



REV 1.2

User Manual

ITrax02 Evaluation Kit

1.08

This manual explains the setting up of the Evaluation Kit.

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Fastrax Oy

CHANGE LOG

Rev.	Notes	Date
1.0	Initial revision	12-12-2002
1.1	Added references	12-12-2002
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COMPLEMENTARY READING

The following reference documents are complementary reading for this document:

Ref. #	File name	Document name
01	Install.pdf	iTrax02 Evaluation Kit: Installation Guide
02	Uguide.pdf	iTrax02 Evaluation Kit: GPS Workbench Users Guide

1. DESCRIPTION OF THE EVALUATION KIT

The following items are included in the Evaluation Kit

- Evaluation Kit including motherboard and iTRAX02
- AC/DC power supply
- Two RS232 cables (Null modem)
- GPS antenna
- Installation CD including GPS Workbench and documentation
- Installation guide

Check that all items are included in the shipment before setting up the system.

1.1 External Interfaces

The Evaluation Kit with the external interfaces is shown below.

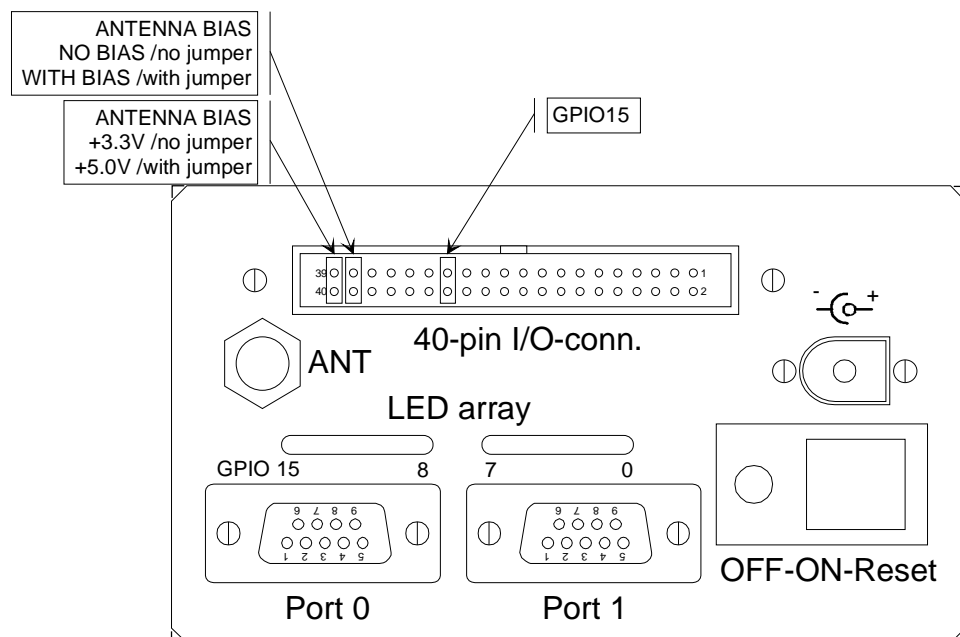


Figure 1 Back panel of the Evaluation Kit

The following external interfaces are available:

- Antenna connector for external GPS antenna (SMA-female)
- DC-power connector (2.1mm socket)
- Two RS232 ports (DB9M)
- Off/On/Reset switch with built-in LED for power indication
- Two LED arrays for indicators (GPIO 0...15, active at "0")
- 40-pin IDC-connector for external I/O interfaces
 - GPIO 0...15, except 12 and 13 which are used internally
 - Pulse measurement inputs PM0, PM1
 - SPI bus
 - 1PPS output
 - XRESET (low active)
 - Two jumpers for antenna bias selection (as described in Figure 1 and in the following chapter). The antenna bias is preset in factory for +5V.
 - Connections are described in chapter 3.

NOTE! Be careful with static electricity! There are no extra means for protection against static discharge other than the CMOS-output clamping diodes of the baseband IC of iTRAX02.

1.2 AC/DC Power supply

The Evaluation Kit is supplied with an AC/DC switch mode power supply with the following properties:

- Wide range universal supply voltage 100-240VAC, 50-60Hz
- Output voltage: 6VDC, 2A (max 15W)
- Multi-standard mains plugs for UK, USA/Japan and EURO

- Supplied with a 1.8m integral lead and 5 interchangeable output plugs. Correct plug (2.1 mm) and polarity is preset in factory.

NOTE! The suitable mains plug must be fitted prior usage.

NOTE! The suitable input voltage range is from +6 to +9VDC. A direct connection from e.g. car battery (+12VDC) is not recommended since the regulators may exceed the maximum dissipation

1.3 RS232 cables

Two standard off-the-shelf Null-modem cables are included.

The cable uses two 9-pin female connectors as shown below:

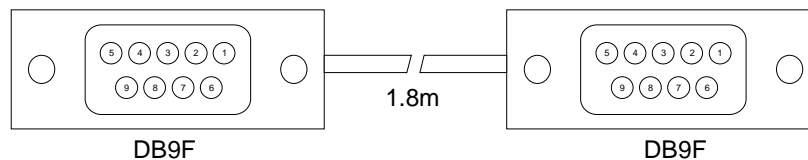


Figure 2 Null modem cable with DB9F connectors

NOTE! Onwards from PCB revision D, the GPS Workbench utilizes the RS232 RTS hand-shake signal to control automatically the Boot-mode selection (GPIO15). This feature may be omitted by using a manual jumper for GPIO15 and then the following minimum cable connection works as well:

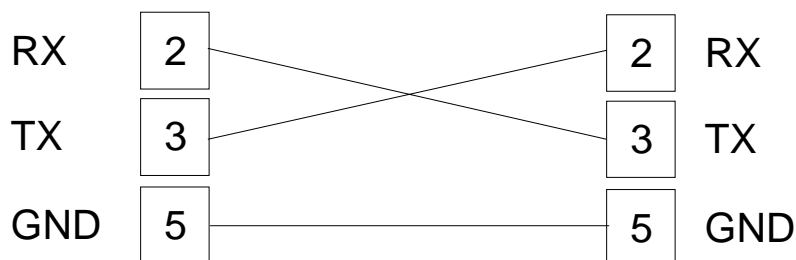


Figure 3 Null modem cable with minimum connections

1.4 On/Off/Reset switch

The switch located on the back panel has a two-fold purpose:

1. Function as an ON/OFF switch
2. Function as an external RESET switch for the iTRAX02 receiver

The switch is of SPDT (Single Pole, Double Throw) – On-Off-Mom type and the positions are following:

Position	Function	Comment
Left	OFF	Power off, LED turns off
Middle	ON	Power on, LED turns on
Right	RESET	Power on, LED is on, iTRAX02 gets RESET

Note that the switch returns to ON position after the switch is released in the RESET position.

1.5 Led Array

The red led array indicates the corresponding GPIO 0...15 state: led active means logical 'low' state (see Appendices for description of the default firmware GPIO usage).

1.6 GPS antenna

The GPS antenna supplied with the Evaluation Kit is SM-66 from San Jose Navigation Inc. The antenna is a high performance GPS patch antenna with a low noise amplifier, suitable bias voltage is +4.5...+5.5VDC. The net antenna gain including 5 meters cable loss is about +20dB. Connect the antenna cable to the ANT connector (SMA).

The antenna is intended for magnet mounting. Place the antenna outside, preferably on the roof with good whole sky satellite visibility. If needed, the antenna installation can be extended with an extra cable, but the cable loss should not exceed 10...15dB.

2. IDC-40 I/O-CONNECTOR

The following I/O-connections are available at the back panel (pin 1 at the upper right corner, pin 2 at the lower right corner etc.):

Table 1 IDC-40 I/O connector X6

Pin	Signal Name	In/Out	Description
1	GPI00	I/O	General Purpose I/O (1)
2	GND	Ground	Power and signal ground
3	GPI01	I/O	General Purpose I/O (1)
4	GND	Ground	Power and signal ground
5	GPI02	I/O	General Purpose I/O (1)
6	GND	Ground	Power and signal ground
7	GPI03	I/O	General Purpose I/O (1)
8	GND	Ground	Power and signal ground
9	GPI04	I/O	General Purpose I/O (1)
10	GND	Ground	Power and signal ground
11	GPI05	I/O	General Purpose I/O (1)
12	GND	Ground	Power and signal ground
13	GPI06	I/O	General Purpose I/O (1)
14	GND	Ground	Power and signal ground
15	GPI07	I/O	General Purpose I/O (1)
16	GND	Ground	Power and signal ground
17	GPI08	I/O	General Purpose I/O (1)
18	GND	Ground	Power and signal ground
19	GPI09	I/O	General Purpose I/O (1)
20	GND	Ground	Power and signal ground
21	GPI010	I/O	General Purpose I/O (1)
22	GND	Ground	Power and signal ground
23	GPI011	I/O	General Purpose I/O (1)
24	GND	Ground	Power and signal ground
25	GPI014	I/O	General Purpose I/O (1)
26	GND	Ground	Power and signal ground
27	GPI015	I/O	General Purpose I/O (1)
28	GND	Ground	Power and signal ground
29	PM0	I	Pulse measurement input 0
30	PM1	I	Pulse measurement input 1
31	SPI_SDI	I	SPI Interface Data In
32	SPI_SDO	O	SPI Interface Data Out
33	SPI_SCK	O	SPI Interface Clock Out
34	SPI_XCS0	O	SPI Interface Chip Select 0 Out
35	PPS	O	1PPS signal output
36	XRESET_M	I	External Reset, Active Low
37	ANT_BIAS	I	Antenna bias for RF input
38	+V_ANT	O	Antenna bias DC Power Supply
39	GND	Ground	Power and signal ground
40	BIAS_SEL	I	Antenna bias selection (3.3/5.0VDC)

(1): The uN8031 in iTRAX02 includes a keeper so that in the Evaluation Kit the GPIO lines have pull-up resistors of 4.7 kohms.

See also iTRAX02 Interface Description for further information.

3. SETTING UP THE HARDWARE

3.1 Jumper settings for antenna bias (I/O-connector)

The antenna port on iTRAX02 can be supplied with an external bias. On the Evaluation Kit the bias can be either +5V or +3.3V. The following jumper settings are available on the 40-pin I/O-connector (X6) on the back panel (see figure 1):

Antenna bias	X6 I/O-connector jumper setting
No bias	-
+3.3V	37 –38
+5V (factory default)	37 –38 and 39 – 40

3.2 Jumper settings for Boot-mode select (I/O-connector)

The iTRAX02 is factory preset for booting from the internal flash memory. There is however the option for booting through RS232 interface (Port 0) by setting GPIO 15 to logical “0”. For this purpose a jumper is placed across X6-27 – X6-28 (GPIO 15) on the 40-pin I/O-connector on the back panel, see [figure 1](#).

Onwards from PCB rev. D, the Boot-mode select is also controlled automatically with GPS Workbench via RS232 RTS hand-shake signal.

3.3 Jumper settings for serial interface (internal)

The RS232-interface is available as true RS232 signals (inverted +/- 10V) at connectors X3 (Port 0) and X5 (Port 1). This requires that the jumpers across X25 are connected (factory default): X25-1 – X25-2, X25-3 – X25-4, X25-5 – X25-6 and X25-7 – X25-8.

The serial interface signals (CMOS levels) are also available at connector X25. In this case the jumpers must be removed.

3.4 Jumper settings for power supply (internal)

The jumpers across X4-1- X4-2 (+3V_BB) and X4-3 – X4-4 (+3V_RF) provide separate voltages for the iTRAX02 receiver (factory default).

3.5 Jumper setting for Antenna bias voltage shut-down (internal)

The jumper across X7-1- X7-2 provides an active shut-down of the Antenna bias voltage (e.g. during sleep mode) that is controlled by the GPIO13 from iTRAX02. If the jumper is omitted, the bias voltage is always active.

4. MOTHERBOARD PCB

4.1 General Description

The Evaluation Kit includes a motherboard PCB for providing the necessary interface electronics and connectors for both iTRAX02 and external interfaces located on the back panel.

The following figure shows the block diagram.

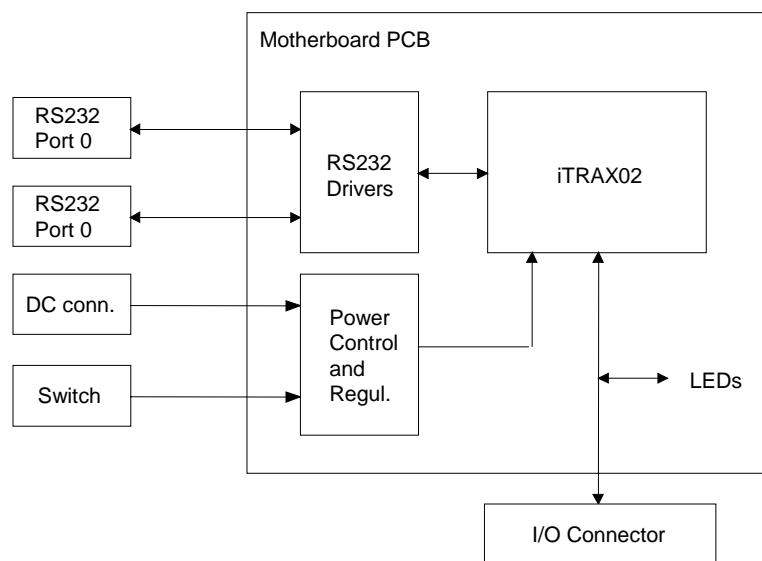


Figure 4 Block diagram of motherboard PCB

The Power Control and Regulators block supplies the iTRAX02 module with suitable regulated voltages (A2, A5) and provides the Power-On-Reset (POR) functionality (D4). It also provides a selectable supply voltage (A1) for an antenna bias via the Antenna Connector. Power switch is utilized with V2 and V1.

The RS232 Drivers block (D5) provides conversion between RS232 and CMOS levels.

The LED Arrays (D6, D7) are connected to the GPIO bus via CMOS-drivers (D2, D3). The LED is active when corresponding GPIO line is at low logical level "0".

4.2 PCB documents

The schematics of the motherboard electronics, the components layout of the motherboard and the Bill of Materials (BOM) can be found in Appendices.

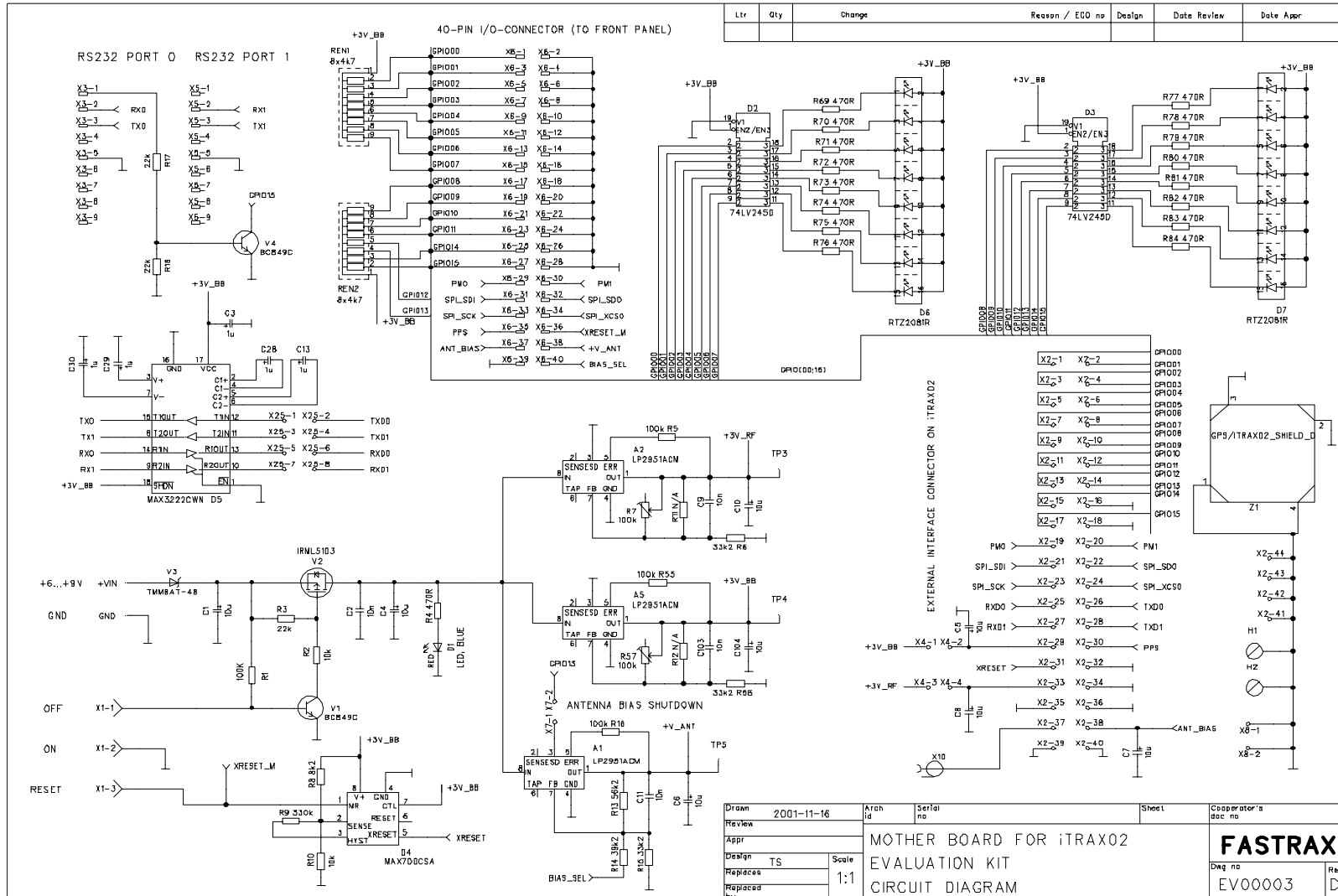
5. APPENDICES

5.1 Description of GPIO leds

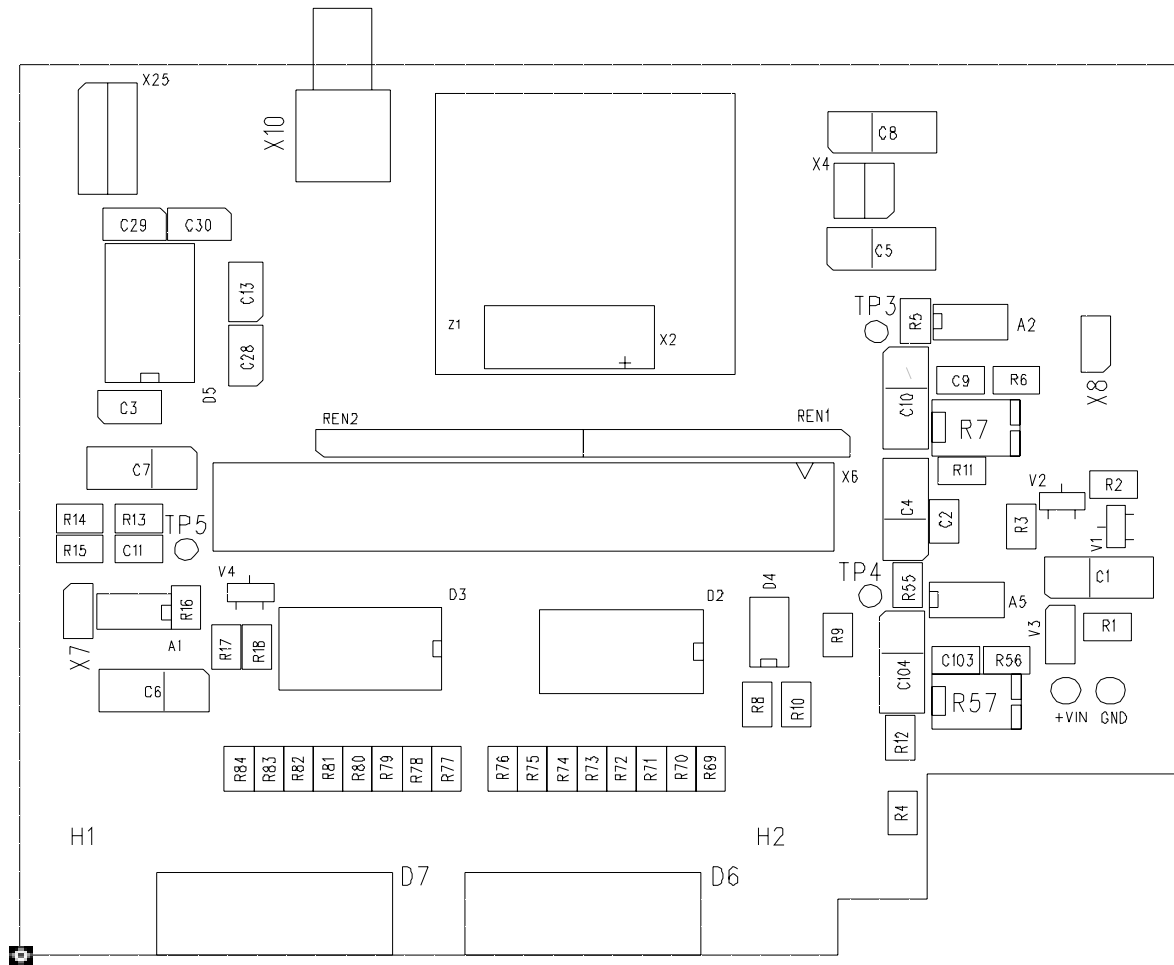
The standard iTRAX02 firmware uses the GPIO for debug purposes, see the following table (the led is active when the GPIO is at low state).

LED	MEANING	TASK	WHEN
0	Calculating pseudo-ranges	MsgTask	Low
1	Calculating new fix	NavTask	Low
2	Valid fix available	NavTask	Low
3	System error (Msg pool full)	any	Low
4	New subframe data	Data_io	Toggle
5	New track data	Track_io	Toggle
6	New acquisition data	Acq_io	Toggle
7	iTRAX02 running	Control	Toggle
8	Serial data to transmit	ISR	Low
9	Serial data received	ISR	Low
10	Serial data buffer overflow	ISR	Low
11	Wake-up from sleep mode	Main	Input
12	Flash device busy	-	Low
13	RF Amplifier on	Main	Low
14	Boot mode select (UART/SPI)	-	Input
15	Boot mode select (Flash/Serial)	-	Input

5.2 Schematics



5.3 Components layout



5.4 BOM

Bill Of Materials for d.sch on 2001-11-16

Item	VAL#	Qty	Reference	Part Name	Manufacturer				
IC	74LV245D	2	D2-3	8x3-STATE TRANSCEIVER					
CONNECTOR	4-353512-0	1	X2	2x20 0.50mm	AMP/FASTRAX				
D-CONNECTOR	DE9PNF	2	X3 X5						
PIN HEADER	2x20	1	X6	2X36N 6mm Au					
CONNECTOR, COAX	85SMA-50-0-144	1	X10	SMA, FEMALE 90 DEGR	SUHNER				
PIN HEADER	1x2	2	X7 X8	2x36N 6mm Au					
PIN HEADER	2x2	1	X4	2x36N 6mm Au					
PIN HEADER	2x4	1	X25	2x36N 6mm Au					
SWITCH	SPDT	1	X1	CON-OFF-MOM					
						GPS-MODULE	iTRAX02	1	Z1
IC	MAX3222CWN	1	D5	RS232C TRANSCEIVER	MAXIM				
LED	LED, BLUE	1	D1	5mm					
LED ARRAY	RTZ2081R	2	D6-7	8xRED ARRAY	FARNELL				
RESISTOR, SMD	N/A	2	R11-12	1% 100 ppM 0805					



RESISTOR, SMD	33k2	3	R6 R15 R56	1% 100 ppM	0805	
RESISTOR, SMD	39k2	1	R14	1% 100 ppM	0805	
RESISTOR, SMD	56k2	1	R13	1% 100 ppM	0805	
RESISTOR, TRIM	100k	2	R7 R57	TRIMMER 4mm	SMD	
IC	LP2951ACM	3	A1-2 A5	V.REG. ADJ. 100mA	SO8	NATIONAL
RESISTOR, ARRAY	8x4k7	2	REN1-2	8x4k7 10 %	SIP9	
COND, SMD	10n	4	C2 C9 C11 C103	20 % X7R	0805	
TANT.EL.KOND	1u	5	C3 C13 C28-30	1U 20 % 16 V	1206	
TANT.EL.KOND	10u	8	C1 C4-8 C10 C104	10U 20 % 16 V	6032	
DIODE	TMMBAT-48	1	V3	SCHOTTKY (MINIMELF)		
RESISTOR, SMD	100k	4	R1 R5 R16 R55	5% 200ppm	0805	
RESISTOR, SMD	10k	2	R2 R10	5% 200ppm	0805	
RESISTOR, SMD	22k	3	R3 R17 R18	5% 200ppm	0805	
RESISTOR, SMD	330k	1	R9	5% 200ppm	0805	
RESISTOR, SMD	470R	17	R4 R69-84	5% 200ppm	0805	
RESISTOR, SMD	8k2	1	R8	5% 200ppm	0805	
FET	IRML5103	1	V2	FET P-CHANNEL		
TRANSISTOR	BC849C	2	V1 V4	NPN SOT23		PHILIPS or EQ.
IC	MAX700CSA	1	D4	VOLT. DETECT WITH RESET		MAXIM

