM tab  in the block Function bar.
2. Place on the program buttons A and B .

In the same way, the PLC contains a screen that can display messages, values and generally provides an output to the user. This screen should not be added as a physical output, but through a block as was done with the buttons.

1. Select again the HMI/COM tab  in the block Function bar.
2. Put on the program two TEXT blocks .

Most blocks placed on the program zone can be edited or configured by double clicking on them. Those blocks do not include a specific configuration menu, only offer a text box to post a comment.

1. Double click on each button.
2. Assign the names Pushbutton A and Pushbutton B respectively.
3. Highlight "Display the comment" in each case.

Configuration menus allow you to assign values or specific values or settings to a block; it means that the options displayed on the menu are completely dependent from the block.

1. Double click on each of the TEXT blocks.
2. Drag the date and time values (Date, Hour) to the gray grid panel.
3. Use the keyboard to type on the panel "if -A- is pressed" or "if -B- is pressed" in each case.

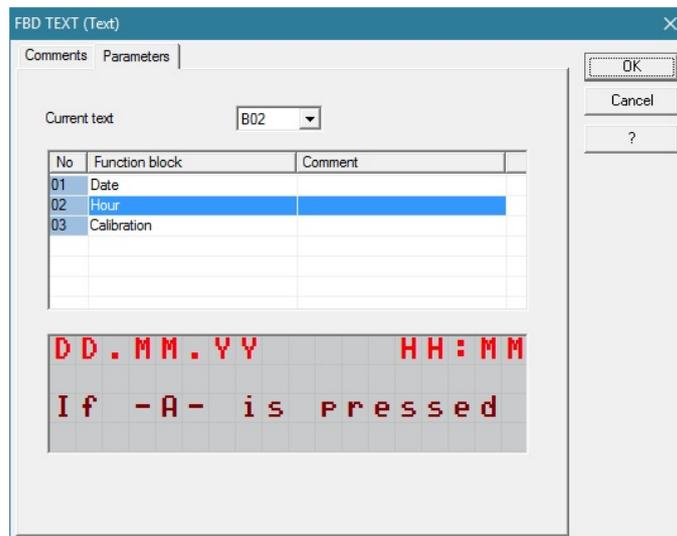


Figure 76 - TEXT Block Configuration

All blocks have inputs and outputs to create connections. If the mouse pointer remains static on any of these inputs or outputs, it will be displayed in a pop-up description of its operation. Should not fully understand the function of some of them, may press the "?" button from the main menu to access to the help where a detailed description is provided.

1. Find the Set input in each of the TEXT blocks.
2. Connect the only output of the Button A to the first input Set of the TEXT block.
3. Connect the only output of the button B to the second input Set of the TEXT block

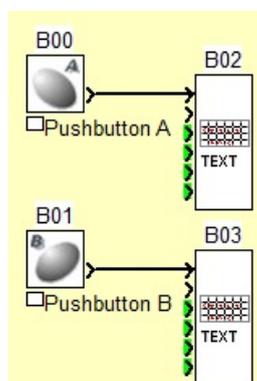


Figure 77 - Full Program

The PLC has a main screen that displays the inputs and outputs status, whenever a TEXT block is activated via its input Set, the content of the screen will change to that programmed in the block, in this way, when the Button A is pressed, the screen will display the message previously configured in the program and the same for the button B.

1. Download the program to the PLC.
2. Place the controller in RUN mode.
3. Press the buttons A and B.

It is useful to display screens on the PLC to inform the user about some event, but also it is important to show data that are useful at that time either numbers that are related to calculation results, analog values, etc.

1. Add two analog inputs IB and IC ports (variable voltage sources P1 and P2 must be physically connected to these ports).
2. Connect IB and IC to Value1 and Value2 ports of the TEXT block associated with the button A, respectively.
3. Modify the TEXT block configuration as shown in Figure 78.
 - a. Drag each of the INPUT ANA to the desired position.

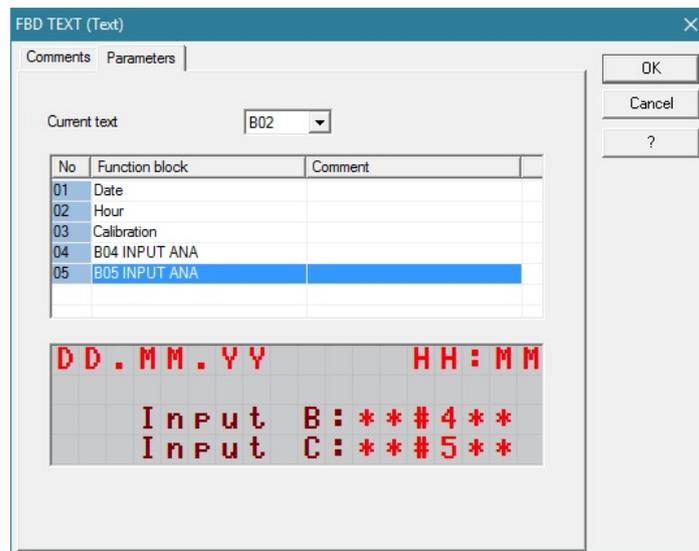


Figure 78 - Analog inputs monitoring

When the button A is pressed, the screen of the PLC displays the read data by the ADC unit (Analog to Digital Converter). When the button B is pressed the display of the PLC, in this case, show the addition and the subtraction results of the both analog inputs; the requirements are:

1. The screen should show the date and the time.
2. The screen will show the Addition and the Subtraction tags associated with each of the results.
 - a. IB + IC
 - b. IB – IC

3. Use the ADD/SUB block  from the  tag of the Function bar.
4. The compilation and download of the program must be correct.
5. Change the values by turning knobs P1 and P2 of the variable power supply.

Questions

1. The values collected in the IB and IC inputs have the same numerical limits? Why?
2. If you double click over the analog inputs you can choose between two modes of operation, what does they mean and how the result changes?
3. How could you add a numerical constant value on the program? (Hint: PROG Tab). Make and evaluate the program.
4. How could you achieve the same results using the block shown in Figure 79? make and evaluate the program.

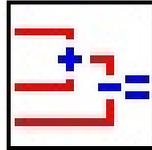


Figure 79 - Block ADD/SUB