XCTouchNav 7 and 5.7 Inch and 80mm User Manual

Android 11

Manual edition 1.14

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1. Description

The XCTouchNav family is a modern device based navigation device with Android operating system supporting wired serial and wireless interfaces as Bluetooth and WiFi. Android applications such as XCSoar, LK8000, Enroute and more can be run. It has a high-resolution sunlight readable IPS type display that can perfectly be read at almost any viewing angle. The power consumption is low, even the display runs in full brightness.

A FLARM or another source for NMEA (GPS) data can be connected to the XCTouchNav directly.
The application does not only reads data from loggers, it can also declare tasks there, settings can be changed e.g. the baud rate of a FLARM or aircraft type and also the IGC log of the flight can then be read out.

By standard, the installed software is XCSoar that offers many features. Thanks to a growing library with lots of glider polars, the software can be adapted to almost any glider. Since the XCSoar software source code is public available on github, developers can clone the software and further develop their own features and ideas.

In connection with a variometer system, mostly the XCVario here is explained, e.g. true airspeed TAS can be calculated with the outside temperature (OAT) and the precise altimeter without hysteresis together with the TE vario signal allows final flight calculations with high reliability. An important feature is the wind calculation that can already be provided by XCSoar together with a GPS source, circling wind or zigzag wind provided by XCSoar is fairly good enough in flat land and furthermore improves the final flight precision.

It is very easy to operate XCSoar with the touchpanel, much more easy than a device with several rotary knobs at any corner that do not operate intuitive and need study and practice. The device has an anti-glare and anti-fingerprint surface already. Normally no extra protection is required.

The system which is manufactured in large numbers is not expensive, comes readily built up and tested (no self craft set), is an excellent addon for any glider cockpit with already a FLARM device or a smart variometer installed and keeps being extensible with a large number of wired and wireless interfaces.
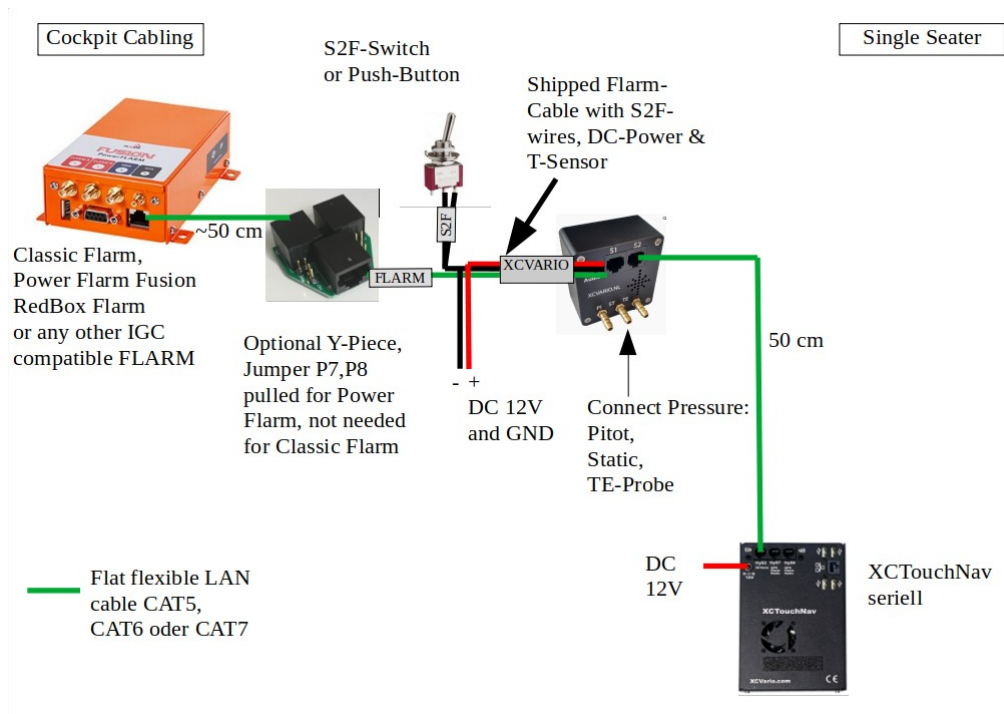
2.   Features

- Black conductive housing material providing effective shielding of EMV
- Power supply directly from 12V with the onboard electrical system
- Low power consumption depending on the display size
- Android 11 incl. Play Store
- Wireless interfaces: WiFi (802.11b/g/n) and Bluetooth (BT4.0)
- IGC compatible serial interfaces on the rear side
- 4 multichannel USB-A type 2.0 ports plus one LAN port (5.7 and 7 inch)
- 2 multichannel USB-A type 2.0 ports (80 mm model)
- 1 USB-A type 3.0 port plus one USB-C port on the side (5.7 and 7 inch)
- USB Devices can be powered from the USB-A ports (max 1A = 5W)
- Micro SD memory card slow, max 32G
- 3.5 mm jack socket for headphones
- Stereo power amplifier 3 W
- 5.1 mm coaxial DC power jack directly from 12V onboard supply
- Builtin fan for low CPU core temperature
- 16 GB Flash memory, 2 GB Ram
- 1.8 GHz Quad-Core CPU
- Multipoint touchscreen display
- 1200 nits brightness in high contrast IPS technology for best sunlight readability
- Anti-glare and anti-fingerprint coating
- XCSoar is pre-installed
- Significantly more performance, more connectivity and user-friendliness than other system available in the market

3.   Overview

The following overview shows the embedding of the XCTouchNav in the cockpit environment.

The standard case and most common case is the connection with an XCVario to the serial interface (recommended), that is connected itself to a FLARM. The second port of the Y-Piece may server for another device like a FLARM Traffic viewer.

4. Operation

This chapter is taken from XCSoar manual, and provides basic instructions for using XCSoar in a typical local flight. It will demonstrate how to use key features. It assumes the configuration options have already been set up to the user's preferences. These instructions are intended to provide a simple step-by-step guide to flying tasks of varying levels of complexity but are not intended to demonstrate all the features of XCSoar. Furthermore, the system can be used productively in ways other than as described here.

For more information please refer to the XCSoar manuals that are provided online here:

https://www.xcsoar.org/discover/manual.html

4.1. Local flight

In this scenario, the pilot intends to fly locally or a casual cross-country task where navigation to pre-determined waypoints is not required.

4.1.1. Prior to takeoff

1. Turn on the device
2. Open the Flight Setup dialogue and adjust the bugs and ballast as required. Set the maximum forecast temperature. Close the dialogue
3. Open the Task Edit dialogue, and create a blank task by pressing New
4. Select "Touring" as task type.
5. Once the task is created, move the cursor to the "add waypoint"item and press enter. Select the start waypoint from the list, e.g. first item is the home base, and press enter. Press close or escape.
6. Select another one "add waypoint", and enter the same waypoint as finish point.
7. Now the task contains one waypoint to home.

4.1.2. In flight

At the appropriate times, set the MacCready manually from the menu, task calculator or from the variometer. Change the bugs/ballast settings as required.

At any time, the glider can reach home when the altitude difference bar is a green arrow pointing upwards.

Optionally, activate MC Auto when ready to return home.

If the MacCready mode was set to "Final Glide" or "Both", then the system will command the optimal speed to return home.

4.1.3. After landing

The Status dialogue shows the elapsed flight time.

The analysis dialogue can be used to analyze or review the flight.

The IGC logger replay can be used to replay the flight.

These actions may be performed after turning the device off and on again.

5.   XCSoar

XCSoar is free open source software optimized for Android systems with a touch screen and comes pre-installed on the XCTouchNav. To launch the preinstalled XCSoar wipe screen once to the right in order to see installed apps, then tap on the icon for XCSoar to start the application.

For a complete glider flight computer, however, further values such as GPS fixes, the dynamic pressure, TE nozzle pressure, static pressure are needed in order to be able to get an indication for an optimal speed to fly, precise final glide or moving map. The XCVario with a FLARM connected delivers exactly this data that can be provided by a RS232 serial cable connection (recommended way) or wireless via WiFi or Bluetooth.

If you don't own a FLARM, there is a cheap GPS module provided in the shop, that can be used instead of FLARM.

Meanwhile smartphones or tables are available on the market and may be suitable in terms of display brightness, contrast and feature a touchscreen, those devices may have issues at higher temperatures and will shut down in the cockpit already before flight when canopy is closed and temperatures rises above 40° C. The XCTouchNav operates directly on the 12V on board grid, no DC converter is needed, is tested until 70° C and won't face you with the danger to shut down from a lipo battery overheat. Beside that, risk of fire from an overheat internal lipo battery is excluded using the XCTouchNav.

With the XCTouchNav, safe and advanced technology is available at an affordable price.

The XCTouchNav running XCSoar, offers a perfect glider computer with the latest technology features quad core CPU, intuitive touchscreen operation, many screens full of features, flight planning, final approach and freely configurable info boxes, beside display of terrain with airspace including side view. Of course topography and landing fields are easy to be setup. There is a thermal assistant for centering thermals, an audio variometer with with external speakers, speed to fly command according to your MC setting or assistance for dolphin cross country speed and more.

6.   Bluetooth

In order to establish a connection via Bluetooth, the XCTouchNav needs to pair with the device. To do this, perform a device scan in the Android device setup under Bluetooth, and pair your device e.g. an XCVario variometer, which should appear there in the device list as e.g. XCVario-5678, in the pairing dialog.
If a Bluetooth password is requested for an older device, try to enter "1234", newer Bluetooth standards won't require this.
Then in XCSoar under Configuration/NMEA connection, setup a new device A..F. Any paired device can be found in the 'Connection' field with its Bluetooth ID. Select this there and in the following dialog enter the desired driver, for current XCVario versions "XCVario". The switch K6Bt remains in the 'off' position. After you have acknowledged the dialog with "OK", XCSoar will connect to the device within a few seconds, which will then appear as a regular NMEA connection, e.g. with the status "connected: Baro,Vario,Environment[,FLARM]". The relevant records of the device should now be visible under 'Monitor'. For details regarding the data there please refer to the manufacturers handbook for the corresponding device. You can paired several different Bluetooth devices via Bluetooth protocol.

7.   Wireless LAN

In order to set up a wireless LAN connection (also called wireless LAN, WLAN or WiFi), e.g. to a variometer, here explained with the XCVario, the device must activate the "Wireless LAN" in Setup/Options/Wireless. After that, you can connect to the corresponding WiFi network ID of this device in your XCTouchNav WiFi settings. The network ID of the XCVario is identical to the Bluetooth ID, e.g. XCVario-5678. To connect with the secured WiFi (https) it is required to enter the password as documented in the manufacturers handbook of the device.
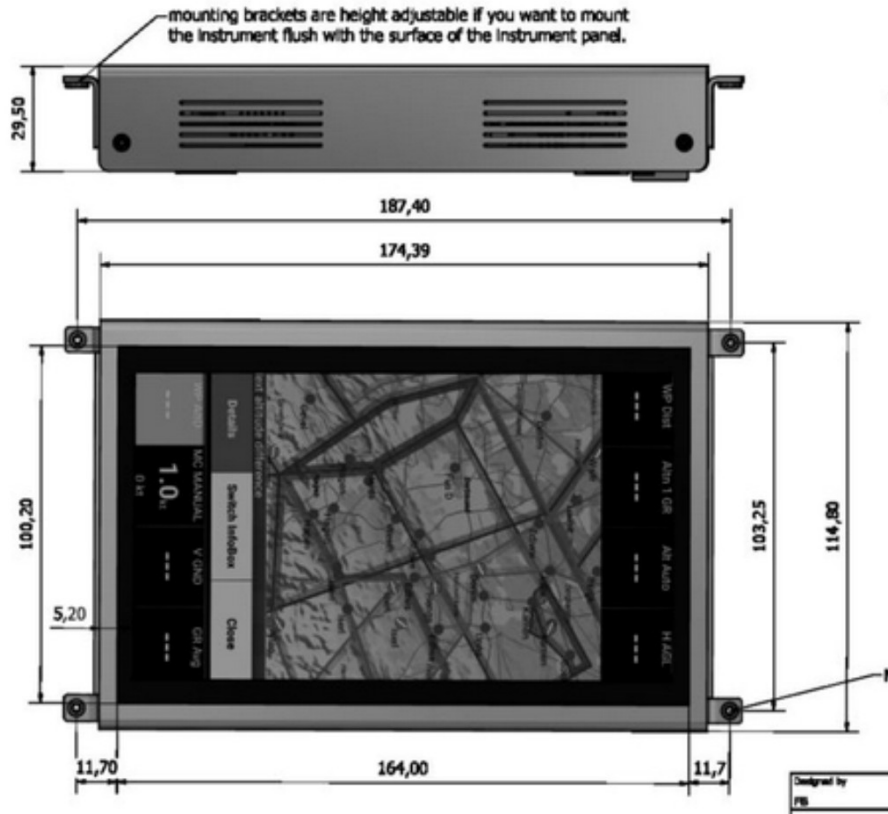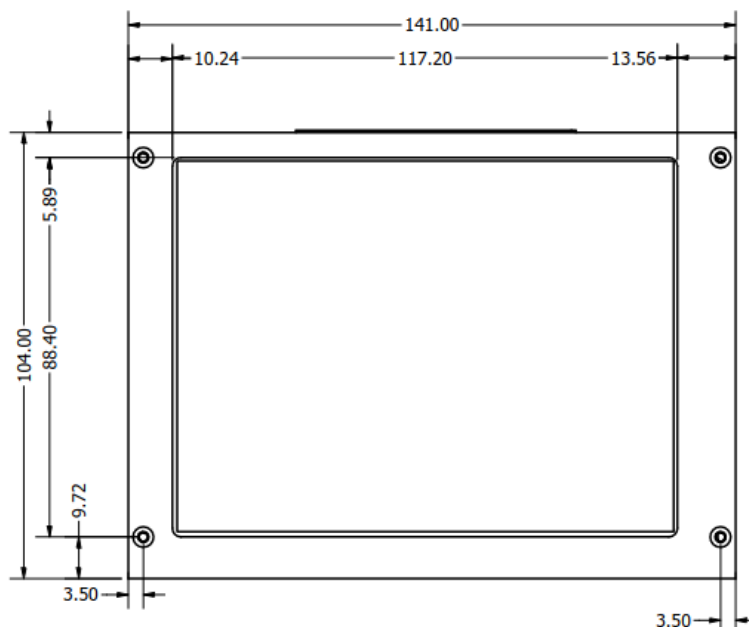
8.   Installation

The device can be installed within the instrument panel with a corresponding cutout, dimensions see technical data section. The 7 inch model comes with two holders that are to adjustable in height so can be adapted to various panel thickness. The 5.7 inch model has threads in the front plate already, and can be screwed directly from the backside of the instrument panel. Screws needed to attach the display to the instrument panel are M2.5x10 typical, maybe longer if panel thickness requires.
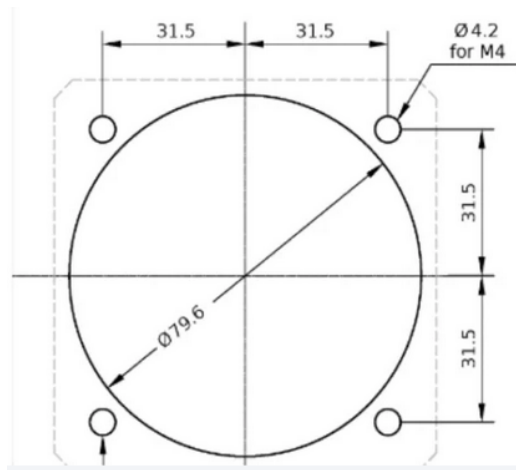
7 Inch:

5.7 Inch:

80 mm:
Note: The 79.6 mm is minimum, a diameter of 80 mm, even more is acceptable as this is covered by the display
There is an own installation manual for the 80mm model that shows the installation of the back and the display.

Note: After installation in the corresponding orientation, screen rotation has to be switched off in the Android settings of the device, in order to avoid turning of screen from g-forces:

1. Wipe down screen to lift up Android Quick Setup menu
2. Tap the „Autorotate" icon to toggle Autorotation status as deactivated (grayed out)

8.1. Electrical connections rear

The electrical connections are similar in both models, just the arrangement is a bit different in the 5.7 inch model where the connector block for USB and LAN horizontally and below the the serial tty connectors. The 80mm model does not feature the LAN connector, just two serial interfaces and two USB ports.

8.2. 12V DC Power

The power supply is normally is connected to the on board electrical system. A single fuse for a
device is not mandatory for gliders, but is recommended. The wiring can be done with copper strands from 0.5

mm², 1 mm² is recommended. Alternatively, the navi can be connected in parallel to another device that is fused with at least 1 ampere. The device must be protected because the cable's are not designed for higher currents. The device tolerates voltages in the range of 10-18 volts, a supply of 12 volts is ideal. If the device is operated without any protection plus an external short circuit, e.g. at ttyS7, internal damage is not expected, current is limited by a 0.5 Ampere self reset PTC fuse.

The navi is protected against polarity reversal and is internally protected against transient over-voltages such as ESD discharges and induction peaks when starting. In general, the avionics should be left switched off when starting, if it cannot be avoided, e.g. when starting the engine during the flight, you have to rely on the over-voltage protection.

The device comes with 30 cm red/black12V DC power a cable with 1 mm² copper strand is internally connected and supplied with the device.

Note: To save space in the instrument panel, there is no power switch in the XCTouchNav. In order to disconnect from power, connect the device either to an existing switch in the panel, already the main switch will do, hence we recommend an extra switch to power off the device individually e.g. on low battery power, or if not needed.

8.3. USB

There larger devices feature four and the 80mm model two USB 2.0 interfaces, each of them can deliver 500 mA, in total 1.5 A can be drawn if the fuse used for the XCTouchNav features at least 2 Amperes.

8.4. Audio Out

Two 3.5mm mono jacks offers an external output for the audio signal of the device. If you need sound from the navigation device, two external speaker's with at least 3W power can be connected to there.

8.5. RJ45 connector ttyS3

This interface implements the IGC standard on the device site (like a FLARM) and so can be connected directly to the PC side or in our case mostly to the XCVario. The RJ45 socket is shown in the figure above in a plan view from the rear. Pin 1 is therefore on the left side.

This interface does not provide 12V power, it is designated as a data circuit equipment (DCE) that does not need to provide power to the peer, e.g. like a classic Flarm. Normally those devices receive power from this connector, hence this power is not suitable for a high power device, the XCTouchNav has its own power cable. As of this, no power splitting is needed towards the peers, and e.g. an XCVario can be connected with a standard patch 1:1 cable.
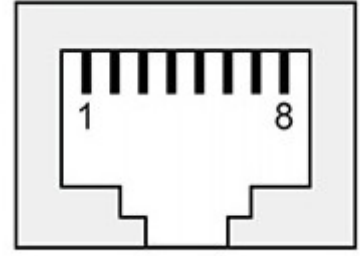
Abbildung 1: ttyS3 Pinout

Interface ttyS3

Pin # RJ45 FCC	identifier	direction	Connection XCVario
1	GND	⊡	GND
2	GND	⊡	
3	RS232 TTL RX	⊡→	Serial TX
4	RS232 TTL TX	⊡	Serial RX
5	NC		
6	NC		
7	NC		
8	NC		

NC: Not connected

8.6. RJ45 connector ttyS7 and ttyS9 or ttyS5

Both serial interfaces are similar with standard IGC assignment for the serial port. This interfaces implement the IGC Standard on the PC site, so devices like a FLARM can be connected to there.

Any device with an IGC compatible port e.g. a FLARM or a Logger, can be connected with a standard 1:1 LAN cable to here.

Also any other serial device supported by the navi application e.g. XCSoar, like a radio device can be connected to the serial interface, pins RX/TX and GND with a custom cable in case the connected device does not have a standard IGC RJ45 plug.
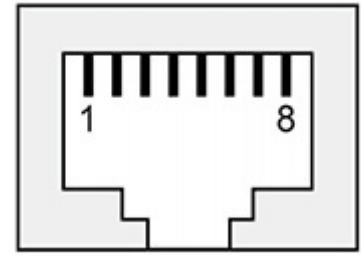

Abbildung 2: ttyS7,9 Pinout

This interfaces works as data terminal equipment (DTE) and provide as well 12V power on Pin 8, so e.g. a classic Flarm can be powered from there.

In case power is not wished there are several options:

1. Cut a PCB wire on the bottom of the I/O board, see right side. Power on ttyS9 is cut per default. If no power is needed on ttyS7 or ttyS9, the PCB can be modified by cuts as shown on the right side here:

2. Use a Y-Piece as offered in the shop with power jumpers pulled

3. Use a 8P4C wire with only Pin 1..4 connected (custom made), a cable like this will be available around Q2/23

4. Use a 6P6C wire (RJ12) centered in the RJ45 ports (amazon provides corresponding cables with RJ12 ends)
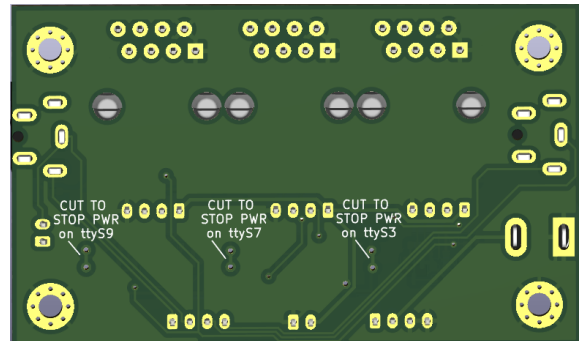
Interface ttyS7, ttyS9 or ttyS5

Pin # RJ45 FCC	identifier	direction	Connection Logger/Radio/GPS
1	GND	⊟	GND
2	GND	⊟	GND
3	RS232 TTL TX	⊟	Serial RX
4	RS232 TTL RX	⊡→	Serial TX
5	NC		
6	NC		
7	NC		
8	+9..15 V	⊟	electrical system +12VDC

The 80mm model features a jumper for ttyS5 (JP1) and ttyS7 (JP3) on the internal I/O board in order to disconnect the 12V power in case not wished, e.g. if FLARM has its own power supply.
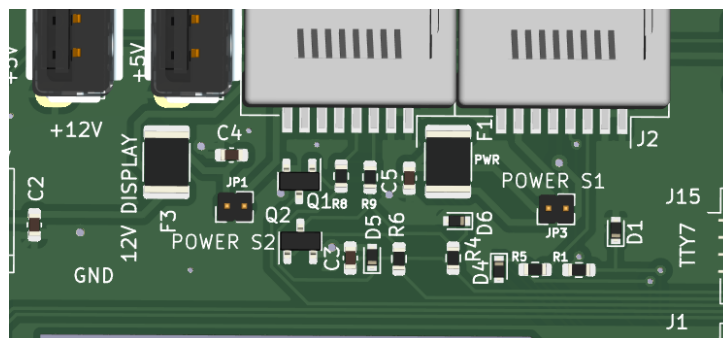
FLARM

FLARM's with an IGC compatible serial interface can be connected and powered by the XCTouchNav with a 1:1 cable. The maximum current is 0.5 Amperes the XCTouchNav can deliver. This enables the flight declaration or flight download from the FLARM via the navigation application (e.g. XCSoar).

KRT2 / ATR 833 Radio

The connection to a radio of the type KRT2, or another model if the navigation device (e.g. XCSoar) has a driver for it, can be established serially via rear interfaces ttyS5, ttyS7 or ttyS9. The baud rate should be set to **9600** baud. To do this, make the connection from the XCTouchNav's pin 3 and 4 to the corresponding serial RX/TX of the KRT2, it is best to solder it there to the existing KRT2 Sub-D connector.

For some older radios with LCD display, a pull-up resistor with a value of 27 Kilo-Ohms may be needed between the radio's TX pin and +12V = battery plus (KRT2 Pin2, ATR 833 Pin 22), otherwise communication might not establish.

It is important to wire together always RX to TX and TX to RX as follows:

XCTouchNav 3 (TX)   <-> 13 KRT2 (RX)
XCTouchNav 4 (RX)   <-> 2 KRT2 (TX Remote)
XCTouchNav 1 (GND) <-> 1 KRT2 (GND)
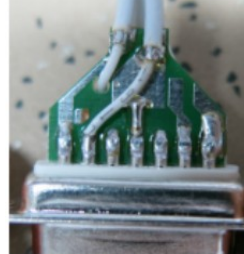
From left to right:
Pin 9: GND Mikrofon
Pin 10: PTT-L
Pin 11: PTT-R
Pin 12: Intercom with Bridge to Gnd
Pin 13: RX
Pin 14: Headset
Pin 15: connected with Pin 8 Batterie+

From left to right:
Pin 8: Batterie plus
Pin 7: Speaker +
Pin 6: Mikrofon R
Pin 5: Ext. NF
Pin 4: Speaker minus (not GND)
Pin 3: Mikrofon L
Pin 2: TX Remote

The pin assignment and connections on the ATR833 are as follows:

XCV 3 green/white   (TX)   <-> 9 ATR 833 (Data RX)
XCV 4 blue   (RX)   <-> 22 ATR 833 (Data TX)
XCV 1 orange/white   (GND) <-> 25 ATR 833 (GND)

ATR833-II / P/N 833-II-(Cxxx)-(Cxxx)
Bedienung und Einbau

f.u.n.k.e.
AVIONICS GMBH

4.7.2   Stecker-Pinbelegung

Pin	Signal		Pin	Signal
14	MIC R GND		1	LSP (+)
15	PTT 0		2	HEAD 0 (+)
16	LSP (-)		3	GND (HEAD 0)
17	PTT 1		4	EXT NF
18	MIC R STD		5	MIC R DYN
19	MIC L STD		6	MIC L GND
20	HEAD 1 (+)		7	INTERCOM SWITCH
21	GND (HEAD 1)		8	MIC L DYN
22	DATA TX		9	DATA RX
23	do not connect		10	do not connect
24	+5VDC (TO REMOTE)		11	BATT (+) (14/28V)
25	BATT (-)		12	BATT (+) (14/28V)
			13	BATT (-)

25-poliger Anschlussstecker am ATR833S
Ansicht von flugzeugseitiger Bestückungsseite

8.7. Electrical connections lower side (only 5.7 and 7 inch models)

The 5.7 and 7 inch models feature several electrical connections on the lower side that may be used, hence normally those should not be needed as usually space is limited in the instrument panel and there are similar connection on the rear side for USB, Power and Audio, hence there might be special applications for this.

8.7.1. DC

The same purpose that the DC connector at rear side to feed 12V DC into the device, hence a 3.2 mm coaxial plug is needed.

8.7.2. USB Type-C
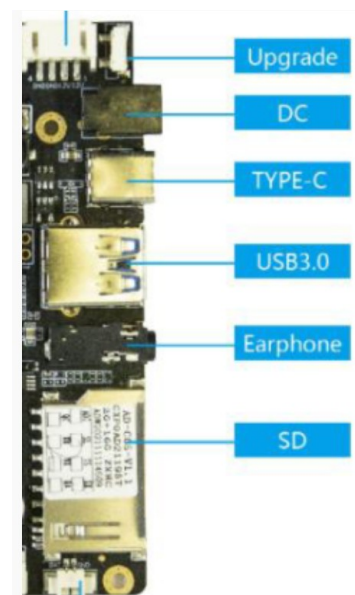
USB type C interface

8.7.3. USB 3.0

Can charge devices up to 500 mA.

8.7.4. Earphone (Jack)

Low power standard stereo earphone Jack 3.5 mm

8.7.5. SD (slot)

SD card slot, for specification see section with technical data.

8.8. Comparison IGC- and FCC Standard

The RJ45 sockets are numbered in the document according to the international standard of the Federal Communications Commission (FCC). Beside the FCC standard, there is also the International Gliding Commission (https://www.fai.org/commission/igc) that has defined a standard for the interfaces of IGC loggers. The XCTouchNav interface follows the IGC standard, but primarily uses the standard FCC numbering in this document.
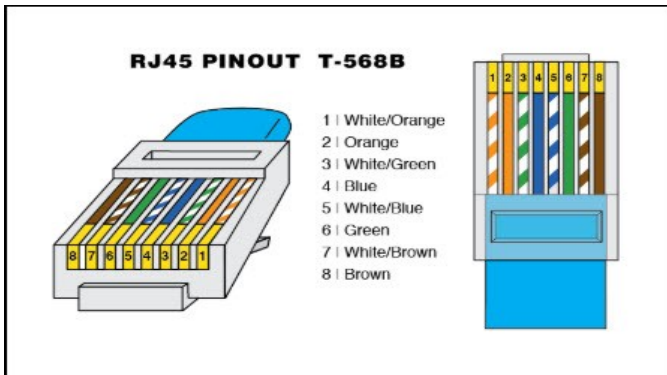

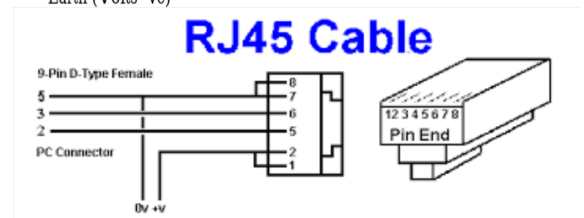*Abbildung 3: FCC-Standard*

Abbildung 4: IGC-Standard (reversed)

Figure 4 on the left shows the FCC standard, which designates the first pin in the top view of the connector as pin 8. Next to it on the right in Figure 5 is the wrongly numbered IGC standard (source: TECHNICAL SPECIFICATION FOR IGC-APPROVED GNSS FLIGHT RECORDERS - Second Edition with Amendment 7 31 January 2022). There the numbering of the first pin on the connector on the left begins with pin 1 (!).

In order to assess whether the pin assignment of a device fits, when reading a document it is therefore always necessary to check which standard the numbering follows, it is the IGC standard, the + 12V are numbered with pins 1 and 2 on the left in the top view of the plug, with the FCC By default, the +12V are of course also on the left, but are numbered with pins 7 and 8. Below is the table with a comparison of both numbering systems with a comparison.

The IGC's incorrect numbering, which differs from the FCC, causes confusion in many cases. Manufacturers all over the world number components, CAD symbols or cables are all according to the FCC standard, as do avionics equipment manufacturers meanwhile again in there documentation. You cannot estimate whether the assignment is correct with the pin number alone. A drawing of the connector must therefore always be taken into account.

Comparison of the pin numbers of the FCC and the (reversed) IGC standard:

Signal	RJ45 FCC Standard Pin#	RJ45 IGC Standard Pin#
Volts +	7+8	1+2
Data out (TX)	4	5
Data in (RX)	3	6
Earth (GND)	1+2	7+8

9. Technical specifications

Operating System		Android 11 with Play Store
Wireless Interfaces		WiFi 2.4 GHz Bluetooth 4.2
Serial Interfaces	5.7 and 7 Inch	3x Serial, 4800..115200 Baud 1xDCE, 2xDTE (+power)
	80 mm	2x Serial, 4800..115200 Baud 2xDTE (+power)
USB Interface	5.7 and 7 Inch	4 x USB 2.0 accessible on the rear and 1x USB 3.0 on the side
	80 mm	2 x USB 2.0 accessible on the rear and
LAN Interface (only 5.7 and 7 inch)		LAN 100/1000 Mbit Ethernet RJ45 LAN connector
Audio Interface		Audio 2 x 3 Watts Stereo 2 Mono Audio Jack's 3.5 mm
Memory		16GB Flash, 2GB Ram, micro SD card can be added
CPU		Quad Core 1.8 GHz
IPS technology display screen size (diagonal) and brightness	7 Inch	1024×600 pixel, 1250 nits
	5.7 Inch	800×600 pixel, 1650 nits
	4 Inch (80 mm)	480x480 pixel, 1200 nits
Power consumption (typical)	7 Inch	6 W or 465 mA at 12.8 V
	5.7 Inch	4 W or 320 mA at 12.8 V
	4 Inch (80 mm)	2.5 W or 200 mA at 12.8 V
Panel-Cutout size	7 Inch	100 x 164 mm
	5.7 Inch	87 x 116 mm
	4 Inch (80 mm)	Standard 80 mm instrument
Dimensions	7 Inch	175x115x28 mm
	5.7 Inch	141x104x34 mm
	4 Inch (80 mm)	84x84x45 mm
Weight	7 Inch	490 g
	5.7 Inch	405 g
	4 Inch (80 mm)	170 g

10. Maintenance

The device does not require any maintenance. Storage shall not be done in a humid environment. Ensure that relative humidity will not exceed 100% in order to avoid condensation.

11. Warranty Policy

For the Navi, the manufacturer provides a guarantee of two years from the date of purchase with regard to the effort and material costs of the repair. Within this period, components that fail under normal operating conditions will be repaired or replaced free of charge, provided the device was sent to the manufacturer free of charge.

The warranty does not cover damage resulting from misuse, abuse, accidents, unauthorized modifications or repairs, proven incorrect or faulty wiring, over-voltage or fire.

According to the German Civil Code, the return can be made within 14 days of the date of purchase. In this case, the device and its accessories must be returned by the buyer to the address from which it was delivered. The buyer bears the costs for this.

12. Permit

For each instrument, if the equipment is part of the minimum equipment list or requires approval, it may only be installed if the supplier or manufacturer provides a document on the proper check for compliance with the respective specification of the individual piece of equipment, area of EASA this is usually the EASA Form One.

For all other equipment, as well as for standard parts, a corresponding examination and documentation of the same is not required (e.g. device, final approach computer, flight data recording devices, navigation computer, additional antennas, batteries, cameras, additional pressure probes, mosquito cleaning systems, etc.). This is regulated in detail by EASA in AMC 21.A.303(c) 2, with the following wording:

AMC 21.A.303(c) Standard Parts

1. In this context a part is considered as a **'standard part'** where it is designated as such by the design approval holder responsible for the product, part or appliance, in which the part is intended to be used. In order to be considered a 'standard part', all design, manufacturing, inspection data and marking requirements necessary to demonstrate conformity of that part should be in the public domain and published or established as part of officially recognized Standards, or

2. For sailplanes and powered sailplanes, where it is a **non-required instrument** and/or equipment certified under the provision of CS 22.1301(b), if that instrument or equipment, when installed, functioning, functioning improperly or not functioning at all, does not in itself, or by its effect upon the sailplane and its operation, constitute a safety hazard.

'Required' in the term 'non-required' as used above means required by the applicable certification specifications (CS 22.1303, 22.1305 and 22.1307) or required by the relevant operating regulations and the applicable Rules of the Air or as required by Air Traffic Management (e.g. a transponder in certain controlled airspace).

Examples of equipment which can be considered as standard parts are, variometers, bank/slip indicators ball type, total energy probes, final glide calculators, **navigation computers**, data logger / barograph / turnpoint camera, bug-wipers and anti-collision systems. Equipment which must be approved in accordance to the certification specifications shall comply with the applicable ETSO or equivalent and is not considered a standard part (e.g. oxygen equipment).

This means that no EASA Form One is required for the Navi, and it can be installed.

Note:
After installation, the equipment list of the aircraft must be adjusted, and if a relevant change in center of gravity due to the additional mass (see technical data) at the mounting place cannot be considered by a weight an balance calculation, a weighing must be carried out and the change has to be approved.

13. Limitation of Liability

With the purchase of the device, the customer agrees that no liability for any direct or indirect damage, claims for damages or consequential damages of any kind and on any legal basis arising from the use of the device.

This navigation device is a purely cross-country flight tactical device, it is not part of the required instrumentation for gliders, and in case of doubt it must not be used as the primary source for controlling/navigating the aircraft, especially in critical flight phases. The target instrumentation is to be used for this. The device therefore does not require any FAA or EASA approval.

14. CE Declaration of Conformity

CE

DECLARATION OF CONFORMITY

XCVario, owner Dipl. Ing (FH) Eckhard Völlm, Panoramastr. 86/1, D-71665 Vaihingen/Enz,
explains that in the normal configuration the device hardware meets the requirements of the CE.

The EMC compatibility corresponds to EN 301 489-3:2002-08 for a Class 3 SRD device (equipment type I).