S.I.C. Connections, Wiring Diagrams & Schematics

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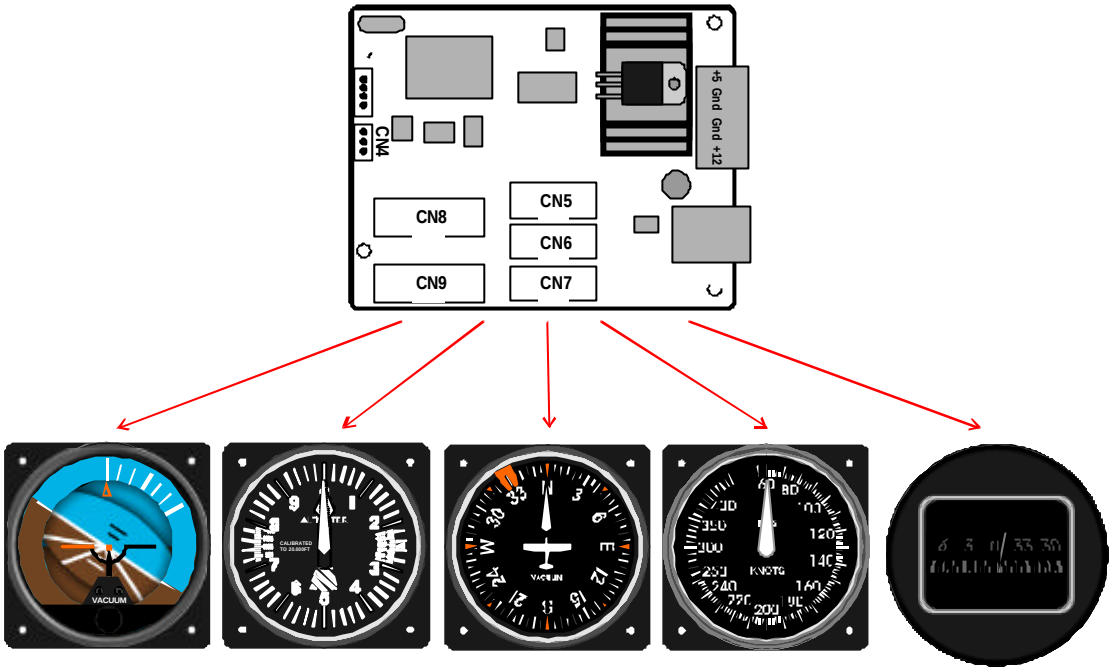
1. Standby Instruments Controller Connections

The S.I.C. can drive a set of Standby Instruments and is designed to be used in Airliner Cockpit simulation.



(Note: the connections in the above picture between the different instruments and the S.I.C. board are just for illustration only. Please see Chapter 2 for exact connections)

This document describes how the instruments are connected and how they are driven by the S.I.C. and what the signals and their description mean.
Although that the document is very clear and can be read by non-technical persons, for full understanding we do recommend that the reader has a basic knowledge of electronics

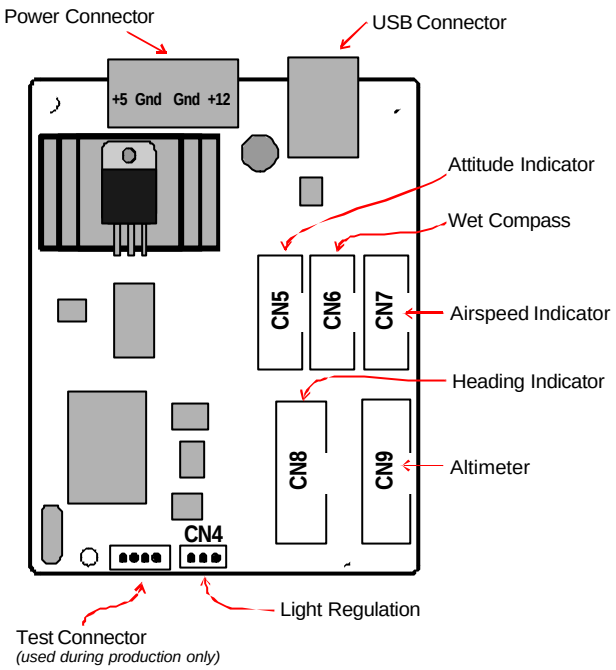
When you like to expand your airliner cockpit with more instruments and gauges, for example for the overhead panel, we do recommend the use of the Multi Controller, an expansion board offering 23 I/O lines, which are each programmable to read out a switch, to drive a LED or to drive a single pointer gauge per each I/O line. Up to 32 of these board can be configured in addition to the S.I.C.. All controllers (including the S.I.C.) are connected to the PC via USB.

Instruments controlled by the S.I.C.

- Attitude Indicator
- Altimeter
- Heading Indicator (with or without Autopilot Heading Bug)
- Airliner Airspeed Indicator 450 Knots
- Wet Compass

Software
The driver software to connect the S.I.C. to Microsoft Flight Simulator is the same software as used for the CCU1 controller board. The S.I.C. is actually a smaller version of the CCU1.
You can download the driver software from the support section of the SimKits website. Please download version 2.xx and use the software installation manual for the TRCLink software 2.xx/

2. The Standby Instruments Controller board



List and position of the I/O connectors

NOTE: The position of the texts on the picture on the left is not identical to the position of the text on the board itself.

CN4	Light Regulation
CN5	Attitude Indicator
CN6	Wet Compass
CN7	Airspeed Indicator
CN8	Heading Indicator
CN9	Altimeter

Regulating the Light

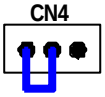
The Light can be regulated or can be switched on permanently.
To regulate the light, connect a potentiometer of 10Kohm to CN 4, where the wiper needs to be connected to the middle pin.

When the light needs to be on all the time, just connect the middle and left pin (as in the drawing) together.

Regulating Light

Potentiometer 10Kohm

Lights always on



4. Connectors and their I/O lines

The description below informs you on what the I/O lines of each connector mean.

Warning: connecting hardware to this I/O lines which draw excessive current, input high currents or short circuit outputs may damage the delicate electronics on the board. Damages caused by improper connection of hardware are not covered by the limited warranty.

For each connector the signal names are mentioned. These signal names can be found back on the schematics (last page).
When necessary a description of the signal is given.

- The term “Digital Input” means and input towards the S.I.C..
- The term “Digital Output” means a signal which is coming from the S.I.C. towards the device.
- The term “Analog input” means that this input can read an analog value between 0 and 5 volts with a resolution of approx. 1024 different values.
- The term “Analog output” means that this ouput can produce a voltage between 0 and 5 volts which can be set by a digital value of 8 bits by software.
- The Term “Ground” or “Gnd” is the common ground of all electronics signals.
- The term “+5v.” or “Vcc” is the 5 volts power needed to drive the electronics on the S.I.C. board and some electronics inside the gauges.
- The term “+5v. **X**” is the 5 volts power needed to drive the servo motors and is derived from the separately connected Power Supply.

The S.I.C. needs 2 different positive voltages of 5 volts.
One 5v. is supplied through the USB connection from the controlling PC and is used to power the electronics except the servo motors. The other 5v. (marked as 5v. X in the schematics and literature) is powered by an external (PC AT) power supply via CN42. This is designed in this way because the servo motors draw more power than can be delivered through the USB connector from the controlling PC.
Both 5v. supplies must be connected in order for the electronics and gauges to function properly.

Modified Servos
In some instruments, lilr the Wet-Compass, the Heading Indicator and the Altimeter, so-called modified servos are used. An normal servo is and electro motor driven by electronics inside the servo motor. Via a number of gears, a small electric motor drives the output axis. The output axis is also connected to a normal potentiometer. The output axis is limited in hardware to turn maximum of approx. 180 degrees.
The potentiometer is used to feed back the position of the output axis to the electronics of the servo. The output axis of the servo can be controlled by a pulse width applied to the servo to turn it into a certain position. This feature is used in most gauges.
However, some gauges need a continously rotating movement. For this we have choosen to use a standard servo motor and modify it in such a way, that the output axis can turn clockwise and anti clockwise without limitations. Due to such modification, the position of the output axis cannot be determined anymore by the built-in potentiometer.
Therefore the mechanics inside the gauge now are also connected to 360 degrees turnable potentiometers, called PIHER position sensors.
These position sensors however, only measure a part of the 360 degrees. Their electronic sensitivity is approx. 240 degrees. By using 2 of such sensors and placing them in line but 180 degrees shifted, the S.I.C. electronics and software now can pickup the position of the output axis over the full 360 degrees. Finally, by software a precise position of approx. 0.5 degrees is being calculated.

Rotary Encoders
A rotary encoder is a mechanical dual switch which can rotate continously. During this rotation the 2 switches are closed and opened over 32 times for a full revolution, but not exactly at the same time.
The direction of the turn can be determined by the phase of which of the 2 switches are closed first and which last.

The software of the S.I.C. reads out both switches and translates this into a signal telling the flight simulator software that the certain knob is turned left or right and at what speed.

Potentiometers
In principle, all analog inputs do measure the position/value of a potentiometer (turn or slide). Throughout the whole design of all instruments, a 10Kohm potentiometer is used which is on one side connected to +5v. (Vcc) and on the other side to Ground. The wiper of the potentiometer is connected to the analog input on the S.I.C..
Potentiometers are used in a.o.: Yoke, Throttle, Mixture, Propeller, Flap Switch, Trim and the Piher Sensors (in essence a potentiometer) in the gauges Altimeter, Heading Indicator, ADF and Compass.

The Connectors

CN4 - Dimmer
Pin 11 – **Dimmer** POTM, Analog Input. A potentiometer of 10Kohm is connected between Ground and 5 volts. The input (pin2) is connected to the wiper of the potentiometer.
Pin 3 – +5vX.
Pin 1 – Ground

CN5 Attitude Indicator
Pin 1 – Ground
Pin 2 – +5v. **X**
Pin 3 – **Attitude Indicator** ATT1 Digital Output Servo Signal
Pin 4 – Ground
Pin 5 – +5v. **X**
Pin 6 – **Attitude Indicator** ATT2 Digital Output Servo Signal
Pin 7 – Ground
Pin 8 – Lamp
Pin 9 – NC
Pin 10 – NC

CN6 Compass
Pin 1 – Ground
Pin 2 – +5v. **X**
Pin 3 – **Compass** CMP1 Digital Output, Servo Signal
Pin 4 – **Compass** CMP2 Analog Input for position sensor 1
Pin 5 – **Compass** CMP2 Analog Input for position sensor 2
Pin 6 – +5v.
Pin 7 – Ground
Pin 8 – Lamp
Pin 9 – NC
Pin 10 – NC

CN7 Airspeed Indicator
Pin 1 – Ground
Pin 2 – +5v. **X**
Pin 3 – **Airspeed Indicator** AIR1 Digital Output, Servo Signal
Pin 4 – AIR2 Analog IN, not used on this instrument, but patched to CN16 pin 6 to provide an analog read out of the position of the Trim Wheel.
Pin 5 – AIR3 Analog IN, not used.
Pin 6 – +5v.
Pin 7 – Ground
Pin 8 – Lamp
Pin 9 – NC
Pin 10 – NC

CN8 Heading Indicator
Pin 1 – Ground
Pin 2 – +5v. **X**
Pin 3 – **Heading Indicator** HED1 Digital Output Servo Signal
Pin 4 – HED2 Digital Output Servo Signal (Not Used)
Pin 5 – **Heading Indicator** HED3 Digital Input (Rotary Encoder)
Pin 6 – **Heading Indicator** HED4 Digital Input (Rotary Encoder)
Pin 7 – **Heading Indicator** HED5 Analog Input, Piher Position Sensor
Pin 8 – **Heading Indicator** HED6 Analog Input, Piher Position Sensor
Pin 9 – **Heading Indicator** HED7 Analog Input, Piher Position Sensor
Pin 10 – **Heading Indicator** HED8 Analog Input, Piher Position Sensor
Pin 11 – Lamp
Pin 12 – + 5v.
Pin 13 – NC
Pin 14 – NC

CN9 Altimeter
Pin 1 – Ground
Pin 2 – +5v. **X**
Pin 3 – **Altimeter** ALT1 Digital Output Servo Signal, drives Modified Servo for 100 feet pointer
Pin 4 – **Altimeter** ALT2 Digital Output Servo Signal, drives Servo for pressure scale
Pin 5 – **Altimeter** ALT3 Digital Input (Rotary Encoder)
Pin 6 – **Altimeter** ALT4 Digital Input (Rotary Encoder)
Pin 7 – **Altimeter** ALT5 Analog Input, Piher Position Sensor, for position of 10,000 feet pointer
Pin 8 – **Altimeter** ALT6 Analog Input, Piher Position Sensor, for position of 100 feet pointer
Pin 9 – **Altimeter** ALT7 Analog Input, Piher Position Sensor or Photo Interruptor, for position of 10,000 feet pointer
Pin 10 – **Altimeter** ALT8 Analog Input, Piher Position Sensor, for position of 100 feet pointer
Pin 11 – Lamp
Pin 12 – + 5v.
Pin 13 – NC
Pin 14 – NC

5. Schematics

The following schematics are included in this document:

Standby Instruments Controller

Attitude Indicator

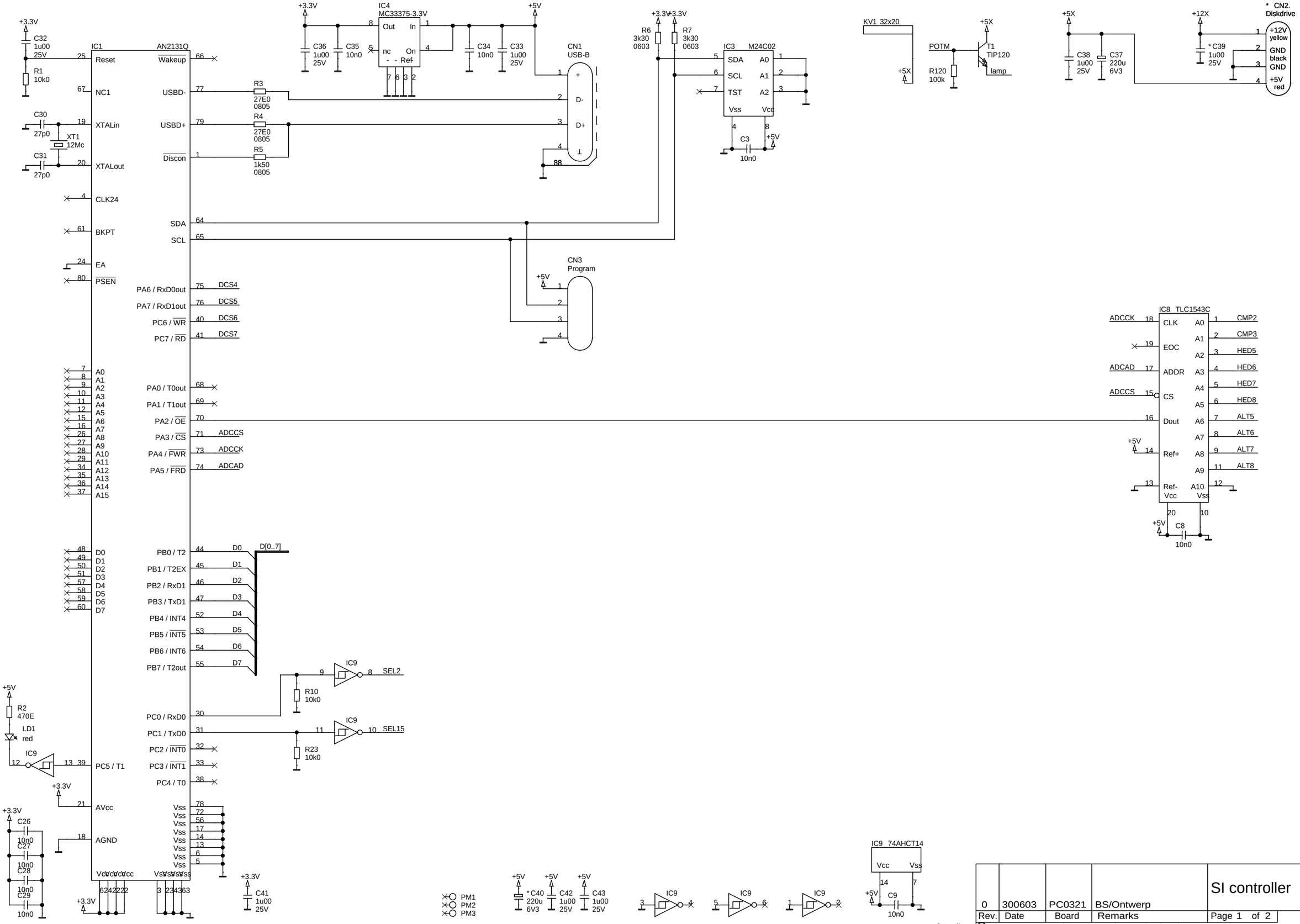
Altimeter / ADF / Heading Indicator with Zero Indicator (combined schematics and PCB for 3 different gauges)

General Instrument (Airspeed Indicator)
Wet Compass

6. Wiring Diagrams

The following wiring diagrams are included in this document:

Cable Light Regulation



				SI controller
0	300603	PC0321	BS/Ontwerp	
Rev.	Date	Board	Remarks	Page 1 of 2

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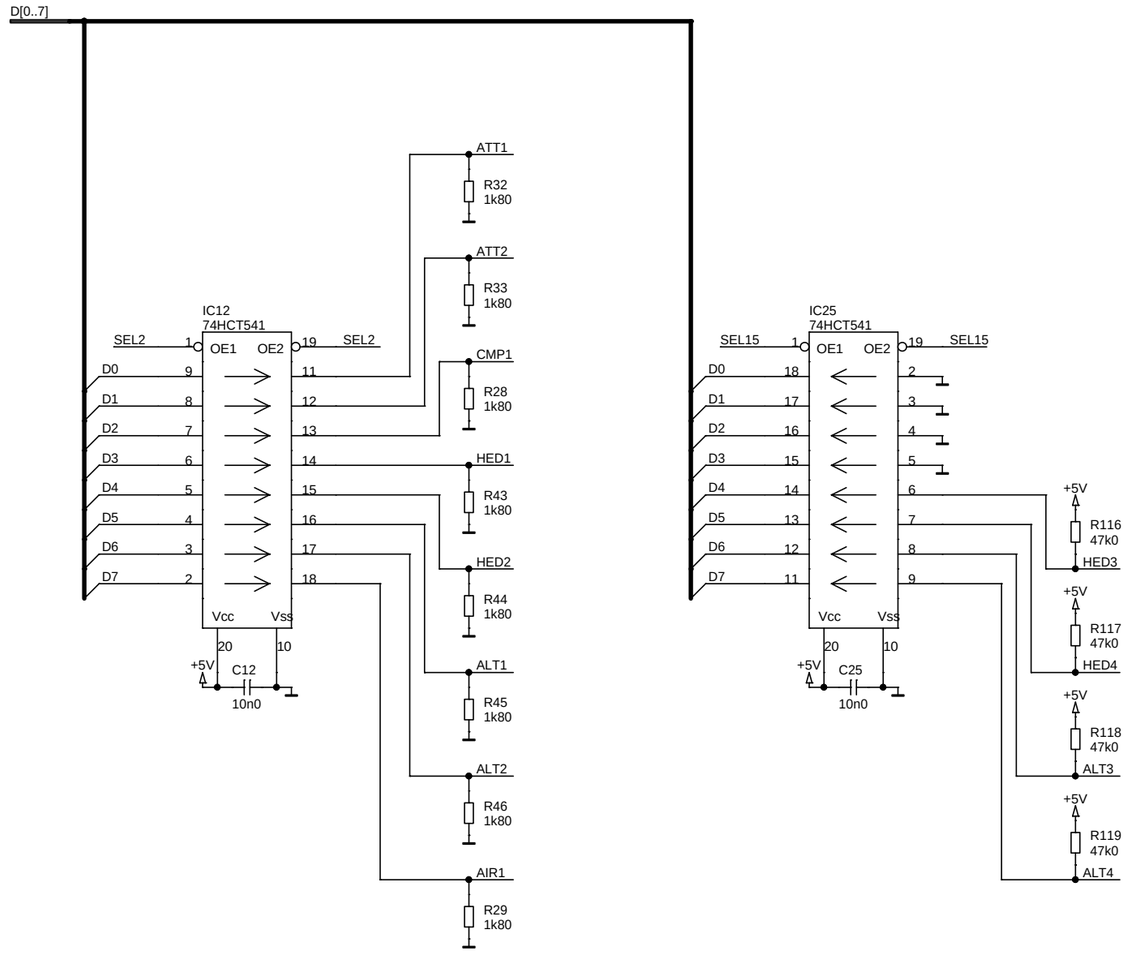
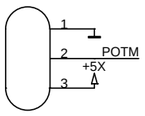
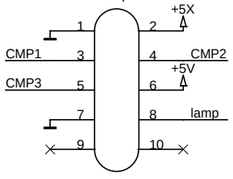


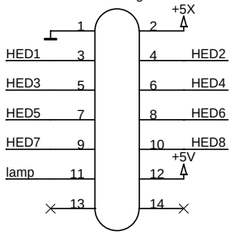
CN4
Dimmer



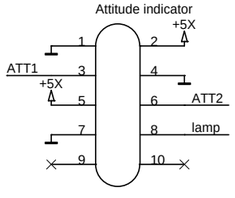
CN6
Compass



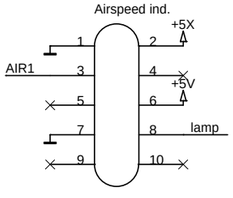
CN8
Heading ind.



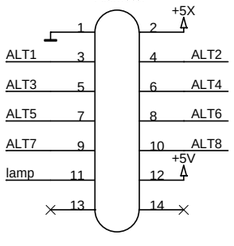
CN5
Attitude indicator



CN7
Airspeed ind.



CN9
Altimeter



Rev.	Date	Board	Remarks	SI controller
0	300603	PC0321	BS/Ontwerp	Page 2 of 2

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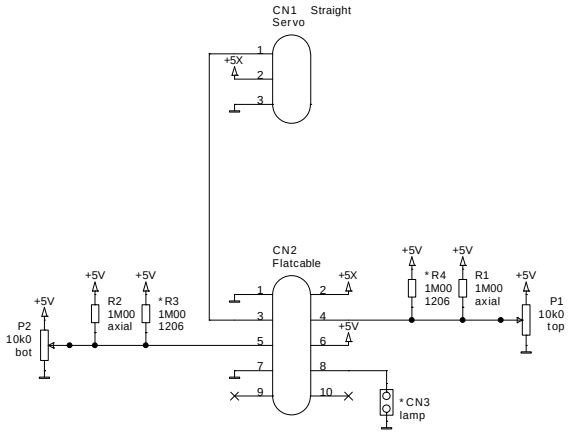

* option

Compass

Rev	Date	Board	Remarks	Page 1 of 1
0	280502	PC0213	BS/Design	

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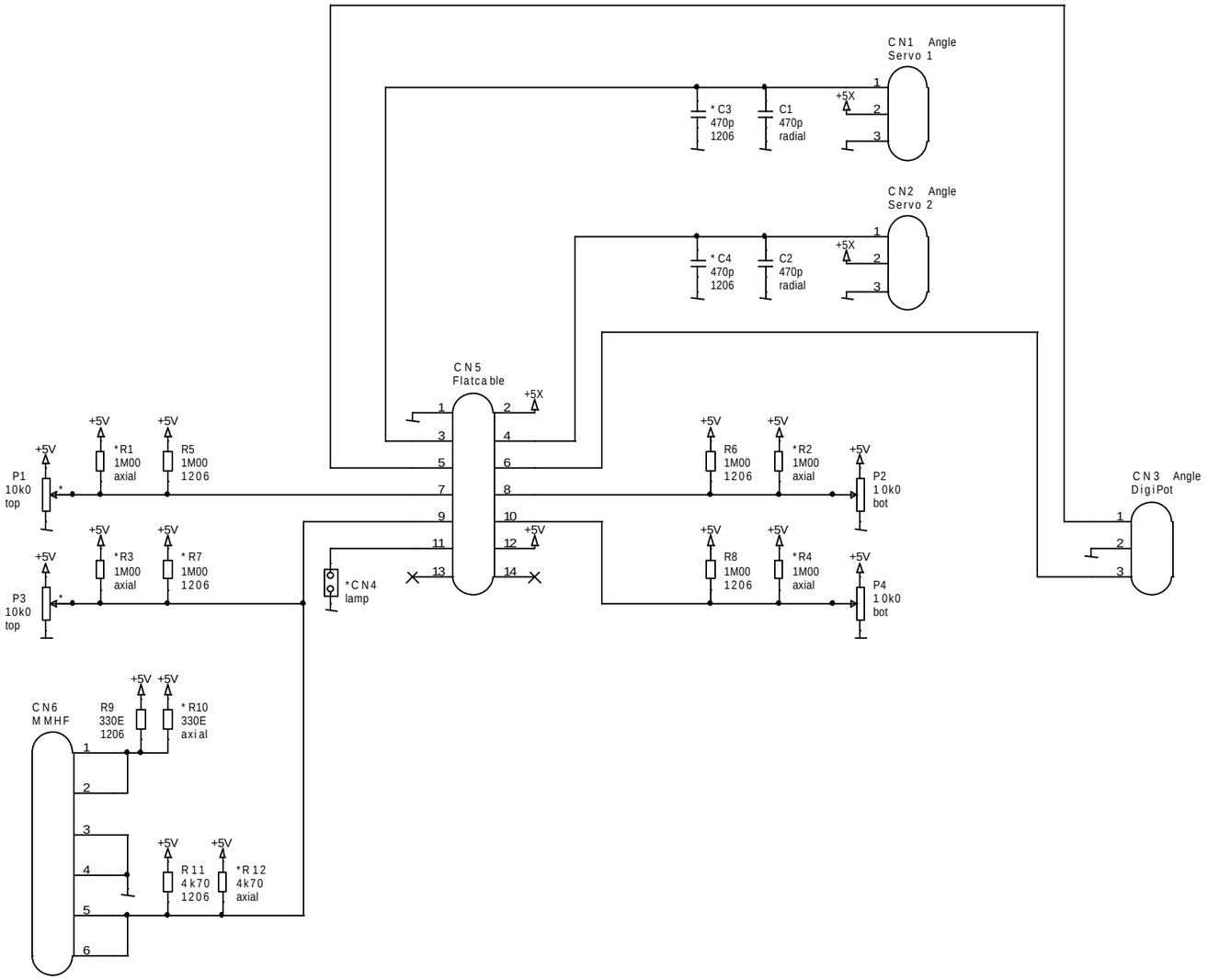

* option

Rev.	Date	Board	Remarks
4	161202	PC0239	BS/C3 moved
3	151002	PC0229	BS/nulsensor
2	180702	PC0223	BS/+470pF, 3p. conn.
1	280502	PC0218	BS/connectors

ALT+ADF -2

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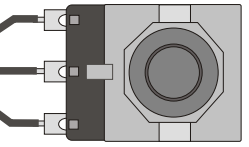
Light regulation connecting cable

Total length 70 cm.

To CN7

Top View
Potentiometer



Potentiometer 10Kohm

Rev.	Date	Remarks	Product
1.1	01-09-2003		Cable Light Regulation
1.2	01-10-2003		

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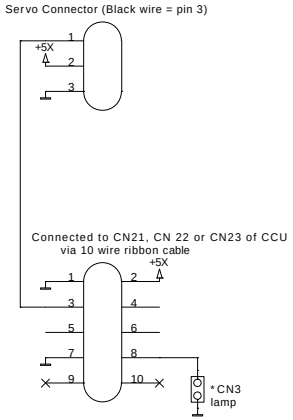

* option

				Gen. Instr.
0	280502	PC0213	BS/Design	
Rev	Date	Board	Remarks	Page 1 of 1

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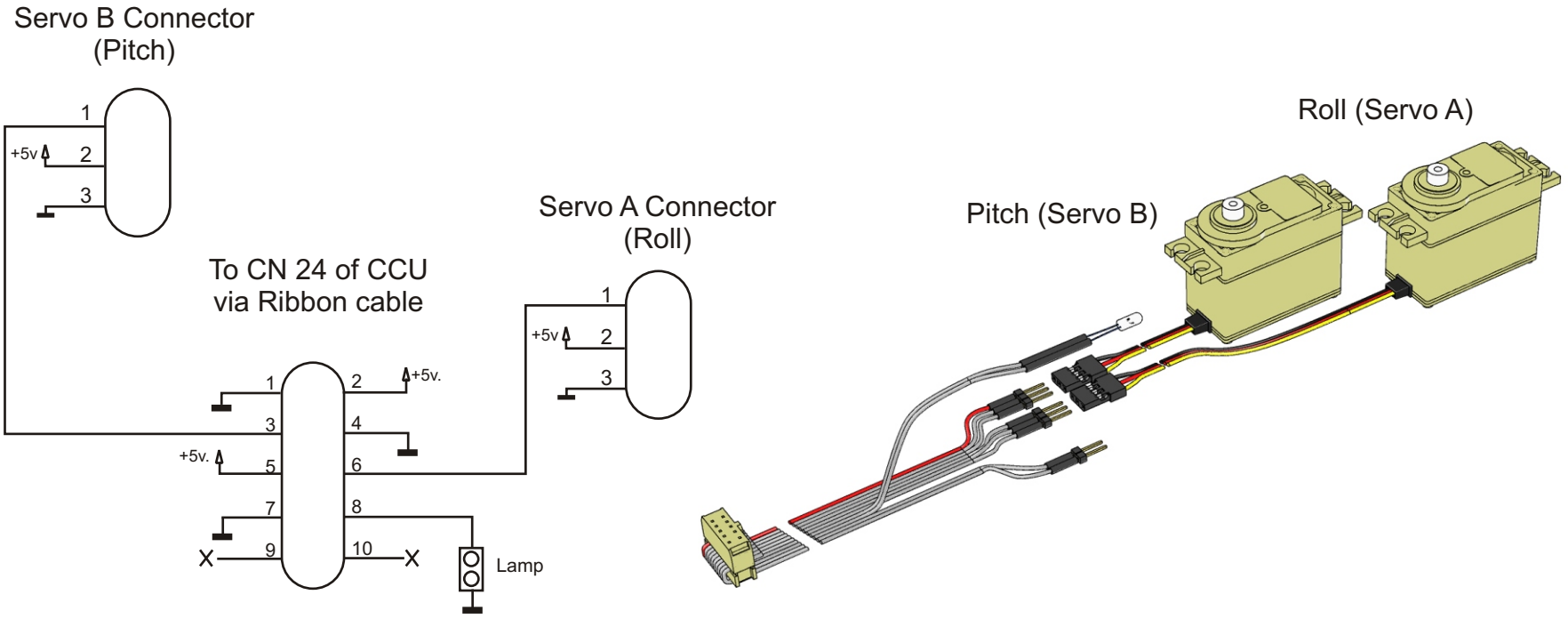

1.0	230603		CR/Design	Attitude Indicator
Rev.	Date	Board	Remarks	Page 1 of 1

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