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REV 4.0

Users manual

iTrax Evaluation Kit

This document describes the usage of the Evaluation Kit for iTRAX™ OEM GPS receivers.

September 1st, 2005

Fastrax Ltd.

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Change log

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1. COMPLEMENTARY READING

The following reference documents are complementary reading for this document:

Ref. #	Document
1	Technical Description for each iTRAX module

2. SETTING UP THE HARDWARE

2.1 GPS Antenna

Place the supplied GPS 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 be compensated with an external in-line amplifier between the active antenna and the external cable.

Connect the GPS antenna to the 'ANT in' connector on the back panel, which is a MCX female RF connector. The antenna is intended for magnet mounting. The supplied antenna bias voltage is +2.8V.

2.2 Serial ports

Evaluation Kit communicates through serial Ports 0 and 1. Check iTrax Application Board documentation for used protocols in each port.

Two DB9F null-modem cables are supplied with the Evaluation Kit for connection to these ports. Connect these cables to the Evaluation kit and to your PC at a suitable serial port, e.g. Port 1 to COM1 and Port 0 to COM2.

2.3 External power supply

Evaluation Kit can be externally powered through the power supply connector. Suitable input voltage is from 6.0 to 16.0 Volts, regulated or unregulated. Minimum power output of power supply should be 1.0 Watts.

The Evaluation Kit is supplied with a multi standard power supply. The suitable mains plug must be fitted prior usage. Connect the DC cable to the DC-power plug, which is marked 6...16V -(+). The center pin has + polarity.

2.4 Batteries for mobile usage (optional)

Evaluation Kit can also be powered by two 1.5V AA/LR6 batteries supplied with the Evaluation Kit.

While batteries are installed, the power source can be changed on the fly by either connecting or disconnecting the external power supply. When the power is supplied through the external power supply, the internal battery regulator is automatically switched off.

The Low Battery indication remains functional even when Evaluation Kit is powered by external power, thus the LowBatt indicator is lid without the batteries.

For mobile usage use install the two 1.5V batteries by removing the four screws at upper corners and opening the top cover of the Evaluation Kit.

NOTE! Place the batteries with correct polarity.

3. DESCRIPTION OF THE EVALUATION KIT

3.1 General

The Evaluation Kit is intended for easy evaluation of the iTRAX™ OEM GPS receivers. The Evaluation Kit is designed to be a platform to any Fastrax OEM receiver module attached on the iTrax Application Board, which is a removable and changeable sub-system of the Evaluation Kit.

The following items are included in the Evaluation Kit

- Evaluation Kit including a removable iTrax Application Board
- AC/DC power supply
- Two RS232 cables (Null modem)
- GPS antenna, SM-19 from San Jose Navigation Inc.
- Batteries (AA/LR6)
- Installation CD including GPS Workbench and documentation

3.2 External Interfaces

The following external interfaces are available:

- On/Off switch
- Reset switch for XRESET and Programming
- Low Battery warning LED
- Two User Interface LEDs A and B
- PPS output
- Antenna connector for external GPS antenna (MCX-female)
- Two RS232 ports (DB9M)

- DC-in power connector (2.1mm socket)

NOTE! Be careful with static electricity! There are no extra means for protection against static discharge.

The iTrax Evaluation Kit with the external interfaces is shown in the pictures below.

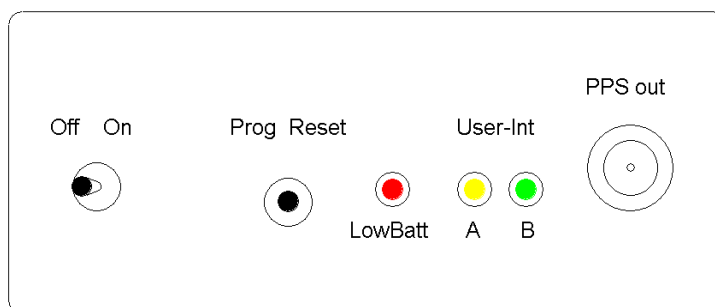


Figure 1. Front panel

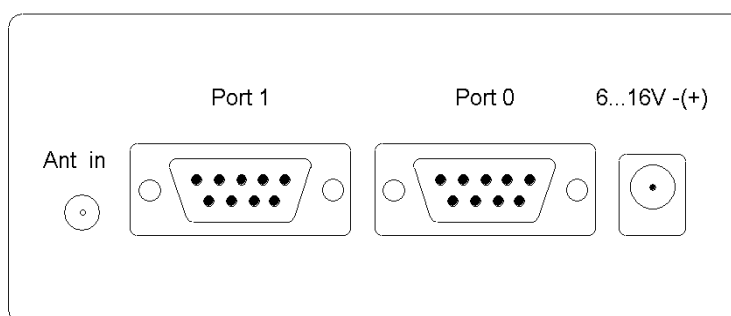


Figure 2. Back panel

3.2.1 On/Off switch

The switch is located on the far left side of the front panel.

When in OFF (left) position the switch turns off all power in Evaluation Kit.

When in ON (right) position the switch turns on power for Evaluation Kit.

3.2.2 Reset / Programming switch

The switch is located on the right of the On/Off switch on the front panel.

Pushing switch to the Programming (left) position Application board resets and boots in the programming mode.

Pushing switch to the Reset position (right) Application board resets and boots in normal operation mode.

3.2.3 Low Battery warning LED

The red Low Battery Led indicates state of the internal batteries. When the Low Battery Led is lid, the batteries are low in voltage (or not present) and need to be replaced with new ones. Note that internal batteries are needed only for mobile usage.

3.2.4 User Interface LEDs

Two User Interface LEDs, yellow (A) and green (B), are driven by dedicated I/O lines through a separate buffer. Refer to the iTrax Technical Description for further information (ref #1).

3.2.5 PPS output

PPS output connector is a BNC female connector on the right side of front panel. To enable PPS output it needs to be turned on by software. The PPS output is buffered and it is capable to source/sink +/-24mA current to the load.

3.2.6 GPS antenna input

GPS antenna connector is located on the left side of back panel; connector type is MCX female.

The GPS antenna supplied with the Evaluation Kit is SM-19 from San Jose Navigation Inc. The antenna is a high performance GPS patch antenna with a low noise amplifier; suitable bias voltage is from 2.5 to 5.0 VDC. The iTrax Application Board supplies a bias voltage at the antenna connector (+2.8V...+3.0V depending on the iTrax module). The net antenna gain is about 10dB including 5 meters cable loss. Connect the antenna cable to the 'ANT in' connector.

3.2.7 RS232 ports

Two DB9F connectors (Port 0 and Port 1) are located at the back panel. The Evaluation Kit provides RS232 level conversion from the CMOS levels in iTrax module.

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

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

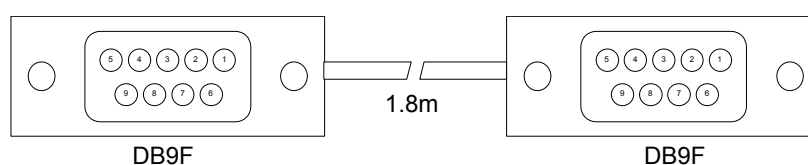


Figure 3. Null modem cable with DB9F connectors

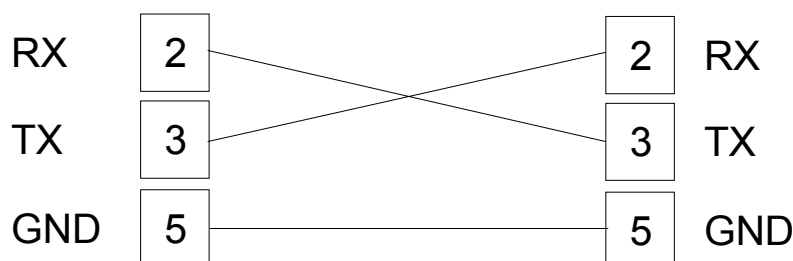


Figure 4. Null modem cable with minimum connections

3.2.8 DC-in power connector

DC-in power connector is located at the back panel. Connector type is a 2.1mm socket. Polarity is following: center pin is positive and outer shell is ground. Suitable input voltage is from 6.0 to 16.0 Volts, regulated or unregulated. For minimum power dissipation the 6.0V supply is suggested.

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.

3.3 Internal Interfaces

The following internal interfaces are available:

- Eight Debug LEDs
- On/Off switch for Debug LEDs
- Jumper connectors for communication ports
- Jumper connector for current measurement
- Card terminal for Module Application Board
- IDC-40 I/O-connector

To access internal interfaces the Evaluation Kit cases cover needs to be removed. To remove the cover; unscrew two upper screws at each end of the case (equals four screws) and lift of the cover part.

Installation is reversed procedure.

3.3.1 Debug LEDs on PCB

Eight debug LEDs inside of Evaluation Kit are available for debugging purposes. They are driven from dedicated I/O of the iTrax through a separate buffer. The number marked below the led indicates the led number (D1...8).

LEDs can be turned on or off by the yellow switch next to them on the PCB, which is marked On/Off.

3.3.2 Jumper connector for communication ports

Four jumpers on the X3 connector can be removed to access CMOS logic interface to the iTrax Application board. Logic level is from 0 to VDDDIG supply, check each iTrax Application Board VDDDIG voltage level.

3.3.3 Jumper connector for current measuring

The current consumption of iTrax Application Board can be measured by removing the jumper on the X12 connector. Connect a current meter between the two pins in X12.

Notes:

- a) Antenna bias supply current is also included in the total current
- b) Supply voltage is +3.3V to the iTrax Application Board but iTrax module supply voltage may be as low as +2.8V in the iTrax Application Board.
- c) Measured Sleep state current may be too small due to current leakage from the RS232 driver, which operates at +3.3V supply. Voltage regulator GND pin currents (2x 10uA typical) are also included in the total current.

3.3.4 Card terminal for the iTrax Application Board

The removable iTrax Application Board is connected to the Evaluation Kit by a 40-pin card terminal connector J3. Terminal connector type is Samtec FCT-120-02-L-D-01-RA-SL. Terminal connector has identical pin numbering and signals with the IDC-40 I/O-connector J4.

See the next chapter, IDC-40 I/O-connector.

NOTE! Be careful with static electricity! There are no extra means for protection against static discharge.

3.3.5 IDC-40 I/O-connector

The following I/O-connections are available on the J4 IDC-40 I/O connector inside the Evaluation Kit case. For un-named pins check the iTrax Application Board documentation in *ref #1*. I/O signal direction is seen from the perspective of the iTrax Application Board.

Pin	Signal name	I/O	Signal description
1	TXD1	O	UART 1 async. output
2	GND	-	Ground
3	RXD1	I	UART 1 async. input
4	GND	-	Ground
5	TXD0	O	UART 0 async. output
6	GND	-	Ground
7	RXD0	I	UART 0 async. input
8	GND	-	Ground
9	VCC	-	Supply voltage +3.3V
10	GND	-	Ground
11	PPS	O	1PPS signal output
12	GND	-	Ground
13	XRESET	I	Active low async. system reset
14	D1	O	Debug led D1

15	-	-	
16	BOOT	I	Boot Select: '1' Flash; '0' Serial Port 0
17	GND	-	
18	D7	O	Debug led D7
19	D4	O	Debug led D4
20	D6	O	Debug led D6
21	GND	-	Ground
22	D5	O	Debug led D5
23	D3	O	Debug led D3
24	D2	O	Debug led D2
25	GND	-	Ground
26	UI_B	O	UI indicator B
27	-	-	
28	D8	O	Debug led D8
29	-	-	
30	UI_A	O	UI indicator A
31	GND	-	Ground
32	-	-	
33	GND	-	Ground
34	-	-	
35	GND	-	Ground
36	-	-	
37	GND	-	Ground
38	-	-	
39	GND	-	Ground
40	-	-	
Pin	Signal name	I/O	Signal description

4. TECHNICAL DESCRIPTION

4.1 General Description

The Evaluation Kit includes the removable Module Application Board and the Motherboard PCB and it provides all the necessary interface electronics and connectors.

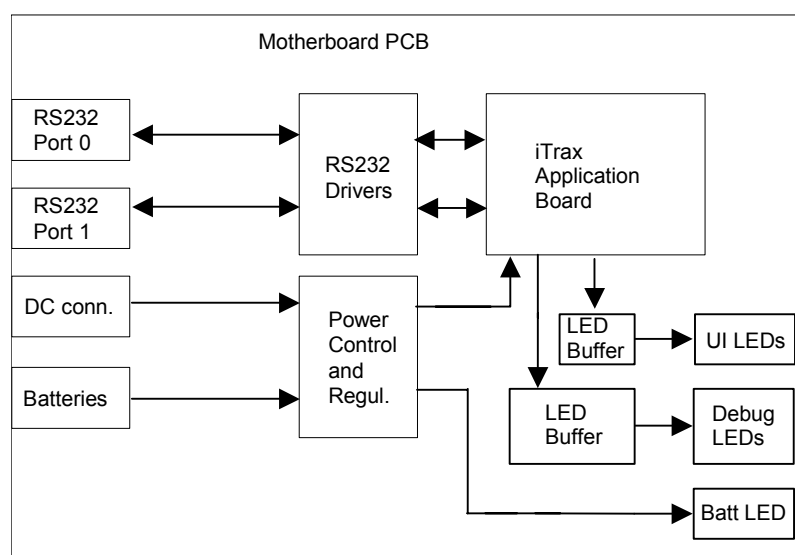


Figure 5. Block diagram of Motherboard PCB

The Power Control and Regulators block provides +3.3V supply voltage for the Module Application Board and to the internal electronics. The +3.3V supply is either regulated for the external power supply or it is generated from internal batteries (2x1.5V AA-size). The RS232 Drivers block provides conversion between RS232 and CMOS levels. The LowBatt LED is driven by the Power Control and Regulators block. Two User Interface LEDs and Debug LEDs are driven through a LED Buffers.

4.2 Motherboard PCB Bill Of Materials (BOM)

Reference	VAL#	Qty	MFG.CODE	MFG	PACKAGE	DESCRIPTION
B1-2		2	1028	Keystone		Holder for 1x AA size battery
C1	47u	1	TAJD476K025R	AVX	D	Tantal Capacitor, 25 Volt
C2	100n	1			0603	Ceramic Capacitor, 25 Volt, X7R
C3 C7-8 C10 C16 C25	220n	6			0603	Ceramic Capacitor, 10 Volt, X7R
C4 C20 C24 C26-27	100u	5	TAJD107K010R	AVX	D	Tantal Capacitor, 10 Volt
C5 C17 C21	100n	3			0603	Ceramic Capacitor, 10 Volt, X7R
C6	10n	1			0603	Ceramic Capacitor, 25 Volt, X7R
C9	47n	1			0603	Ceramic Capacitor, 10 Volt, X7R
C11-15	1u	5	TAJA105K016R	AVX	A	Tantal Capacitor, 16 Volt
C18 C22	1n	2			0402	Ceramic Capacitor, 10 Volt, X7R
C19 C23	18p	2			0402	Ceramic Capacitor, 10 Volt, X7R
E1-8		8	LOR976	Osram	0805	Orange SMT LED
E9	Yellow	1	HLMP-1719	Agilent		Low Power 3mm LED
E10	Green	1	HLMP-1790	Agilent		Low Power 3mm LED
E11	Red	1	HLMP-1700	Agilent		Low Power 3mm LED
J1-2		2	747840-4	AMP		D-Sub-9 Male Connector for PCB
J3		1	FCT-120-02-L-D-01-RA-SL	Samtec	2,00mm	2x20 pin Flex Card Terminal
J4		1		Perlos	2,54mm	2x20 pin-header, straight
J5		1		Multicomp		50 Ohm BNC male connector, 90 Deg
J6-7		2	MCX6252B1-3GT30G-50	Amphenol		50 Ohm MCX female connector, 90 Deg
J8		1			2,54mm	2x4 pin-header, straight
J9		1			2,54mm	1x2 pin-header, straight
J10		1				2,1mm Power Socket
L1	22u	1	LPC 4045	KOA		Inductor with Ferrite Core
R1-2	4R7	2			0805	Resistor, 5%, 0.125 W, 50 VDC
R3 R7	22k	2			0603	Resistor, 5%, 0.1 W, 50 VDC
R5 R4 R16	47k	3			0603	Resistor, 5%, 0.1 W, 50 VDC
R6	220k	1			0603	Resistor, 5%, 0.1 W, 50 VDC
R8 R23 R26 R28	0R0	4			0603	Resistor, 5%, 0.1 W, 50 VDC
R10	470k	1			0603	Resistor, 5%, 0.1 W, 50 VDC
R11	1k2	1			0603	Resistor, 5%, 0.1 W, 50 VDC
R12 R19 R21-22 R9 R24-25 R29	Not placed	8			0603	Resistor, 5%, 0.1 W, 50 VDC
R13	220R	1			0603	Resistor, 5%, 0.1 W, 50 VDC
R14	1k5	1			0603	Resistor, 5%, 0.1 W, 50 VDC
R15	100k	1			0603	Resistor, 5%, 0.1 W, 50 VDC
R17-18	0R0	2			0805	Resistor, 5%, 0.125 W, 50 VDC
R20	47R	1			0603	Resistor, 5%, 0.1 W, 50 VDC
R30-38	1k	9			0603	Resistor, 5%, 0.1 W, 50 VDC
R39	820R	1			0603	Resistor, 5%, 0.1 W, 50 VDC

4.4 Motherboard PCB Components layout

