



# CAVOK

Simulations

## Manual for ATC/TCAS Panel Power Supply Conversion Kit



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- Please read this manual carefully before installing your product
- Please follow all Precautions to safely install your product. When these guidelines are not followed the product or the aircraft component to be interfaced might be damaged. This damage will then not be covered by warranty.
- All parts provided by Cavoksim Ltd. are strictly for Simulator use only and can not be used in aircraft

Convert the panel at your own risk. CAVSIM Ltd. takes no responsibility in case the panel is defective or becomes defective after the conversion. It is highly recommended to test your panel with a 115V/400Hz supply BEFORE ordering a conversion kit to ensure that your panel is not defective.

**All CAVOKSIM components are strictly for Simulator use only. CAVOKSIM components are not designed and certified aircraft use.**

## General Safety Warnings and Precautions

- Please read this manual carefully before installing the ATC/TCAS power supply board and powering up the ATC/TCAS panel. There is a risk of damaging the panel if the installation procedure is not followed correctly
- The ATC/TCAS panel contains highly static sensitive components. Touch the main processor board only at the edges. Avoid touching components and integrated circuits. Follow standard procedures for handling static sensitive components. The use of an antistatic wrist band is strongly recommended. Take extra care when working on the TCAS/ATC panel in a low humidity environment. Dry air increases the conditions that cause a static electricity discharge. Avoid electrical isolating materials at your workspace that can accumulate a charge, like synthetic carpet floor, styrofoam and similar materials.
- Take extra care when connecting the supply voltage to the panel. Applying a voltage that is too high or applying the voltage to the wrong connector pins can damage the power supply board or the panel itself. Do not connect or disconnect wires to the panel while the power is switched on. Take precautions to avoid accidentally connecting a 115V supply to the ATC/TCAS panel after the panel has been converted for 28V DC supply.

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# 1 Introduction

The CAVOKSIM ATC/TCAS PSU conversion kit is custom designed for Airbus A318-A340 ATC/TCAS control panels. With this board it is possible to power your panel from a standard 24-28V DC power supply instead of a specialized 115V/400Hz power source. It replaces the originally installed two 115V PSU units installed and fits exactly inside the panel without any permanent modifications. The conversion is “plug and play” and the panel can be restored to its original state at any time.

Many cockpit builders prefer to not have to deal with a 115V/400Hz power source. The available 115V/400Hz power supplies are mostly second hand static inverters from scrapped aircraft in unknown condition. These inverters often use very old technology which makes them unreliable and noisy. They are also designed as a short term aircraft emergency power source and not to run for a long time. Dedicated new 115V/400Hz supplies for simulator use are expensive and hard to find.

By installing a CAVOKSIM conversion kit this problem can be avoided and the whole simulator can be powered from the same standard 24-28V DC PSU. The board offers the following features:

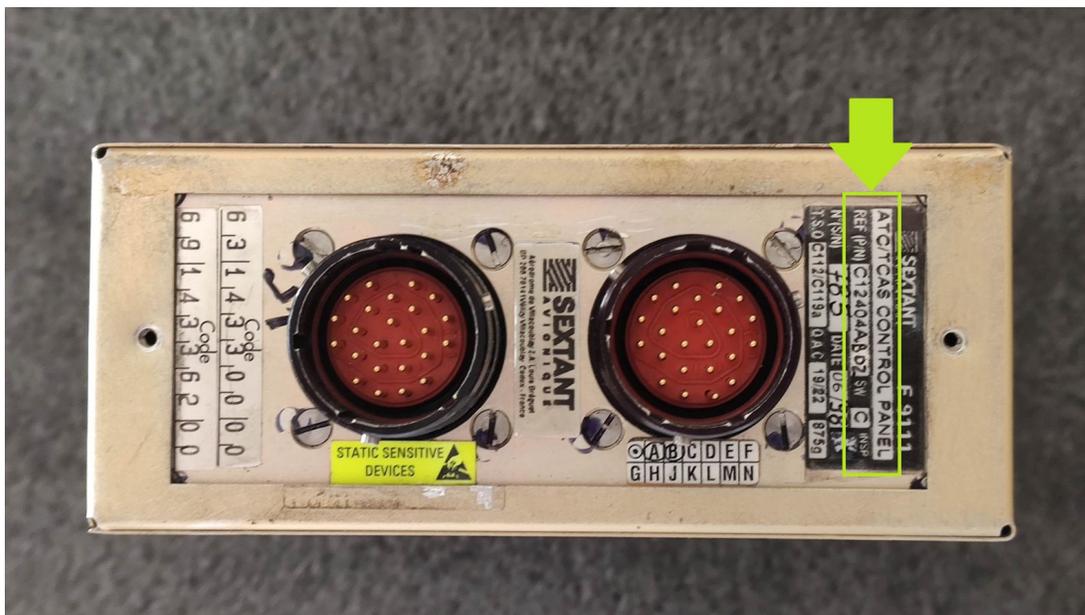
- Custom design that fits exactly into the ATC/TCAS panel without changing the outer appearance
- Highly efficient design to minimize waste heat. No external cooling required.
- Protection circuits monitor all voltages supplied to the panel and switch the power off in milliseconds if an overvoltage is detected. This protects the panel from damage in case of a PSU malfunction.
- Reverse input voltage protection
- LED indicators for most generated voltages to monitor the correct functioning of PSU
- Easy installation with basic tools
- The installation of the original 2 separate PSU boards is emulated. A failure of each of the two systems of the ATC/TCAS panel can be simulated separately by removing power from the associated connector
- The 28V conversion is fully reversible to return the panel to its original state if desired

## 2 Compatibility

The CAVOKSIM ATC/TCAS PSU conversion kit is compatible with Sextant/Thales ATC/TCAS Control Panels with the Part Number **C12404AB02**. They are used in many Airbus Aircraft.



Front View of the ATC/TCAS Panel



Rear View with part number location

### 3 Contents of the Conversion Kit



The CAVOKSIM ATC/TCAS PSU conversion kit contains the following parts:

- 1x ATC/TCAS-PSU-1 Main board
- 1x ATC/TCAS-PSU-2 Adapter board
- 2x Acrylic support brackets
- 4x M2 screws

## 4 ATC Panel Overview

Airbus Aircraft have 2 independent transponders installed. This is for redundancy in case that one of the systems fails. The ATC/TCAS Panel internally also has 2 redundant systems that are connected to their respective transponders so that a single failure inside of the panel does not render both transponders unusable simultaneously.

The ATC panel main board contains 2 identical processor units with microcontrollers that are powered by 2 separate identical 115V/400Hz power supplies. Each processor unit can control the keyboard and the display of the panel and send Arinc data. Only one processor unit and transponder can be active at a time. The system selector switch on the front panel selects the active system. Airlines usually alternate between the 2 systems to ensure that both are used evenly. Usually system 1 is used when the Captain is Pilot flying and system 2 for the First officer.

The Panel has 2 connectors in the back that connects it to the respective transponders 1 and 2. The power supply to the panel is also separated with each system powered by its own connector.

When the conversion kit is installed both original 115V PSUs are removed and replaced with a single 28V PSU board. The board plugs into the main processor board from above.

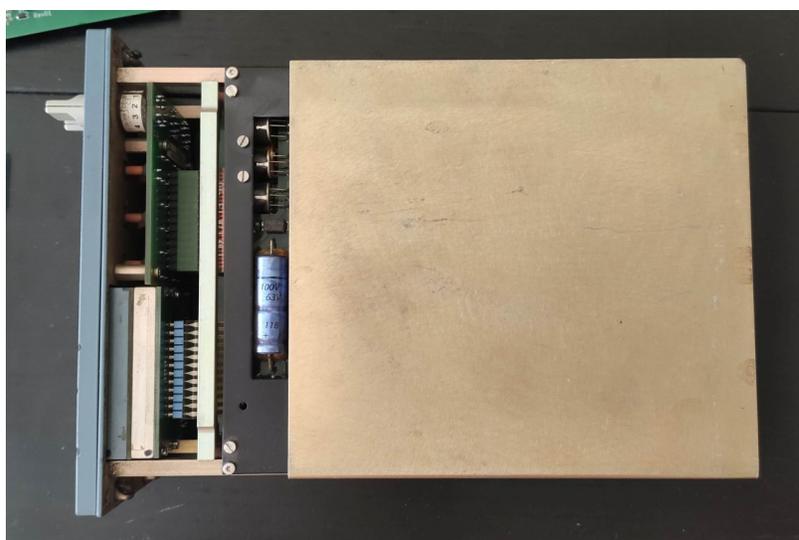
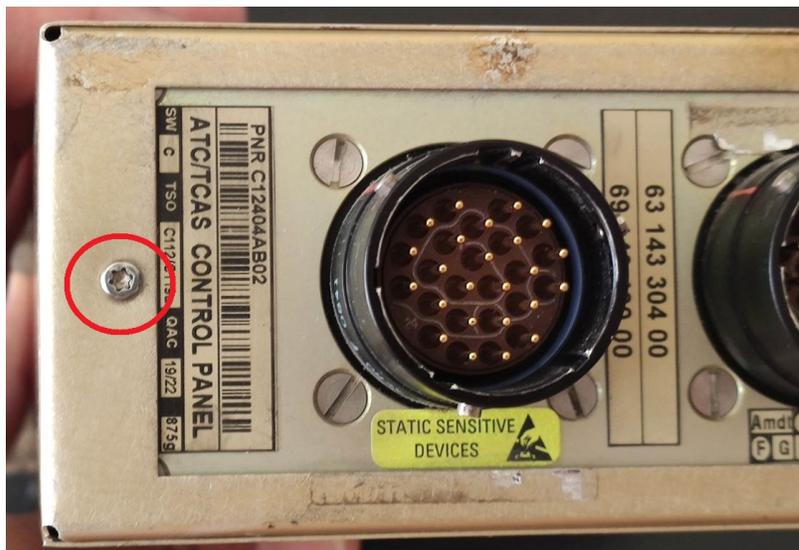
The 28V PSU board detects if voltage is supplied from connector 1 and/or connector 2 and switches the systems 1 and 2 of the ATC panel on and off accordingly to copy the behavior of the two original 115V PSUs.

The power consumption of the ATC Panel is low and no active cooling is required.

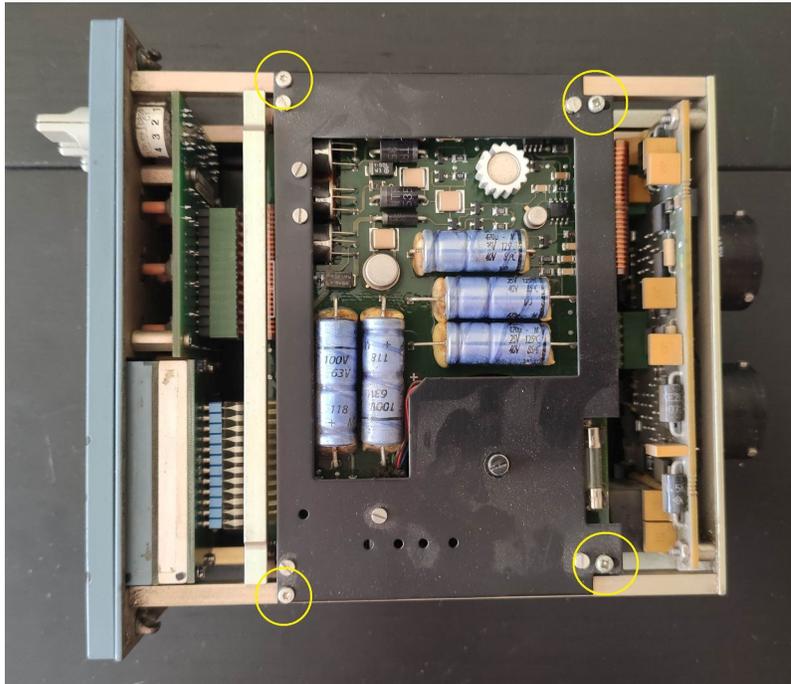
## 5 Disassembly

**WARNING:** Follow standard precautions for handling static sensitive devices. A static discharge can easily damage the ATC panel processor board.

Remove the 2 screws located at the edges from the back of the panel. Carefully slide the housing backwards and separate it from the panel assembly.



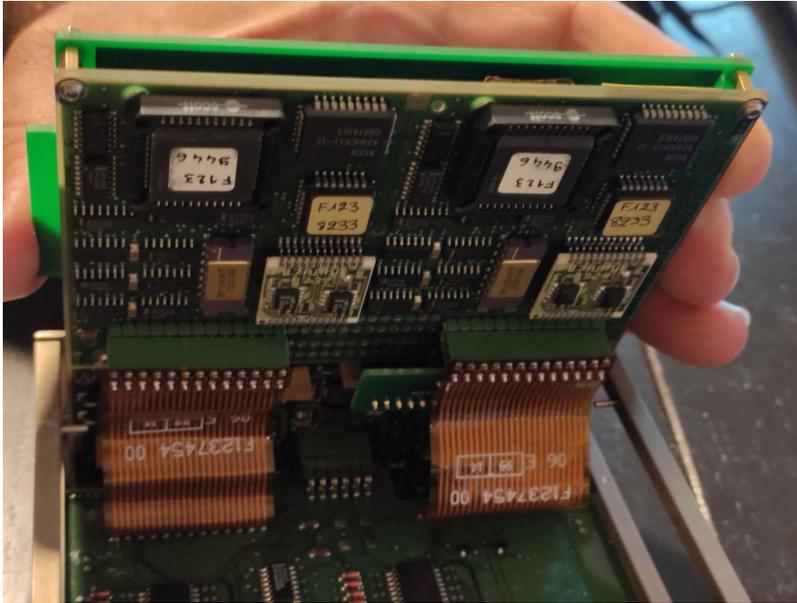
After removing the housing the system 1 power supply is visible on top:



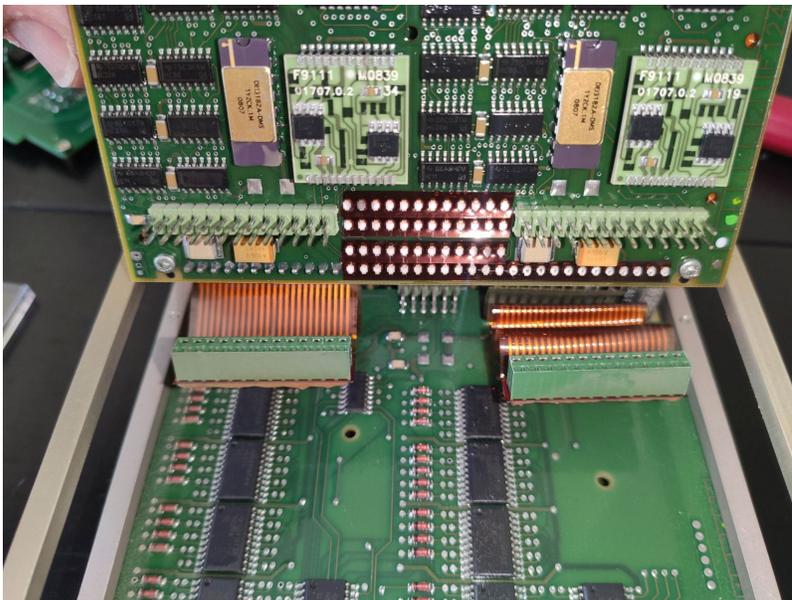
Remove the 2 screws that connect the PSU with the frame (on the left side above). After that the PSU can carefully be lifted upward. It is still connected to the back of the frame with hinges via 2 screws (on the right side above).



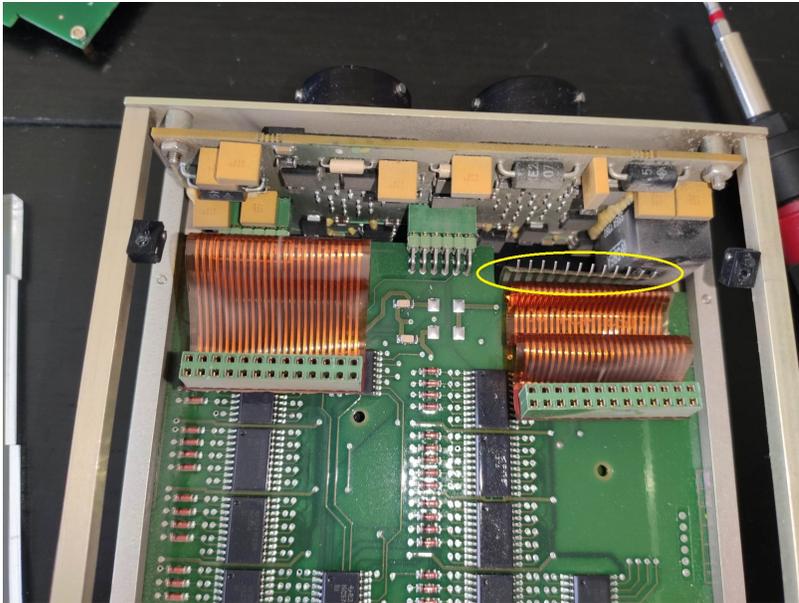
You can now either remove all 4 screws shown above at once, which will disconnect the PSU/processor board assembly from the frame and then disconnect the cables. Or you can disconnect the cables first and then remove the remaining 2 screws. Either way, be careful to bend the flat cables as little as possible.



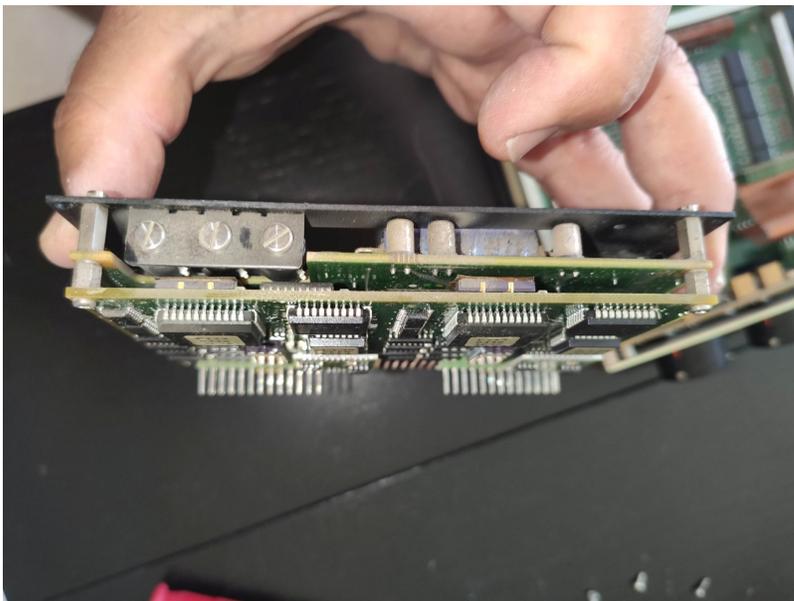
After the top PSU is lifted upward, you will see the main processor board as shown above. Carefully disconnected the 2 green pin header connectors as shown. Pull evenly on both edges of the connector and avoid touching components on the processor board. Try to bend the copper colored flat cables as little as possible. They are a frequent source of contact problems and can fail when bent too often.



Unplug the flat cable that connects the bottom PSU to the processor board (yellow circle in the photo below). Try not to bent the contacts:



Remove the 2 remaining screws that connect the Top PSU/processor board assembly to the frame (see yellow circles on page 10), if not already done. The Top PSU can now be removed from the frame together with the processor board.

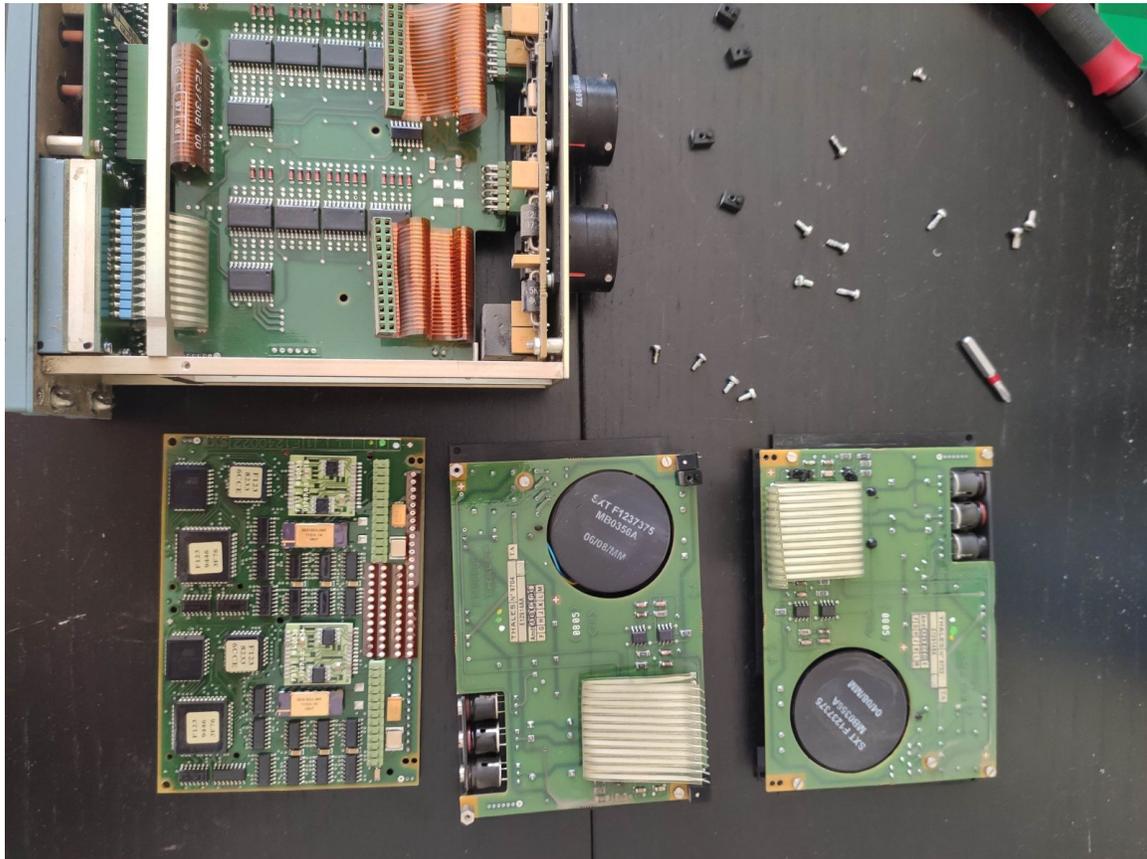




Now follow similar steps as before to remove the bottom PSU from the frame as well. Remove all 4 screws shown on the photo on page 10 to disconnect the bottom PSU from the frame and remove it.



This is a photo of all disassembled parts. Only the processor board is needed for the conversion. The two 115V PSUs and the screws and black hinges are not needed anymore.



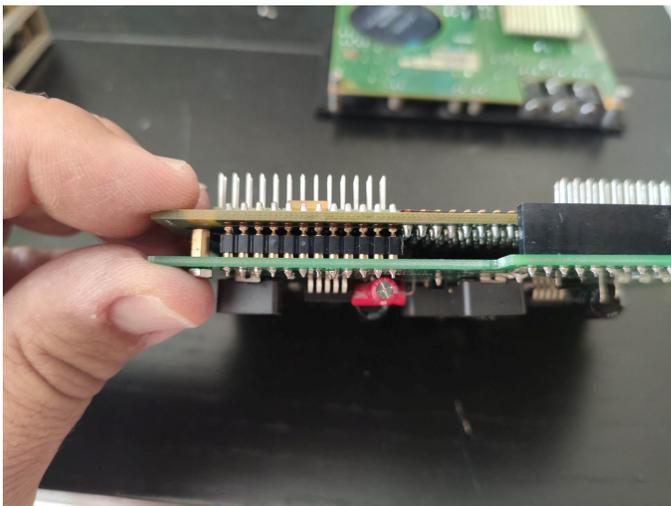
### 3 Assembly

To install the Cavoksim PSU board first connect it to the Processor board with the following steps:

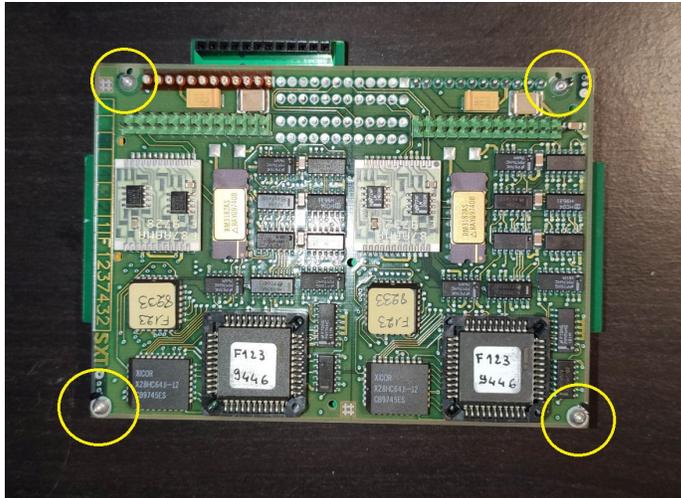
Align the Cavoksim PSU board and Processor board on top of each other as shown in the photo below



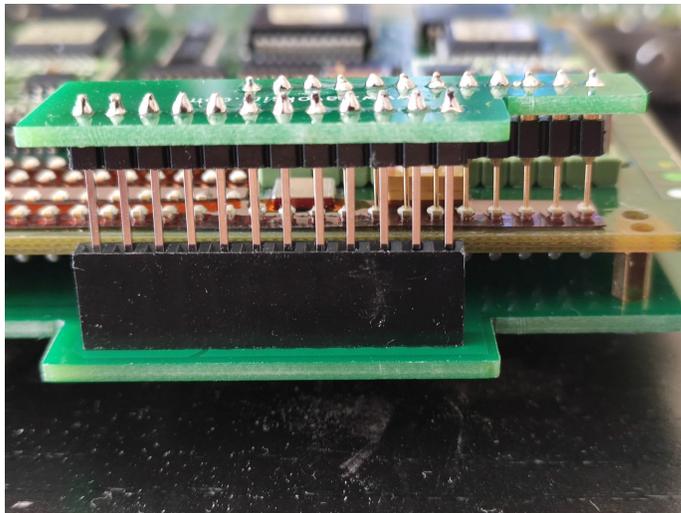
Carefully insert the PSU Pin connector into the Processor board. Make sure that the pins are exactly aligned with the socket because they are delicate and can easily be bent

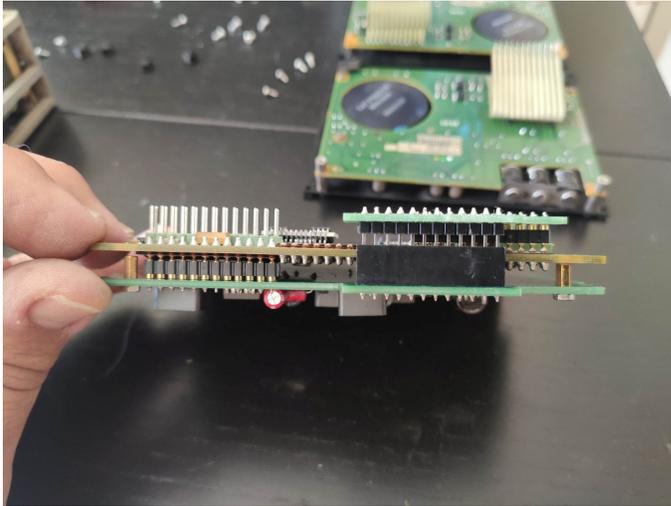


Screw the processor board to the PSU with the 4 provided M2 screws. Do not use the original screws because they will not fit.



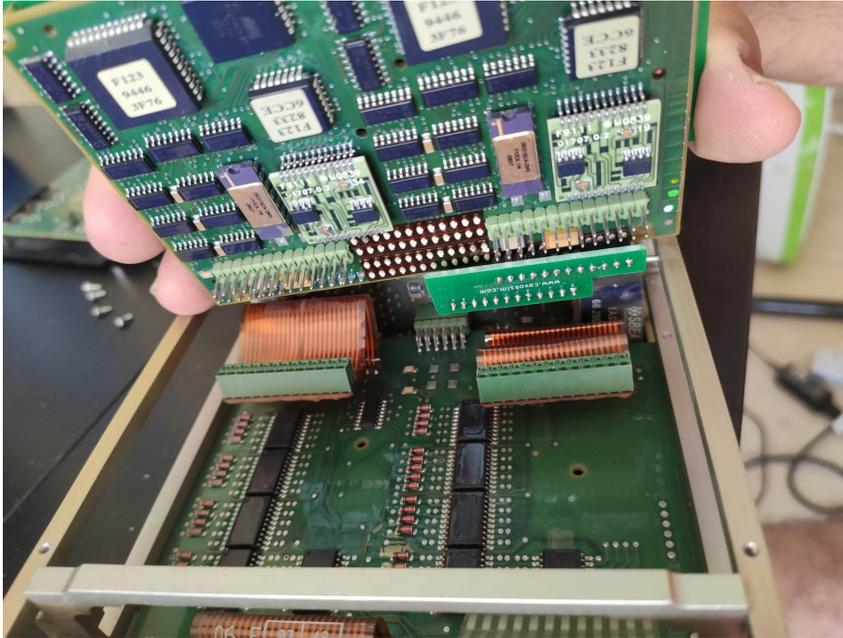
Next insert the ATC/TCAS-PSU-2 Adapter board as shown below. As before, align the connectors carefully and avoid bending the pins.





## 4 Installation

The Processor board/PSU assembly can now be reinstalled into the ATC frame.

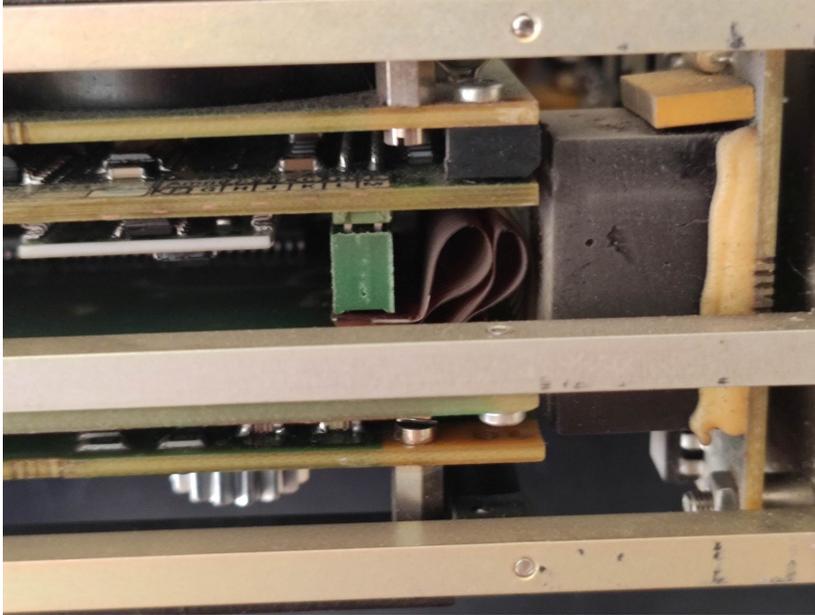


First align the assemblies as shown above. Then reinsert the green connectors carefully into the processor board.

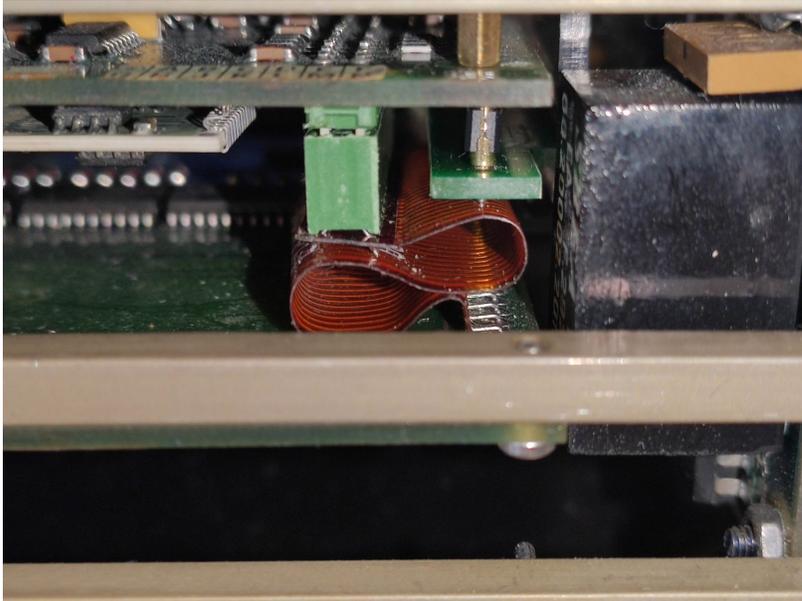


Please note that the small adapter board now partly occupies space that has previously been used by one of the flat connector cables. For reassembly it is recommended to bend the cable in a different way to make space for the adapter board as shown in the following photos. This is not mandatory but it can help to protect the cable from damage.

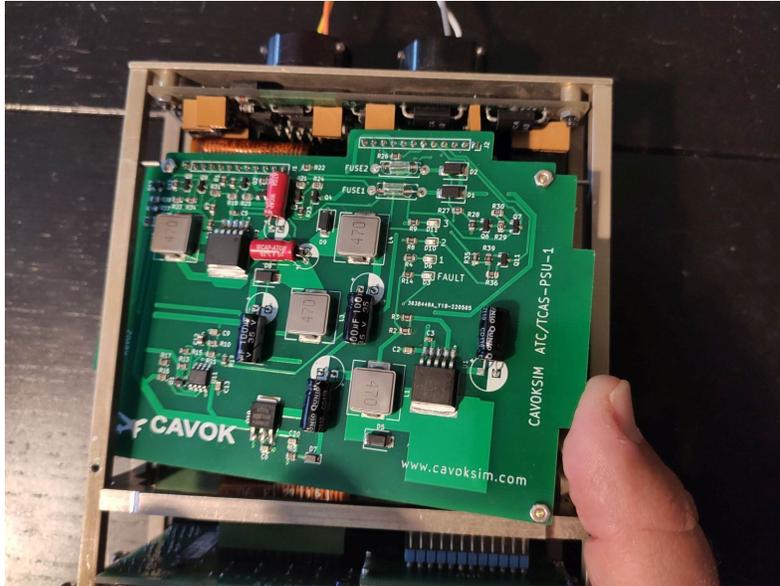
Original position of the flat cable:



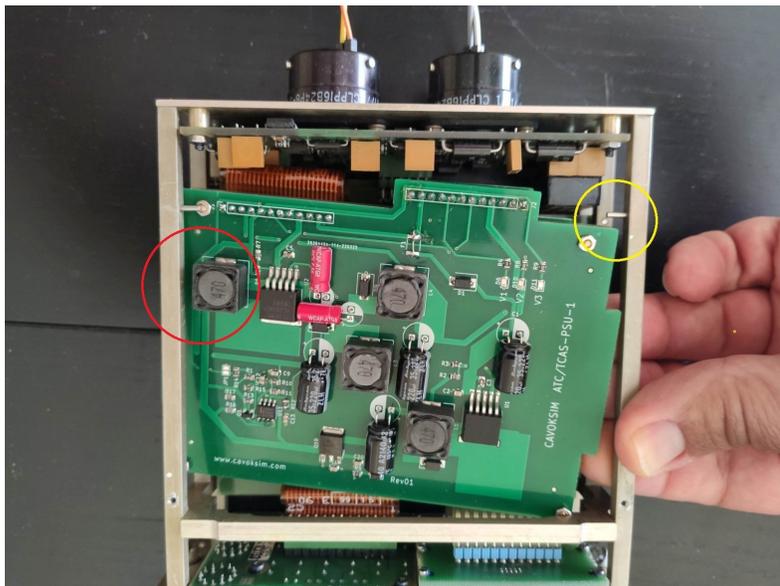
Recommended position of the flat cable after installation of the Cavoksim PSU board:



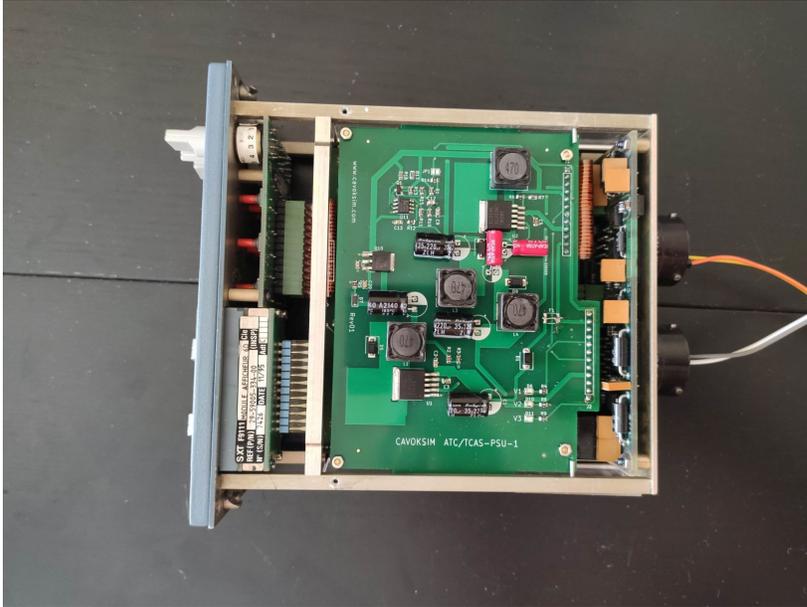
The Cavoksim PSU board is wider than the frame of the ATC panel. For installation into the frame insert it on the left side first (viewed from the front) as shown on the photo below. **Be careful not to damage any electronic components by forcing them against the metal frame.**



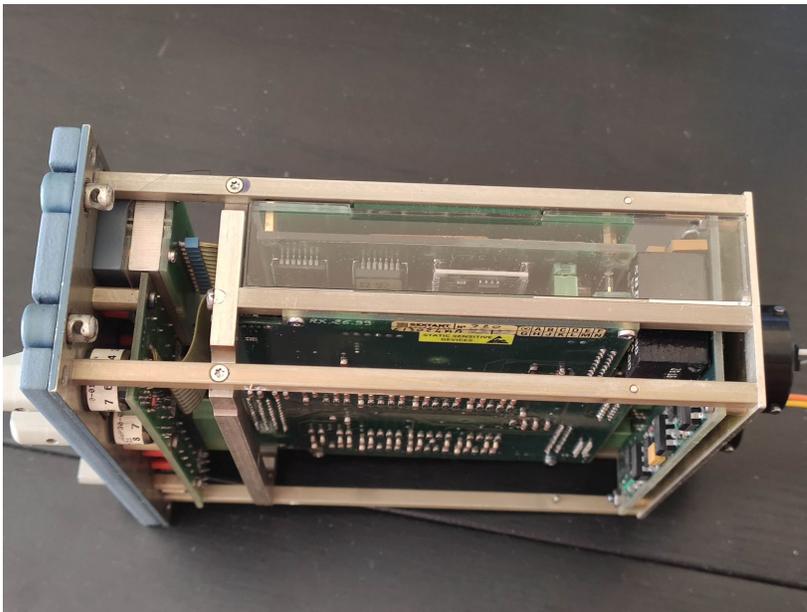
After that push it more to the left until it is clear of the frame on the right side and the small pin sticking out of the frame (yellow circle in photo below). Then it can be fully inserted:



Insert the assembly carefully and do not apply excessive force. Be especially careful not to press the ceramic inductor against the metal frame which (red circle in the photo above)



Once the PSU/processor board assembly is in the correct position as shown above it can be secured by inserting the two acrylic mounting brackets that are provided with the kit. The brackets hold the PSU assembly securely in place. In turn the brackets are held in place by sliding the ATC panel housing over the frame.



The PSU can be moved forward or backward as required until it fits into the notch of the acrylic bracket. It may be helpful to use a small screwdriver to press the board upwards against the frame while the acrylic bracket is inserted.

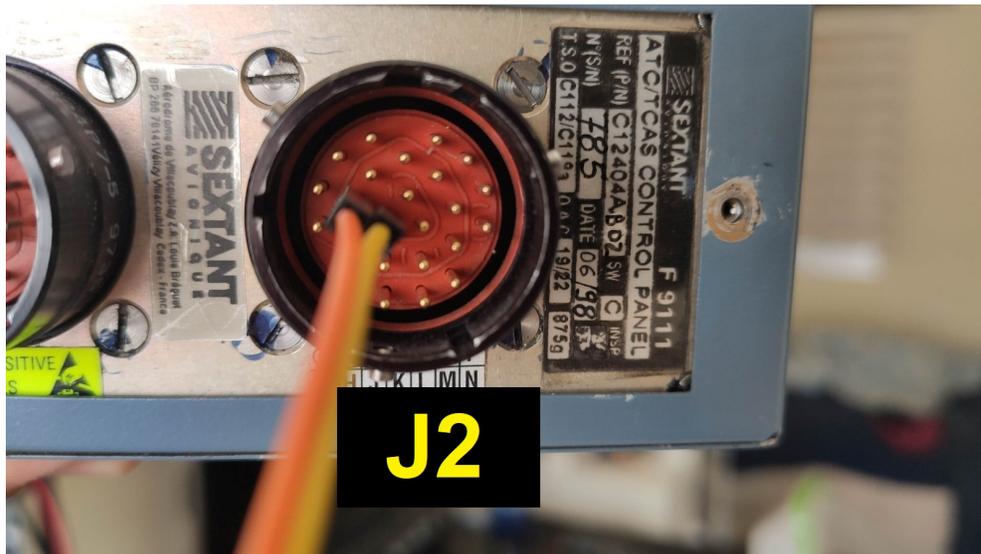
## 5 Electrical Connections

The basic electrical connections to the ATC panel are easy and straightforward. As described in Chapter 4 the ATC panel contains two separate systems which are separately powered via connectors J1 and J2. Looking at the back of the panel, J1 is on the left side and J2 on the right. J1 powers system 1 and J2 powers system 2. The active system is controlled by the selector switch on the front panel. For testing purposes it is recommended to initially only supply power to one system/connector. After confirming that this system is working the other side can then be connected as well.

To operate the ATC panel with the CAVOKSIM PSU a 24 to 28V DC standard power supply is required. The Cavoksim PSU board has protection against reverse polarity, but not against overvoltage.

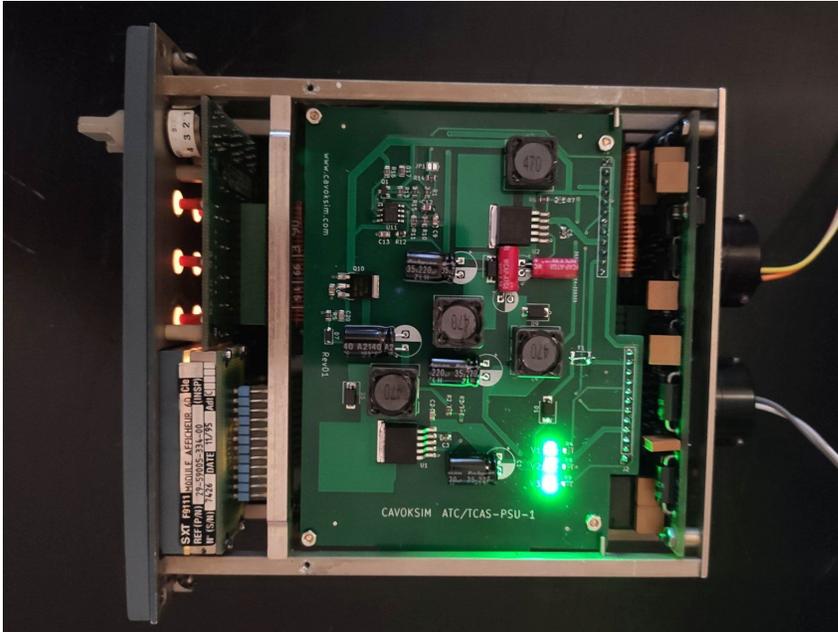
**Do not apply a voltage higher than max. 29V to the board.**

The power consumption of the ATC panel is low. The current is approximately 100mA at 28V with both systems operating. However, during start up a higher current is required for a short time. A power supply with 1Amp or greater is recommended.



24-28V DC voltage is provided to the panel via pin 3 and 4 of both connectors. The pin numbering is starting at the center of the connector and then spiraling outwards. Pin 1 is marked with '1'. Pin 3 has to be connected to negative/GND and Pin 4 has to be connected to positive/+28V (GND is the yellow wire in the photo above and + is the orange wire). **Check carefully that you apply the power to the correct pins. Applying power to the wrong pins might damage your panel.**

The panel can be powered on without installing the sliding cover for testing purposes. 3 green LEDs as shown on the photo below should be visible when the PSU is working correctly. The LCD panel on the front will show a 4 digit transponder code, but only when the selected system is currently powered by its respective connector.



A transponder code can be entered without any connection to an Arinc board or PC. However to transmit the current transponder code and the position of the panel switches to a simulator an Arinc 429 decoder board is required.

## 7 Troubleshooting

If one or both sides of the panel don't display a transponder code or if the displayed transponder code is corrupted (invalid numbers) it doesn't necessarily mean that the processor board is defective. If the flat ribbon cable that connects the processor board with the IO/display board has bad or intermittent contact it can generate this kind of malfunction. Try to reseal/ clean the connector. Check the flat cable for electrical conductivity or intermittent contact. **Be careful to follow all standard precautions against electrostatic discharge to avoid damage to the processor board.** Older technology integrated circuits as used in the ATC panel are much more sensitive to electrostatic discharge than modern components.

You might notice that the LCD display of your ATC panel has a bad contrast or is difficult to read due to blank spots. The LCD displays in both older Airbus RMPs (Radio Management Panels) and ATC panels have incandescent backlight that create high temperatures. Over time this heat can damage the LCD. This process is irreversible. However Cavoksim offers replacement LCD kits that fit for the ATC panels. These LCD kits are developed for simulator use and are much more affordable than the original spare parts.

When the green LEDs on the PSU board don't illuminate, check that the power supply is working and connected to the correct pins. Check the polarity. Contact Cavoksim for assistance if the problem can not be resolved.