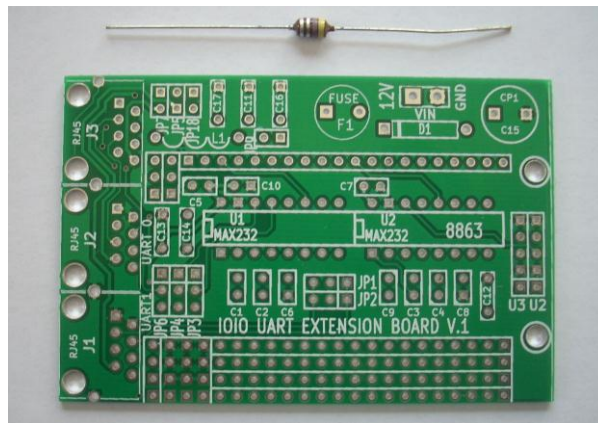


# SoarTronic IOIO UART extension board DIY project manual

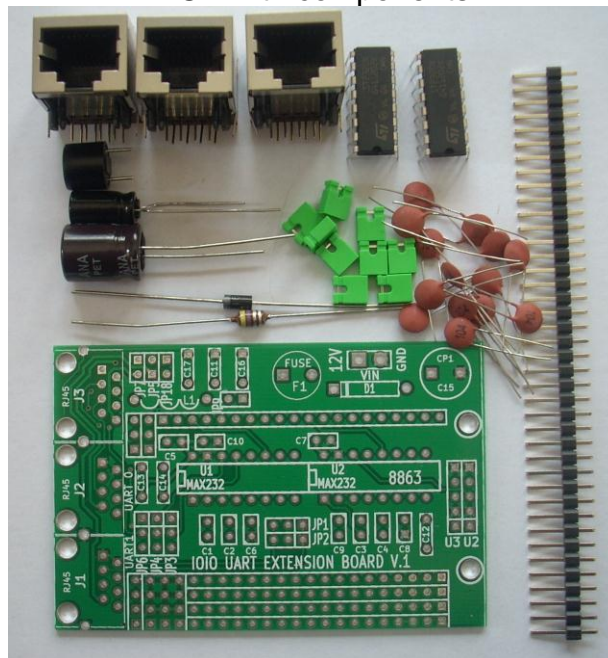
This manual includes information for building  
*SoarTronic IOIO UART Extension board*

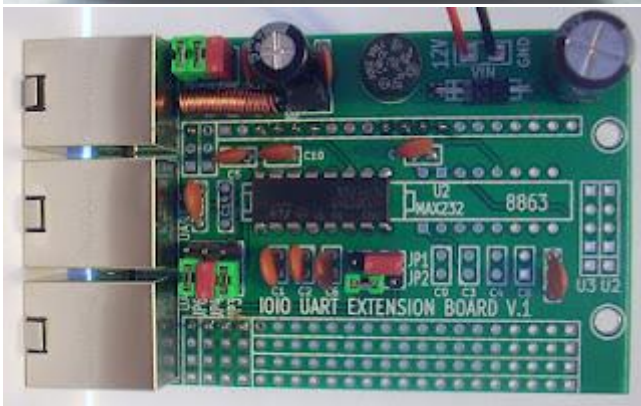
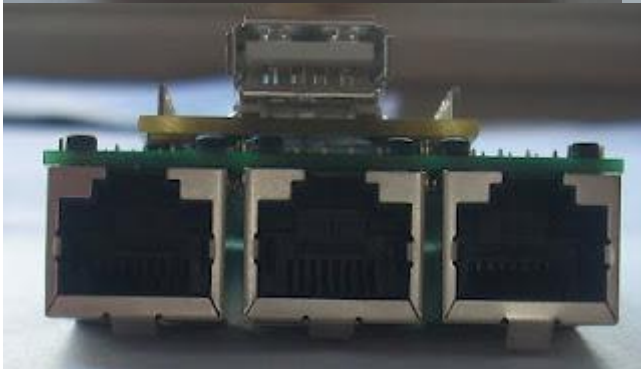
Please note, that this device is a result of an experimental project  
and no guarantee of safety or usability can be given.  
This device is used on your own risk!

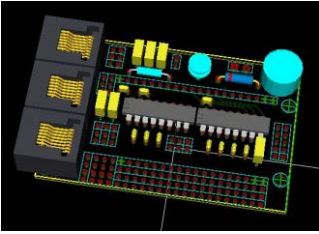
PCB with a coil



PCB with components







### ***SoarTronic IOIO UART extension board***

*SoarTronic IOIO UART extension board* is an extension board for **SparkFun IOIO module**. This electronics board can be used to connect four RS232 devices to an Android device running XCSoar program. It also provides charging power to the Android device using standard USB connector. *SoarTronic IOIO UART extension board* has two MAX232 microchips, which convert the IOIO board's four TTL lever serial communication lines (UARTs) to RS232 lines. *SoarTronic IOIO UART extension board* also filters the electromagnetic noise caused by the 12V/5V regulator build in into the IOIO board.

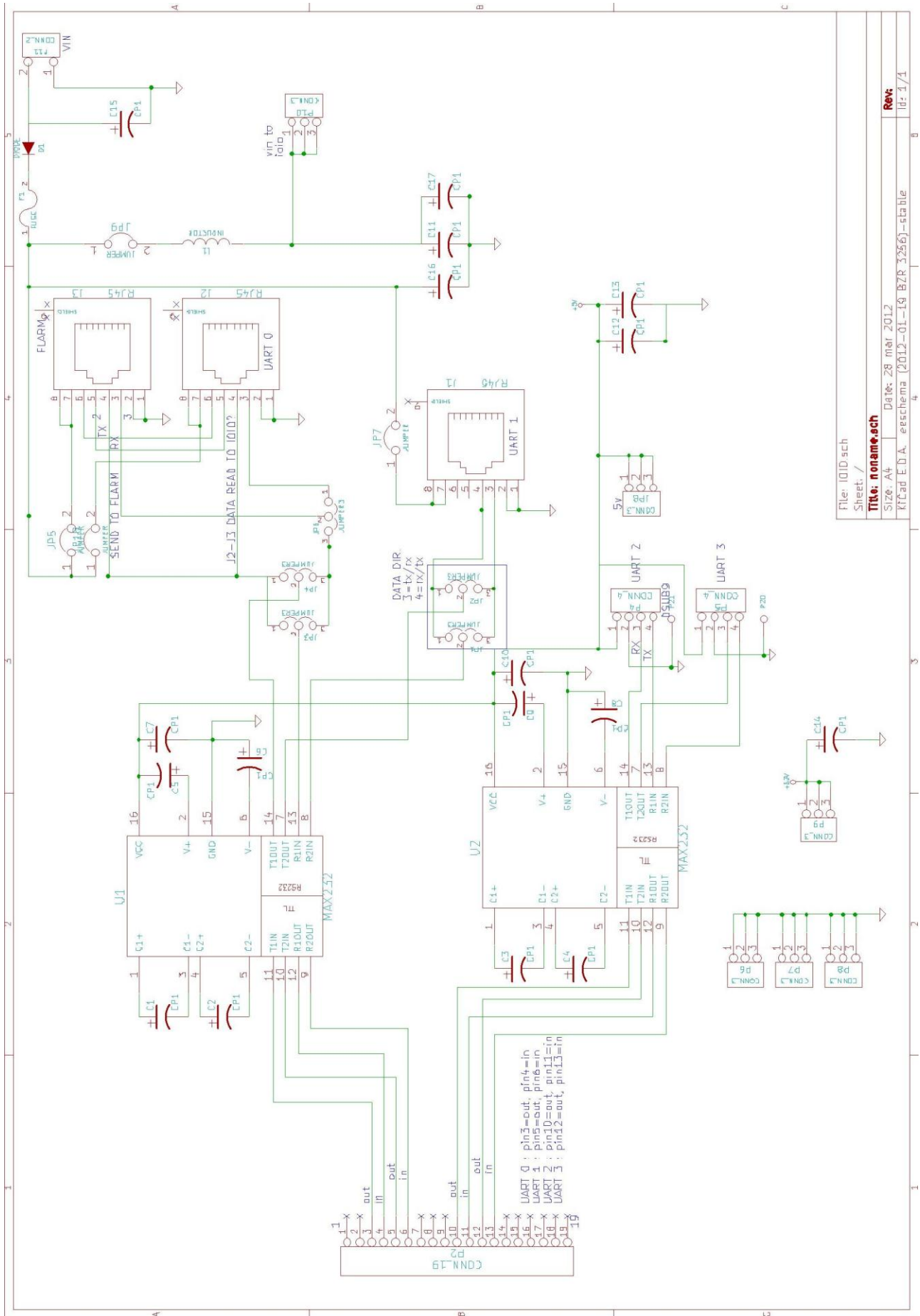
*SoarTronic IOIO UART extension board* has three RJ45 connectors. RJ45 connectors J2 and J3 are designed for IGC standard pinout for easy connection with FLARM units, and they can also work as splitter. *SoarTronic IOIO UART extension board* can be connected between FLARM unit and other device, like external display. Also the third RJ45 connector has IGC standard pinout, and can connect to most FLARM devices and loggers. Before connecting any devices make sure that the wiring is correct. RJ45 leads use 8 wires and Rj12 6 wires. IGC standard RJ12 male connectors used in LX FLARM devices can be connected to female RJ45 connectors.

The 12V pins of the RJ45 connectors are jumper connected into internal 12V line. 12V input can be connected through any of the RJ45 connectors using IGC standard cabling, or through dedicated 12 V input of *SoarTronic IOIO UART extension board*. If 12V input is connected into the *SoarTronic IOIO UART extension board* 12V and GND inputs, it is protected with a diode against reverse polarization, and this 12V can be distributed into all RJ45 connectors. It is recommended to feed operating voltage to FLARM units from *SoarTronic IOIO UART extension board*.

Please pay attention to 12V dc supply line of these RJ45 connectors, especially if you have several sources for operating voltage. The pins 7 and 8 are connected with internal 12V over jumpers. Remove these jumpers if you do not want to connect RJ45 connectors with the same potential with the IOIO board. Also note that if the devices connected to RJ45 connectors have already supply voltage connected, you can use these connection points to connect power directly between connectors J2 and J3, without connecting with the internal 12V line.

Other two RJ232 lines have connection points for cabling to external connectors. It is recommended, that the user of this board solders appropriate length shielded cable into these points, and connects directly with units like variometers and loggers. Connection points to GND for cable shields are provided, and since unshielded communication cables are significant source of electromagnetic noise, it is recommended to connect shields to ground in both ends, if possible. Many devices have build-in male Sub D9 connector, which is grounded in the devices metal housing..

On the next pages you can find wiring diagram of this board and a component list. Each component printed on the PCB is found from the diagram and specified on the list. Many jumpers can be replaced with wire, and the design is made such that modifications are easy to make.



**BOARD: SoarTronic IOIO UART Extension board V1.0**

Description: Extension board for use with IOIO board of Ytai Ben-Tsvi  
 UART interfe module, four build-in TTL/RS232 level sifters  
 RJ45 splitter for use with FLARM units (IGC standard pinout)  
 Filtering of 12V Dc supply  
 Reverse current and fuse protection

## Suggested components:

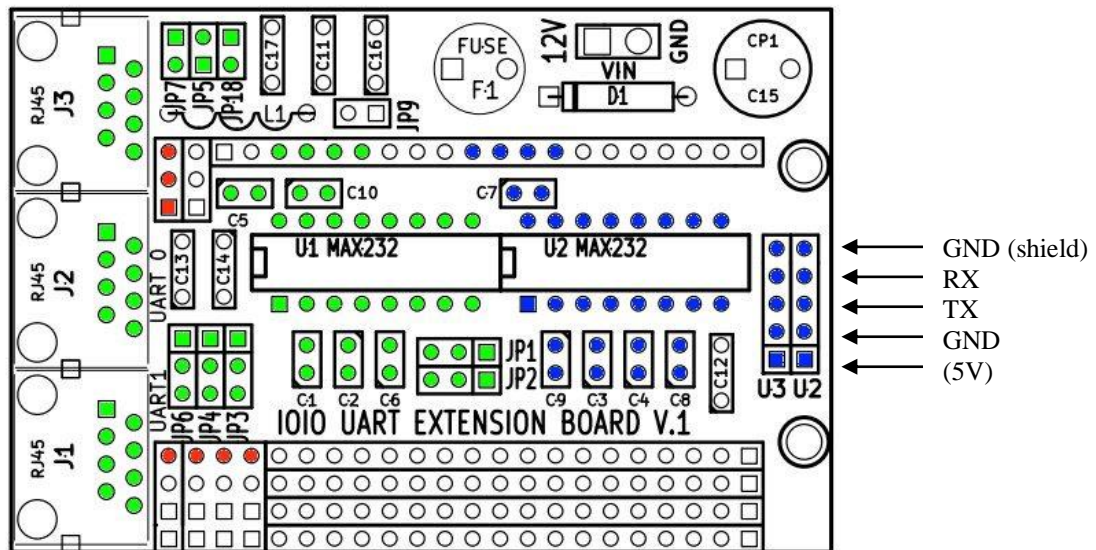
Symbol in drawing	Raster	Component	Description	Order code <a href="http://www.tme.eu">http://www.tme.eu</a>
C1	2.5 mm	100 nF	Capacitor:ceramic;100nF;50V;THT;2.54mm	CC-100N
C2	2.5 mm	100 nF	Capacitor:ceramic;100nF;50V;THT;2.54mm	CC-100N
C3	2.5 mm	100 nF	Capacitor:ceramic;100nF;50V;THT;2.54mm	CC-100N
C4	2.5 mm	100 nF	Capacitor:ceramic;100nF;50V;THT;2.54mm	CC-100N
C5	2.5 mm	100 nF	Capacitor:ceramic;100nF;50V;THT;2.54mm	CC-100N
C6	2.5 mm	100 nF	Capacitor:ceramic;100nF;50V;THT;2.54mm	CC-100N
C7	2.5 mm	100 nF	Capacitor:ceramic;100nF;50V;THT;2.54mm	CC-100N
C8	2.5 mm	100 nF	Capacitor:ceramic;100nF;50V;THT;2.54mm	CC-100N
C9	2.5 mm	100 nF	Capacitor:ceramic;100nF;50V;THT;2.54mm	CC-100N
C10	2.5 mm	100 nF	Capacitor:ceramic;100nF;50V;THT;2.54mm	CC-100N
C11	5 mm	220uF/16v diameter 6mm	Capacitor: electrolytic; THT; 220uF; 16V; Ø6.3x11mm; Pitch:2.5mm	CE-220/16PHT-Y
C12	5 mm	100 nF	Capacitor:ceramic;100nF;100V;Y5V/Z5V;-20+80%;THT;5mm	CCK-100N
C13	5 mm	100 nF	Capacitor:ceramic;100nF;100V;Y5V/Z5V;-20+80%;THT;5mm	CCK-100N
C14	5 mm	100 nF	Capacitor:ceramic;100nF;100V;Y5V/Z5V;-20+80%;THT;5mm	CCK-100N
C15	5 mm	470uF/25v diameter 10mm	Capacitor:electrolytic;THT;470uF;25V;Ø10x12.5mm;Pitch:5mm	RD1E477M1012MBB
C16	5 mm	100 nF	Capacitor:ceramic;100nF;100V;Y5V/Z5V;-20+80%;THT;5mm	CCK-100N
C17	5 mm	100 nF	Capacitor:ceramic;100nF;100V;Y5V/Z5V;-20+80%;THT;5mm	CCK-100N
D1		Diode	Rectifying diode;1.8kV;2A;DO15	EM516
F1				
U1		MAX232	Integrated circuit:Line-RS232,driver;RS232;DIP16	ST232CN
U2		MAX232	Integrated circuit:Line-RS232,driver;RS232;DIP16	ST232CN
J1		RJ45	Metal housing recommended, maximum with 16mm	
J2		RJ45	Metal housing recommended, maximum with 16mm	
J3		RJ45	Metal housing recommended, maximum with 16mm	
F1		Fuse	Fuse:miniature,time-lag;1.6A	RFT-1.6A
L1		Coil	0.22 - 1 uH	Delivered with the PCB
	Pinstrips Jumpers		Pin header;pinstrips:male;PIN:40;straight;2.54mm;THT;1x40 Recommended to use colour coding	ZL201-40G

Note! Capacitor values for C1-C10 can also be 1uF depending of used max232 version. For correct capacitors please refer to the datasheet of selected MAX232 microchip, or ask your vendor.

IOIO board is innovation of Ytai Ben-Tsvi. It is recommended to read IOIO board documentation.

Information of IOIO board is available from <http://www.sparkfun.com/products/10748>

and from <https://github.com/ytai/ioio/wiki>



The above picture shows placing of components needed for serial lines. J1, and J2/J3 use level shifter circuit U1 and U2 and U3 uses level shifter circuit U2.

All components and connections related to U1 are marked with GREEN colour, and all connections and components related to U2 are marked with BLUE colour. All connection points marked with RED colour are related to 12/5 V power supply.

### Assembly:

Solder the RJ45 connectors last, so that they do not block your access to the board.

If you replace JP6 with external switch you might chose not to use jumper pins.

Capacitor C14 is used only if the 3.3 V available from IOIO board is used, and it is normally not installed.

Place and solder the components according to the print in the component list. All components except the IOIO board are located in the printed side.

Once all other components (except the IOIO board) are placed and soldered, solder the RJ connectors in place. IOIO board is then soldered into the opposite side of the *SoarTronic IOIO UART extension board*

Even if you are not using all RS232 lines, it might be better to install all components, since after the IOIO board is in place soldering any missing components may require first removing the IOIO board. Also it is recommended to solder the wires for U2 and U3 before IOIO installation.

Wiring for the U2 and U3 is explained in the above picture. The 5 Volts connection point is connected with IOIO board's 5 volts. You can use this as a 5 V output or 5 V input.

**If 5 V input is used, 12 V input voltage should not be connected.**

**Jumpers:**

## Jumpers related to J1 (RJ45 connector)

JP 1	Used to switch RX and TX lines of the RJ45 connector J1. The middle connection point is connected with the RT (in) pin of the MAX232 chip. Jumper's pin 1 (square) is connected with the pin 4 of the J1 (RJ45), and jumper's pin 3 is connected with the pin 3 of the J1 (RJ45) Normally JP1 and JP2 jumper positions are opposite.
JP 2	Used to switch RX and TX lines of the RJ45 connector J1. The middle connection point is connected with the TX (out) pin of the MAX232 chip. Jumper's pin 1 (square) is connected with the pin 4 of the J1 (RJ45), and jumper's pin 3 is connected with the pin 3 of the J1 (RJ45). Normally JP1 and JP2 jumper positions are opposite.
JP 5	Connects RJ45 connectors pins 7 and 8 with 12V line.

## Jumpers related to J2 and J3 (RJ45 connectors)

JP 3	Used to switch RX and TX lines of the RJ45 connectors J2 and J3. The middle connection point is connected with the RT (in) pin of the MAX232 chip. Jumper's pin 1 (square) is connected with the pin 4 of the J1 (RJ45), and jumper's pin 3 is connected with the pin 3 of the J1 (RJ45) Normally JP3 and JP4 jumper positions are opposite.
JP 4	Used to switch RX and TX lines of the RJ45 connector J2 and J3. The middle connection point is connected with the TX (out) pin of the MAX232 chip. Jumper's pin 1 (square) is connected with the pin 4 of the J1 (RJ45), and jumper's pin 3 is connected with the pin 3 of the J1 (RJ45). Normally JP3 and JP4 jumper positions are opposite.
JP 6	Used to select the serial communication RX signal source of the device connected into the J2 (RJ45). If jumper connects pins 1 (square) and 2 the serial communication is received from the J3 (RJ45) connector pin 3. If jumper connects pins 2 and 3 the serial communication is received from the IOIO board. This jumper can be replaced with a switch to connect external display messages during flights or IOIO board for declaration and logger file download.
JP 7	Connects J3 (RJ45) connectors pins 7 and 8 with 12V line
JP 18	Connects J2 (RJ45) connectors pins 7 and 8 with 12V line

## Jumpers related to power input

JP 5	Connects J1 (RJ45) connectors pins 7 and 8 with internal 12V line
JP 7	Connects J3 (RJ45) connectors pins 7 and 8 with internal 12V line
JP 9	Connects the 12V input to the internal 12V line
JP 18	Connects J2 (RJ45) connectors pins 7 and 8 with internal 12V line

**Please note that while it is possible to feed 12V in to the *SoarTronic IOIO UART extension board* it is recommended to use the dedicated 12V input line. This is because the 12V input is filtered and protected for reverse current.**

Once your circuit and all connections are fully tested and operational you can replace the diode D1 used for reverse polarization protection with a jumper wire. This reduces power consumption. Also the internal fuse can be replaced with external fuse placed on instrument panel for easy access.

Notes: