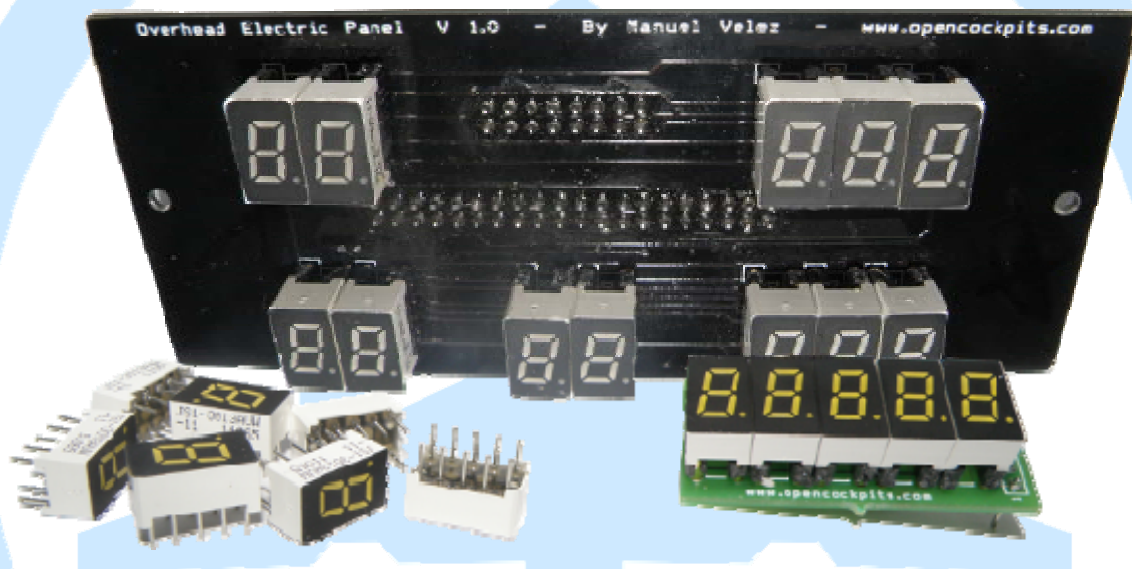




Opencockpits



7 Segments Displays Wiring Manual

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Introduction:

In this manual we are going to learn how to build the wiring of the diverse displays that are used to build the different screens in an airplane cockpit. For that purpose we shall go from basics to more professional techniques in order to reduce or avoid problems with wiring, let them be short circuits, interferences, broken cables or similar.

In this manual we will only mind the physical part of the displays, not the programming side. We will carry out the tests with SIOC monitor.

Displays:

We have displays of 7 loose or grouped segments; these last ones can be found in groups of 3, 5 or 6 digits (2TD1, 2TD4, 2TD2, etc.) and we can also find the electric panel of the overhead of a commercial airplane (2TD7).

All we are about to do in this manual it is based on the 7 segments displays that are sold at Opencockpits store and it is very important to keep in mind that all are of **common cathode**.

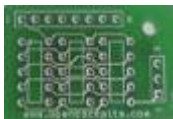
Displays description and connecting plates:



- 1. - 7 segments displays in green, white and yellow colour with dot point.** Opencockpits works with the HDSP-7403 or equivalent (Datasheet: http://www.opencockpits.com/uploads/datasheets/digito_hdsp7403.pdf).



- 2. - Pre-perforated** board for prototypes, can be purchased at electronics shops and are very practical to test components and circuits.



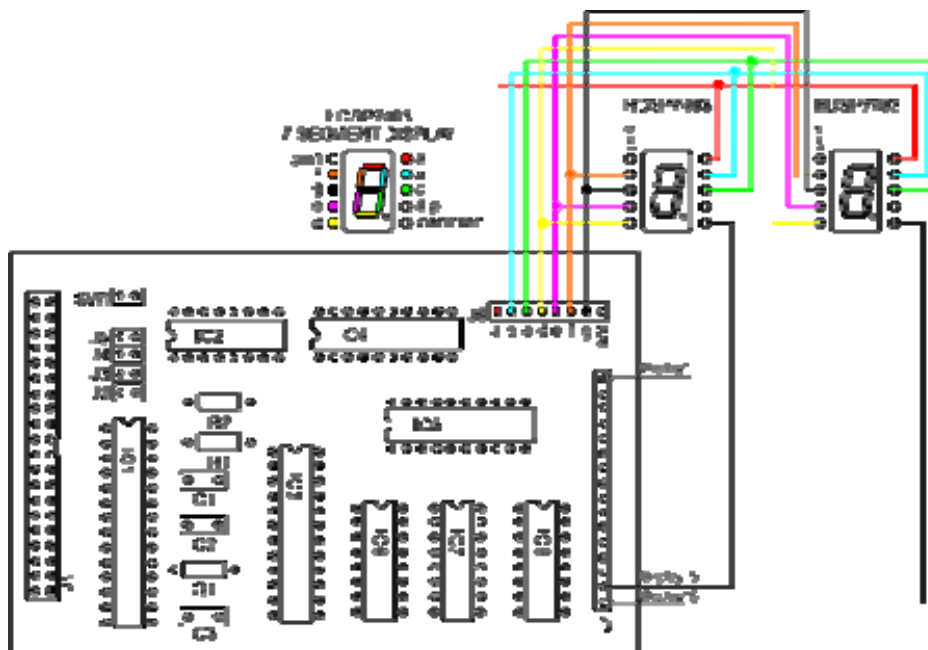
- 3. - KIT PCB-displays** Opencockpits, can be purchased for 3, 5 and 6 seven segments displays



- 4. - PCB-displays board** Opencockpits, can be purchased for 3, 5 and 6 seven segment displays completely finished and ready to connect to the IOCard Displays II card.

Connecting schemes:

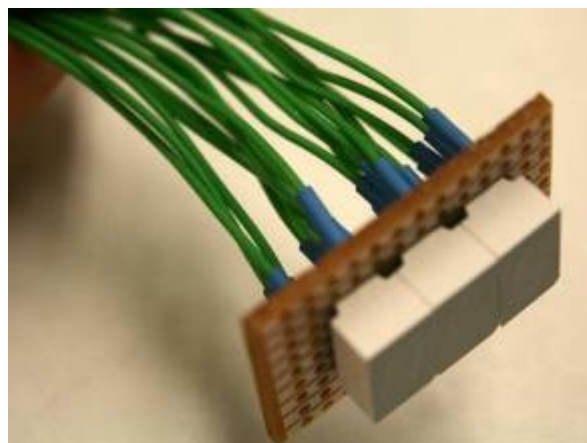
1. - 7 segments display: Directly to the Displays II Card.



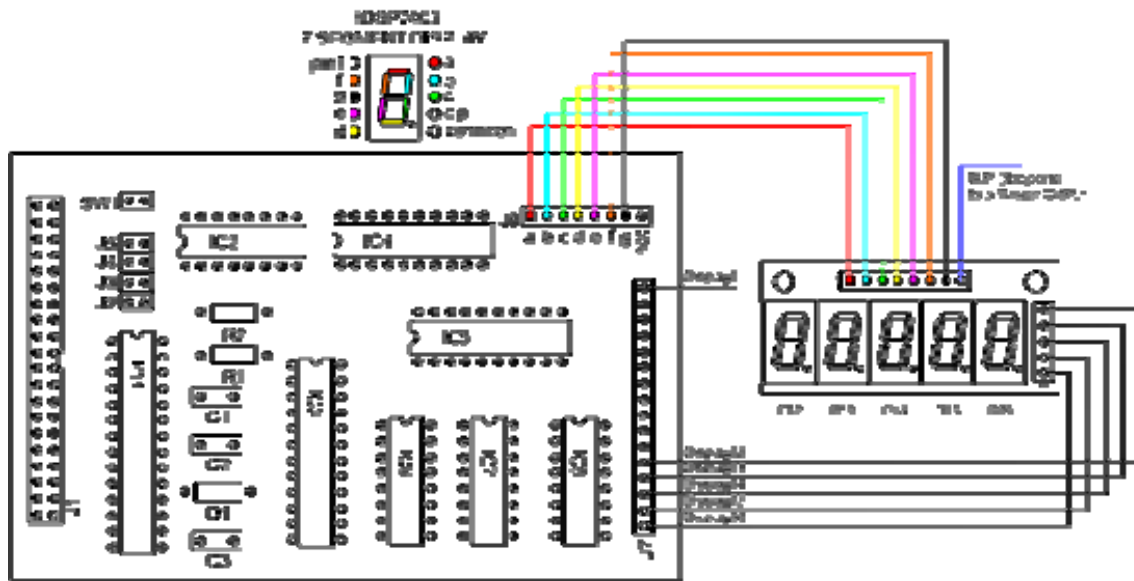
It would look like:



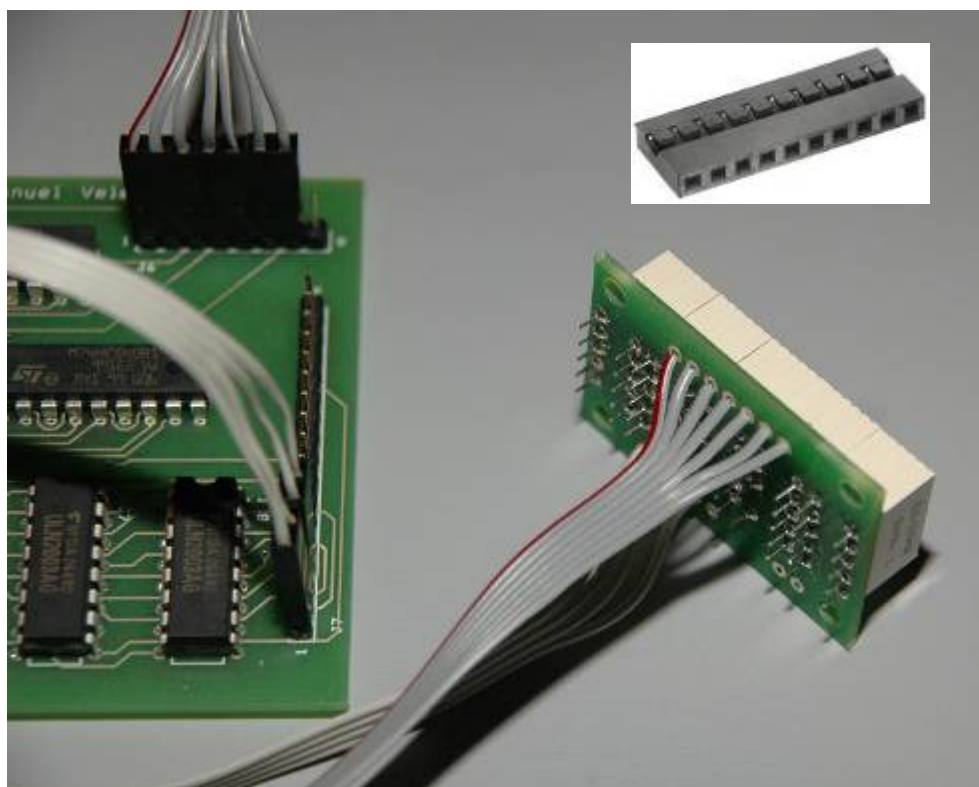
2. - Pre-perforated board: Same as directly, but the connections will be more rigid and secure.



3 and 4. - PCB-displays: to connect the pcb-displays we can follow the scheme as shown:



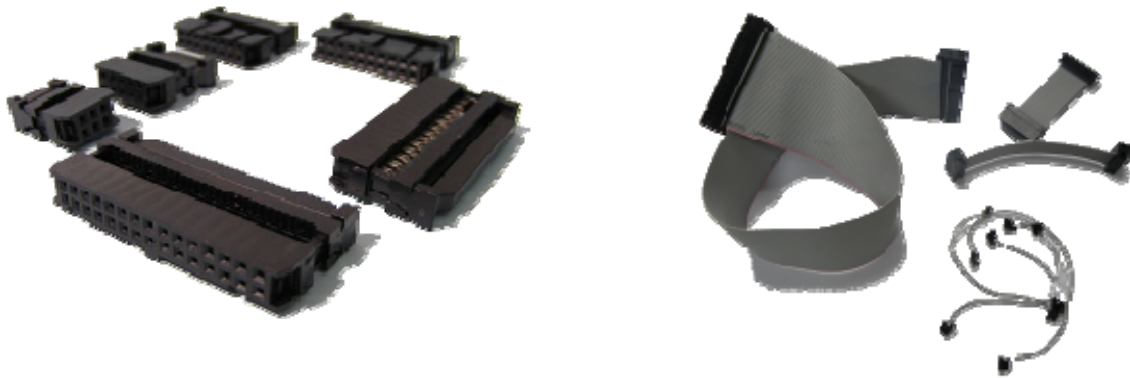
They would look like:



As it can be seen, we used flat shielded cable like the ones used for data in computers. We soldered the end of the cables from one side directly to the pcb-display coming from a kit and from other we used connectors like the ones used in computers for accessories like loudspeaker, HDD LED, reset button, etc. As the latter are often difficult to get, in the next example we will use the same connectors used in the flat data cables of the computer which are much easier to get and besides giving us more flexibility regarding uses and mobility, keeping in mind that they will be often used in installations with Opencockpits components.

Cables and connectors:

In this section we will learn how to build the connectors used between pre built PCB Display boards with 7 segments displays and the IOCard Displays II cards.

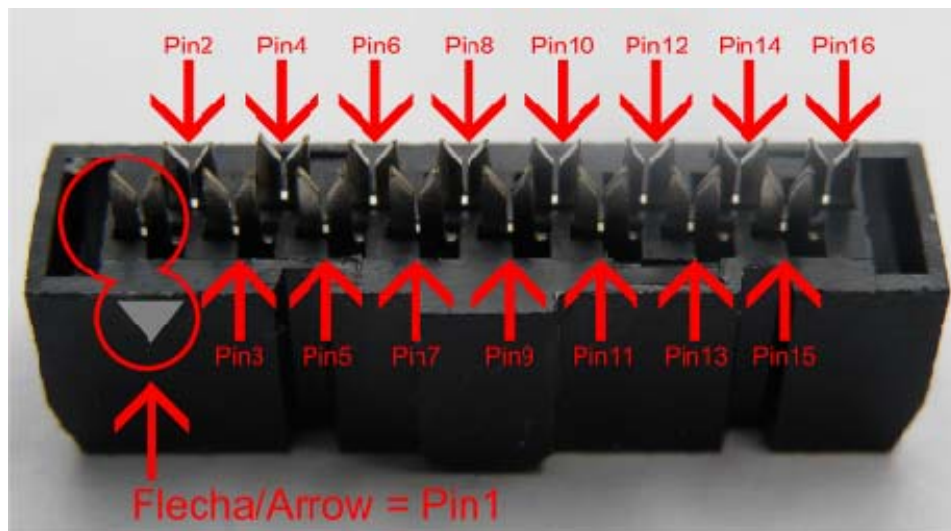


The use of these connectors is very simple, a crimping tool is not needed but it is very advisable.

In this section we will see what must be kept in mind for the use of these connectors. The connectors can have 10, 16, 40, etc. contacts. In our case we currently use the enumerated as 16 and 40.

IDC pins numeration:

16 contacts IDC Connector:



40 contacts IDC Conector:



We already know how cables are numbered, so let's build the ones needed for our examples, i.e.:

One Pcb-Displays of 5 elements connected to an IOCard Displays II.

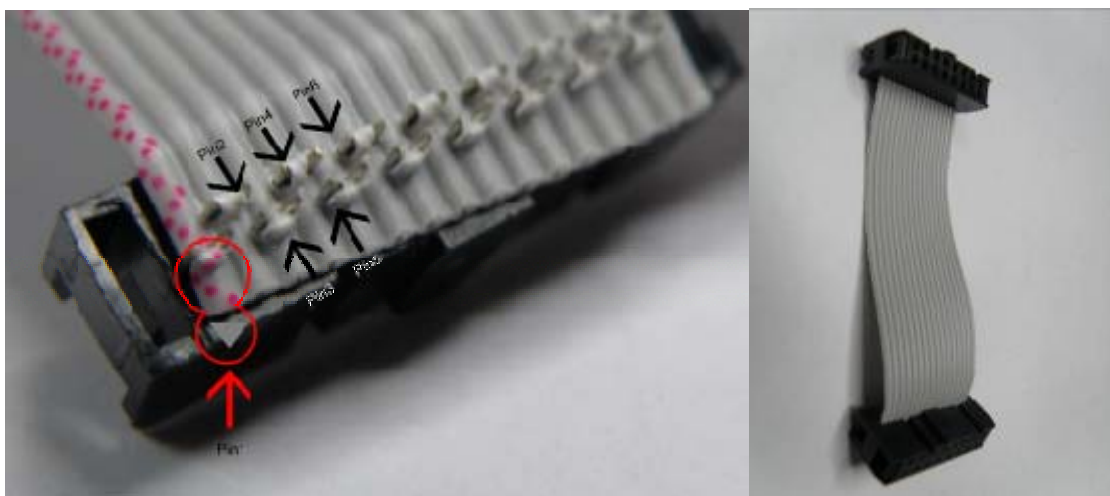
One B737 electric panel (12 elements) connected to an IOCard Displays II.

Building the cable:

To build the cable that we will use to connect the Pcb-Displays board of 5 elements to the IOCard Displays II, we need two 16 threads flat cables and two IDC 16 contacts connectors. We will get the threads from a flat 16 threads cable or from one 40 threads, throwing away the ones not needed:



We see that we are about to use 16 contacts cables and connectors, when we are really only going to use 8, what is it all about?, simply the IDC connectors "bite" the cables by alternating the numeration between odd and even, that means that the row in pin 1 only connects the odd numbers and the row in pin 2 only connects the even ones, we must use the connections in the same row to be able to use the lined up connectors in the Displays II board:



While connecting the cables we must mind the connecting position, which means, if in the pcb-display of 5 elements (or any other board) we prick the IDC connector for pin 1, in the Displays II card we also must connect pin 1, or it will not work.

Let's build the other cable for the electric panel of the B737 and afterwards we will check our cables.

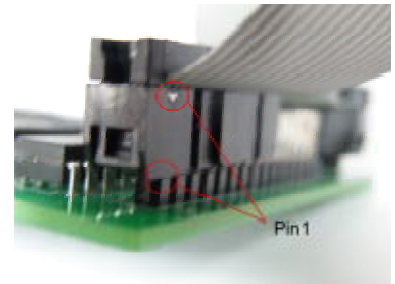
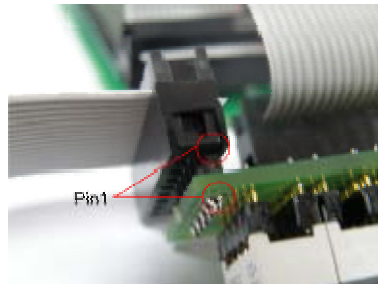
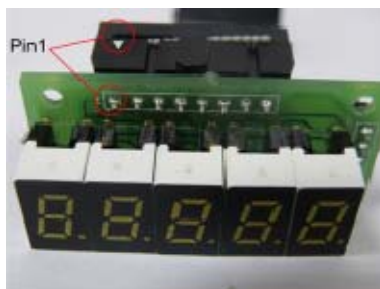
For the panel we need a complete 40 threads cable and a complete 16 threads cable. We have already built the 16 threads one for the previous example, so we will use it. For the 40 threads we can buy one like the ones for IDE hard disks or build it ourselves:



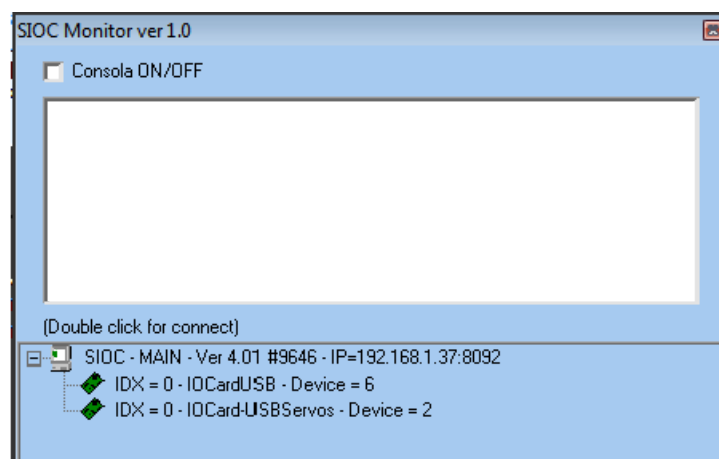
Practical examples:

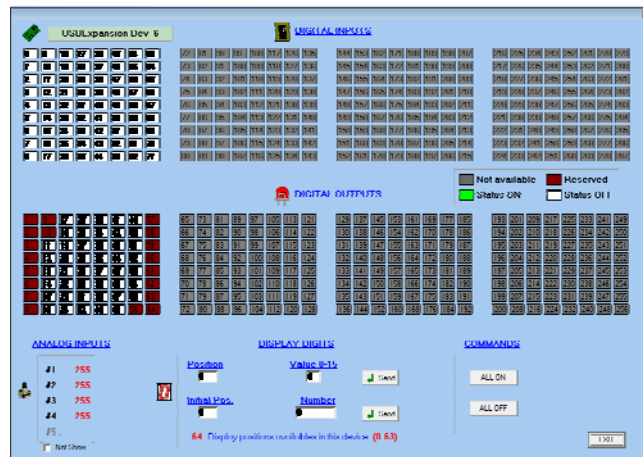
7 segment PCB-Displays with 5 displays:

Let's connect the 7 segment pcb-displays of 5 displays and let's check it.



Once we have all connected we can verify with SIOC MONITOR, we select the USBExpansion where it is connected the IOCard Displays II,

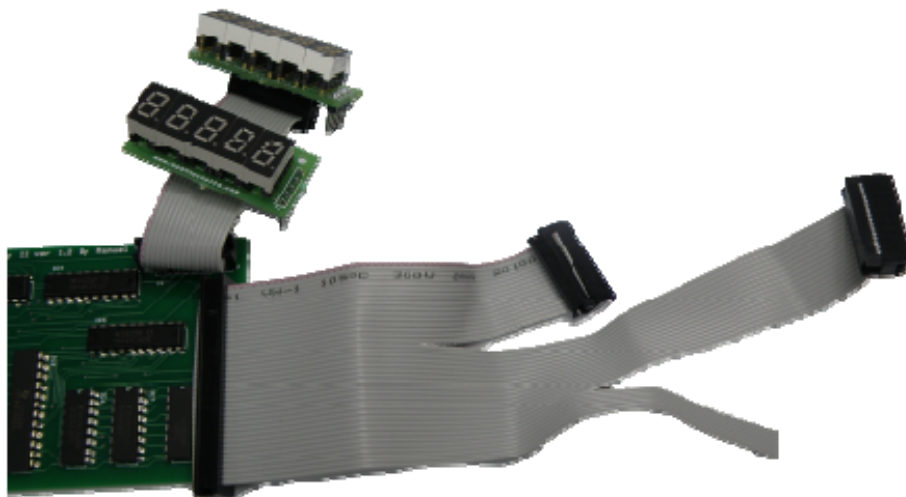




if we press ALL ON all digits will light up and if we introduce the sequence: value 9 to position 0, value 8 to position 1 and so on until position 4, in value 5 we must obtain this:



In this case many outputs will remain available in the Displays II card (11), we could combine the use of several IDC 16 threads connectors in the same flat cable until all possibilities in the Displays II card are spent, using a flat 40 threads cable for common cathode outputs:

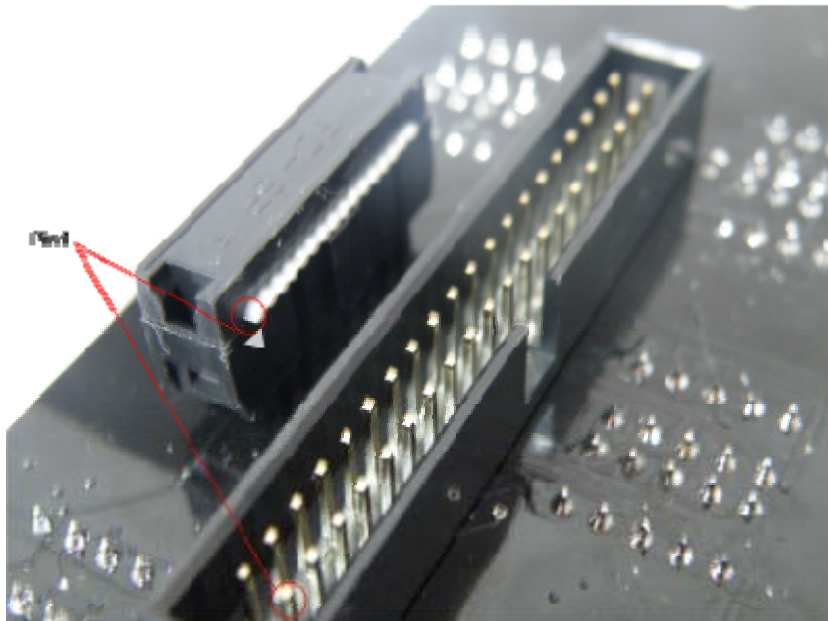


Electric panel B737:

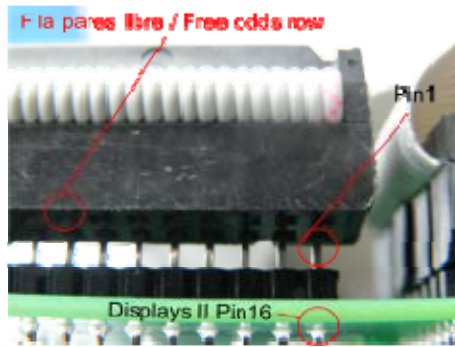
This panel is sold fully build and creates certain connecting difficulties to newcomers because it uses 12 seven segments displays that bears in a lot of wiring. To avoid any connecting error or omission in the position of the wires, we have built the two cables needed to connect it to an IOCard Displays II dedicated to the module, one with 16 threads (we will only use 8) and another with 40 threads (we will only use 12), both with the connector assembled with the same orientation.



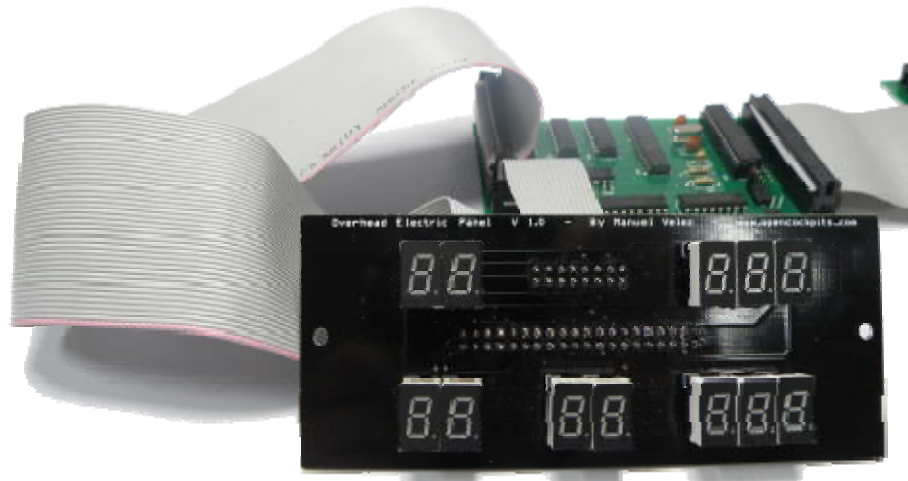
Cables must be connected in the following position:



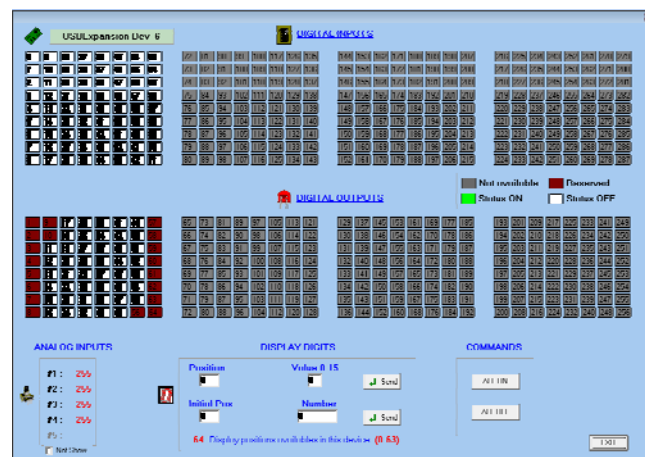
and in the IOCard Displays II board they must be connected this way:



This is how the installation will remain:



Once we have it all connected we can verify with SIOC MONITOR, we select the USBExpansion where it is connected our IOCard Displays II,

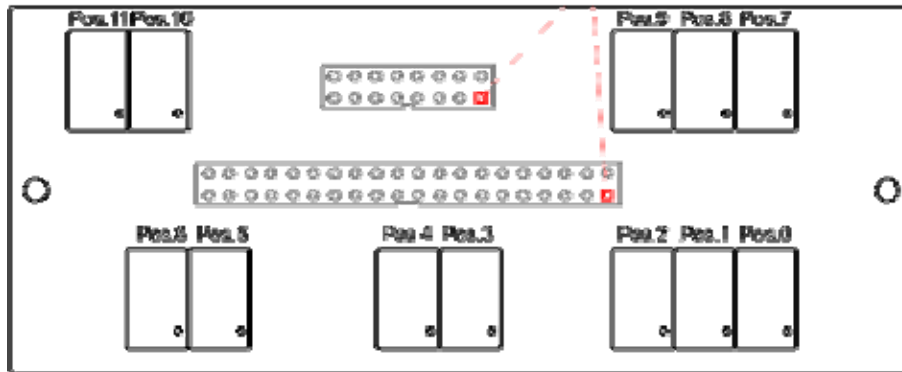


If we press ALL ON, all digits must light up



If we want to program the panel we must know the positions occupied by each display in the connections with the IOCard Displays II, let us see the following scheme:

Pin 1



Insert the following sequence in the MONITOR:

| POSICIÓN | VALOR |
|----------|-------|
| 0 | 1 |
| 3 | 2 |
| 5 | 3 |
| 7 | 4 |
| 10 | 5 |

This is how it must look:

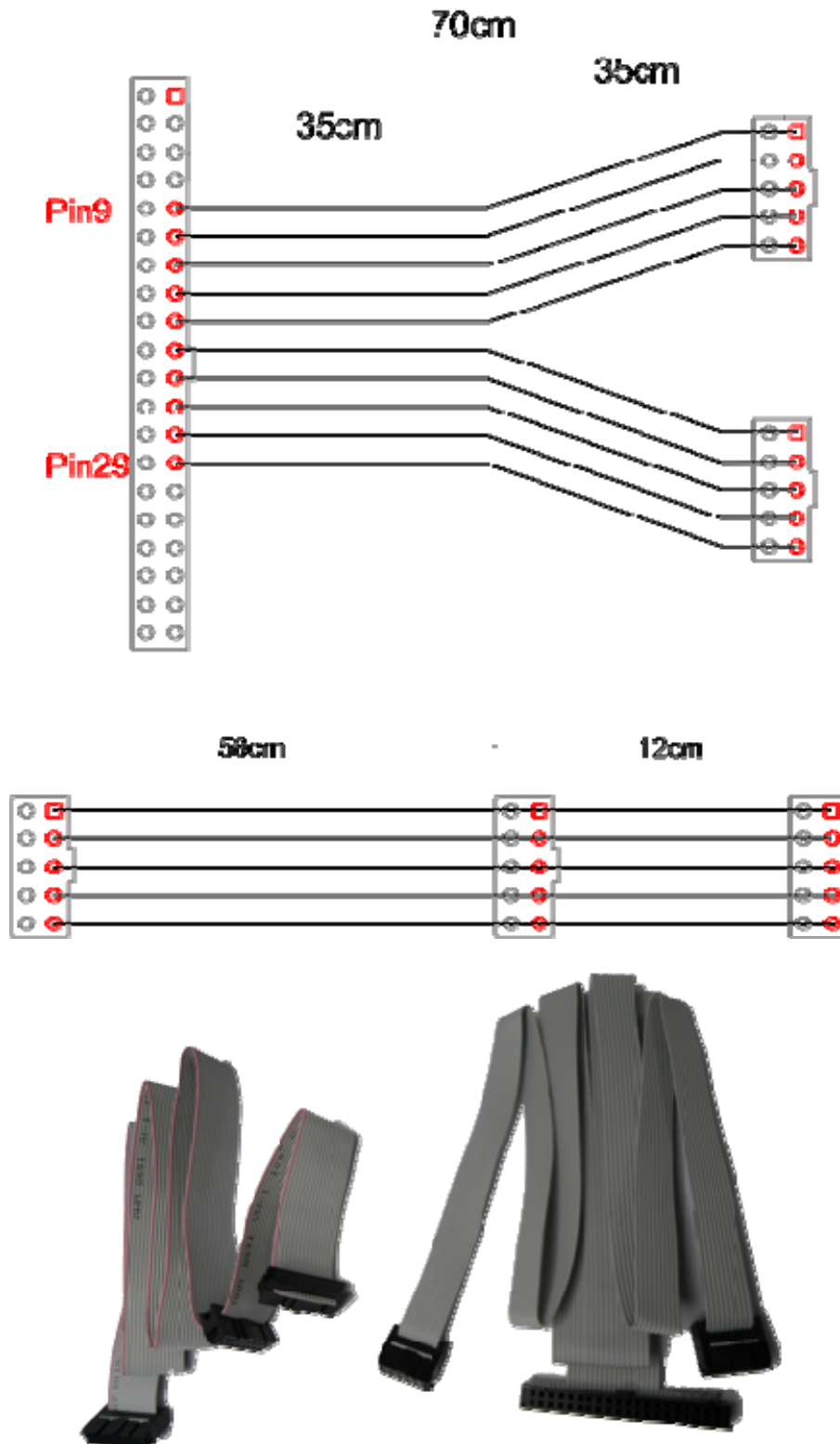


Cabin Press Gauge Displays:

This panel uses two 5 digits displays, which use 10 common cathode connections in the IOCard Displays II. That means, one cable with three connections of 16 contacts each and one cable of 40 contacts with a connection of 40 connects and two connections of 10 contacts each.



In the installation of our overhead this cable of the common cathodes has the particular property of using intermediate inputs, the do not start in pin 1 but in pin 9 and ends in pin 29, dividing in "Y" with two terminals of 10 contacts. Let's see its outline and images:



Software installation and configuration:

We already know how to connect our Displays II cards to our 7 segments modules and electric panel, now we must program them in SIOC, for that we need the following software:

SIOC,
Flight Simulator 2004, FSX, Xplane...,
The necessary plugins for the simulator,
Etc.

At the end of this document there is a link for unloading the necessary software in order to practice all explained in this manual.

Definition of variables and use of displays:

Let's see some theory, the statement of a variable for a digit:

Var 0001, Name digito_0, Link IOCARD_DISPLAY, Device 0, Digit 0, Numbers 1

Device, indicates the IOCard USBExpansion board that the Display II Card is connected to.

Digit, indicates the physical number of the less significant digit (those more to the right or units) of the number we want to use.

Numbers, defines how many digits are used in the number that want to send to the display.

If we want to show a "5" in this digit, we only have to assign a 5 to the variable:

v0001 = 5

or

digito_0 = 5

To use more than one digit we must keep in mind the following:

Let's suppose that we have to write the Heading of the Captain's MCP, that it is a 3 digits figure going from 0 to 359 degrees, let's assign its value to the 1000 variable 1000 and let's show it in a 3 digits display:

```
Var 1000 //Cruise del capitán
{
    &HDG = v1000
}
```

Var 3000, Name HDG, Link IOCARD_DISPLAY, Device 0, Digit 0, Numbers 3

This code means that the variable v3000 (HDG) will show the V1000 value in a display placed in device 0 (our sole connected Master), starting at digit 0 (the less valuable one or the one most to the right of all three displays), using 3 displays (0, 1 and 2). We must remember that they must be physically assembled in this order: 2, 1, 0.

You can go deeper in the programming of the displays reading the IOCard Displays II Manual and the SIOC Manual. This ends this manual, we invite you to read the manuals the other Opencockpits elements and of the SIOC software and we thank you for trusting us.

Links of interest:

Support Area for clients: <http://www.opencockpits.com/catalog/info/>