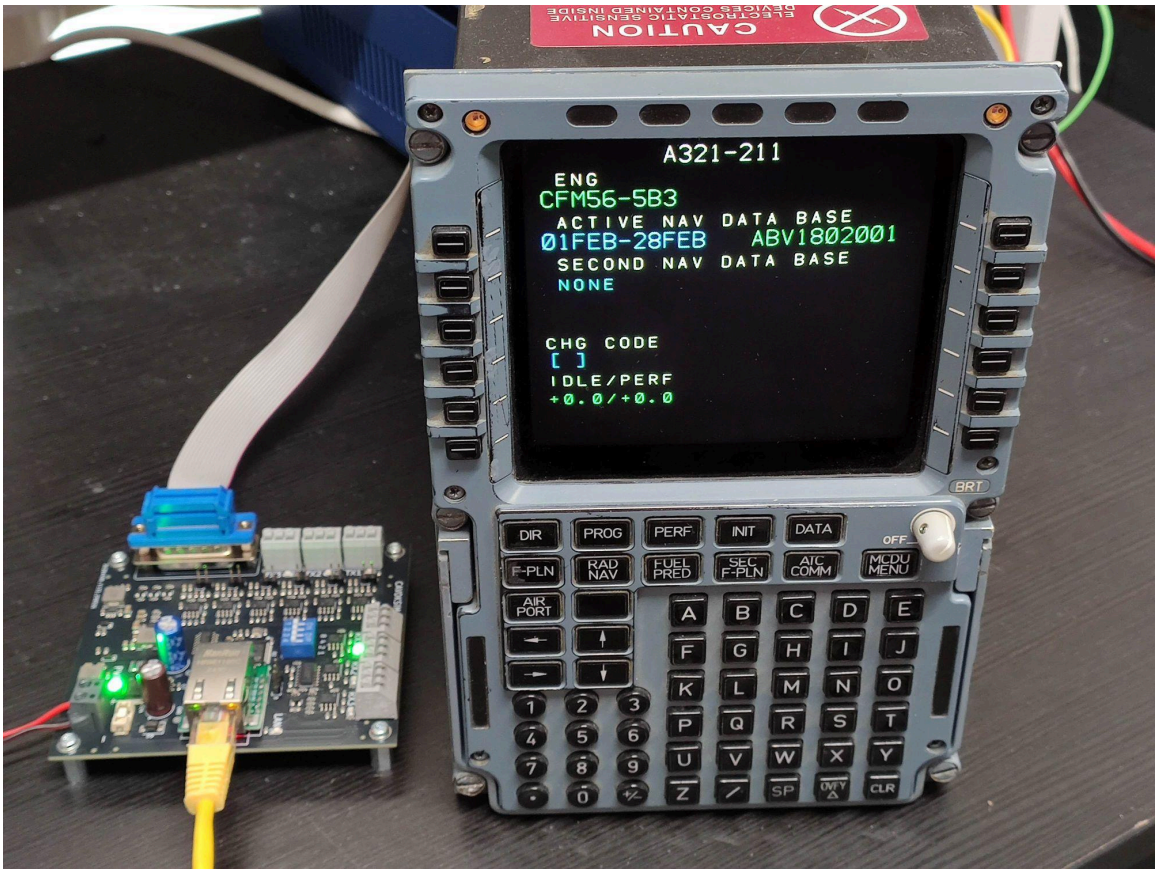
Arinc MCDU Interface Manual



Rev 1.1 9/2025

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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.
- ➔ The MCDU operates with high voltage. The User is solely responsible for the safe wiring and operation of the MCDU and the safe usage of CAVOKSIM components.

General Precautions

- **The Cavoksim Arinc board is a static sensitive device. Observe the following precautions to reduce the possibility of electrostatic discharge:**
  - Handle the board carefully, holding it only by its edges.
  - Do not touch solder joints, pins, or bare circuitry.
  - The use of a grounding system improves safety. Wear an electrostatic-discharge wrist strap, if one is available. If you do not have a ESD wrist strap, first touch a grounded metal object to discharge static electricity before touching the board
  - Take extra care when you handle the board in a low humidity environment. Dry air increases the conditions that cause static electricity to accumulate.

- **Take extra care when connecting the main supply voltage to the board. Applying a voltage that is too high or has reversed polarity or applying the voltage to the wrong board terminals can damage the board. Do not connect or disconnect wires to the board while the power is switched on.**

- **When powered, keep the Arinc board and the MCDU adapters away from metal objects or conductive surfaces that might touch the boards and create short circuits with exposed solder joints and components of the boards. Install the boards in protective enclosures.**

ELECTRICAL SAFETY:

This kit is intended for qualified personnel to install it into flight simulator assemblies. The qualified personnel are responsible for the safe installation.

The MCDU must be operated with a galvanic isolated high voltage power supply or the MCDU case and/or the GND terminal on the MCDU adapter board must be connected to mains EARTH

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1 Introduction

The Arinc MCDU interface board connects a genuine aircraft MCDU to a PC flight simulation via LAN/Ethernet. One board is needed per MCDU. It is the easiest solution for this purpose on the market and is mostly plug and play. Currently only X-Plane 12+ and Toliss aircraft are supported. All Toliss aircraft types can be used.

The Interface solution consists of the Arinc interface board and 2 adapter boards that plug into the connectors on the back of the MCDU. It is also possible to manually wire the Arinc board to the MCDU via an original aircraft connector. All MCDU types used in Airbus aircraft (both with 1 or 2 connectors, Honeywell and Thales, CRT and LCD display) are supported.

Additionally to the Arinc interface solution you will need a 115V/400Hz avionics power supply or aircraft static inverter to power the MCDU, a 24-28V DC power supply for the CAVOKSIM MCDU Arinc board and static inverter and a 5V DC power supply for the MCDU keyboard backlight. You will also need a forced air cooling solution because all MCDU types (especially the CRT types) need active cooling to prevent overheating. We can provide a STL file to 3D print an adapter that plugs into the back of the MCDU. WIth this adapter you can connect a standard hose and connect any small vacuum cleaner for cooling.

WARNING: DO NOT ATTEMPT TO OPERATE YOUR MCDU FROM A NORMAL 115V/50-60HZ SUPPLY! USE A 115V/400Hz AVIONICS GRADE SUPPLY ONLY

WARNING: DO NOT OPERATE YOUR MCDU FOR MORE THAN 5 MIN WITHOUT FORCED AIR COOLING

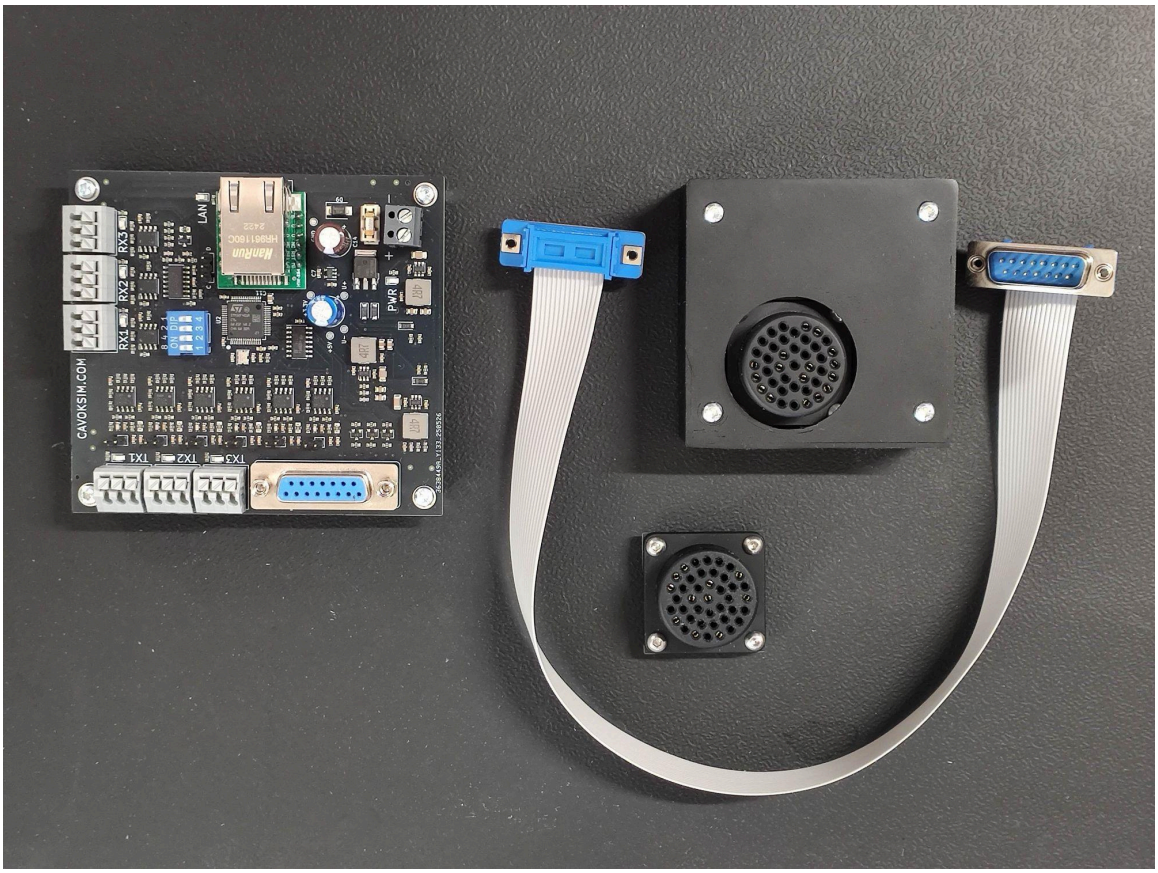
The Arinc MCDU interface adapter boards are not compatible with the CAVOKSIM MCDU-PSU power supply boards. If you have installed a CAVOKSIM MCDU-PSU board in your MCDU you can not use the adapter boards and have to manually wire the Arinc interface to the MCDU.

The MCDU interface solution uses a CAVOKSIM AR-33 Arinc 429 interface board. This board produces very high quality Arinc 429 signals. The board has 3 receive channels and 3 transmit channels. For MCDU interfacing, only one receive and up to 2 transmit channels are used. The AR-33 can be used to interface all kinds of Arinc devices. The MCDU version of the AR-33 has a special firmware that allows it to communicate with the CAVOKSIM MCDU server software on the PC.

Only the MCDU versions of the AR-33 Arinc board can be used for MCDU interfacing. Other types of AR-33 boards will not be accepted by the MCDU server software

2 MCDU Kit content

The MCDU interface kit contains the following parts:



- AR-33 Arinc interface board with MCDU firmware
- J1 connector board with protective enclosure
- J2 connector
- Flat ribbon connector cable

3 Installation and wiring instructions

The MCDU kit is mostly plug and play and makes the installation as easy as possible. However, to avoid damage to your kit or the MCDU please read the instructions carefully.

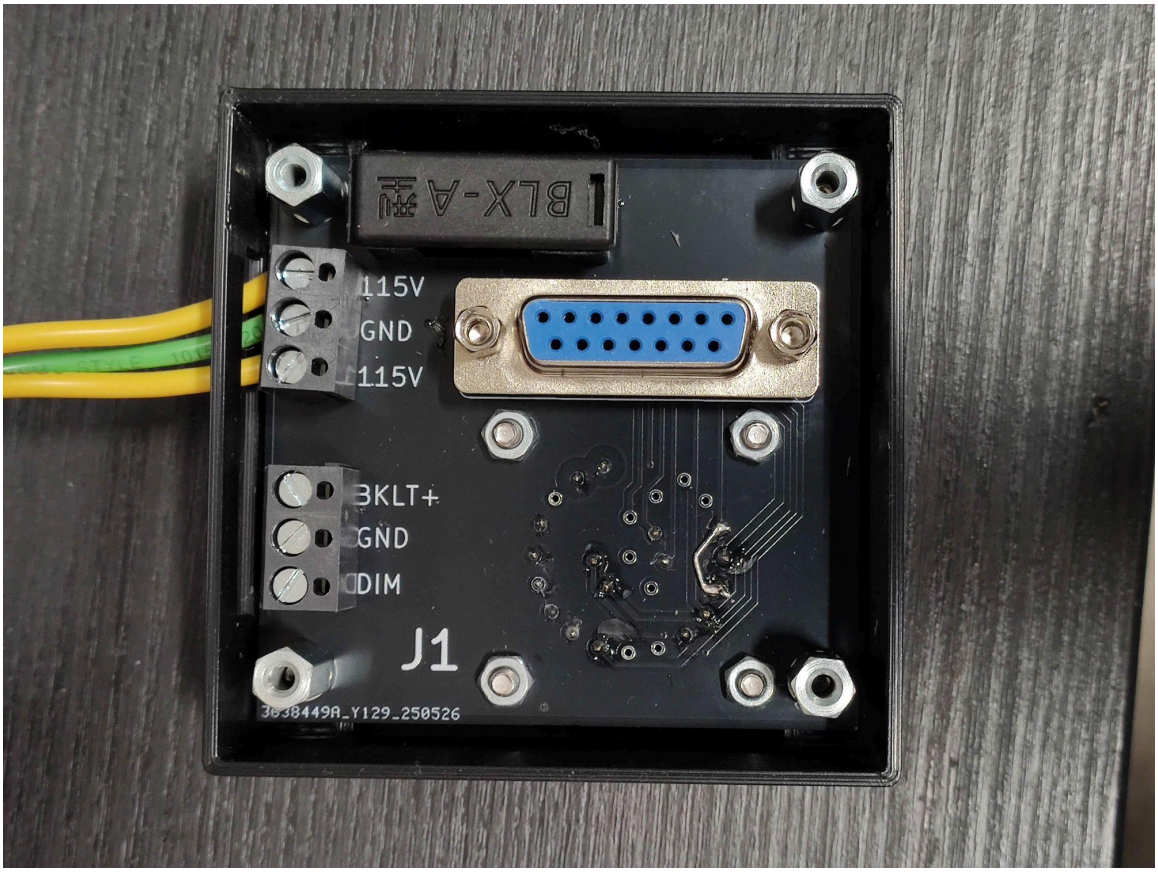
To connect the power supply to backlight wiring to the MCDU, remove the cover of the J1 connector enclosure first as shown in the photo:

Make sure your 115V inverter is switched off. Connected now the following wires to the terminals of the J1 connector board:

Connect 115V/400Hz from the inverter to the 2 terminals marked 115V. Usually the inverter will be internally isolated and will be powered by a 28V DC power supply. These mains connected power supplies are internally isolated themselves. So in this case you have two layers of safety already. However, we strongly recommend connecting the GND terminal to power supply earth as an additional layer of electrical safety.

Connect the GND terminal between the two 115V terminals to the Earth/GND of your power supply or any other terminal that is connected to mains EARTH. This is important for electrical safety.

Photo with 115V supply wires (yellow) and Earth wire (green) connected:



Next connect a 5V DC power supply for the backlight to the terminals BKLT+ (+5V) and GND. To adjust the brightness of the backlight you will need an adjustable power supply or an CAVOKSIM LC-25 backlight controller. The maximum current at full brightness (5.0V) is about 4-5A. Because of the current use wires with sufficient diameter to avoid a voltage drop and lower brightness, especially when the wire is longer than 1-2m. Use at least AWG20, better AWG18.

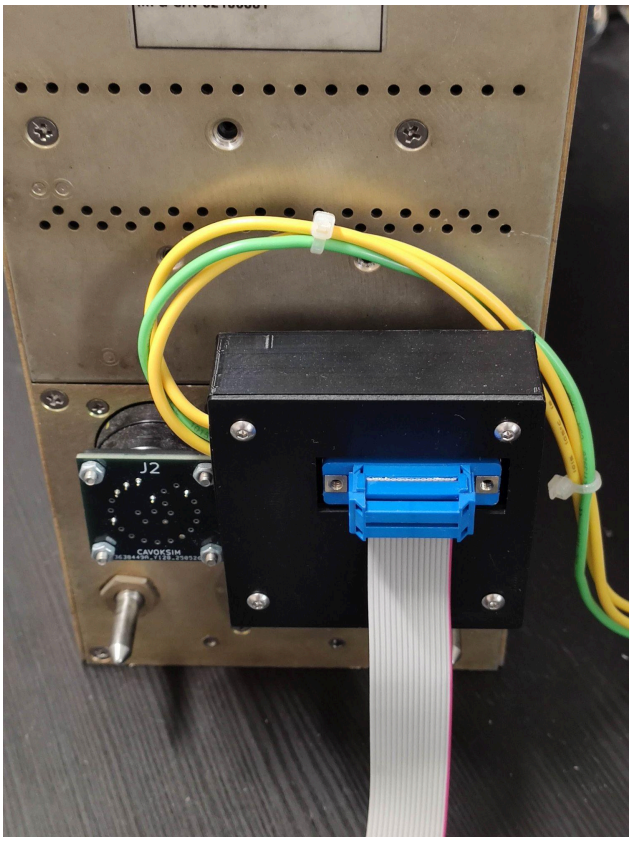
The DIM terminal is a control input that will dim the annunciator lights when it is connected to GND. Annunciator lights are currently not supported, so this input does not need to be connected. Do not connect anything else the GND potential to this input!

After connecting your wires double check that everything is correct. Check especially that you have not connected the 115V supply to the wrong terminals (i.e. BKLT terminals). This would damage your MCDU!

After you have connected the wires, close the lid and screw it to the enclosure.

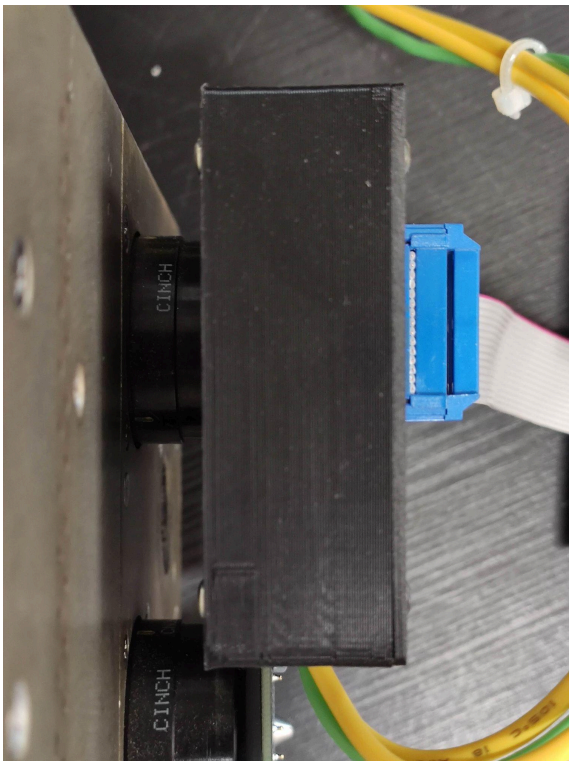
WARNING: High voltage is present inside the MCDU adapter enclosure when connected to a high voltage power supply! Do not operate the MCDU when the lid is not installed. Do not connect or disconnect the MCDU connector or touch the MCDU connector when AC power is applied!

Installing the adapters into the MCDU is easy. The photo below shows how the adapter connectors are installed:



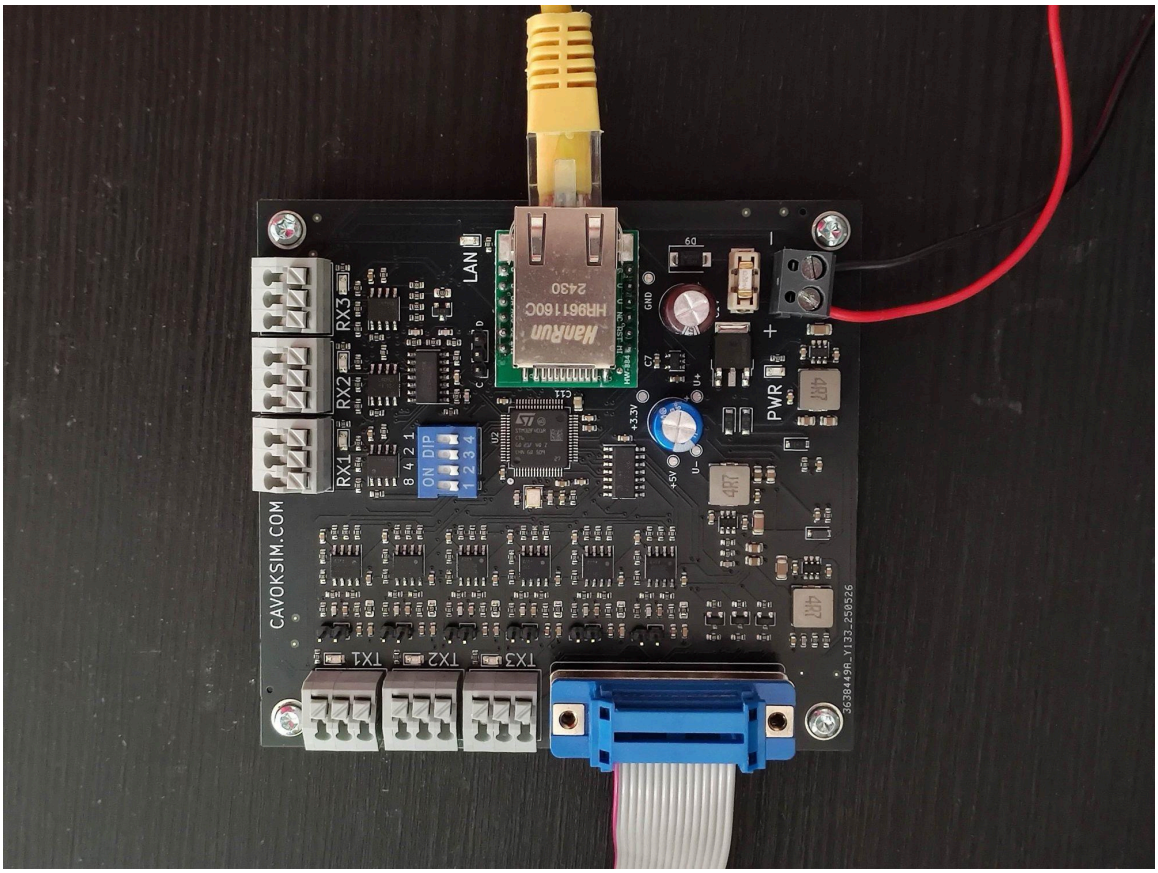
Before plugging in the adapters check that all pins of the MCDU sockets are straight. No pin should be even slightly bent. This is important to protect the adapter connectors from damage. If you find bent pins, carefully straighten them with a small screw driver or similar tool. When plugging in the connectors there should not be much resistance. If the adapter is difficult to insert, remove it and check for bent MCDU pins and damaged adapter connector sockets. When inserting the J1 adapter, make sure that it is inserted parallel to the back of the MCDU. Make sure that there is no force pushing or twisting on the J1 adapter when it is installed to prevent connector damage.

The photo below shows how the J1 adapter should be inserted in the MCDU:



Plug in the J2 Adapter when your MCDU has a J2 connector. Check that the top is pointing upwards before plugging it in. If you have an older MCDU type with only a J1 connector, the J2 Adapter is not required.

After wiring the MCDU, connect the AR-33 board next. The photo below shows the wiring:

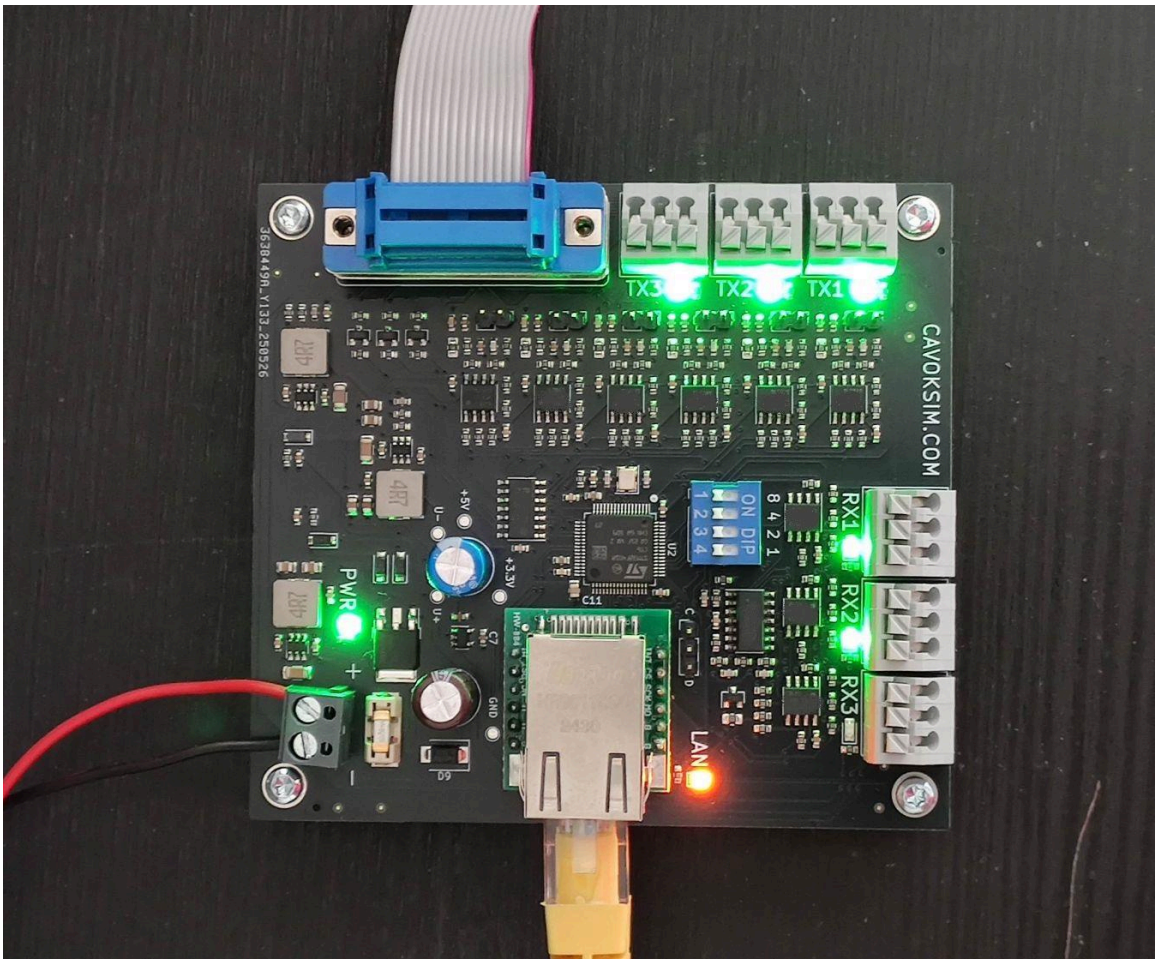


Plug in a LAN cable (shown yellow) into the Ethernet port. Connect this LAN cable to your router. The PC running X-plane must also be connected to the same router. Make sure that the UDP ports 50050-50070 are not blocked by the router or a firewall and are not used by other software running on the host PC. Connect the 24-28V DC power supply to the terminals as shown. **Do not connect or disconnect the power wires when the DC power supply is switched on**. The board has a fuse and reverse polarity protection. Plug in the flat ribbon cable from the MCDU into the blue socket.

The gray RX/TX sockets are usually not used. When you have an OEM MCDU connector and want to use this instead of the J1 adapter and flat ribbon cable, you can plug the Arinc connection into the terminals. Contact CAVOKSIM for details.

AR-33 board LED indicators

The photo below shows all LED installed on the AR-33 board:



All LEDs will light up for 2 seconds after reset for self testing. After that there will be the following indications:

- The orange LAN LED will light up when there is no connection to a CAVOKSIM server SW via Ethernet
- The green PWR LED should always be on when power is supplied. It indicates that the on board power converter is working
- The RX/TX LEDs located next to the gray terminals indicate if there is Arinc activity and the respective receive and transmit channels. For the MCDU interface only RX1 and TX1 are used. **RX3 is disabled on MCDU boards.**

Using the AR-33 MCDU board as a generic Arinc 429 interface board

The AR-33 Arinc 429 board has a special firmware for MCDU interfacing and is intended for this purpose.However it can also be used as a generic AR-33 board if desired. AR-33 boards have 3 receive and 3 transmit channels. **RX3 is disabled on AR-33 MCDU boards**. Each RX/TX channel can be configured separately as a Arinc 429 high speed or low speed channel. The RX channels can be switched between HS and LS by software command, but the TX channels have additional hardware jumpers to switch between HS and LS mode. Yellow jumpers to configure the TX channels for LS speed mode are included. When the jumpers are removed the TX channels are in HS mode. No changes are necessary for use as an MCDU interface. For other uses, please contact CAVOKSIM.

4 Software

Introduction

The software to control the MCDU via a PC simulation is currently only available for ToLiss aircraft and X-plane 12. It works with any Toliss Airbus aircraft. It consists of 2 main parts:

- The first part is CAVOKSIM driver software that has to be placed in the plugins folder of the ToLiss aircraft folder. It exchanges data with X-plane and Toliss on one side and the CAVOKSIM MCDU server on the other side. The driver software is the same that is also used for the CAVOKSIM FCU interface and the CAVOKSIM QuickConnect IO system.

- The second part is the CAVOKSIM MCDU server. This is an application independent of X-plane and Toliss. It is also located in the Toliss plugins folder because it uses the same configuration file as the driver software (Arinc.ini) . This application communicates with the driver software on one side and the MCDU Arinc board on the other side via Ethernet/LAN.

Installation of the CAVOKSIM Toliss driver

The Cavoksim Toliss driver is In the `CavoksimLink Toliss` folder that is part of the software package. It has to be copied into this location/folder:

```
X-Plane 12/Resources/plugins
```

No further installation is necessary.

The folder contains 2 configuration files that can be edited with a text editor: Config.ini and Arinc.ini

For the MCDU interface only Arinc.ini has to be modified. Config.ini is for the FCU and the QuickConnect hardware.

Configuration of Arinc.ini

The Arinc.ini file selects the purpose of all connected CAVOKSIM Arinc interface boards. It can be edited with a simple text editor (WINDOWS notepad, etc.). There can be up to 16 boards connected for various interfaces (for example MCDU, ECAM, DDRMI, RMP, ATC, etc.). When you connect your AR-33 MCDU board you have to select an address for this board. Every connected board needs a different address. The default address is 0. In the following example we assume that we have 2 MCDUs connected (Captain and FO side) via 2 AR-33 MCDU boards. The AR-33 board for the Captains side MCDU has the address 0 selected and the one for the FO side has the address 1. The Arinc.ini file will look like this in this case:

```
; Configuration file for all connected Arinc AT23/AT33 boards
; Number_of_boards should be the number of physically connected
boards
; and equal to the number of board entries in this file
; Update_interval_sec is the data refresh interval in seconds.
default is 0.1 (100ms, 10Hz)
;  change only if necessary. Affects PC performance and
communication timing

[Global Settings]
Number_of_boards = 2
Update_interval_sec = 0.1

[Board_AT33}
Address = 0
Function = MCDU1

[Board_AT33}
Address = 1
Function = MCDU2
```

Global Settings -> Number_of_boards is the total number of AR-33 boards connected (2 in this case)
Update_interval_sec determines the interval between updates from and to Toliss. The standard value is 0.1s and should not be changed. This value means that the MCDU text content is synchronized with Toliss 10 times per second. A higher value is not recommended because the Arinc 429 bus is too slow to update MCDU text at a higher rate. It would also be unrealistic because the MCDUs are also not updated faster in the real aircrafts.

Next is the configuration for each connected AR-33 board. A board entry always starts with `[Board_AT33}`. Next is the address of the board that you want to configure. Next is the function of the board to be configured. In the case of the MCDU board only 2 entries are valid: MCDU1 for the Captains side MCDU and MCDU2 for the FO side MCDU.

Use of the MCDU server software

The MCDU server software consists of a single file called MCDU_server.exe. It is an independent application, which means it needs to be opened and terminated independently of X-Plane. Be careful that only a single instance of this application is running at a time. If a second instance is opened while the first one is still running there will be an address conflict and the driver will not work.

When running the MCDU_server application, a terminal window will open with status messages. The initial messages will look similar to this:

```
MCDU Arinc Interface module for Toliss aircraft
Version 1.1  (c) 2025 CAVOKSIM Ltd.

Trying to connect to Arinc board(s)
```

The application is now trying to connect to the Arinc AR-33 boards that are listed in the Arinc.ini configuration file. It will only connect to boards that have the correct address as configured in Arinc.ini. When it finds an AR-33 MCDU board it will show this message:

```
AR-33 board with address 0 connected and verified for MCDU interface
use
Waiting for connection. Start X-Plane
```

This means that the AR-33 is responding correctly and is approved for use as MCDU interface. The orange LAN light on the AR-33 MCDU board will extinguish to show that it is connected. The server is now waiting for you to open X-plane and Toliss so it can start communicating with the CAVOKSIM Toliss driver. Once X-plane and Toliss is running, this message will appear:

```
Connected to X-Plane
```

The MCDU interface is now fully functional on the PC side. When the MCDU is correctly connected, functional and powered, the same text that is shown on the virtual MCDU inside the Toliss cockpit should be displayed on the real MCDU as well.

4 Troubleshooting

The first step to check in cause that the interface is not functioning as expected is to confirm that the MCDU is not defective. Every MCDU will show at least the text ‘MCDU MENU’ in the first line of the screen after it is powered up. This text should appear after about 30s after the MCDU is supplied with AC power. This text will always appear independently of the Arinc interface. All that is required is AC power to the MCDU. Both CAVOKSIM adapters (or in case of MCDUs with only 1 connector the J1 adapter only) have to be connected but the AR-33 board does not need to be powered for this test. When ‘MENU TEXT’ is not appearing check that:

- The MCDU is physically switched on (some older MCDUs have to be switched on by turning the brightness control knob clockwise
- The brightness is turned up fully (turn clockwise to the end stop, applies only to CRT MCDUs. LCD MCDUs will automatically adjust to default brightness)
- you hear a soft 400Hz humming from the MCDU and the power consumption increases after power on

If you still can not see the ‘MENU TEXT’ one minute after power up your MCDU is likely defective. The MCDU will only show this text when the internal self test is passed.

If you can see ‘MENU TEXT’ but the MCDU is not showing any other text from X-plane/Toliss contact CAVOKSIM for assistance and further troubleshooting. The appearance of ‘MENU TEXT’ just means that the MCDU has passed its internal self test. That is good, but it does not guarantee that the MCDU is fully functional. Further testing is required to check if it is responding to Arinc commands.