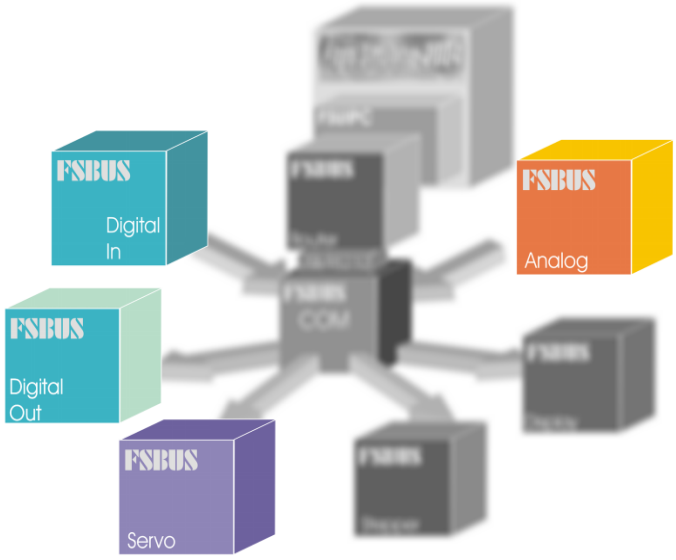
FSBUS



DO64

Beta

Impressum

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History

April 2007 Preliminary version

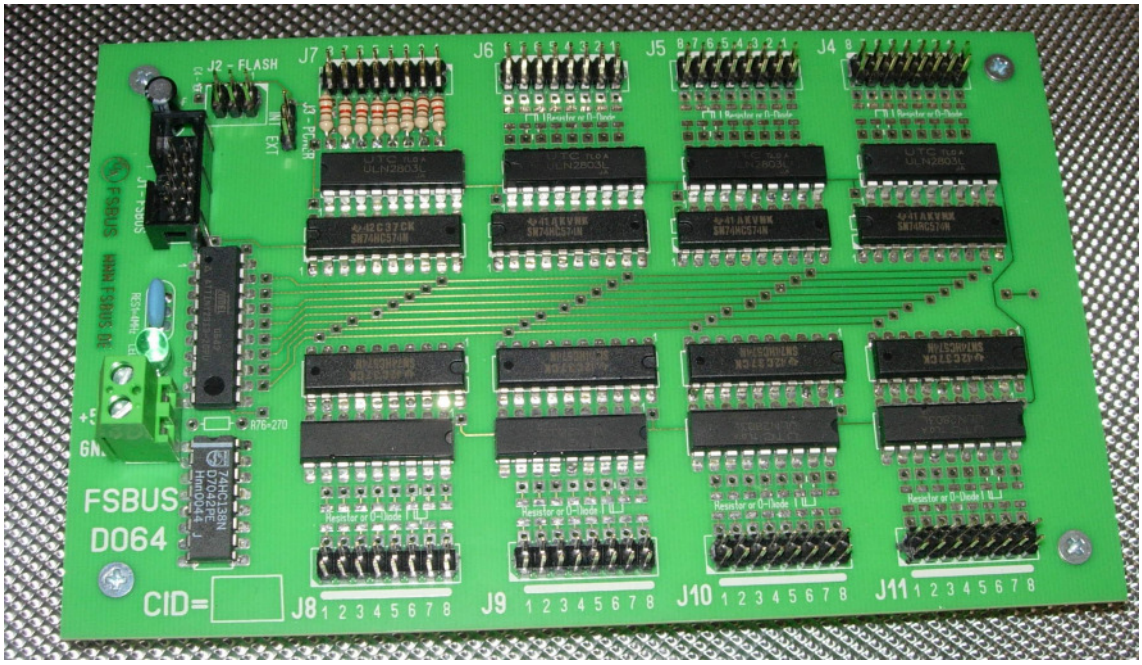
Digital Output Controller

Cockpits of big airliners have hundreds of annunciators and signal lamps. Since the FSBUS IO controller only supports up to 16 outputs, there is need for a more powerfull output controller.

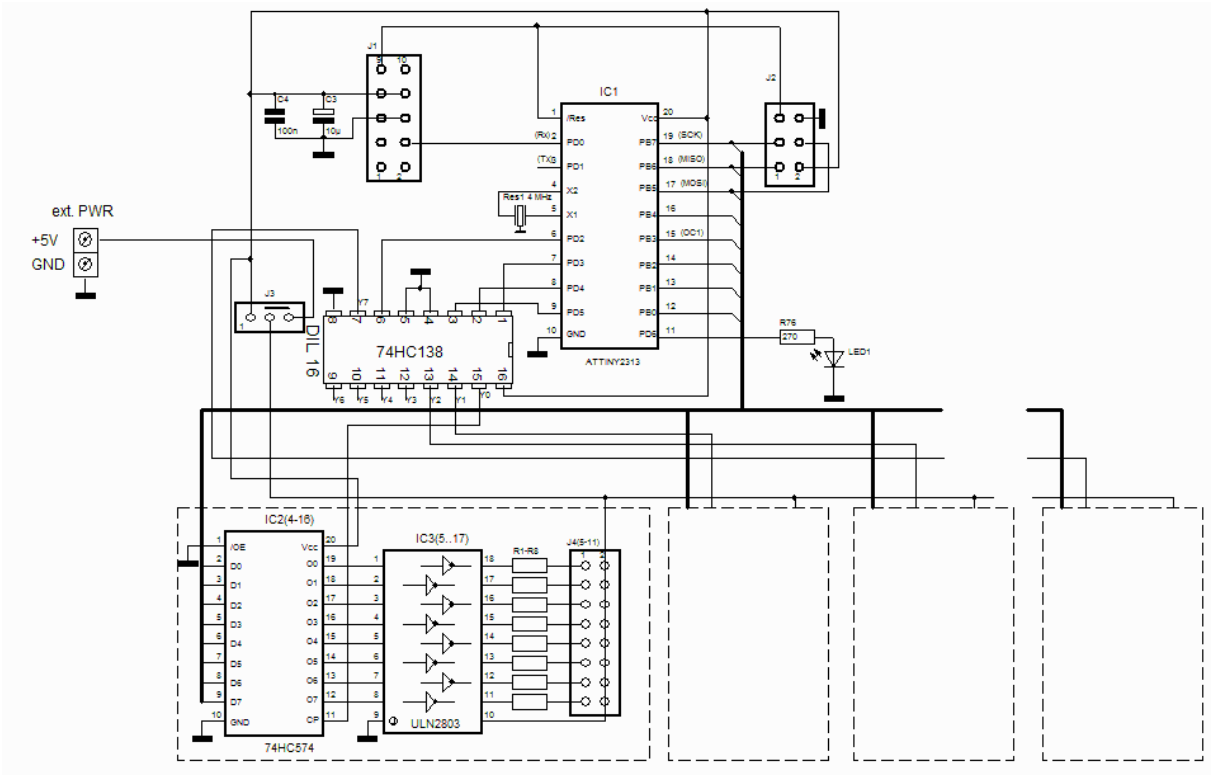
This Digital Out 64 controller supports up to 64 digital channels. It is a microcontroller driven electronic component based on ATTINY2313. The output section is driven by the ULN2803 chips to have a robust interface.

Each channel can drive up to 500 mA. But the maximum load for all 64 channels should not exceed 2A. Jumper J3 selects between the FSBUS power or an extra power supply connected to the Ext.Pwr terminal.

All lamps and LEDs are connected by 16 pin connectors. Between an output pin and the corresponding ULN driver pin, you can mount a resistor or a simple wired bridge. The value usefull for LED's is about 120 Ohm. You can calculate the value by yourself.

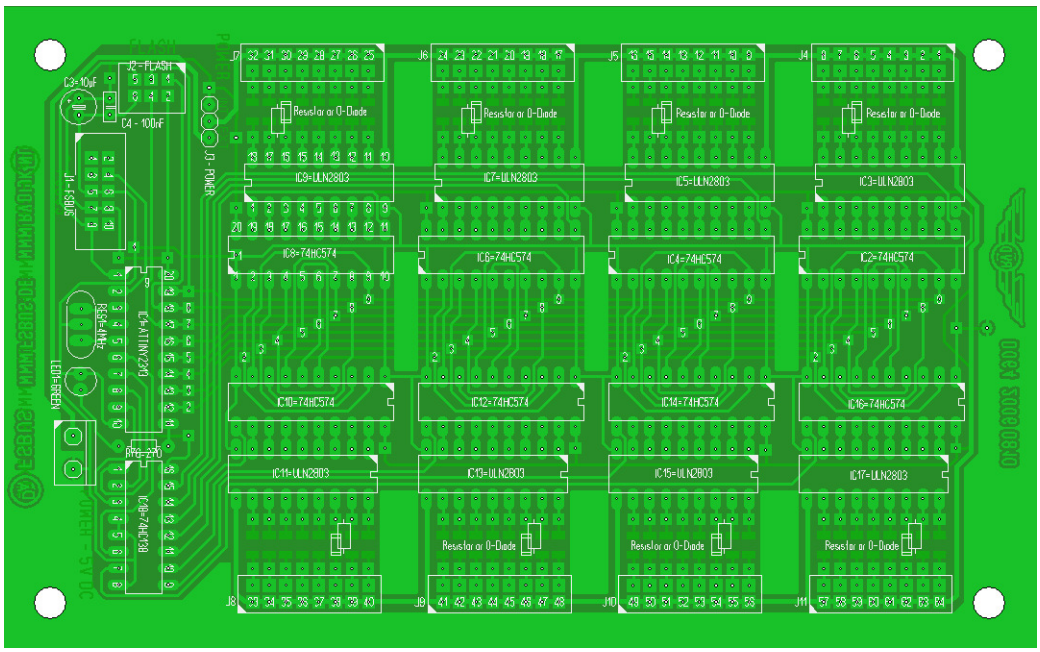


Schematic

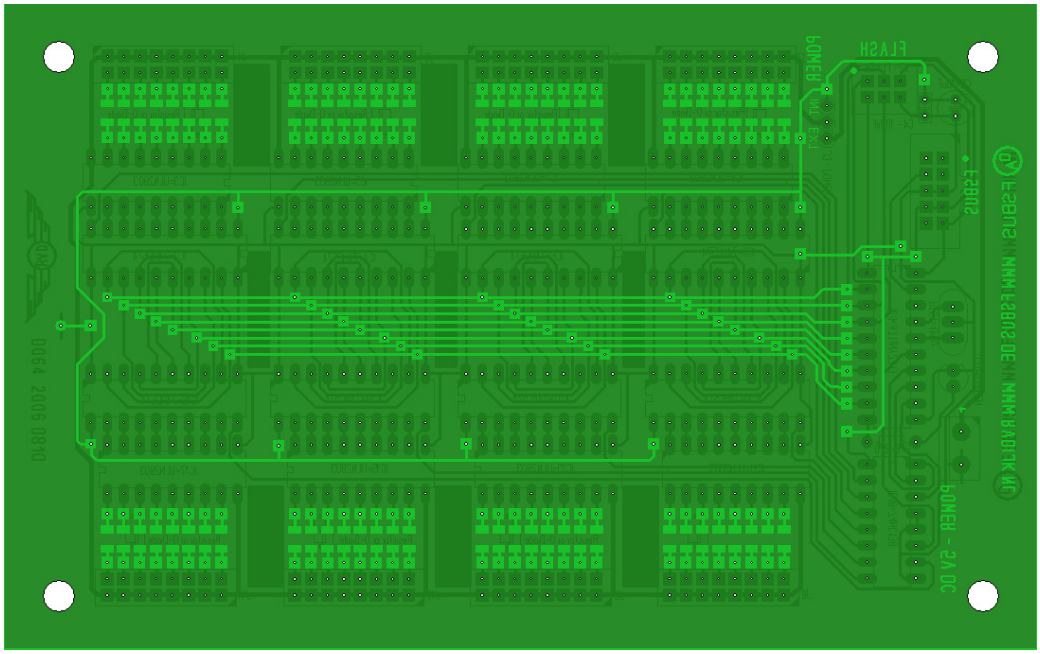

ext. PWR
+5V
GND
J1
J2
J3
C4
100n
C3
10u
IC1
ATTINY2313
Res1 4 MHz
74HC138
DIL 16
R76
270
LED1
IC2(4-16)
74HC574
IC3(5..17)
ULN2803
R1-R8
J4(5-11)

PCB

The pcb shown here is a 2 layer pcb.



IO controller component side



IO controller copper side

Microcontroller section

The heart of the IO board is a microcontroller ATTiny 2313 which is driven by a 4Mhz resonator. Connection blocks for FSBUS (10pin) and a compatible ISP adapter (6pin) as well as a few capacitors builds the core of the controller.

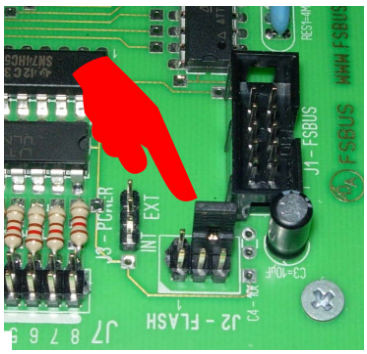
Diagnostic LED

A green led mounted on the pcb indicate several states. After power on and reset, the green LED shows the configured CID (Controller ID). The CID value consists of 2 digits. The first is shown by long blips and the second is shown as short blips.

A value of 27 for example is shown as 2 long blips and 7 short blips.

Setup CID

Any FSBUS controller have a CID to identify it in the network.
The value from 1 to 30 can be burned into the ATTINY EEPROM with the Fsbus CDK. (select [Setup] – [FSBUS setup]).
Usually this is done once in the controllers lifetime. To prevent accidently unwanted changes of the CID, you need to set a jumper from pin 4 to 6 on the ISP connector J2.



This jumper enables the setup of the controller. After setup you must remove this jumper again.

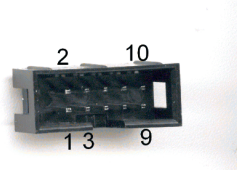
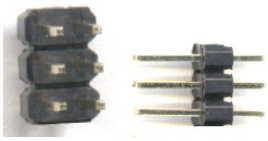
Reset

A reset is caused by different events.

- Power On
- Low on FSBUS pin 9
- Software command 128
- Configuration commands

In any case, the initialization function rereads the internal EEPROM and resets the internal states.

Partlist

IC1	ATTINY2313		ATMEL microcontroller, 20DIP package, 4MHz
IC2	74HC138		Multiplexer for the LED interface.
IC3, IC4	ULN2803		Driver containing 8 darlingtons for a maximum of 500mA per bit.
LED1	5mm LED green		
Q1	Resonator 4MHz		
J1	10 pin		
J2	6 pin terminal block		

Cables

FSBUS modules require some cables and connectors

16 pin ribbon cable is used to connect controller pcb to LED's.

10 pin ribbon cable is used to connect controller pcb to FSBUS COM pcb for ordinary use. This is also called FSBUS cable.

6 pin ribbon cable is used to connect controller pcb to FSBUS COM pcb for ISP flash mode. This is also called ISP cable.

Software

The software for the microcontroller is available in a compiled, linked and prepared format to flash into the ATTINY2313. The filename is io64.hex.
The frequency of resonator is also very important and may not differ from 4MHz.

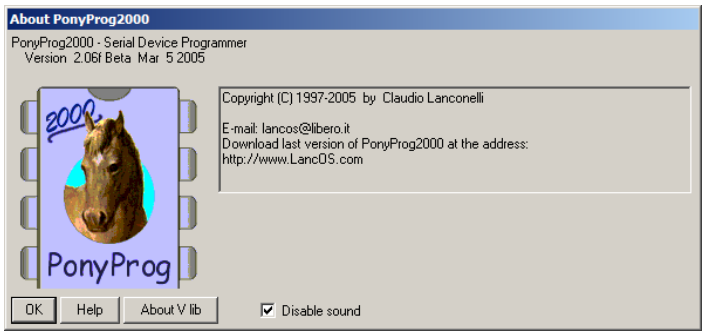
The software starts after reset, caused by power, hardware, or by command. It reads setup values from the internal EEPROM. After the init phase is passed, the green Led will show the configured CID.

Flash File

You may download the file “io64.hex” from the internet site www.fsbus.de. This file contains the binary for the ATTINY2313 program memory. It is in Intel standard hex format and can be flashed by commercial products or with the free “PonyProg2000” by Claudio Lanconeli.

Step by Step

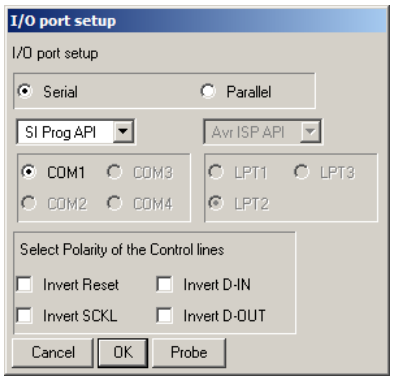
1



The COM interface board contains flash hardware to support PonyProg software.

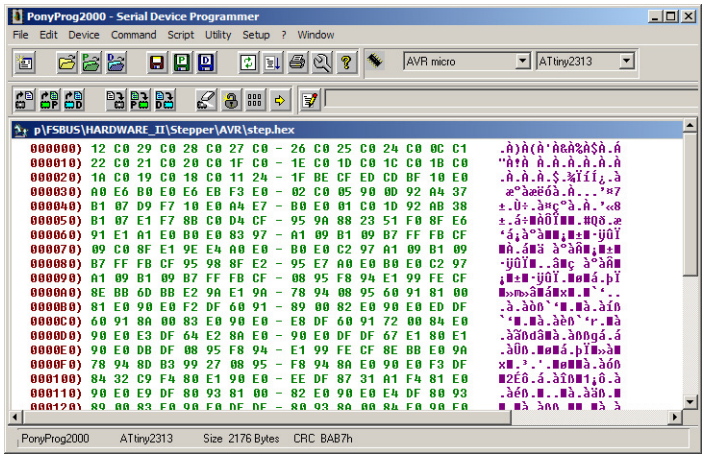
PonyProg2000 version 2.06 or higher is recommended.

2



The [Setup] [Interface Setup] dialog box must be set according to the left graphic.

3

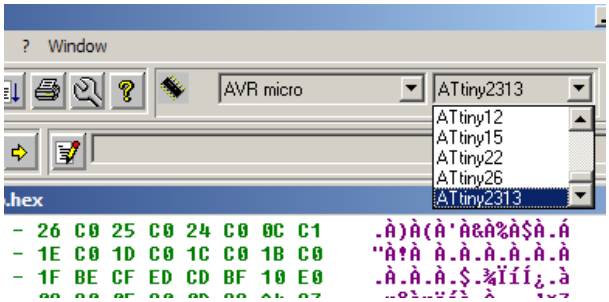


Open the program flash file “do64.hex”.

4

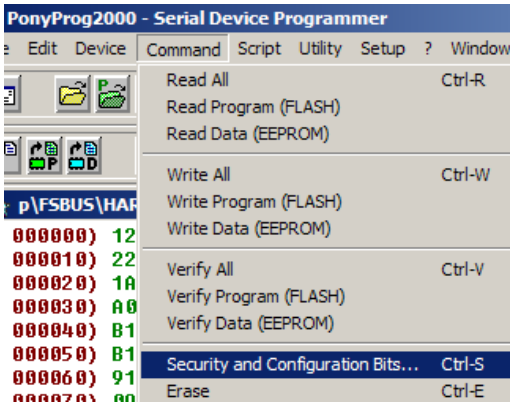
Remove the 10-pin FSBUS cable and connect the 6-pin ISP cable from COM board to the stepper controller.

5



Select the correct processor type in PonyProg.

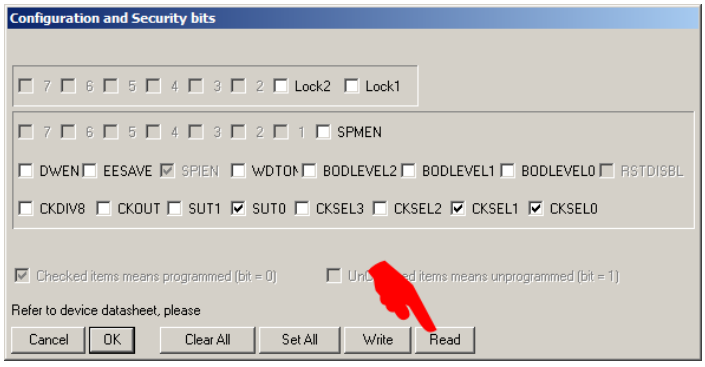
6



At the very first time, you must setup the security and configuration bits.

Wrong settings may result in an unusable device.

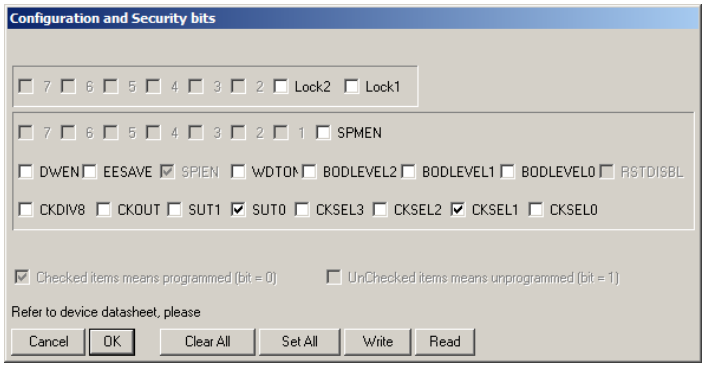
7



You get the current settings from your ATTINY2313 with the Read button.

If you get an error, your controller is not working. Don't continue, try to find the trouble before proceeding.

8

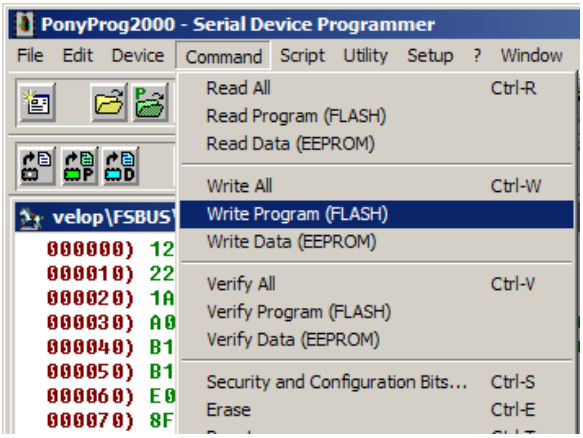


Set the checkboxes according to the left picture and press the "Write" button.

Be carefull! Wrong settings may make the device unusable.

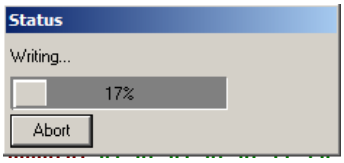
If you get any error at this step, don't proceed and do troubleshooting.

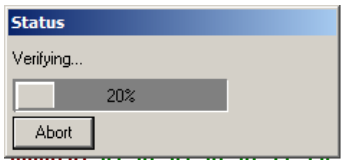
9



Now it's time to write (flash) the program into the microcontroller.

10



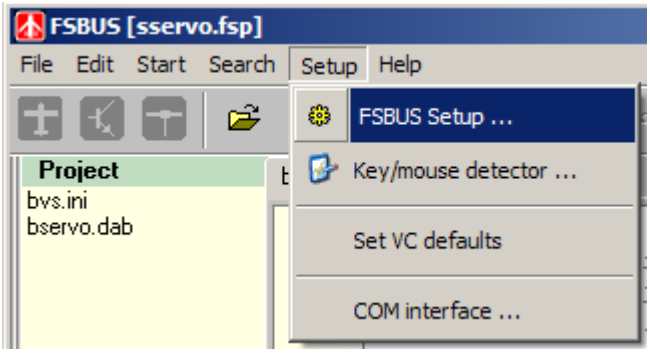


You will get 3 messages about the progress of the flash mode.

11

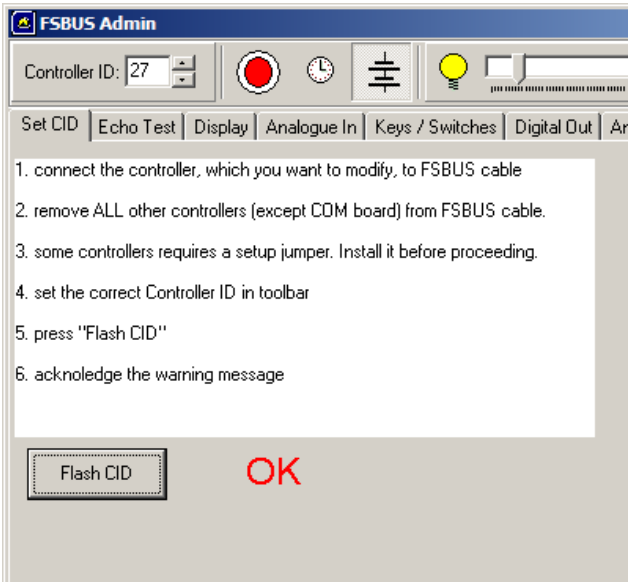
So far, the microcontroller is ready to run.
Remove the 6-pin ISP cable and connect the 10-pin fsbus cable from COM to the new controller.

12



Any of the FSBUS controller have a CID to identify them in the network.
The value from 1 to 30 can be burned into the ATTINY EEPROM with by select [Setup] – [FSBUS setup] in Fsbus CDK.
Set a jumper from pin 4 to 6 on the ISP connector J2.
This jumper enables the setup of the controller.

13



Change to Set CID tab and set the desired controller ID (in this example CID 27 is chosen).

Follow the guidelines in textbox. After pressing FlashCID, the red counter counts 1,2,3 OK and the according commands are sent to the controller.

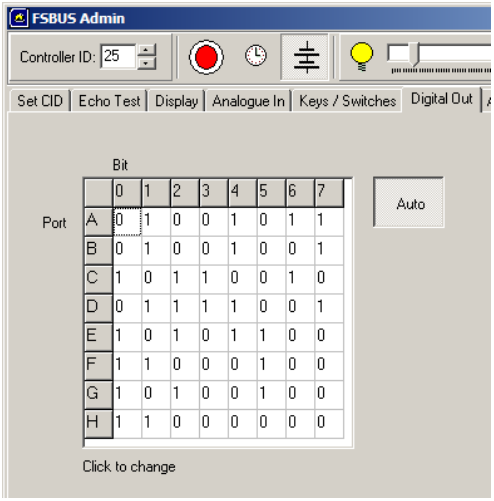
After this procedure, the new CID is stored in EEPROM, the controller resets and shows its new CID.

Don't forget to remove the setup jumper.

Testing digital out

After the controller is flashed with the correct firmware and the CID is set to the appropriate value, you must set a jumper on J3 from 1 to 2. This connects the 5V from FSBUS to drive the output.

Then connect some LED's to the controller. You can test the LED's with fsadmin.



If you click on one of the bit cells, it will toggle between 0 and 1. The corresponding LED will follow the on/off state.

If you click "Auto", all values change randomly.