Dedicated microcontroller for multi drives control

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Abstract: -In this paper it is described the design and implementation of a dedicated microcontroller used for multi drives control. The controller is implemented with Cubloc, a controller that is capable of processing Ladder diagrams and Basic subroutines. For the controller is presented the system block diagram, the process algorithm and some photo in different stages of work.The designed controlled is simulated in Matlab Simulink and the working model behave exactly like in real life condition.

Key-Words: dedicated controller, Matlab Simulink, Cubloc, multi drives control,

1 Introduction

In the case of large scale industrial machines, are used actions with multiple motor for the same drive. It is necessary a control after a certain program for starting and accelerating this motors.

For this situations but also in more complex cases are used certain PLC'S which have many functions, some rarely used.

In this paper is presented an alternative solution, low cost and great reliability, but also having the quality of intrinsic protection at positive safety, based on a universal graphic device which can be personalized by user (CUTUCH).

This kind of system can manage information from many bias points, this way obtaining a better general overview of the entire technological process.
This is a graphical touchscreen device, completely integral in any technical complex, device which contains a CUBLOC microcontroller. In recent years, touchscreens have found utility ever more on automation. Most touchscreen devices require an external connection with a PLC and a complex interface with it.

Fig.1. CUTOUCH

Such a controller can be done with a touchscreen controller that can manage both GUI and input / output controller at the same time, thus reducing the complexity and cost.

BASIC programming language is used for programming, which also can be used for graphics or LCD character display and processing of touchscreen coordinates. BASIC facilitates machine interface with different types of sensors, reading analog values, text processing, math, serial communications RS232 and RS485, very complicated operations performed with traditional PLCs.

Also LADDER diagrams can be used for programming. It can process both BASIC and LADDER simultaneously diagrams thanks to multitasking possibility. Memory is divided between the two

languages, user can take advantage of both. Another advantage is parallel processing of diagrams LADDER and BASIC routines.

Some technical specifications of the system are:

Microprocessor	ATMEGA 128 with dual core speed of 18.432 MHz
Memory (flash)	80 Kb
Memory (RAM)	24KB (for BASIC) + 4KB(for LADDER)
EEPROM	4KB
Processing speed	36000 instructions per second
I / O	32 entries from 24 V isolated by opt coupler
	32 outputs the output transistor to 24V
	17 inputs / outputs independently configurable TTL type
Serial	2 RS232 ports hardware independent
Analog Inputs	8-channel 10-bit configurable 0-5V or 0-10V
Analogue Outputs	-6-channel 16-bit PWM
	Output voltage 0-5V
	Output frequency between 35Hz and 1.5MHz
Counters	2 16-bit counters (up to 2 MHz)
Interrupts	4 channels
Real time clock	yes
Timer	a timer every 10 ms configurable
Memory backup	yes

(source: „Cutouch user manual" www.cubloc.com)

2 Problem Formulation

The designed control will be used for automate drive of a conveyor belt, that is driven by several motors, in this case the number of motor will be considered four. Each motor is started at a time, with a delay of 2 seconds. From every motor we have a feedback, in order to manage the optimal parameters for start, if an error occurs in one of the motors previous started, the whole system will stop. The stopping of the motors is made in the opposite direction to their start.
The schematic of the drive control system is shown in Figure 2

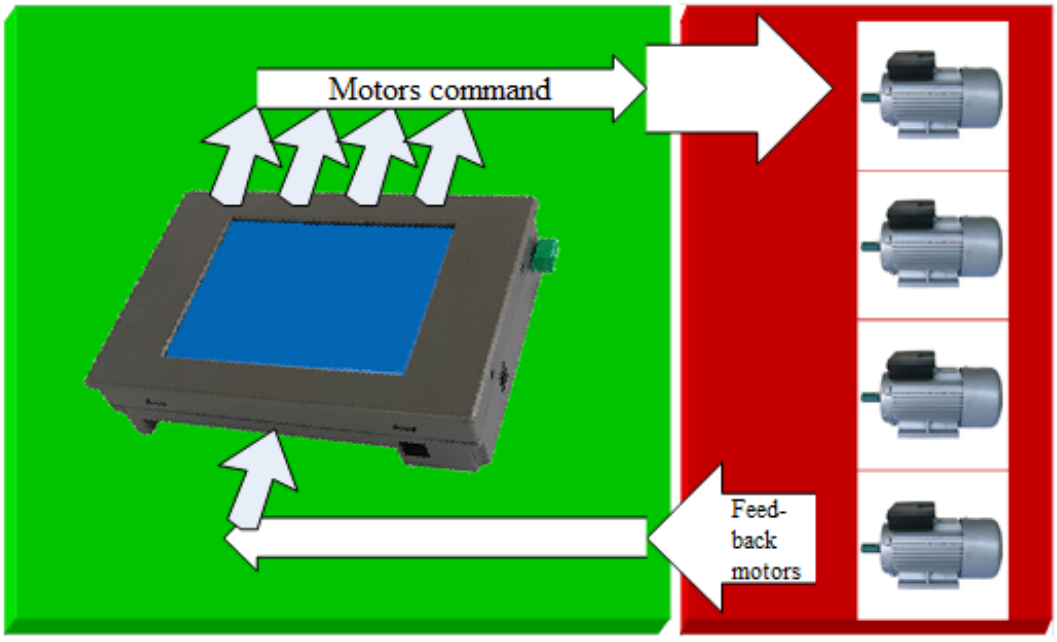

Fig.2. Control system block diagram of the drive carrier.

The entire algorithm form start to stop is shown in the figure below.

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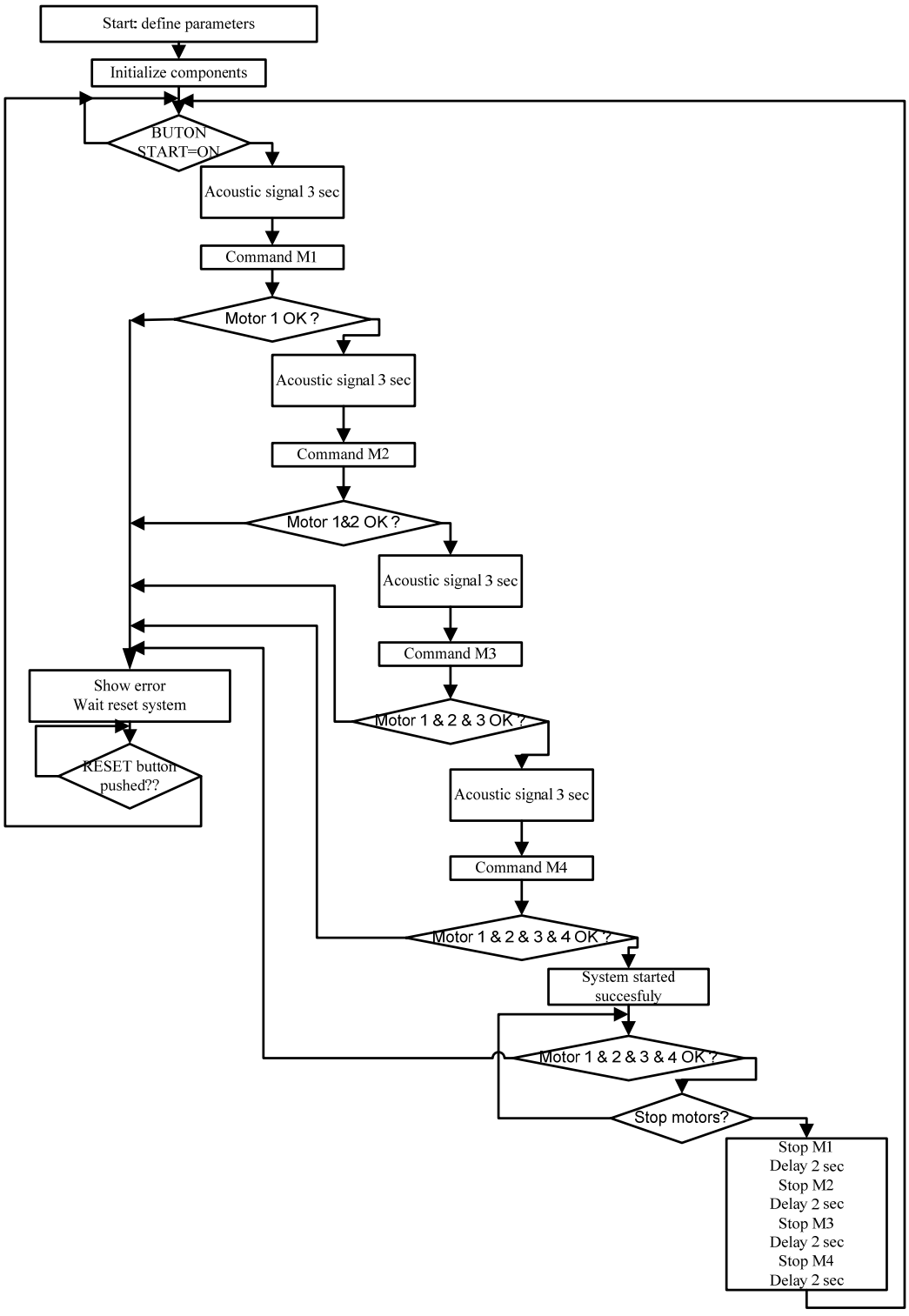

Fig.3. The process algorithm

The whole algorithm was simulated in Matlab Simulink. In the figure 4 it can be seen the simulated model and in figure 5 is a scenario with the start of all 4 motors, the stop procedure.

In the middle of the diagram can see, if a motor is started and give an error, all motors stops without delay, the entire system stop. The system can be started only after the error was eliminated.

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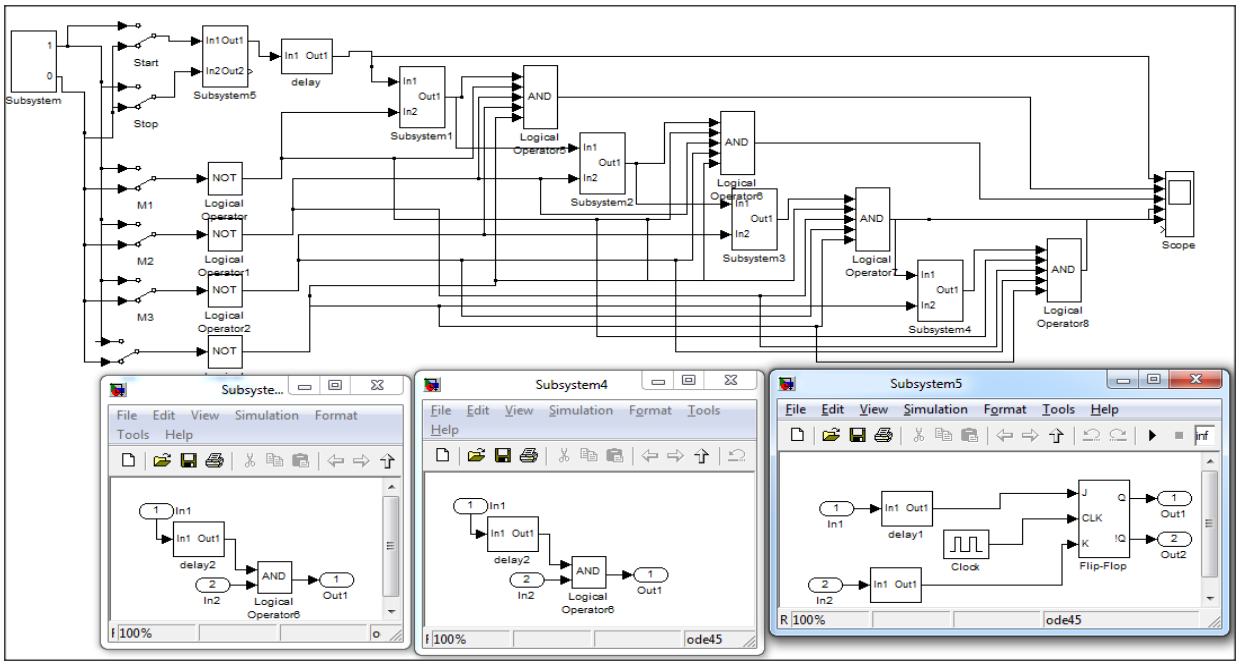

Fig.4.The Matlab Simulink model

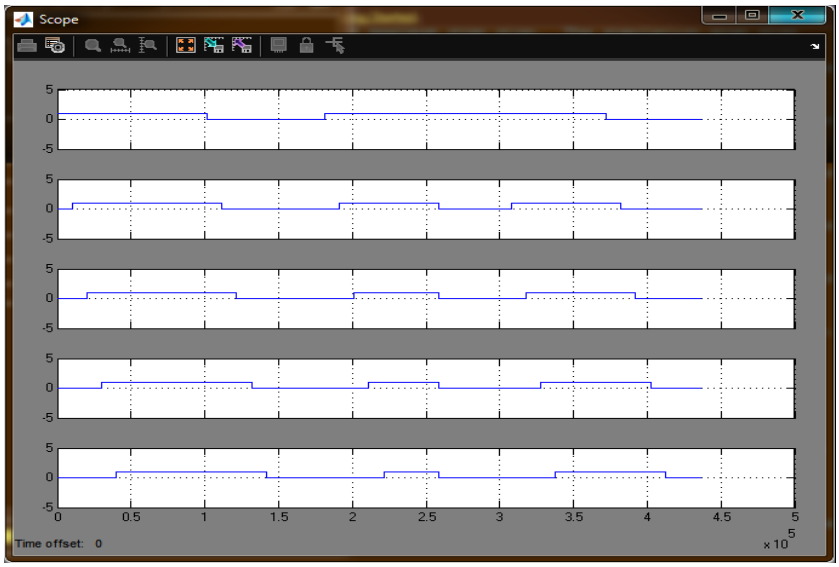

Fig.5.The Start, Stop simulated diagram

3 Problem Solution

The implemented software is easy to use, to understand and follow. In the design of the software the accent is on tracking the steps of the multi motors driving control, on the start and in time of process functioning and a graphical interface is used. Screen contains a START button, a STOP button, (they become active only after the start of the four motors and work flawless), RESET button (it is active only if an error occurs and the whole system off and bring the system to its initial state).In the right side of the screen are placed elements of system monitoring and fault diagnosis.

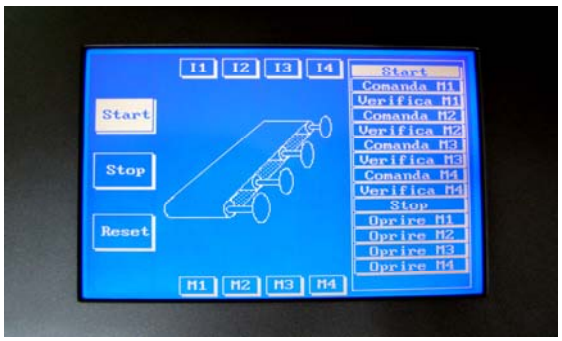

Fig.6 The home screen of the system,

The motor control is made by static relays.

When the whole process start, the only button which is active is the START button and can be pressed, other buttons are visible, but inactive. After pressing the START button, it emits an acoustic signal for 2 second and gives the command to start the motor, to check that the motor has been started, and then the algorithm will continue with the other three motors. On the right side will mark every step in the development of starting a motor, fig.7.a.

If the all motors started without any errors (fig.7.b) system continues to run until its stops normally from the STOP button, and the occurrence of an error the system will stop with an acoustic signal.

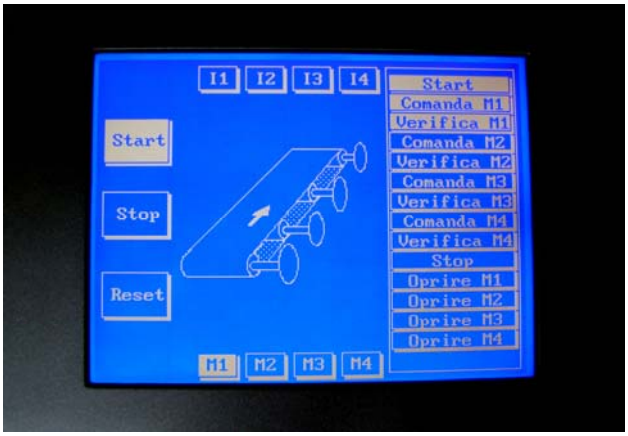

Fig.7.a) Starting first motor

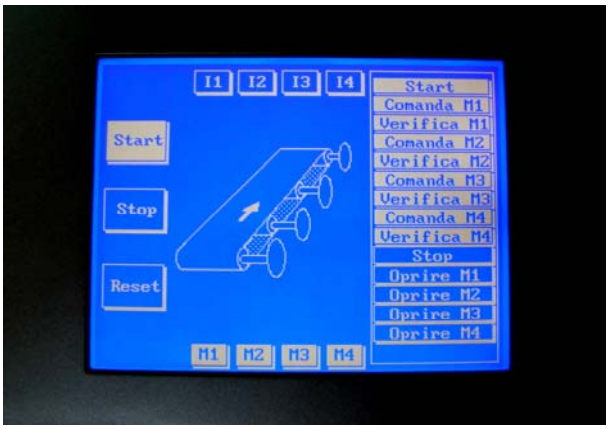

Fig.7. b) The system started successfully

After each time a motor is started, is checked if there was a malfunction at the motor or from a motor running above. Errors (fig.8.a) will result in instant stop of all motor and will display the motor which caused the error.

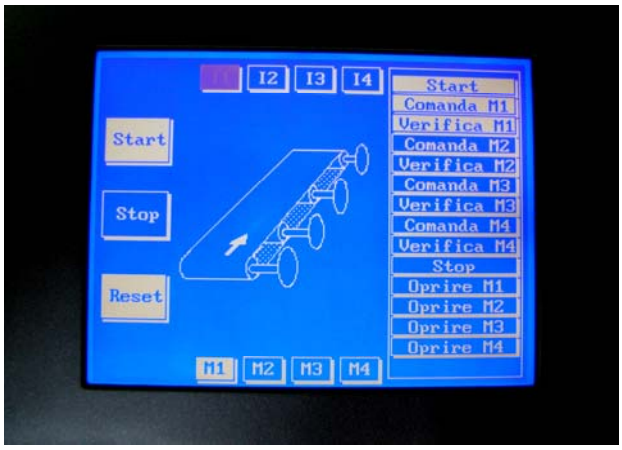

Fig.8.a) Error to the motor 1.

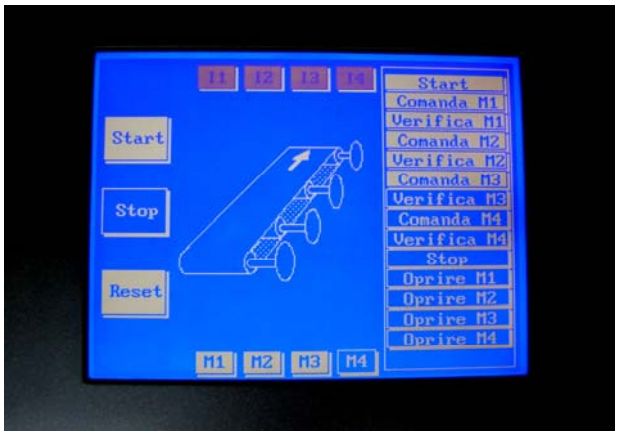

Fig.8.b) A general failure is occurred

The occurrence of an error, other than the 4 motors will be displayed by flashing the 4 blocks corresponding simultaneous motor failures (fig.8.b). The initialization of the stop procedure (it will be active at the press of the STOP button) will give the command to stop motors, with a 2 seconds pause between them, in the same order they were started (fig.9.a).

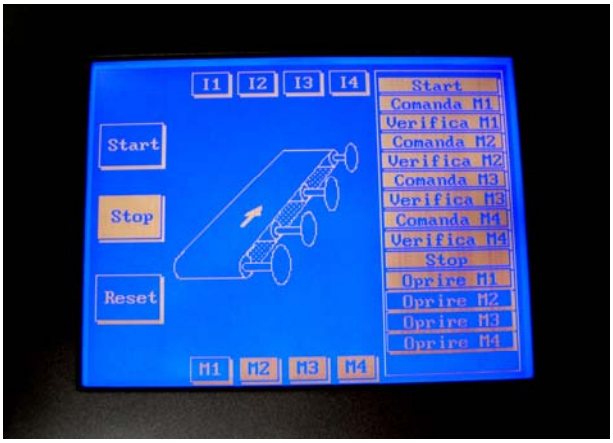

Fig.9.a) The Stop procedure;

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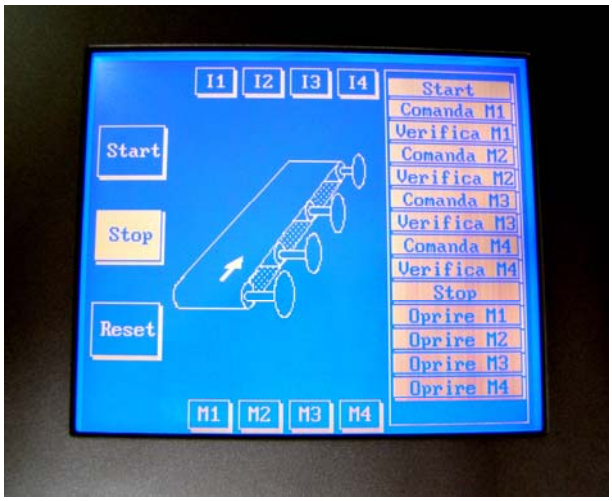

Fig.9.b)The system stops successfully

If on the stopping procedure, no error occur, the procedure will continue until a complete stop.

The restarting can be done only by the START button. It can be seen on the right side of the screen (fig.9.b) the steps in starting and stopping of the system.

The automat was programmed in Cubloc Studio programming environment, the language being a restriction of Basic (Figure 10). The procedure showed is responsible with the read of touchscreen coordinates.

```
Do
Loop
procedura:
TX1 = Getpad(2)
TY1 = Getpad(2)
If (start = 0 ) And
(avarie=0)Then
      If
Menucheck(0,TX1,TY1) = 1
Then
      If stop=1 Then
      Dim h As Integer
      For h=1 To 13
      Menureverse 13+h
      Next
      Endif
```

The fig.10 shows a subroutine

4 Conclusion

The PLC made by customizing the Cublock, offers many practical advantages. It has a large number of inputs and outputs, being used to read data from many sensors or to control multiple devices as it is the case of this application or others with multiple inputs and outputs.

Using the graphic display ensures reliable monitoring of the process making it very useful in control of sequence applications. Both the monitoring and control are made from the touchscreen display.
Friendly graphical interface, offers a comprehensive monitoring of process states.

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