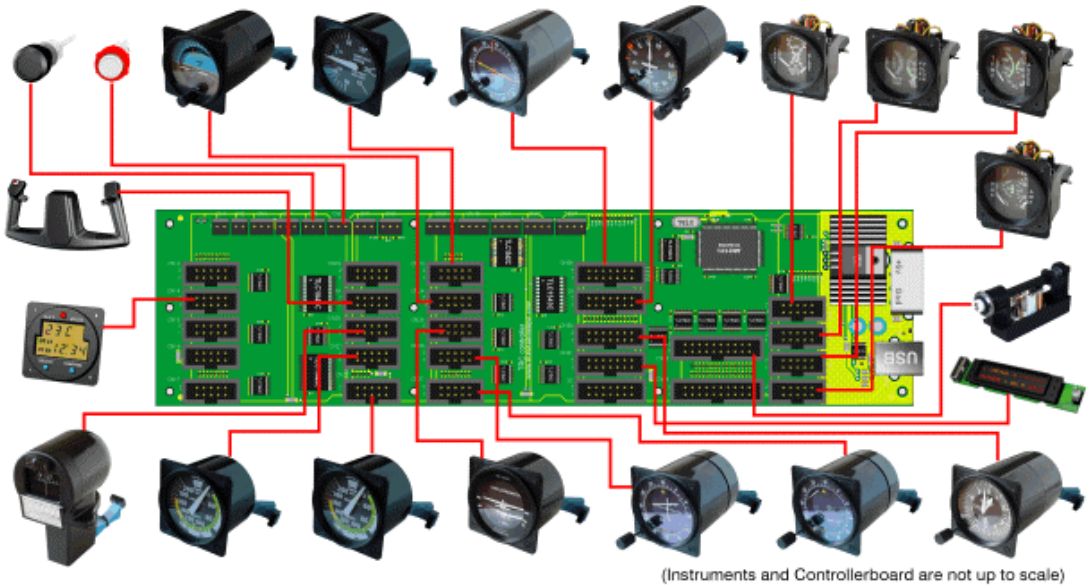
CCU2 Connections, Wiring Diagrams Modifications & Schematics

TRC Development b.v. – The Netherlands – www.therealcockpit.com - www.simkits.com

Contents

1. CCU2 Connections

The CCU2 can drive many different gauges and is able to read out many different instruments, like Throttles, Switches, Trim wheel etc. compared to the CCU1.



(Note: the connections in the above picture between the different instruments and the CCU2 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 CCU2 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

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 gauge 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.

When you like to expand your cockpit with more instruments and gauges, 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 CCU2. All controllers (including the CCU2) are connected to the PC via USB.

Instruments controlled by CCU2

ADF Indicator

Airspeed Indicators, choice out of the following types (see the website for the latest additions):
- 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)

2 Throttle Controls *)

2 Mixture Controls *)

2 Propeller Controls *)

Oil Temperature & Oil Pressure Indicator (dual indicators)

Switches

Tacho meter, choice of face plate for (see the website for the latest additions):
- Cessna 172 Skyhawk
- Cessna 182 Skylane
- Sopwith Camel
- Vaught Corsair

Turn Coordinator

Vertical Speed Indicator, choice of face plate for (see the website for the latest additions):
- Beechcraft Baron 58
- Bell 206B Jet Ranger
- Cessna 172 Skyhawk
- Cessna Caravan
- Vaught Corsair

VOR1 Indicator

VOR2 Indicator

Wet Compass

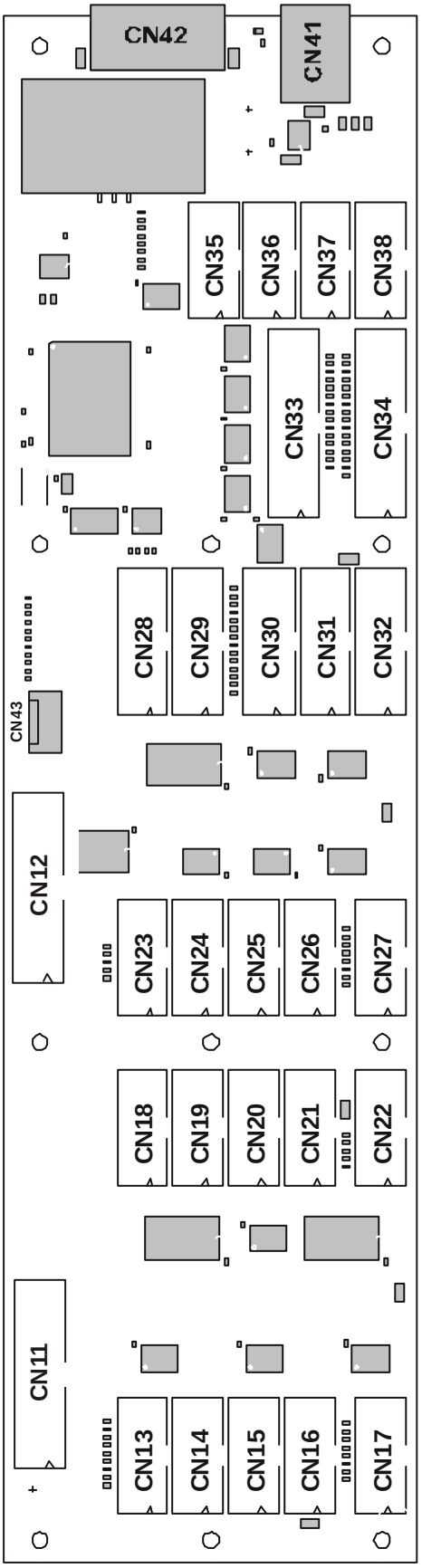
Yoke Control

Rudder Pedals *)

8 Additional Single pointer gauges *)

**) These additional instruments need a future software release.*

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.

The CCU2 is prepared for future expansion with more I/O lines and will be able to control instruments for a twin engine aircraft. Therefore more I/O lines are made available. At the same time a number of smaller connectors have been combined into 2 larger connectors. The additional I/O lines will become supported in the near future via software updates.
NOTE: T**he position of the text on the picture on the left is not identical to the position of the text on the board itself.**

CN11 Handbrake, Avionics Switch, Gear, Light Control, Master Switch
CN12 Analog outputs, 8 pcs.*), Quartz Counter
CN13 Fuel selector + Shut off
CN14 Digital Clock
CN15 Flaps, Throttle1/2, Mixture1/2, Prop1/2
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 Future Expansion
CN33 Circuit breakers (15 outputs)
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./AMindicator

*) These connections are for future expansion and are not yet supported by the firmware and software.

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 CCU2.
- The term “Digital Output” means a signal which is coming from the CCU2 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 CCU2 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 CCU2 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 CCU2 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 CCU2 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 CCU2.
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 to CN10 Do not exist on the CCU2 Board

CN11 Handbrake, Avionics Switch, Gears, Dimmer and Master Switch
Pin 1 – Ground
Pin 2 – **Handbrake** HNDB, Digital Input. The pin is forced high, when not connected, via a resistor on the CCU2. When connected to Ground, the Handbrake is active.

Pin 3 – Ground
Pin 4 – **Avionics Switch** AVSW, Digital Input. The pin is forced high, when not connected, via a resistor on the CCU2. When connected to Ground, the Handbrake is active.

Pin 5 – Not Connected
Pin 6 – Ground
Pin 7 - **Gear Switch** GEAR1, Digital Input. The pin is forced high, when not connected, via a resistor on the CCU2. When connected to Ground, the Gear Switch is active.
Pin 8 – +5v.
Pin 9 - Ground
Pin 10 - **Gear Light** GEAR2, Digital Output. When the Gear is down, a digital “high” (5 volt / max. 20mA) is present on this output.
Pin 11 – +5v.
Pin 12 - Ground
Pin 13 - **Gear Light** GEAR3, Digital Output. When the Gear is working, a digital “high” (5 volt / max. 20mA) is present on this output.
Pin 14 – +5v.
Pin 15 – Ground
Pin 16 – **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 17 – +5v.
Pin 18 – Ground
Pin 19 – **Master Switch** MSW1, Digital Input. The pin is forced high, when not connected, via a resistor on the CCU2. When connected to Ground, the Master Switch 1 (ALT) is active.
Pin 20 – **Master Switch** MSW2, Digital Input. The pin is forced high, when not connected, via a resistor on the CCU2. When connected to Ground, the Master Switch 2 (BAT) is active.

CN 12 - Quartz Counter & Future Expansion
Pin 1 – Not Connected
Pin 2 – Ground
Pin 3 – **Quartz Counter** 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 CCU2.
(Quartz Counter signals are not yet supported)
Pin 4 – **Lamp** output (background lighting)
Pin 5 to Pin 20 – Future expansion

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 CCU2. 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 CCU2. 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 CCU2. When connected to Ground, the FSS3 input is active.
Pin 5 – FSS4 Digital Input.
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 – **Flaps** FLA1 Digital Output Servo Signal, Flaps position indication
Pin 4 – **Flaps** FLA2 Analog Input to read out the position of a 10K potentiometer, which positions are an indication for the desired flaps position.
Pin 5 – **2nd Throttle** THR2, Analog Input to read out the position of a 10K potentiometer, which positions are an indication for the desired 2nd throttle position.*)
Pin 6 – **2nd Micture** MIX2, Analog Input to read out the position of a 10K potentiometer, which positions are an indication for the desired 2nd mixture position.*)
Pin 7 – **2nd Propeller Adjust** PRP2, Analog Input to read out the position of a 10K potentiometer, which positions are an indication for the desired 2nd propeller adjust position.*)
Pin 8 – **Primary Throttle** THR
Pin 9 – **Primary Mixture** MIX
Pin 10 – **Primary Propeller Adjust** PRP

CN16 Trim wheel
Pin 1 – Ground
Pin 2 – +5v.
Pin 3 – TRW1
Pin 4 – TRW2
Pin 5 – TRW3
Pin 6 – **Trim wheel** 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 – **Starter Switch** STA1 Digital Input. The pin is forced high, when not connected, via a resistor on the CCU2. When connected to Ground, the STA1 input is active.
Pin 4 – **Starter Switch** STA2 Digital Input. The pin is forced high, when not connected, via a resistor on the CCU2. When connected to Ground, the STA2 input is active.
Pin 5 – **Starter Switch** STA3 Digital Input. The pin is forced high, when not connected, via a resistor on the CCU2. When connected to Ground, the STA3 input is active.
Pin 6 – **Starter Switch** STA4 Digital Input. The pin is forced high, when not connected, via a resistor on the CCU2. 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 – **Rudder Pedals** RUD1 – Analog in – Main analog input
Pin 4 – **Rudder Pedals** RUD2 – Analog in – Toe brake left
Pin 5 – **Rudder Pedals** RUD3 – Analog in – Toe brake right
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 – **Yoke** YOK3 Analog Input, PITCH
Pin 6 – **Yoke** YOK4 Analog Input, ROLL
Pin 7 – NC
Pin 8 – NC
Pin 9 – NC
Pin 10 – NC

CN20 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

CN21 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

CN22 Tachometer
Pin 1 – Ground
Pin 2 – +5v. **X**
Pin 3 – **Tachometer** 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. **X**
Pin 3 – **Vertical Speed Indicator** 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. **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

CN25 Turn Coordinator
Pin 1 – Ground
Pin 2 – +5v. **X**
Pin 3 – **Turn Coordinator** TRN1 Digital Output Servo Signal
Pin 4 – Ground
Pin 5 – +5v. **X**
Pin 6 – **Turn Coordinator** 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. **X**
Pin 3 – **VOR 1 Indicator** VOR1 Digital Output Servo Signal
Pin 4 – **VOR 1 Indicator** VOR2 Digital Output Servo Signal
Pin 5 – **VOR 1 Indicator** VOR3 Digital Output Servo Signal
Pin 6 – **VOR 1 Indicator** VOR4 Analog In
Pin 7 – **VOR 1 Indicator** VOR5 Analog In
Pin 8 – Lamp
Pin 9 – +5v.
Pin 10 – NC

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

CN28 ADF Indicator
Pin 1 – Ground
Pin 2 – +5v. **X**
Pin 3 – **ADF Indicator** ADF1 Digital Output Servo Signal
Pin 4 – ADF2 Digital Output Servo Signal (Not Used)
Pin 5 – **ADF Indicator** ADF3 Digital Input (Rotary Encoder)
Pin 6 – **ADF Indicator** ADF4 Digital Input (Rotary Encoder)
Pin 7 – **ADF Indicator ADF Indicator** ADF5 Analog Input, Piher Position Sensor
Pin 8 – **ADF Indicator** ADF6 Analog Input, Piher Position Sensor
Pin 9 – **ADF Indicator** ADF7 Analog Input, Piher Position Sensor
Pin 10 – **ADF Indicator** 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 – **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

CN30 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

CN31 Warning Lights & Switch

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

CN32 Servo expansion (connects to servo expansion board)

Pin 1 – Ground
Pin 2 – +5v. **X**
Pin 3 – AUT1 Digital Output
Pin 4 – AUT2 Digital Output
Pin 5 – AUT3 Digital Output
Pin 6 – AUT4 Digital Output
Pin 7 – AUT5 Digital Output
Pin 8 – AUT6 Digital Output
Pin 9 – AUT7 Digital Output
Pin 10 – AUT8 Digital Output
Pin 11 – AUT9 Digital Input (Not Used)
Pin 12 – AUT10 Digital Input (Not Used)
Pin 13 – Lamp
Pin 14 – + 5v.

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. **X**
Pin 3 – **Switches** SW1 Digital Input
Pin 4 – **Switches** SW2 Digital Input Fuel Pump, OFF when Grounded
Pin 5 – **Switches** SW3 Digital Input BCN, OFF when Grounded
Pin 6 – **Switches** SW4 Digital Input Land, OFF when Grounded
Pin 7 – **Switches** SW5 Digital Input Taxi, OFF when Grounded
Pin 8 – **Switches** SW6 Digital Input Nav, OFF when Grounded
Pin 9 – **Switches** SW7 Digital Input Strobe, OFF when Grounded
Pin 10 – **Switches** SW8 Digital Input Pitot Heat, OFF when Grounded
Pin 11 – **Switches** SW9 Digital Input Alt Static Air, OFF when Grounded
Pin 12 – **Switches** SW10 Digital Input (Not Used)
Pin 13 – **Switches** SW11 Digital Input (Not Used)
Pin 14 – **Switches** SW12 Digital Input (Not Used)
Pin 15 – **Switches** SW13 Digital Input (Not Used)
Pin 16 – **Switches** SW14 Digital Input (Not Used)
Pin 17 – **Switches** SW15 Digital Input (Not Used)
Pin 18 – **Switches** SW16 Digital Input (Not Used)
Pin 19 – NC
Pin 20 – NC

CN35 Servo Ctrld. Fuel Left/Right *)
Pin 1 – Ground
Pin 2 – +5v **X**
Pin 3 – **Fuel** SFL1 Digital Output Servo Signal
Pin 4 – Ground
Pin 5 – +5v **X**
Pin 6 – **Fuel** 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 **X**
Pin 3 – **EGT/Fuel Flow** SEC1 Digital Output Servo Signal
Pin 4 – Ground
Pin 5 – +5v **X**
Pin 6 – **EGT/Fuel Flow** 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 **X**
Pin 3 – **Oil Temp/Pressure** SOP1 Digital Output Servo Signal
Pin 4 – Ground
Pin 5 – +5v **X**
Pin 6 – **Oil Temp/Pressure** 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 **X**
Pin 3 – **Suction G./AMM** SSA1 Digital Output Servo Signal
Pin 4 – Ground
Pin 5 – +5v **X**
Pin 6 – **Suction G./AMM** 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 version 2.

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

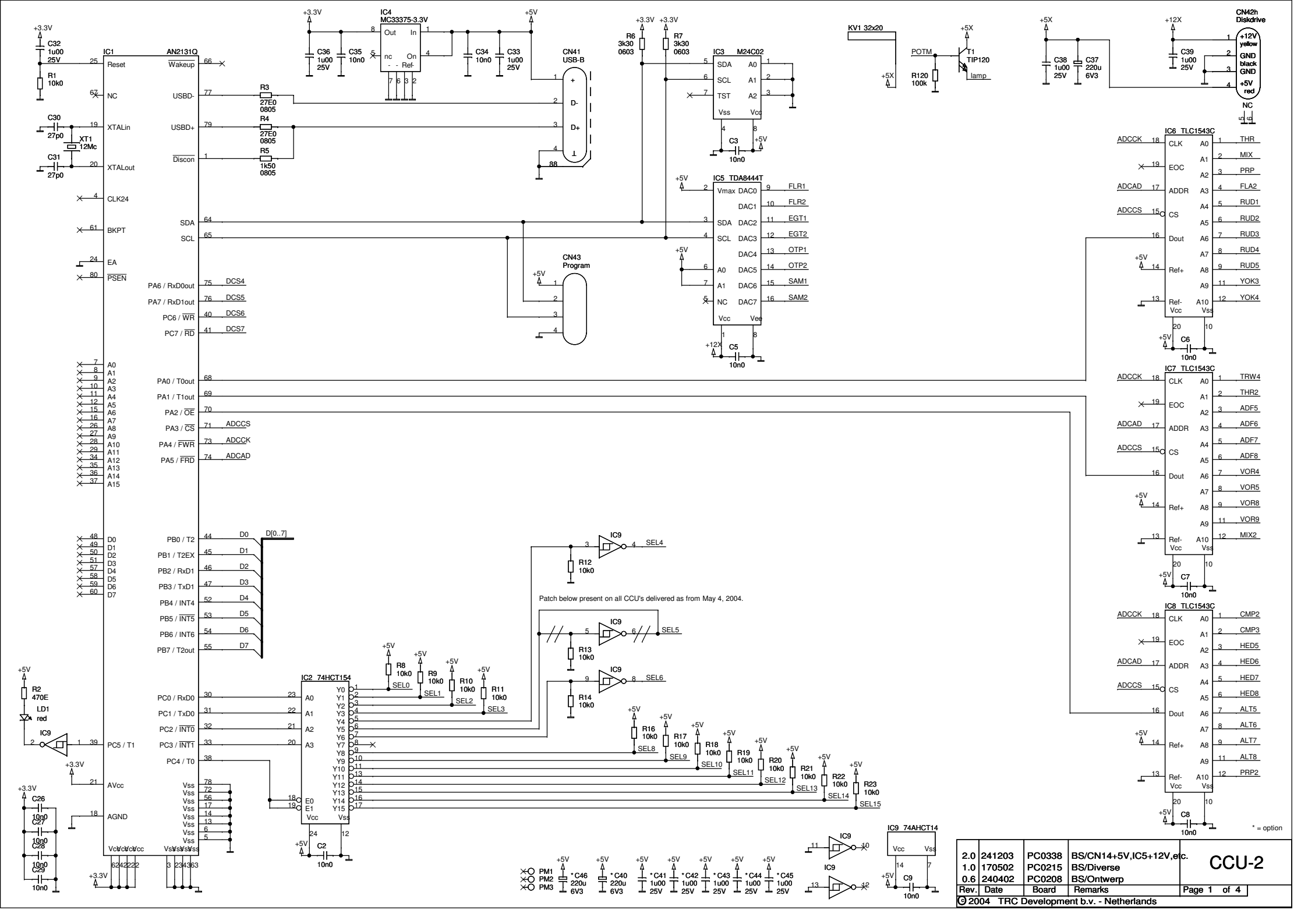
Warning Panel

Wet Compass

6. Wiring Diagrams

The following wiring diagrams are included in this document:

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


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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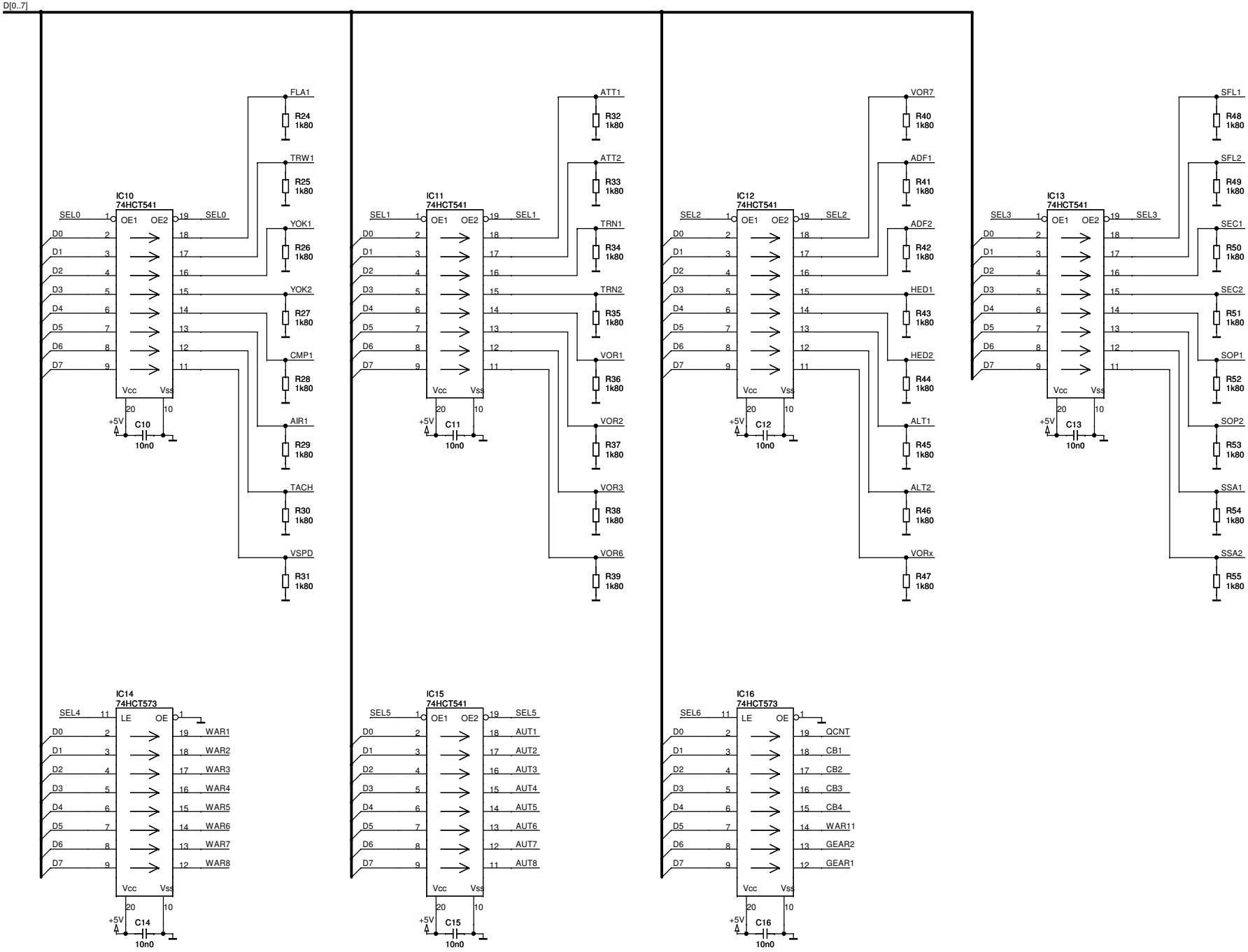
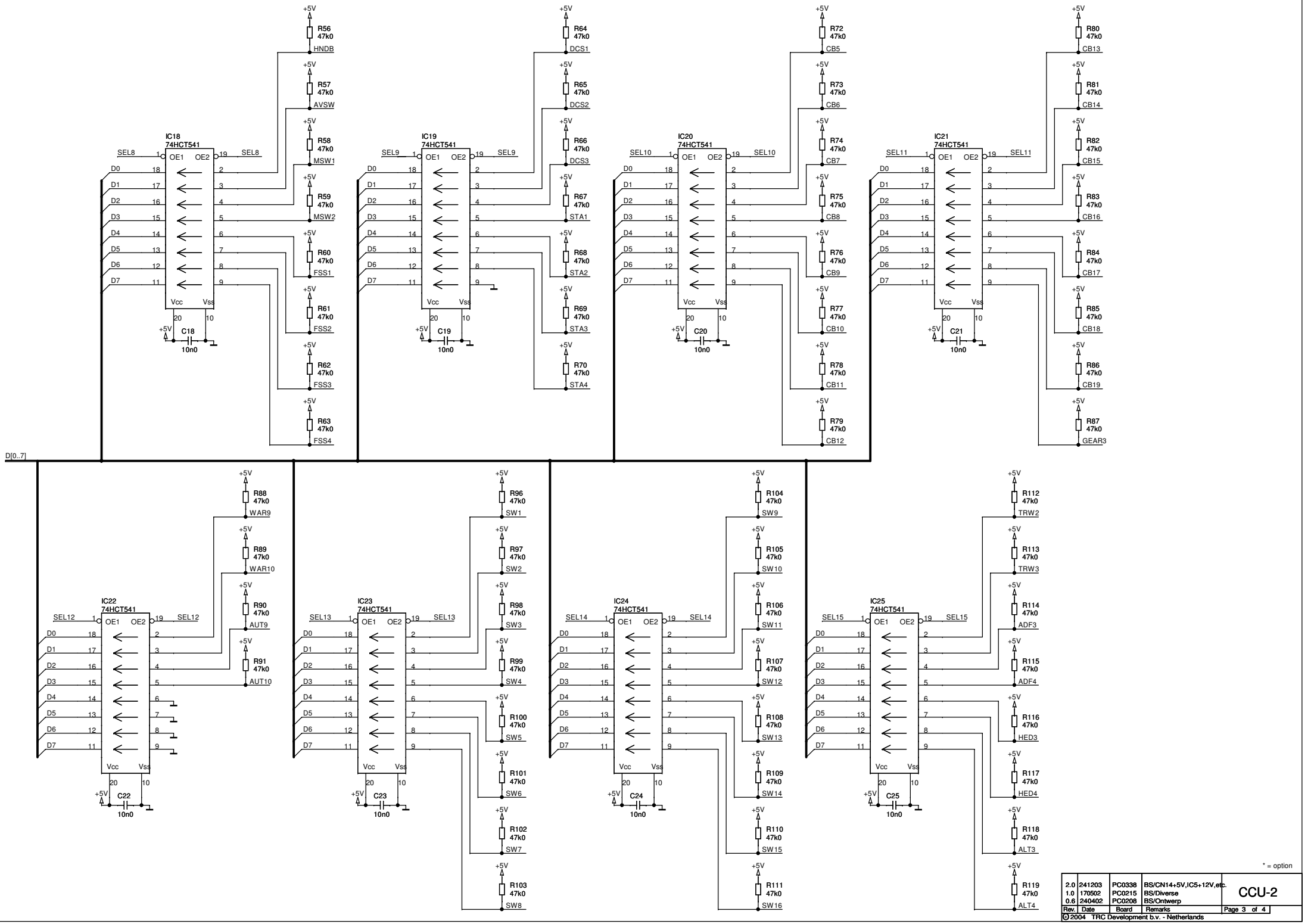


* = option

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

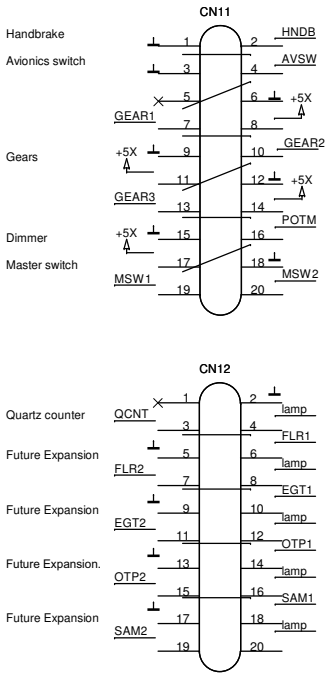


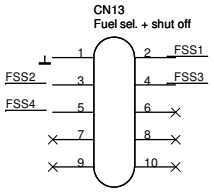
* = option

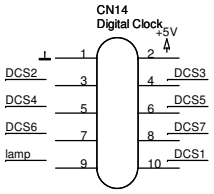
Rev.	Date	Board	Remarks
2.0	241203	PC0338	BS/CN14+5V,IC5+12V,etc.
1.0	170502	PC0215	BS/Diverse
0.6	240402	PC0208	BS/Ontwerp

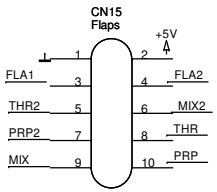
CCU-2

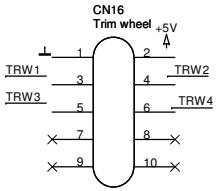
Page 3 of 4

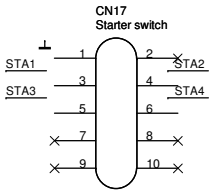


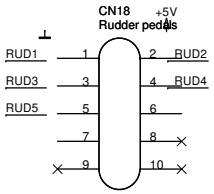


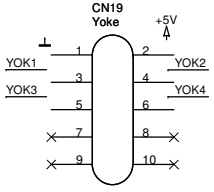


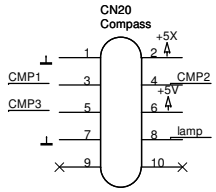


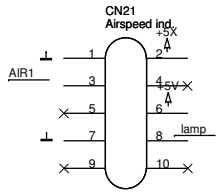


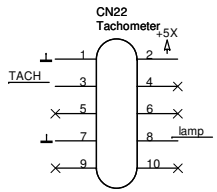


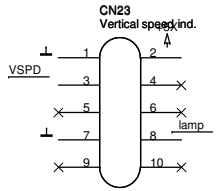


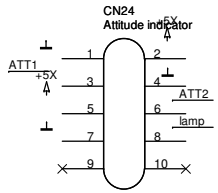


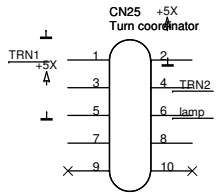


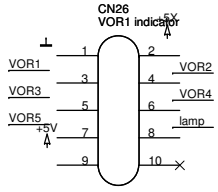


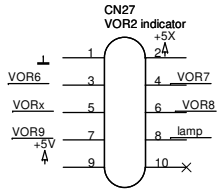


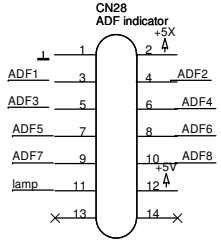


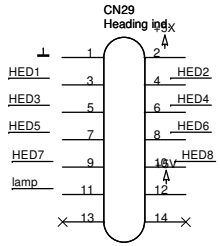


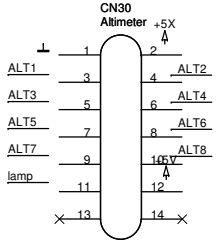


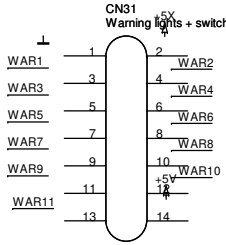


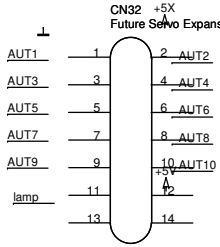


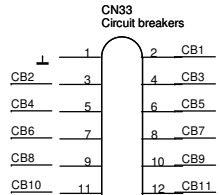


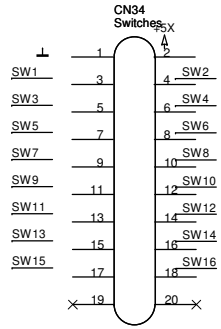


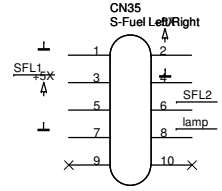


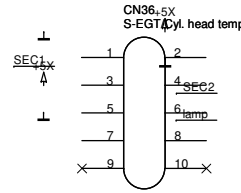


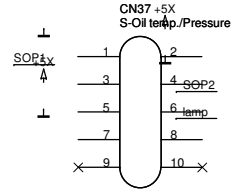


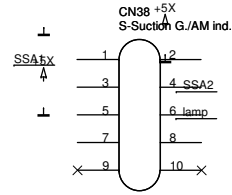








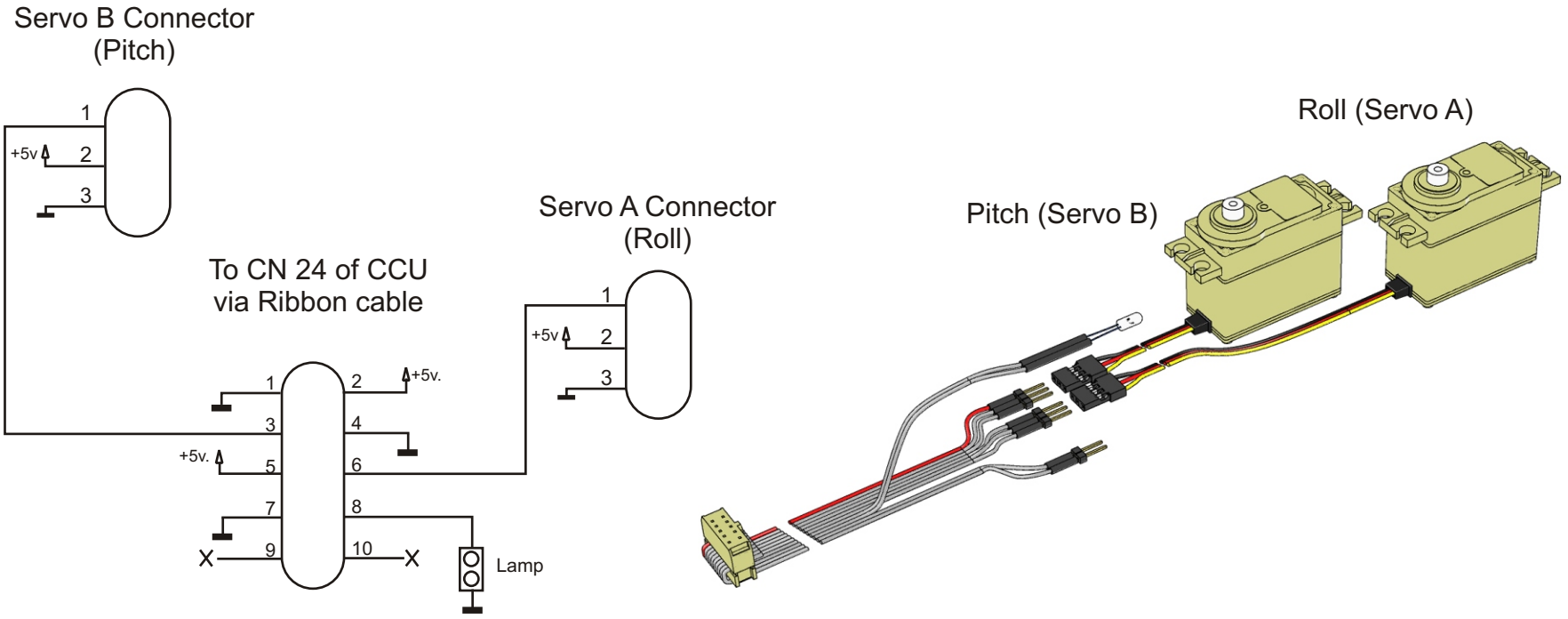




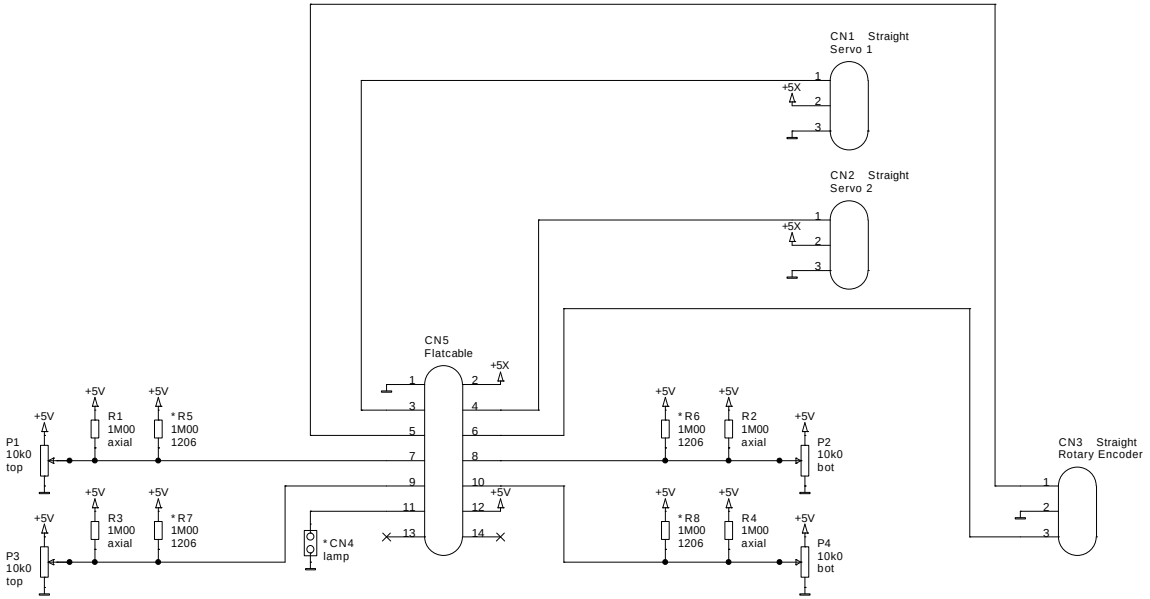
LAMP connection present on all CCU's delivered as from May 4, 2004. -->

* = 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

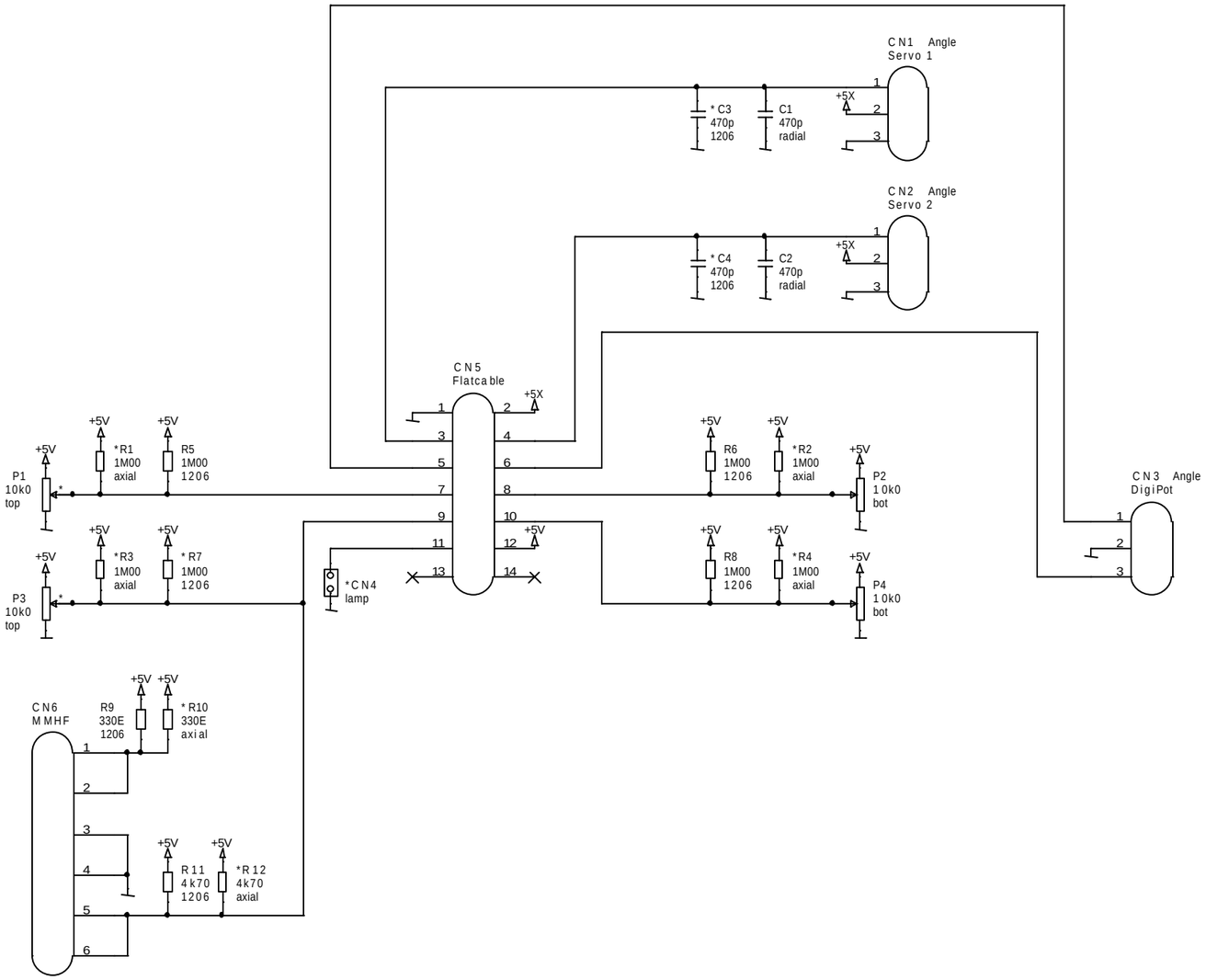


* option

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

ALT+ADF

Page 1 of 1

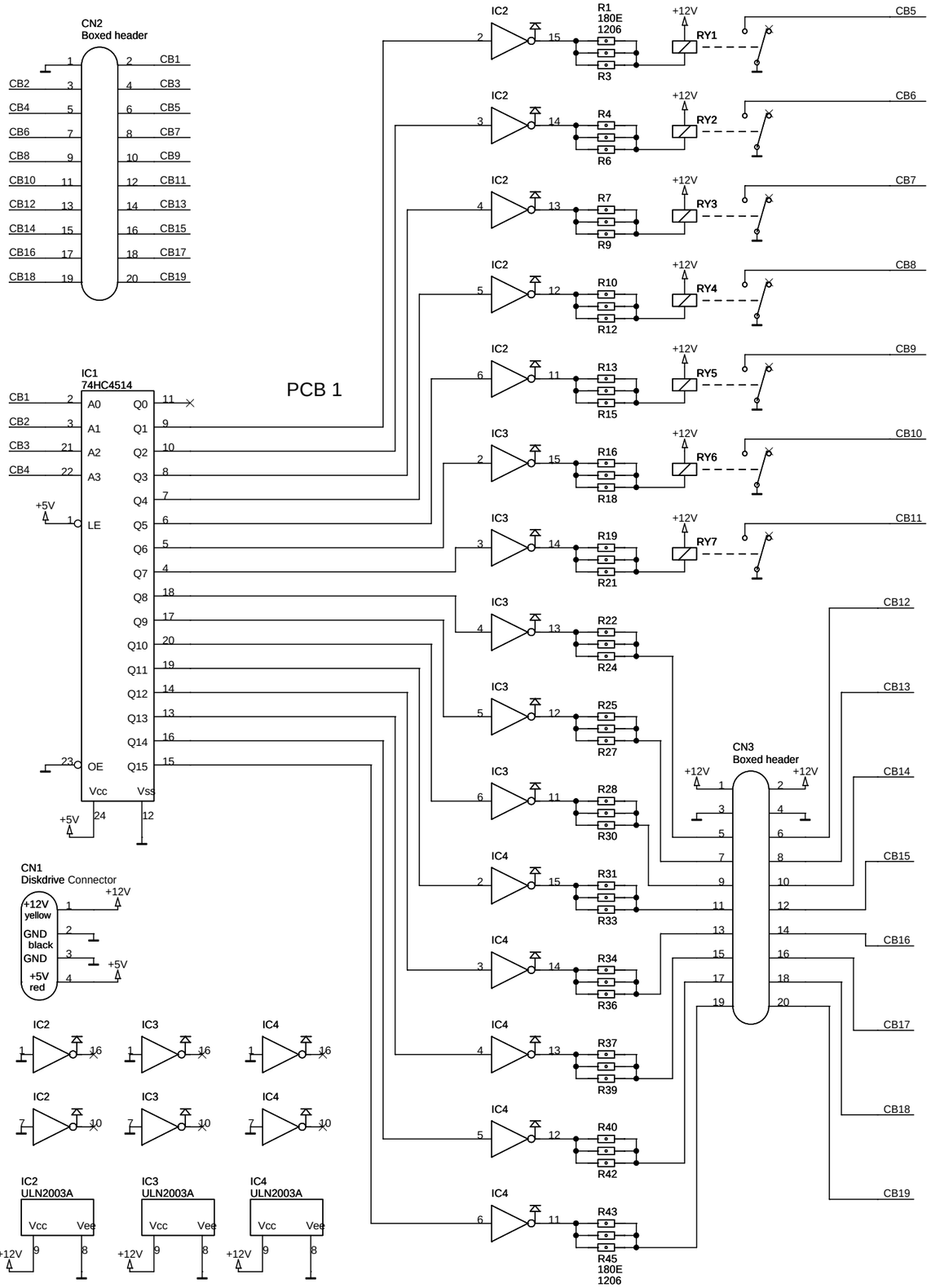


* option

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

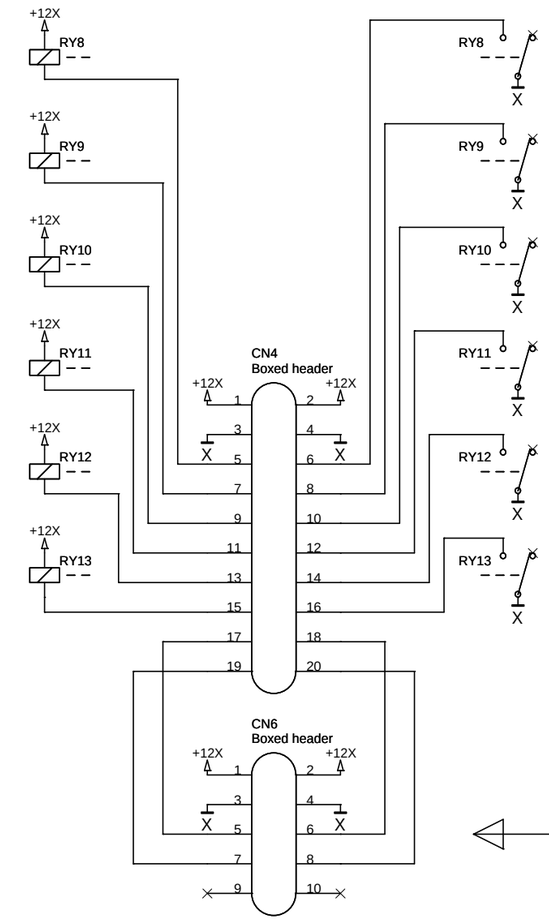
Page 1 of 1

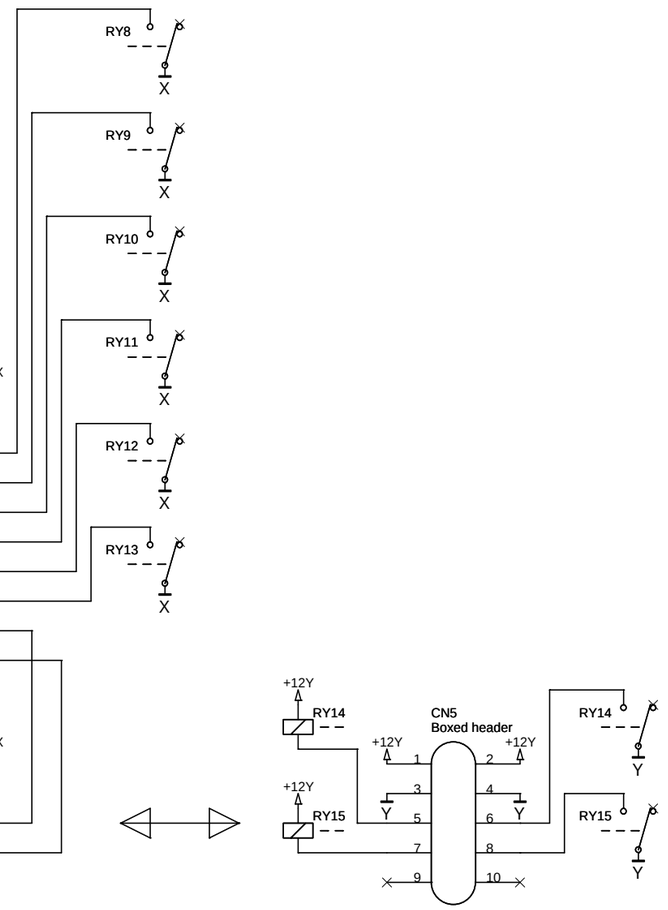


PCB 1

PCB 2

PCB 3

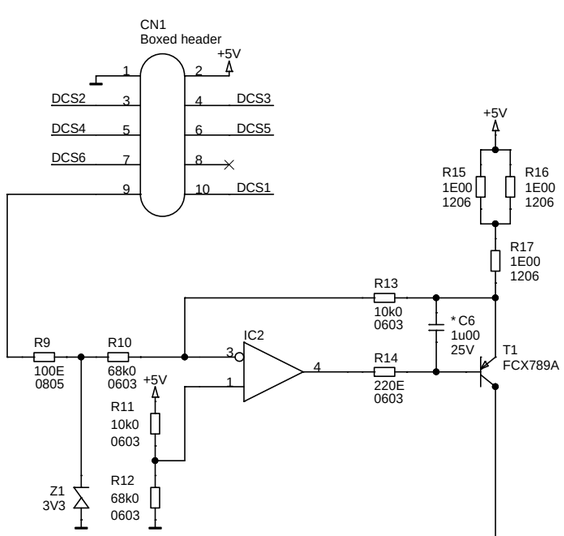


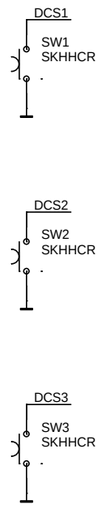


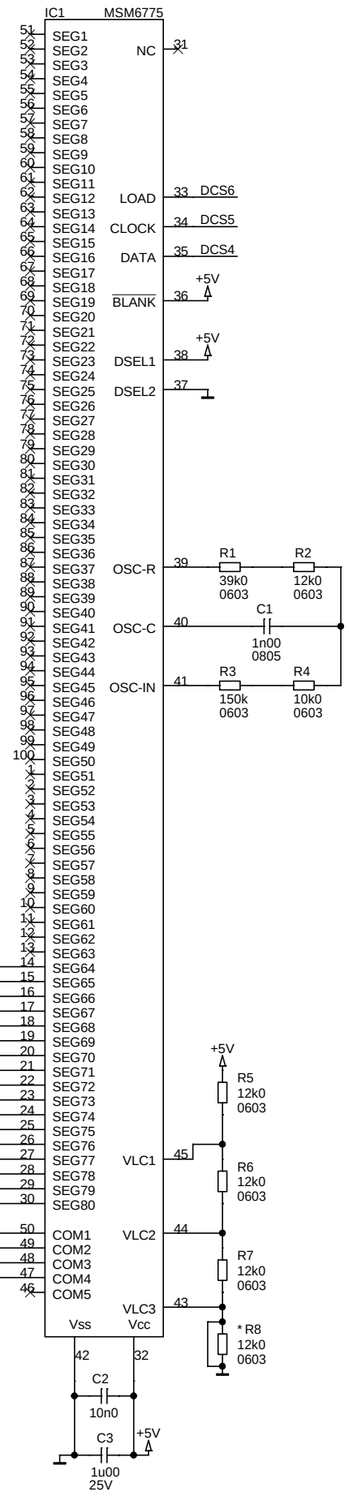
* option

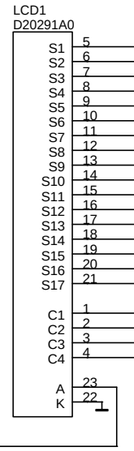
TRC circ. breakers

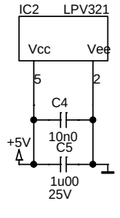
Rev.	Date	Board	Remarks	Page 1 of 1
0	241003	PC----	BS/Ontwerp	





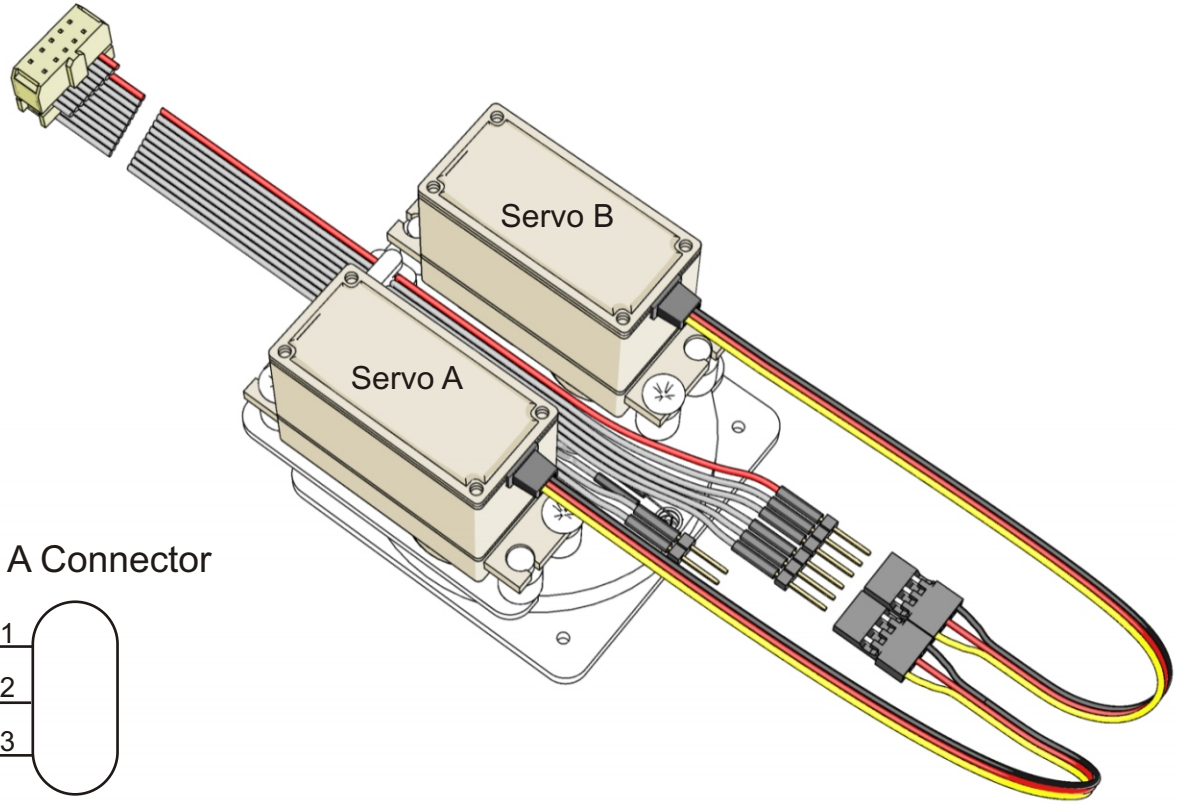




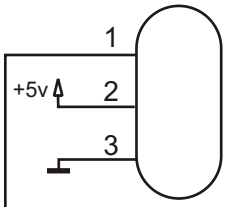


* option

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	

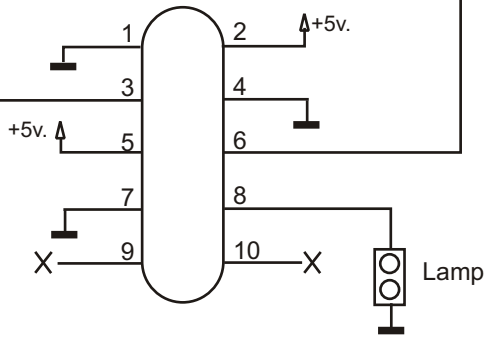


Servo B Connector



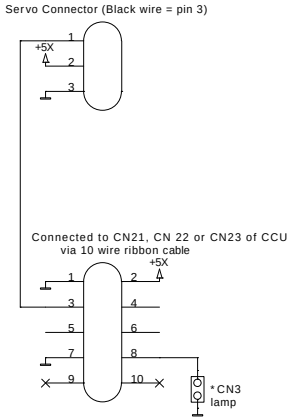
To CN 13, CN14,
CN15 or CN16
of CCU
via Ribbon cable

Servo A Connector



Lamp

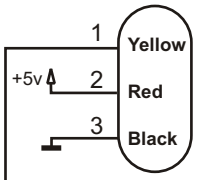
1.0	230603		CR/Design	Dual Small Gauge
Rev.	Date	Board	Remarks	Page 1 of 1



* option

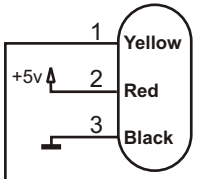
				Gen. Instr.
0	280502	PC0213	BS/Design	
Rev	Date	Board	Remarks	Page 1 of 1

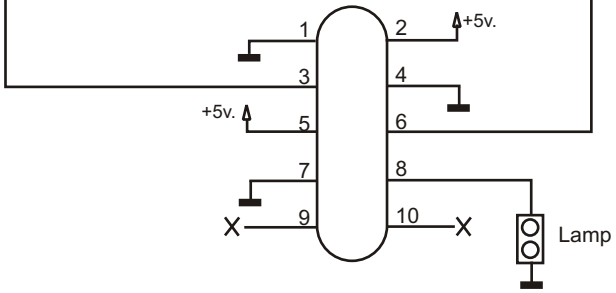
Servo B Connector
(Bank Indicator)



To CN 25 of CCU
via Ribbon cable

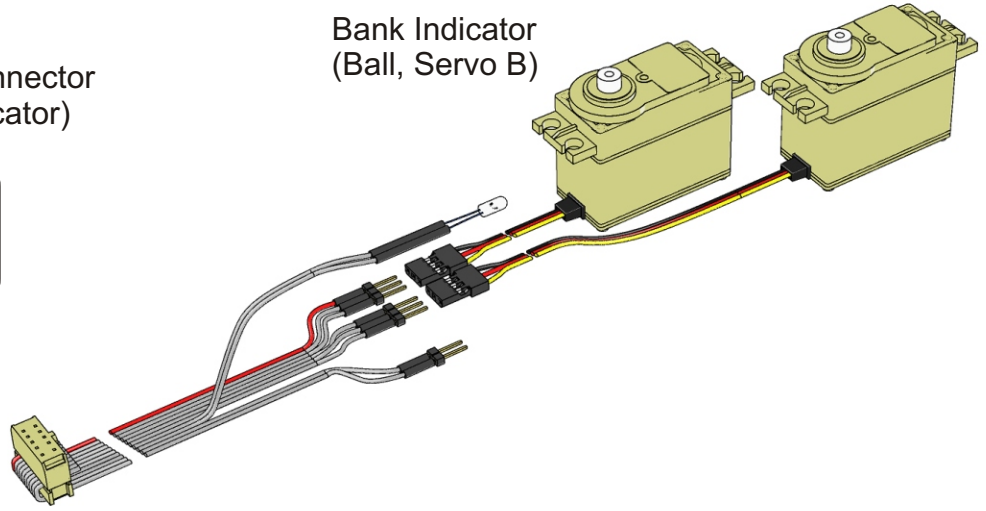
Servo A Connector
(Turn Indicator)



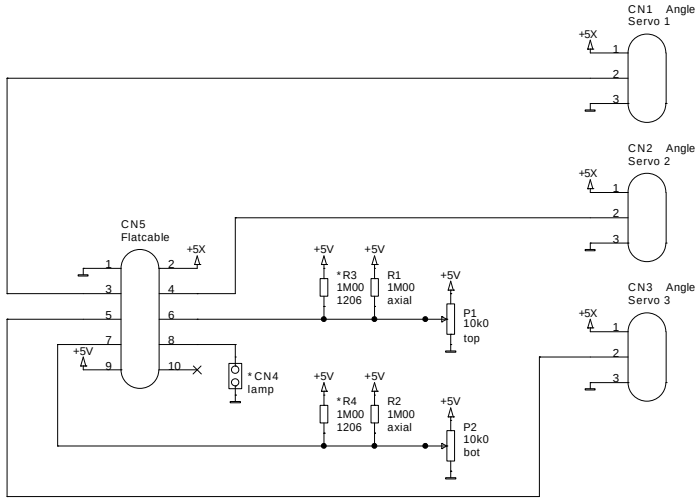


Turn Coordinator
(Airplane, Servo A)

Bank Indicator
(Ball, Servo B)



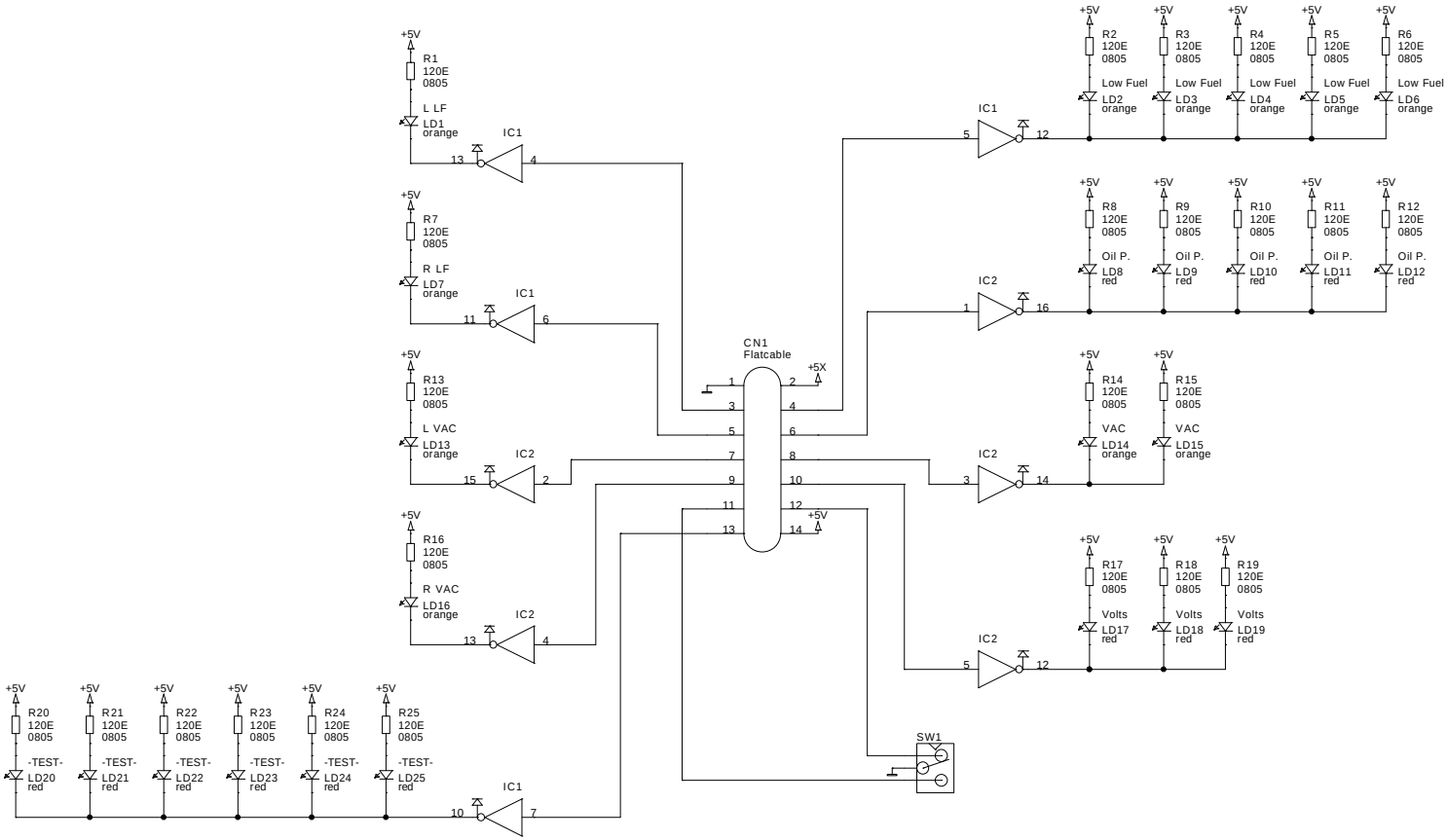
1.0	230603		CR/Design	**Turn & Bank Indicator**
Rev.	Date	Board	Remarks	Page 1 of 1

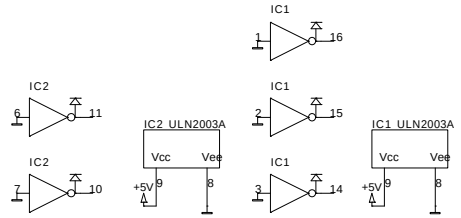


* option

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

VOR 1+2

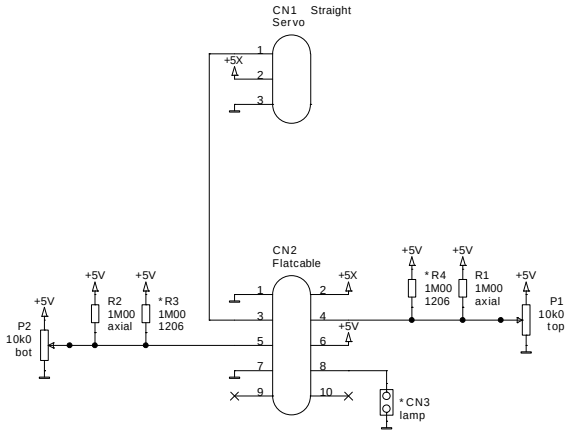




* option

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

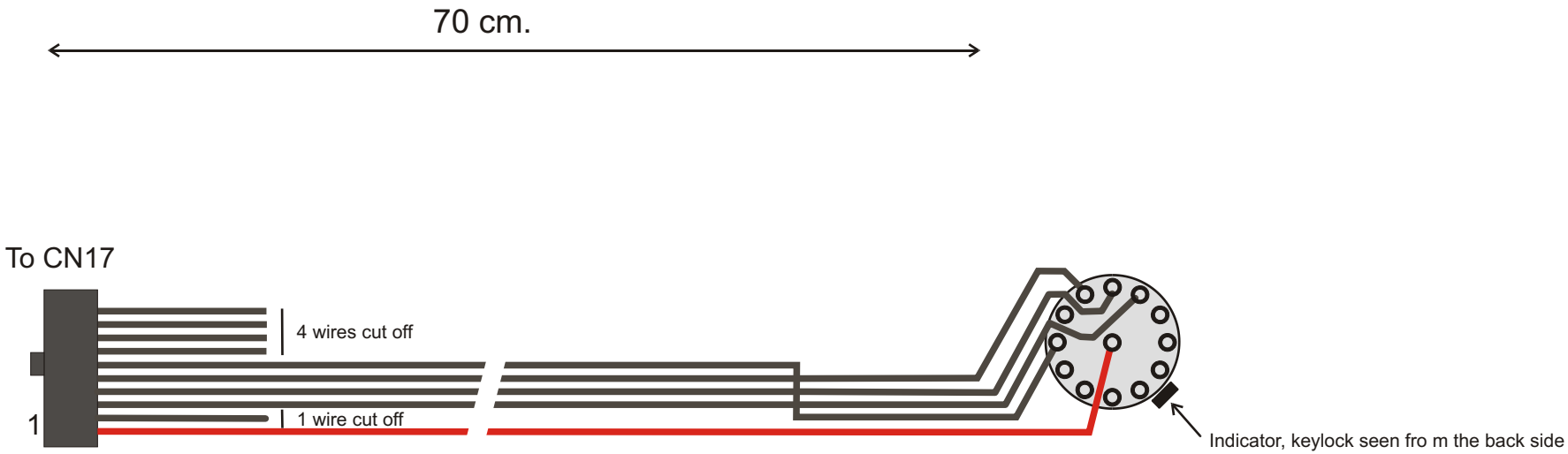
Warning



* option

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

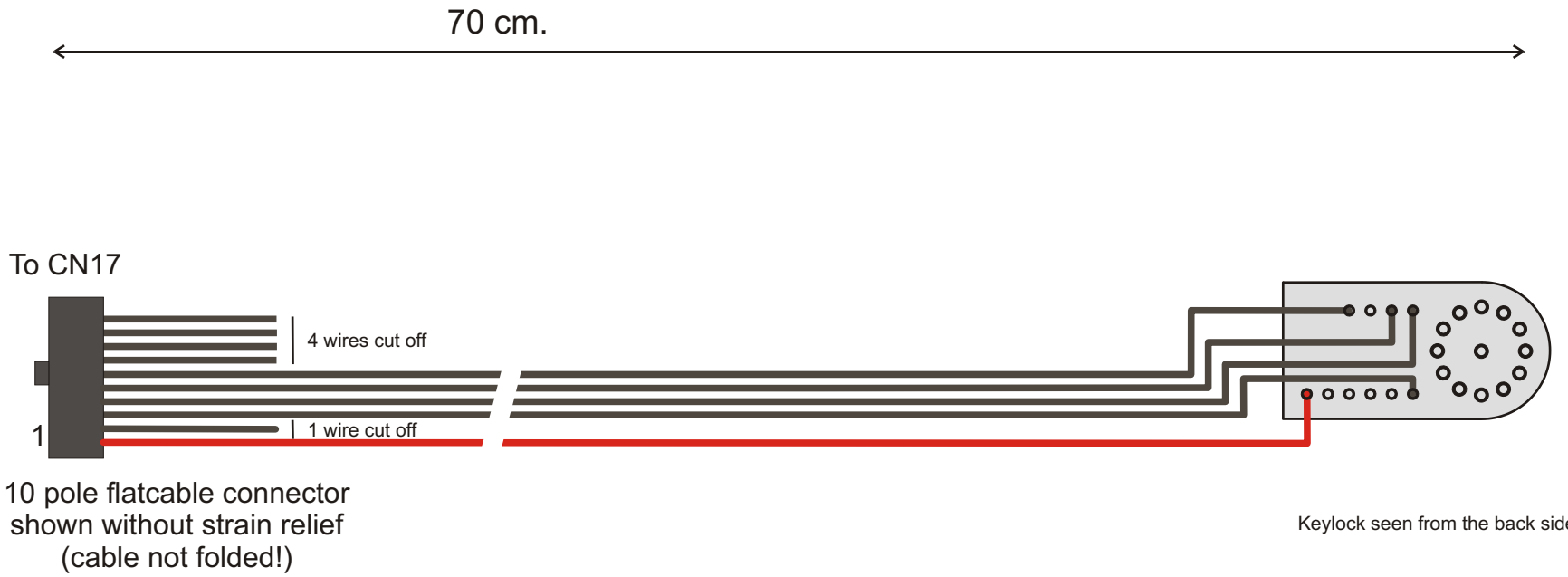
Starter Switch (Key Lock) connecting cable



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)

Starter Switch (Key Lock) connecting cable + PCB



Rev.	Date	Remarks	Product
1.1	22-03-2004		Key Lock Cable + PCB (Starter Switch)
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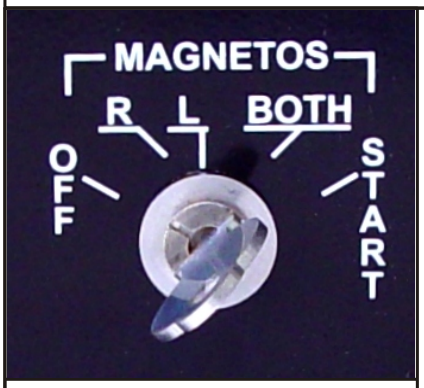
Starter Switch for Flight Simulators

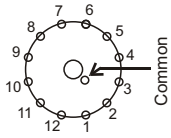
Parts Number 871 722 802 34 91



Picture of Starter Switch, mounted in TRC472 Panel.
(Panel not included)

Bottom View - connections 1

(for general use)

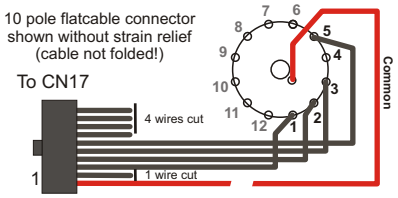


For Flight Simulation use, only pins 1 to 5 (positions 6-12 are mechanically locked).

Connections	1	2	3	4	5	C
Off	x					x
Right		x				x
Left			x			x
Both				x		x
Start					x	x

Bottom View - connections 2

(for use on the CCU1 or CCU2)



Connection Table

Connector CN17	Starter Switch
Pin 1	Common
Pin 3	Pin 1
Pin 4	Pin 2
Pin 5	Pin 3
Pin 6	Pin 5

The Starter Switch for Flight Simulation is constructed around a Rotary Switch combined with high quality stainless steel mechanics

The Starter Switch has totally 5 positions, whereof the 5th position is spring returned to the 4th position. The 5th position functions as a starter position.

Once mounted, the key cannot be removed and is therefore safe for loss.

The switch functions are:

- OFF
- Right Magneto
- Left Magneto
- Both Magnetos
- Start (spring returned to position “Both”)

The Starter witch can be controlled from the Central Control Unit as offered by SimKits via connector CN17 on the CCU or from any existing electronics.

Mounting Instructions

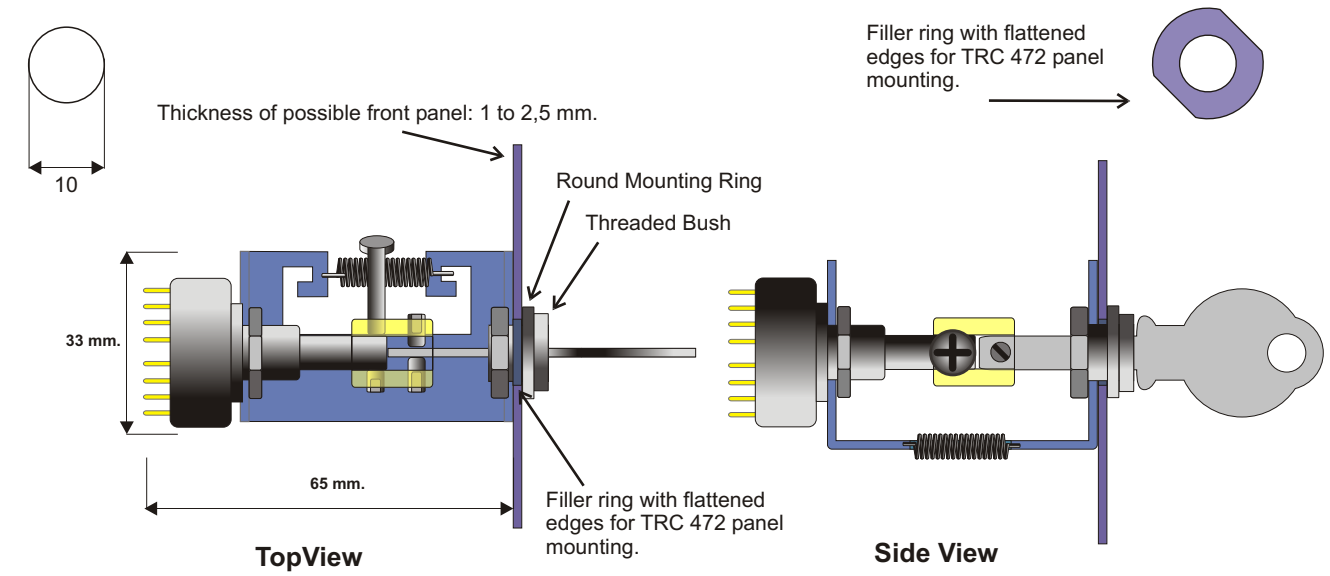
The Starter Switch comes assembled. To mount the switch into a panel, loosen the small screws on the copper bushing to release the key.
Now loosen the nut from the Threaded Bush, and mount it in a panel, together with the metal parts as shown in the picture below. Do not forget to use the Round Mounting Ring.The panel hole must be 10 mm. (0,3937”). When the Starter Switch is mounted into the TRC472 panel, the Filler Ring with flattened edges should be used.

It is strongly recommended to turn the small screws properly towards the key. Note: the small screws must be screwed in equally to keep the key in the middle.
Finalize the mounting by securing the screws with Locktite to avoid loosening during use.

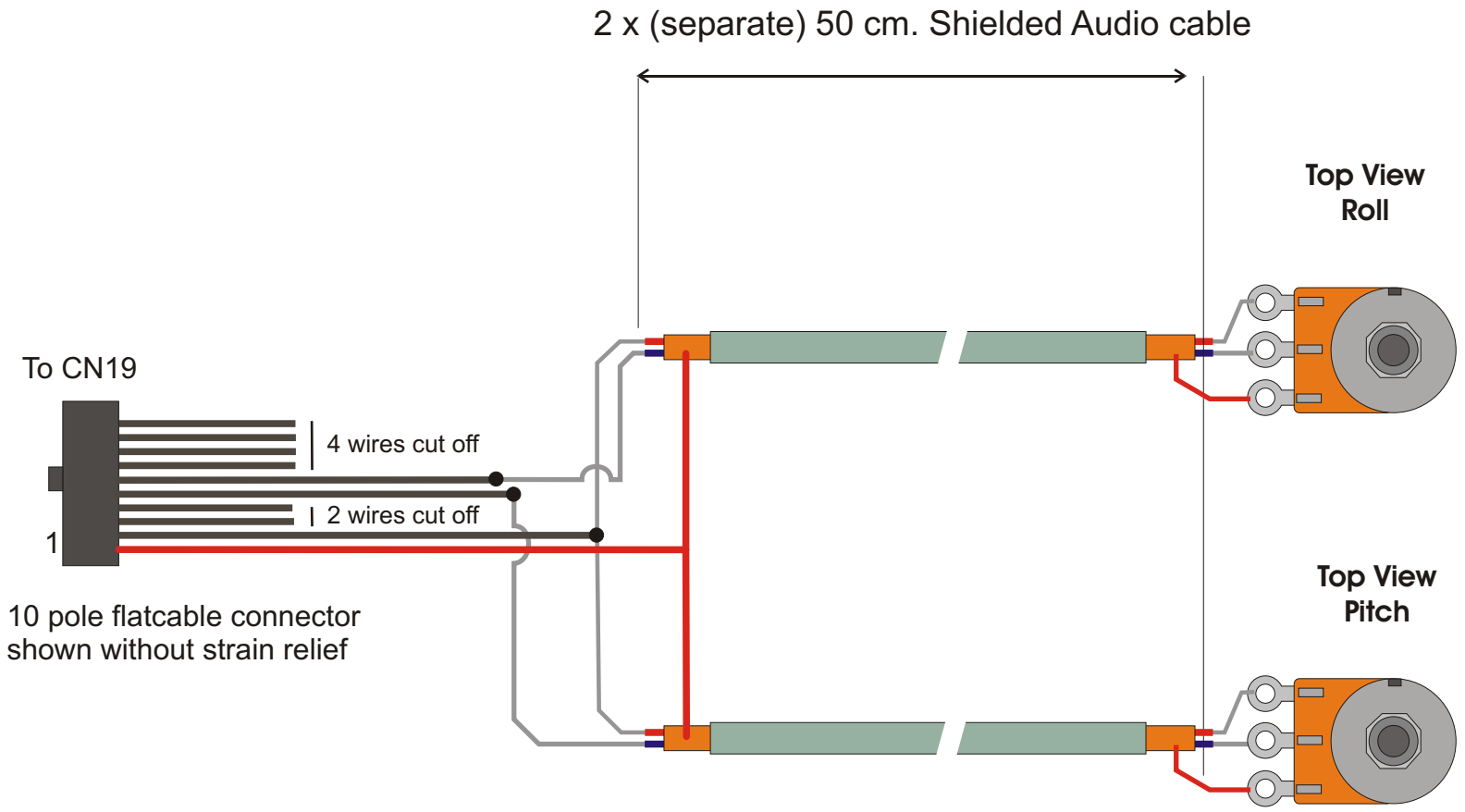
Contact specifications	
Contact configuration	1 CO (SPDT)
Rated current/Maximum peak current A	16/30
Rated voltage/Maximum switching voltage V AC	250/400*
Rated load in AC1 VA	4,000
Rated load in AC15 (230 VAC) VA	750
Standard contact material	AgCdO
Technical data	
Mechanical life AC/DC cycles	10 · 106/20 · 106
Electrical life at rated load AC1 cycles	100 · 103
Operate/release time (bounce included) ms	10/10 - (15/12 sens.)
Insulation according to EN 61810-5	3.6 kV/3
Insulation between contacts (1.2/50µs) kV	3 (4mm)
Dielectric strenght between open contacts V AC	1,000
Ambient temperature range °C	–40…+85
Protection category	IP 50

All measurements are in millimeters. (1 Inch = 25.4 mm.)

Panel cut-out

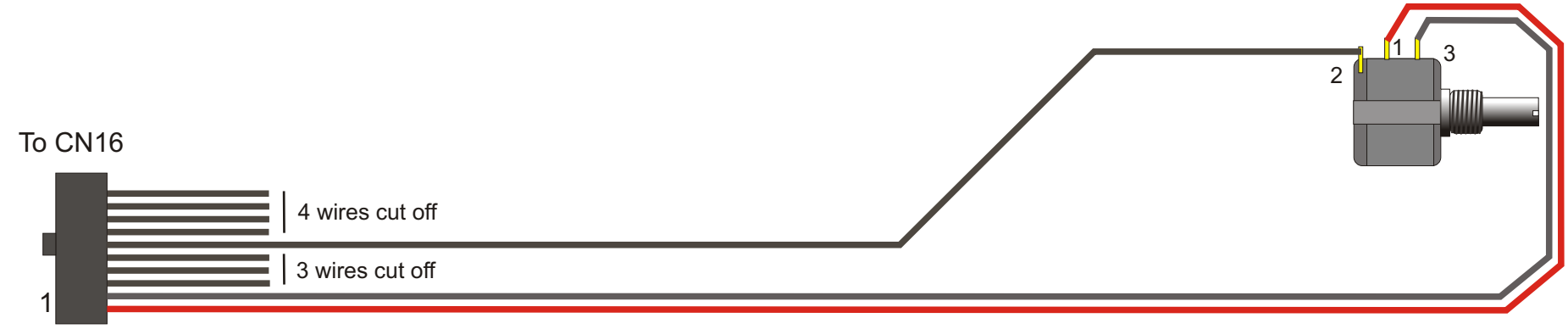


Yoke connecting cable



Rev.	Date	Remarks	Product
1.2	01-10-2003		Cable Yoke
1.3	29-04-2004		

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		
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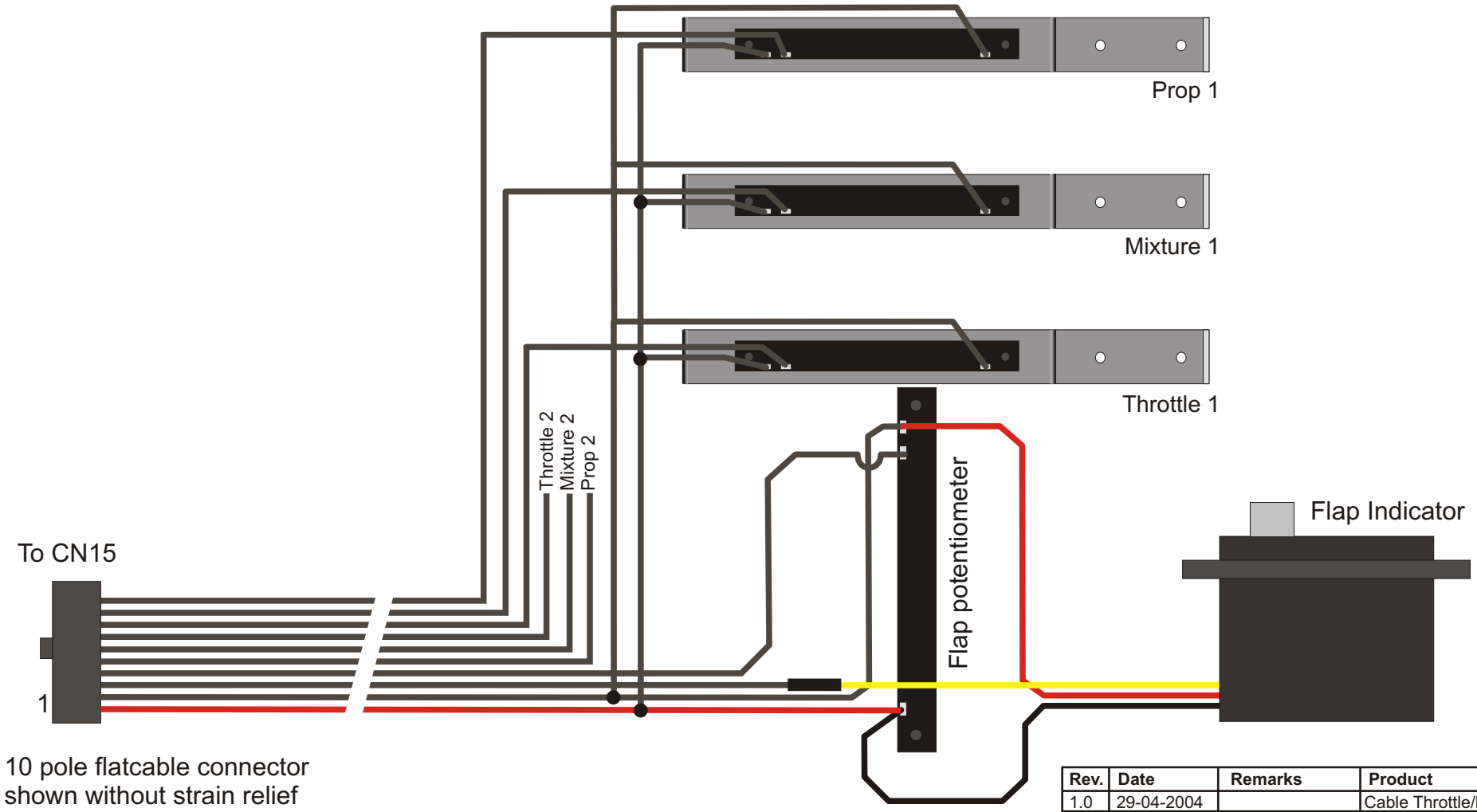
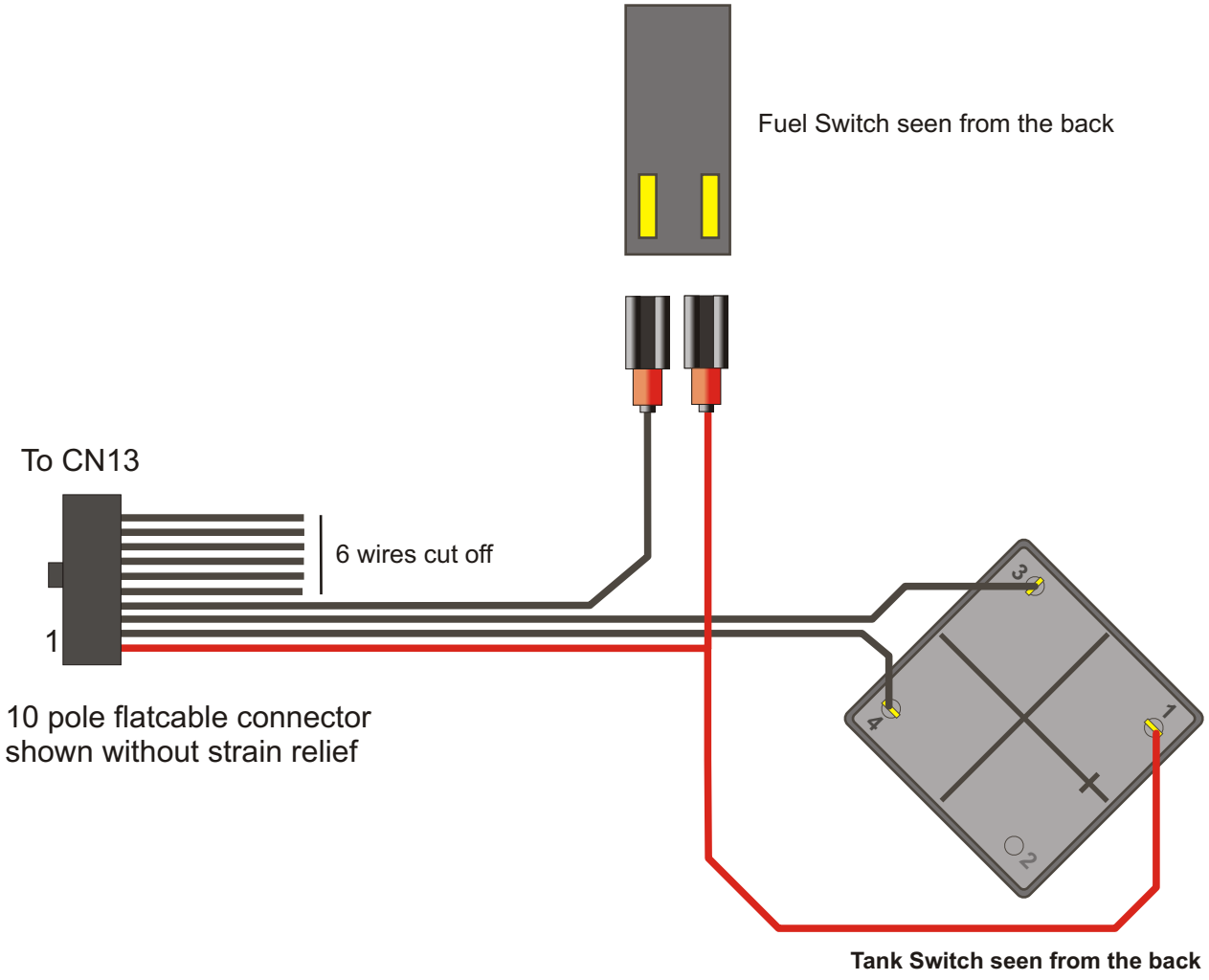
Flaps/Throttle/Mixture/Prop



10 pole flatcable connector
shown without strain relief

Rev.	Date	Remarks	Product
1.0	29-04-2004		Cable Throttle/Mix/Prop

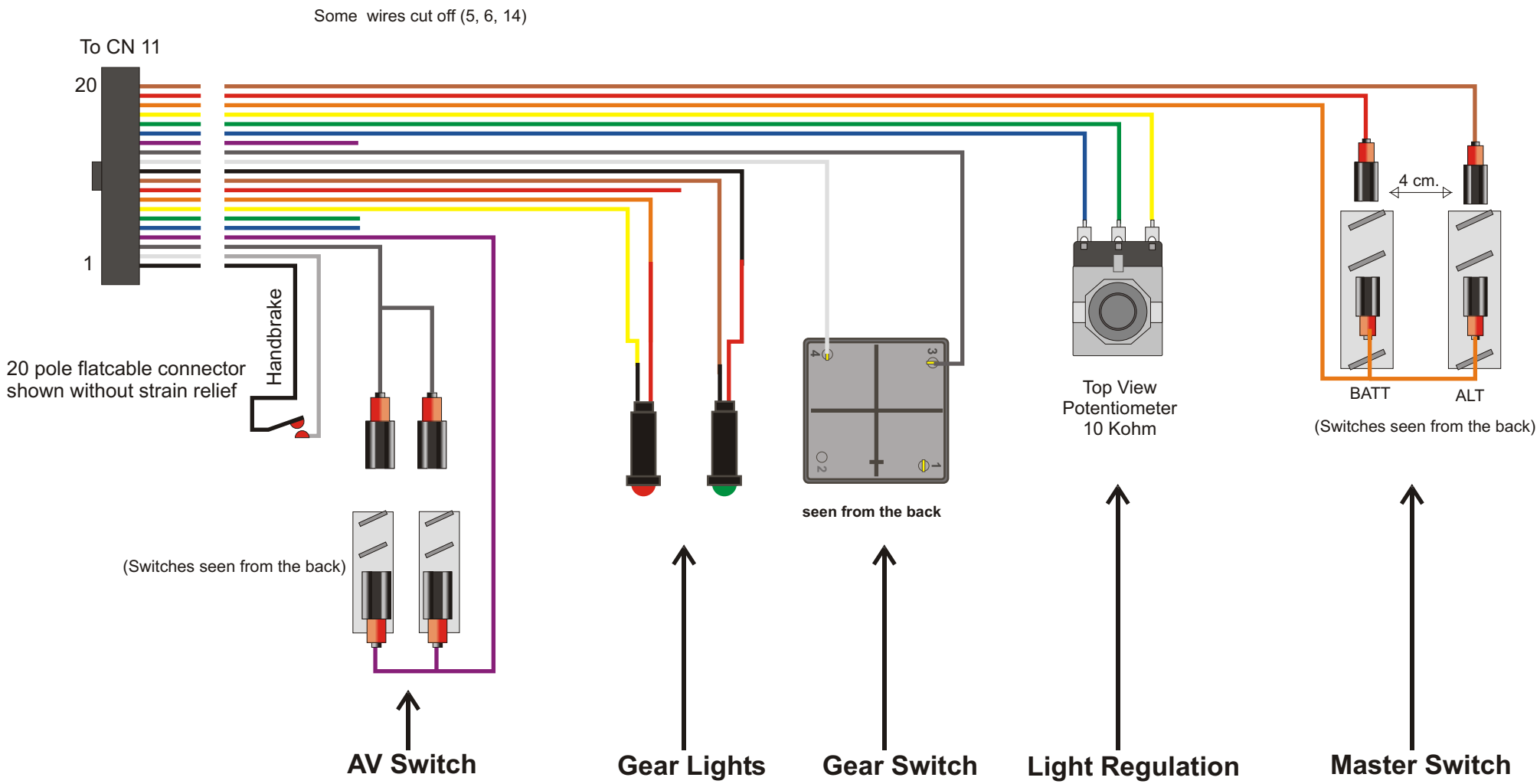
Tank Switch / Fuel cut-off connecting cable



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

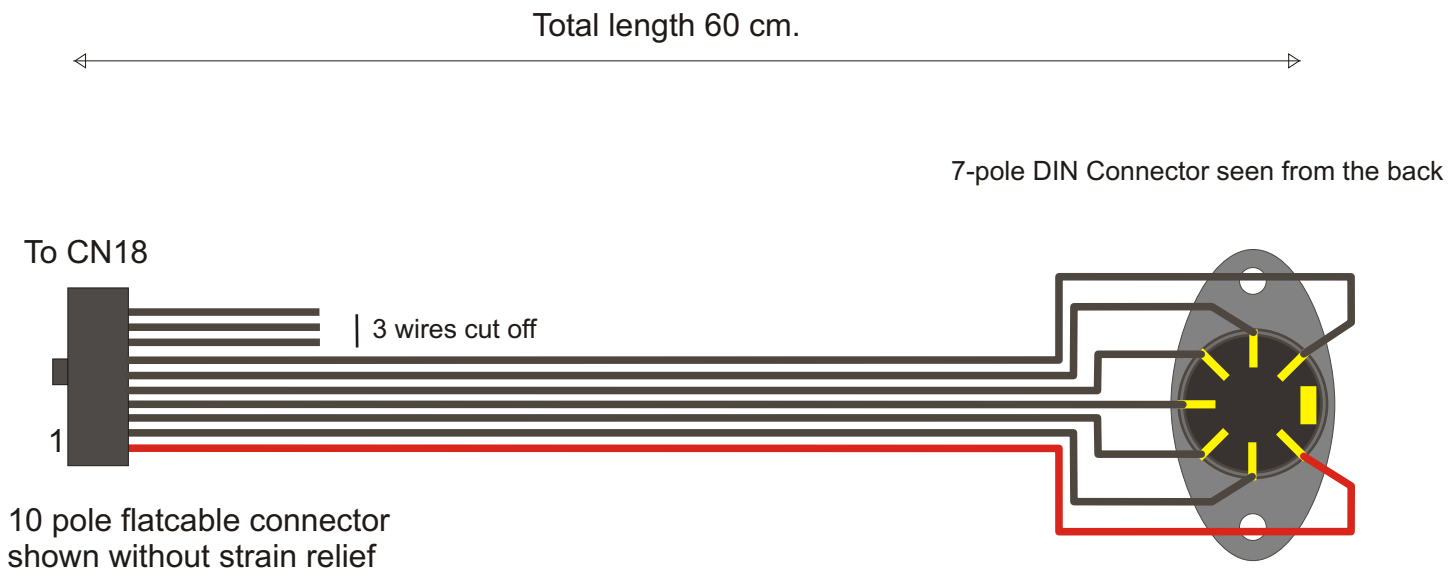
Rev.	Date	Remarks	Product
1.1	01-09-2003		Cable Tank Switch / Fuel Cut-off
1.2	01-10-2003		

Switches connecting cable



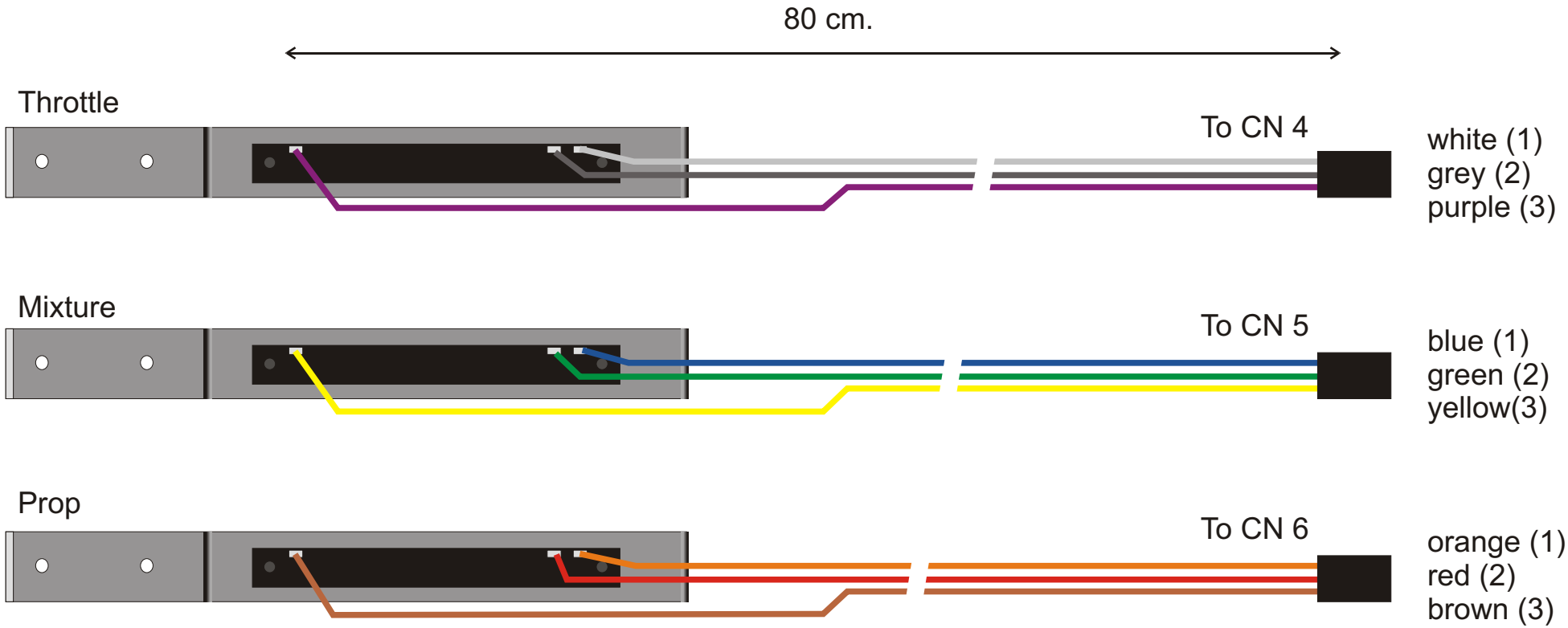
Rev.	Date	Remarks	Product
1.0	01-03-2004		CN12 Cable Assembly
			for **CCU v. 2**

Rudder Pedals connecting cable



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

Throttle Mixture Prop connection



Rev.	Date	Remarks	Product
1.1	01-09-2003		Cable Throttle/Mix/Prop
1.2	01-10-2003		