User manual

FLIGHT ILLUSION

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1. General

The Flight Illusion gauge/module concept is based on a so called "Bus" system, by which all gauges and logic components can be daisy chained. Advantage of this concept is a very serious reduction of wiring and cabling.
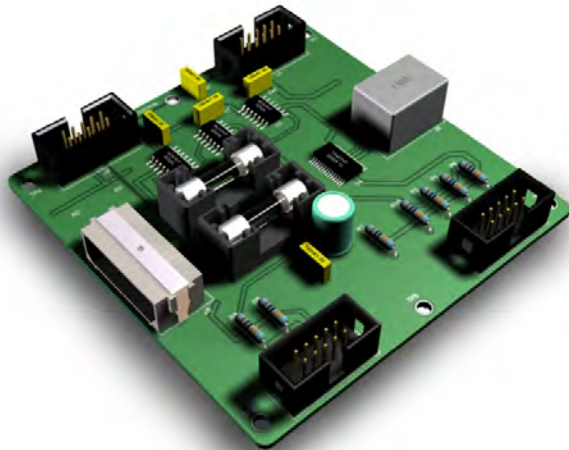
Basic component of the system is the Central Interface Module (GSA-55 or GSA-55PS). One side of this module is connected to the USB port for communication between the control program and a standard Hard Disk style power connector to power all the connected gauges.

On the other side are four ten pin connectors combining both the power to the gauges and the data interchange between the PC and the gauges. Because of power consumption and signal degradation the number of units that can be connected per connector on the CIM is limited to a maximum of 16.

Due to the daisy chain concept the gauges are in fact all connected in parallel, so a sort of protocol is needed to communicate with one single gauge or logic unit. For that reason each gauge has a unique address –called GaugeID- that enables the control program to exchange data with one particular unit. The address range is in total 255 different addresses varying from 1 to 255.

By default, new gauges get either an address that is specific for a certain gauge type or 255 when the gauge is a universal type. Example: the altitude indicator (a specific fixed function gauge) will at production be set to address 101, but a small generic single needle gauge (that can be used as e.g. flap indicator) will be set to 255.

As addresses must be unique on a daisy chain, you can add only one new generic instrument (with address 255) at a time. The software enables the user to detect the new gauge and the user can then change the address of the gauge to an address that isn't in use yet.
The configuration part of the control program allows the user to change addresses but also gauge specific things like the needle speed (for smooth movements), the altimeter mode (Inches HG or mBar), etc. These settings have to be done only once as the address and other settings are saved in the gauge.

To build- up your configuration it is the best to start with only one gauge connected. Do a "search" with the software and configure the gauge. Also give the gauge a unique ID, other than 255. When done click apply and save your configuration. After this step you can apply your next gauge and repeat these steps.

2. Hardware installation.

The CIM and Gauges must be connected as shown in the picture below.

INTERCONNECTION
FLATCABLE

POWER

FUSE

FUSE

USB
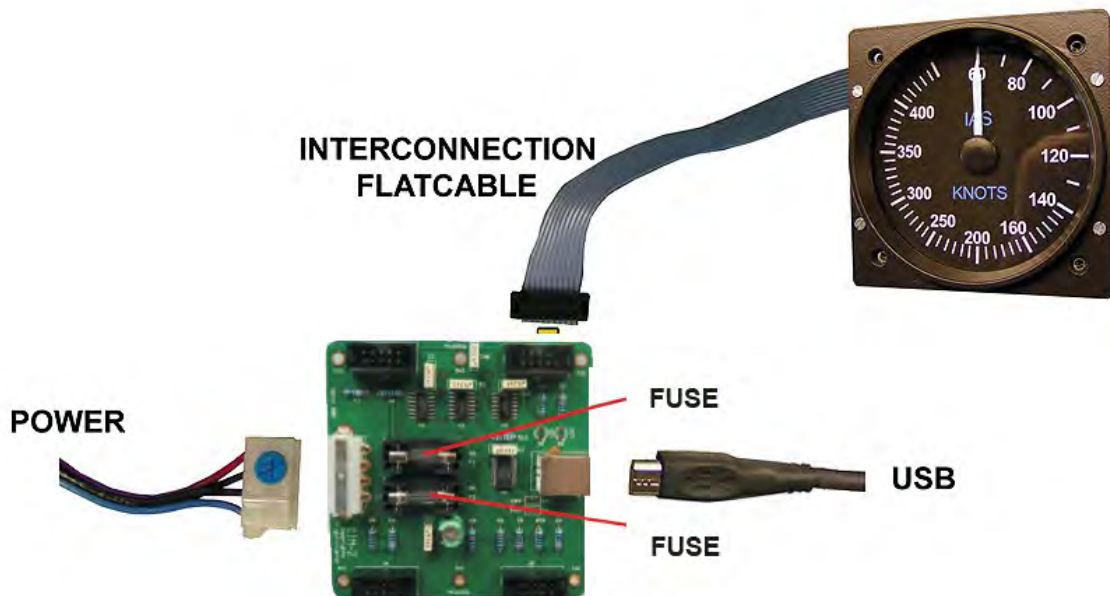
FIG 1.

For the power you can either use a separate power supply (EP-CPS) or -via an extension cable and free power connector - the power supply from the PC. The power consumption will vary with the number of units connected. Roughly each connected G-Step components will draw maximum 50mA from the 5 volts and 20mA from the 12 volts.

Never connect or disconnect gauges while the power is switched on (this may damage the processor on the gauge)

On the CIM both voltages are protected via a fuse located closely to the power connector.

The CIM has six mounting holes that can be used to mount the CIM.
The mounting holes are connected to ground and can be used to mount the PCB to metal surfaces providing these are either grounded or "floating".

To prevent short circuits take care to keep the PCB free from metal or other conductive surfaces.

USB is a standard cable from either the PC directly or a USB hub. The little sub-PCB is a converter that translates the USB interface into serial communication levels as used by the gauges.

The four flat cable connectors on the PCB are for connecting the daisy chained gauges. These connectors are identical and can be used as wanted. You can connect up to 16 gauges on each connector. Hence, a maximum of 64 gauges/modules can be hooked up to 1 interface.

All gauges and G-Step components have two interface connectors (except for the compass, that has only one connector). Also these are identical and don't care which one you use. We added two connectors per gauge to simplify the daisy chain system. One can be used as the input from the CIM or another gauge and the other one to connect it with a flat cable to the next one. It is also possible to use cables with more than two connectors, by which one connector on the gauge will remain free. Using a short cable this connecter can be used to e g a gauge located aside.

interconnection
flatcable

FIG. 2
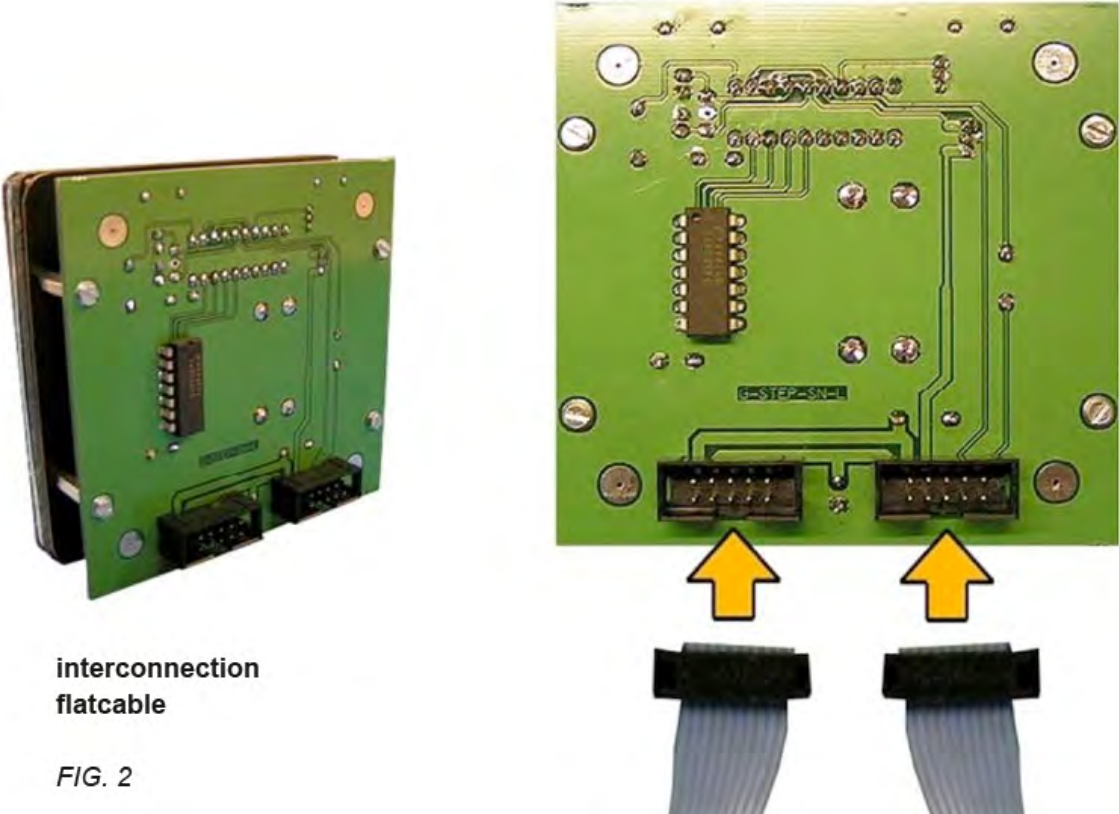
3. Software installation.

Flight illusion gauges can be used with different simulator software. The gauges are compatible with Microsoft Flight Simulator (both 2004 and FSX) , Prepare3D, IL2 and X-Plane. in order to make the gauge work with your specific simulator platform you need to download the following:

1) the USB to COM driver. (ftdichip.com)
2) the Flight Illusion software files

3.1. Driver installation.

When the CIM is connected properly to USB and Power, the PC can be switched on. Windows will now detect new Hardware. The interface of the CIM uses a translator circuit, to map the USB interface onto a Serial Communication Port. In general PCs have one of these ports so the CIM will be installed as communication port 2 for example. But, depending on your configuration, a higher port number is possible. This mapped communication port requires drivers and Windows installation manager will ask for them. If windows didn't have a driver for this board you can download it from the internet page: http://www.ftdichip.com/FTDrivers.htm

Depending of your used windows version you can find the right driver here. Our software is tested on the following windows versions: Windows XP (Home or professional), Windows – 7 (all versions), Windows 8 and 10. Other systems could be worked also but are not supported yet.

When driver installation is done this can be checked in the Hardware page via "My computer/System/Hardware". An additional serial port should appear there.
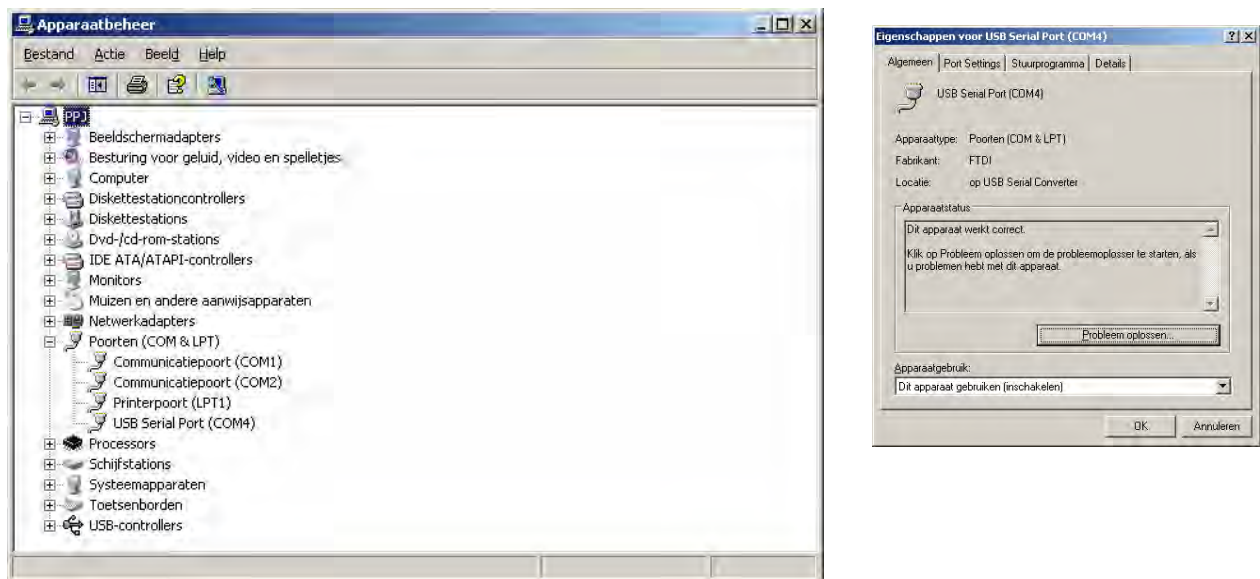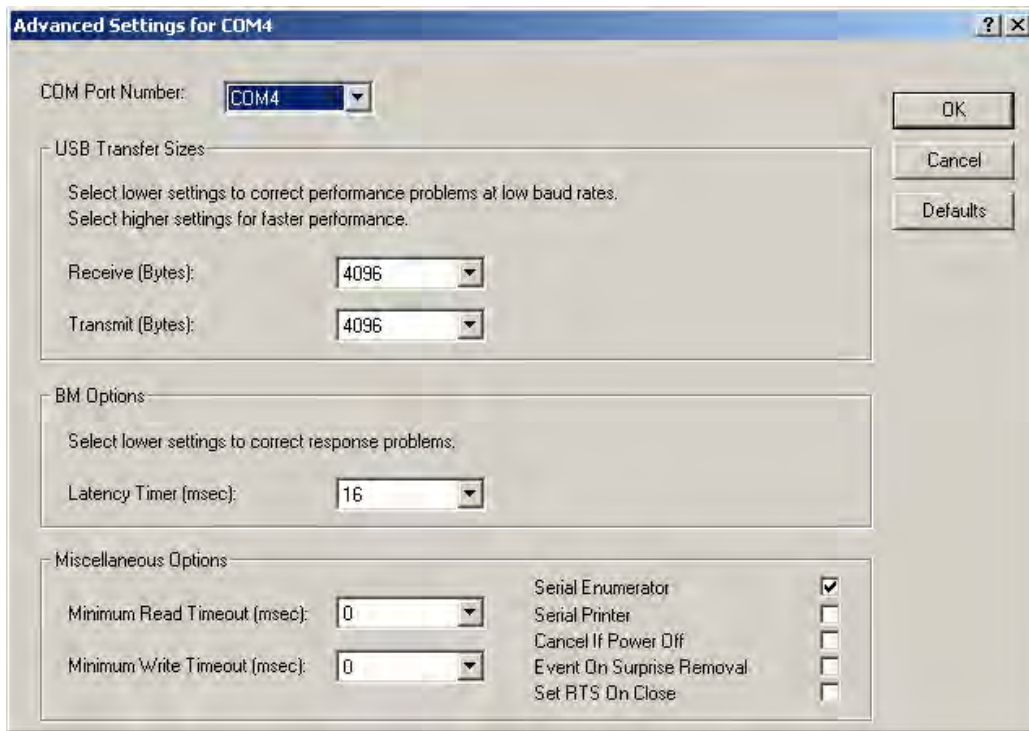

Clicking the –in this case COM4- port brings up the properties of this port:

If wanted, the port number can be changed via the Advanced Port Settings:

Be sure that you know the right COM port number, because you need this information to set the correct COM port number in the GSTEP software.

The selected comport should of course match the com port selection in the G-Step Control program, which you will install later.

The supplier of the USB to Serial port converter updates the drivers regularly. These drivers can – when needed- be downloaded from http://www.ftdichip.com. Use in that case the virtual com port drivers for the FT232B and the operating system you are using. Latest drivers are in the installation package.

No other drivers need to be installed, as the application program communicates with the instrument cluster via this communication port solely.

To use the instruments, FSUIPC in the Flight Simulator Modules folder should be loaded and running. Testing and setting the configuration however can be done without running Flight Simulator.

3.2. The Application Program

The application program can be installed from the install package via the Setup program. This package can be download from our website. It will install some extra extensions for driving the serial port and will put the Instrument Control program in your program list. The serial port drivers will remain unchanged and will need no update.
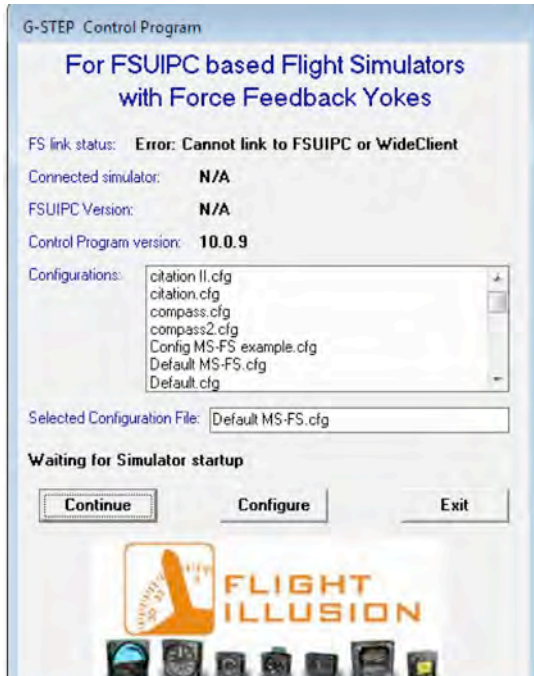

The application program (G-Step Control Program .exe) is an intermediate between the G-Step components on one side and Flight Simulator on the other side. Using FSUIPC it reads gauge values and other parameters from FS and the software calculates the values for the gauges.

After the driver installation is completed this program can be started. If you start the .exe file you should see this screen:

"FS Link status" shows whether Flight Simulator is running with FSUIPC activated in its module folder. When Flight Simulator loaded and running (including FSUIPC) this should read "connected".

The other fields give data on version and type of programs. The two buttons "Continue and Configure" below the will be enabled as soon as you have selected a configuration file.

If the Control Program is started before FS, it will show the message "Waiting for FS startup". At one second intervals, the program will check whether FS comes up.
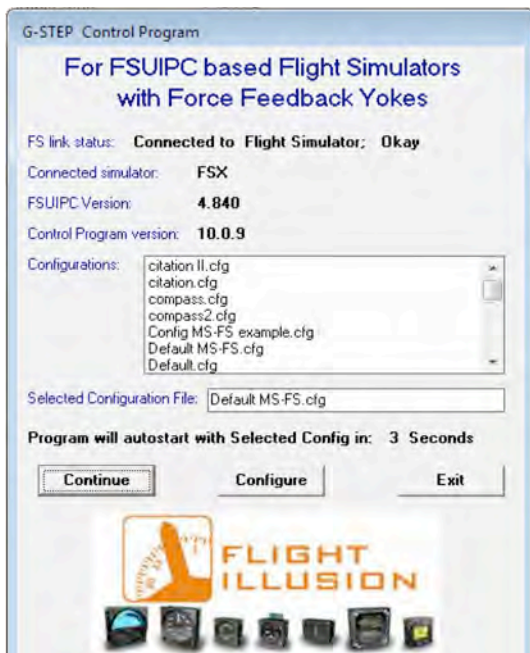
As soon as the connection with FS is made the Wait message will be replaced by an autostart message. If no action is taken, the program will then load the default configuration and start automatically. The autostart function is aborted if one of the buttons is clicked or a configuration file is selected manually.

At first run or when you add or remove G-Step components you should click on the "configure" button. This will open the configuration window and gives you the tools to set the gauges and connect them to the various Flight Simulator functions. The configuration files delivered with the installation package are just examples and contain the standard variables, like available functions, types of devices, etc. Together with these you need to create your own configuration file. This is specific for your setup and can't be done by default.

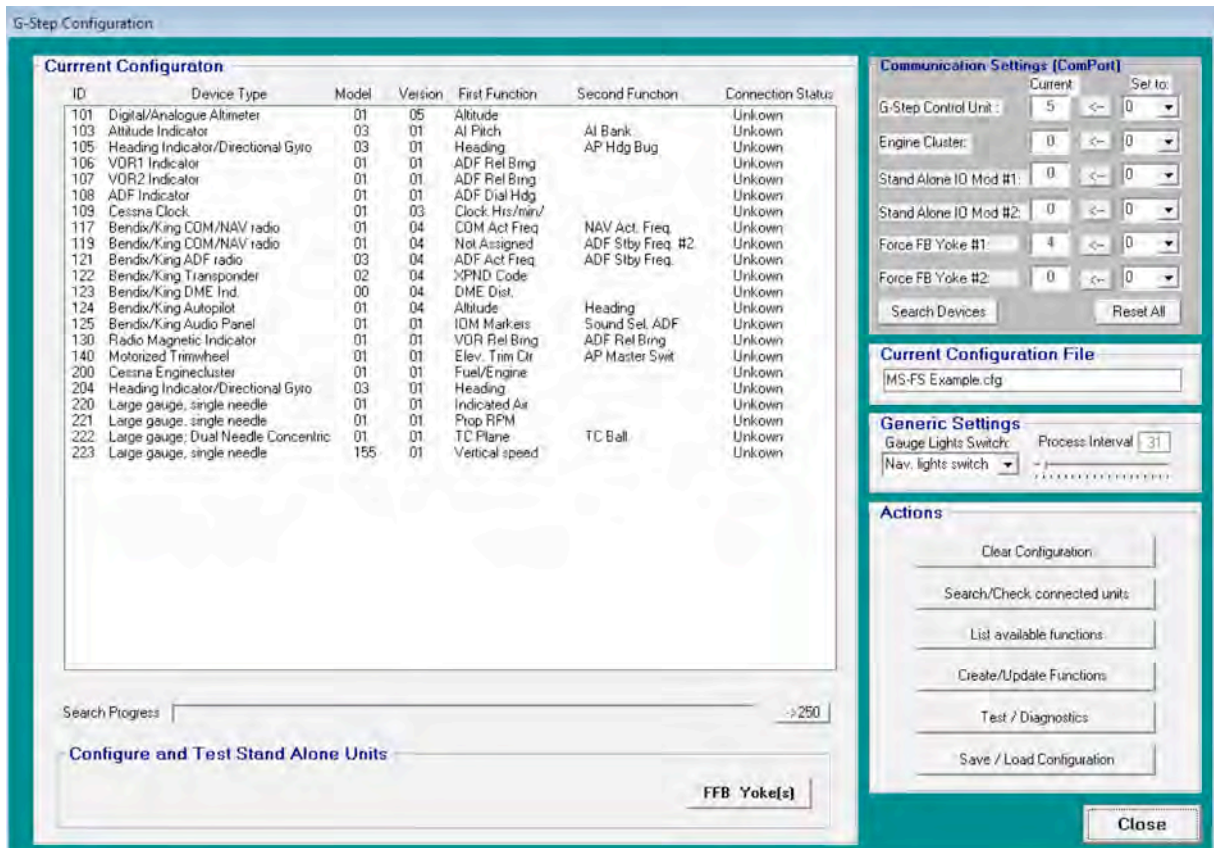## 3.3. The configuration setting
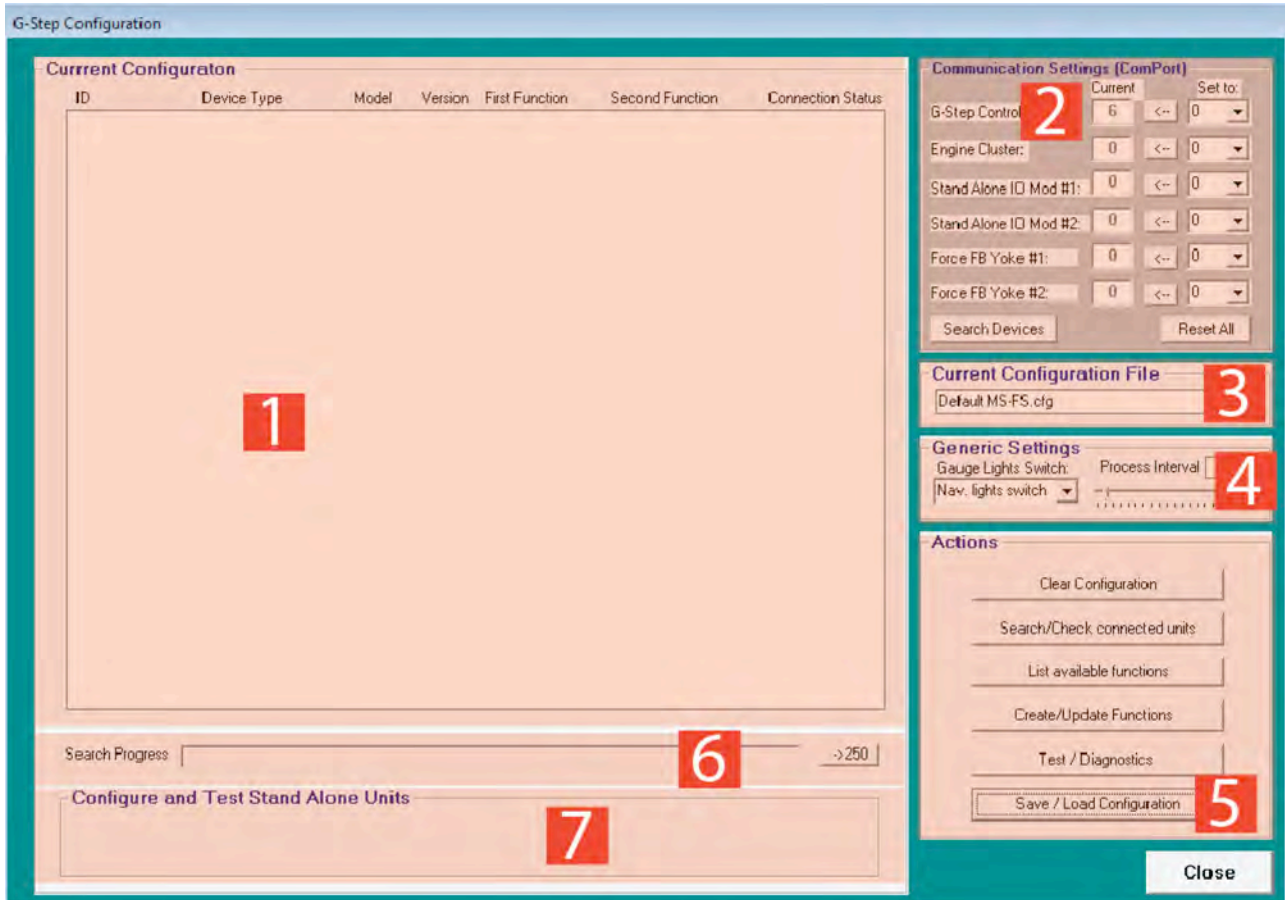
The configuration screen consists of 7 zones. Each of them has one or more specific functions.

1 **Current configuration:** In this zone you will see all the connected gauges after performing a "search"

2 **Communication settings:** In this zone you must assign the com ports that are active. Perform a search devices and assign the ports manually or automatically.

3 **Current configuration file:** reflects the configuration file that is actually in use

4 **Generic settings:** You can assign the gauge light switch and the process interval (number of times /second that the data is refreshed)

5 **Actions:** The Actions section contains a number of buttons to maintain, create and test your configuration.

6 **Search progress:** is a control bar that colors blue as the "search" command moves through the 255 possible gauge ID's to see if they are populated.

7 **Configure and test stand alone units:** is the zone where other modules will appear if they are connected and properly assigned to a com port.

After clicking "configure" you get the screen that enables you to create a configuration file that matches your setup. Any of the supplied configuration files can be used as basis.

In this example you can see lots of gauges that seem to be connected. We have used the configuration file MS-FS Example.cfg (as found in the general setting).You will have to clear this configuration to get started with your own gauge assignment.

1) Current configuration

you will see all the gauges that are connected to this configuration. It actually shows the contents of the selected configuration.

- **ID** is the GaugeID of the device
- **Device type** gives the universal device type, like large, small and number of needles or type specific gauge.
- **Version** is the level of hardware and micro program.
- **Model** is an indication for future G-Step Control programs. It will be used for e.g. the faceplate as used on that gauge.
- **First function** the function(s) the first needle is assigned to .
- **Second function** the function the second needle is assigned to (to be used when some gauges have a double function (like the dual needle gauge).
- **connection status** shows "unknown" when no communication was done yet. After the search/check, it will show either "connected" or "not connected".

2) Communication setting

Most important part is setting the virtual Com Port to which the Central Interface Module is connected. The pull down list will only list the ports that are available on your computer. Mostly comport 1 and 2 are standard ports. The virtual communication port you added for the CIM will in general be 3 or 4, but any port number can be selected when you change that via the Windows Configuration Setup as described in the Hardware configuration.

To change the Comport select one from the pull-down list and click the set "⇦" button. The control program will now communicate via this com port. When you save the configuration also this comport number will be written in the configuration file and will be selected at next run.

3) Current configuration
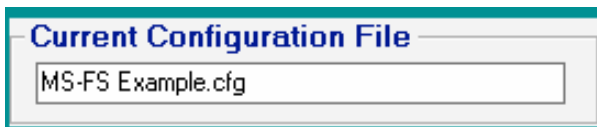
The box Current configuration file shows the active configuration.

At distribution some example files are inserted, but these are for demo purposes only and will not automatically contain the configuration you have installed.

4) Generic Setting

You can change the settings for the gauge light switch. This will define what light switch will turn on the backlight of the gauges. You can also modify the process interval. This is only needed when you are not happy with the refresh rate. The interval determines how often the data is send to the gauges. E.g. a process interval of 31 means that the data string is sent 31 times per second. Don't set this process too fast. This results in inoperable gauges, because a new string is initialized before the previous one is ended.

5) Action settings
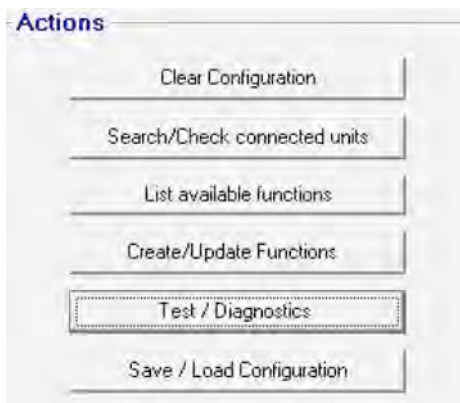
The Actions section contains a number of buttons to maintain, create and test your configuration.
Most buttons will be self explaining, but the Create Functions from Offsets is more difficult and for advanced users only.
It will open a window enabling users to create or update functions from the raw FSUIPC offsets. To use this, a good understanding of the offsets, data types, etc. is required. In general users will not need this facility, but it is made for the specialist that want to make special functions.
For those users this function is explained in section 9 (Advanced section) of this guide.

6) Search Progress
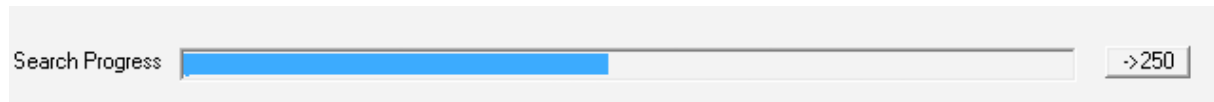
When you click on "search/check connected units" in the "actions" pane, you will see a progress bar moving as the software polls each of the 255 ID's that can be assigned. All those gauges that are connected and that have a unique ID number will show up in the "current configuration" pane.

7) Configure and test stand alone units
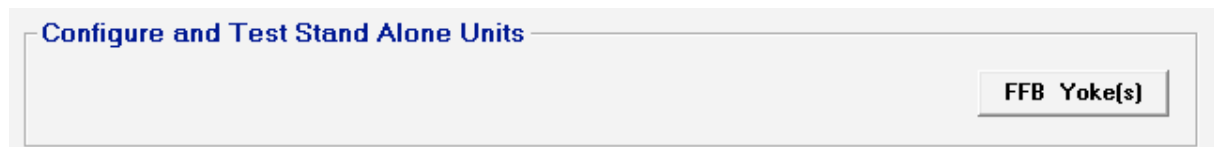
If you have other units connected, like the I/O module, an engine cluster or the Force Feedback yoke,

Note on the Configuration file:

The Configuration file contains both settings for the program itself, like the specification of functions, supported Gauge types, etc. and the user specific configuration data like gauge IDs, assigned functions, etc. For that reason it is possible that the settings part of configuration file will change when a new release of the GSC program is distributed. A new package will always contain the latest configuration file matching the released version.

Get started

To personalize your configuration file at first start-up you can best click the Clear Configuration and then search for connected units. By starting that function the program will try all possible addresses from 1 to 255 and when a unit "answers" it will "tell" which gauge-type it is and which address (GaugeID) it has.
When the search is ready, you should have a list with the connected units and overview of your configuration. When an instrument is already assigned to a FS function, this will also be listed. Otherwise it will show "not assigned".

Most generic gauges are delivered with the standard address 255. These are gauges that can have more functions, depending on faceplate, number of needles, display, etc. This means that you can add only one new gauge at a time. Before connecting a next instrument you must change the address to a free number.

Dedicated instruments, like e.g. the Altimeter (101) and Attitude Indicator(103), will have a standard ID at delivery, but you can change that afterwards if wanted. Should a configuration contain one or more gauges with the same address (ID) these gauges will probably not be found at search, simply because two replies at the same time will result in a garbled and not recognized data package.

Configure Single needle Gauge

Gauge Assignment and Settings

Gauge ID: 220 | Large gauge, single needle | New ID:

157
158
159
160
161
162
163
164

Category: | Function:
Assign to: Position | 002. Indicated Air Speed

Plate type: 012. Indicated Airspeed Cessna 172 | <--

Desciption: | Rotation
| C CW
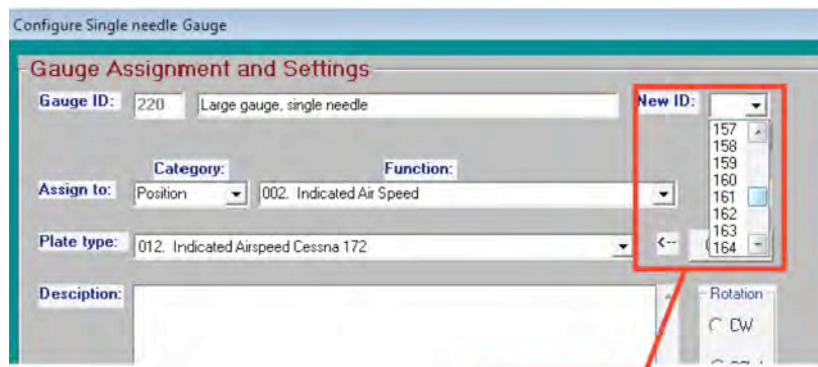
Change the ID of all the gauges
that have ID 255 in order to have
all different ID numbers for all
the gauges

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4. Testing your configuration.

Gauge configuration can be tested by clicking the Test / Diagnostics button in the Actions section. It will bring up the form below:

For all gauge types a sequence of commands is predefined, which can be executed either manually step-by-step or automatically. The speed of execution can be adjusted using the command interval slider. Range of this slider is from 40 milliseconds up to 5000 milliseconds (5 seconds).

The lower part (Create and test gauge manually) is for diagnostics only and should be used with care. It enables user to "force" a gauge into the configuration and to constantly poll a particular gauge. The Poll Gauge button will generate a command to the GaugeID selected in this section and the reply is written into the reply box. This is hexadecimal format and interpretation is more difficult. However in general replies will be 25 characters long and end with "FF". Receiver progress is monitored by the rotating "cross" on the right site of the reply.

You can add any gauge to the configuration using the Add to Config button, but be careful doing that. As you can force any gauge and any gauge type into the configuration, there is a risk that the control program will generate commands that do not match the gauge. So: just use this function for diagnostics and fault finding only.

When you are in configuration mode and the search results are showing in the current configuration window pane, you can click on a gauge line to open a set-up screen for that device. The screen you get will depend on the gauge type and contains the settings specific for that gauge. Below the screen for a generic Large Single Needle gauge is given:

On top of this window the current GaugeID and the Gauge Type is shown. Using the drop down "new ID:" you can select another ID. The list will only show the free GaugeIDs.

5.1 Assigning functions to a gauge

Depending on the gauge type a sub-set of assignable functions is given. The functions are grouped into a number of categories like Engines, Surfaces, etc.
If you select a category, the functions that belong to that category will be given in the function dropdown list.

Next to that a number can be given. Mostly that can be "1", but in particular motor instruments can have a number varying from 1-4. So having, for example, two small single needle gauges, you can assign one gauge to "Oil temperature, left motor (1)" and the other one to "Oil temperature, right motor (2)".

If not appropriate (as the function is single), you can leave it unfilled or zero. In that case the program will assume number one.

The description box is an extended description or remark of the function. It does not effect the operation and can be edited by the user via the button "list available functions" on the configuration screen.

5.2 The Plate

Assignment of a function to a gauge is universal. All aircraft types will have parameters like indicated airspeed, vertical speed, etc. But depending on the aircraft and its construction the gauge indicating that measurement will differ as to range and plate layout. Most gauge plates (when identical to the real aircraft) are not linear, which requires calibration of the needle against the measured value.
Using the Plate Type dropdown list, the plate can be selected that matches a particular aircraft. Most standard plates will be included in the default configuration file and can be assigned to a gauge.

For "special" plates however, the user can create its own plate (or modify an existing one) using the Calibrate button to the right of the Plate Type dropdown. This button will open a screen to create, update and test the correctness of a plate. The possibility to create/modify a plate is for advanced users and will in general not be needed by users using the standard G-step gauge range. For those who want to create their own specific plate: the Advanced section describes how to do that.

5.3 Needle speed.

The needle speed slider sets the needle speed. Some "nervous" flight simulator readings can be compensated by that function. Most usual setting is around 80% to 90% , but setting will depend on personal preference and the function assigned.

Oil temperature for instance can be set very low, but vertical speed will require a faster needle. Setting too fast can result in a hampering stepper motor and wrong needle positions.

5.4 Testing the gauge

To test your settings you can use the Test Gauge slider. A complete 360 degrees rotation of a needle is 1080 steps, but due to the "stop" we loose 45 degrees thereof, so the needle will have 945 positions (0-944).

Backlight can be tested by clicking the on/off selections. Light will remain on or off when you close this window, but when you start the actual simulation, the backlight on/off will be synchronized with the light switches of FS and whether the aircraft has a power source on its main voltage bus. (Battery on or a generator of a running engine). Note: in more complex configurations it is sometimes difficult to locate a gauge just by its ID. Lights on/off then helps you to locate that particular gauge.
Some gauges from the latest generation (purchased after January 2015) can even be dimmed.

By clicking the "Apply" button the settings are saved in the configuration file. From that moment on the instrument is assigned to the selected function and will (if changed) get its new GaugeID.

Clicking "Uninstall" will remove the instrument from the configuration. However, the instrument will remain active via the current GaugeID and will -at a next search- show up again but then with the "not assigned" label.

By clicking "cancel" no changes to either the configuration or instrument will be made. However, as the

needle speed is saved in the instrument itself, this will keep its last speed setting.

The G-step gauge range has some gauges with more functions combined in one gauge. As an example a dual needle gauge can be configured similar to a single needle, but the assignment is doubled. One for each needle.

5.5 The Altimeter

Another instrument type is the Digital Altimeter. Clicking this gauge type will pop up the following window:
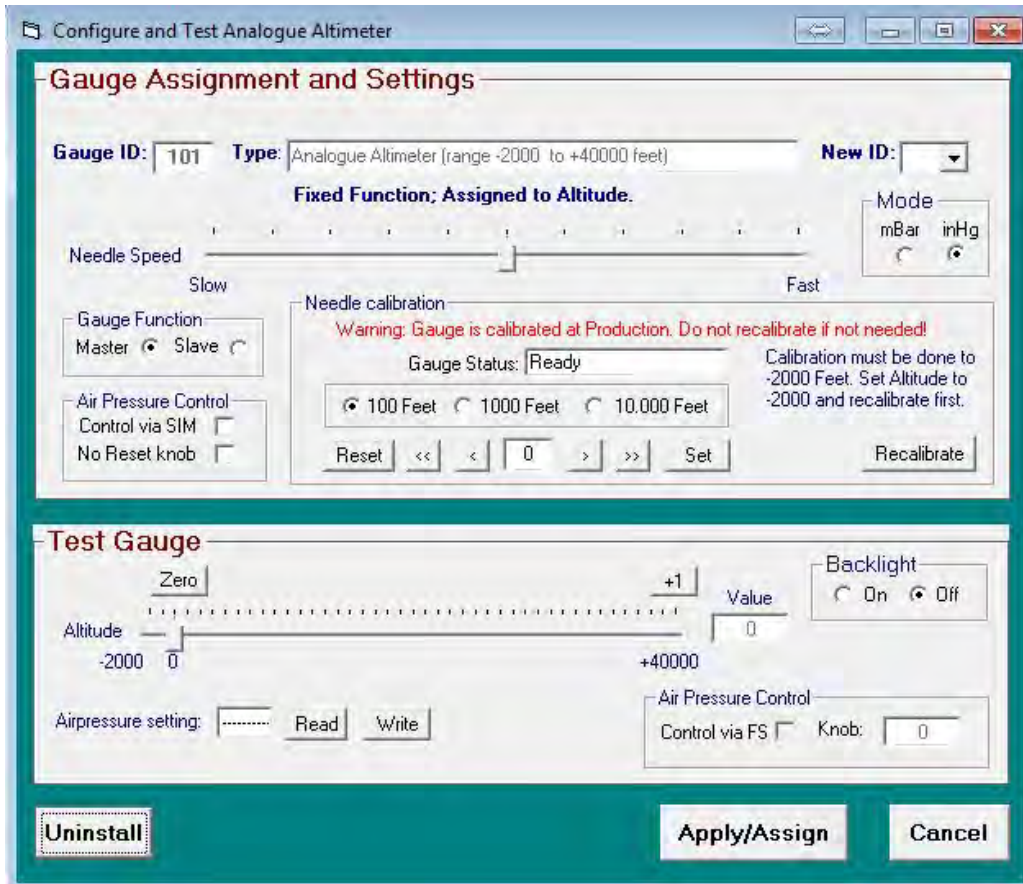
As this is a dedicated Gauge it is not possible to assign it to another function. The settings here only effect the Gauge itself.

As mentioned at the previous Single Needle window, the Gauge ID can be changed from its standard "101" to another ID. Mode of the air pressure can be changed from Inch Hg to Millibar, but should of course match the text on the faceplate of the Gauge. Needle speed function is identical to the Single needle gauge.

A special word about the checkbox "Air pressure effects Altitude".

This function is not made for Flight Simulator connection and should in general be off. What it actually does is making a direct connection between the air pressure setting and the altitude that belongs to that air pressure. So, should you activate it, the altitude will increase roughly 10 feet per 1/100 inch HG air pressure decrease.
It is made for applications where the setting of the air pressure cannot be effected, making the altimeter more or less "self supporting" as to that. However, for testing the gauge you can temporarily switch it on.

The altimeter has a needle that can make full rotations in both directions. A photo interrupter inside the instrument is used to calibrate the zero position of the needle. But as needle can (depending on assembly) have an other position than the sensor, this difference can be adjusted using the needle calibration box. At Reset, the gauge will search for the photo interrupter and stop there. Using the left and right arrows, the needle can be moved to its corresponding zero position. Then click Set and the displacement is saved in the instrument.

At delivery this is already done so normally it should not be necessary to do this, but we left it in for situations where you disassemble the instrument and would take off the needle.

To check whether the air pressure setting can be read from the instrument, you can click the "Read" button. It should show the same reading as on the display of the gauge. To get the reading you have to click twice.

In the Test Gauge box you can also check the gauge for correct functioning and whether light and displays can be switched on/off. After closing this window, the settings for Display and Backlight will remain, but when you start the simulation the displays and backlight will be synchronized with the FS aircraft. So: there must be a power source for the display (otherwise it will be switched off) and for backlight both power must be there and light switch must be on.

Important note

The air pressure setting is read from the instrument about 10 times per second and send to FS. There it will "rotate" the knob on the altimeter on the screen and as such synchronize the on screen altimeter with the external gauge.
You can check whether this reading works on the status screen in run mode. The value there should follow the reading on the instrument display. From there it is fed into FS.

Although possible (as it is an electronic display) it does not work the other way around. So, changing the air pressure by mouse or keyboard will NOT change the display reading of the Gauge. In other words: the G-Step Altimeter Gauge is master.
This is compatible with other analogue simulator gauges, as –should this be realized- a change in air pressure setting by mouse or keyboard would require an extra motor to make the knob and pressure plate rotate.

6. Configuration and functions
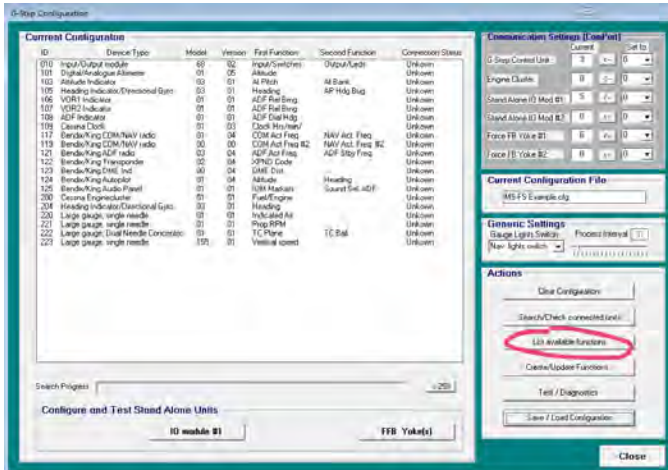
Back to the main configuration screen.

Another button will show the list of available functions. It contains a full list of functions that will be implemented or are already implemented.
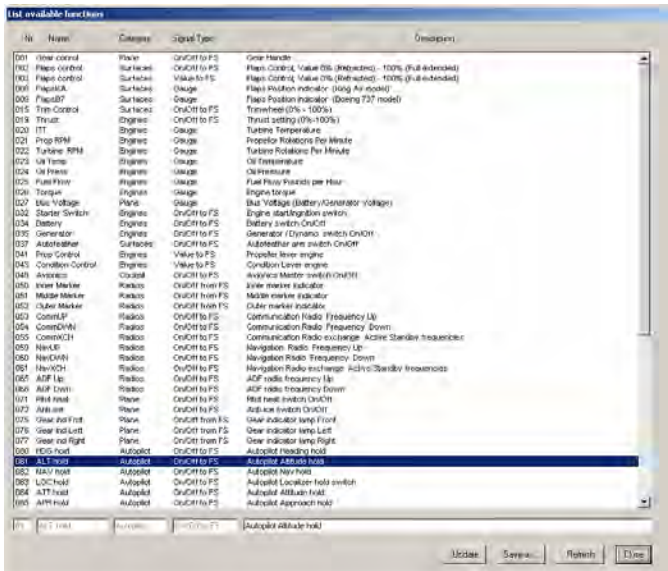
Not all functions are fully implemented yet, but the list will grow with the types of instruments we supply. At regular times we will update this list and put it on our web-site together with a new version of the control program. As you will see the functions have fixed names, categories, types, etc. However, the description can be edited by the user and also stored in the configuration file. To change a description click on it and it is copied to the line below the list. You can now change the description and by clicking the update button the changes will by copied to the configuration. These updates are made in memory but not saved to the file on disk. If wanted, you can click on "save as" to do so.
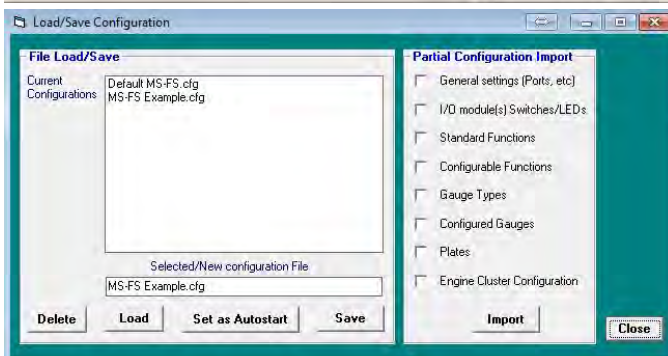
Last button on the main configuration screen is the Save/Load button.
It will bring up a small window with the available files and buttons to either save, load or delete a file.

Clicking a filename will copy that file to the new filename box. But you can also type a new filename. Please note the file should have the .cfg extension.

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By clicking delete, save or load, the file corresponding with the "filename new configuration" will be saved, deleted or loaded *the GSTEP software.*

7. Running the simulation

When you click Continue on the main start up window you should see the screen below.
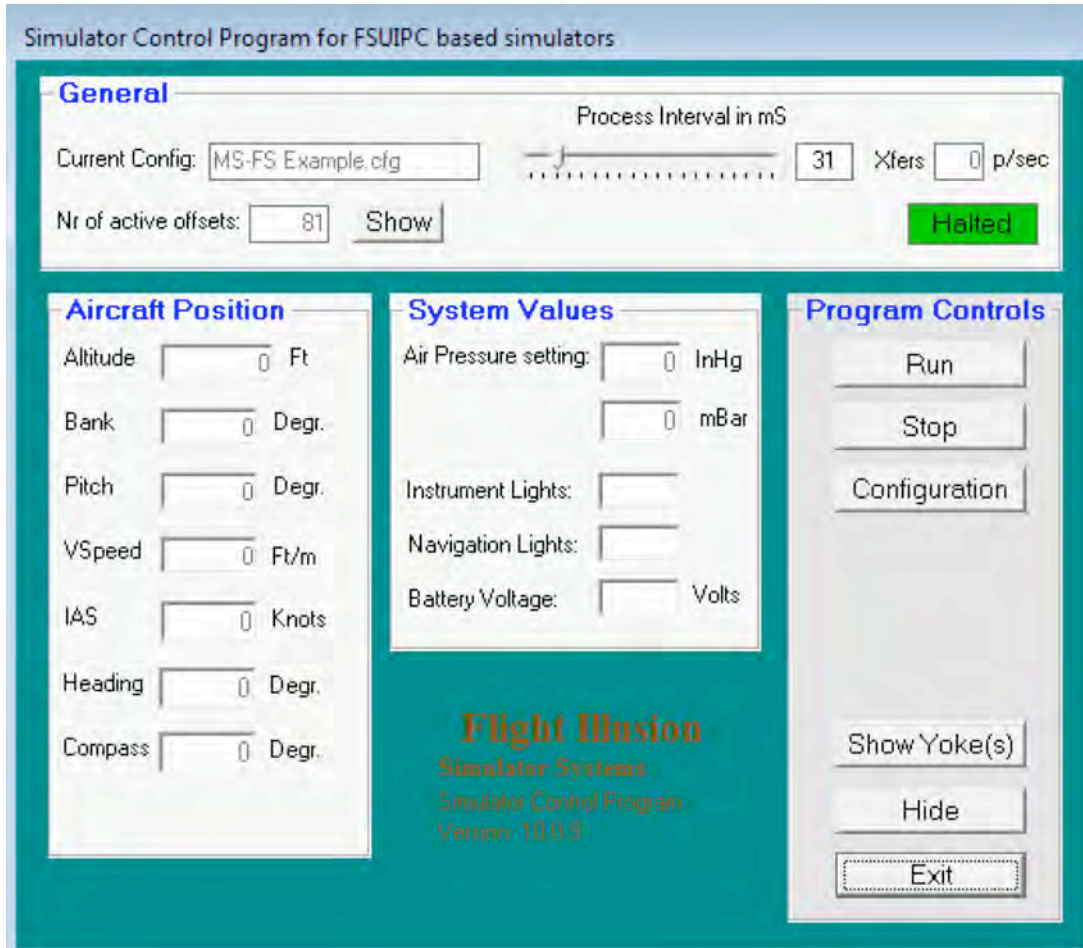
On top of the screen the current name of the configuration file is given and the status of the connection between the Control Program and Flight Simulator and FSUIPC.
The Xfers box shows how may times per second the information for setting the gauges is refreshed.
The value will depend on the speed of the computer and how much process time for the GS Control program is "allowed" by FS and other active applications. Remember here that "faster is not always better". About 30 x per second is normally good enough.

Some key values are shown on this screen, but not all. Run and Stop control the simulation mode and when running the various boxes will show the actual FS readings. They are just there for test/reference and to see if there is communication between the software and FSUIPC. By clicking "hide" this screen will be minimized and when in Run mode the program will remain active and update the connected gauges.

> When al values are still 0, (as shown in the picture) there is no communication with FSUIPC. In this case, the gauges can't be driven. Refer to FSUIPC to see if the program is installed correctly

8. Trouble shooting

The basics for good troubleshooting is a step-by-step approach and isolating the problem.

First step is a check whether power is connected to the Central Interface Module and whether fuses are OK. One fuse is for the +12 Volts and the other one for the + 5 Volts driving all electronics.

When no communication at all check in Windows whether the virtual comport is available and working correctly. And make sure the Communication port number matches the settings of the G-Step control program. If the port number does not exist the GSC program will give a runtime error as soon as you activate a function.

Next you can start the control program without starting flight simulator. And go to the configuration screen. Click clear configuration and search for the connected instruments. All connected instruments should pop up now. If not or one or more are missing, check the flat cables or exchange them. Before doing so better switch off power from the Central interface Module.

As mentioned before, the G-Step concept is a bus system where all "participants" are connected in parallel and in order to communicate with a single one, it needs to have a unique address. There are bus protocols to handle that, but in general these protocols create a serious protocol overhead, which will always be there, also at run time. So we decided to use a straight forward concept and keep the auto-addressing out of the run time.

But, as all benefits, it has a disadvantage. Addressing must be done by human intelligence and only one instrument at a time. However, if you administer your gauge IDs correctly, you can just disconnect all other gauges and connect only the new one for configuration. This has to be done once. Nevertheless, double addressing can occur and result in "not found" gauges.

Individual gauges can be tested by clicking them. Move needle and test whether you can switch the backlight. In larger configurations it is sometimes difficult to locate a gauge by its Gauge ID. Simple way of locating an instrument is clicking it and switch on/off light to identify it via the Gauge window.

When all gauges can be reached and react on needle and light commands, you can be sure the Hardware and interconnection is OK.

Next problem could be a configuration file that does not match your current configuration. To check that print the list (by e.g. copy screen) of the gauges found during "Search" with a cleared configuration and check if the configuration file you use matches gauge ID's and functions.

If that is all OK, the only problem that can remain is the connection between the GSC program and flight simulator. In order to To check that load Flight Simulator and AFTER that load the GSC program with the appropriate configuration file. Status of the connection between the GSC control program and FSUIPC and FS displayed on both the main start up screen and the status screen that is shown when clicking "continue". It should show "connection OK".

By depressing the "RUN" button the interface between the GSC program and FS will be activated. Now all boxes should contain the actual FS values, like altitude, IAS, etc. If not the problem is outside the GSC program and probably something wrong with either FSUIPC or FS.

9.1 The Creation and Maintenance of Functions

Users can create their own functions from the full set of offsets available via FSUIPC. This is for users having a good knowledge of how the interface with Flight Simulator works and some basic understanding of the representation of numbers in computers is required.

> *As said this is for specialists. Wrong definitions and/or functions can "hang-up" the computer and/or make FS functioning wrongly. Not permanently of course, but a re-boot would possibly be required in that case.*

> It is good practice to back-up a working configuration file by saving it with another name before making changes or additions.

Depressing the Creation and Maintenance button from the configuration screen will open the following page:

It is roughly divided into two parts:

- The **top part** relates to the FSUIPC values that can be imported from a text file (which is standard supplied with the install package).
- The **lower part** is used to create or update G-Step functions.

9.2 The top part

Clicking on the "Read Raw Offsetfile" button will load the offsets into memory and contains all the known offsets. An offset (its reference) is a 16 bits number represented in hexadecimal format. Clicking a line in the raw offset list will pop-up the details in the right part of the screen. It will show the Offset, the number of bytes used for the value access mode, etc. Depending on the offset one or more bytes are used The number of bytes will mainly depend on the precision of the value. FSUIPC uses more representations defined by the number of bytes:

- *- 1, Byte, an 8 bit value ranging from 0 to 255*
- *- 2, Integer, a 16 bit value ranging from – 32767 to + 32767*
- *- 4, Long integer, a 32 bits value ranging from -2147483647 to +2147483647*
- *- 8, Floating point, a 64 bits value, for very large numbers (over 300 digits)*

The 1,2 and 4 bytes lengths are integers, whilst the 8 byte length can contain fractions as well. Apart from these FSUIPC uses some other representations (like for radio frequency setting).

Important note
Internally Flight Simulator uses a bunch of units like miles, meters, feet, Celsius, Fahrenheit, Kelvin, Rankine and more. Obviously we need in many cases a formula to translate the raw value into a value that matches the gauge. The "formula" box contains the formula to perform that conversion. In some cases this proposed formula isn't directly usable by the G-Step control program. Most formulas can be simplified to a single multiplier and divisor part, and the boxes below the formula will show that two values. However, some formula's in the raw file aren't complete or correct, so just see it as a proposal

The Copy -> Function button will copy the current raw offset to the lower screen part, but before saving the function to the configuration file it will need some editing and additions.

9.3 The Lower Part

The lower part list box will show the current functions as used by the control program. Currently the Function list contains 300 slots and by clicking one, the function will be copied to the boxes located below the list box for detailed editing.

The "short name" is the name of the function and this name will show up as assignable function in gauge configuration screens. Next to that you can choose a category to which the function should belong.

The "signal type" box is an addition used by the control program. It tells the process what to do with the result when the function is executed. For gauges you can select "Gauge". Do not select " dedicated gauge" here. This is for gauges that are not freely assignable as they have a unique function.

Data type is already filled in by the "Copy->Function" based on the offset value length. G-step control uses one extra data type: Unsigned integer. This data type contains only positive values ranging from 0-65535.
Next to the data type dropdown box are four boxes for offsets. In the raw offset file each engine has one slot, but of course the naming, definition and processing is identical for all the engines or a multi engine aircraft.

In the control program, these functions are packed together into one slot: Nr 1 for motor one, Nr 2 for the second motor, etc. The Copy button below each box will copy the offset from the offset in upper part of the screen. Name, Formula, etc. will be equal for all of them.

Finally there are three boxes for the transformation of the value. A pre-add/subtract number, a multiplier and a divisor. The pre-add is needed mostly for temperature conversions. In the example it converts Rankine (the Fahrenheit version of Kelvin, so with the absolute zero point temperature) to degrees Celsius.

In formula: Celsius = (Rankine - 491.67) x 1 / 1.8
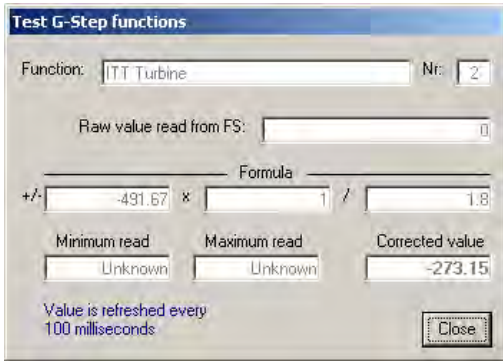
To test the function and re-calculation you can use the red test button. Please note that you have to save the created or updated function in advance! Of course FS and FSUIC must be up and running. If so a small window (see below) will show the value read from FS and the corrected value thereof.
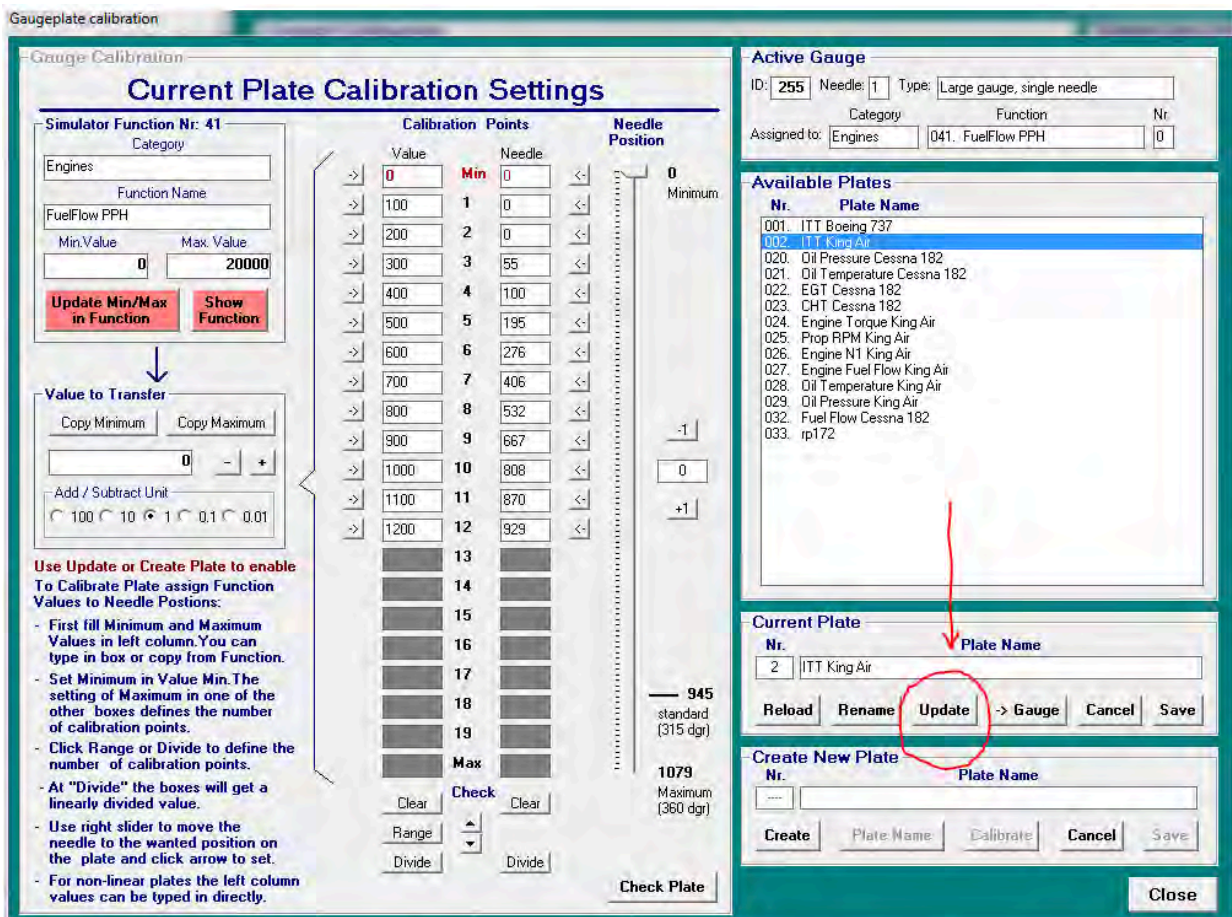
9.4 Gauge Calibration and Plates.

Realistic plates are identical to the ones in the real aircraft. These real instruments are as to construction completely different and often driven by analogue sensors and actuators like air pressure, non linear temperature sensors, etc.

On the other hand the G-step needles are driven by high resolution stepper motors and due to that absolutely linear. The "lazy" approach would be to create plates that fit the linear stepper motors, but that would result in plates that would strongly differ from the original.

For that reason the G-Step control program has a built in utility to convert a FS/FSUIPC reading into a plate that is identical to the original aircraft plate.

Clicking the "calibrate" button from a gauge configuration window will popup the screen below. The principle is that a plate is divided into a number of calibration points that must match a certain needle position. Between the calibration points the needle position is interpolated linearly.

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On the left Gauge Calibration frame, the left Slider represents the value read from FS and the right part represents the needle position. For the creation of a new plate, you can Clear the row containing the "value boxes".

On top the Minimum value of the offset should be typed in and one of the 20 boxes below the calibration points. For your convenience you can just type the maximum value into one of the boxes and the depress "divide". The in-between boxes will then linearly be divided. Trick here is to "play" with the number of calibration point in order to get nice integer values. But you can also fill the calibration points one by one> To do so use the slider and +/- buttons to set a particular value and then copy this value to the corresponding Calibration Point box using the corresponding little arrow button.

The "Read" button will pop-up the small window as used in during the "Creation and Maintenance of Functions" and can be used to view real FS values for reference.

When left "Value" row is completed, the needle can be can be calibrated.
For a quick check the needle positions can spread over the calibration points, which would give a full scale linear plate.

Calibration of the needle is done using the slider and +/- buttons on the right side. First select the value to be calibrated on the left side (it will turn red), move the needle to the correct position and click on the small arrow right of the corresponding box. The Value on the right side is now corresponding with that particular Needle position.

When all done, you can check the calibration using the two Up/Down buttons on the bottom of this frame.

The right part of this screen is for the plate "administration" . Top part shows the current gauge and its assignments. Below that is a list of available plates, where the current selected plate is highlighted.

Underneath the plate list are buttons to assign the plate to the current active gauge, to save the plate and to add a new plate. Latter button will save the plate (e.g. when modified) as a new plate. The reload button will restore the original values into the calibration points rows.

When adding a new plate a new plate name and category must be given. The added plate will get a number and will be added to the list of available plates. To remain consistent with previously assigned plates it is not possible to delete a plate.

Last frame on this screen gives the possibility to test the gauge and the (new) plate.
When activated both sliders on the left part of the screen will be "connected" to the real value read from FS. Of course FS and FSUIPC should be Up an Running to do

Important note

Creation of new functions and/or new plates can be rather complicated. However, it has to be done only once and increases the functionality seriously. To get examples you can select the standard available functions and plates. But–as said before- before updating functions and plates: back-up the working one before, by saving it with another name.

10.1 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 product range. This means the I/O module can be connected to with a USB to the same architecture as the other gauges or modules. It will have it's own COM port and will be visible in the lower pane of the configuration screen.

In the box of Stand Alone units, the button "I/O Module #1" will appear.

Configure and Test Stand Alone Units

IO module #1

The I/O module is a stand alone module, requiring no additional power (unlike the GSA-55 interface)

10.2 Capacity of the Flight Illusion I/O module:

The Input/output module can drive switches, LED's or POT-meters. The capacity is as follows:

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)

10.3 Hardware

The Flight Illusion I/O module has several connectors. Three connectors for digital inputs (switches), a connector for 8 analogue inputs (potentiometers) and two connectors for using digital outputs (LED) In figure 3 you can see a schematic representation of the I/O module.
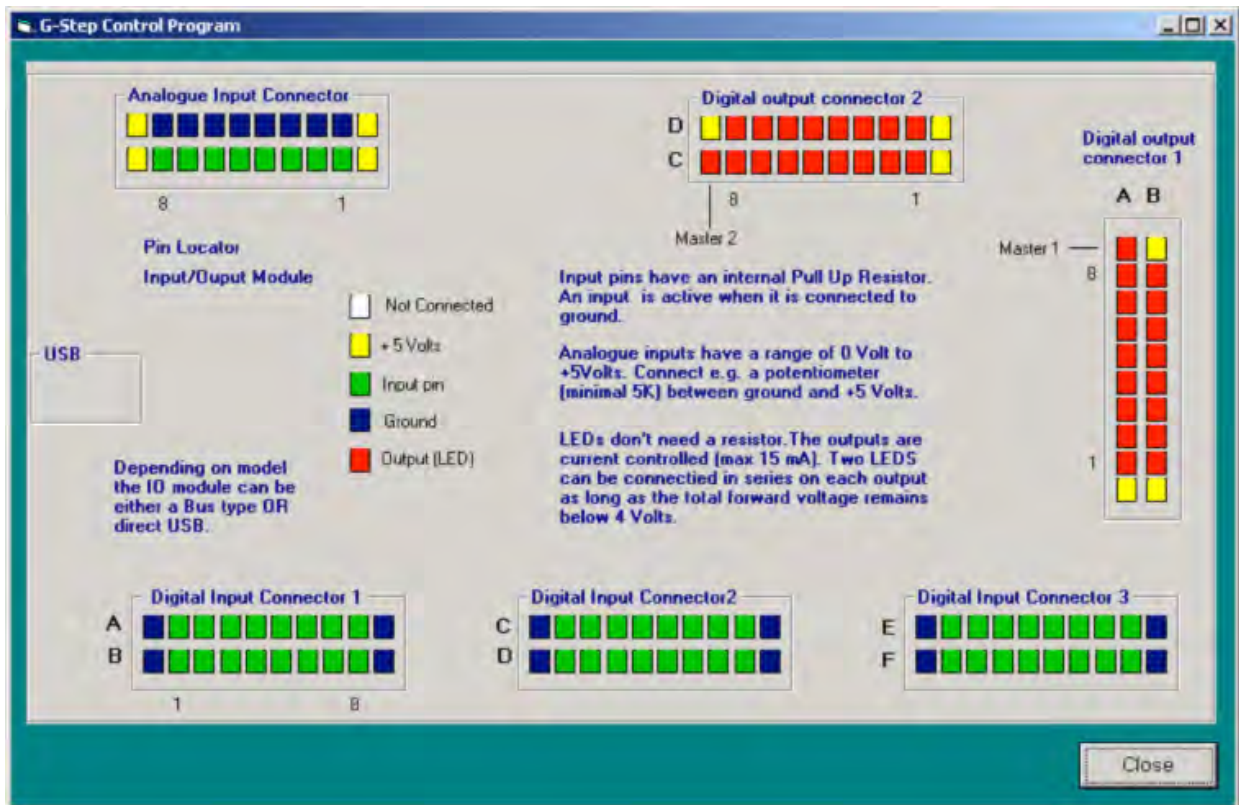
Fig 3. The Card layout

Understanding connections

As can be seen on figure 4 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)

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.
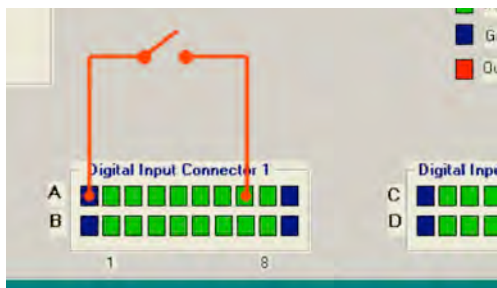
(fig. 4)
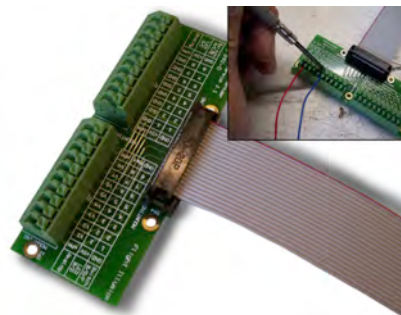
(fig. 5)

Figure 4 above shows a schematic representation of switch number **A7** connected.

10.4 Software

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.
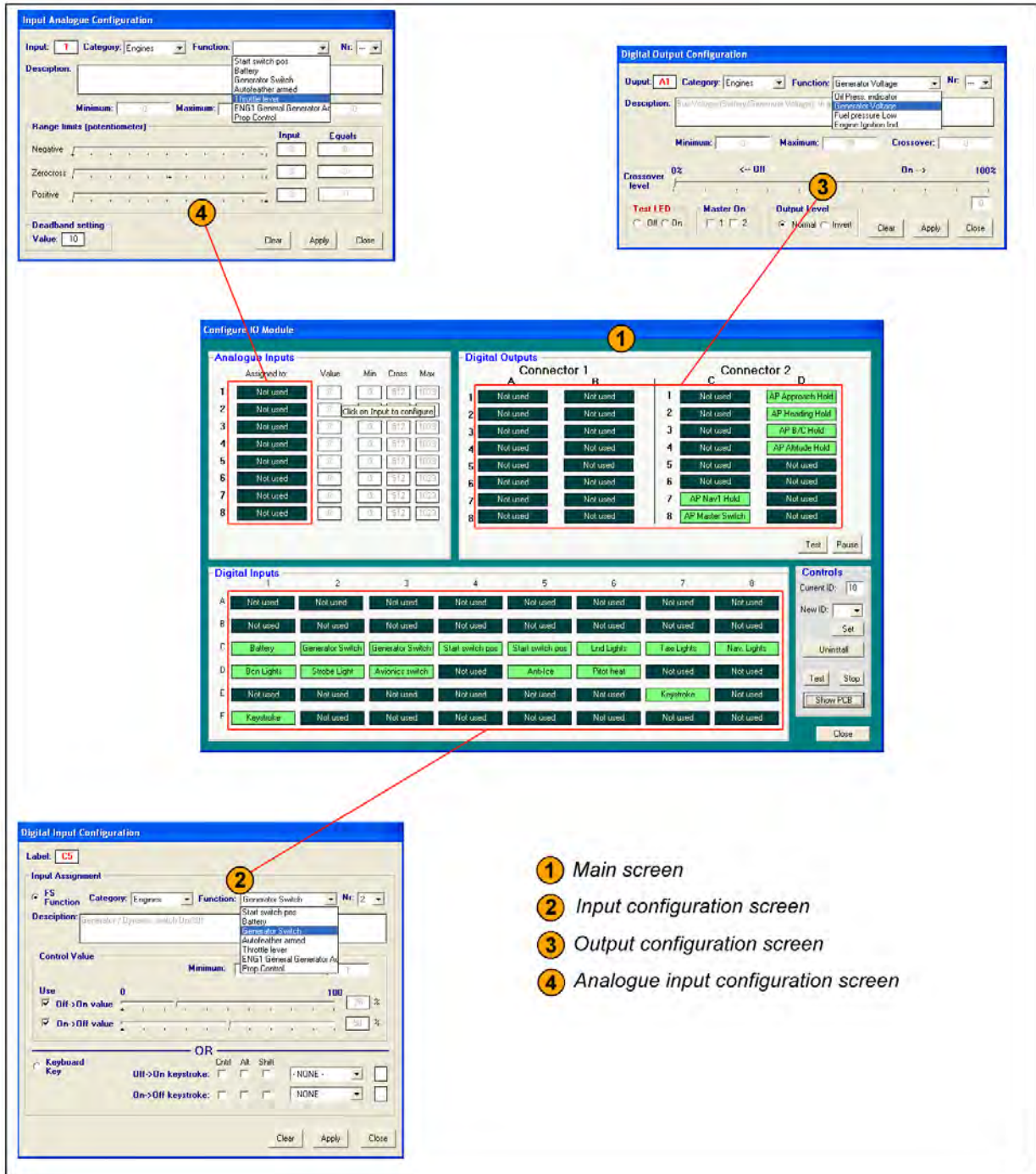
Fig. 6

10.4.1 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)

Fig. 7

10.4.2. Connecting switches

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)
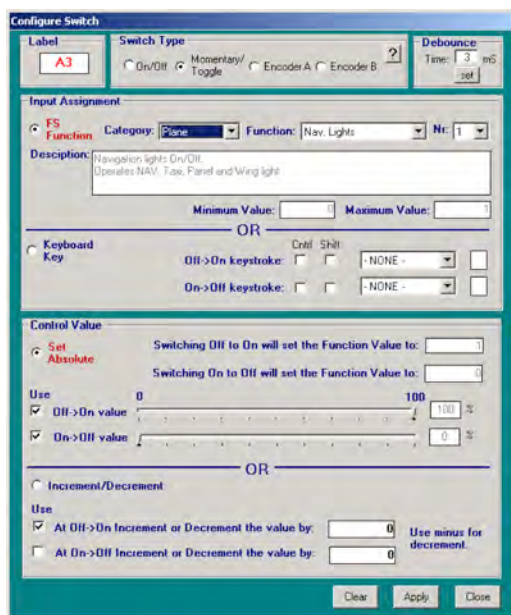

Fig. 8 Configuring a switch for Absolute mode

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 Off/On alternately per switch operation. This switch type is mostly used for Pushbuttons, that will switch on/off a function alternately

In this example switch A3 is used to switch Navigation Lights. (see Fig. 8)

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.

Only assign a function to an input isn't enough. Even the action must be assigned before it should do anything. (control value). So be sure to set the action correctly before you click "apply".

10.4.3. Connecting rotary encoders

Second mode of a switch within the FS function mode is the Increment/Decrement mode. This mode is mainly used to connect rotary encoders. To use/read a rotary encoder, you will need to connect 2 switches, as in this example switch A1 and switch A2.
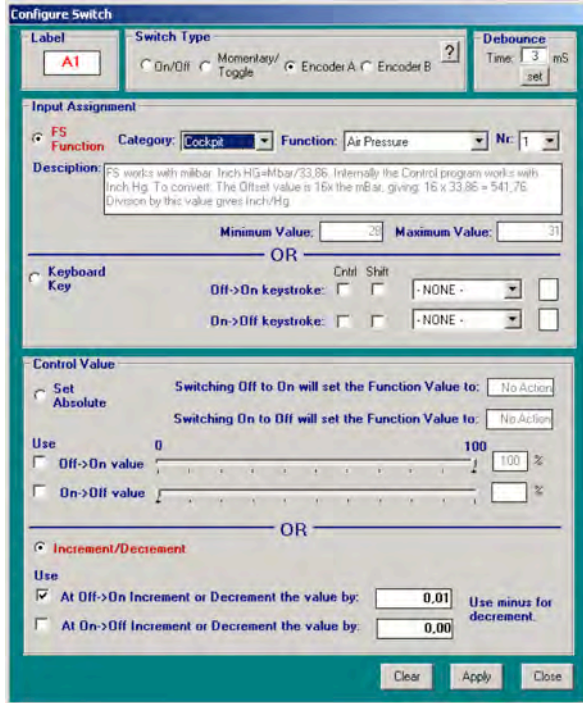

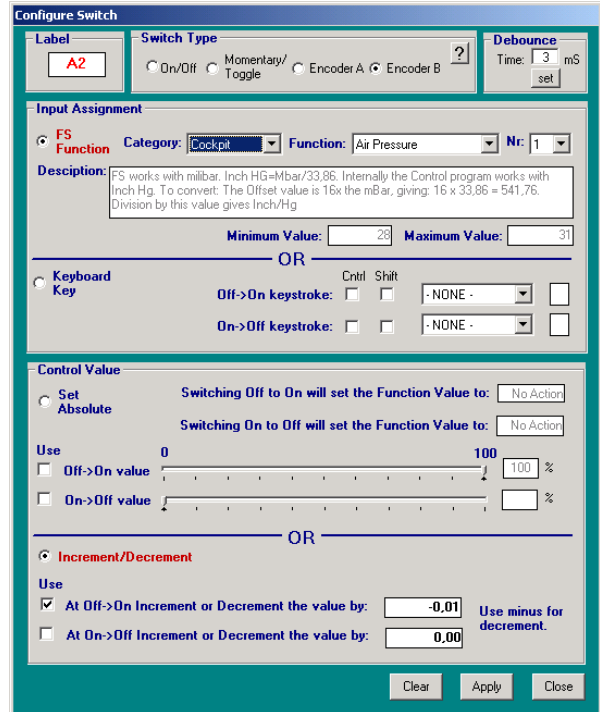
Figure 9. Configuring a rotary encoder   *Figure 10. Configuring a rotary encoder*

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 setting when rotating counter clockwise.

10.4.4. Assigning keystrokes to a switch

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.)
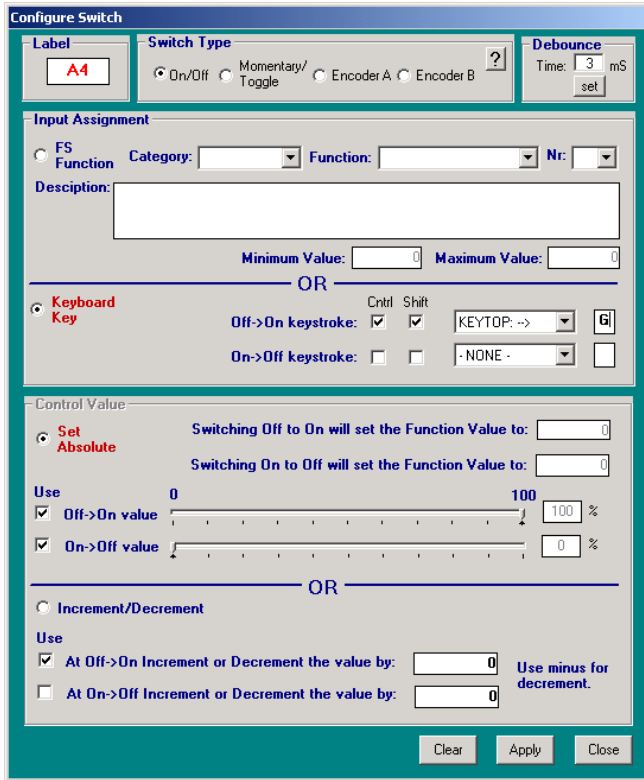

Fig 11. Configuring a keyboard stroke

10.4.5. 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)

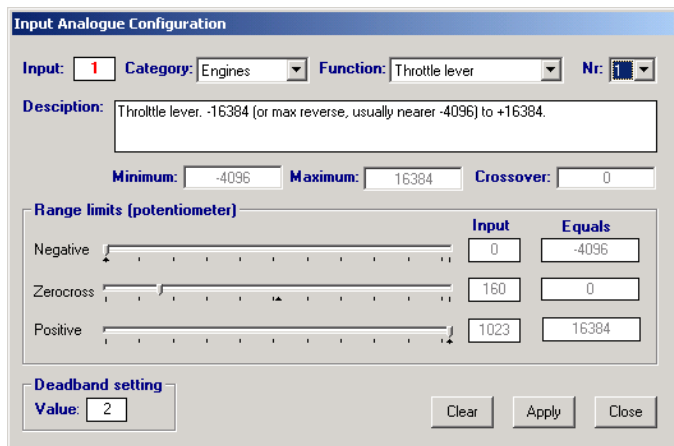After clicking on a connected potentiometer the configuration screen will open:

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.

10.4.6. Configuring Digital Outputs (LEDs)

Up to 32 LEDs can be connected on the two Digital Output connectors. LEDs (common anode) 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

After clicking on a Digital Output on the main screen the configuration menu will open:
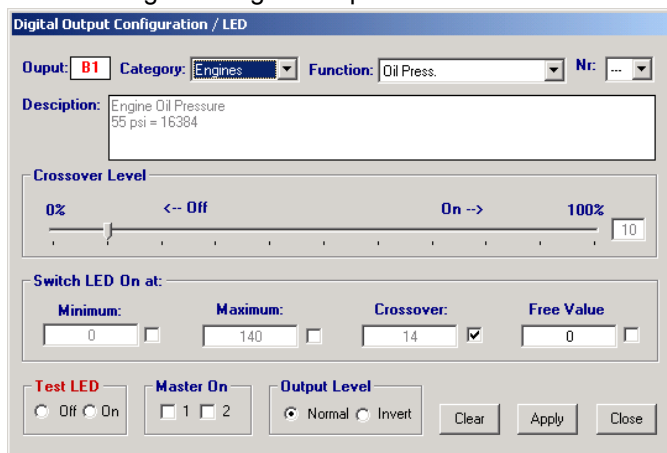
Assigning a function to a LED works the same way as assigning a function to a Digital input using the Pull Down menus. With the slider you can select a Crossover value. E.g. Functions that switch bweeen 0 and 1 mostly set cross over to 50%.

Fig13. Configuring LEDs

The LED can be controlled via several 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.
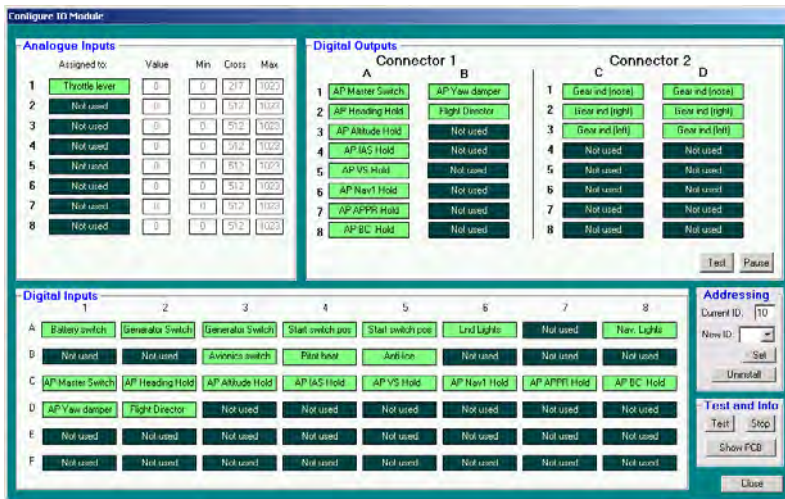
34
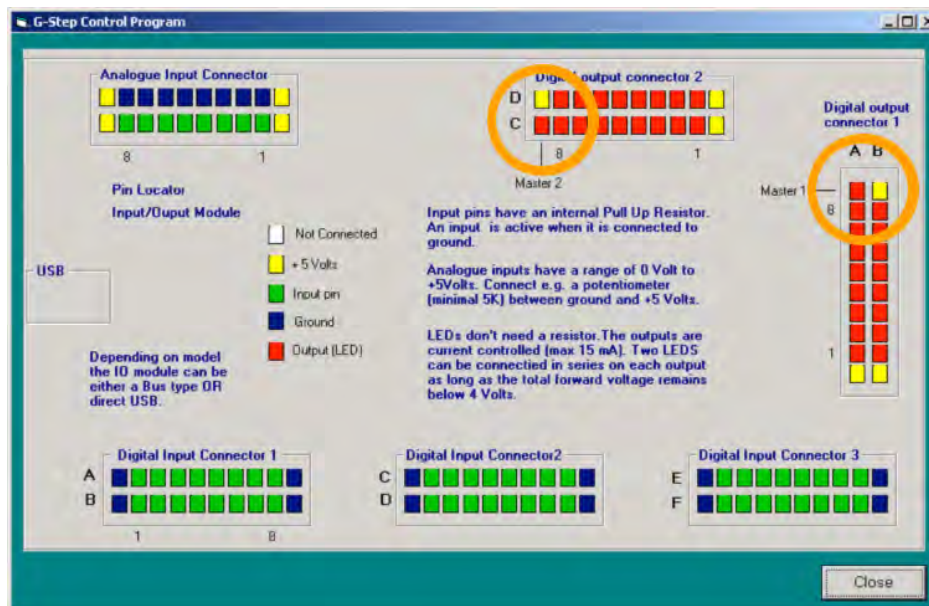
11. Examples for input/output connections

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

11.1 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:
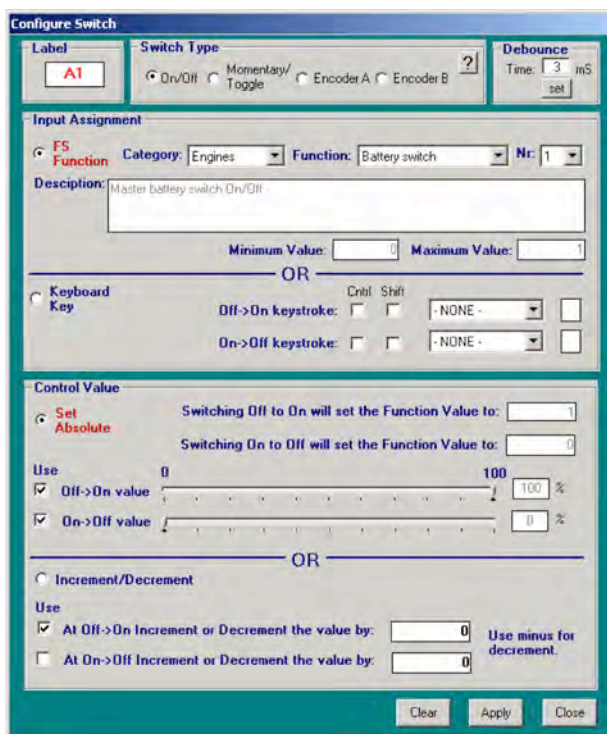
We configure it as a On/Off switch type, select it as a FS function and use the Set Absolute mode of the Control value. We want to use both the On->Off actions and the Off->On action, so we set to use them both.

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.

11.2 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
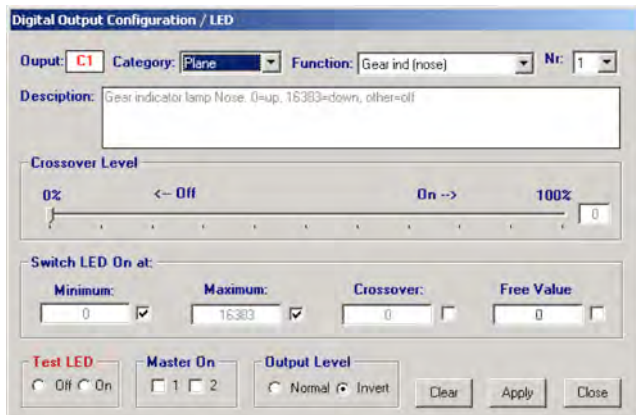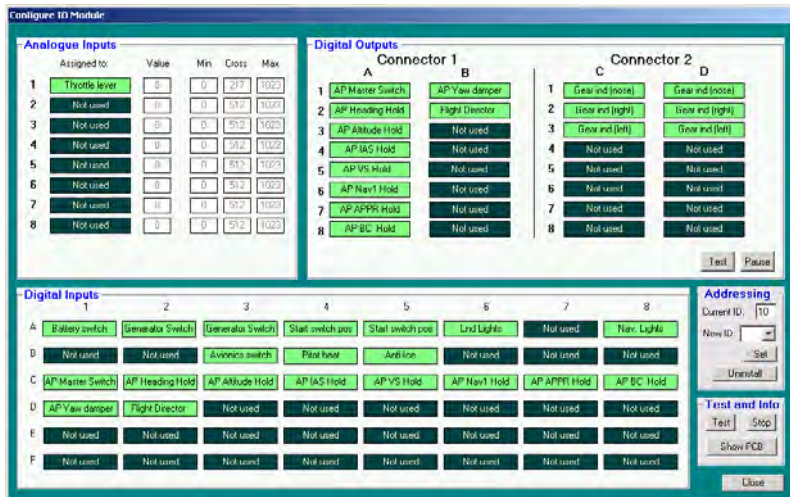
Now we need to configure the Red LED on output C1. It should only burn if gear is NOT fully in and NOT fully out:

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.
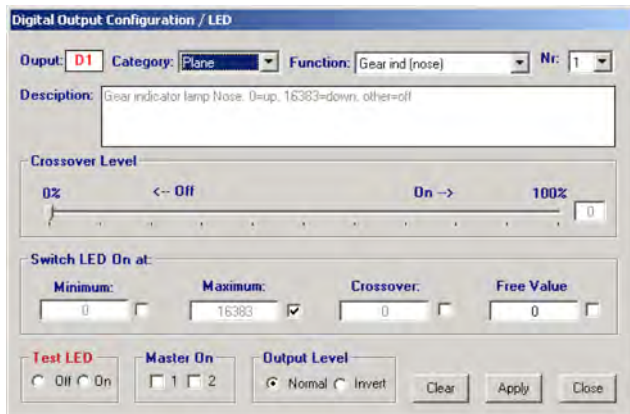
For the green LED on output C2 it is more simple. It should only burn when gear is fully down:

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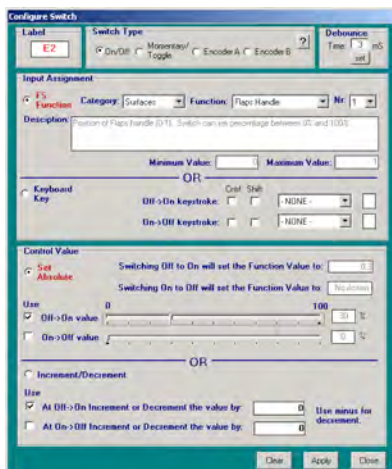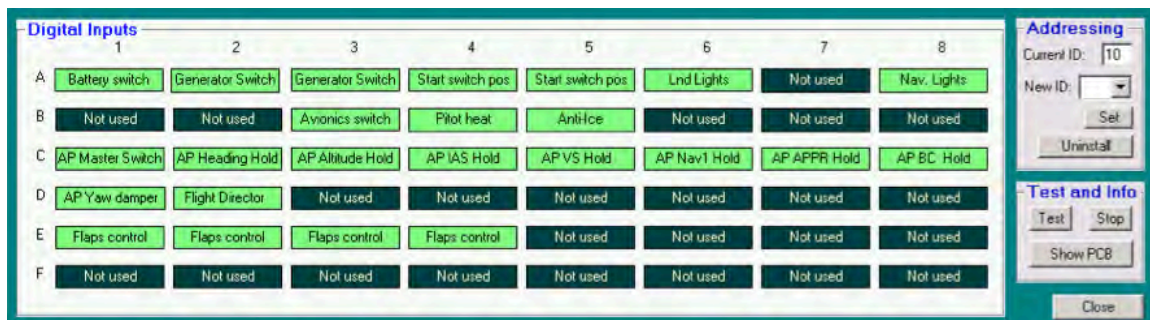
Now, for each position we need to set the flaps to the corresponding position As Example the switch E2. This switch should set the flaps to 30%:

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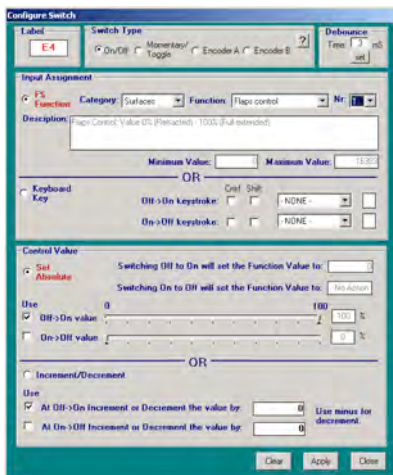
For Fully extended we of course set the slider for switch E4 to 100%:

11.4 Making an 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.

12. The Force Feedback Yoke

12.1. Introduction

The HW- FFB-737/GA Flight yoke has been designed to give the user the sturdy and robust feeling like flying a real aircraft. The concept was to develop a reliable control loading yoke as can be found in many professional trainers, but also at a price that keeps it in reach for the dedicated flightsim enthusiasts and home cockpit builders.

By using standard available but at the same time heavy duty components we think we've succeeded in creating one of the best control yokes available in it's class. Once you take control of your virtual plane with this yoke, it will feel as if you actually have a real aircraft in your hands.

The Flight Illusion team

12.2 safety

Please remember that the force feedback yoke is not a toy. Make sure it is firmly attached to your desk before use. As the forces can be significant in some cases, it's not recommended to be used by small children.

Do not open the casing when the yoke is in use and switch the power off when leaving the yoke unattended.

Although the yoke has a safety feature to prevent it from overheating (it will automatically switch of after a couple of minutes when not in use) it is recommended to check it from time to time for overheating.

Never leave the power supply unattended when on, as it can generate heat. Also make sure the power supply is operated in a ventilated area so it's able to release its heat to the surrounding air.

Be careful after switching on the yoke, in some cases it can make an abrupt movement towards its centre position.

12.3. Installation

Step 1. Make sure the yoke is firmly attached to your desk. This can be done by using the two
mounting holes on the bottom side of the yoke housing (see illustration below) You can use
the two supplied bolts for it or use your own (metric: M6) You can also use the two square holes
that are on the lower front of the casing by using two small clamps.
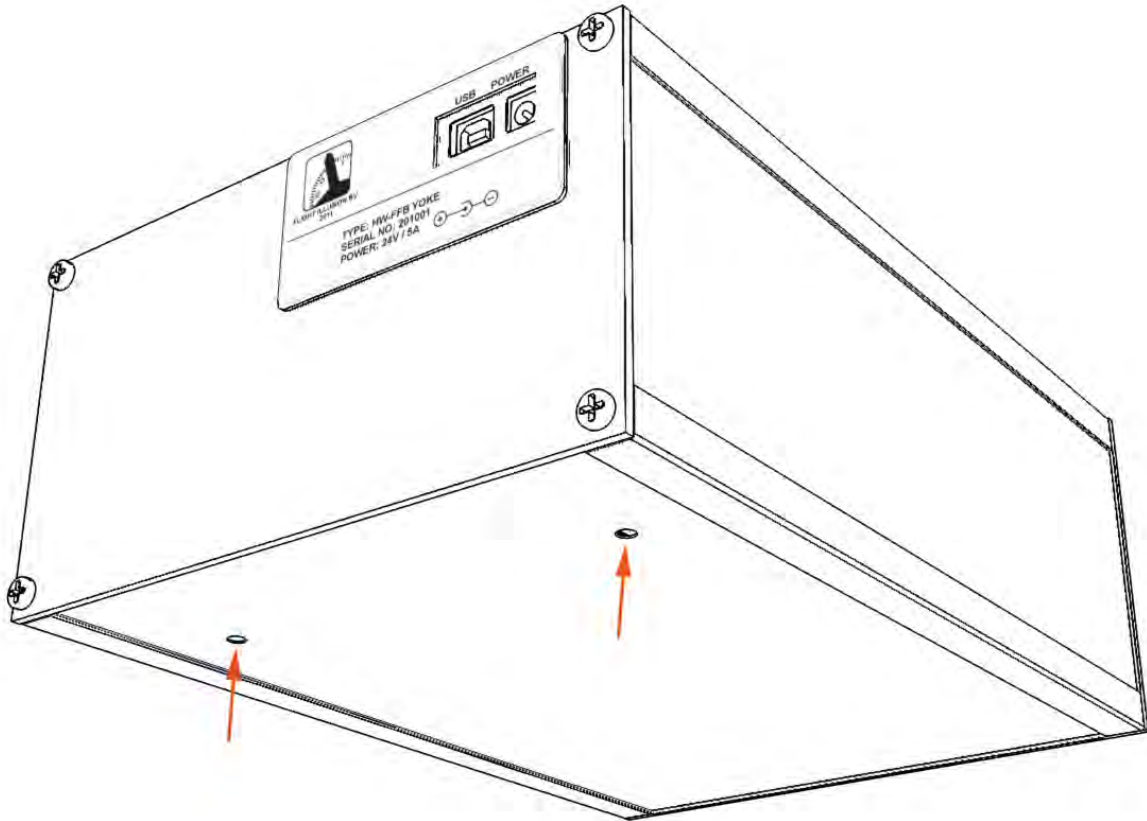
Step 2. Connect the yoke to your PC using the USB cable.

Step 3.a. If you have already the software installed on your PC, you don't need to do anything. The
FFB yoke will be recognized and become visible in the software window.

Step 3.b. If you don't have already the software installed on your PC you can do it now. Installing the
software gives total acces to Flight Illusion products. It will allow you to configure the yoke, but also to
configure gauges or input output commands if these modules are installed later.

  See point 3 in this manual for software installation including the:
    - USB Driver
    - FFB Yoke Control (you can download the latest version on www.flightillusion.com)
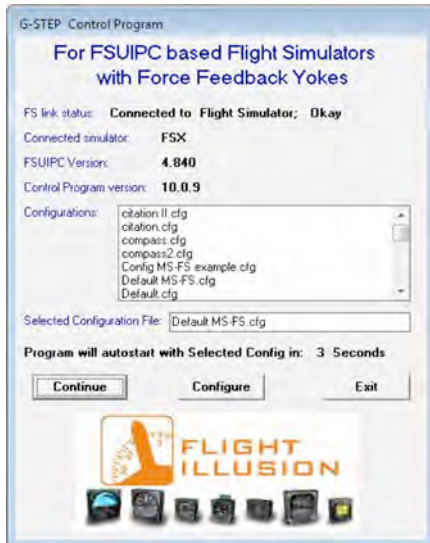
Note: FSUIPC is required to run the yoke with Microsoft Flight Simulator.

Step 4. Connect the power supply

12.4 Software

After starting the control program the opening screen appears.


Here you can select a configuration file for a specific type of airplane or select your own configuration files. You can also check if the control software is connected to Flight Simulator (FS link status)

When using the yoke for the first time, click on 'Configure' to adjust the basic settings for the yoke. This will enter the configuration mode and see the button which gives access to the FFB yoke for easy tweaking.
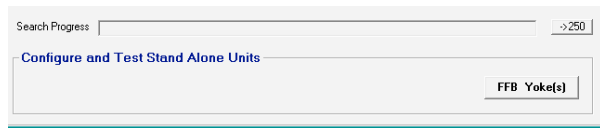
Click on the FFB Yoke(s) button to access the main screen
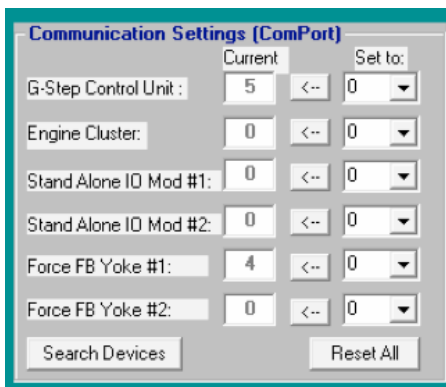
Make sure that your yoke has the correct com port setting

In the main screen the current configuration file is showed and the mode the yoke is in. The status of a second yoke is also shown as it is possible to connect two yokes. Yoke one is standard set to be the master yoke and is in force feedback mode. The yoke can be used in different modes:

1. Force Feedback Mode (FFB Mode): the yoke follows and reacts to values coming out of Flight Simulator
2. Centre Mode: the yoke will return to centre (like a yoke or joystick with springs)
3. Servo Mode: the yoke will follow the movements of a second yoke as if mechanically linked (if it is assigned as 'slave')
4. Follow AP Mode: the yoke follows inputs as given by the autopilot in Flight Simulator.

Click on 'Run' to activate the yoke, or click on 'Configuration' to adjust the basic settings for the yoke.

12.5. The configuration screen:

To define your own settings, click on 'show yoke #1' (or yoke #2) in the main screen or click on 'configure yoke #1' or 2 in the configuration screen.

After opening the yoke configuration file you should see the following screen:
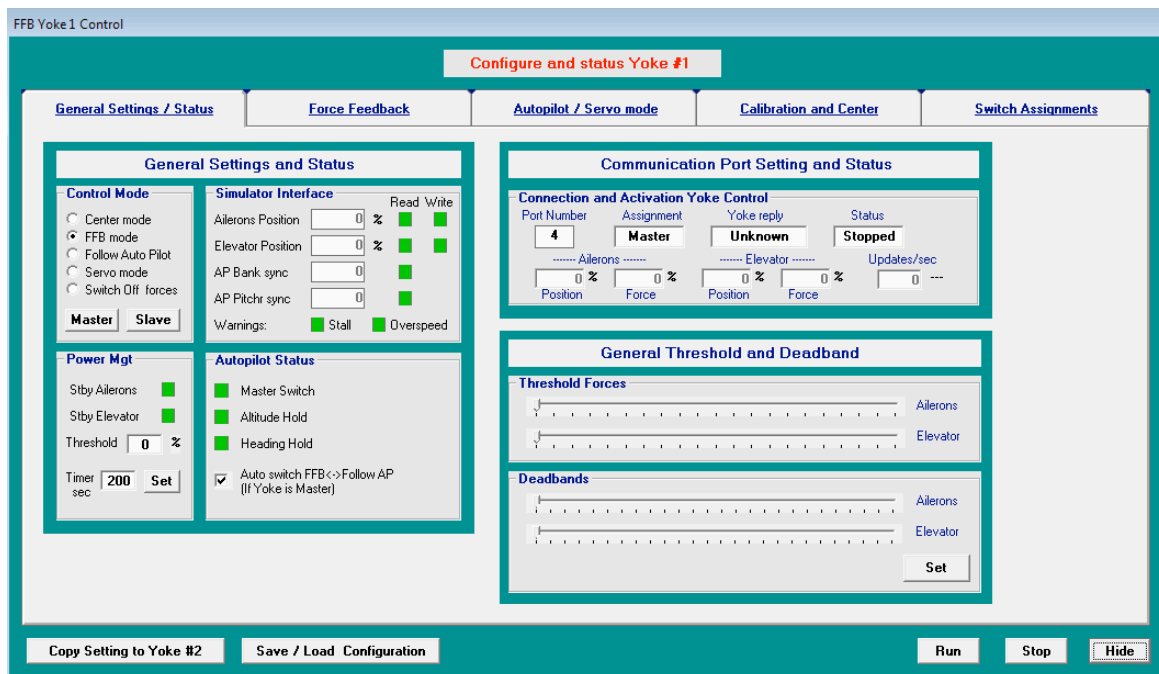
Here you are able to tweak the forces that effect the yoke and set multiple options like switches, autopilot settings etc.

This window has 5 tabs, dealing with specific values and tweaking possibilities.

1) General settings and status
2) Force feedback
3) Autopilot / Servo Modus
4) Calibration and Center
5) Switch assignments

> *Due to the complexity of the advanced settings it is recommended to save the configuration file under a new name or make a backup of the standard configuration files.*

12.5.1 General Settings / Status

You can click on 'Save settings for (particular) mode' to save your setting temporary for testing. To save the settings permanent as a configuration file you'll need to click on 'File' and name it. Overview of the functions in the Yoke Configuration Screen (see illustration above)
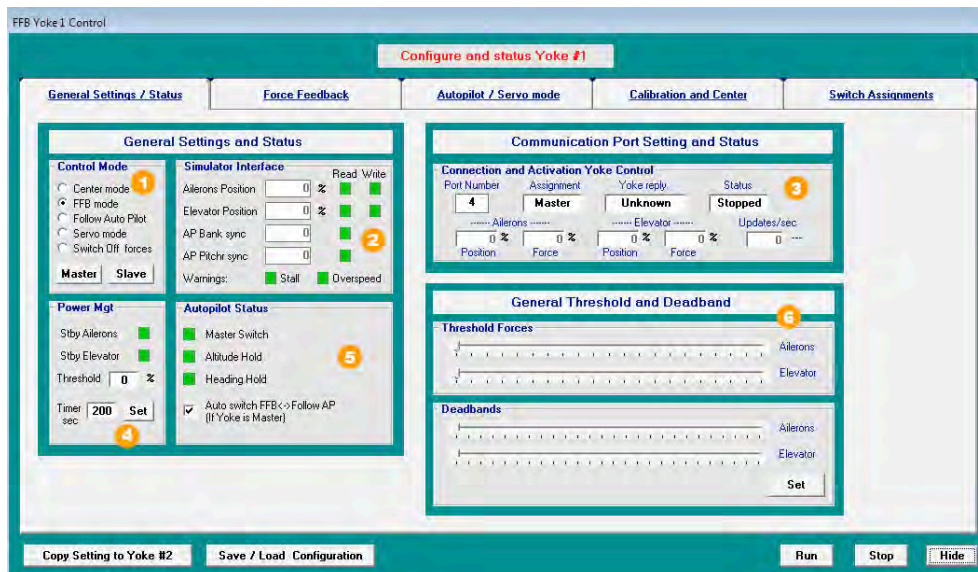
1. *Control Mode*

The Yoke can work in several modes.
   - Centre mode: In this mode the Force Control mechanism behaves as two springs.
   - FFB Mode: The forces on the Yoke depend on the status of the aircraft. The forces depend on airflow along the Ailerons and Elevator surfaces. Also Turbulence and wheel shocks - when rolling- are send to the yoke.
   - Follow Autopilot: The Yoke follows the controls as commanded by the Autopilot. Up/Down follows the vertical trim and Left/right follows the horizontal trim
   - Servo mode: In case two yokes are connected, the Yoke will follow the position of the other Yoke. Or, in case the other control is another device it will follow the values read from the Simulator
   - Switch Off Forces: The forces are switched Off.

2. Simulator Interface:

This part shows the status and action read from or written to the simulator. Ailerons and Elevator position is given in a percentage from -100% to +100%. Centre position is 0. Trim values are the integer values as read from the simulator. The Read ad Write indicators show the Read/Write actions on the Simulator interface. Warnings are read from the simulator.

3. Connection and Activation Yoke Control

This frame shows the actual status of the interface between the Yoke and the Control Program. It shows the status of the connection, the actual forces and position of the Yoke and the number of updates per second.

4. Power Mgt.

The Yoke has a protection mechanisms to prevent Overheating and permanent forces to one of its mechanical limits. If a force is constant within a certain limit (the threshold percentage) for a certain time (the value in seconds) the force of that direction will be switched off and go to Stand By mode. As soon as the force changes over the given threshold, the force will be switched on again.

5. Auto Pilot Status

This frame shows the status of the switches of the Simulator Auto Pilot. In the check box the automatic switch between Force Feedback Mode and Follow Autopilot mode can be selected.

6. Configuration File

The Control Program can be set to one or more Aircraft types using a configuration File.
Each mode (see 1) has its own set of parameters and can be saved or loaded. The settings are saved in memory and can be saved in a particular Configuration File. In case two yokes are connected, you can (to prevent double work) copy the basic settings from the other yoke. The Control Program can automatically start when activated. In this case it will select the file named: Default.cfg. So in case that is wanted, the file –or copy thereof- must be saved under that name.

12.5.2 Force Feedback mode
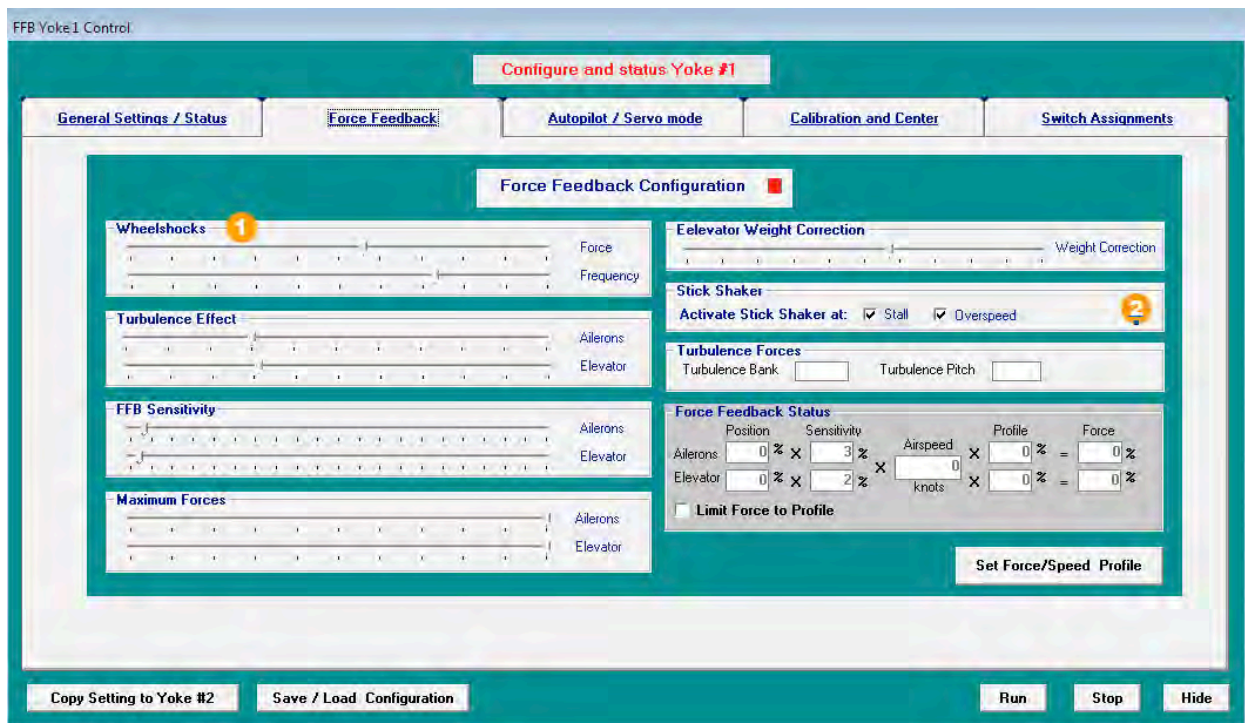
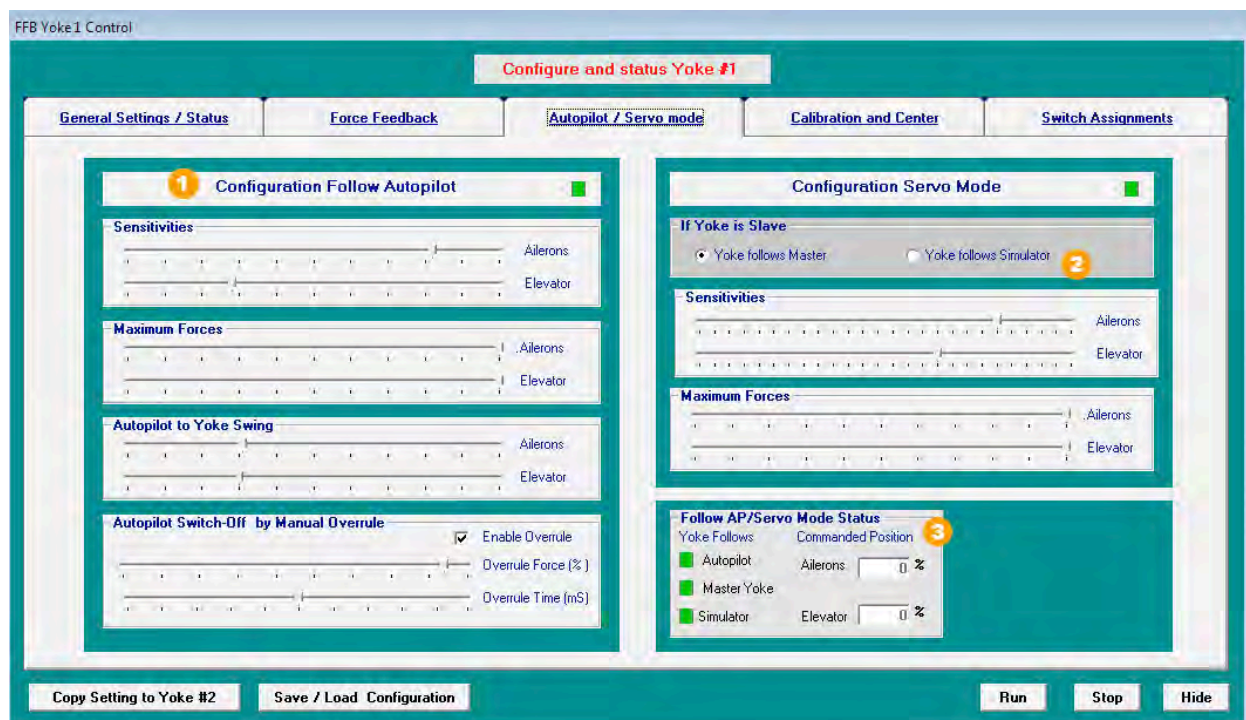### 1. Setting Configuration Variables Force Feedback Mode.
In this frame the behaviour of the Yoke in Force Feedback Mode can be configured.

- *The Wheel Shock Force:* When on ground and wheels rolling over the strip, both Wheel Shock Force and Wheel Shock Frequency are used to simulate the feedback of rolling wheels to the Yoke. The Force defines the strength of the force, whilst the frequency defines the frequency of the shocks. The latter one will depend on the speed of the aircraft. As soon as Aircraft will be airborne the wheel shock simulation will be disabled

- *Turbulence Effect:* By turbulence the Aircraft can roll or go up/down by changing airflow. The Up/Down movements will give forces on the Elevator, whilst roll will give forces on the ailerons. The level of these forces transferred to the Yoke can be set by both sliders.

- *Elevator Weight correction:* When on ground and no airflow along the elevator will drop down the elevator by gravity. The effect thereof can be simulated by the Elevator Weight correction slider.

- *Maximum Forces:* Depending on aircraft type the flow of air along the surfaces will result in a force needed to move the surfaces from middle position. By using both sliders, the effect thereof can be adjusted. The force needed will depend on the airspeed. In the box below in this frame the effects and the results of these calculations is shown. Force increases by the square of the airspeed.

2. Stick Shaker enable/disable.
Yoke has a stick shaker function. In the selection boxes can be selected to activate this at stall and/or over speed

12.5.3 Autopilot / Servo Mode

1. Configuration Variables Follow Autopilot.

• *Autopilot Ailerons and Elevator swing.* To enable more aircraft types the values generated by the auto pilot that control heading and altitude settings, the translation from the auto pilot outputs and related swings of the Yoke is made configurable by sliders. Depending on the setting of these sliders the values generated by the autopilot will be translated into a roll- and pitch-swing of the Yoke. The best setting must be found by getting the

• *Maximum Forces* (which is Aileron and Elevator trim). This maximum should correspond with the limits of the Yoke or somewhat lower.

• *Autopilot switch-Off by manual overrule.* By forcing the yoke to another position than commanded by the auto pilot, the auto pilot can be switched off. In that case the check box Enable Overrule must be set. The auto pilot will be switched of when a certain counter force (slider Overrule force) is maintained during a certain time (slider Overrule time).
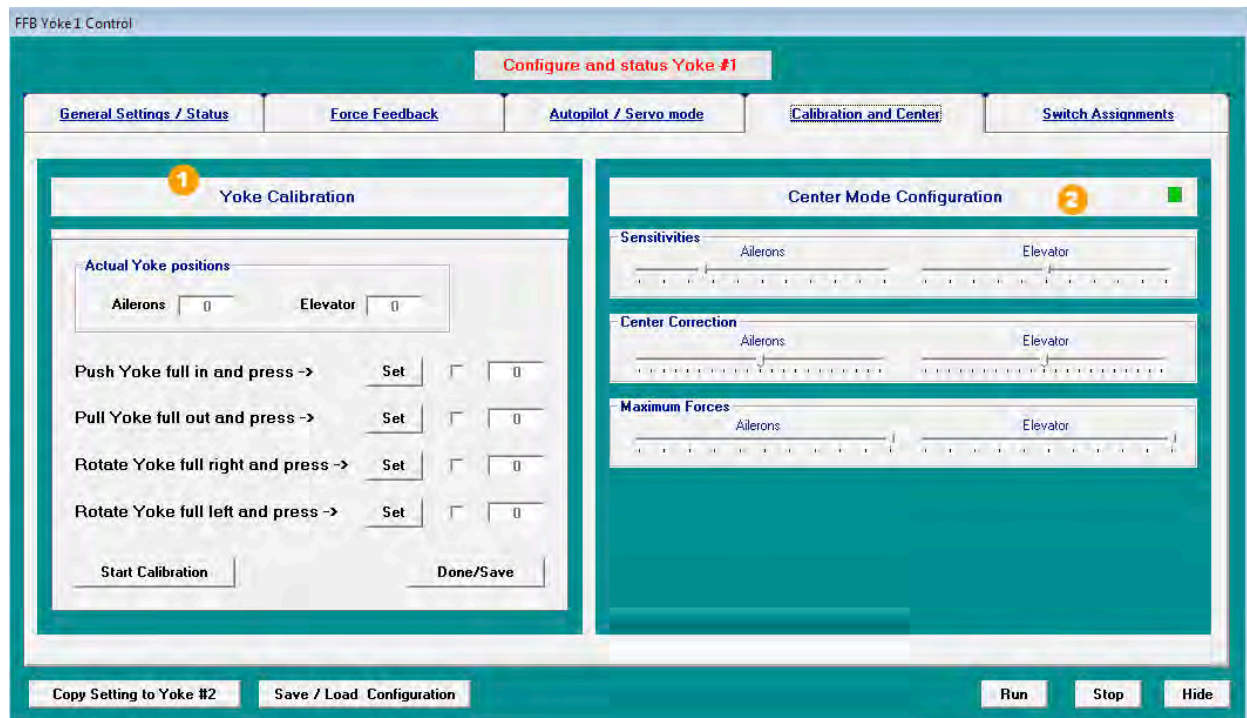
2. Configuration Servo Mode

In this frame can be selected what the yoke should do when in Slave mode. It can either follow the master yoke or follow the autopilot.

3. Follow AP/Servo Mode Status

This frame shows the actual status of the Yoke when externally controlled. It can follow the auto pilot, the master yoke in case it is in slave mode or the simulator when controls are done in another manner. The commanded position (where the yoke should go) is given in the + and – percentages.

## 12.5.4. Force Feedback calibration and Center

1. Yoke Calibration
You can calibrate the yoke by performing the 4 movements and set each position. Then save the new calibration

2. Configuration Variables Centre Mode.
The sliders Ailerons and Elevator Centre are to match the mechanical and electrical centres of the Yoke. Centre is factory adjusted so in general the sliders can be set to zero. Range of the sliders is -100% to +100%

12.5.5 Switch assignment
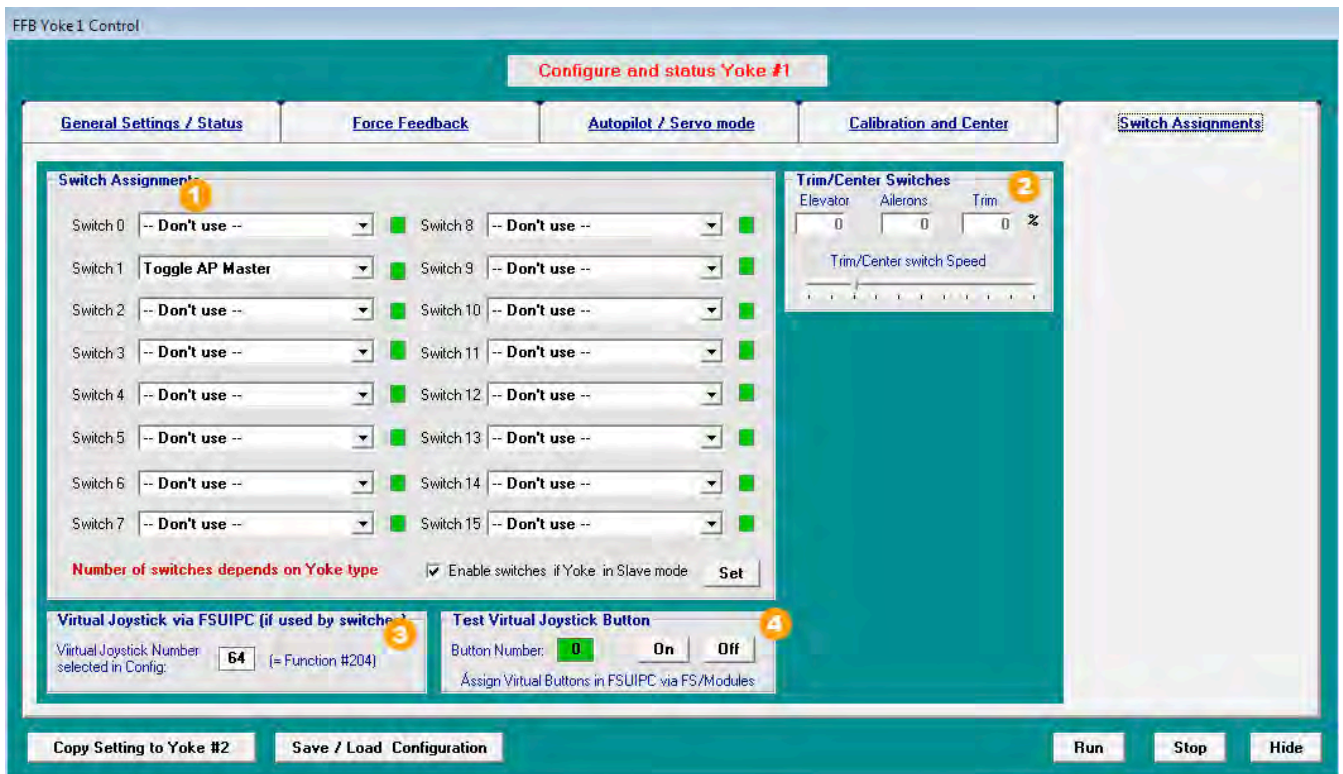
1. Switch Assignments

The Yoke has at maximum 6 switches. When a switch is activated in Running mode, the square of the related switch will change from green to red. Using the Pull Down menu a function can be assigned to that switch.

> To save the switch setting it is needed to push the Set switch in this frame. Then save the configuration

2. Trim Switch.

In case the trim switch for trim Up/Down trim is selected, the function can de enabled and disabled here. When the Trim switch is kept in the Up or Down position the Trim will be increased or decreased at a certain speed. This speed is adjustable by the slider in this part. Trim position is shown as send to the Simulator. This value can vary from -16383 to +16383.

3. Virtual Joystick via FSUIPC

You can assign a virtual joystick number if configured as such in FSUIPC.

12.6. Maintenance

The Flight Illusion Force Feedback Yoke is a sturdy construction. Where needed axial and linear ball bearings are used and the shifting mechanism is constructed from high precision silver steel bars. Also a metal chain is part of this mechanism.

Although very solid, it needs like other mechanical constructions some maintenance.

Over time the components need some greasing and after some time it will be needed to adjust the chain tension.

The following regular maintenance is advised:

- Greasing the silver steel bars.
- Greasing the main steering axle.
- Adjusting the chain tension.
- Inspecting the mechanics.

For opening the case to get access to the mechanical parts only a screwdriver is needed. After removing one of the four metal corner profiles you can shift the top- and side plate out (see illustration below) Make sure that when you close the casing again, all the parts are lined up correctly. Note: opening the case will not void warranty.
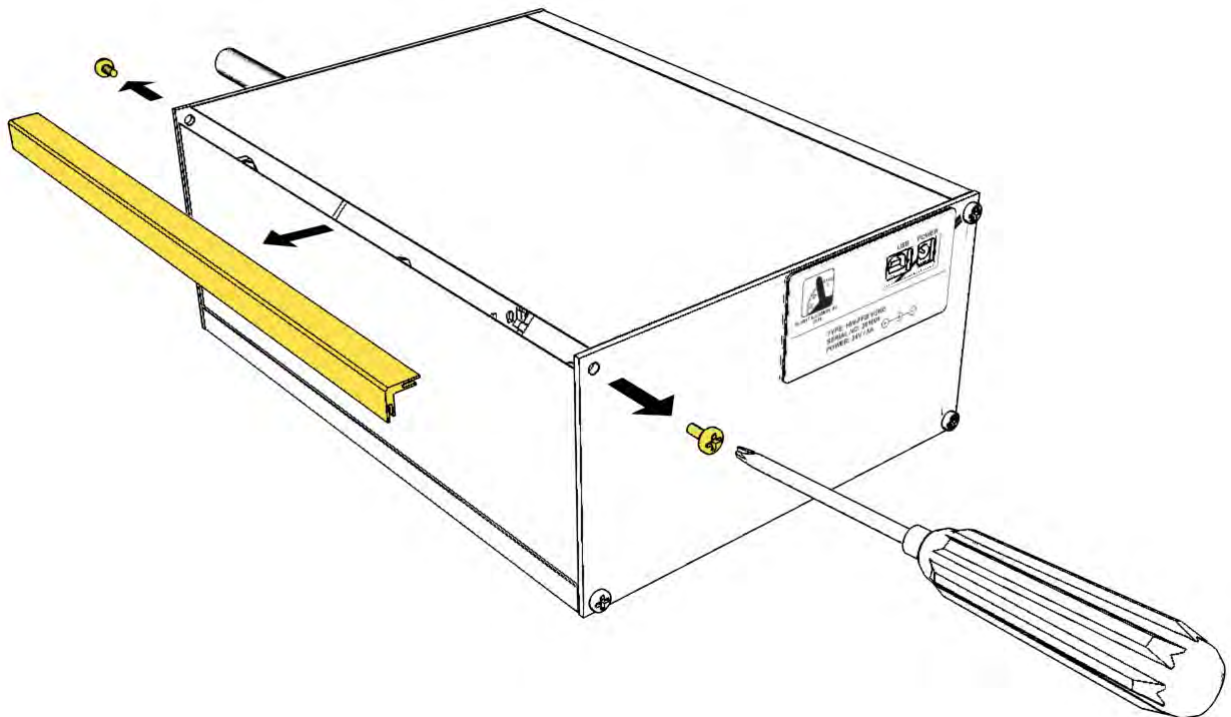
The main steering axle that holds the control yoke has to be lubricated most often. There's no need to open the casing for this as you can apply it from the outside. The silver steel bars that guide the linear motion only need greasing once in a while or when you notice the motion gets less smooth. See illustration below for the main axle and the silver steel guiding bars.
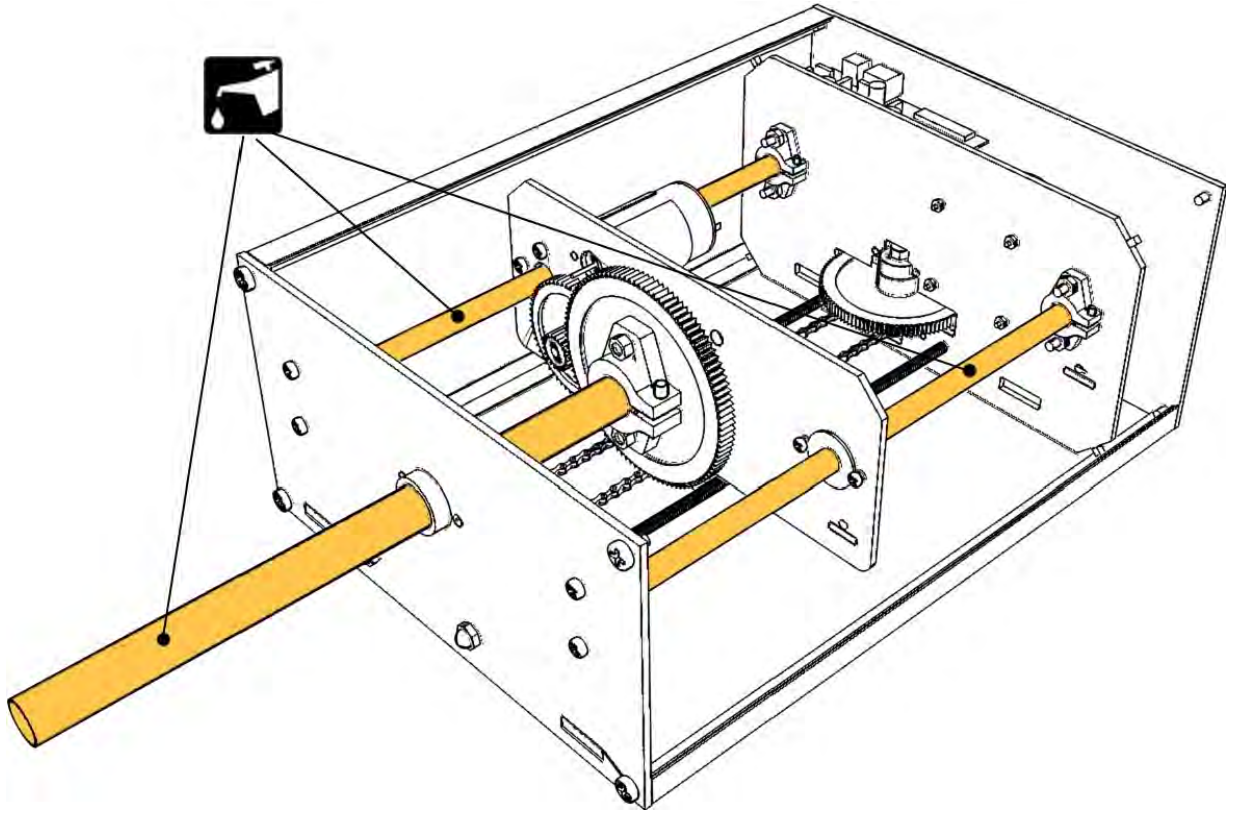
To adjust the chain tension you'll need to turn the nuts that are on the two long screw rods (see illustration below) Tension on the chain is right when the yoke moves smooth without rattling noises. Never tighten the chain tension too much.
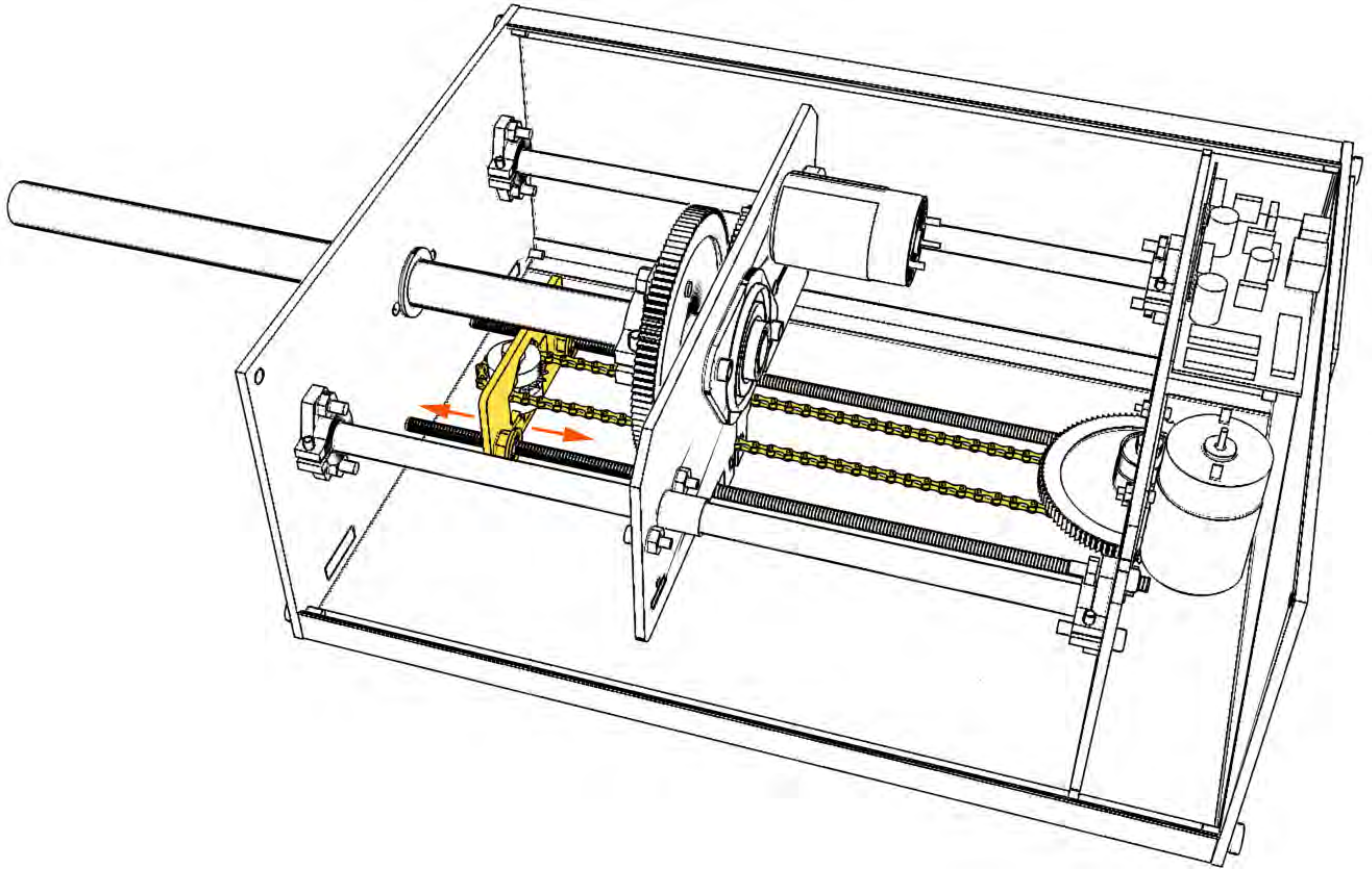
12.7. Technical Specs:

Power supply:	36 V
Linear mechanical range:	approx. 17 cm / 6.7 Inch
Rotational range:	approx. 90 degrees left / 90 degrees right
Interface:	USB

Dimensions (excluding control wheel):
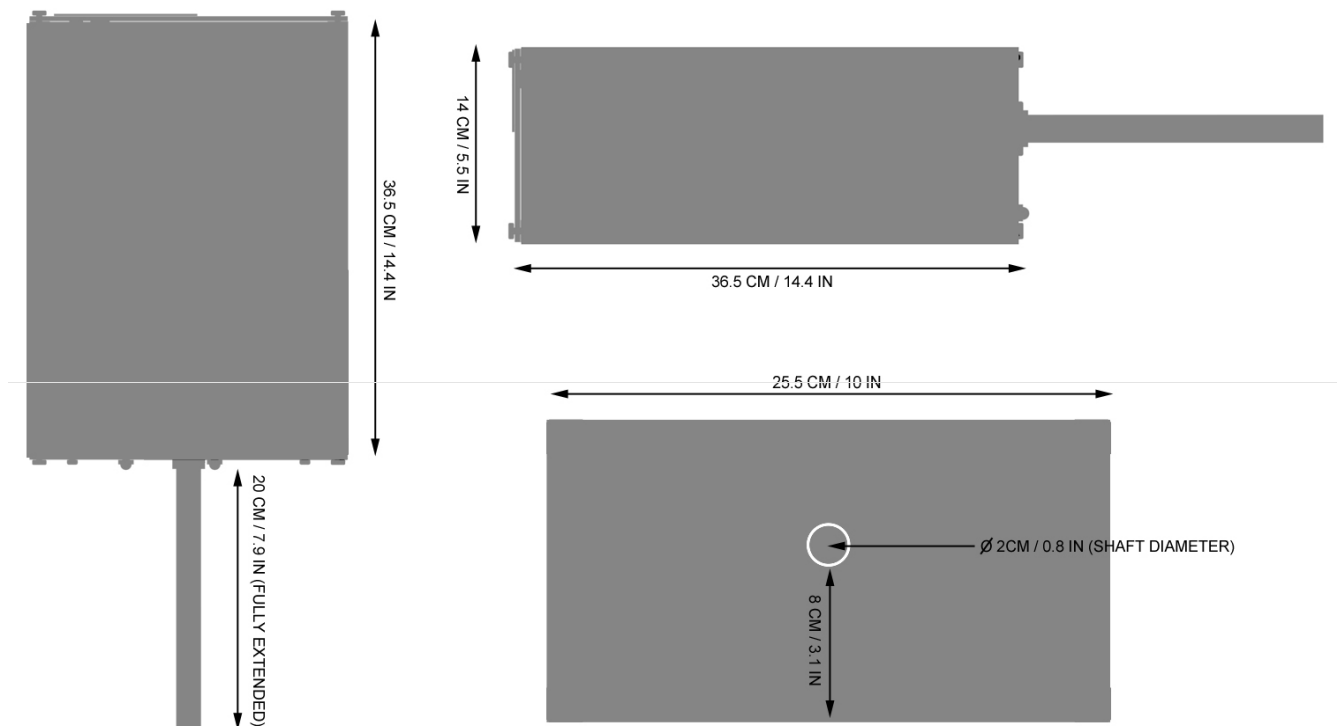
For further technical questions or support you can contact Flight Illusion at:

support@flightillusion.com or info@flightillusion.com

Note: we're always working to improve our software and this is an ongoing process. If you have any suggestions or tips that might improve our software we like to hear from you! You can send your e-mail to info@flightillusion.com or support@flightillusion.com.

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