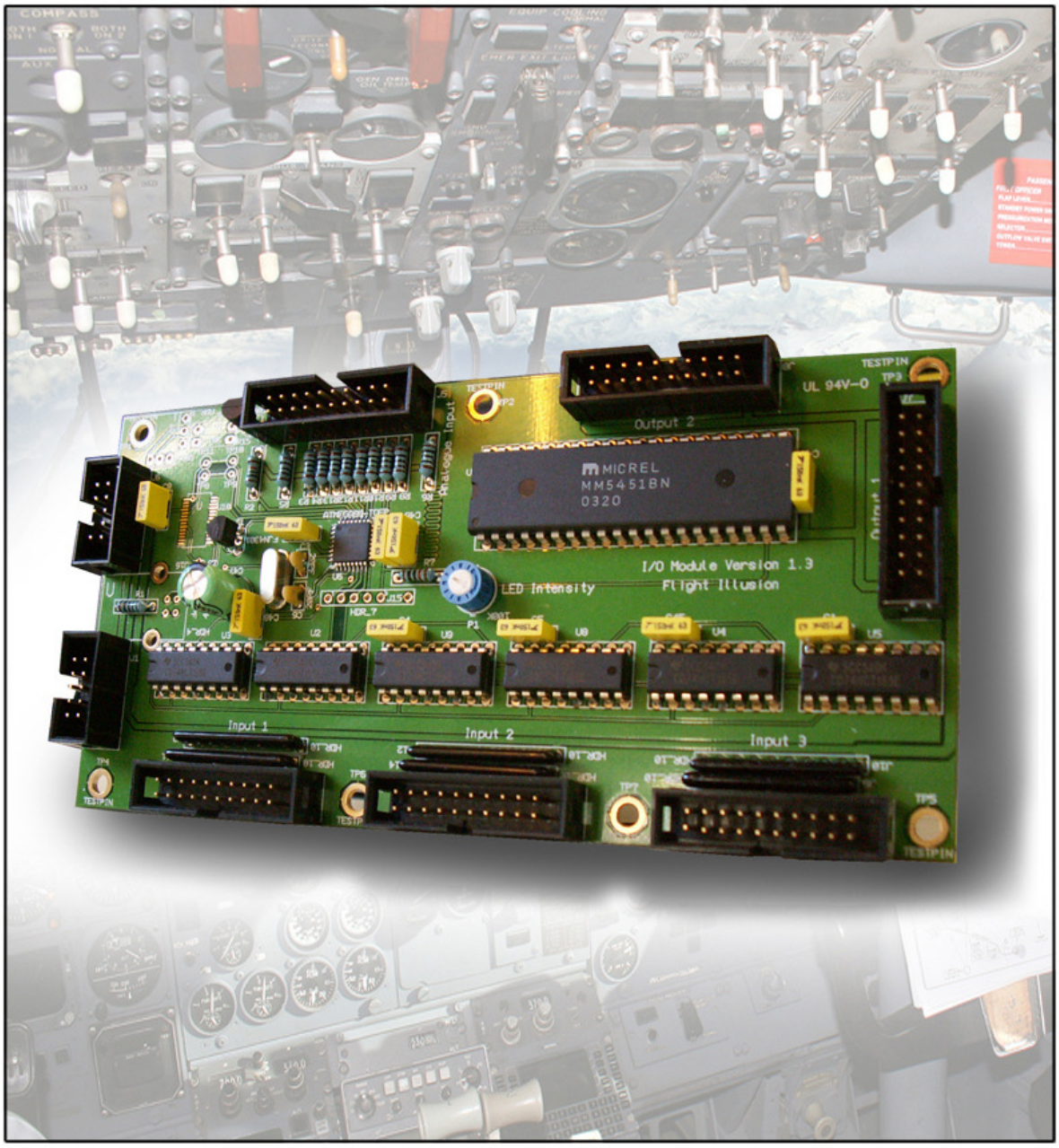
USER GUIDE

INPUT/OUTPUT MODULE ***GSA010***



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English

FLIGHT ILLUSION

Contents:

The Flight Illusion Input/Output module

Introduction:

The Flight Illusion I/O module offers the possibility to connect switches, potentiometers and LED's together to X-Plane or Microsoft Flight simulator in a relative easy way. The Flight Illusion team tried to build an interface card that enables users to realise a cockpit project or panel easy and quickly.

Contrary to many other interface solutions, the Flight Illusion I/O module is especially designed for working with Microsoft Flight simulator or X-Plane. Due to the many possibilities, the software for the I/O module will be continued in development and functionality will be extended. Most functions however can be defined "from scratch" by the user itself as all functions are user definable.

The I/O module is part of the Flight Illusion G-Step range. This means the I/O module can be connected to the same 'bus' that connects other Flight Illusion units (see fig.1) The I/O module has, just like all other units from Flight Illusion, its own address (ID number)
There is also a USB version. This version connects to the USB interface and needs no separate power. It can run stand alone without the need for a Central Interface Module.
The USB version is much faster as it doesn't share the communication bandwidth with other bus devices.

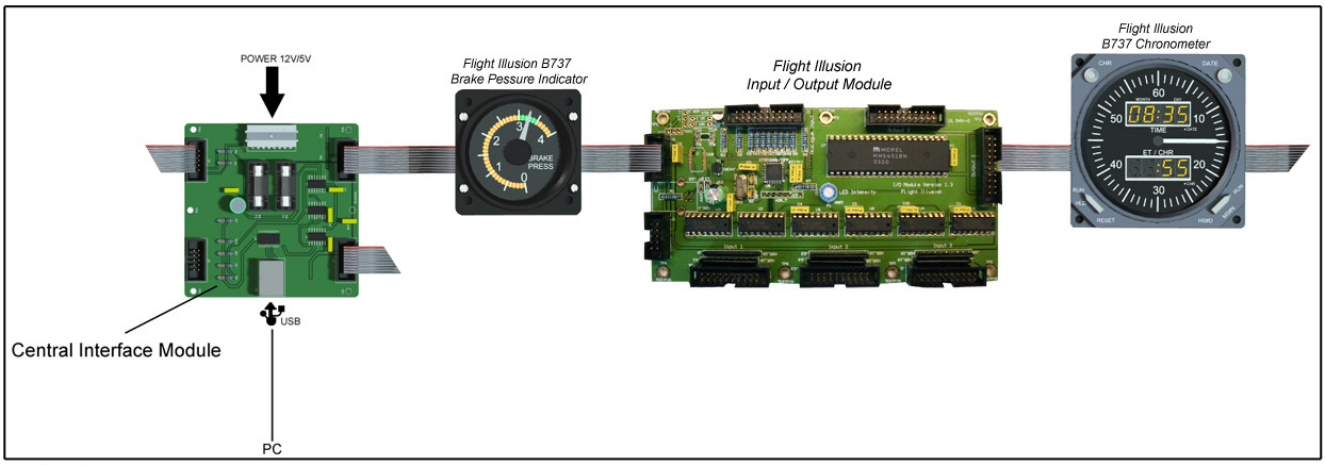


Fig. 1

To make the I/O module work you need to connect it to our Central Interface Module (GSA-055) This module can connect up to 64 other Flight Illusion units such as e.g. a radio unit or an altimeter. For more information you can download our general users manual from our website: www.flightillusion.com

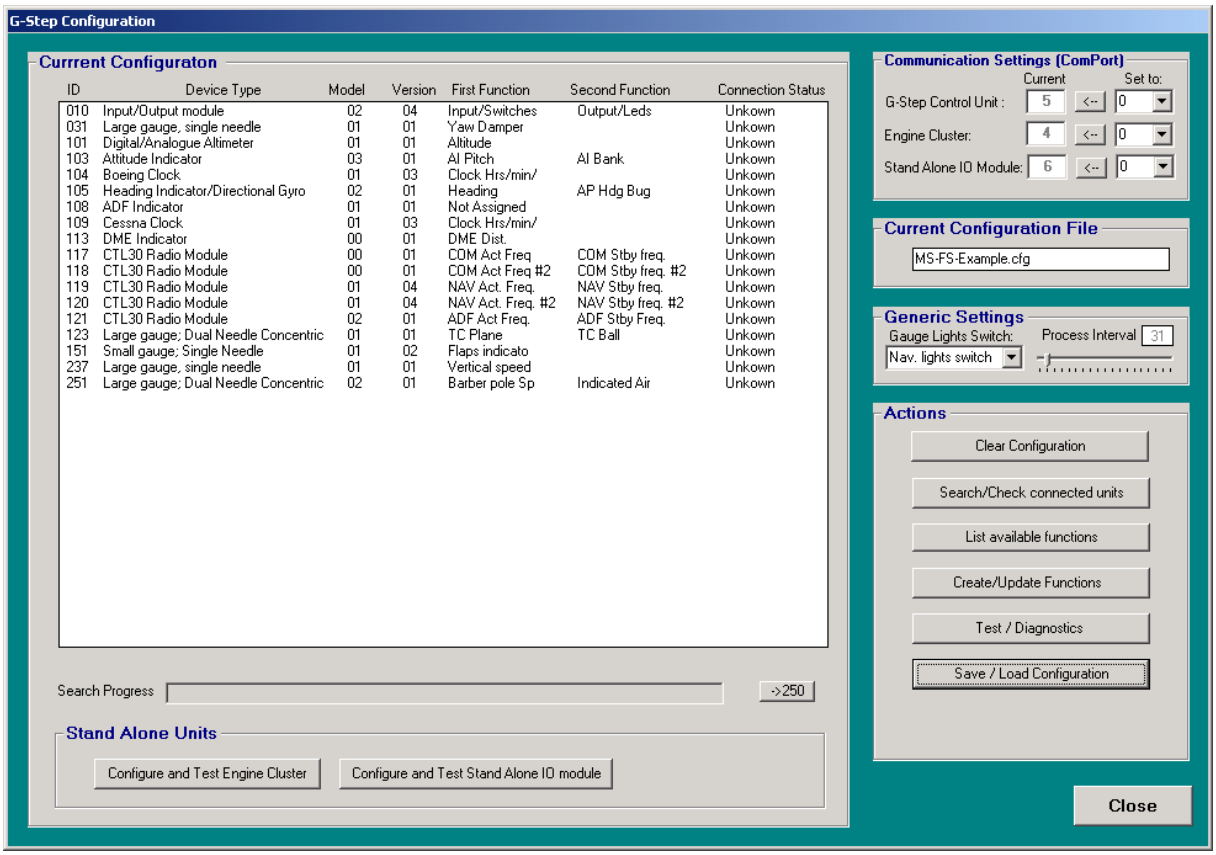
The USB version directly connects to USB and has its own integrated interface module.

Capacity of the Flight Illusion I/O module:

Connect up to 48 digital inputs (switches)
Connect up to 8 analogue inputs (potentiometers)
Connect up to 32 LED outputs (direct without a resistor)
Connect up to 2 Master LEDs (for master annunciator)

From version 7 on, the control software allows the conection of a Stand Alone IO module, eventually in combination with one or more BUS type IO modules.
Advantage of the stand alone IO module is the very fast reaction time of switches and other connected controls. As it is not sharing the interface with other gauges, it can run with an update speed of more than 50 updates per second.

The stand alone IO module will "pop-up" by giving it a Communication Port Number in the main configuration window:



In the box of Stand Alone units, the button "Configure and Test Stand Alone IO module" will appear. The configuration of switches, Potentiometers and Leds is equal to the configuration of the BUS type IO module.

1. Hardware

The Flight Illusion I/O module has several connectors. Two connectors for interconnecting to the Central Interface Module/Bus, three connectors for digital inputs (switches), a connector for 8 analogue inputs (potentiometers) and two connectors for using digital outputs (LED) See

fig.2 for the location of the connectors. In figure 3 you can see a schematic representation of the I/O module. In case you have a USB version, the two bus connectors will not be mounted. They are replaced by one USB connector.

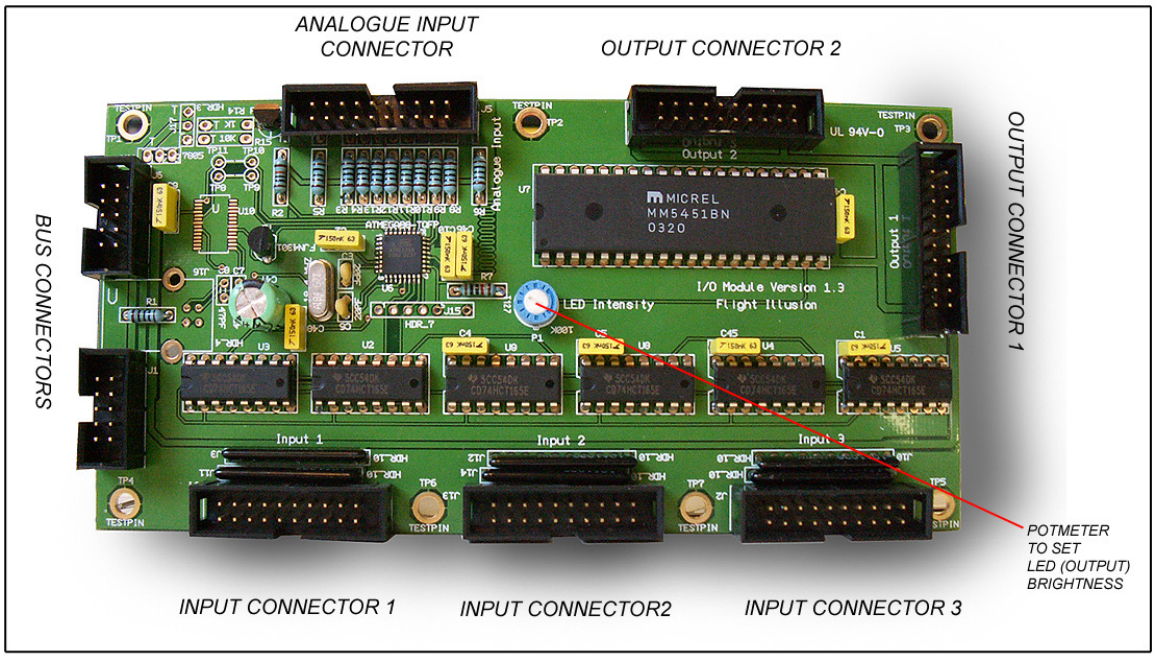


Fig 2.

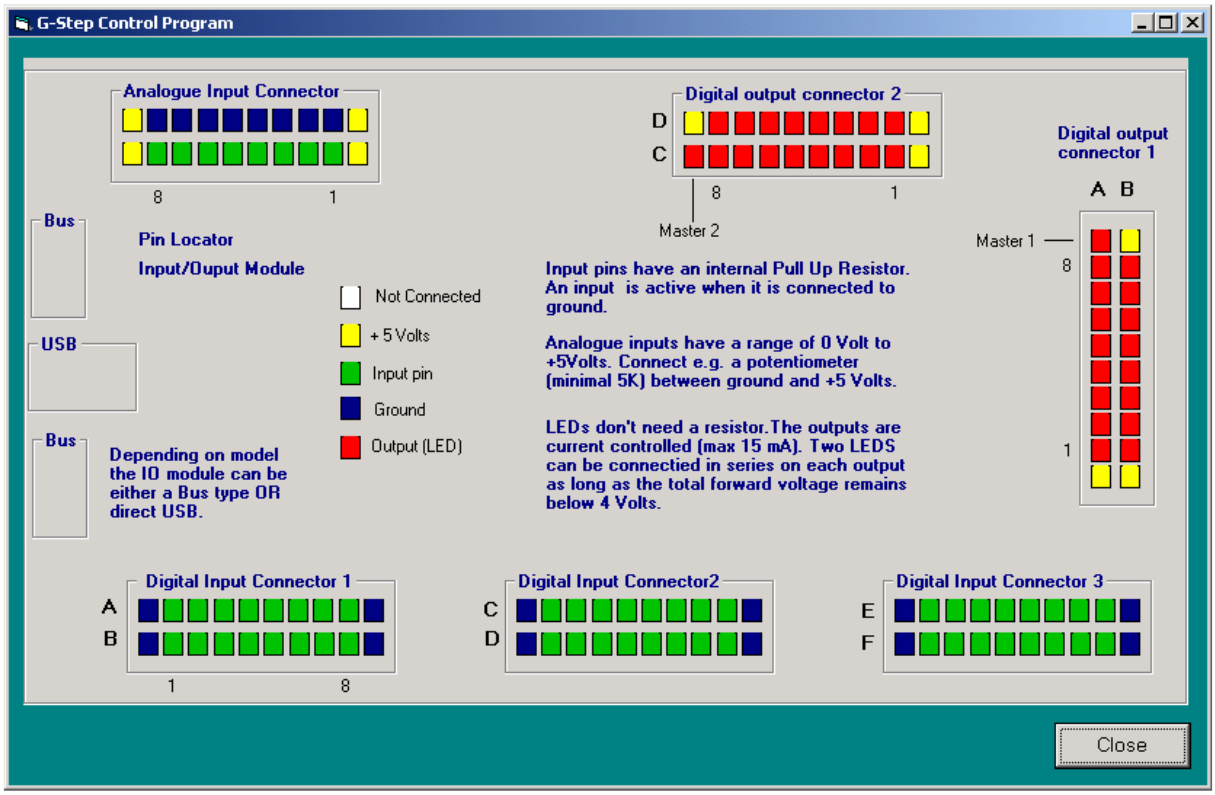


Fig 3. The Card layout

2. *Connecting Inputs & Outputs (e.g. a switch)*

As can be seen on figure 3 every connector has a certain sequence of pins. A connection will be accomplished by connecting a 'ground' pin (coloured blue on the schedule) with one of the 'input' pins (coloured green on the schedule) The switch number is determined by the input pin it is connected to (A1 to A8, B1 to B8, C1 to C8, D1 to D8, E1 to E8 or F1 to F8)

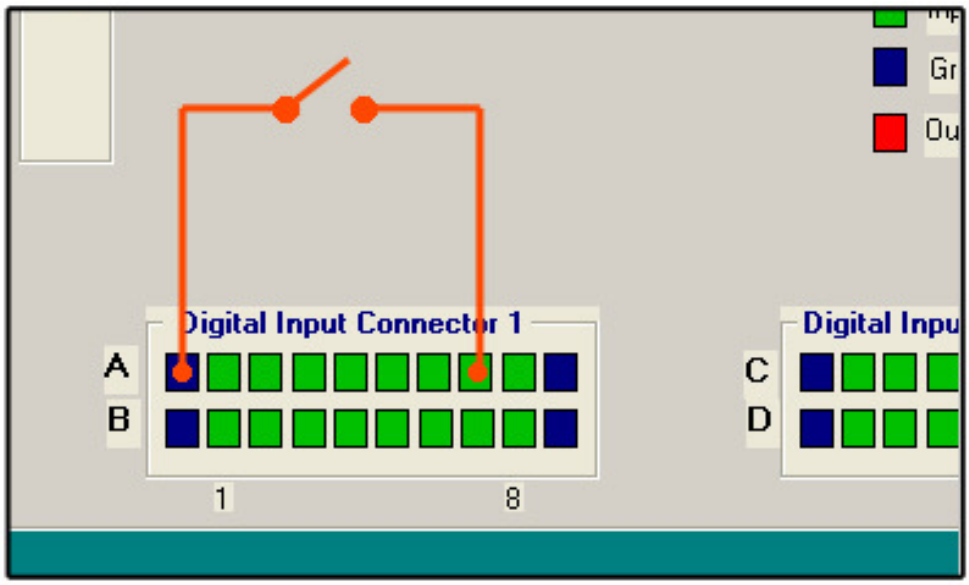


Fig. 4

In figure 4 above is as an example switch number **A7** connected. Connecting wires to the I/O module can be done by using e.g. standard 20 Pin flatcable connectors. Flight Illusion also has special ´Extenders boards´ for connecting inputs and outputs in a easy way (see figure 5). This enables a more simple wiring and no need for soldering.

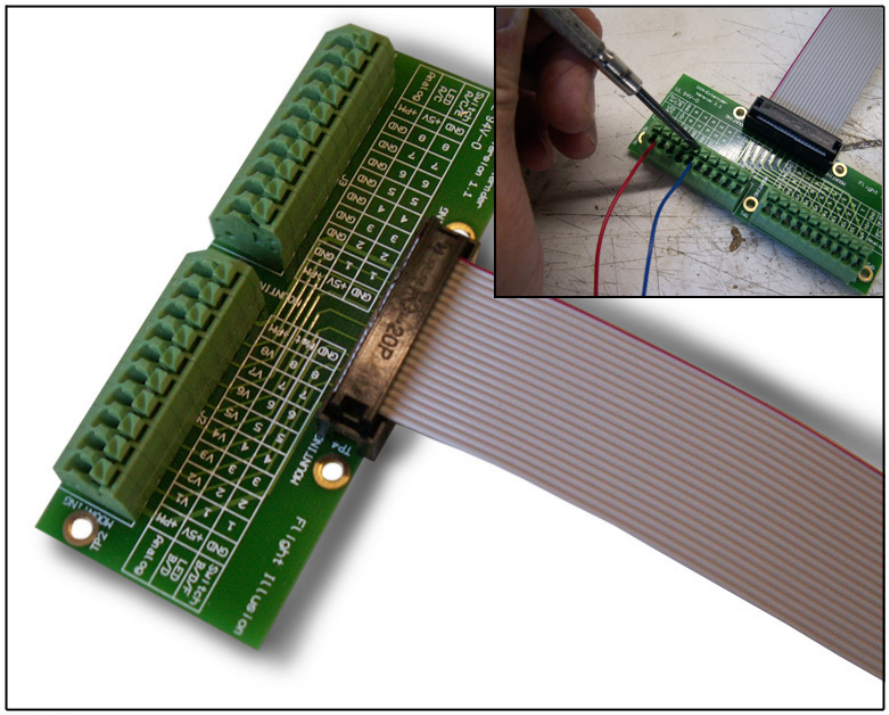


Fig. 5
Flight Illusion Extender board

3. Software

After connecting the I/O module to the Central Interface Module the Flight Illusion control program can be started. For more information about our control program and connecting units in general you can download our general users manual from our website www.flightillusion.com.

In case it is a Bus type, the IO module will show up after searching for connected units in the Configuration screen.
A USB I/O module will appear after assigning a Communication port to it.. After clicking on the I/O module with the mouse the main configuration screen of the I/O module will appear. For an overview see figure 6 below.

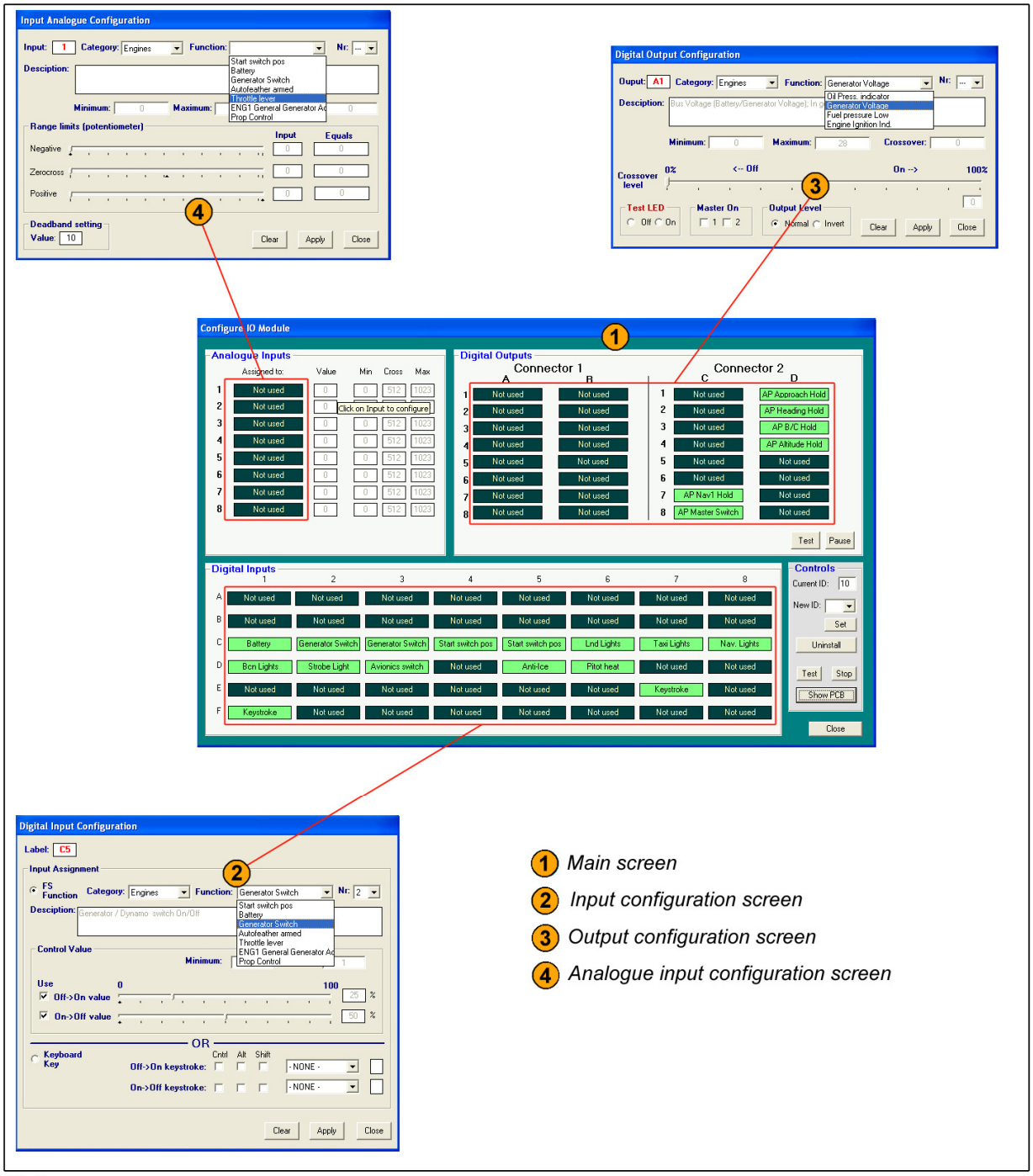


Fig. 6

4. Testing connected Inputs/Outputs

After connecting inputs or outputs in the correct way to the I/O module or Extender board you can click on the test button (in the right corner below in the controls section, see figure 7 below) As a connected input is activated (e.g. pressing or toggling a switch) the corresponding field will light up. A switch that is connected and configured will light up green, and when pressed the corresponding field will turn red. Inputs that are connected but not yet configured will light up grey when pressed, for example switch number E8 in the figure below (fig. 7)

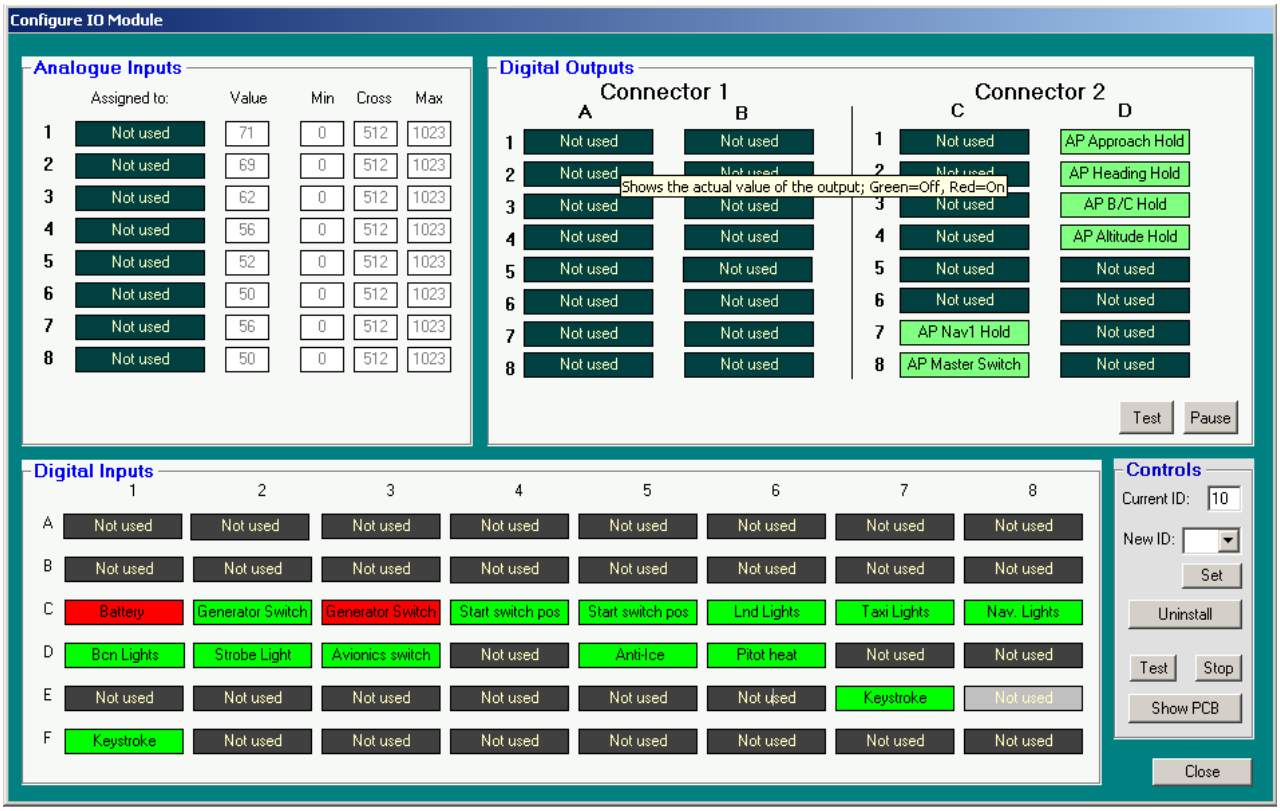

Configure IO Module
Analogue Inputs
Assigned to:
Value
Min
Cross
Max
Digital Outputs
Connector 1
Connector 2
A
B
C
D
Shows the actual value of the output; Green=Off, Red=On
AP Approach Hold
AP Heading Hold
AP B/C Hold
AP Altitude Hold
AP Nav1 Hold
AP Master Switch
Test
Pause
Digital Inputs
Battery
Generator Switch
Start switch pos
Lnd Lights
Taxi Lights
Nav. Lights
Bcn Lights
Strobe Light
Avionics switch
Anti-Ice
Pitot heat
Keystroke
Controls
Current ID:
New ID:
Set
Uninstall
Test
Stop
Show PCB
Close

Fig. 7

5. *Connecting Inputs & Outputs (e.g. a switch)*

After clicking on a connected switch the configuration menu for switches will open and a function can be assigned to the input (see figure 8 below)

There are two main options for assigning a function to a digital input. The first option is to assign a FS function by clicking on the FS Function option and select a Category and Function using the pull down menus in that part of the screen. After choosing a category (e.g. Cockpit) you can select a function - in the second pull down menu- that in belong to that Category. For advanced users it is also possible to add functions theirselfs, but that subject is described in this maual.

In case the main mode is “Assign a FS function to a switch, you have two possibilities. In the Control Value section in the middle of the screen you have again two choises. Either you set the function “Absolute” by setting it to one or two values depending on the switch position, or you increment or decrement a function by a predefined value.

The Absolute option will set the function to two predifined values. Depending on the selected switch type it will follow the On/Off position of the connected switch. With the check boxes you can select which switch action must be used. With the 0 to 100 % slider you can define a certain percentage to be send to Flight Simulator: some functions like e.g. Flaps use a percentage in Flight Simulator, for instance position 1 equals a Flap position of 20 %. This can be used with switches that have multiple positions.

However in case the switch type Momentary/ Toggle is selected, it will go On/Off and Offf/On alternately per switch operation. This switch type is mostly used for Pushbuttons, that will switch on/off a function alternately.

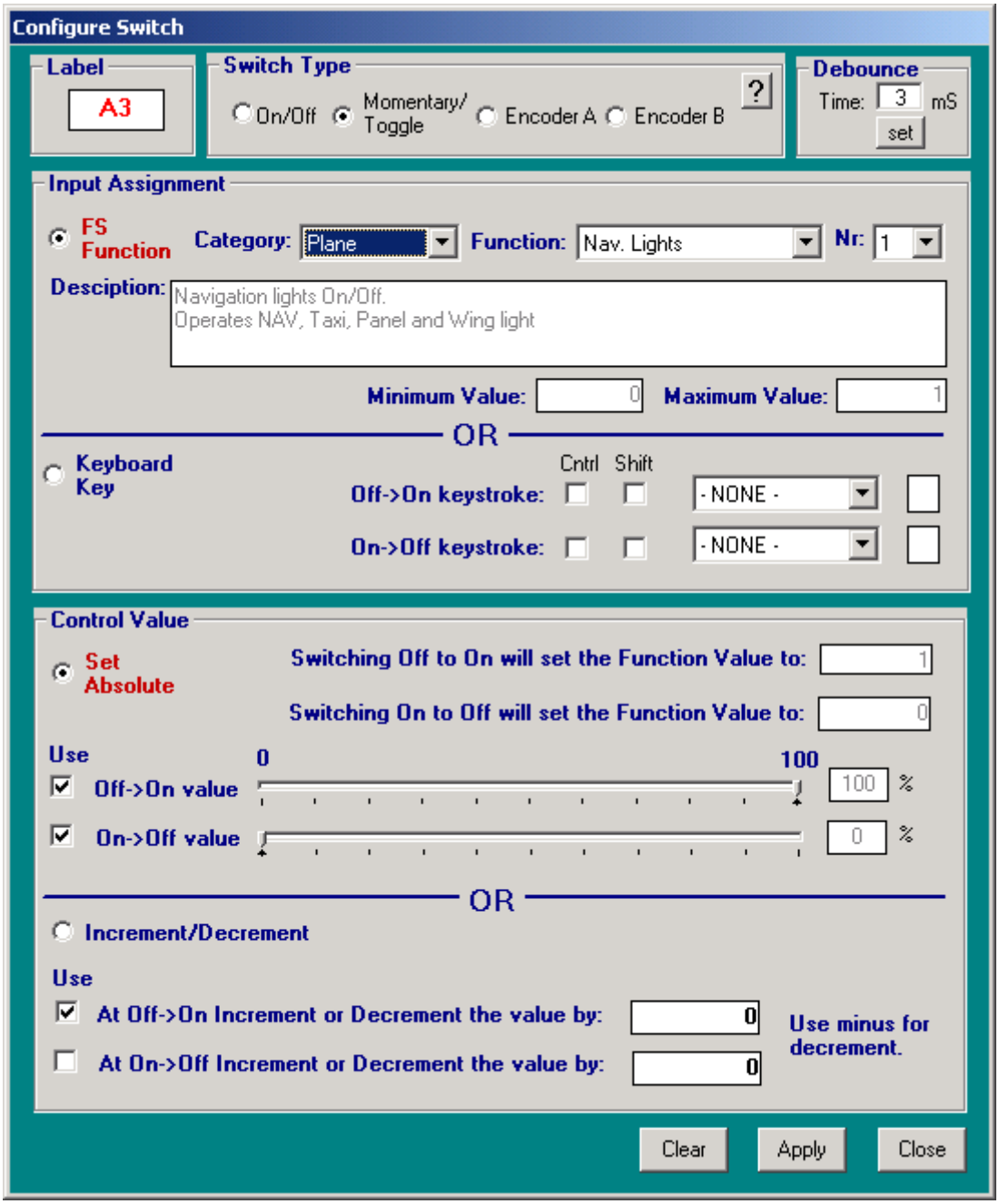


Fig. 8 Configuring a switch for Absolute mode

In this example switch A3 is used to switch Navigation Lights.
In the middle section the option “Set Abolute” is selected and both actions Off-> On and On-Off are activated. This means that, if a switch changes form position, the value as set by the sliders will be written to the selected function.

Second mode of a switch within the FS function mode is the Increment/Decrement mode. This mode is mainly used to connect rotary encoders.

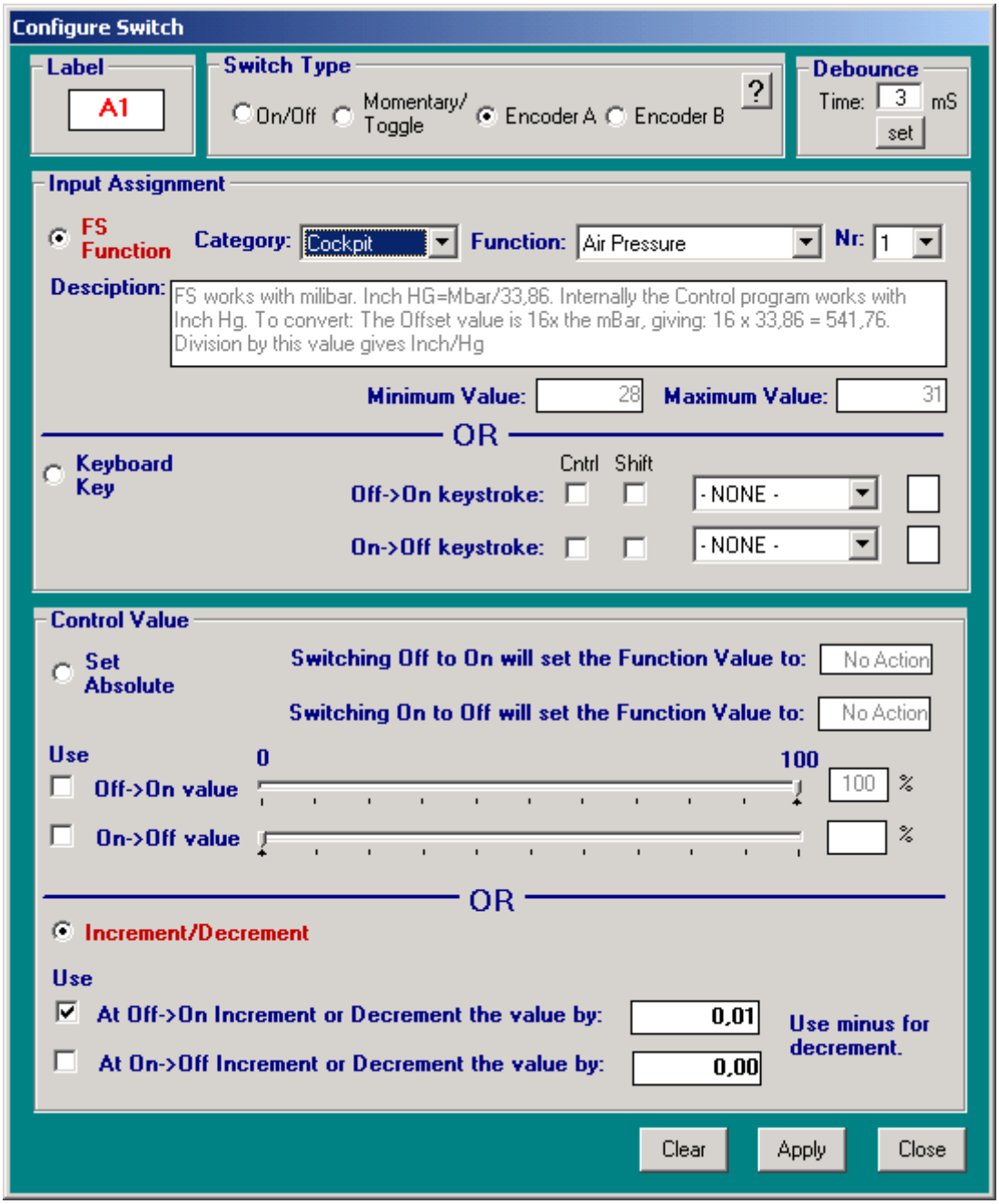


Figure 9. Configuring a rotary encoder

In this example we use a rotary encoder to control the air pressure setting. By defining the switch type as an encoder contact, you get in fact two switches. One (this one shown in the picture) is the one that toggles turning clockwise. A second switch with switch type “Encoder B” will have -0,01 to decrease the air pressure setiing when rotating counterclockwise.

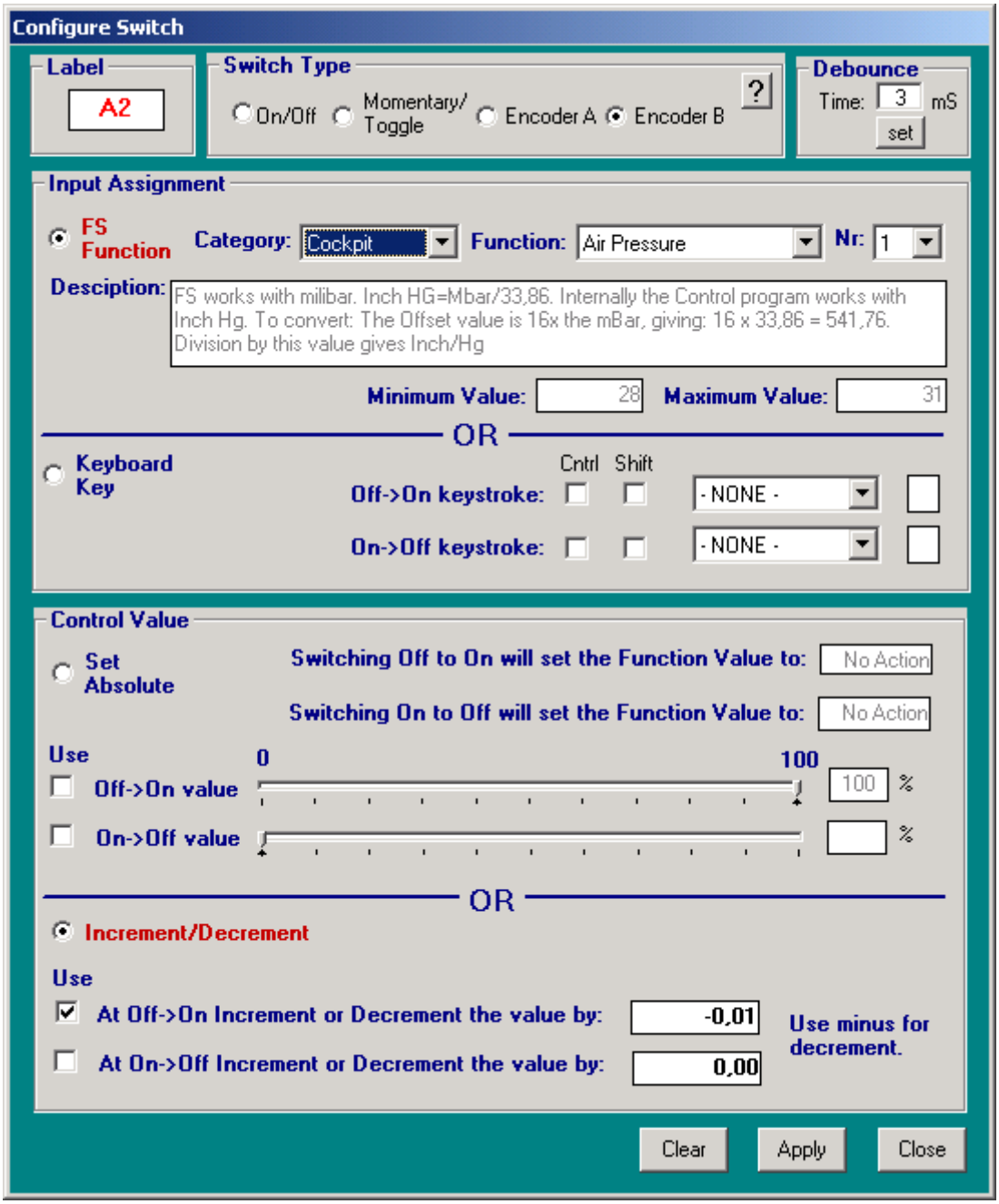


Figure 10. Configuring a rotary encoder

The second main possibility is to assign a keyboard stroke . This can be done by clicking on the Keyboard Key option field in the lower part of the configuration screen.

In figure 11 below an example of the keyboard combination CTRL SHIFT G is configured.Every time the switch changes from Off-> On, this keyboard stroke will be send to the active Windows window (which should be the Simulator of course.)

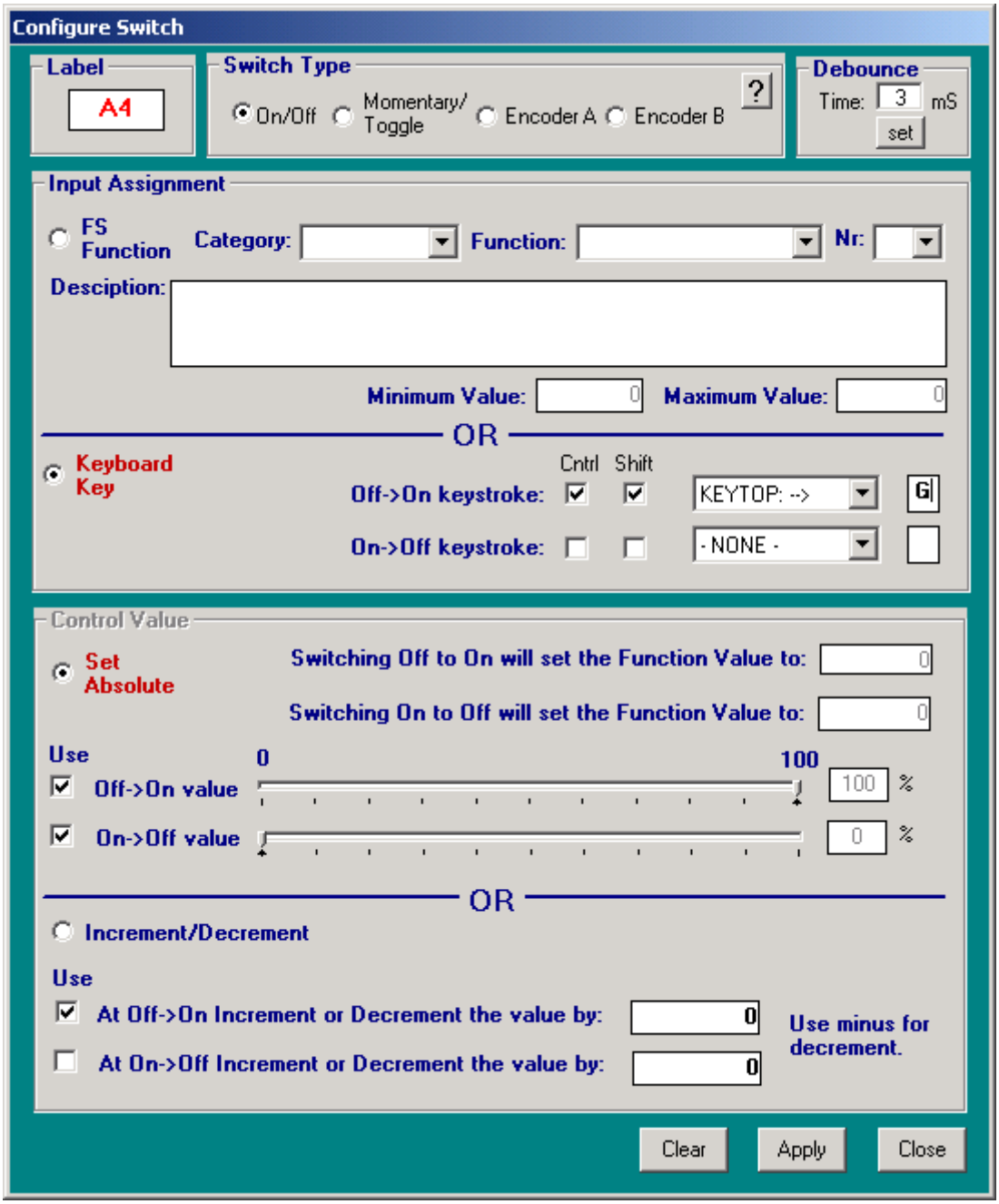


Fig 11. Configuring a keyboard stroke

6. Configuring Analogue Inputs (potentiometers)

On the Analogue Input connector on the I/O module you can connect up to eight potentiometers. A connected potentiometer can have a value between 5 and 20K. **Be sure not to connect the slider to the 5 Volts pin, otherwise the potentiometer may be damaged.** Connecting ground to the 5 Volts pin will only result in the potentiometer working contrary. The slider of the potentiometer should be connected to one of the Input pins (See figure 3 or the Extender board)

After clicking on a connected potentiometer the configuration screen will open:

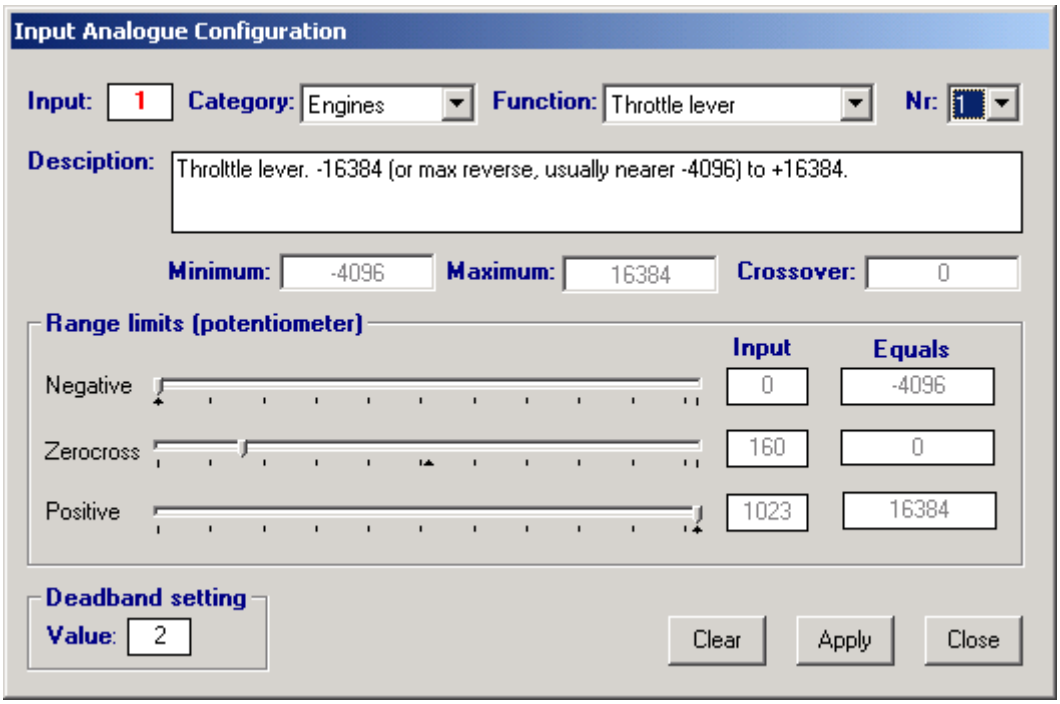


Figure 12. Configuring a potentiometer.

Assigning a function works in the same way as a Digital Input with a pull down menu. With the Range Limits the usable range of a potentiometer can be defined. This can be used for instance with a Throttle lever, where the first part of a potentiometer can be used to operate a Thrust Reverser.

Negative defines the lower range limit of the potentiometer
Zerocross defines the changeover point (or zero point)
Positive defines the upper range limit of the potentiometer

As Analogue inputs in general have some jitter –caused by interference-, signals can vary around the setting. This depends on quality of wiring, potentiometer and sources of interference. To block these little changes you can set a “deadband”. This means that a value to the simulator is only done if the current read value differs more than “deadband value” from the previous read value.

7. *Configuring Digital Outputs (LEDs)*

Up to 32 LEDs can be connected on the two Digital Output connectors. LEDs can be connected directly without a resistor (resistors are integrated on the I/O module)

In addition to the +5 Volt and Input pins there's an extra pin where a 'Master' LED can be connected (see figure 12) The Master LED will light up whenever any other Digital output is on. This LED can be used as a 'Master Warning Light' as can be found in many airplane systems.

The brightness of the LEDs can be adjusted by the small potentiometer on the I/O module (see figure 2 on page 4)

After clicking on a Digital Output on the main screen the configuration menu will open:

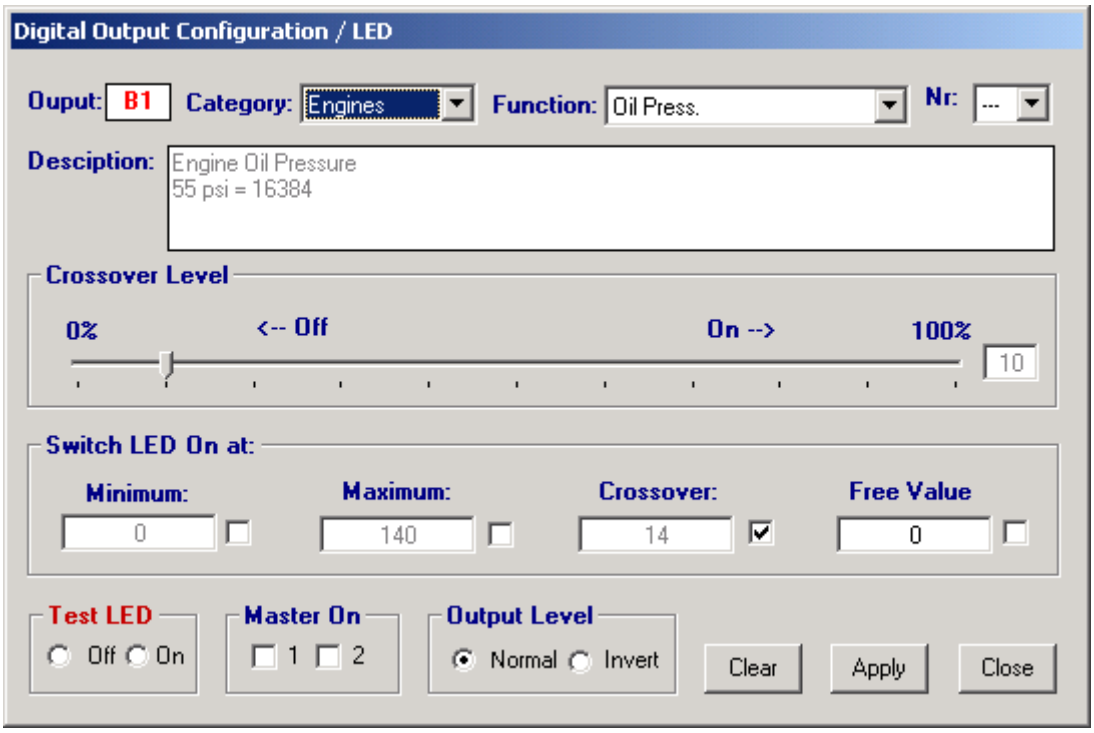


Fig13. Configuring LEDs

Assigning a function to a LED works the same way as assigning a function to a Digital input using the Pull Down menus. With the slider you can select a Crossover value. E.g. Functions that switch beween 0 and 1 mostly set cross over to 50%.

The LED can be ontrolled via saveral conditions:

- Switch on at Minimum: In case the function has the minimum value LED is ON
- Switch on at Maximum: In case the function has maximum value LED is ON
- Switch on Crossover: Below this value the Led is OFF, if higher the Led is ON,
- Switch on Free value: In case function has this value LED is ON

With the Output level normal/invert, the On an Off of the LED can be reversed. Off when value is ON and On when value is OFF.

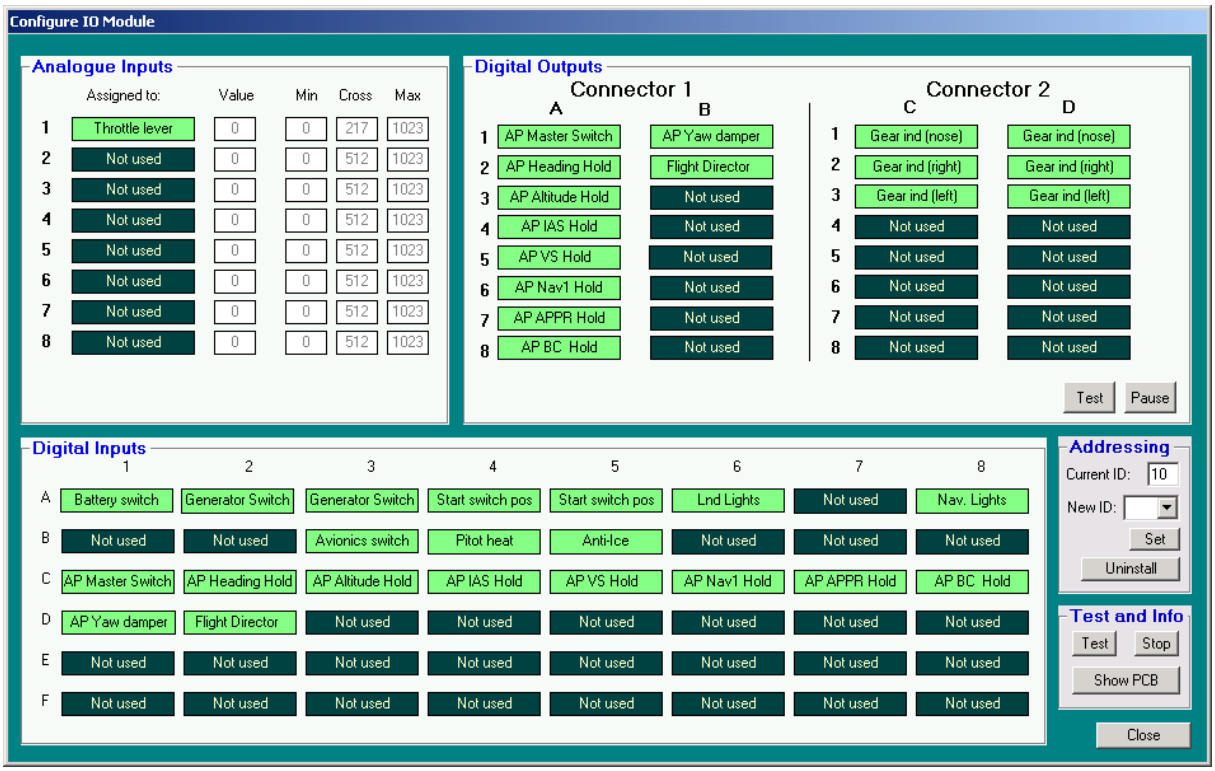
On the IO module we have 32 free configurable leds. But there are two Master LEDs. These LEDs will go ON when one of the LEDs where Master On 1 or 2 is selected. The connection of these master LEDs is shown on the IO module card layout.

8. *Examples*

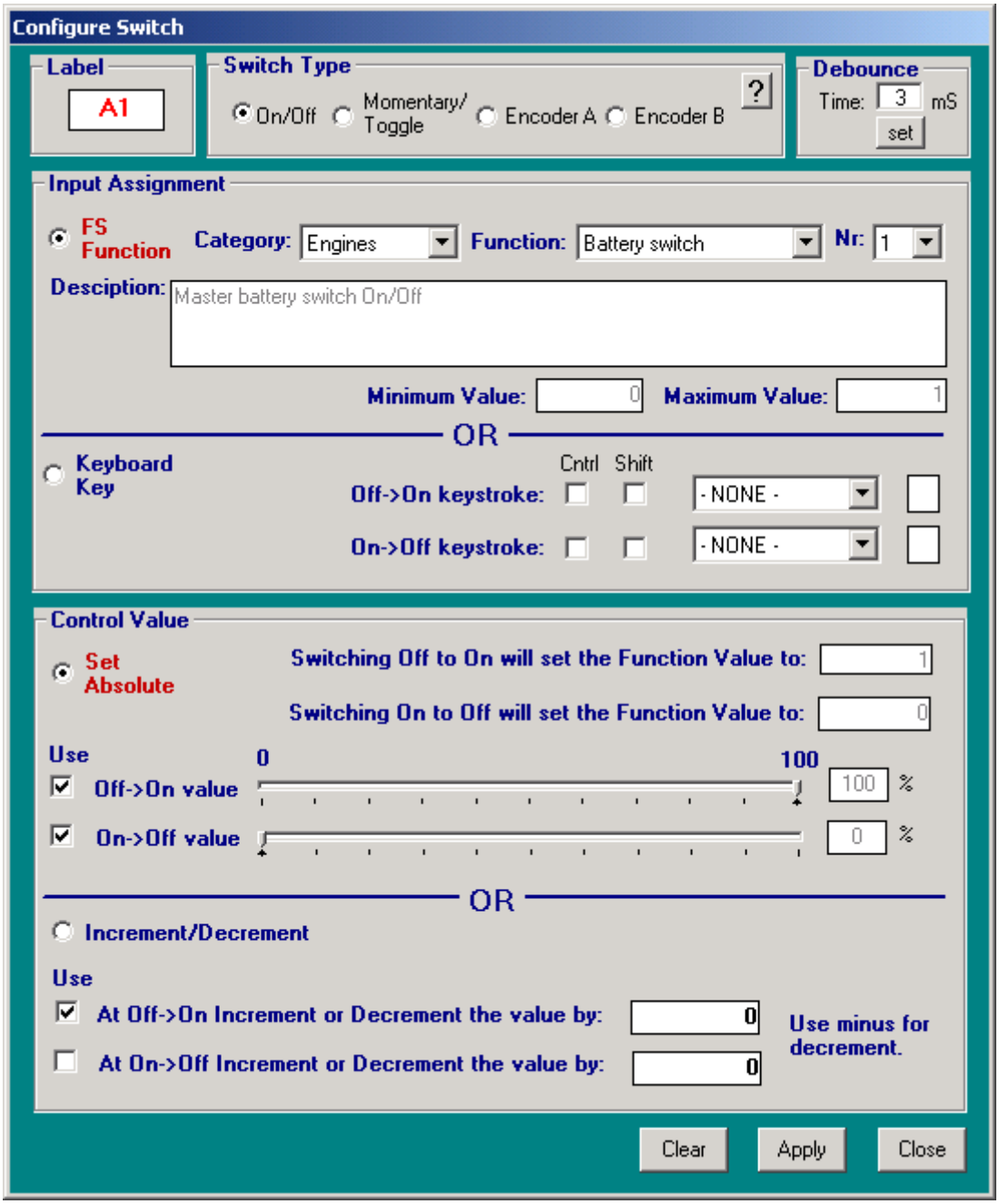
In this chapter some examples are given on how switches, analogue inputs and LEDs are configured.

1. Configuring a Battery On/Off switch

This is the most simple switch configuration. The simulator should just follow the switch state. For this example we use switch A1:



Now click on the A1 switch in the Digital Inputs part and configure this switch:



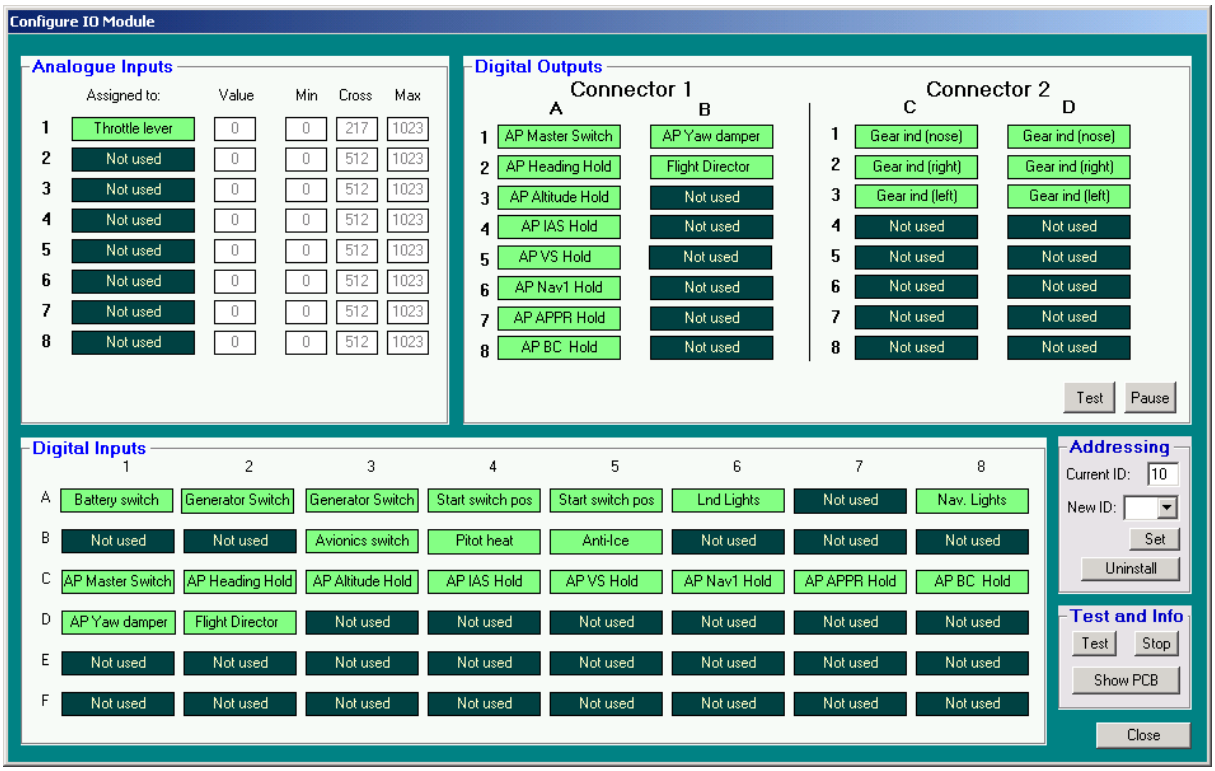
We configure it as a On/Off switch type, select it as a FS function and use the Set Absolute mode of the Control value. We want to use both the On->Off actions and the Off->On action, so we set to use them both.

If switch goes from Off to On, it will set the function to 100% of its maximum, being 1.
If switch goes from On to Off, it will set the function to 0% of its maximum, being 0.
When done click Apply and switch is configured.

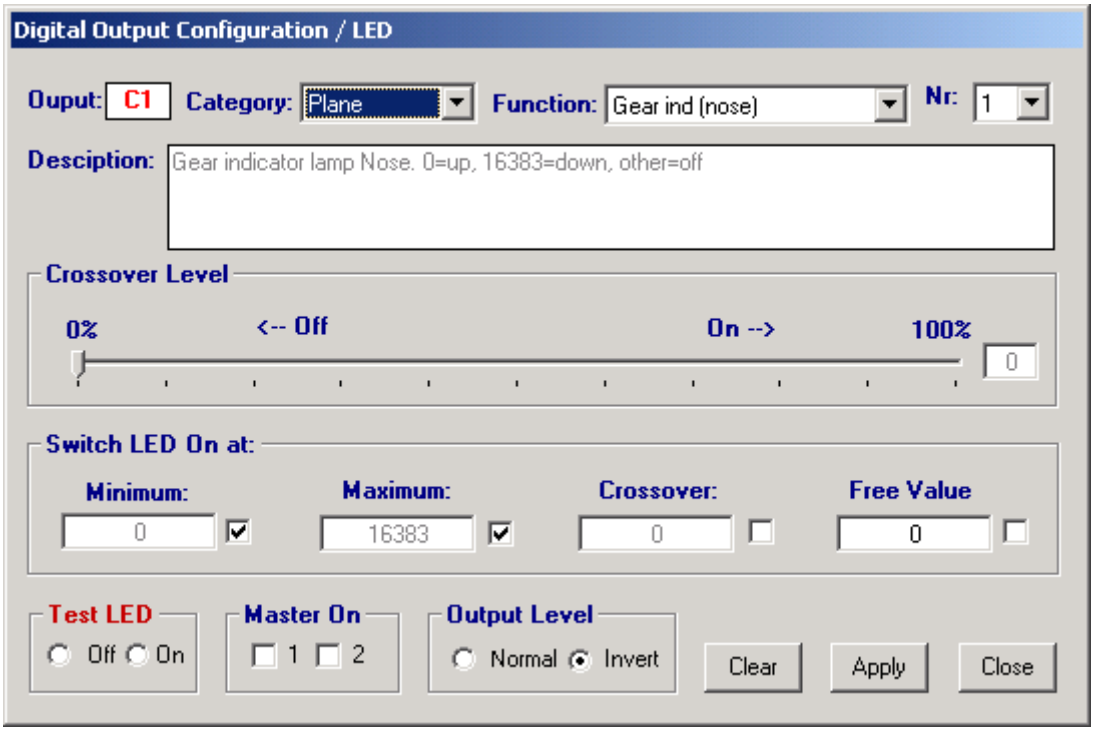
2. Configuring Landing Gear Leds

Most Landing gears indicators have three sets of leds. One for Nose wheel, One for Left wheel and One for the right wheel. For each wheel there are two Leds: one green and one red.

The Green Lamp only burns when gear is fully down. The Red lamp only burns when gear is somewhere between Full down and Full up.
So, To simulate that you'll need six LEDs. On this example these are C1-C3 for the red lamp and D1-D3 for the green lamp

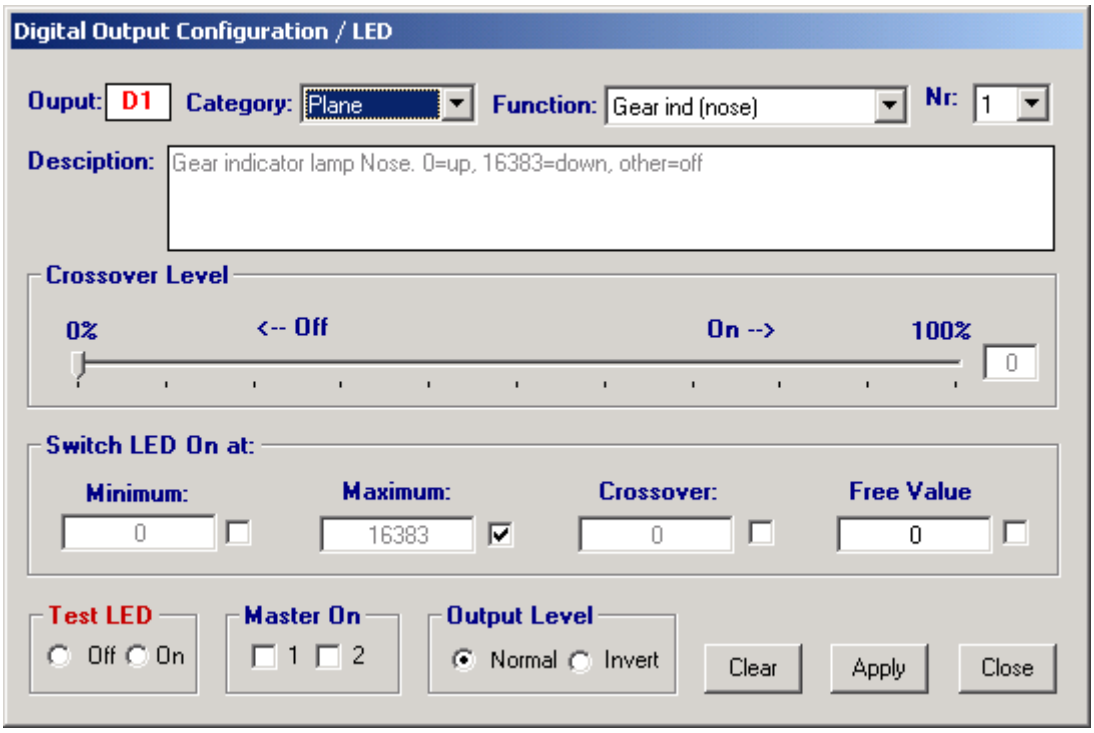


Now we need to configure the Red lamp. It should only burn if gear is NOT fully in and NOT fully out:



So, the LED will switch on at maximum and minimum, but by inverting the output it will only burn if not on minimum and not on maximum.

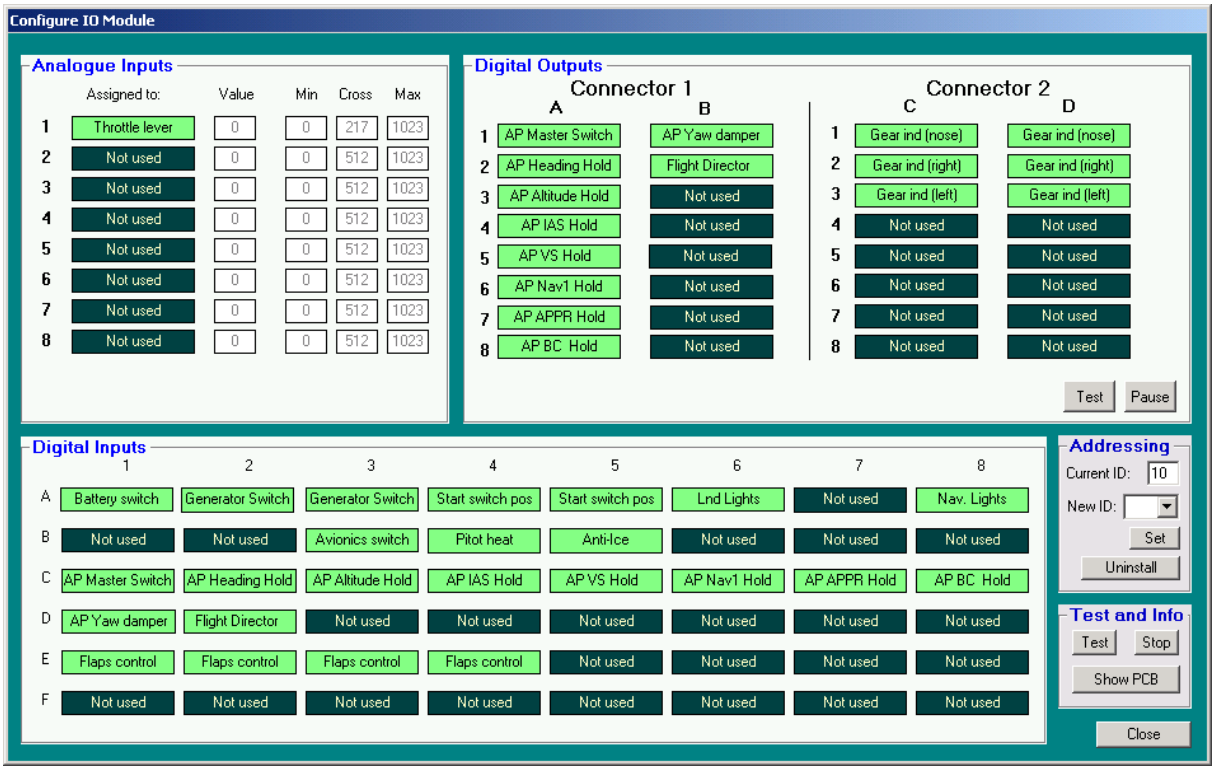
For the green LED it is more simple. It should only burn when gear is fully down:



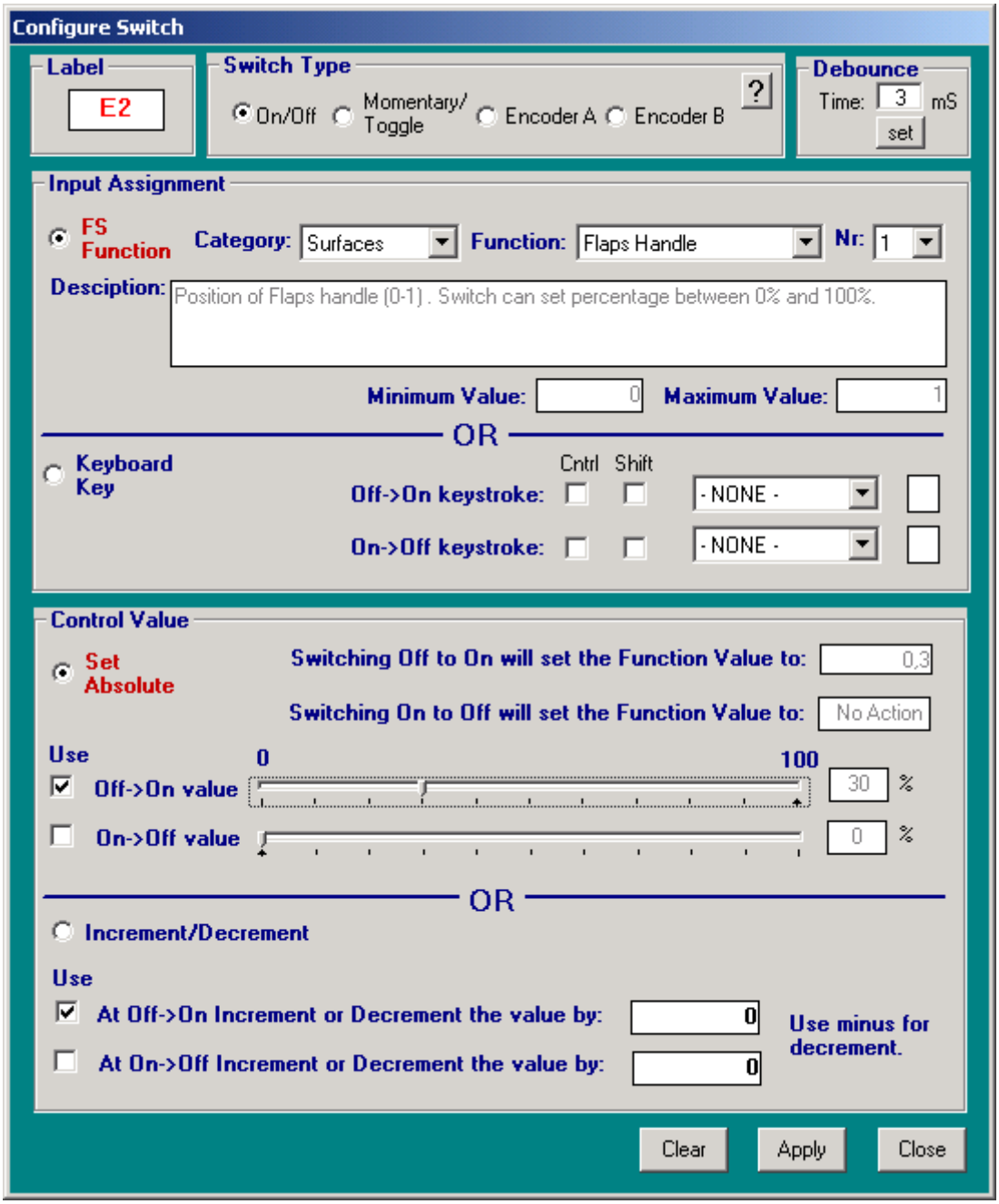
3. Making a simple Flaps Lever.

Many aircrafts have a flap lever with some detents. You can put it in more positions. The number of detents depend on the aircraft type, and in this example we use a lever that has four positions: fully In, 30% out, 80% out and fully extended.

Now we take a simple rotary switch with four positions like the one above. Mount it transverse, make a lever to the shaft and the flap handle is almost ready.
The mother contact is connected to the Ground pin and the contacts corresponding with the switch position are connected to four switches. In this case E1-E4:

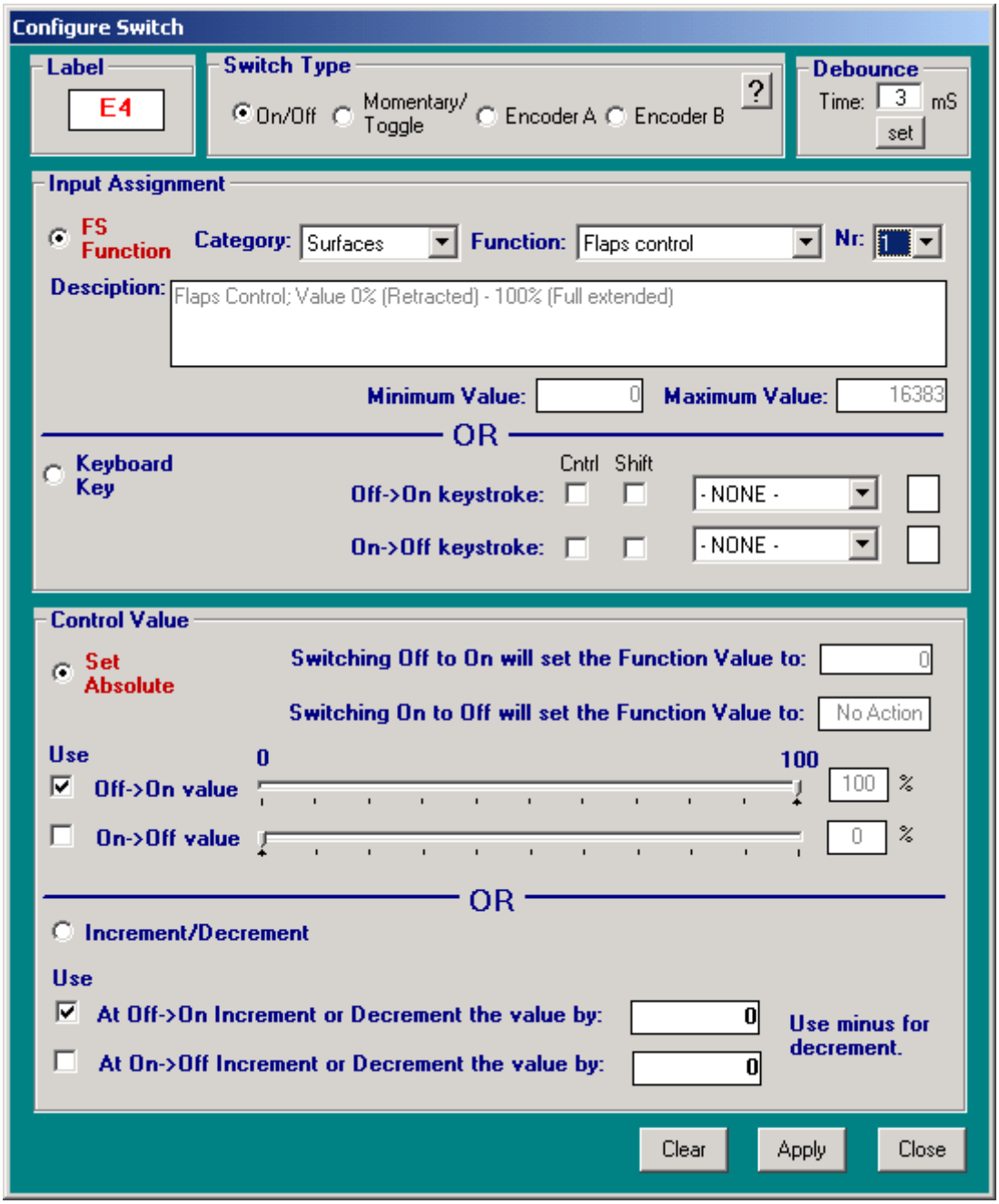


Now, for each position we need to set the flaps to the corresponding position As Example the switch E2. This switch should set the flaps to 30%:



As soon as the switch goes to position 2, the On->Off value will be written to the simulator. We do not use the On->Off state in this case.

For Fully extended we of course set the slider for switch E4 to 100%:

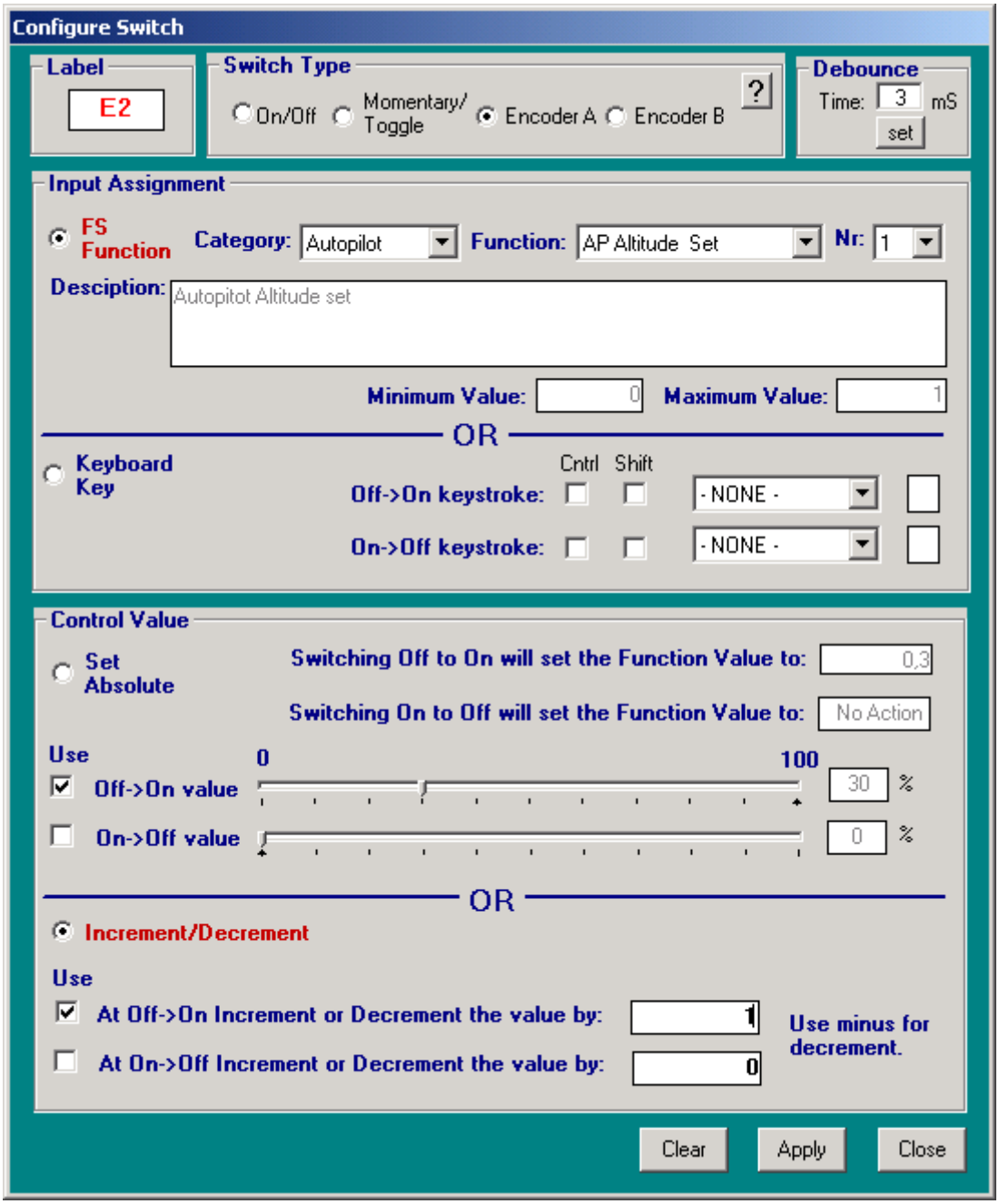


4. Making a Autopilot control

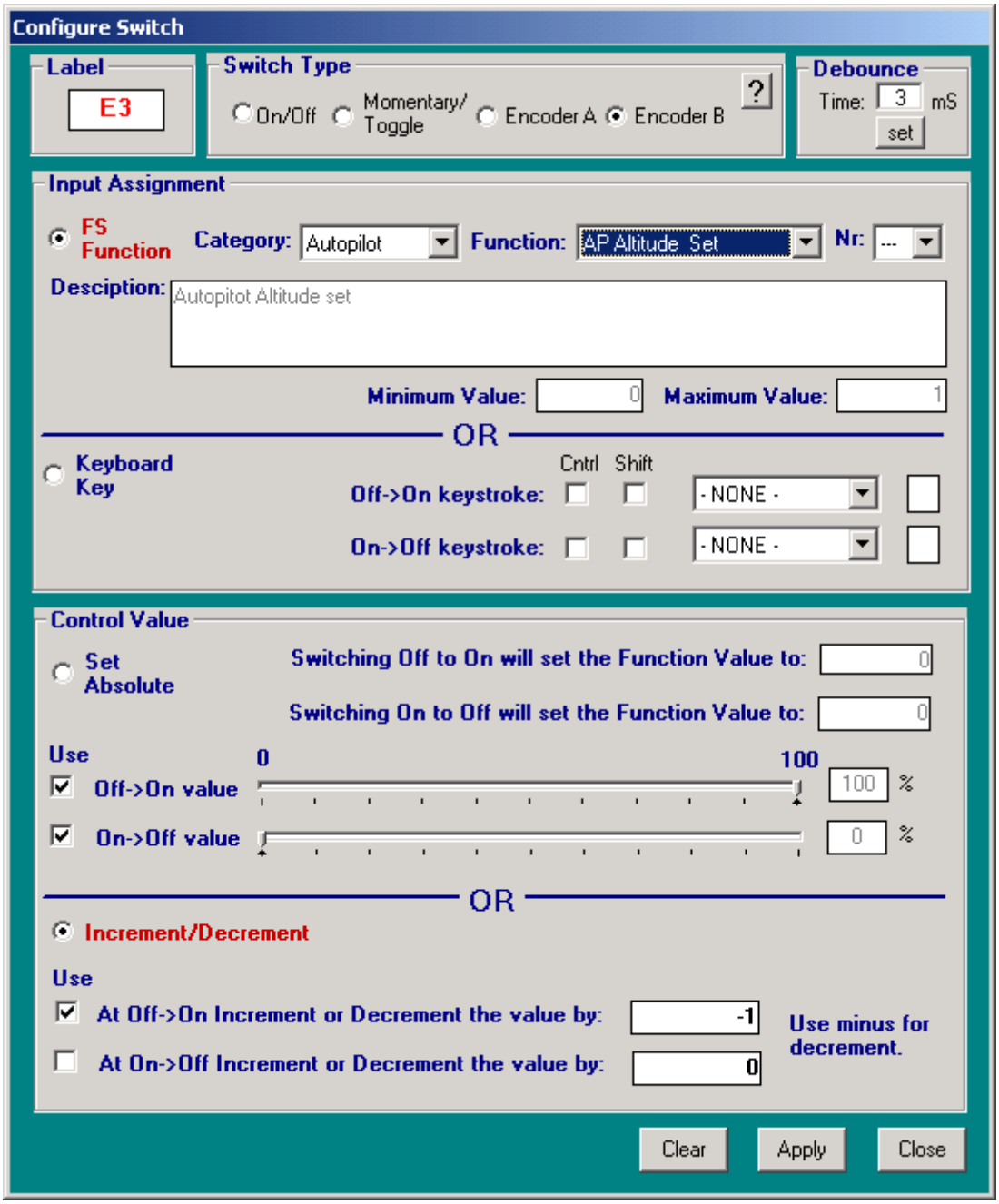
In this example we use a rotary encoder to set the Autopilot Altitude. A rotary encoder is in fact a switch with two contacts that, depending on the rotation direction, are time shifted. It has a centre contact and the two switch contacts mostly called A and B.

In the control program we can configure both contacts. Logically seen they will be converted into two “push buttons”. One is pushed on every click clockwise and the other one on every click counter clockwise.

The contact are configured as follows:



So, on the rotation in one direction, this switch will toggle and increment the altitude by one.



The other contact will decrease the Altitude setting every click in the opposite direction.

As the clicks can be very fast when rotating the encoder, this can best be used in combination with the USB version of the IO module.