MCPEX1

Expansion board for MCP737

The MCPEX1 is a board that allows to interface to Flight Simulator (and Project Magenta) external hardware like switches, pushbuttons, potentiometers etc. to command functions like flaps, lights, throttles etc.
The MCPEX1 is an expansion of the CPflight MCP737 autopilot module and cannot be directly connected to the computer, it require the MCP737 module to works. The MCPEX1 is made for generic I/O connections; for the functions located on the 737 Main Instrument Panel a specific preconfigured expansion board "MIP737" is available; see "Main Instrument Panel interface board Operation Manual" on download page.

WARNING! The use of Input/Output without suitable knowledge could lead to damage of the MCP737 and also may involve risk of electrical shock, if you don't fully know what and how to connect, don't do it; warranty does not cover damages due to incorrect wiring of any external device.

The MCPEX1 board can manage:

64	digital input
10	digital output (relay contact)
6	Analog input
2	Analog output

Connected hardware can be assigned to FS functions through the configuration software MCP_CONF. The configuration software save all assignment information on 5 text files: DigitalIN.txt, DigitalOUT.txt, AnalogIN.txt, AnalogOUT.txt and Preferences.txt.
MCP_CONF take selectable functions from files with the same above names (excluding Preferences) , but with .cfg extension (DigitalIN.cfg etc.). So the .cfg files contains all the selectable commands while the .txt files contains your selected commands. The distributed .cfg files support the most common FS commands, not all FS variables are supported, anyhow it is possible to add any other command (supported by FSUIPC) inserting or modifying existing items in the .cfg files. To do this refer to "FSUIPC for programmers" document included in the FSUIPC_SDK (or to Project Magenta FSUIPC offset document if you use Project magenta), both document are downloadable at the related website:
http://www.schiratti.com/dowson.html
http://www.projectmagenta.com/
A detailed description of the .cfg files structure are on the last pages of this manual.
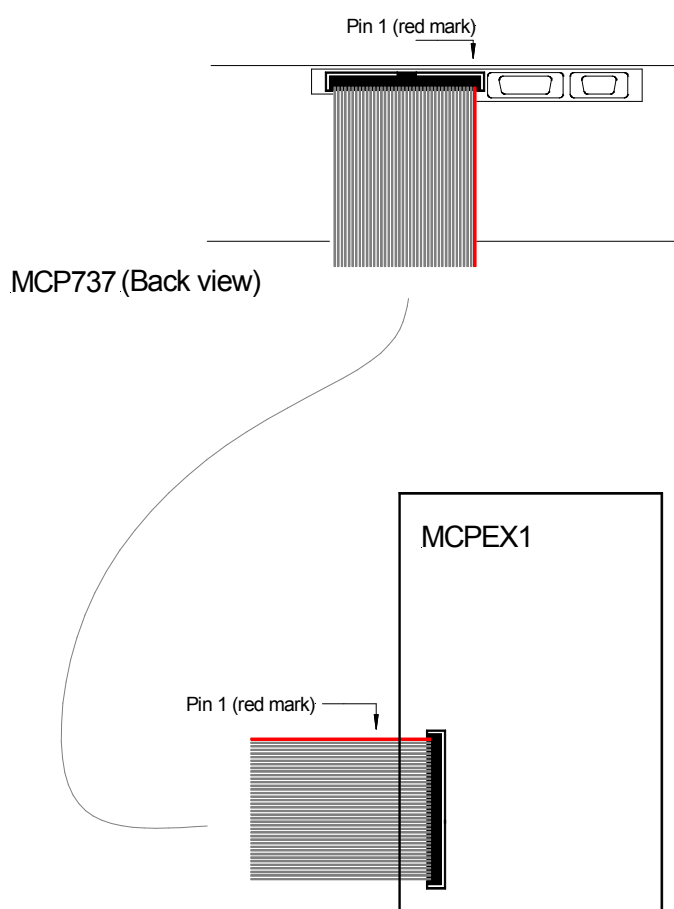

Figure 1: flat cable connection to the MCP737

IMPORTANT NOTE: if you use the MCPEX1 board with Project Magenta it is very important to copy all configuration files in the Project Magenta MCP folder. After any modify in the configuration, locate Preferences.txt, DigitalIN.txt, DigitalOUT.txt, AnalogIN.txt and AnalogOUT.txt files in the CPflighttools folder and copy all them in the Project Magenta MCP folder.

The following section gives you some tips to clarify possible doubts that you may find in the development of your flight deck. Even though the contents of this section can appear obvious for experienced users, we think it can please many users.

WARNING! MCP737 contains very delicate Integrated Circuit (IC) chips. To protect them against damage from static electricity, apply following precautions whenever you work on external device connections:

- Always disconnect the power supply and unplug the MCPEX1 40 pole flat cable from your MCP before connect anything.

- Use grounded wrist strap before handling components and wires. If you do not have one, touch both of your hands to a safely grounded object or to a metal object (such as the power supply case of your PC) to discharge the static electricity.

- Wire your switches, buttons etc. to MCPEX1 terminal blocks and plug the 40 pole flat cable to MCP just when you have finished your work.

- Do not touch connector terminals on MCP

- Reduce the wire length at least what is necessary and avoid extending wire close to high disturbance lines.

- Use 0,25 to 1mm^2 wires with different colors. It's better to mark each wire on both heads with a plate; it may be hard work but you never will find problems in case of further modifies or additions.

- Always use MCPEX1 adapter and refer to the indication of this manual. Do not try to connect anything directly to the MCP connector or differently from here indicated.

Hints about commands

It is important to distinguish between analog and digital commands used in Flight Simulator:
- Digital commands may take two conditions as ON and OFF: i.e. landing lights, gear control, etc.
- Analog variables may assume any value within two limits: i.e. engine throttles etc.
Note that some analog variables may be controlled with "Raise" "Lower" command using digital inputs, for example the elevator trim position can be controlled with potentiometer but also you may command it with two pushbuttons like using key of your keyboard. Of course you will choose the more realistic way.
About digital inputs it is important to discriminate between commands with steady condition (switches) and with momentary condition (pushbuttons). Many command may be controlled with both of type, for instance you may control the landing gears position with a pushbutton like occur pushing the "G" key of your keyboard; of course if you have MCP737 you will connect a switch lever to command the gears. The configuration software will suggest an adequate type for the selected function. In some cases you will be able to change it, in other cases there's no possibility to change it as a different type could create error.
The appendix of this manual shows the examples as diagrams used by the following symbols:

Pushbutton: it has a momentary action (like MCP mode selection). It can be used as direct control (i.e. brakes), to select a value or toggle a two state command (flip flop)

Switch: it has steady position (like the MCP Flight-director switch). You can use it to command any thing like gears, lights, fuel pumps etc.
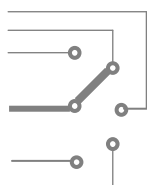
Rotary switch: it may be considered as a switch with more than two positions. Normally it has a common pole (traced with bold line in the symbol) that makes electrical contact with the selected position pole. You may use it to control the flap position, the auto brakes or any other multi-position command of Flight Simulator.
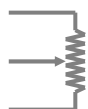
Potentiometer: It consists in an electric resistance with a variable value. It normally has three poles; the cursor (traced with an arrow in the symbol) is in the central position or differently it has a mark.

Digital Input wiring:

An 8x8 diode matrix obtains the reading of the 64 digital inputs. The digital inputs can be connected to dry contact (typically switches and pushbuttons). Each input channel has a two pole terminal related to the respective "box" in the configuration software MCP_CONF. Each channel is formed by the crossing between row and column, the rows are identified by numbers (1 to 8) while the column with letters (A to H). Do not connect switches between terminals of different column or different row (see Figure 2). Run MCP_CONF and select DigitalIN tab to test connected devices.

If you use rotary switches or any other multi-position selector; connect the common pole to the terminal of a row and the poles of contacts to the respective columns. All 8 poles in the same row are already shorted on diode matrix, so you haven't to link them, if you need to connect a selector with more than 8 positions, it is necessary to use a two-way selector (it consists in a double selector driven by the same knob). On example of Figure 18 you may see an example of this situation (flap lever).

WARNING! Each external device must be connected between a row and a column; do not join row with row or column with column because this could lead to damage the MCP. Do not connect to digital inputs external voltage sources or any think different from contact.
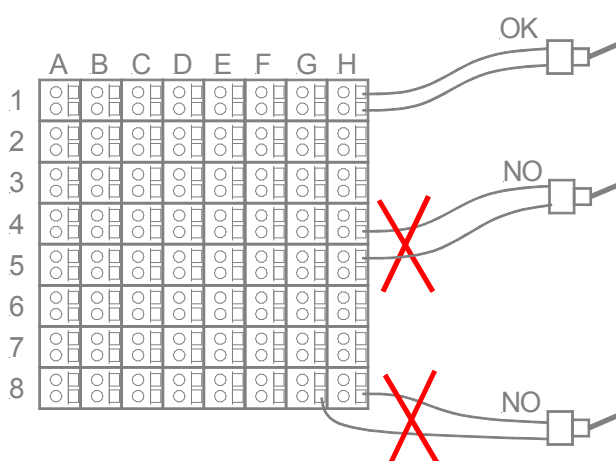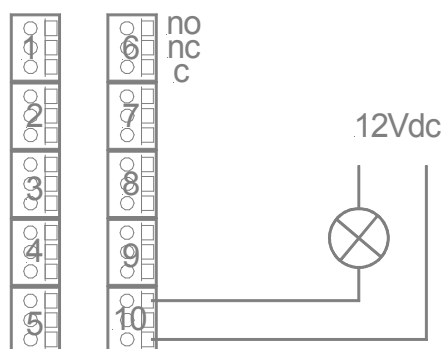

Figure 2

Digital output wiring:

On MCPEX1 each digital output channel dispose of dedicate three-pole terminal block with exchange relay contact to control external supplied devices. Each terminal block has a common pole (C), a normally open pole (NO) and a normally closed pole (NC). The NO pole makes electrical contact with the C pole when assigned function is activated whereas the NC pole makes contact with C when assigned function is deactivate.

WARNING! If you connect external supplies to MCPEX1 relay contact do not exceed 24 Volts (ac or dc); each relay can drive maximum 2-Ampere current load. Always place a protection fuse on your externally supplied circuit.

Figure 3: Control of an external supplied 12V lamp

Analog Inputs wiring:

On MCPEX1 connection board you dispose of dedicate three pole terminal block for each analog input channel. You can use round shaft or slide potentiometers of any value between 10KΩ to 100KΩ. The "cursor" of potentiometer has to be connected to the central pole terminal. Usually the "cursor" also is the central pole of the potentiometer; furthermore, in some case it may be different. Check your potentiometers and be sure to correctly connect it as you may damage the MCP (see Figure 4). It is not much important to pay care to the rotating direction as you may invert the action with the configuration software. When you assign a Flight Simulator variable to potentiometers pay attention to the possible conflicts with joystick directly connected to the PC; in particular avoid duplicate assignments (eventually disable the relative axis in the assignment menu of Flight Simulator). After the connection and assignment the input has to be calibrated, follow the calibration procedure described on "Configurator" section of this manual.
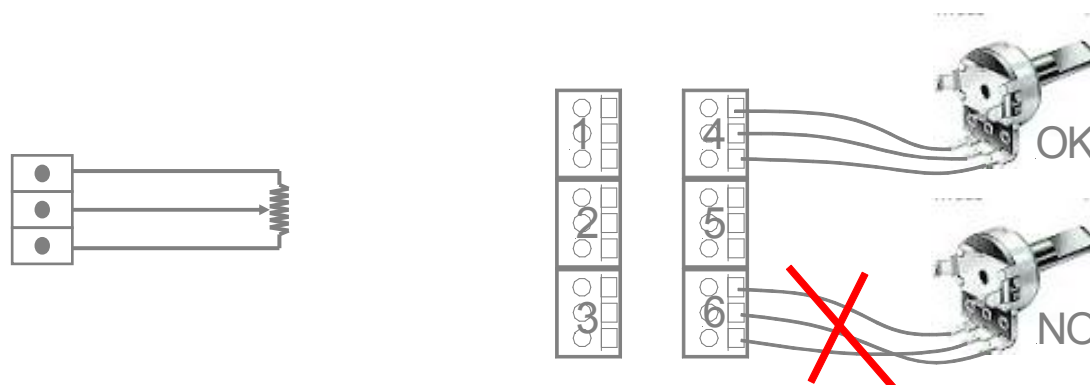An example of analog input use is on Figure 18 at the end of this manual.

Figure 4: potentiometer connection diagram

Note: On analog inputs there is a 2,5% of dead zone; this to avoid repercussions in the transitional situations like the passing from automatic flight to manual pilots. Note that last two Analogue Inputs (5 and 6) are high-resolution channels. If you connect inputs to these channels you should use very stable potentiometer. These two inputs are especially dedicated for multi-turn potentiometers useful to assign pitch-trim or similar controls.

Analog outputs:

Analog outputs may be assigned to airplane attitude or some likes variables. The output range is 0÷5Vdc; if assigned to a bi-directional variable (i.e. pitch or bank), the neutral position will be at half of full-scale voltage (2,5Vdc). Analog outputs have a low current drive capability (5mA max) and requires external electronic amplification circuits to be used on transducers or indicators. Use of analog outputs is dedicated to expert users; do not attempt to use analog output if you don't have an adequate electronic and technical knowledge.

CONFIGURATION

A suitable Configuration Software is provided to choose functions for any input and output you connect to MCP. Besides digital and analog I/O assignment, the software allows you to test your connected devices and it also permits to calibrate the potentiometer wired to analog inputs. Using the software you could also configure the Joystick port (not available on the USB version of the MCP) and to set up the operating preferences of MCP. The software create your configuration files, they are usual text files subdivided by typology: "DigitalIN.txt", "DigitalOUT.txt", "AnalogIN.txt" and "AnalogOUT.txt". A "Preferences.txt" file is also created to hold some setting of MCP operating mode. A tab strip also subdivides commands by typology as "Digital inputs", "Digital outputs" etc. The program is capable to operate in connection with the hardware or without it, in this case the test and calibration function will not operate, anyhow you will be able to assign commands and save configuration files.
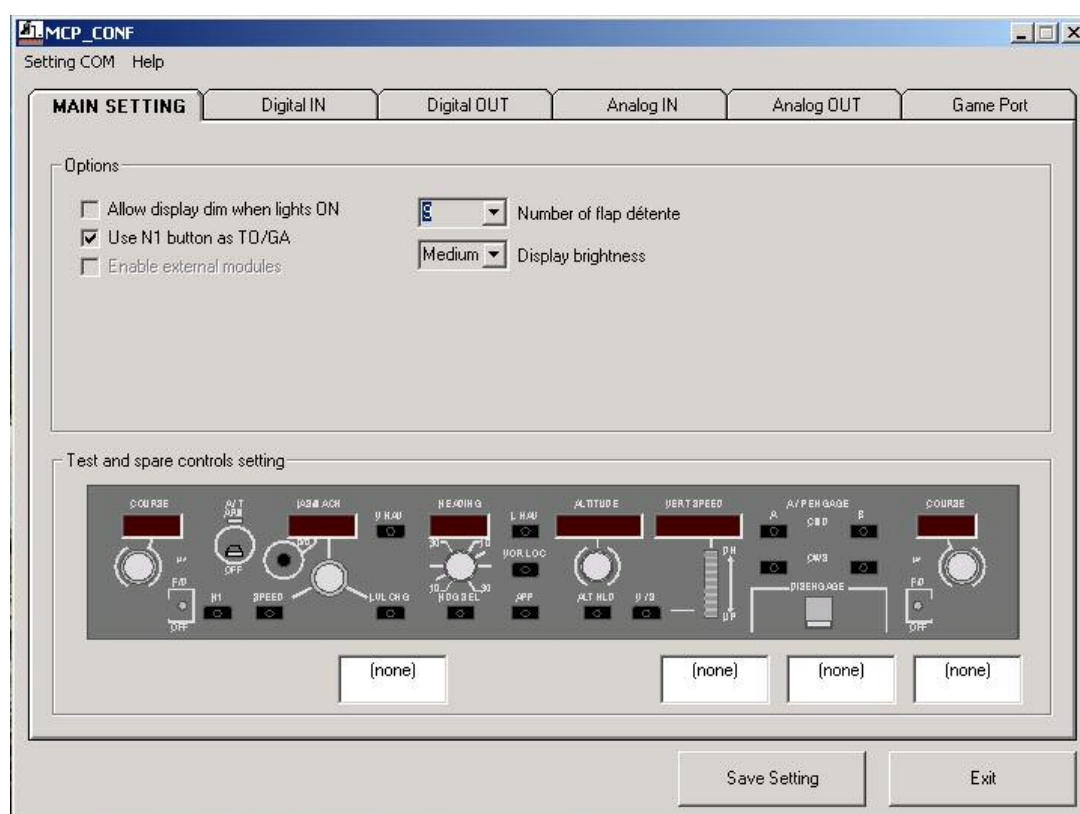

Figure 5: configuration software MCP_CONF

Note: Due to the continuous evolution of product, some functions may slightly differ from those indicated in this manual.

When you run the software for the first time you will be required to select a communication port (Figure 6); select the communication port used to connect MCP (see also "MCP737 Operations manual"). The communication driver FS_COM when running the Flight Simulator also uses the selected port. You may change the selection at anytime through the "Setting COM" menu.

Figure 6

Configuration files are saved on ..\\CPFLIGHT\CPFlightTools directory; before operating substantial changes on your configuration it is wise to make a copy of .txt files in your own directory. If you remove a configuration file from the CPflight directory, MCP_CONF will create a new empty file.

The drop-down lists of assignments include some duplicate choice; this occurs because some commands may be controlled in different ways; for example flaps may be controlled using pushbutton (choose "Flaps inc" and "Flaps dec" in the list) or with a more realistic lever combined with a rotary switch (choose "Flaps zero", "Flaps 1° détente", "Flaps 2° détente" etc.). As above you may find same control in both of the digital input list and in the analog input list (for example the pitch trim may be controlled with "inc/dec" buttons or with a potentiometer); you can choose the way to be used. Furthermore, in the list there are controls for four engines; for propellers aircraft and some other commands not used on 737; these are included for who intend to use the MCP with a different aircraft too.

"MAIN SETTING" TAB

The "Main setting" tab (Figure 5) is used to test functionality of MCP and to select following:

❑ **Options:** In the "Options" frame you may select: number of flap detents (it define number of positions when external selector is wired to expansion port); display brightness and some other useful option. If you don't connect external TO/GA button, you may assign here the function to N1 key of MCP; if on ground or below 1200ft during approach N1 key will function as TO/GA.

❑ **Test and spare controls setting:** In this frame you may test MCP connection and functionality. The virtual panel becomes active only if MCP hardware is connected to the computer and the correct communication port has been selected. In this area you may also assign a function to MCP unused buttons (excluding Project Magenta that use them). Available buttons are CWS A", "CWS B", "VNAV" button and right F/D switch. For assignment procedure refer to "Digital Input assignment" section.

Digital Input assignment

To assign a digital input to a Flight Simulator command select "Digital IN" tab and double click on to check you need to assign. The tab is subdivided in 64 checks corresponding to MCPEX1 terminal blocks. Select a command in the drop-down list that appear (Figure 7 and Figure 8); the program will show you the suggested device type on control property frame. In some cases you will able to change a type of control (Figure 9); this choice make depend of the handling of the control by FS, it's suggested to maintain the default. The means chosen are:

• *Toggle Switch or Direct Pushbutton:* with this type, the MCP sends a command to FS in both of the cases when you close the contact, and when you open it. The command is an "ON" status (when closed) or an "OFF" status (when opened). You may use this type when a switch is connected (for example "Landing Gear" control) and also with buttons (i.e. "Brakes").
• *Multi-selection Switch or Pushbutton:* It sends a command to FS only when you close contact (no action occurs when opened). The type is useful when you have for example a selector with more than two position (like "Flap control"). In this case a new command is sent due by closing of new position of the selector and no "OFF" command is needed for previous position opening.
• *Flip Flop Pushbutton:* this type inverts the status of assigned control ("toggle"); functioning is similar to the control of a command by computer keyboard (like the "G" key to toggle the gear position).
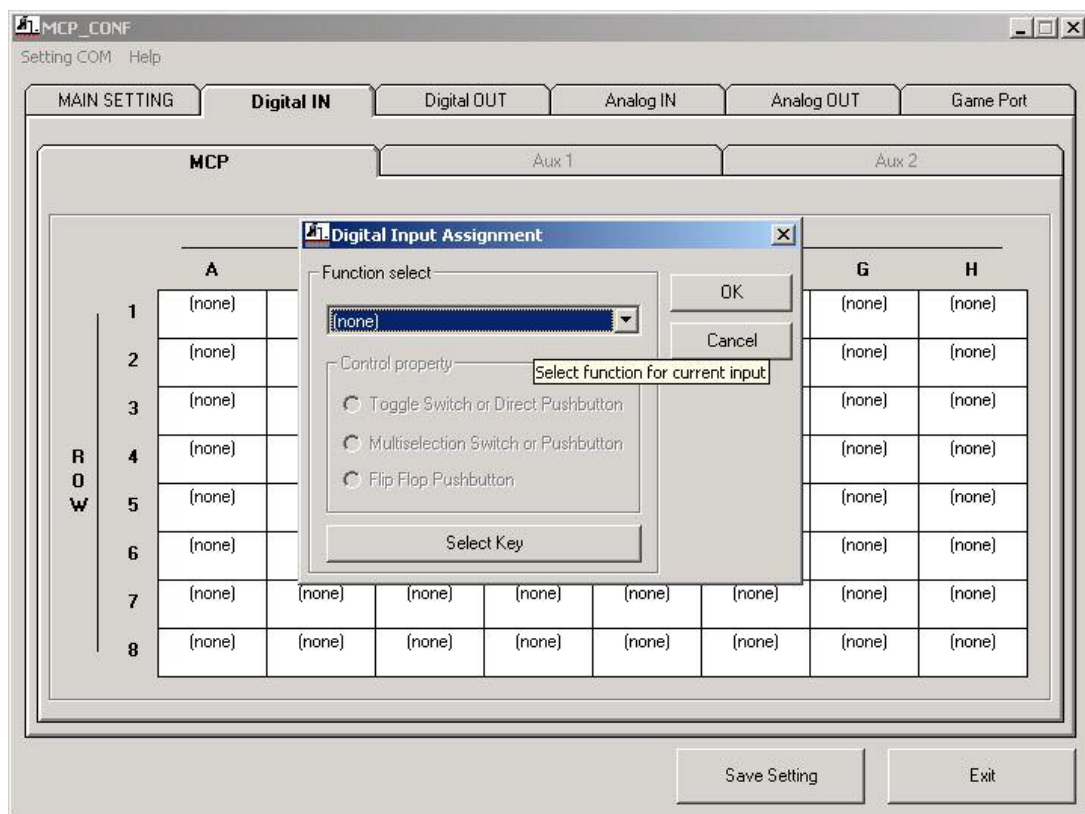

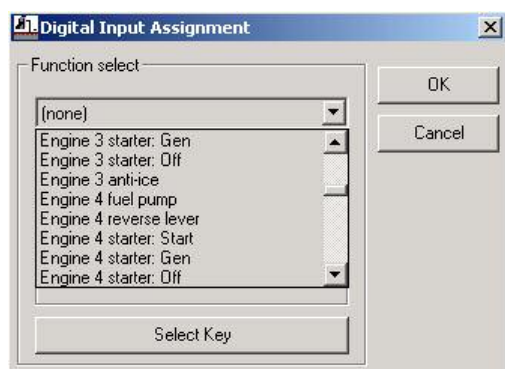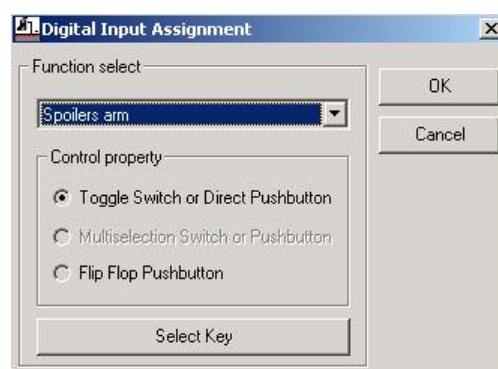
Figure 7: Digital input assignment

Figure 8

Figure 9

If the drop-down list do not include the command you wish, you may assign a keystroke emulation clicking on "Select key" button and pressing a key on your computer keyboard (Figure 10 and Figure 11). You may use the function keys and flags (shift ctrl) and select the auto repeat with its rate as used in FS assignment menu. If you change assignment in FS menu, do not forget to update the MCP configuration. On Digital IN tab, the inputs assigned to the keystroke are identifiable by the color of checks (light blue).
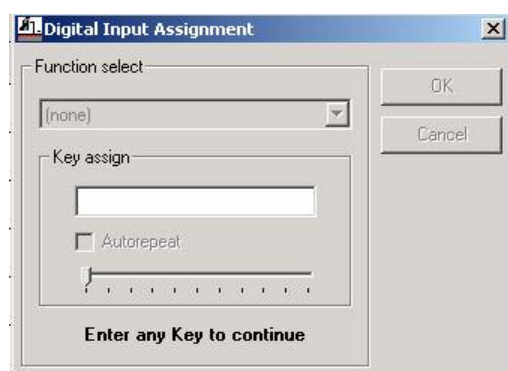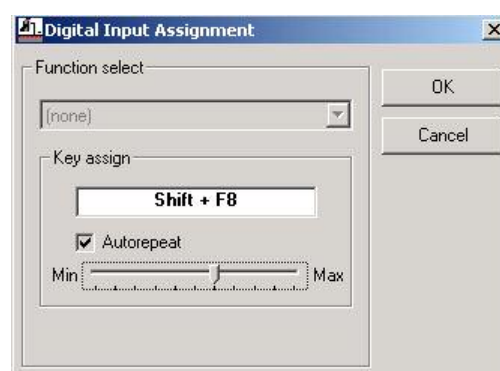

Figure 10

Figure 11

Through the "Digital IN" tab it is possible to test functioning of your wired switches. When you close a contact the color of the corresponding check becomes orange in color.
In the drop-down list there are Project Magenta specific command for some display modes, you may recognize them by "PM" suffix. In some cases there is also "CP" suffix to indicate the Captain side and "F/O" for the first official side. To use I/O extensions with Project Magenta you have to copy configuration files in the Project Magenta MCP folder. Configuration files are: Preferences.txt, DigitalIN.txt, DigitalOUT.txt, AnalogIN.txt and AnalogOUT.txt. All files are stored in the CPflight folder when you run the configuration software MCP_CONF .

Digital Output assignment

Through the "Digital OUT" tab (Figure 12) you may assign up to 10 digital outputs. The assignment procedure is quite similar as above descript for digital inputs. To connect outputs to MCP use MCPEX1 board (refer to "EXPANSIONS" section).
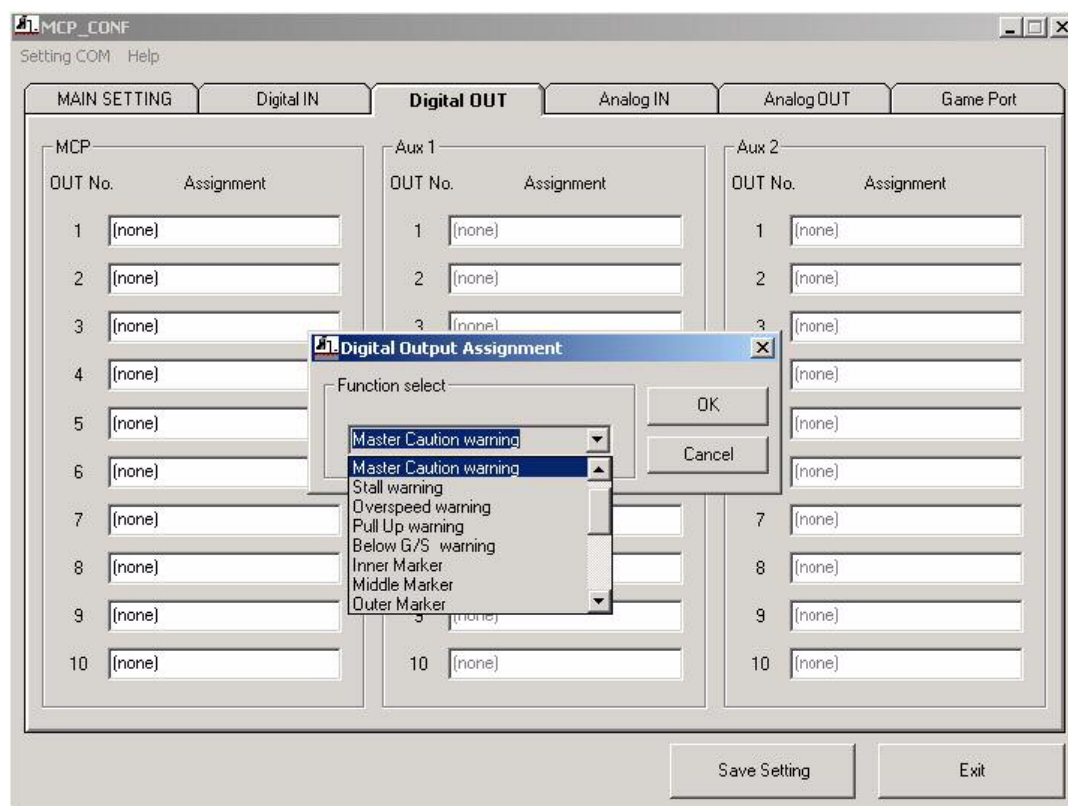
Figure 12: Digital OUT tab

Analog Input assignment

Through the "Analog IN" tab you may assign up to 6 analog inputs (further 4 inputs are on Game-port). The assignment procedure is quite similar as described above for digital inputs; when you assign or change the assignment for any input, you have to calibrate it; depending on the selected function, the calibration takes effect to the center position or to the zero position (see next).

Figure 13: Analog IN tab

If you assign an input to an engine throttle, you may enable Thrust Reverse. It also may be assigned to the digital inputs (more realistic for 737 if you have Thrust Reverse lever); in this case leave unchecked the "Allow Thrust Reverse" checkbox.

Figure 14

Figure 15

Calibration:

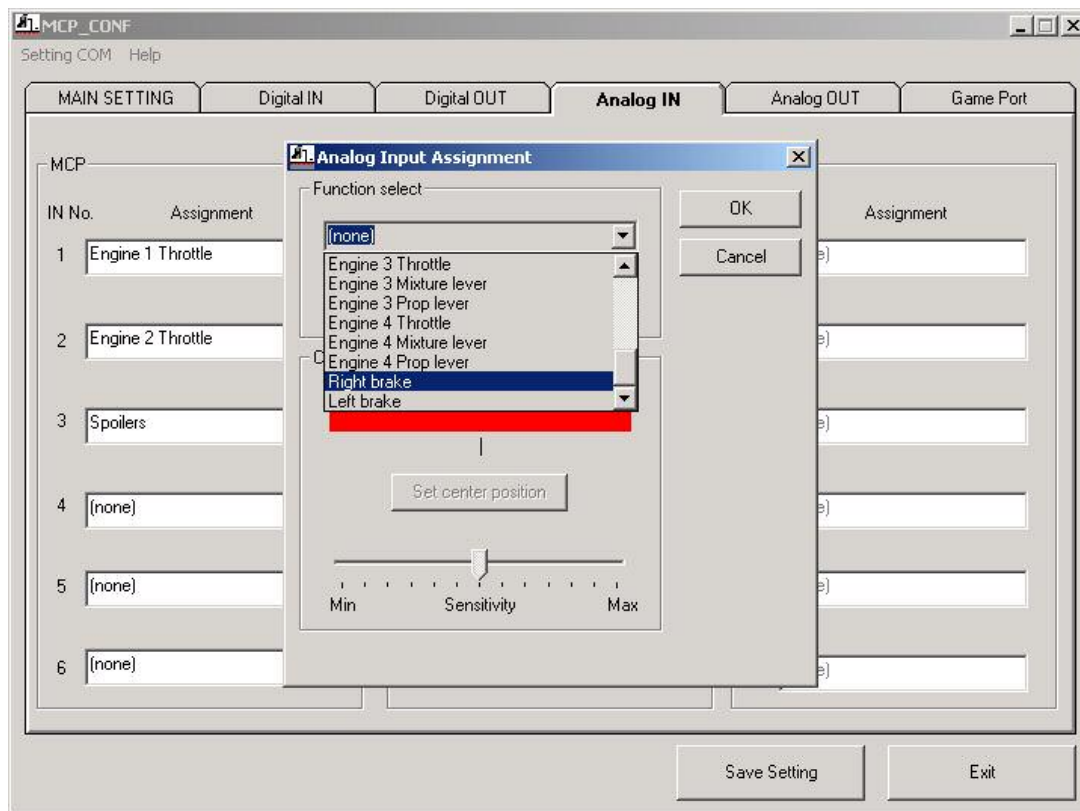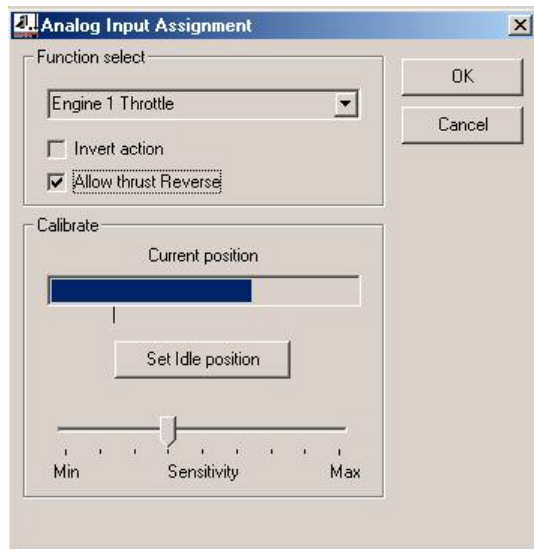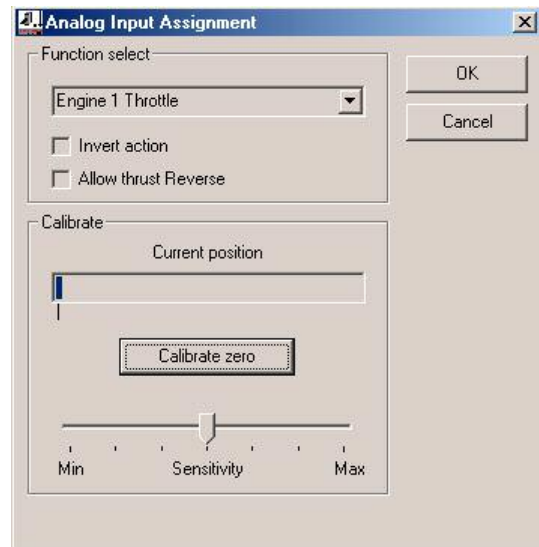To calibrate an analog input does following steps:

1- Move your potentiometer to the neutral position. Neutral position consists in the center for bilateral controls or zero for unilateral controls (idle position for throttles if you enabled thrust reverse).

2- Click on calibration button; note that the button show different captions depending on the control type ("Calibrate zero", "Set center position" or "Set idle position"). Do not move the control during calibration.

3- Move the potentiometer cursor to check its range (you may see it on the "Current position" indicator bar) and regulate the sensitivity if needed.

All assigned analogue inputs should be connected to a potentiometer. Avoid leaving open assigned analogue inputs, if you disconnect a previous assigned potentiometer; remove its assignment from the configuration file (run MCP_CONF and select "none" in the drop-down list).
Last two Analogue Inputs (5 and 6) are high-resolution channels. If you connect inputs to these channels you should use very stable potentiometer. These two inputs are especially dedicated for multi-turn potentiometers useful to assign altimeter pressure setting, pitch-trim or similar controls.

Analog Output assignment

Through the "Analog OUT" tab you may assign the two analog outputs. The assignment procedure is quite similar as above described for other tabs; it is possible to regulate the gain of assigned control (sensitivity) and reverse the action of it. As mentioned on "EXPANSIONS" section, the use of analog outputs requires external electronic circuits and it's dedicated to expert users. Do not attempt to use analog output directly.
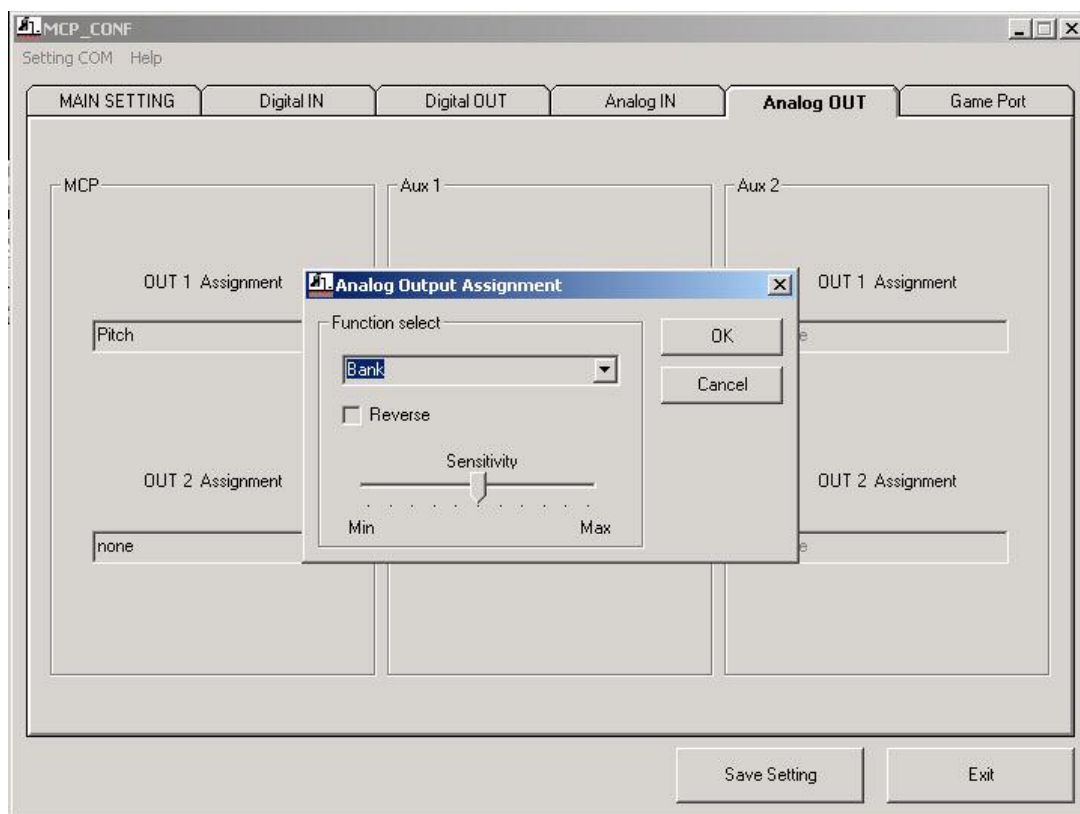
Figure 16: Analog output assignment

Game Port assignment (not implemented in the MCP737 USB version)

Axis assignment for game-port is quite similar to other analog inputs. Some differences are on calibration procedure of analog inputs (axis) that requires two steps in addition to those above indicated. This procedure is totally guided by software messages.

The button assignment use the same procedure used for digital input and the same list of controls is shown. Avoid assignments that require steady position switches, as normally, the joystick has momentary pushbuttons. If you do not use a joystick and wire your devices, you may assign any type of selection.
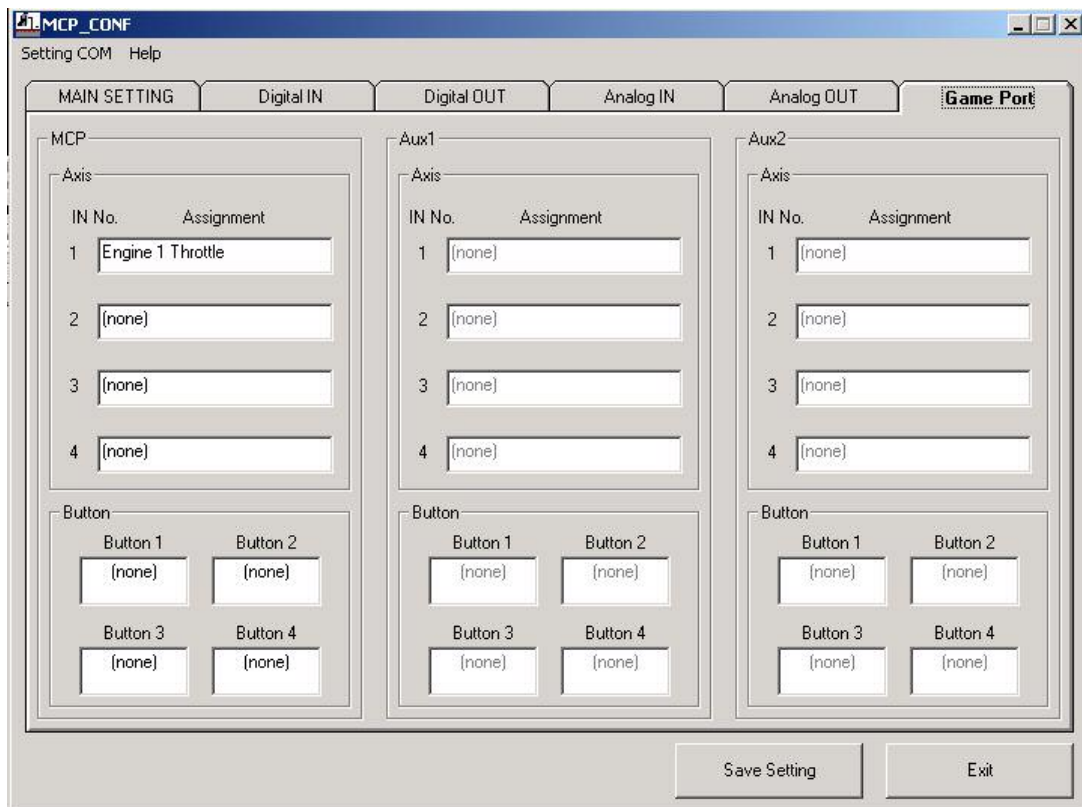
Figure 17 *Game Port assignment*

[2] *The joystick axis on Flight Simulator assignments menu do not have any influence on joystick connected to MCP as they are referred to the computer game-port. When you assign a Flight Simulator variable to MCP game-port pay attention to the possible conflicts with joystick directly connected to the PC; in particular avoid duplicate assignments (eventually disable the relative axis in the assignment menu of Flight Simulator).*

APPENDIX

FILES AND ASSIGNEMENT

The configuration software MCP_CONF.exe save all information about assignments to five text files: DigitalIN.txt, DigitalOUT.txt, AnalogIN.txt, AnalogOUT.txt and Preferences.txt.
MCP_CONF take selectable functions from files with the same above names (excluding Preferences) , but with .cfg extension (DigitalIN.cfg etc.).
So, .cfg files contains all the selectable commands; .txt files contains your selected commands. Not all FS variables are supported, anyhow, for who have knowledge of FSUIPC offsets and variables it is possible to select any other command (supported by FSUIPC) adding it to the .cfg files, or modifying existing items. Running MCP_CONF, your addition will be shown and selectable in the drop-down list of assignments.

Structure of .cfg files:

Files . cfg contain **assignable** command and data. Each command is on a new line; command has six field separated by commas, no spaces (except in the text field). Example of DigitalOUT.cfg file

"(none)","&H0",0,0,0,0
"Stall warning","&H36C",1,0,0,2
"Overspeed warning","&H36D",1,0,0,2
"Inner Marker","&HBAC",2,0,0,2
"Middle Marker","&HBAE",2,0,0,2
"Outer Marker","&HBB0",2,0,0,2
"Gear transit","&HBEC",4,0,16383,2
"Gear position (nose)","&HBEC",4,0,16383,0
"Gear position (left)","&HBF0",4,0,16383,0
………………..
………………..
etc.

FIELD DESCRIPTION (SEE ABOVE EXAMPLE)

First field: is the text you will see in the selection drop-down list; must be included between " simbols.

Second field: is the FSUIPC address as indicated in "FSUIPC for programmers.doc" document. Address has to be in Hexadecimal notation with "&H" suffix and between " simbols.

Third field: is the number of byte as indicated in "FSUIPC for programmers.doc" document.

Fourth field: is the valueOFF for the control according with the table below

Fifth field: is the valueON for the control according with the table below

Sixth field: is the type of control according with the table below

To allows de-select, first item of the list must always be as follow:

"(none)","&H0",0,0,0,0

Structure of .txt files:

Files . txt contain **assigned** command and data. The structure of .txt files is quite similar to the .cfg ones except:

•   a field more in front to the "text" field indicate the assigned channel

•   a field more is between the "text" field and the FSUIPC address. It is for future development

IMPORTANT NOTES:
•   If you reinstall the CPflight software, the .cfg files will be overwritten; if you have created or modified your .cfg file, make a copy in a your own folder before reinstall/update the software.

•   Data for an assigned command in the .txt file has to match the related field in the .cfg file; it is advisable to deselect the assigned command if you need to modify a line in the .cfg file.

•   Do not exchange the position of existing lines in the .cfg file; if you delete a line in the .cfg file, all subsequent lines of .txt file will don't match with the configuration. New lines may be added on the back of .cfg file

•   It is advisable to always make a copy of your .cfg and .txt files before modify. If you delete a .txt file, MCP_CONF will create a new empty file.

TYPE OF CONTROL AND ACTION

Depending of kind of variable (Analog input, digital input etc.) and depending of type of action the assigned control will operate in different way; see following:

1 Type and actions for Digital input

Type	ValOff	ValOn	Action when switch OFF	Action when switch ON
0	Any within the range	Any within the range	assign ValOff	assign ValOn
1	0	Any within the range	none	assign ValOn
2	Any within the range	Any within the range	none	Exchange ValOff / ValOn
3	Any within the range	Any within the range	Logic AND with ValOff	Logic OR with ValOn
4	Low Limit value	Any within the range	none	Subtract ValOn to actual value
5	High Limit value	Any within the range	none	Add ValOn to actual value
6	Assigned key	0	none	Send Key specified by ValOff
7	Assigned key	Number of Repeat	Stop autorepeat	Send Key continuously

Note: The input control device (switch, pushbutton etc.) have to be choose according to the type.

2 Type and actions for Digital output

Type	ValOff	ValOn	Action
0	not used	Any within the range	Output activate when: Actual value = ValOn
1	OFF threshold	ON threshold	Output activate when: Actual value > ValOn Output activate when: Actual value < ValOff
2	not used	not used	Output activate when: Actual value <> 0
3	low value	high value	Output activate when: Actual value included between ValOff and ValOn
4	not used	Logic AND mask	Output activate when: (Actual value AND ValOn) <> 0

3 Type and actions for Analog input

Type (+128 invert action)	Minimum range	Maximum range	ValOff	ValOn
0	-16383	16383	Center calibration point	Calibration gain
1	0	16383	Zero calibration point	Calibration gain
2	-4096	16383	Zero calibration point	Calibration gain
3	Same of type 0 for Float 8 byte variables			
4	Same of type 1 but allow type 2 selection in MCP_CONF			
5	Same of type 2 but divide for ValOn (gain) instead multiply			
6	ValOff/2 + 15939 (special for altimeter pressure setting)			

Note: Input resolution 10 bit (0÷1023)

4 Type and actions for Analog output

Type (+128 invert action)	Range	ValOff	ValOn	Action
0	-16383 ÷ 16383	~0	Calibration gain	Output = Actual value / ValOn * 10 + 128
1	0 ÷ 16383	~0	Calibration gain	Output = Actual value / ValOn
2	-128 ÷ 127	~0	Calibration gain	Output = ((Actual value+128) AND &HFF) / ValOn
3	Unknown	625	Calibration gain	Output = ((Actual value – ValOff) / ValOn +128
4	Double floating point (converted in 1 byte by firmware)	0	Calibration gain	Output = -(Actual value * ValOn) + 127

Note: Output resolution 8bit (0÷255)

CONTROL OF PMSYSTEM BIT VARIABLES

To control PMsystem variables through switches connected to the MCPEX1 expansion board, you have to add lines in the DigitalIN.cfg file. The type for single bit control is 3; the type 3 control execute a logic AND with first value (ValOff) when the switch goes OFF, and a logic OR with the second value (ValOn) when the switch goes ON.
In a logic AND operation, all bit with "0" value will be cleared and the related function deactivated; all bit with "1" value will remain unchanged respect the previous value. The contrary happens when a logic OR operation is executed; all bit with "0" value will remain unchanged, all bit with "1" value will be settled and the related function activated.
In the tables below you may see the values in binary (you may see the status of each single bit), in hexadecimal and decimal notation for a single byte variable.
So, if you need to change the status for a function controlled by the bit 2 of a specific offset, for example "Antiiceeng2 5657.2", the line to add will be:

" Antiiceeng2","&H5657",1,251,4,3

ValOff values for single bit handling when the switch goes OFF (logic AND operation)

offset.7	offset.6	offset.5	offset.4	offset.3	offset.2	offset.1	offset.0	Exadecimal	Decimal
1	1	1	1	1	1	1	0	FE	254
1	1	1	1	1	1	0	1	FD	253
1	1	1	1	1	0	1	1	FB	251
1	1	1	1	0	1	1	1	F7	247
1	1	1	0	1	1	1	1	EF	239
1	1	0	1	1	1	1	1	DF	223
1	0	1	1	1	1	1	1	BF	191
0	1	1	1	1	1	1	1	7F	127

ValOn values for single bit handling when the switch goes ON (logic OR operation)

offset.7	offset.6	offset.5	offset.4	offset.3	offset.2	offset.1	offset.0	Exadecimal	Decimal
0	0	0	0	0	0	0	1	01	1
0	0	0	0	0	0	1	0	02	2
0	0	0	0	0	1	0	0	04	4
0	0	0	0	1	0	0	0	08	8
0	0	0	1	0	0	0	0	10	16
0	0	1	0	0	0	0	0	20	32
0	1	0	0	0	0	0	0	40	64
1	0	0	0	0	0	0	0	80	128

A modified DigitalIN.cfg file for PMSystem use is included in the "MCPEX1 for PMSystem Operation Manual" .zip file downloadable at:
http://www.cpflight.com/sito/downloads/downloads.asp

I/O CONNECTION EXAMPLES:

Throttle Quadrant realization
Note: this is an example for your build up; we don't produce throttle quadrant
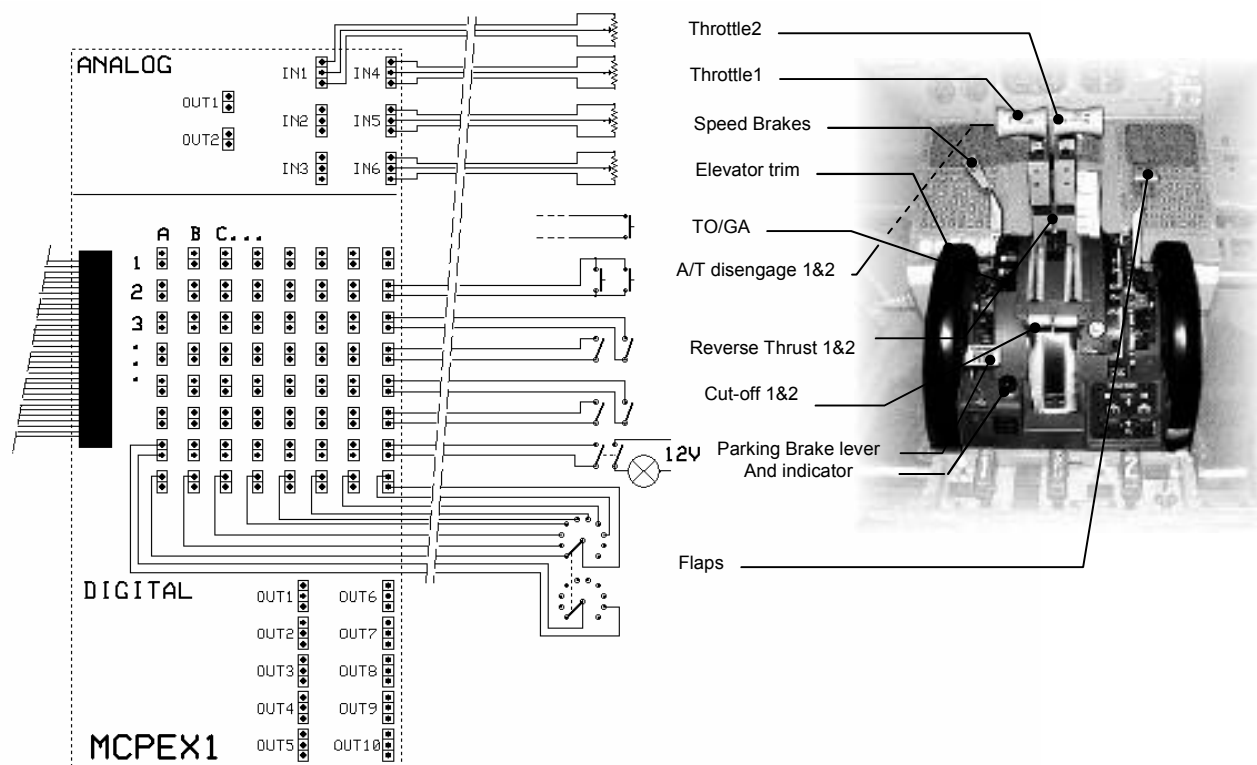

Figure 18: Throttle Quadrant realization using MCPEX1 adapter. The example circuit use 4 analog inputs and 15 digital inputs. The analog inputs are wired to potentiometers to control the two engine throttles, the spoiler and the elevator trim; the digital inputs commands the flap position, the external Auto-Throttle disengage, the thrust reverse for each engine, the engine start levers and the parking brakes. The TO/GA button may be directly connected to MCP dedicate input.

You may use slide potentiometer for throttle, round shaft potentiometer for the spoilers and multi-turn potentiometers for the manual elevator trim. All devices may be easily found on electronic and HI-FI shop.

For flaps you may fix a lever to a rotary switch, if you use more than 8 positions a double rotary switch should be used; use switches with low angle between position (there are switches with 15° angle), or switches with more position than used to avoid a big lever excursion between flap "UP" and full flap position.

On 737 two auxiliary levers located on the main thrust levers activate the thrust reverse; you may fix your levers on two switches wired to digital inputs. The Auto-Throttle also has a remote disengage button on thrust levers on 737; you may use a normal pushbutton for it. If you have more buttons to control the same command from different locations, you may connect them in parallel on the same digital input (see A/T disengage 1 & 2 on diagram).

In the end, using a bipolar switch for parking brake you may connect a pole to digital input and the second pole to a 12 volts external supplied indicator lamp.

LINKS/REFERENCES

Web site: http://www.cpflight.com
Support: http://www.cpflight.com/sito/support.asp

email: info@cpflight.com

Project Magenta Web Site: http://www.projectmagenta.com

FSUIPC software and upgrade: http://www.schiratti.com/dowson.html