# CCU Connections, Wiring Diagrams Modifications & Schematics

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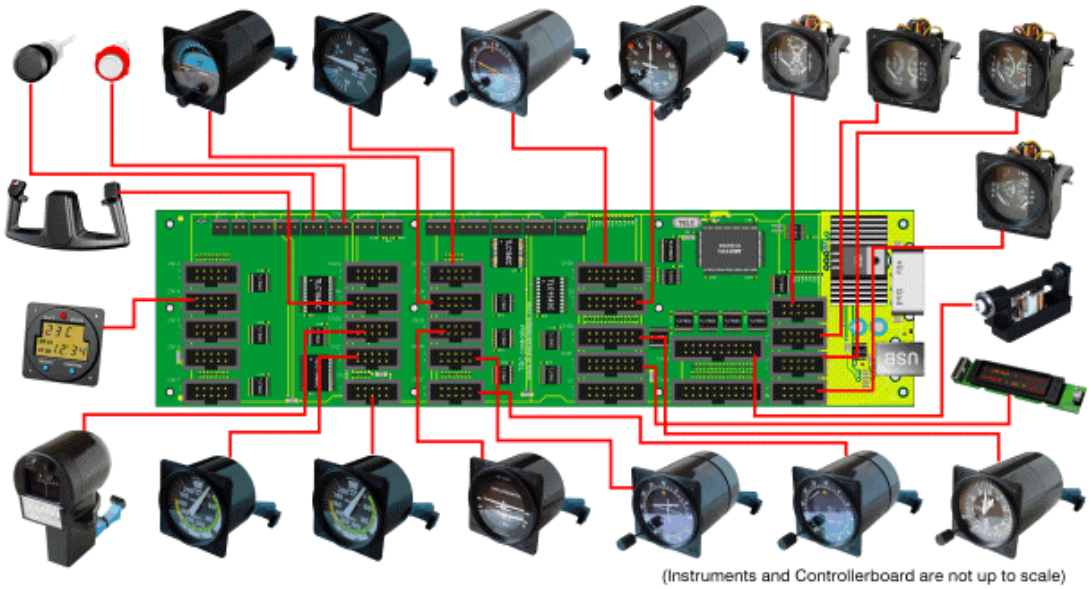
# 1. CCU Connections

The CCU can drive many gauges and is able to read out many different instruments, like Throttle, Switches, Trim wheel etc.




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

This document gives information on how the instruments are connected and how they are driven by the CCU and what the signals and their description mean.

Below you find a list of supported gauges for the aircraft as they are present in Microsoft FS2004. Not all gauges of each aircraft is supported yet, but will be in future with new hardware and software.

Some gauges are identical from a hardware viewpoint. There is a so-called “General Instrument” which is a gauges driven by a single servo motor and which has a set of gear wheels inside to enable the output of the pointer to turn up to 360 degrees, while the servo shaft output only produces a 190 degrees turn.

Using different face plates (dials) and using the calibration software to inform the driver how to behave, with this “General Instrument” gauges like an Airspeed Indicator, Tachometer and Vertical Speed Indicator for different aircraft can be installed. Therefore the hardware (except the faceplate) for an Airspeed Indicator for a Cessna 172 Skyhawk and a Boeing 737 are basically the same. Using the calibration software, the driver is informed that the pointer can move up to a maximum of 450 Knots for the Boeing and up to a maximum of 145 knots for the Cessna.

One can even design a customized faceplate using the available blank, pre cutted faceplates (made from high quality glossy paper) which can be printed in a high resolution inkjet printer like any today available photo quality printer and using one of the available calibtration scales which are close to the one you design yourself.

**Instruments controlled by CCU**

ADF Indicator

Airspeed Indicator, choice of face plate for:
- Airliner 450 Knots
- Beechcraft Baron 58
- Bell 206B Jet Ranger
- Cessna 172 Skyhawk
- Cessna 182 Skylane
- Cessna Caravan
- Extra 300S
- Mooney Bravo
- Schweizer 232 Sailplane
- Sopwith Camel
- Vaught Corsair

Altimeter

Attitude Indicator

Elevator Trim Control

Exhaust Gas Temperature & Fuel Flow Indicator (dual indicators)

Flaps Control & Indicator

Fuel Tank Indicator (dual indicators for left and right tank)

Gyro Suction Indicator & Ammeter (dual indicators)

Heading Indicator (with Autopilot Heading Bug)

Mixture Control

Oil Temperature & Oil Pressure Indicator (dual indicators)

Propeller Control

Switches

Tacho meter, choice of face plate for:
- Cessna 172 Skyhawk
- Cessna 182 Skylane
- Sopwith Camel
- Vaught Corsair

Turn Coordinator

Vertical Speed Indicator, choice of face plate for:
- Beechcraft Baron 58
- Bell 206B Jet Ranger
- Cessna 172 Skyhawk
- Cessna Caravan
- Vaught Corsair

VOR1 Indicator

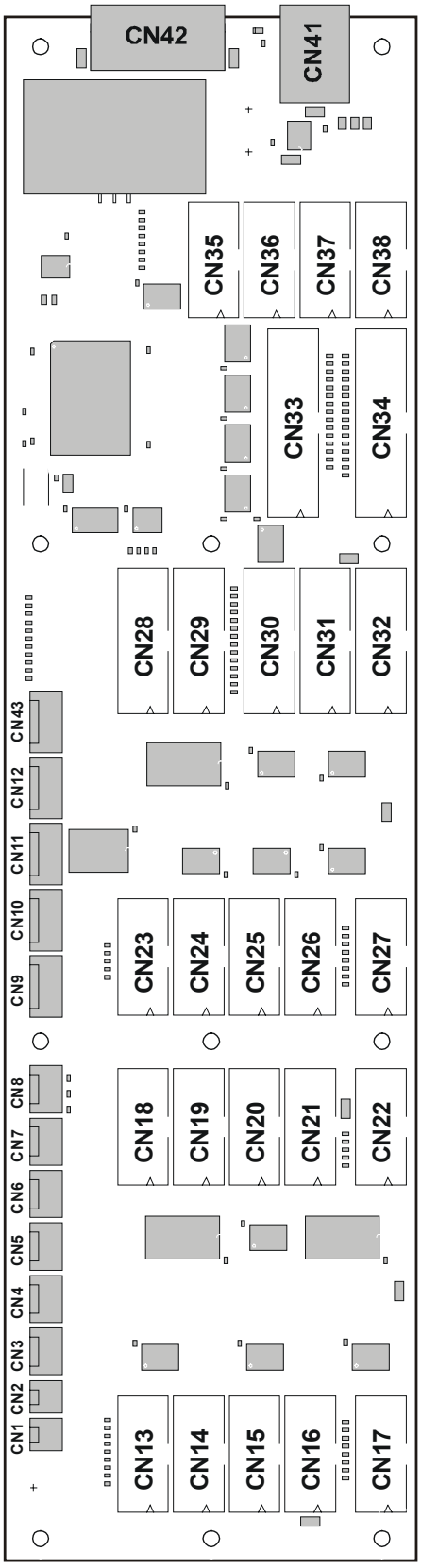
VOR2 Indicator

Wet Compass

Yoke Control

*Rudder Pedals (to be released later)*

# 2. The Central Control Unit




**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.

CN1 Handbrake
CN2 Avionics Switch
CN3 Quartz Counter
CN4 Throttle
CN5 Mixture
CN6 Prop
CN7 Light Control Input
CN8 Master Switch
CN9 Analog Ctrld. Fuel Left/Right *)
CN10 Analog Ctrld. EGT/Fuel Flow*)
CN11 Analog Ctrld. Oil Temp/Pressure *)
CN12 Analog Ctrld. Suction G./Amm. Indicator *)
CN13 Fuel selector + Shut off
CN14 Digital Clock
CN15 Flaps
CN16 Trim wheel
CN17 Starter Switch
CN18 Rudder Pedals
CN19 Yoke
CN20 Compass
CN21 Airspeed Indicator
CN22 Tachometer
CN23 Vertical Speed Indicator
CN24 Attitude Indicator
CN25 Turn Coordinator
CN26 VOR 1 Indicator
CN27 VOR 2 Indicator
CN28 ADF Indicator
CN29 Heading Indicator
CN30 Altimeter
CN31 Warning Lights & Switch
CN32 Autopilot Switch + Warnings
CN33 Circuit breakers (4 outputs, 15 inputs)
CN34 Switches (16 inputs)
CN35 Servo Ctrld. Fuel Left/Right *)
CN36 Servo Ctrld. EGT/Fuel Flow *)
CN37 Servo Ctrld. Oil Temp/Pressure *)
CN38 Servo Ctrld. Suction G./AMM. Indicator *)

*) The small analog meters are available only with servo motors built in (CN35, 36, 37 and 38). The Analog Output controlled small analog meters (CN9, 10, 11 and 12) are not supported in the present software version. They also will not be supported in future.

**Note:** Most inputs are internally pulled-up to Vcc with a 10Kohm resistor on the CCU, see schematics for more information.

# 3. CCU Modifications

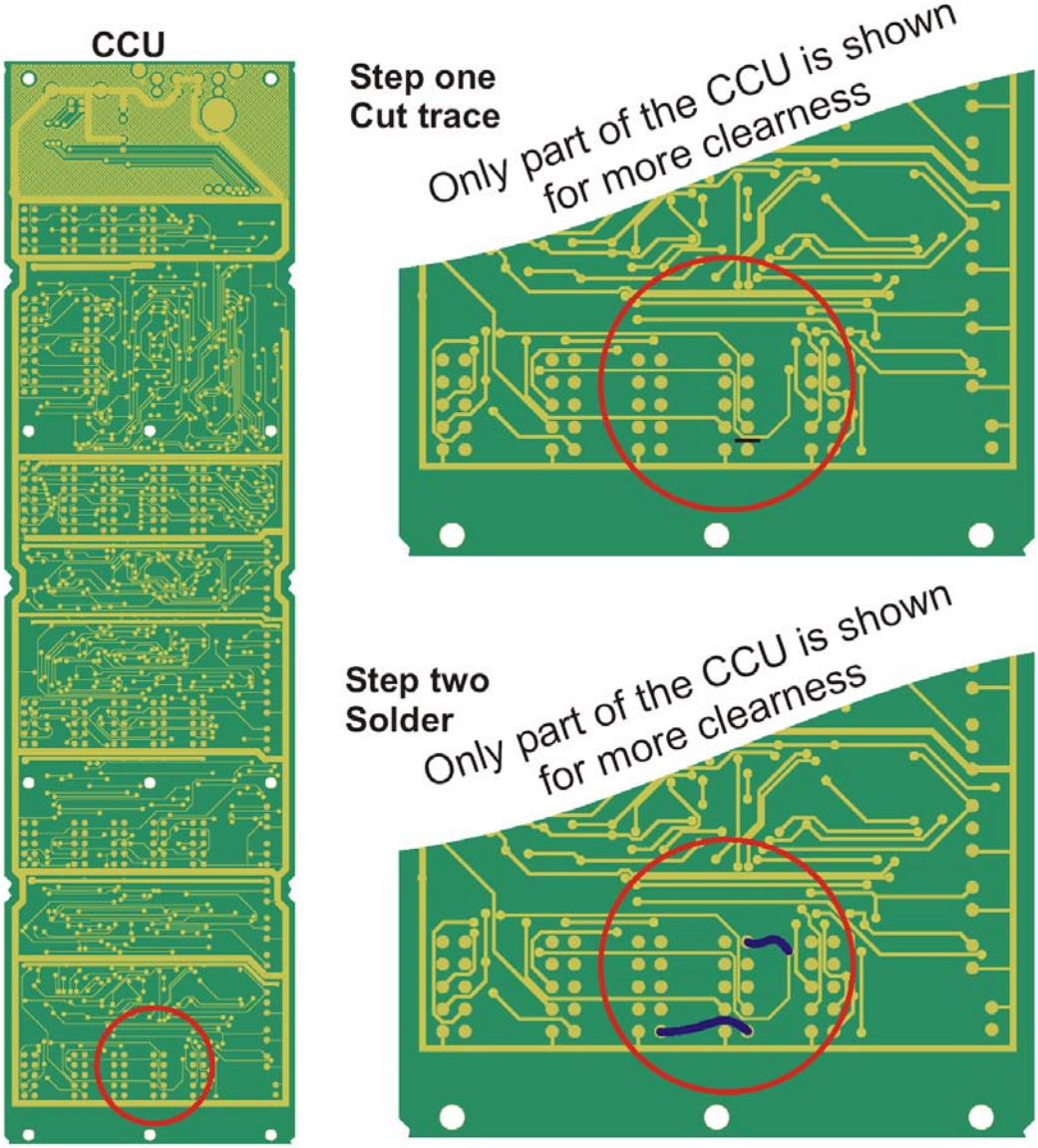
During the development of the software and the development of the different instruments and gauges, some improvements have been made in order to add more functionality.

Therefore, the CCU board needs some modifications in order to function properly with all present instruments and gauges.

In case that your CCU board has been acquired before these modifications were published, please check the modifications as described below and carry them out only when you have experience with delicate electronics soldering.

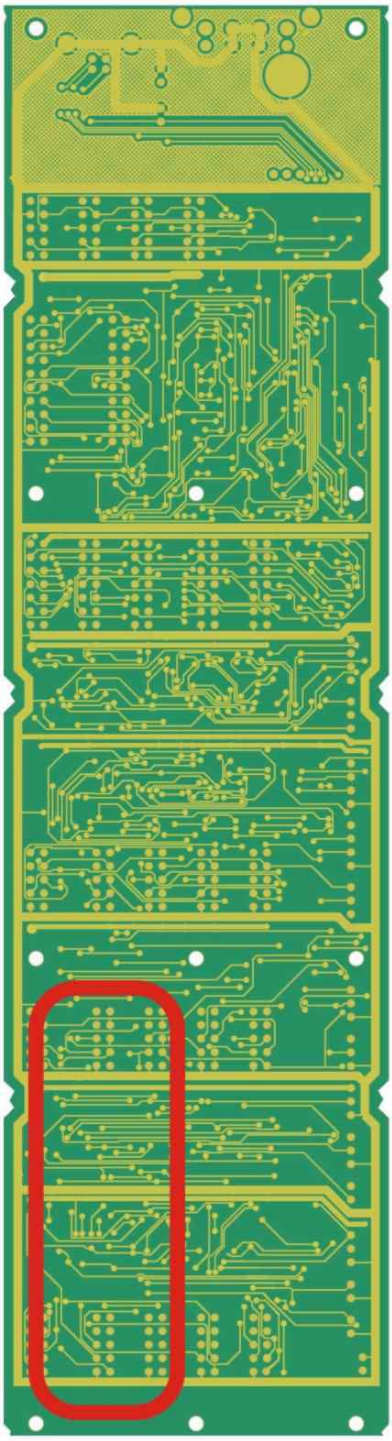
**Modification for Digital Clock**
The modification for the Digital Clock requires the cutting of one PCB trace and the soldering of 2 wires. It is recommended to use very small wire, like Wire Wrap wire or similar.

**Step 1:** cut the trace on the back of the board as indicated by the black stripe in picture "Step 1" in order to free pin 2 of CN 14. Use a sharp knife. Be very carefull not to damage any other traces!
**Step 2:** solder 2 new wires in place as shown on the picture "Step 2".

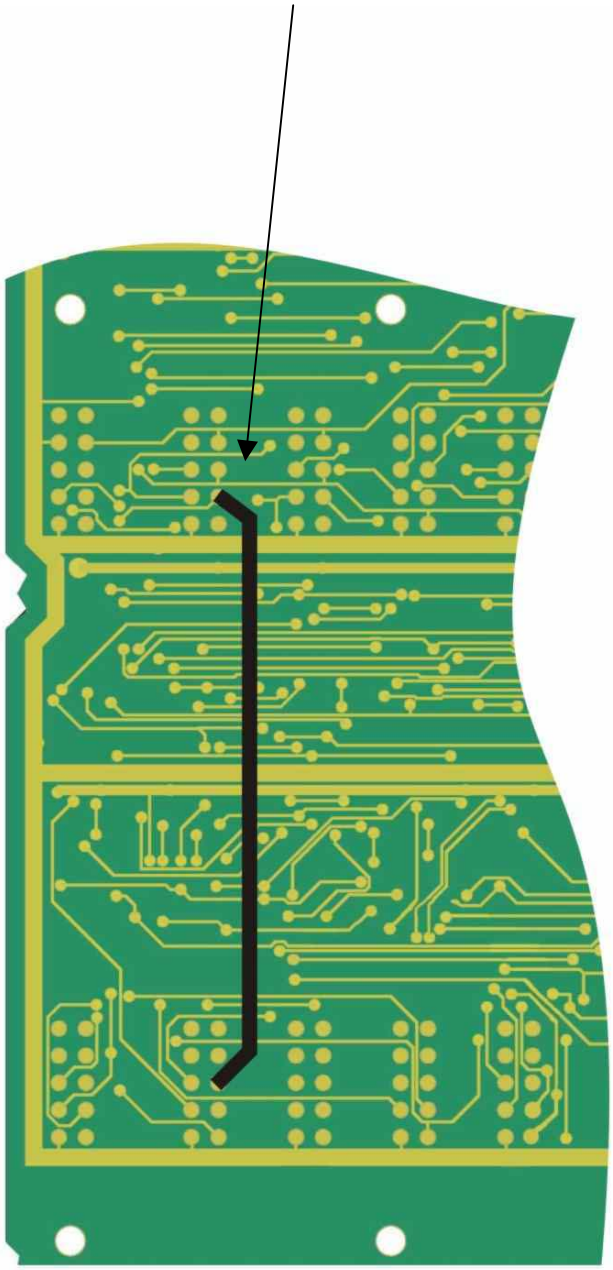


**Modification for the Trim Wheel**
Originally, the Trim Wheel was designed to operate using a rotary encoder. During development, there was finally choosen for a potentiometer. Since there is originally no analog input available on CN16, an unused analog input is “borrowed” from CN21 pin 4 (Airspeed Indicator) and wired to pin 6 of CN16.

This modification only requires the soldering of a jumper wire between these two locations. It is recommended to use very small wire, like Wire Wrap wire or similar.



**To enable the Trim Wheel to function properly, run a wire from connector CN21 pin 4 to connector CN16 pin 6.**



**Solder side (back) of CCU.**

# 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 CCU.
- The term “Digital Output” means a signal which is coming from the CCU 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 CCU 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 CCU needs 2 different positive voltages of 5 volts.**
One 5v. is supplied through the USB connection from the controlling PC (CN41) 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, 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 CCU 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 CCU 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 CCU.
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.

**CN1 Handbrake**
Pin 1 – Ground
Pin 2 – HNDB, Digital Input. The pin is forced high, when not connected, via a resistor on the CCU. When connected to Ground, the Handbrake is active.

**CN2 Avionics Switch**
Pin 1 – Ground
Pin 2 – AVSW, Digital Input. The pin is forced high, when not connected, via a resistor on the CCU. When connected to Ground, the Handbrake is active.

**CN3 Quartz Counter**
Pin 1 – Ground
Pin 2 – QCNT, Digital Output. The pin is forced low periodically with 1 HZ. Intervals, when activated by Flight Simulator Software or propriety software and can drive a Quarz Counter via a Transistor Circuit. Never connect a coil of a mechanical counter directly to this output to avoid damages on the CCU.
*(Quartz Counter signals are not yet supported up to TRC Link version 2.7)*

**CN4 Throttle**
Pin 1 – Ground
Pin 2 – THR, 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 - +5v

**CN5 Mixture**
Pin 1 – Ground
Pin 2 – MIX, 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 - +5v

**CN6 Prop**
Pin 1 – Ground
Pin 2 – PRP, 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 - +5v.

**CN7 Light Control Input**
Pin 1 – Ground
Pin 2 – 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 - +5v.

**CN8 Master Switch**
Pin 1 – Ground
Pin 2 – MSW1, Digital Input. The pin is forced high, when not connected, via a resistor on the CCU. When connected to Ground, the Master Switch 1 (ALT) is active.

Pin 3 – MSW2, Digital Input. The pin is forced high, when not connected, via a resistor on the CCU. When connected to Ground, the Master Switch 2 (BAT) is active.

**CN9 Analog Ctrld. Fuel Left/Right *)**
Not supported

**CN10 Analog Ctrld. EGT/Fuel Flow*)**
Not supported

**CN11 Analog Ctrld. Oil Temp/Pressure *)**
Not supported

**CN12 Analog Ctrld. Suction G./Amm. Indicator *)**
Not supported

**) The analog controlled gauges on C9, C10, C11 and C12 are not supported in the software for the present CCU and will also not be supported in future, due to the internal memory size of the microprocessor on the CCU.*

**CN13 Fuel selector + Shut off**
Pin 1 – Ground
Pin 2 – FSS1 Digital Input. The pin is forced high, when not connected, via a resistor on the CCU. When connected to Ground, the FSS1 input is active.
Pin 3 – FSS2 Digital Input. The pin is forced high, when not connected, via a resistor on the CCU. When connected to Ground, the FSS2 input is active.
Pin 4 – FSS3 Digital Input. The pin is forced high, when not connected, via a resistor on the CCU. When connected to Ground, the FSS3 input is active.
Pin 5 – FSS4 Digital Input. NOT USED
Pin 6 – No connection
Pin 7 – No connection
Pin 8 – No connection
Pin 9 – No connection
Pin 10 – No connection

**Tank Switch Table (as connected for TRC Link operation):**
Left: FSS1 = 0, FSS2 = 1
Both: FSS1 = 1, FSS2 = 0
Right: FSS1 = 0, FSS2 = 0

**Fuel Switch Table (as connected for TRC Link operation):**
On: FSS3 = 1
Off: FSS3 = 0

**CN14 Digital Clock**
Pin 1 – Ground
Pin 2 – +5v.
Pin 3 – DCS2
Pin 4 – DCS3
Pin 5 – DCS4
Pin 6 – DCS5
Pin 7 – DCS6
Pin 8 – DCS7
Pin 9 – Lamp
Pin 10 – DCS1
These I/O lines are dedicated as a combination to drive the sub-assembly Digital Clock and cannot be controlled by propriety software, but only via the SDK.

**CN15 Flaps**
Pin 1 – Ground
Pin 2 – +5v.
Pin 3 – FLA1 Digital Output Servo Signal, Flaps position indication
Pin 4 – FLA2 Analog Input to read out the position of a 10K potentiometer, which positions are an indication for the desired flaps position.
Pin 5– No connection
Pin 6 – No connection
Pin 7 – No connection
Pin 8 – No connection
Pin 9 – No connection
Pin 10 – No connection

**CN16 Trim wheel**
Pin 1 – Ground
Pin 2 – +5v.
Pin 3 – TRW1 – not used
Pin 4 – TRW2 – not used
Pin 5 – TRW3 – not used
Pin 6 – AIR2 Analog Input, relocated by modification from CN21 pin 4. Reads out the position of the Trim Wheel.
Pin 7 – No connection
Pin 8 – No connection
Pin 9 – No connection
Pin 10 – No connection

**CN17 Starter Switch**
Pin 1 – Ground
Pin 2 – No connection
Pin 3 – STA1 Digital Input. The pin is forced high, when not connected, via a resistor on the CCU. When connected to Ground, the STA1 input is active.
Pin 4 – STA2 Digital Input. The pin is forced high, when not connected, via a resistor on the CCU. When connected to Ground, the STA2 input is active.
Pin 5 – STA3 Digital Input. The pin is forced high, when not connected, via a resistor on the CCU. When connected to Ground, the STA3 input is active.
Pin 6 – STA4 Digital Input. The pin is forced high, when not connected, via a resistor on the CCU. When connected to Ground, the STA4 input is active.
Pin 7 – No connection
Pin 8 – No connection
Pin 9 – No connection
Pin 10 – No connection

**As wired for operation under TRC Link:**
OFF = STA1 to Ground
R = STA2 to Ground
L = STA3 to Ground
BOTH = All inputs open
Start = STA4 to Ground

**CN18 Rudder Pedals**
Pin 1 – Ground
Pin 2 – +5v.
Pin 3 – RUD1 – Analog in
Pin 4 – RUD2 – Analog in
Pin 5 – RUD3 – Analog in
Pin 6 – RUD4 – Analog in
Pin 7 – RUD5 – Analog in
Pin 8 – NC
Pin 9 – NC

Pin 10 – NC
*(Rudder Pedals are not yet supported up to TRC Link version 2.7)*

**CN19 Yoke**
Pin 1 – Ground
Pin 2 – +5v.
Pin 3 – YOK1 Digital Output. Servo Signal for future implementation of control loading (force feedback)
Pin 4 – YOK2 Digital Output. Servo Signal for future implementation of control loading (force feedback)
Pin 5 – YOK3 Analog Input, PITCH
Pin 6 – YOK4 Analog Input, ROLL
Pin 7 – NC
Pin 8 – NC
Pin 9 – NC
Pin 10 – NC

**CN20 Compass**
Pin 1 – Ground
Pin 2 – +5v. ✘
Pin 3 – CMP1 Digital Output, Servo Signal
Pin 4 – CMP2 Analog Input for position sensor 1
Pin 5 – CMP2 Analog Input for position sensor 2
Pin 6 – +5v.
Pin 7 – Ground
Pin 8 – Lamp
Pin 9 – NC
Pin 10 – NC

**CN21 Airspeed Indicator**
Pin 1 – Ground
Pin 2 – +5v. ✘
Pin 3 – 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

**CN22 Tachometer**
Pin 1 – Ground
Pin 2 – +5v. ✘
Pin 3 – TACH Digital Output Servo Signal
Pin 4 – NC
Pin 5 – NC
Pin 6 – NC
Pin 7 – Ground
Pin 8 – Lamp
Pin 9 – NC
Pin 10 – NC

**CN23 Vertical Speed Indicator**
Pin 1 – Ground
Pin 2 – +5v. ✘
Pin 3 – VSPD Digital Output Servo Signal
Pin 4 – NC

Pin 5 – NC
Pin 6 – NC
Pin 7 – Ground
Pin 8 – Lamp
Pin 9 – NC
Pin 10 – NC

**CN24 Attitude Indicator**
Pin 1 – Ground
Pin 2 – +5v. ✘
Pin 3 – ATT1 Digital Output Servo Signal
Pin 4 – Ground
Pin 5 – +5v. ✘
Pin 6 – ATT2 Digital Output Servo Signal
Pin 7 – Ground
Pin 8 – Lamp
Pin 9 – NC
Pin 10 – NC

**CN25 Turn Coordinator**
Pin 1 – Ground
Pin 2 – +5v. ✘
Pin 3 – TRN1 Digital Output Servo Signal
Pin 4 – Ground
Pin 5 – +5v. ✘
Pin 6 – TRN2 Digital Output Servo Signal
Pin 7 – Ground
Pin 8 – Lamp
Pin 9 – NC
Pin 10 – NC

**CN26 VOR 1 Indicator**
Pin 1 – Ground
Pin 2 – +5v. ✘
Pin 3 – VOR1 Digital Output Servo Signal
Pin 4 – VOR2 Digital Output Servo Signal
Pin 5 – VOR3 Digital Output Servo Signal
Pin 6 – VOR4 Analog In
Pin 7 – VOR5 Analog In
Pin 8 – Lamp
Pin 9 – +5v.
Pin 10 – NC

**CN27 VOR 2 Indicator**
Pin 1 – Ground
Pin 2 – +5v. ✘
Pin 3 – VOR6 Digital Output Servo Signal
Pin 4 – VOR7 Digital Output Servo Signal
Pin 5 – VORx Analog In (Not Used)
Pin 6 – VOR8 Analog In
Pin 7 – VOR9 Analog In
Pin 8 – Lamp
Pin 9 – +5v.
Pin 10 –

**CN28 ADF Indicator**
Pin 1 – Ground
Pin 2 – +5v. ✘
Pin 3 – ADF1 Digital Output Servo Signal

Pin 4 – ADF2 Digital Output Servo Signal (Not Used)
Pin 5 – ADF3 Digital Input (Rotary Encoder)
Pin 6 – ADF4 Digital Input (Rotary Encoder)
Pin 7 – ADF5 Analog Input, Piher Position Sensor
Pin 8 – ADF6 Analog Input, Piher Position Sensor
Pin 9 – ADF7 Analog Input, Piher Position Sensor
Pin 10 – ADF8 Analog Input, Piher Position Sensor
Pin 11 – Lamp
Pin 12 – + 5v.
Pin 13 – NC
Pin 14 – NC

**CN29 Heading Indicator**
Pin 1 – Ground
Pin 2 – +5v. **X**
Pin 3 – HED1 Digital Output Servo Signal
Pin 4 – HED2 Digital Output Servo Signal (Not Used)
Pin 5 – HED3 Digital Input (Rotary Encoder)
Pin 6 – HED4 Digital Input (Rotary Encoder)
Pin 7 – HED5 Analog Input, Piher Position Sensor
Pin 8 – HED6 Analog Input, Piher Position Sensor
Pin 9 – HED7 Analog Input, Piher Position Sensor
Pin 10 – HED8 Analog Input, Piher Position Sensor
Pin 11 – Lamp
Pin 12 – + 5v.
Pin 13 – NC
Pin 14 – NC

**CN30 Altimeter**
Pin 1 – Ground
Pin 2 – +5v. **X**
Pin 3 – ALT1 Digital Output Servo Signal, drives Modified Servo for 100 feet pointer
Pin 4 – ALT2 Digital Output Servo Signal, drives Servo for pressure scale
Pin 5 – ALT3 Digital Input (Rotary Encoder)
Pin 6 – ALT4 Digital Input (Rotary Encoder)
Pin 7 – ALT5 Analog Input, Piher Position Sensor, for position of 10,000 feet pointer
Pin 8 – ALT6 Analog Input, Piher Position Sensor, for position of 100 feet pointer
Pin 9 – ALT7 Analog Input, Piher Position Sensor or Photo Interruptor, for position of 10,000 feet pointer
Pin 10 – ALT8 Analog Input, Piher Position Sensor, for position of 100 feet pointer
Pin 11 – Lamp
Pin 12 – + 5v.
Pin 13 – NC
Pin 14 – NC

**CN31 Warning Lights & Switch**
Pin 1 – Ground
Pin 2 – +5v. **X**
Pin 3 – WAR1 Digital Output, Left Fuel
Pin 4 – WAR2 Digital Output, Low Fuel
Pin 5 – WAR3 Digital Output, Right Fuel
Pin 6 – WAR4 Digital Output, Oil Press
Pin 7 – WAR5 Digital Output, Left Vacuum
Pin 8 – WAR6 Digital Output, VAC
Pin 9 – WAR7 Digital Output, Right Vacuum
Pin 10 – WAR8 Digital Output, Volts
Pin 11 – WAR9 Digital Input, TEST – if connected to Ground all lights will go on.
Pin 12 – WAR10 Digital Input, DIM – if connected to Ground all lights will dim.
Pin 13 – WAR11 Digital Output, Line
Pin 14 – + 5v.

**CN32 Autopilot Switch + Warnings**

Pin 1 – Ground
Pin 2 – +5v. ✘
Pin 3 – AUT1 Digital Output (Not Used)
Pin 4 – AUT2 Digital Output (Not Used)
Pin 5 – AUT3 Digital Output (Not Used)
Pin 6 – AUT4 Digital Output (Not Used)
Pin 7 – AUT5 Digital Output (Not Used)
Pin 8 – AUT6 Digital Output (Not Used)
Pin 9 – AUT7 Digital Output, Gear Switch Indicator RED. LED with resistor is connected between +5v. and this output.
Pin 10 – AUT8 Digital Output, Gear Switch Indicator GREEN. LED with resistor is connected between +5v. and this output.
Pin 11 – AUT9 Digital Input, Gear Switch. When brought to Ground the Gear goes down.
Pin 12 – AUT10 Digital Input (Not Used)
Pin 13 – AUT11 Digital Input (Not Used)
Pin 14 – + 5v.

*The Autopilot Switch + Warnings connector is not implemented as such, but used for the Gear Switch instead.*
*Since the Autopilot Switch + Warnings connector was initially designed to control the so-called Annunciator Panel - which is only used when a GPS is present – the designers have decided to implement this functionality onto the RSC (Radio Stack Controller Board) when a GPS is connected to this board. The GPS is scheduled to be released during mid 2004.*

**CN33 Circuit breakers (4 outputs, 15 inputs)**

Pin 1 – Ground
Pin 2 – CB1 Digital Output
Pin 3 – CB2 Digital Output
Pin 4 – CB3 Digital Output
Pin 5 – CB4 Digital Output
Pin 6 – CB5 Digital Input, AVN FAN
Pin 7 – CB6 Digital Input, AUTO PILOT
Pin 8 – CB7 Digital Input, GPS
Pin 9 – CB8 Digital Input, NAV COM1
Pin 10 – CB9 Digital Input, NAV COM2
Pin 11 – CB10 Digital Input, ADF
Pin 12 – CB11 Digital Input, XPNDR
Pin 13 – CB12 Digital Input, FLAP
Pin 14 – CB13 Digital Input, INST
Pin 15 – CB14 Digital Input, AVN BUS1
Pin 16 – CB15 Digital Input, AVN BUS2
Pin 17 – CB16 Digital Input, TURN COORD
Pin 18 – CB17 Digital Input, INST LTS
Pin 19 – CB18 Digital Input, ALT FLD
Pin 20 – CB19 Digital Input, WARN

*Signal is output as a 4 bit value and is decode by the Circuit Breakers circuitry to control up to 15 CB's. The value of the 4 bits must be applied during 300 milliseconds in order for the CB to pop out.*

**Output table:**

| CB4 | CB3 | CB2 | CB1 | |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | - No circuit breakers |
| 0 | 0 | 0 | 1 | - AVN FAN |
| 0 | 0 | 1 | 0 | - AUTO PILOT |
| 0 | 0 | 1 | 1 | - GPS |
| 0 | 1 | 0 | 0 | - NAV COM1 |
| 0 | 1 | 0 | 1 | - NAV COM2 |
| 0 | 1 | 1 | 0 | - ADF |
| 0 | 1 | 1 | 1 | - XPNDR |
| 1 | 0 | 0 | 0 | - FLAP |
| 1 | 0 | 0 | 1 | - INST |
| 1 | 0 | 1 | 0 | - AVN BUS1 |
| 1 | 0 | 1 | 1 | - AVN BUS2 |
| 1 | 1 | 0 | 0 | - TURN COORD |
| 1 | 1 | 0 | 1 | - INST LTS |
| 1 | 1 | 1 | 0 | - ALT FLD |
| 1 | 1 | 1 | 1 | - WARN |

**CN34 Switches (16 inputs)**

Pin 1 – Ground
Pin 2 – +5v. ✘
Pin 3 – SW1 Digital Input
Pin 4 – SW2 Digital Input Fuel Pump, OFF when Grounded
Pin 5 – SW3 Digital Input BCN, OFF when Grounded
Pin 6 – SW4 Digital Input Land, OFF when Grounded
Pin 7 – SW5 Digital Input Taxi, OFF when Grounded
Pin 8 – SW6 Digital Input Nav, OFF when Grounded
Pin 9 – SW7 Digital Input Strobe, OFF when Grounded
Pin 10 – SW8 Digital Input Pitot Heat, OFF when Grounded
Pin 11 – SW9 Digital Input Alt Static Air, OFF when Grounded

Pin 12 – SW10 Digital Input (Not Used)
Pin 13 – SW11 Digital Input (Not Used)
Pin 14 – SW12 Digital Input (Not Used)
Pin 15 – SW13 Digital Input (Not Used)
Pin 16 – SW14 Digital Input (Not Used)
Pin 17 – SW15 Digital Input (Not Used)
Pin 18 – SW16 Digital Input (Not Used)
Pin 19 – NC
Pin 20 – NC

**CN35 Servo Ctrld. Fuel Left/Right *)**
Pin 1 – Ground
Pin 2 – +5v ✘
Pin 3 – SFL1 Digital Output Servo Signal
Pin 4 – Ground
Pin 5 – +5v ✘
Pin 6 – SFL2 Digital Output Servo Signal
Pin 7 – Ground
Pin 8 – Lamp
Pin 9 – NC
Pin 10 – NC

**CN36 Servo Ctrld. EGT/Fuel Flow *)**
Pin 1 – Ground
Pin 2 – +5v ✘
Pin 3 – SEC1 Digital Output Servo Signal
Pin 4 – Ground
Pin 5 – +5v ✘
Pin 6 – SEC2 Digital Output Servo Signal
Pin 7 – Ground
Pin 8 – Lamp
Pin 9 – NC
Pin 10 – NC

**CN37 Servo Ctrld. Oil Temp/Pressure *)**
Pin 1 – Ground
Pin 2 – +5v ✘
Pin 3 – SOP1 Digital Output Servo Signal
Pin 4 – Ground
Pin 5 – +5v ✘
Pin 6 – SOP2 Digital Output Servo Signal
Pin 7 – Ground
Pin 8 – Lamp
Pin 9 – NC
Pin 10 – NC

**CN38 Servo Ctrld. Suction G./AMM. Indicator *)**
Pin 1 – Ground
Pin 2 – +5v ✘
Pin 3 – SSA1 Digital Output Servo Signal
Pin 4 – Ground
Pin 5 – +5v ✘
Pin 6 – SSA2 Digital Output Servo Signal
Pin 7 – Ground
Pin 8 – Lamp
Pin 9 – NC
Pin 10 – NC

# 5. Schematics

*The following schematics are included in this document:*

Central Control Unit

Attitude Indicator

Altimeter / ADF / Heading Indicator (combined PCB for 3 different gauges)

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

Circuit Breakers

Digital Clock

Dual Small Gauge

General Instrument (Airspeed, Vertical Speed, Tachometer)

Turn & Bank Indicator

VOR1 + VOR2

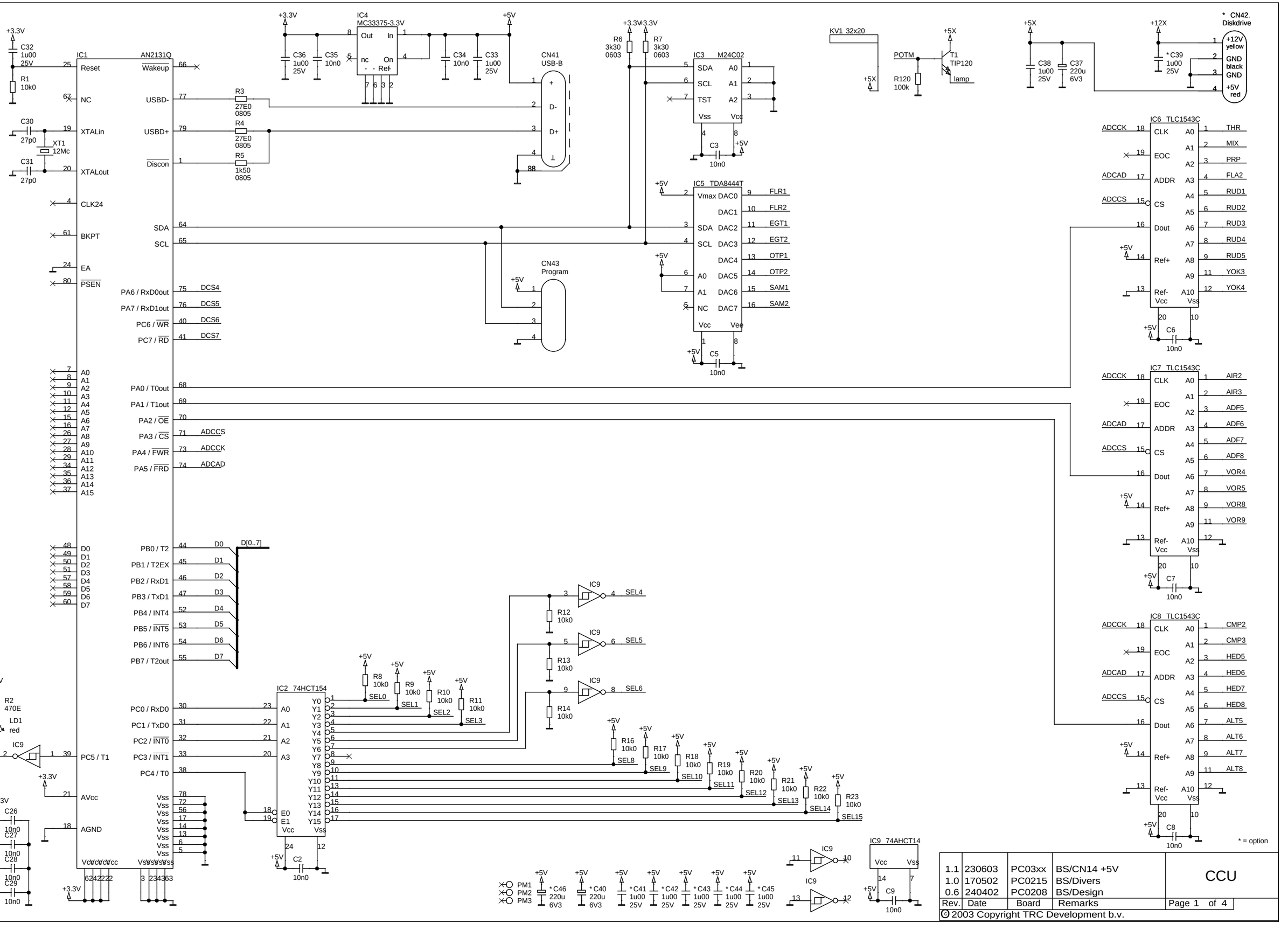
Warning Panel

Wet Compass

# 6. Wiring Diagrams

*The following wiring diagrams are included in this document:*

Keylock
Cable Yoke
Cable Trim Wheel
Cable Throttle, Mixture and Propeller
Cable Tank Switch
Cable Switches
Cable Rudder Pedals
Cable Master Switch
Cable Light Regulation
Cable Gear Switch and Indicators
Cable Flap Switch
Cable Avionics Switch




| Rev. | Date | Board | Remarks | Page 1 of 4 |
|---|---|---|---|---|
| 1.1 | 230603 | PC03xx | BS/CN14 +5V | CCU |
| 1.0 | 170502 | PC0215 | BS/Divers | |
| 0.6 | 240402 | PC0208 | BS/Design | |

D[0..7]

IC10
74HCT541
SEL0
OE1
OE2
SEL0
D0
D1
D2
D3
D4
D5
D6
D7
Vcc
Vss
+5V
C10
10n0
FLA1
R24
1k80
TRW1
R25
1k80
YOK1
R26
1k80
YOK2
R27
1k80
CMP1
R28
1k80
AIR1
R29
1k80
TACH
R30
1k80
VSPD
R31
1k80

IC11
74HCT541
SEL1
ATT1
R32
1k80
ATT2
R33
1k80
TRN1
R34
1k80
TRN2
R35
1k80
VOR1
R36
1k80
VOR2
R37
1k80
VOR3
R38
1k80
VOR6
R39
1k80

IC12
74HCT541
SEL2
VOR7
R40
1k80
ADF1
R41
1k80
ADF2
R42
1k80
HED1
R43
1k80
HED2
R44
1k80
ALT1
R45
1k80
ALT2
R46
1k80
VORx
R47
1k80

IC13
74HCT541
SEL3
SFL1
R48
1k80
SFL2
R49
1k80
SEC1
R50
1k80
SEC2
R51
1k80
SOP1
R52
1k80
SOP2
R53
1k80
SSA1
R54
1k80
SSA2
R55
1k80

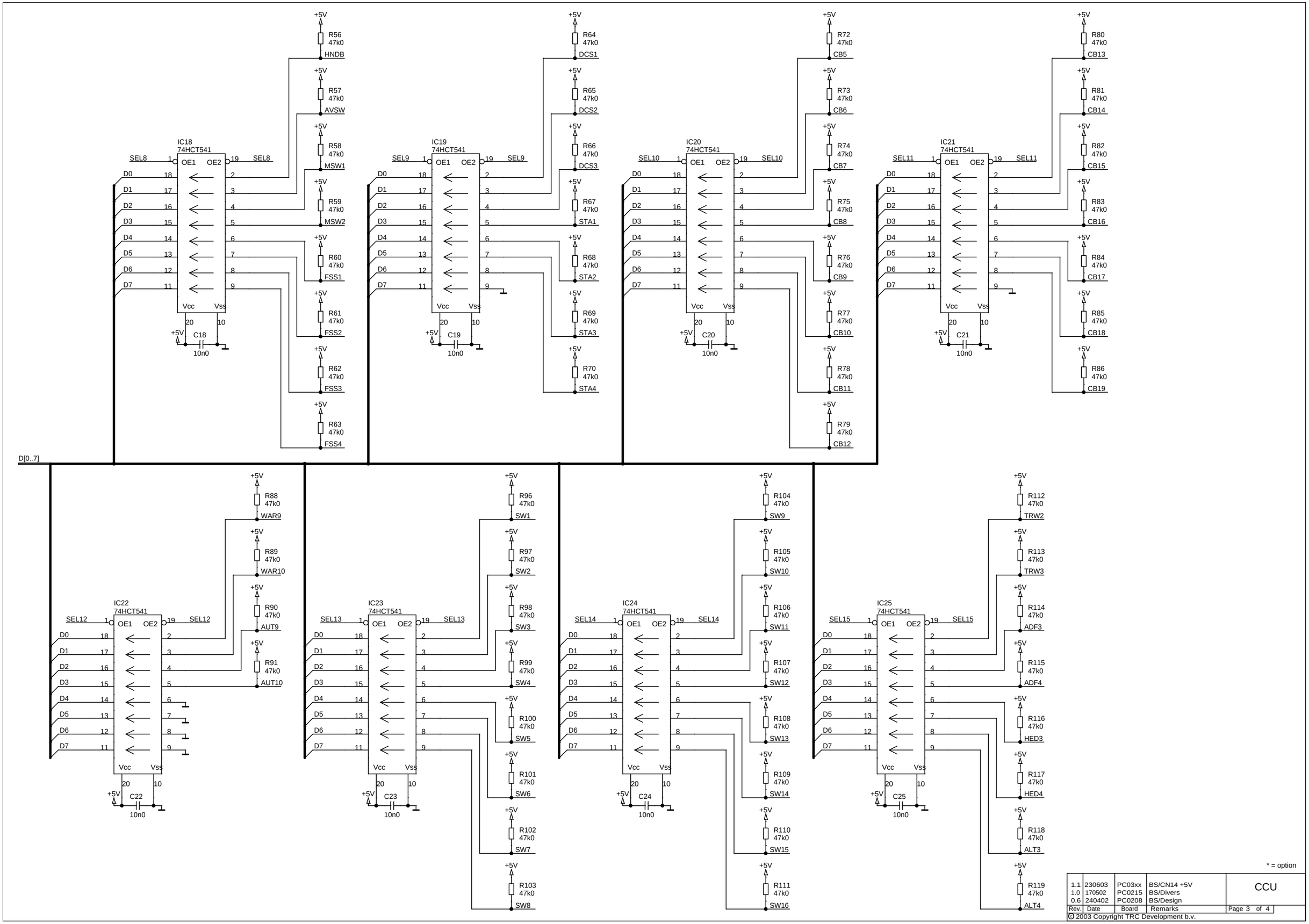
IC14
74HCT573
SEL4
LE
OE
D0
D1
D2
D3
D4
D5
D6
D7
WAR1
WAR2
WAR3
WAR4
WAR5
WAR6
WAR7
WAR8
Vcc
Vss
+5V
C14
10n0

IC15
74HCT573
SEL5
AUT1
AUT2
AUT3
AUT4
AUT5
AUT6
AUT7
AUT8

IC16
74HCT573
SEL6
QCNT
CB1
CB2
CB3
CB4
WAR11
AUT11

* = option

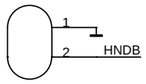
| Rev. | Date | Board | Remarks | Page 2 of 4 |
|---|---|---|---|---|
| 1.1 | 230603 | PC03xx | BS/CN14 +5V | CCU |
| 1.0 | 170502 | PC0215 | BS/Divers | |
| 0.6 | 240402 | PC0208 | BS/Design | |




* = option

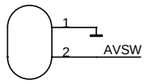
| Rev. | Date | Board | Remarks | Page 3 of 4 |
|---|---|---|---|---|
| 1.1 | 230603 | PC03xx | BS/CN14 +5V | CCU |
| 1.0 | 170502 | PC0215 | BS/Divers | |
| 0.6 | 240402 | PC0208 | BS/Design | |

CN1
Handbrake

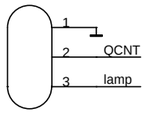



Avionics switch

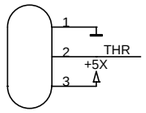
CN2



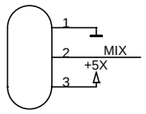

CN3
Quartz counter



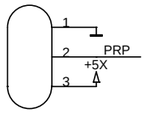

CN4
Throttle



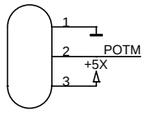

CN5
Mixture



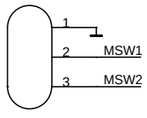

CN6
Prop



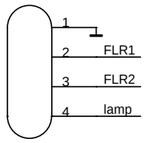

CN7
Dimmer



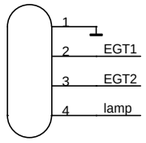

CN8
Master switch



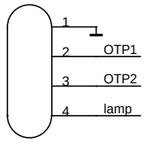

CN9
Analog Fuel L/R



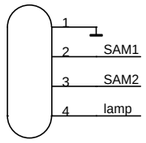

CN10
Analog EGT/Cyl. head temp




CN11
Analog Oil temp./press.

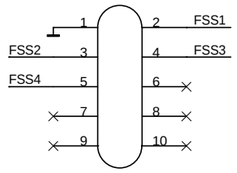



CN12
Analog SuctionG./AM ind.

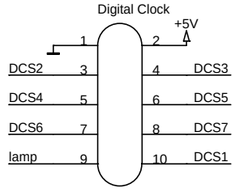



CN9, CN10, CN11 and CN12 are not supported in software.

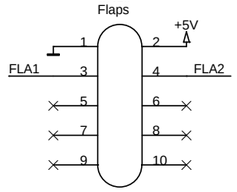
CN13
Fuel sel. + shut off



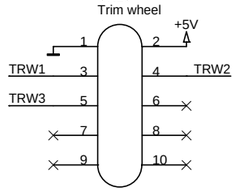

CN14
Digital Clock



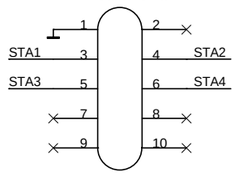

CN15
Flaps



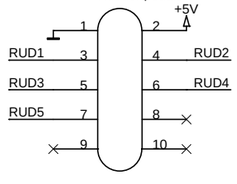

CN16
Trim wheel



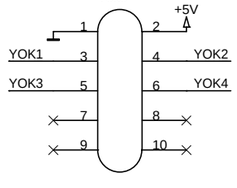

CN17
Starter switch



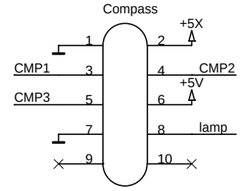

CN18
Rudder pedals



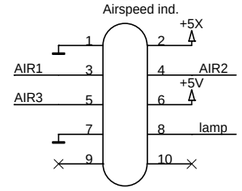

CN19
Yoke



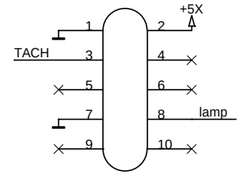

CN20
Compass



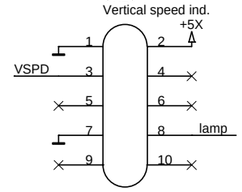

CN21
Airspeed ind.



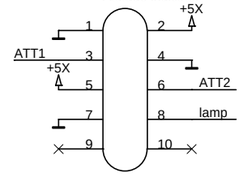

CN22
Tachometer



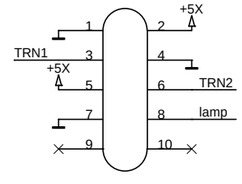

CN23
Vertical speed ind.



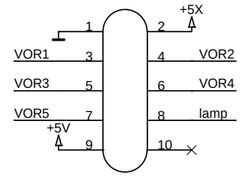

CN24
Attitude indicator



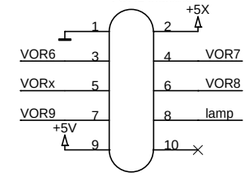

CN25
Turn coordinator



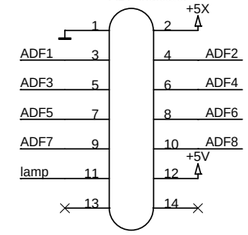

CN26
VOR1 indicator



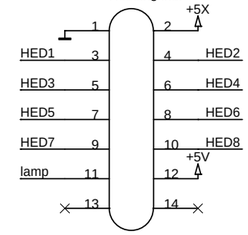

CN27
VOR2 indicator



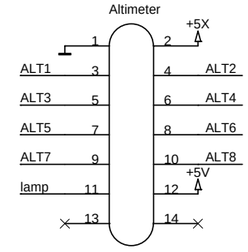

CN28
ADF indicator



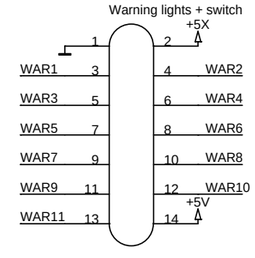

CN29
Heading ind.



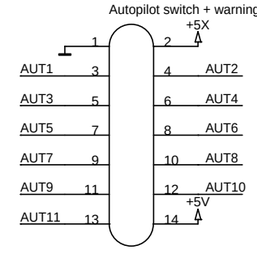

CN30
Altimeter



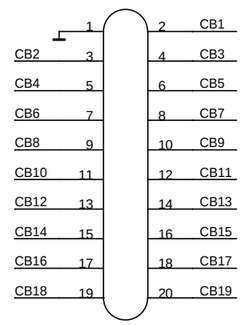

CN31
Warning lights + switch



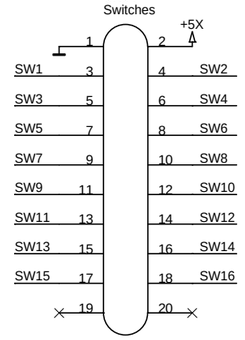

CN32
Autopilot switch + warning



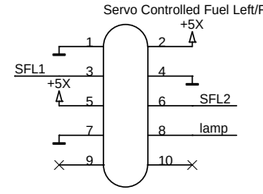

CN33
Circuit breakers



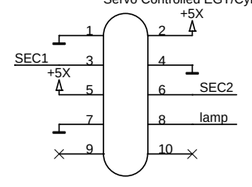

CN34
Switches



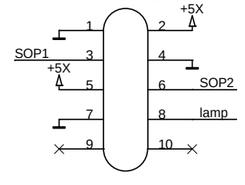

CN35
Servo Controlled Fuel Left/Right



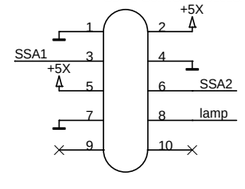

CN36
Servo Controlled EGT/Cyl. head temp.




CN37
Servo Controlled Oil temp./Pressure

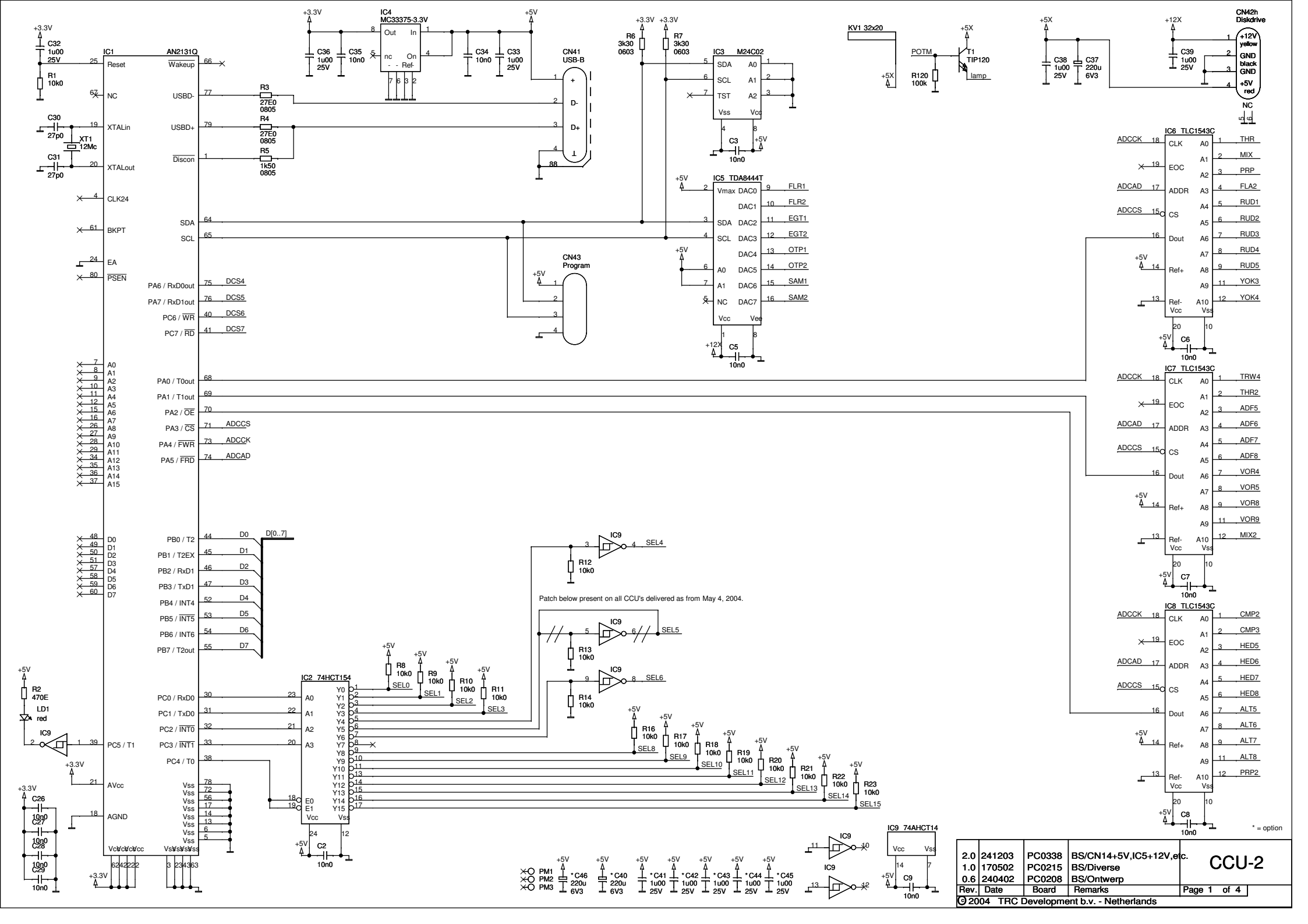



CN38
Servo Controlled Suction G./AM ind.




* = option

| Rev. | Date | Board | Remarks | Page 4 of 4 |
|---|---|---|---|---|
| 1.1 | 230603 | PC03xx | BS/CN14 +5V | CCU |
| 1.0 | 170502 | PC0215 | BS/Divers | |
| 0.6 | 240402 | PC0208 | BS/Design | |


IC1 AN2131Q
Reset
NC
XTALin
XTALout
CLK24
BKPT
EA
PSEN
Wakeup
USBD-
USBD+
Discon
SDA
SCL
PA6 / RxD0out
PA7 / RxD1out
PC6 / WR
PC7 / RD
PA0 / T0out
PA1 / T1out
PA2 / OE
PA3 / CS
PA4 / FWR
PA5 / FRD
PB0 / T2
PB1 / T2EX
PB2 / RxD1
PB3 / TxD1
PB4 / INT4
PB5 / INT5
PB6 / INT6
PB7 / T2out
PC0 / RxD0
PC1 / TxD0
PC2 / INT0
PC3 / INT1
PC4 / T0
PC5 / T1
AVcc
AGND
Vcc Vcc Vcc Vcc
Vss Vss Vss Vss
IC4 MC33375-3.3V
Out In
nc On
Ref
IC3 M24C02
SDA A0
SCL A1
TST A2
Vss Vcc
IC5 TDA8444T
Vmax DAC0
DAC1
SDA DAC2
SCL DAC3
DAC4
A0 DAC5
A1 DAC6
NC DAC7
Vcc Vee
FLR1
FLR2
EGT1
EGT2
OTP1
OTP2
SAM1
SAM2
CN41 USB-B
CN42h Diskdrive
+12V yellow
GND black
GND
+5V red
CN43 Program
KV1 32x20
POTM
T1 TIP120
lamp
R120 100k
IC6 TLC1543C
IC7 TLC1543C
IC8 TLC1543C
ADCCK
EOC
ADCAD
ADDR
ADCCS
CS
Dout
Ref+
Ref- Vcc
A10 Vss
THR
MIX
PRP
FLA2
RUD1
RUD2
RUD3
RUD4
RUD5
YOK3
YOK4
TRW4
THR2
ADF5
ADF6
ADF7
ADF8
VOR4
VOR5
VOR8
VOR9
MIX2
CMP2
CMP3
HED5
HED6
HED7
HED8
ALT5
ALT6
ALT7
ALT8
PRP2
IC2 74HCT154
A0
A1
A2
A3
E0
E1
Vcc
Vss
Y0
Y1
Y2
Y3
Y4
Y5
Y6
Y7
Y8
Y9
Y10
Y11
Y12
Y13
Y14
Y15
IC9
IC9 74AHCT14
SEL0
SEL1
SEL2
SEL3
SEL4
SEL5
SEL6
SEL8
SEL9
SEL10
SEL11
SEL12
SEL13
SEL14
SEL15
Patch below present on all CCU's delivered as from May 4, 2004.
PM1
PM2
PM3
* = option
2.0 241203 PC0338 BS/CN14+5V,IC5+12V,etc.
1.0 170502 PC0215 BS/Diverse
0.6 240402 PC0208 BS/Ontwerp
Rev. Date Board Remarks
CCU-2
Page 1 of 4
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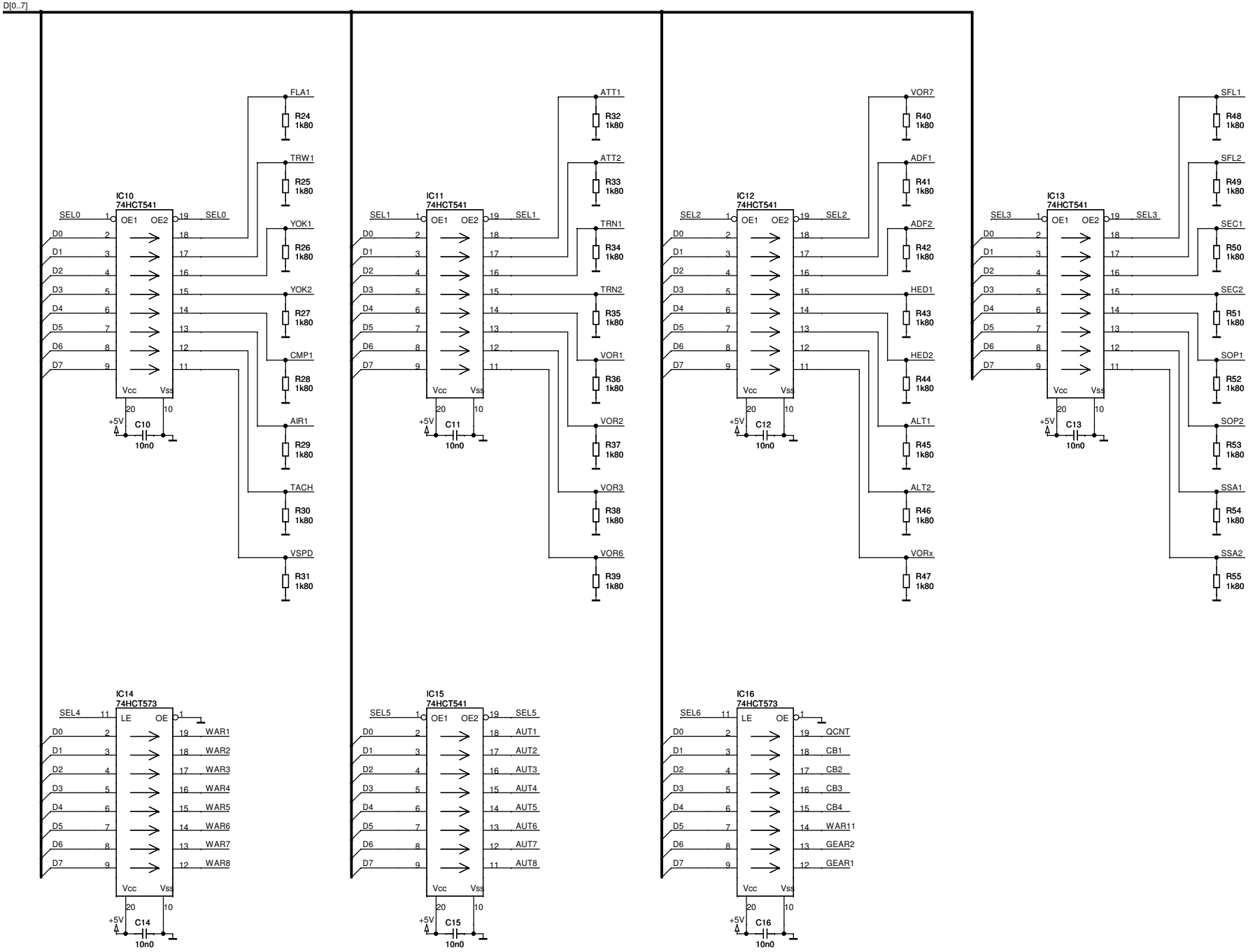
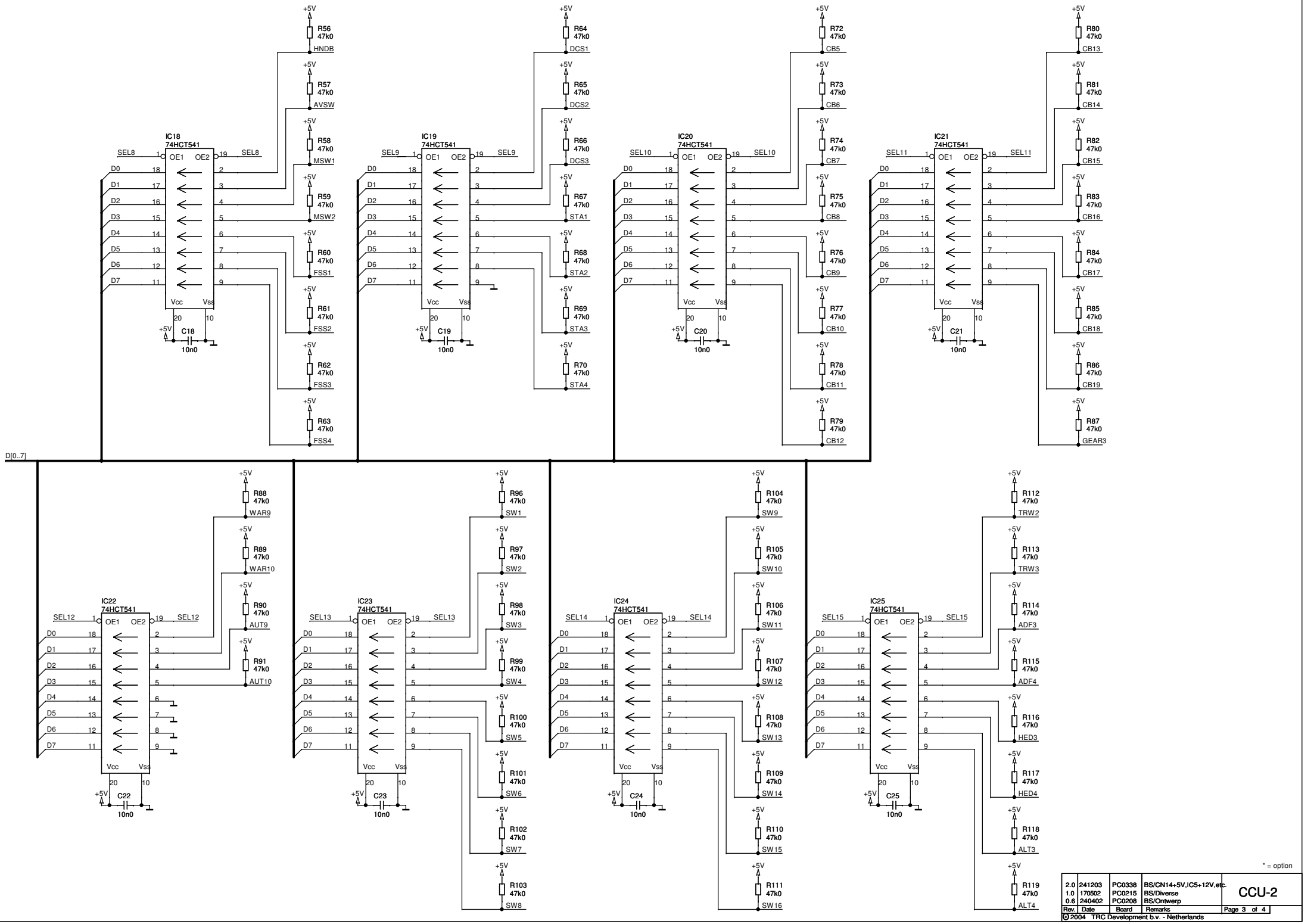



* = option

| Rev. | Date | Board | Remarks |
|---|---|---|---|
| 2.0 | 241203 | PC0338 | BS/CN14+5V,IC5+12V,etc. |
| 1.0 | 170502 | PC0215 | BS/Diverse |
| 0.6 | 240402 | PC0208 | BS/Ontwerp |

CCU-2

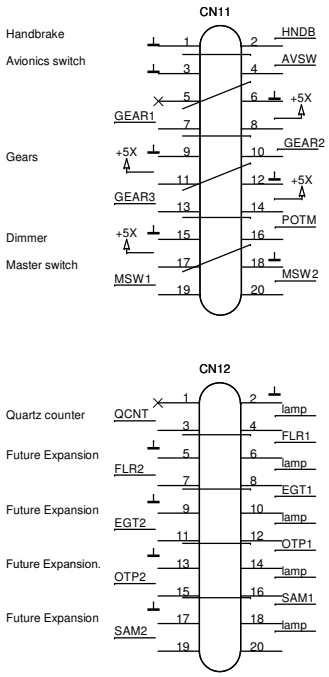



* = option

| Rev. | Date | Board | Remarks |
|---|---|---|---|
| 2.0 | 241203 | PC0338 | BS/CN14+5V,IC5+12V,etc. |
| 1.0 | 170502 | PC0215 | BS/Diverse |
| 0.6 | 240402 | PC0208 | BS/Ontwerp |

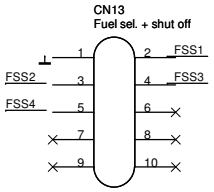
CCU-2

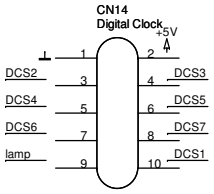
Page 3 of 4

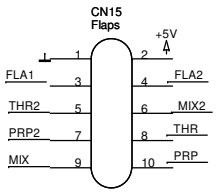


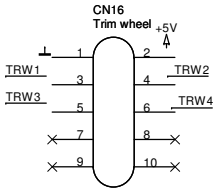


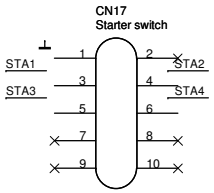


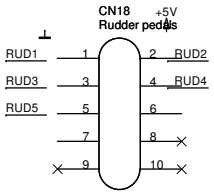


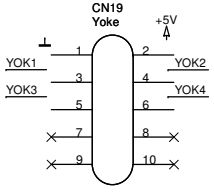



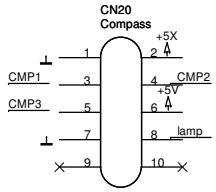



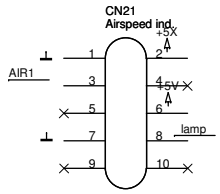



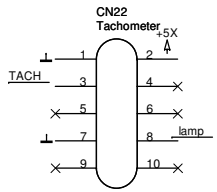



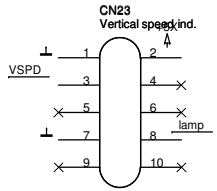



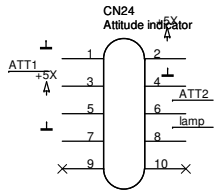



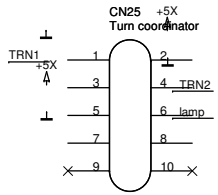



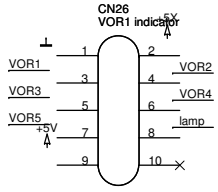



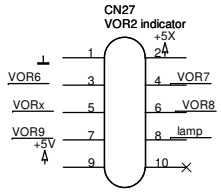



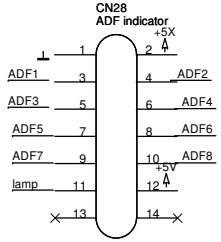



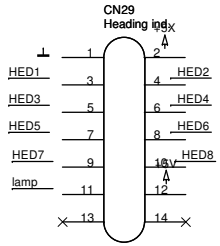



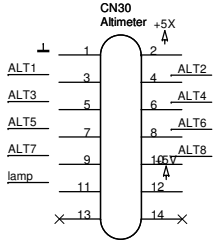



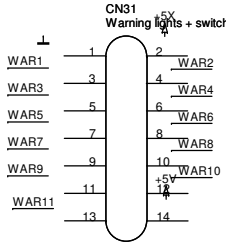



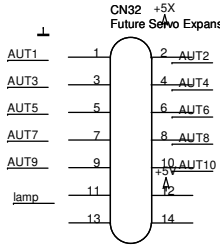



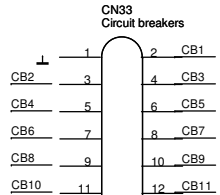



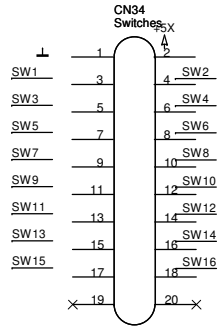



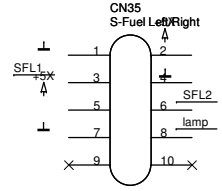



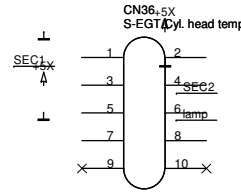



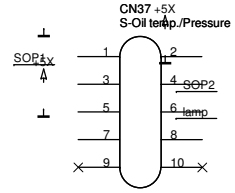



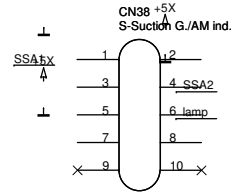



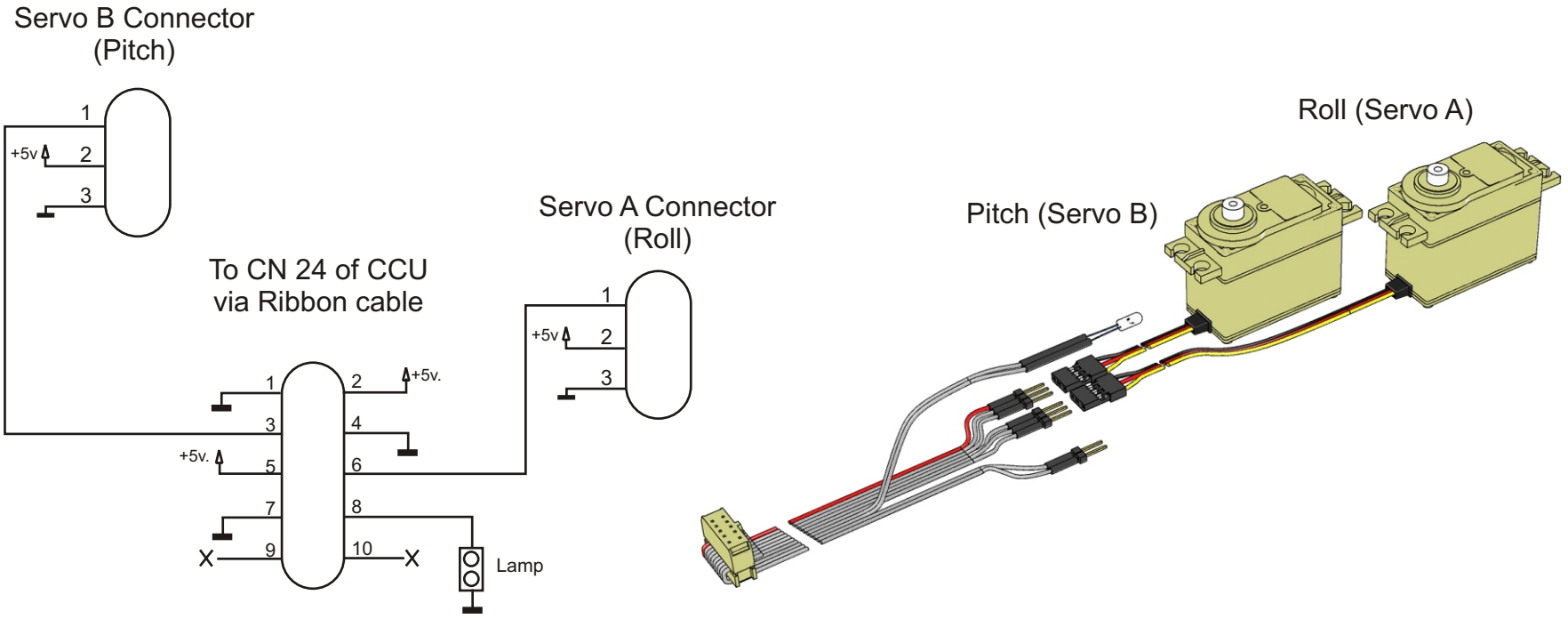



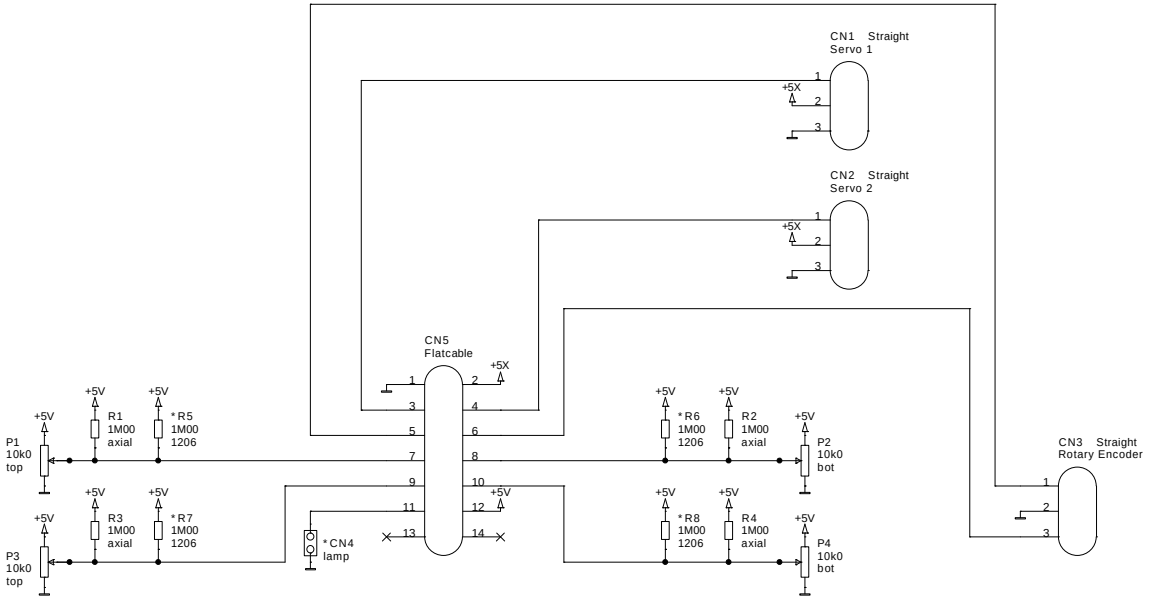

LAMP connection present on all CCU's delivered as from May 4, 2004. -->

* = option

| Rev. | Date | Board | Remarks | Page 4 of 4 |
|---|---|---|---|---|
| 2.0 | 241203 | PC0338 | BS/CN14+5V,IC5+12V,etc. | CCU-2 |
| 1.0 | 170502 | PC0215 | BS/Diverse | |
| 0.6 | 240402 | PC0208 | BS/Ontwerp | |




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

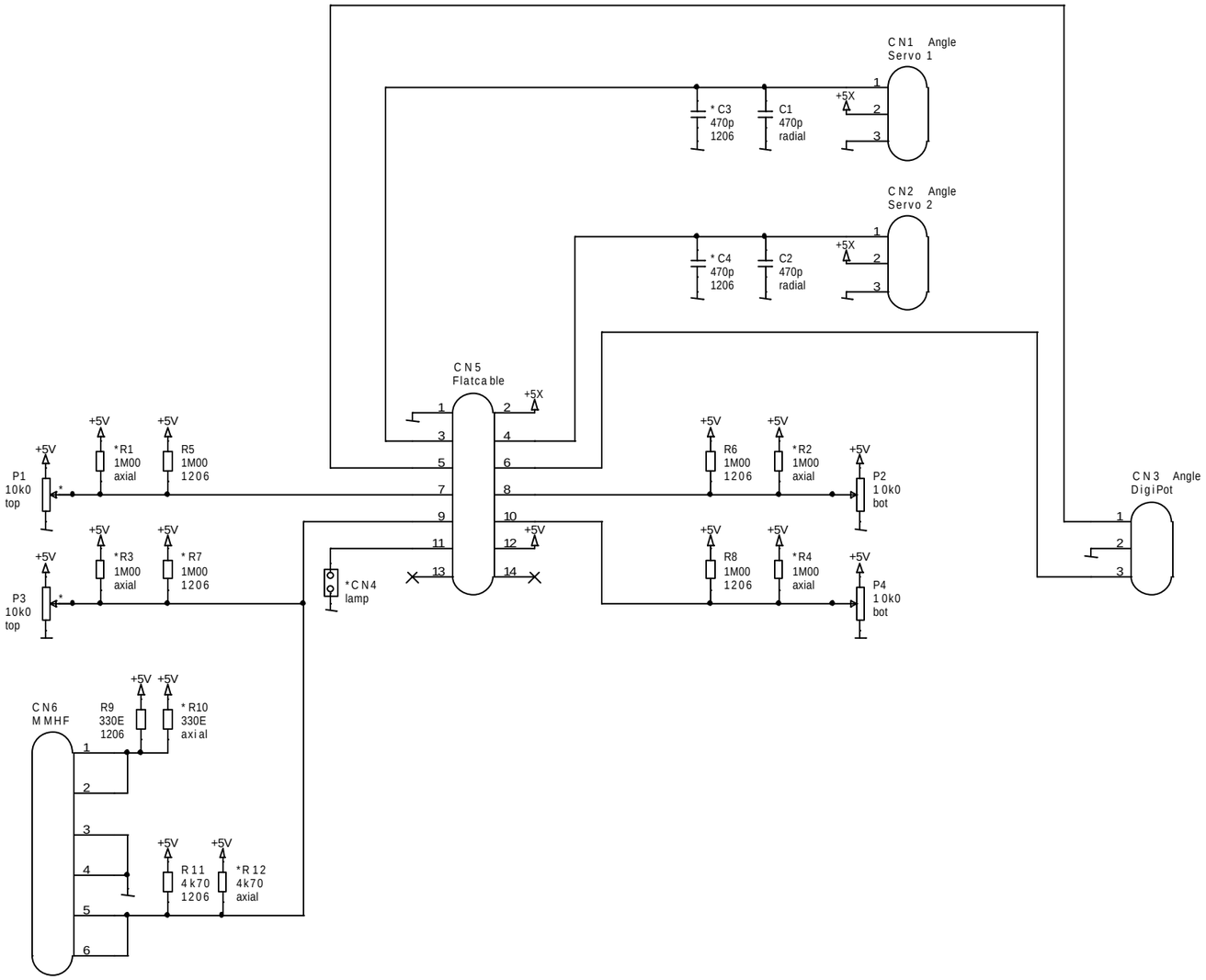



* option

| Rev | Date | Board | Remarks |
|---|---|---|---|
| 1 | 280502 | PC0218 | BS/connectors |
| 0 | 130502 | PC0211 | BS/Design |

ALT+ADF

Page 1 of 1

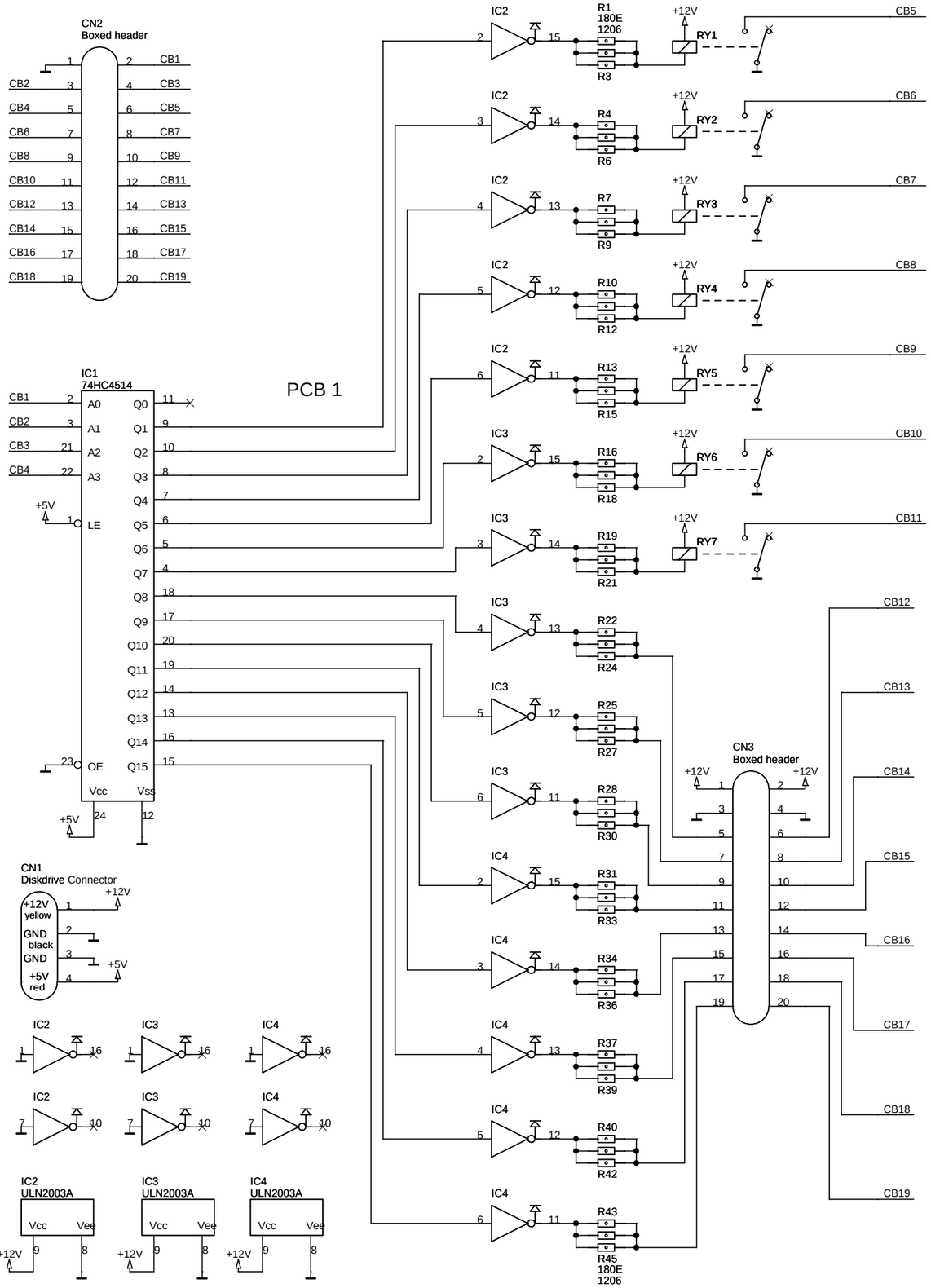



* option

| 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

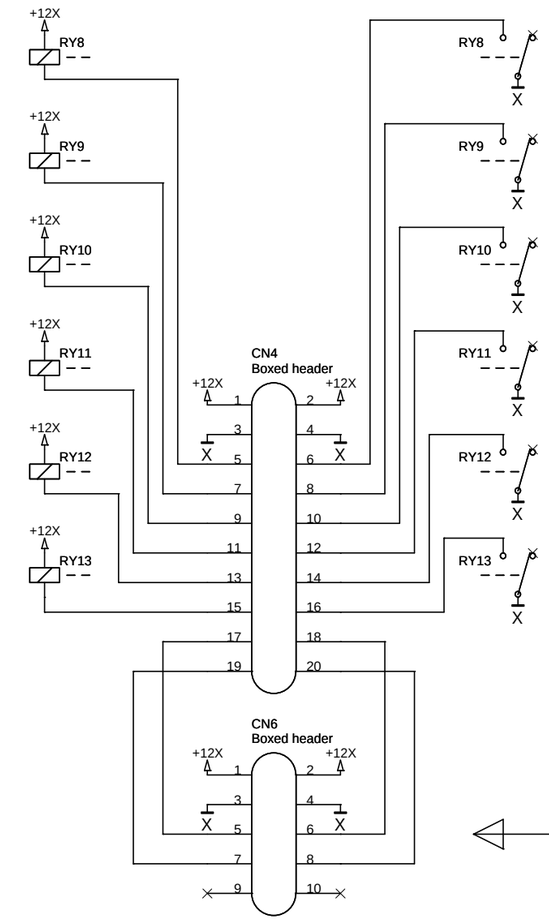
Page 1 of 1

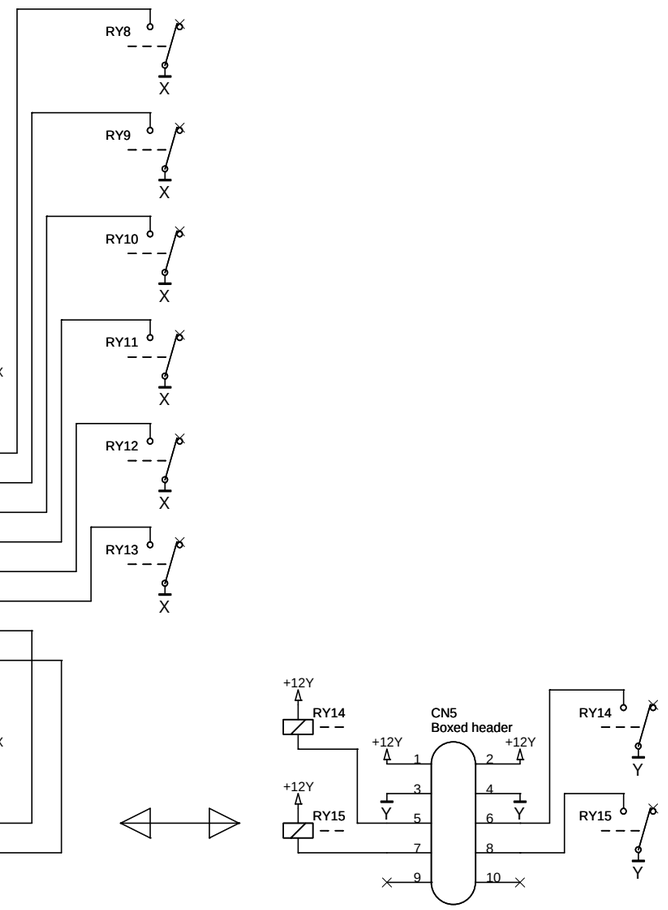



PCB 1

PCB 2

PCB 3

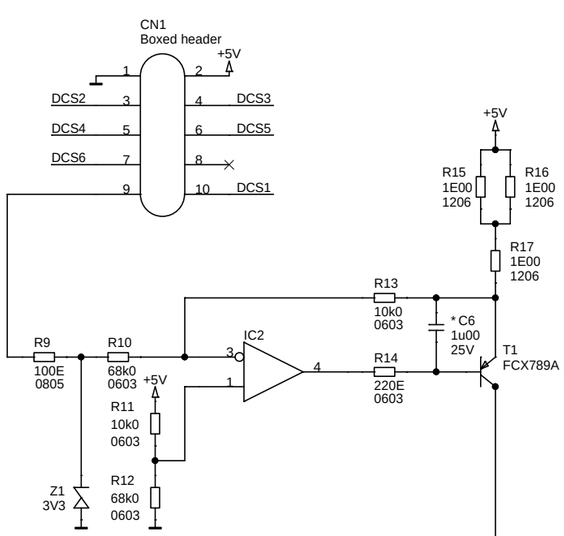


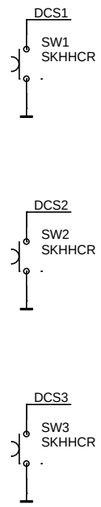



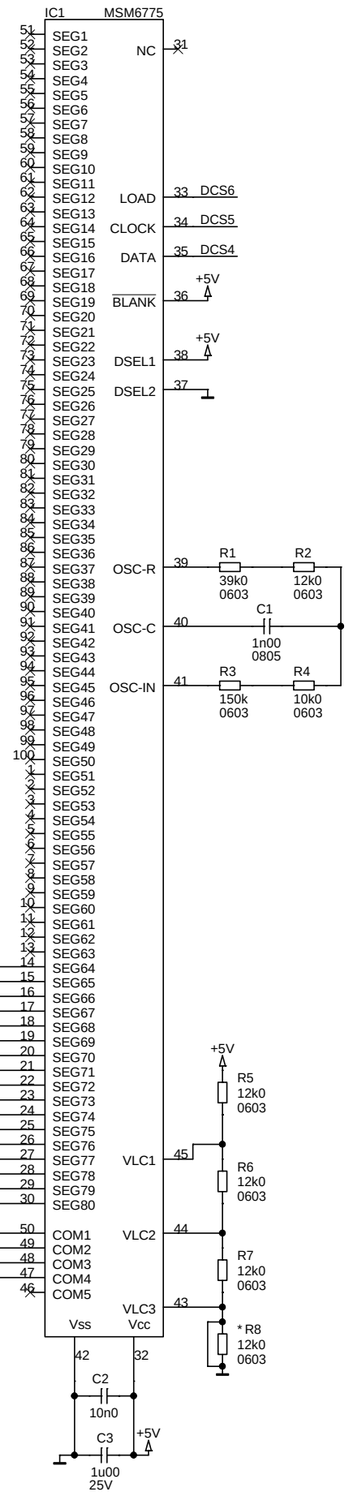

* option

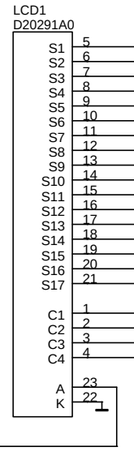
TRC circ. breakers

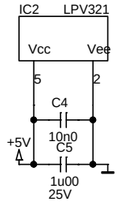
| Rev. | Date | Board | Remarks | Page 1 of 1 |
|---|---|---|---|---|
| 0 | 241003 | PC---- | BS/Ontwerp | |



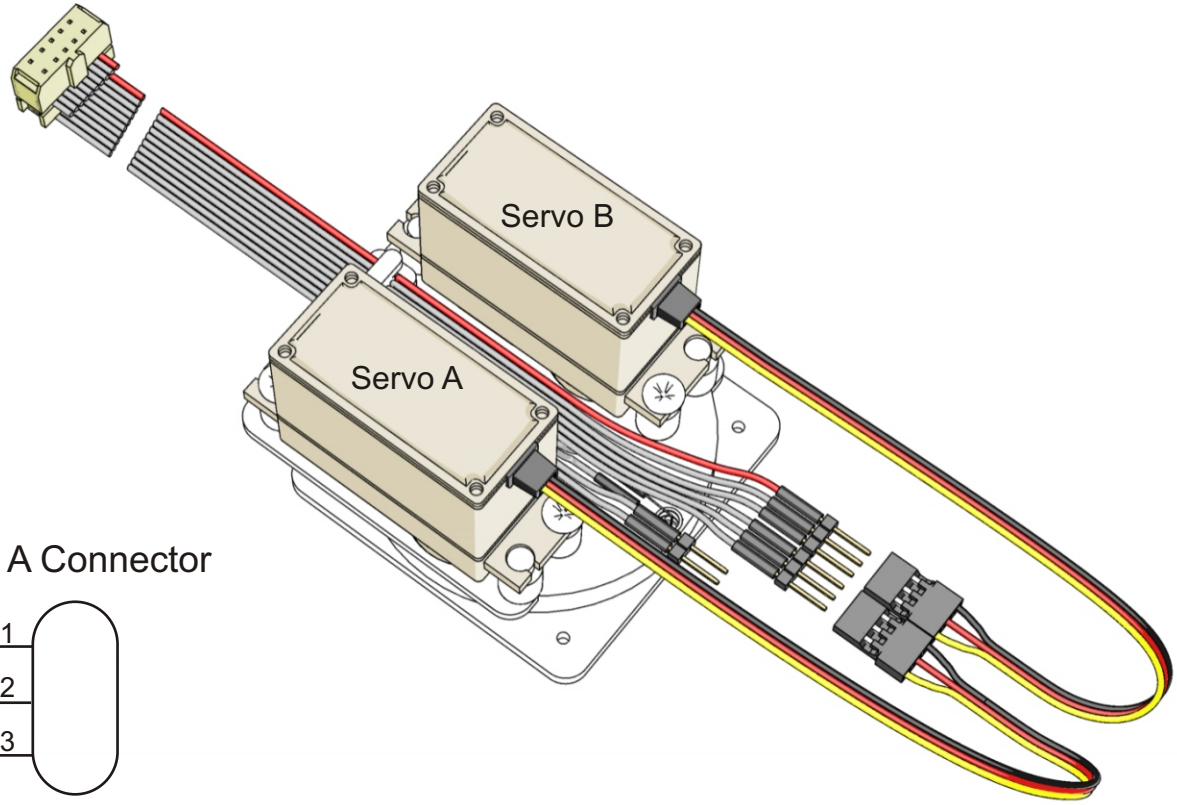



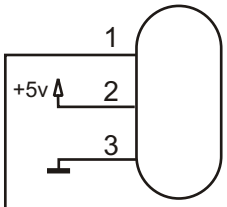




* option

| Rev. | Date | Board | Remarks | Page 1 of 1 |
|---|---|---|---|---|
| 1.1 | 280303 | PC0305 | BS/proc,knob,backl,p5<>7 | Digital Clock 1 |
| 0 | 291002 | PC0232 | BS/Design | |



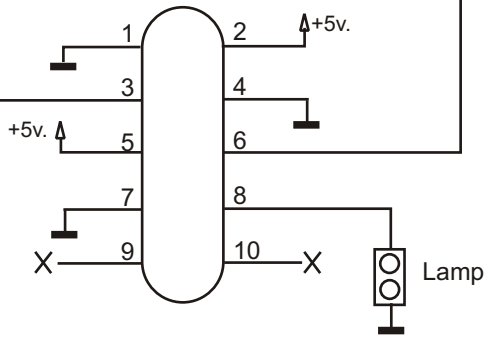

Servo B Connector




To CN 13, CN14,
CN15 or CN16
of CCU
via Ribbon cable

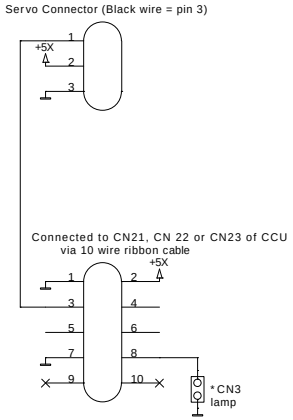
Servo A Connector




Lamp

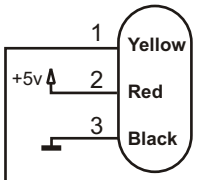
| | | | | |
|---|---|---|---|---|
| 1.0 | 230603 | | CR/Design | Dual Small Gauge |
| Rev. | Date | Board | Remarks | Page 1 of 1 |




* option

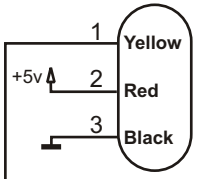
| | | | | |
|---|---|---|---|---|
| | | | | Gen. Instr. |
| 0 | 280502 | PC0213 | BS/Design | |
| Rev | Date | Board | Remarks | Page 1 of 1 |

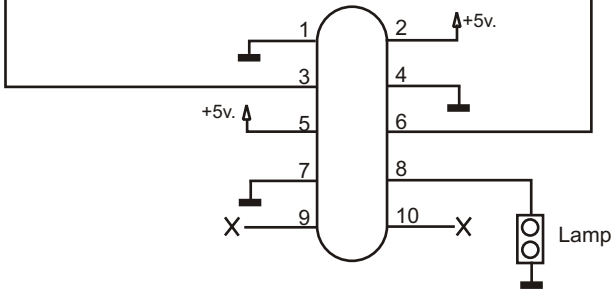
Servo B Connector
(Bank Indicator)




To CN 25 of CCU
via Ribbon cable

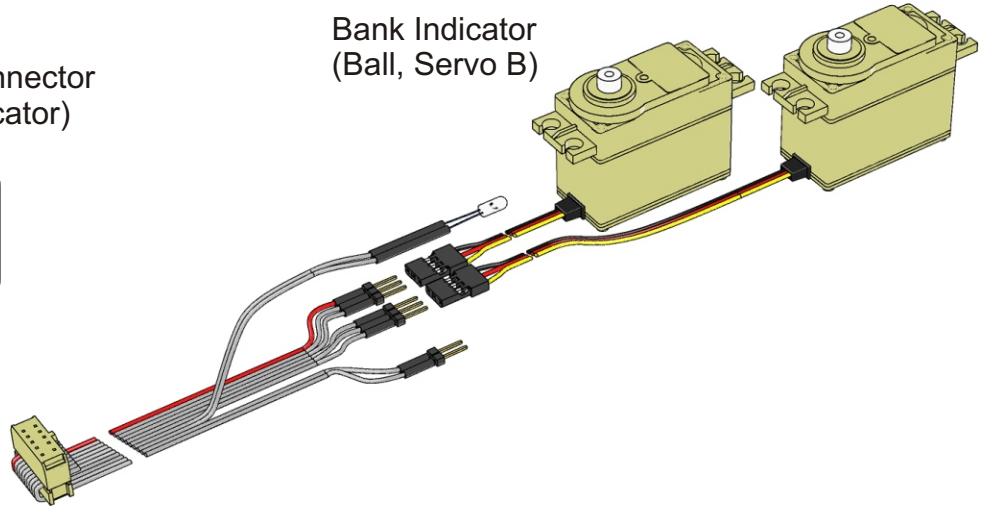
Servo A Connector
(Turn Indicator)



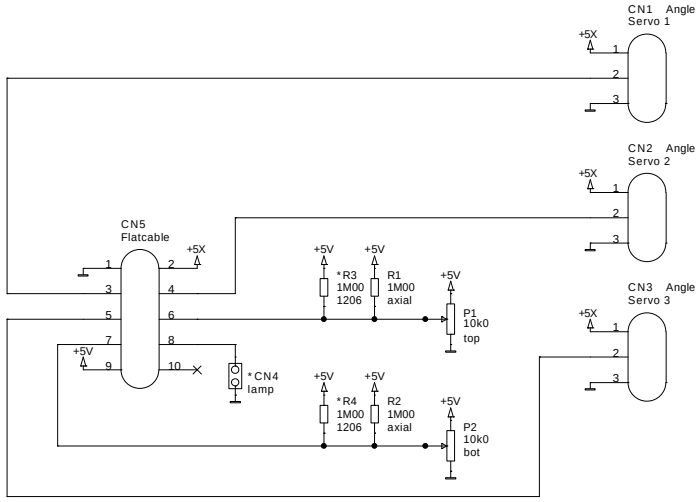




Turn Coordinator
(Airplane, Servo A)

Bank Indicator
(Ball, Servo B)



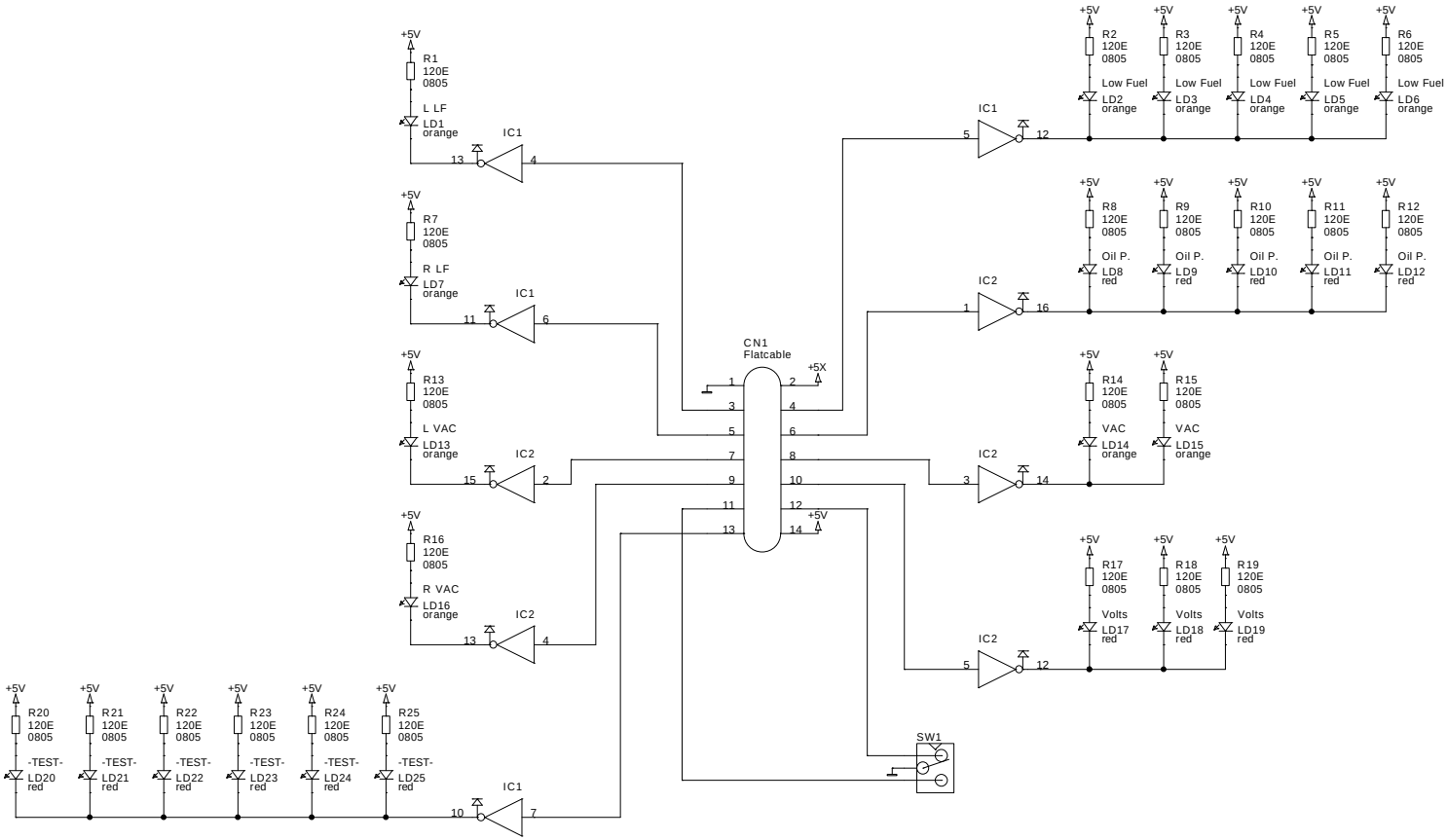
| | | | | |
|---|---|---|---|---|
| 1.0 | 230603 | | CR/Design | **Turn & Bank Indicator** |
| Rev. | Date | Board | Remarks | Page 1 of 1 |

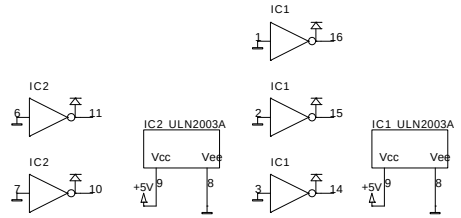



* option

| Rev | Date | Board | Remarks | Page 1 of 1 |
|---|---|---|---|---|
| 0 | 130502 | PC0210 | BS/Ontwerp | |

VOR 1+2

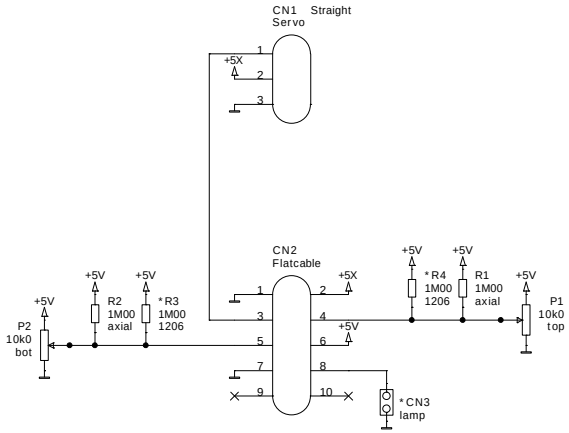



* option

| Rev | Date | Board | Remarks | Page 1 of 1 |
|---|---|---|---|---|
| 0 | 130502 | PC0213 | BS/Design | |

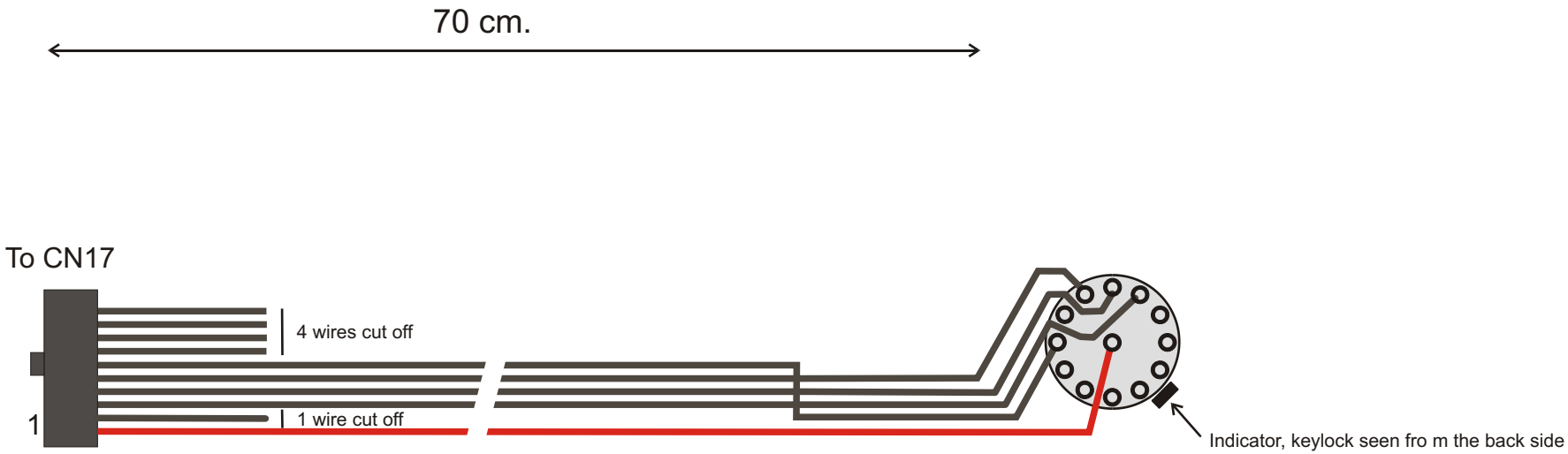
Warning




* option

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

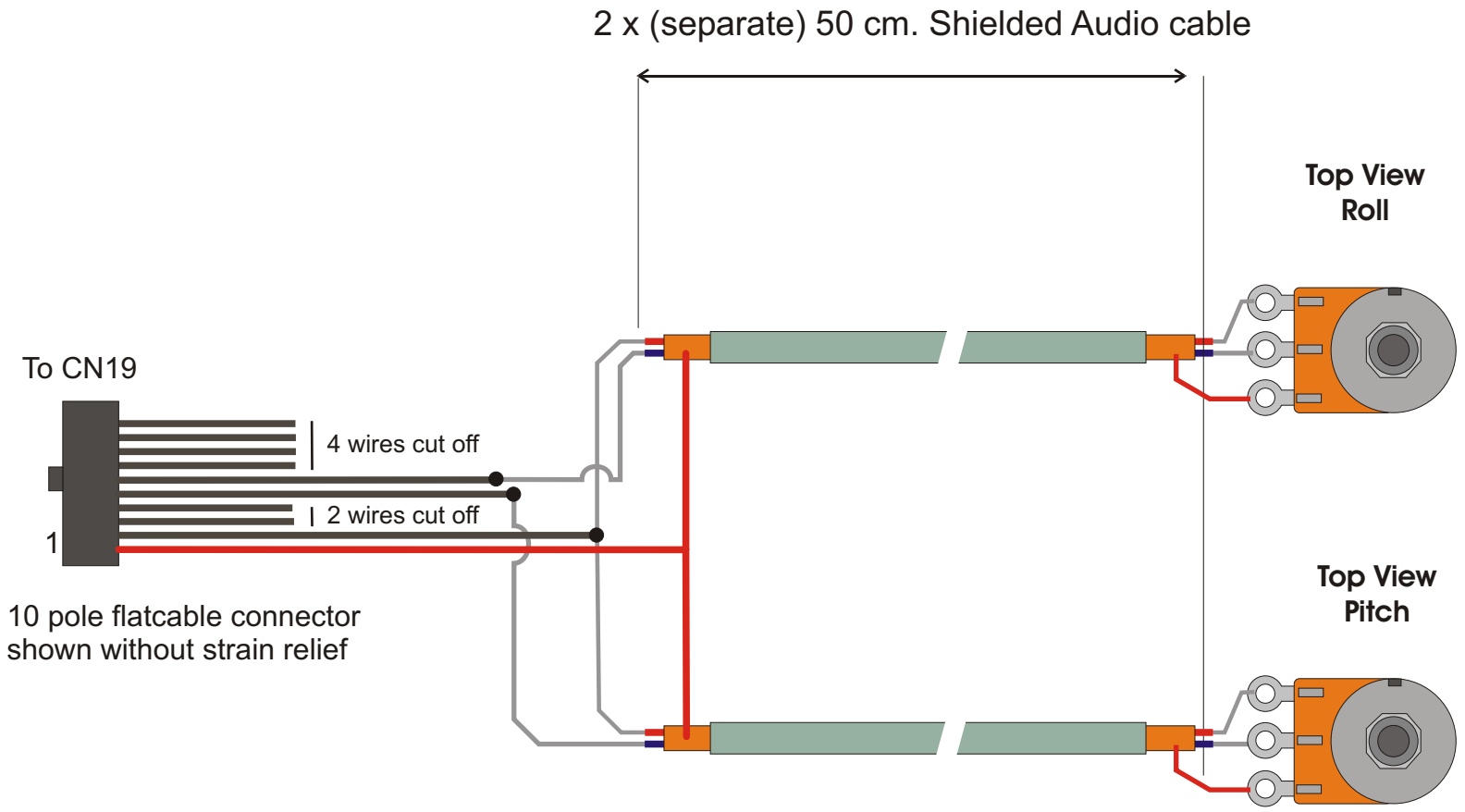
## Starter Switch (Key Lock) connecting cable




10 pole flatcable connector
shown without strain relief

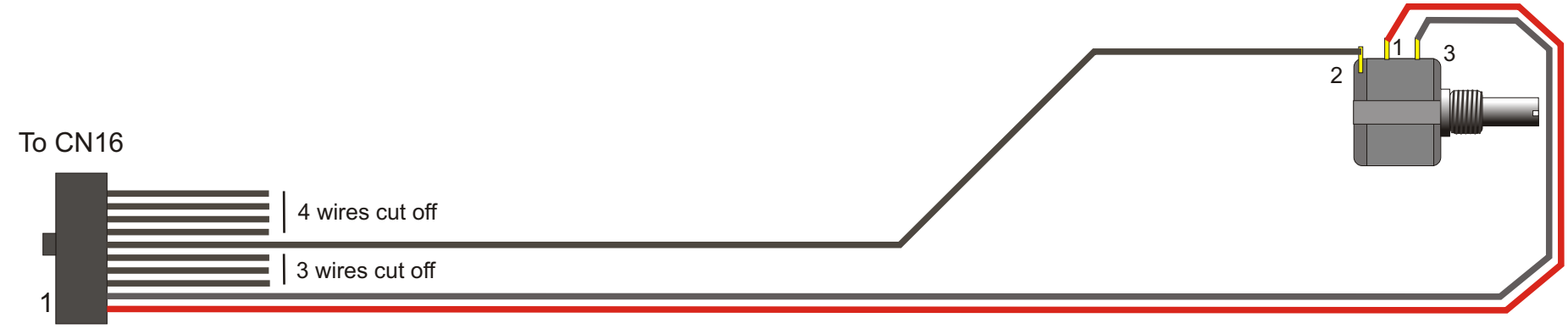
| Rev. | Date | Remarks | Product |
|---|---|---|---|
| 1.1 | 01-09-2003 | | Key Lock Cable |
| 1.2 | 01-10-2003 | | (Starter Switch) |
|  | | | |

**Yoke connecting cable**




| Rev. | Date | Remarks | Product |
|---|---|---|---|
| 1.2 | 01-10-2003 | | Cable Yoke |
| 1.3 | 27-04-2004 | | |

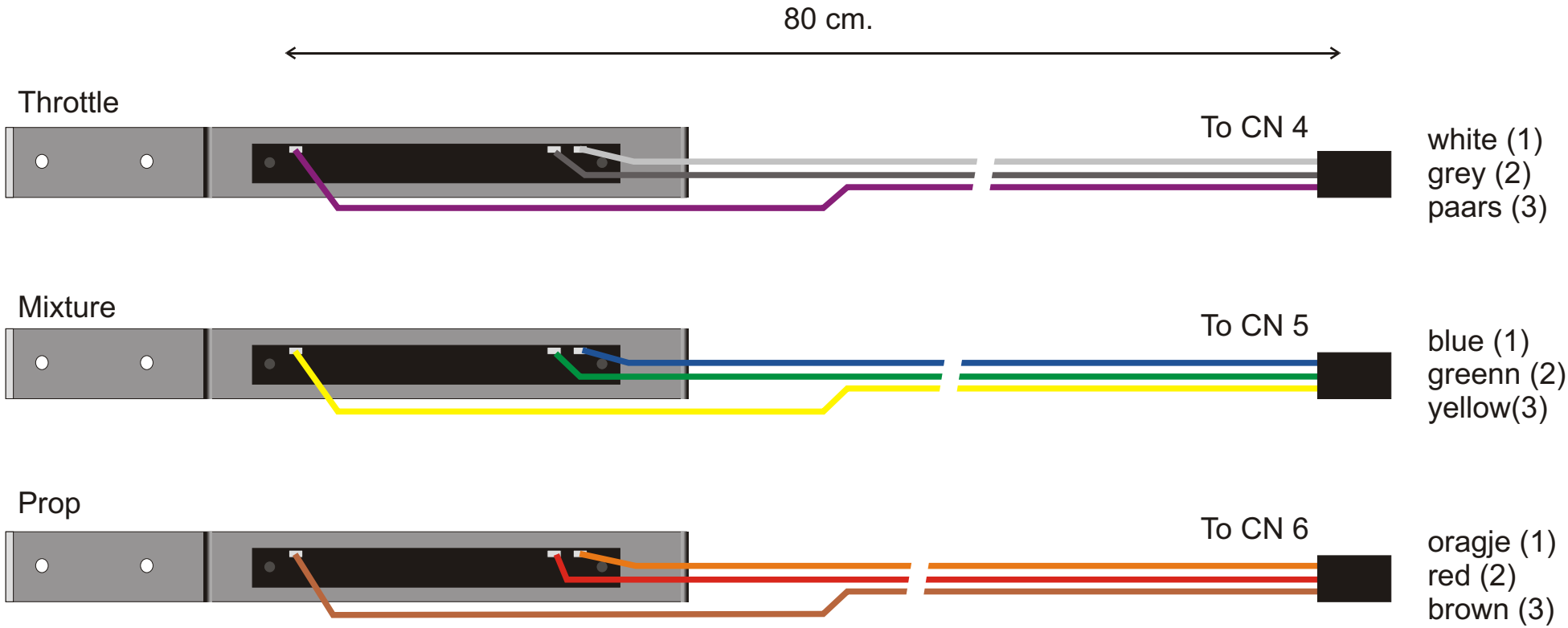
## Trim Wheel connecting cable




10 pole flatcable connector
shown without strain relief

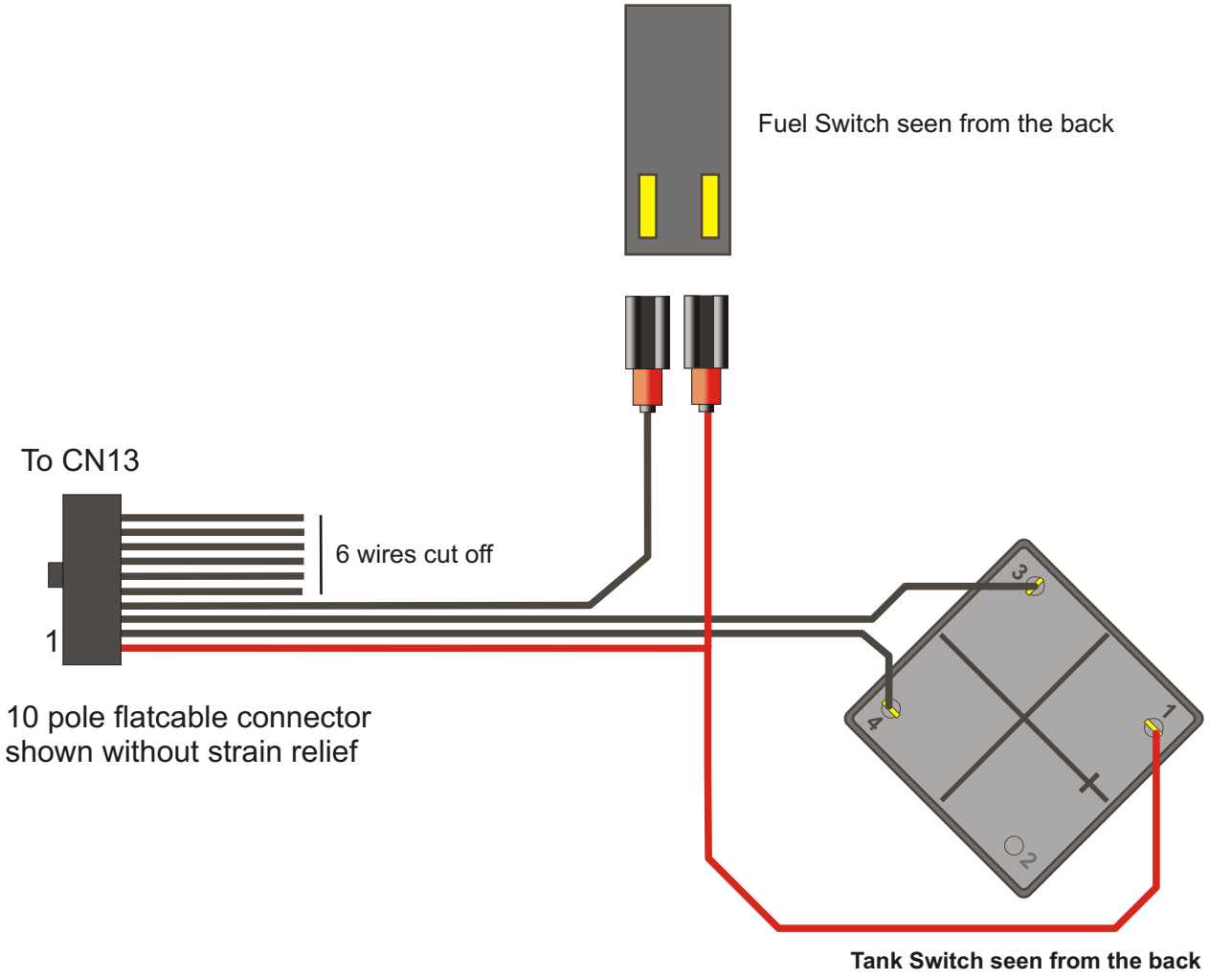
| Rev. | Date | Remarks | Product |
|---|---|---|---|
| 1.1 | 01-09-2003 | | Cable Trim Wheel |
| 1.2 | 01-10-2003 | | |
| Copyright 2003 TRC Development b.v. - Holland | | | |

## Throttle Mixture Prop connection




| Rev. | Date | Remarks | Product |
|---|---|---|---|
| 1.1 | 01-09-2003 | | Cable Throttle/Mix/Prop |
| 1.2 | 01-10-2003 | | |
| Copyright 2003 TRC Development b.v. - Holland | | | |

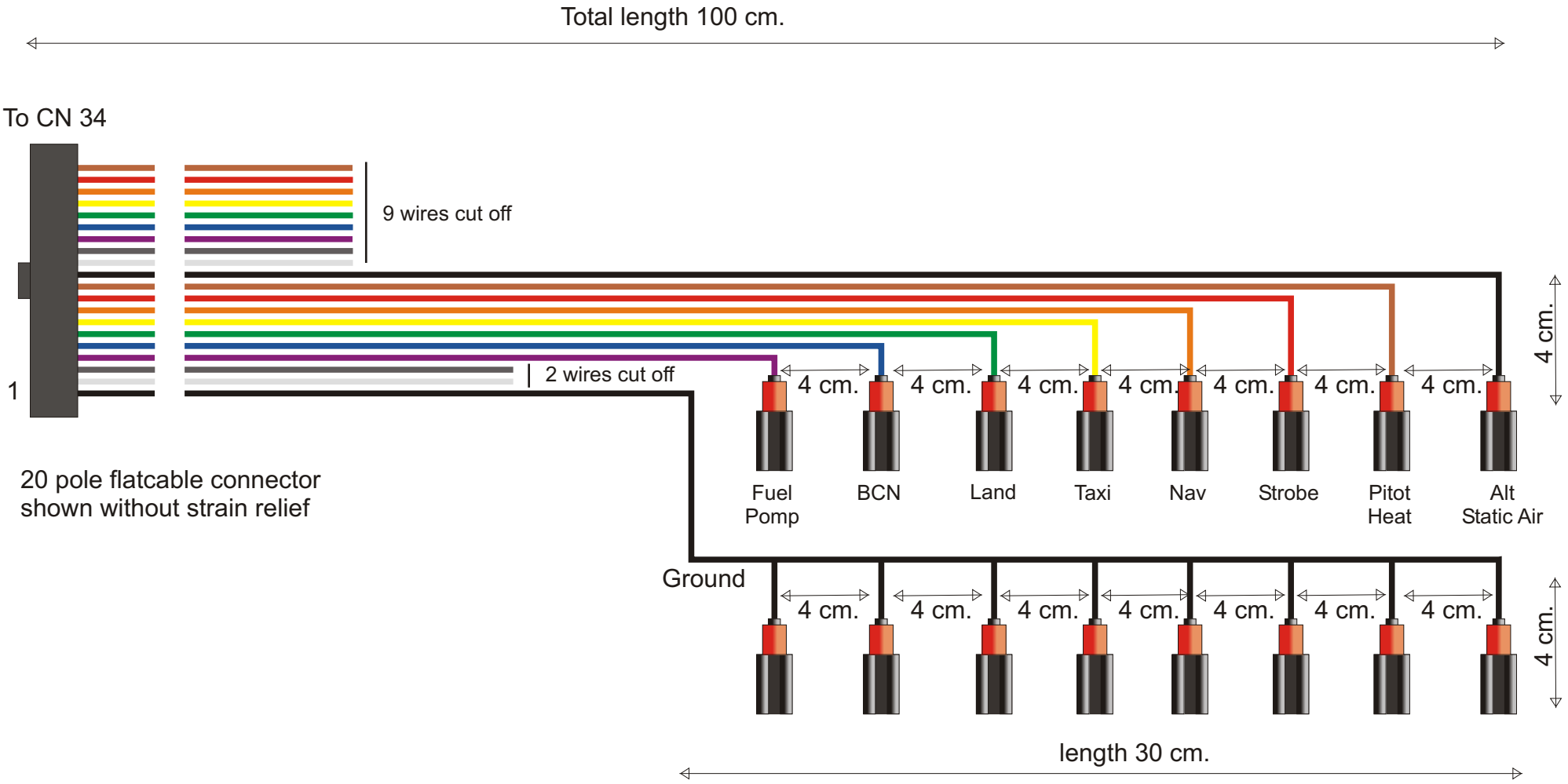
## Tank Switch / Fuel cut-off connecting cable




| Tank Sw. | FSS1 | FSS2 |
|---|---|---|
| Left | 0 | 1 |
| Both | 1 | 0 |
| Right | 0 | 0 |
| | | |
| **Fuel Switch** | FSS3 | |
| On | 1 | |
| Off | 0 | |

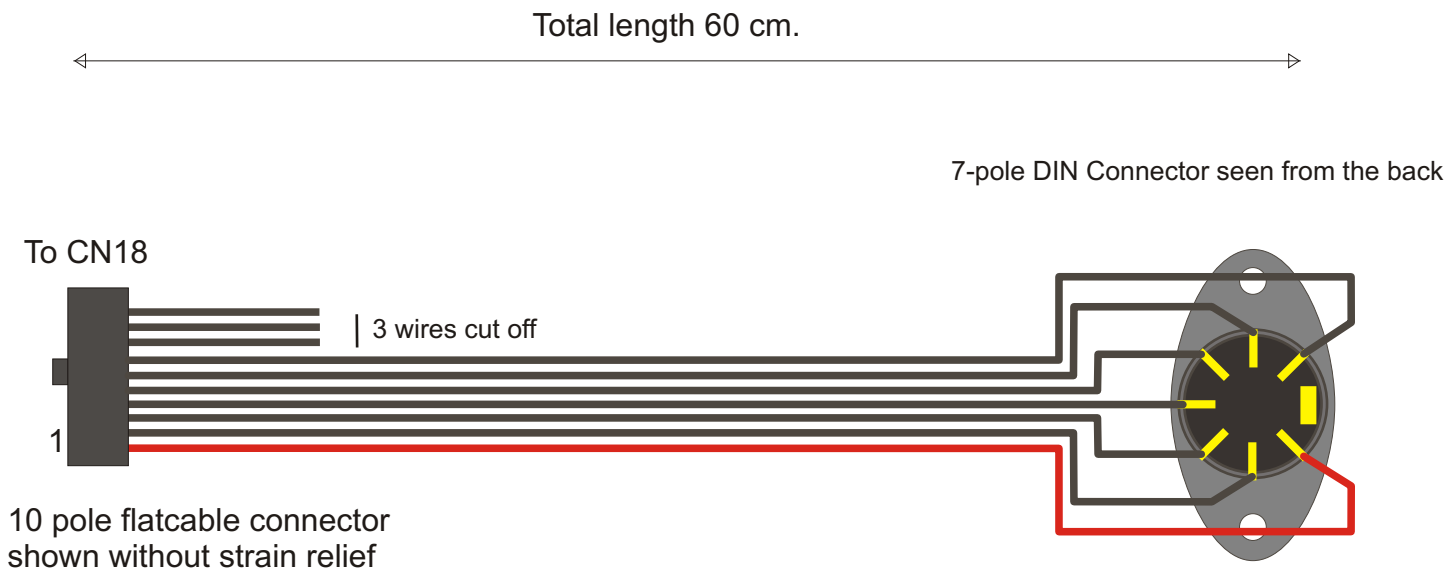
| Rev. | Date | Remarks | Product |
|---|---|---|---|
| 1.1 | 01-09-2003 | | Cable Tank Switch / Fuel Cut-off |
| 1.2 | 01-10-2003 | | |

## Switches connecting cable



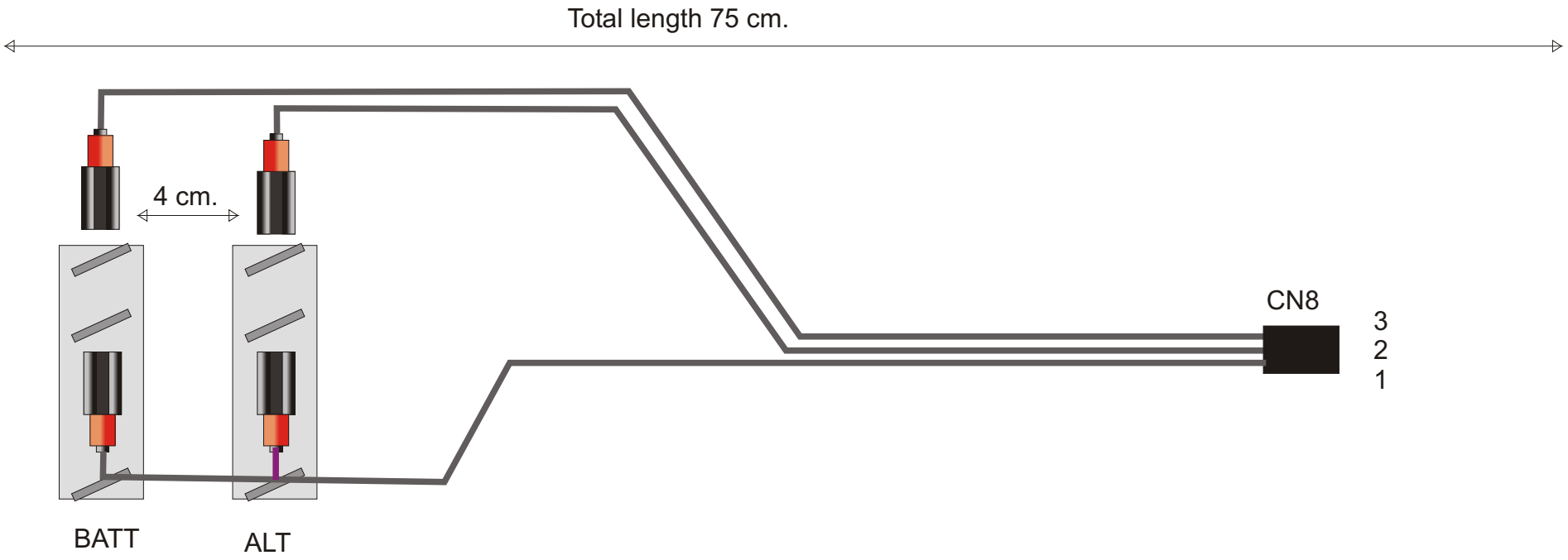

| Rev. | Date | Remarks | Product |
|---|---|---|---|
| 1.1 | 01-09-2003 | | Cable Switches |
| 1.2 | 01-10-2003 | | |
| Copyright 2003 TRC Development b.v. - Holland | | | |

## Rudder Pedals connecting cable




| Rev. | Date | Remarks | Product |
|---|---|---|---|
| 1.1 | 01-09-2003 | | Cable Tank Switch / |
| 1.2 | 01-10-2003 | | Fuel Cut-off |

## Master switch connecting cable




(Switches seen from the back)

| Rev. | Date | Remarks | Product |
|---|---|---|---|
| 1.1 | 01-09-2003 | | Cable Master Switch |
| 1.2 | 01-10-2003 | | |

## Light regulation connecting cable

Total length 70 cm.

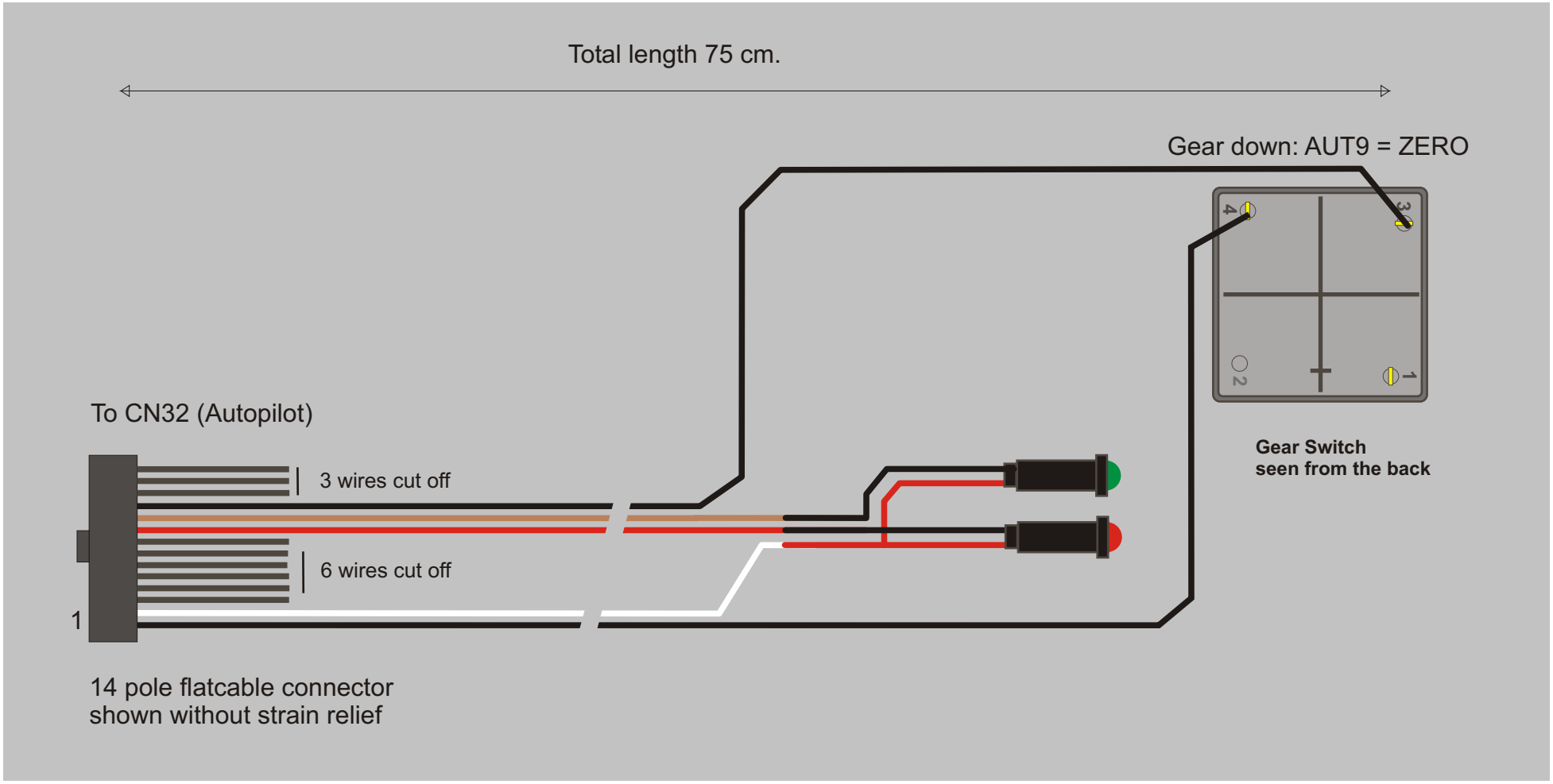
**Top View Potentiometer**

To CN7

**Potentiometer 10Kohm**

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

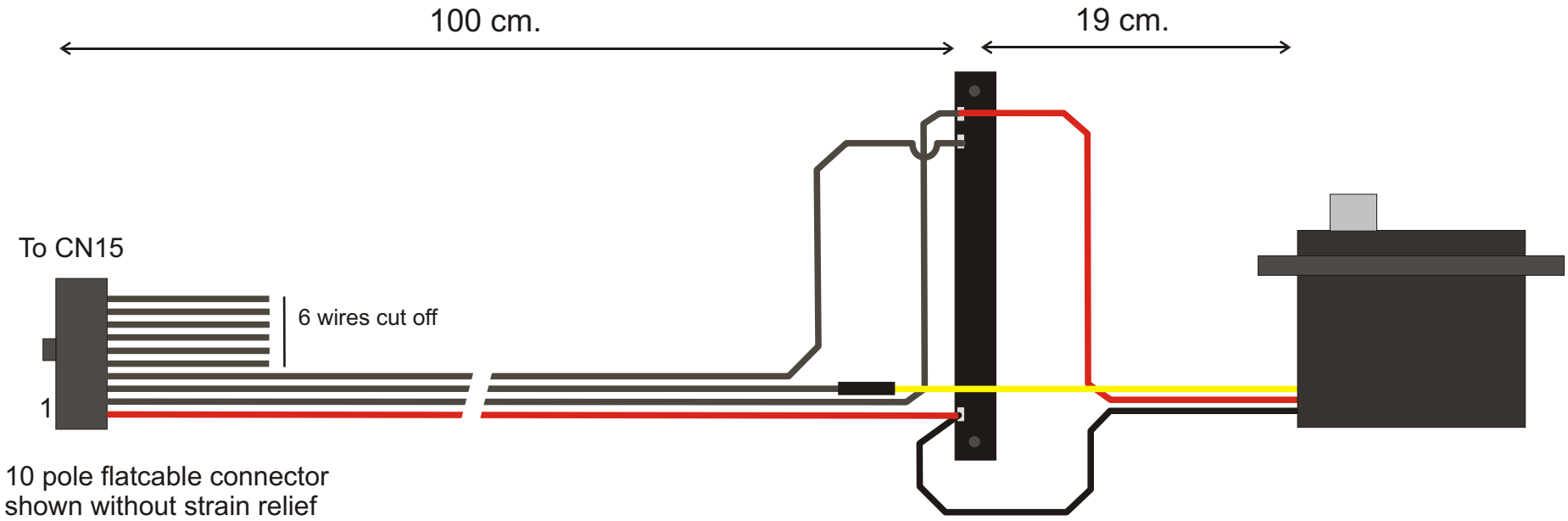
## Gear Switch and Indicators connecting cable




- AUT 7 (pin 9) = Red LED (during movement of Gear). Ground applied = LED on
- AUT 8 (pin 10) = Green LED (when landing gear is in locked down position). Ground applied = LED on.
- AUT 9 (pin 11) = Connection of Gear Switch. When switched to Ground, the Gear Switch is read as "Gear Down".

| Rev. | Date | Remarks | Product |
|---|---|---|---|
| 1.2 | 01-10-2003 | | Cable Gear Switch and Indicators |
| 1.3 | 04-12-2003 | | |

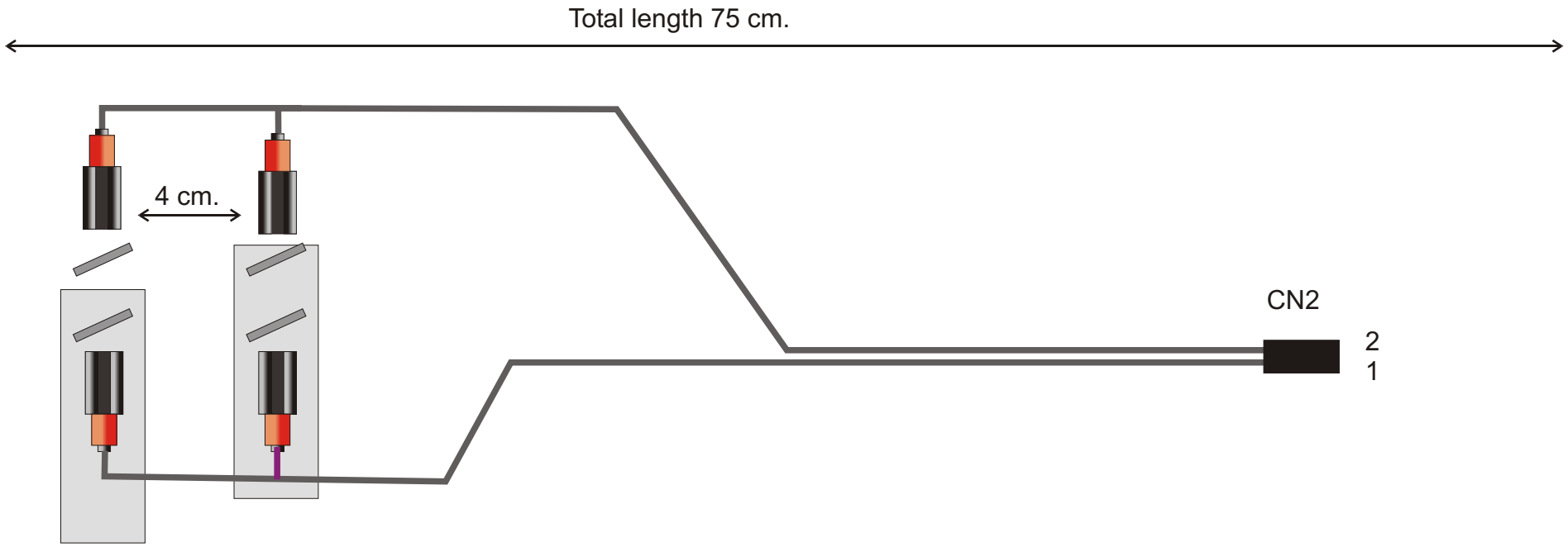
## Flap Switch connecting cable




10 pole flatcable connector
shown without strain relief

| Rev. | Date | Remarks | Product |
|---|---|---|---|
| 1.1 | 01-09-2003 | | Cable Flap Switch |
| 1.2 | 01-10-2003 | | |

**Avionics Switch connecting cable**




(Switches seen from the back)

| Rev. | Date | Remarks | Product |
|---|---|---|---|
| 1.1 | 01-09-2003 | | Cable Avionics Switch |
| 1.2 | 01-10-2003 | | |
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