



Version 1.2

FAQ

IT600

Frequently Asked Questions and answers for IT600 OEM receiver

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Fastrax Ltd

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REFERENCES

| Ref. # | Publisher; Reference |
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CHANGE LOG

| Rev. | Notes | Date |
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| 1.0 | Initial template, draft status | yyyy-mm-dd |
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2 Overview

2.1 General

IT600 contains a low of new features including Glonass capability, DR support, and versatile programming support. This document is a set of questions and answers to address the new features.

The following table shows the firmware versions. New features are added continuously. Firmware version numbers for the coming releases are TBD.

| Firmware Version | Date | Features |
|------------------|-----------------------------|--|
| 7.1.2.6 | April 20 th 2011 | Initial Alpha release with combined GPS and Glonass Navigation. Requires ST GNSS Testing tool version 4.2.1 due to modified NMEA messages. Fastrax WorkBench version TBD can also be used. |
| x.x.x.x. | July 2011 | 5Hz/10Hz navigation update rate and support for 1-axis analog gyro + odometer for Dead Reckoning. |
| x.x.x.x | August 2011 | Production Release firmware |
| x.x.x.x | October 2011 | DWP-based DR support |
| | | |
| | | |
| | | |

2.2 FAQ's – GNSS & Navigation

Q: What GNSS systems are supported and how many satellites can the receiver track and utilize?

A: IT600 has 32 channels that can be used for acquiring and tracking any mix of GPS, Galileo, Glonass and QZSS signals. Current firmware 7.1.8.28 can use GPS, Glonass and QZSS. Galileo support is scheduled later when satellites are available. The same applies for the Chinese Compass/Beidou system.

Q: Does multi-GNSS improve accuracy?

A: Yes, here is a snapshot of a test drive in Helsinki downtown using 18 satellites. A picture explains more than 1000 words...



Q: When is support for 5Hz/10Hz navigation update rate planned?

A: It is scheduled for July 2011. Using 5Hz/10Hz requires that CPU is clocked at 208MHz (CPU usage 40-50% @ 10Hz and 20-30% @ 5Hz). Impact on power consumption is TBD.

Q: What will be the power consumption by GPS only and by a mix of Glonass / GPS, Galileo / GPS be?

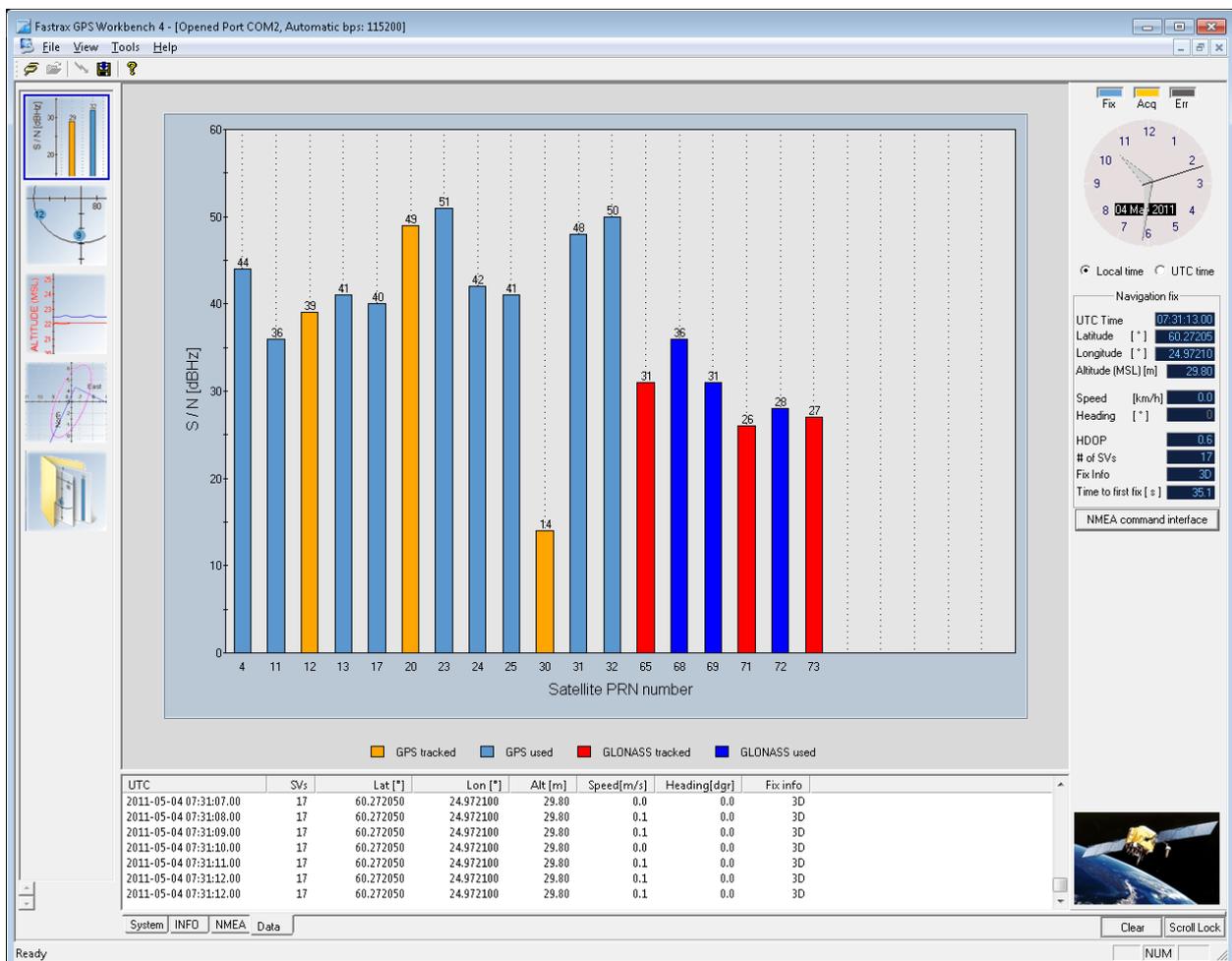
A: GPS/Galileo radio consumes about 15mA, enabling the Glonass radio adds another 12mA. The baseband current consumption is TBD (depends on ARM9 CPU speed, number of channels being used and firmware features).

Q: Is a passive GPS antenna enough?

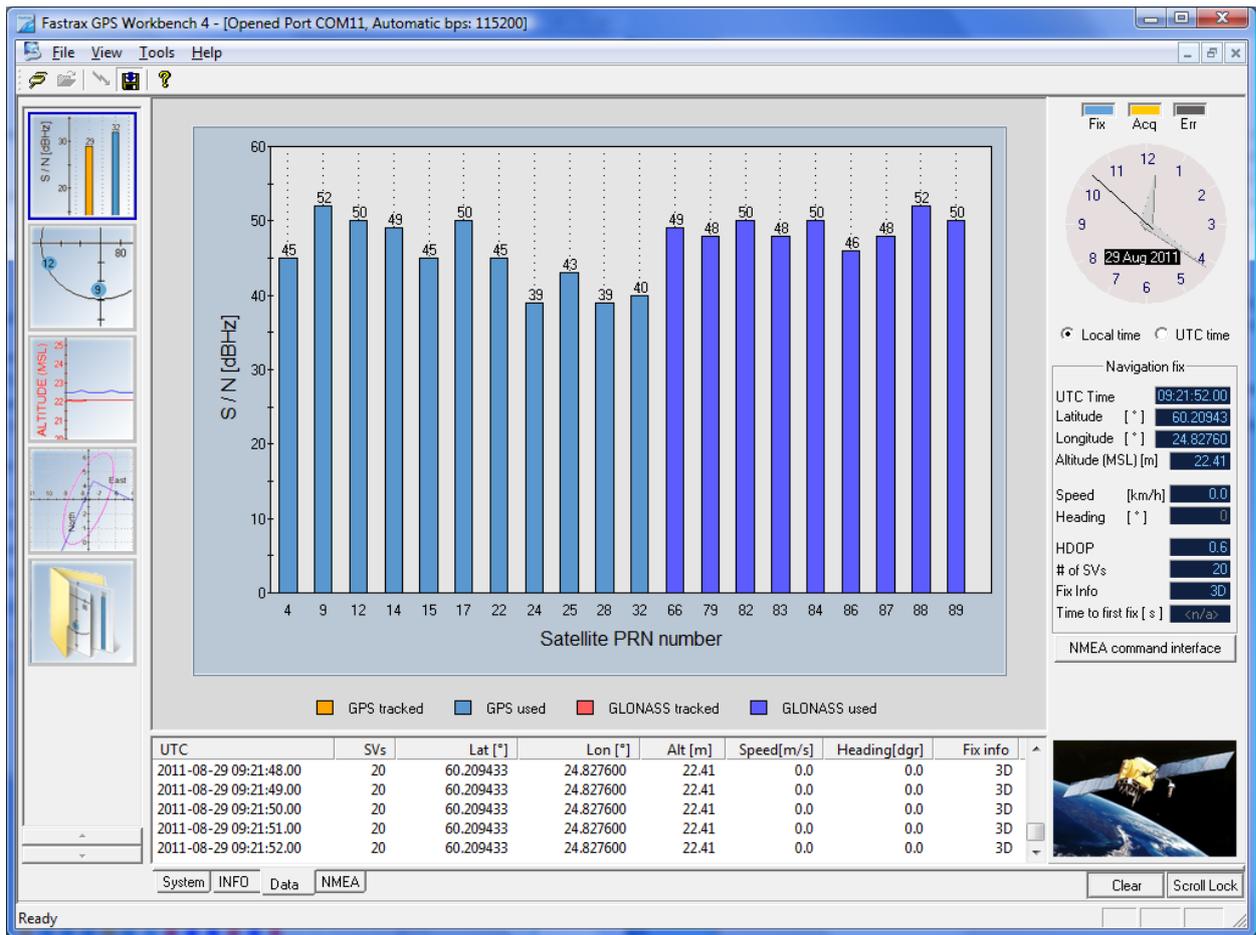
A: For best sensitivity an active antenna is recommended. Please note also that the antenna should be also wideband that can handle both GPS band around 1575,42MHz and Glonass band from 1598MHz-1608MHz. The antenna should be RHCP on both bands also. Note that most commercial GPS/Glonass antennas are a compromise in this respect: linearly polarized on both bands.

Q: Does IT600 work with a GPS only antenna?

A: Yes, a GPS only antenna can be used. Typical commercial GPS antennas can also pass through Glonass signals albeit attenuated. The following GPS Workbench screenshot shows a typical example where a total of 6 Glonass signals are seen about 20dB attenuated using a GPS only antenna. Nominal signal levels for both GPS and Glonass should be around 50dBHz with a proper wide band antenna.



With a wideband antenna the signal levels look like below



Q: How are SBAS signals utilized in current firmware?

A: Current setting for SBAS is configured for PRN 124 (EGNOS). In order to change the PRN Configuration ID 135 must be used. This can be done with the WB4 IT600 NMEA Command Interface dialog.

Note that the PRN must be given as HEX-value.

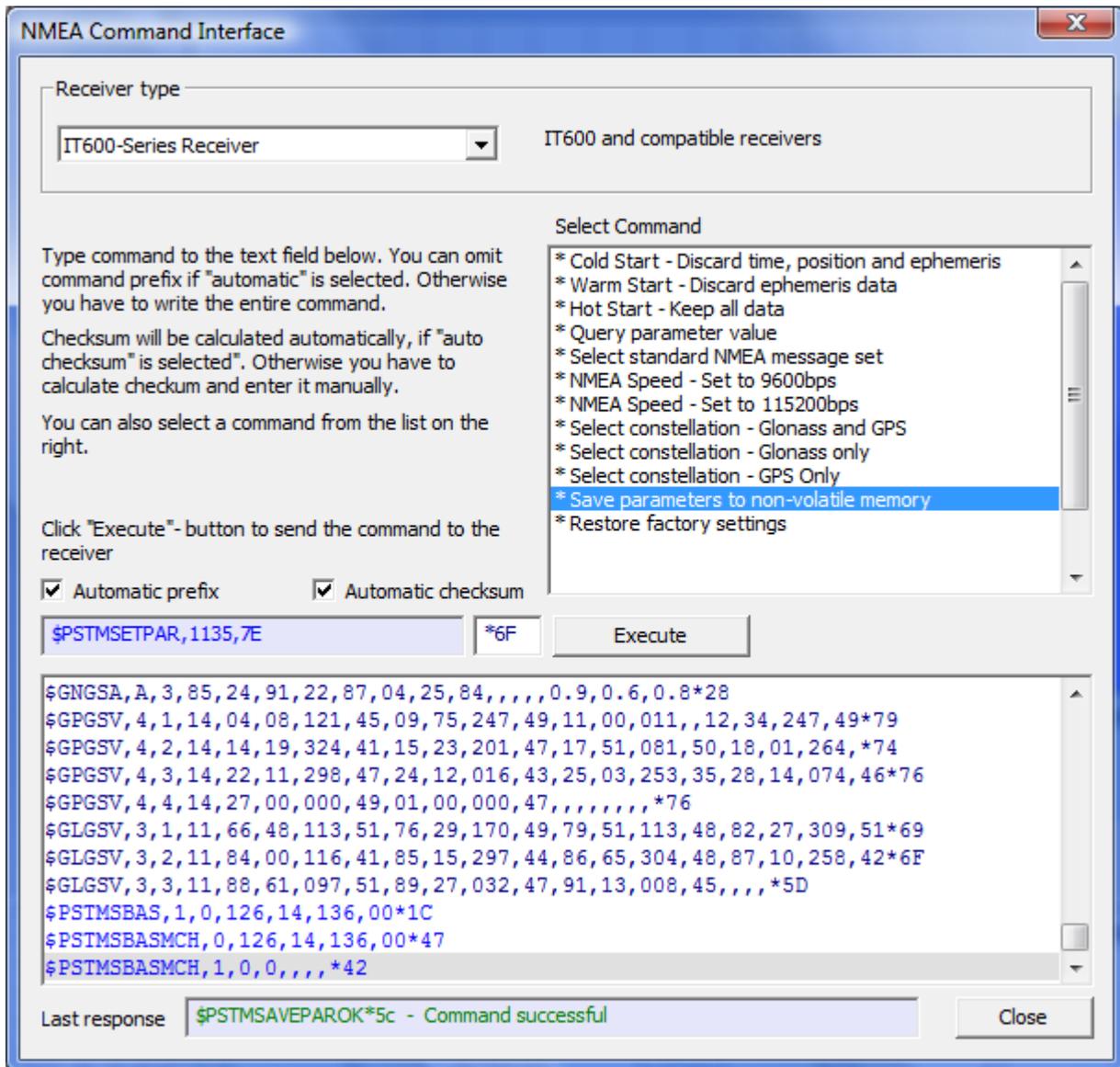
| SBAS Satellite | PRN (decimal) | PRN (hex) |
|----------------|---------------|-----------|
| EGNOS | 120 | 78 |
| EGNOS | 124 | 7C |
| EGNOS | 126 | 7E |
| GAGAN | 131 | 83 |
| MSAS | 129 | 81 |
| MSAS | 137 | 89 |
| WAAS | 133 | 85 |
| WAAS | 135 | 87 |
| WAAS | 138 | 8A |

Example: change to EGNOS PRN 126:

\$PSTMSCTPAR,1135,7E*6F

\$PSTMSAVEPAR

followed by Off-ON

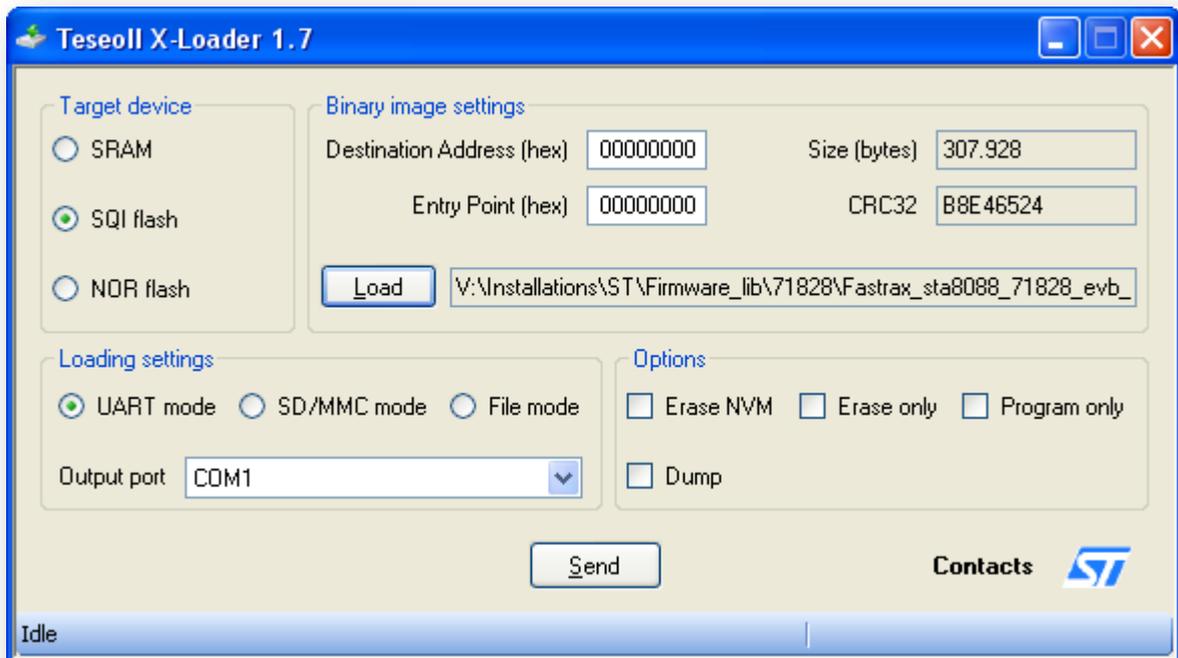


Note also that SBAS data is provided as separate \$PSTMSBAS messages in current firmware.

2.3 FAQ's – Tools

Q: How do I Flash a new firmware to IT600?

A: ST has a GUI Software called XLoader. Latest version is XLoader 1.7. It can be used for downloading a new firmware to IT600 using UART Port 2. In order to do that the IT600 must be booted into serial mode (pulling UART_TX2 pin low at Reset).



Q: Can the receiver be configured for GPS only, Glonass only or GPS+Glonass modes?

A: Yes, the following instructions and procedures are needed (new GPS Workbench 4.21.0009.beta supports these also):

GPS only mode:

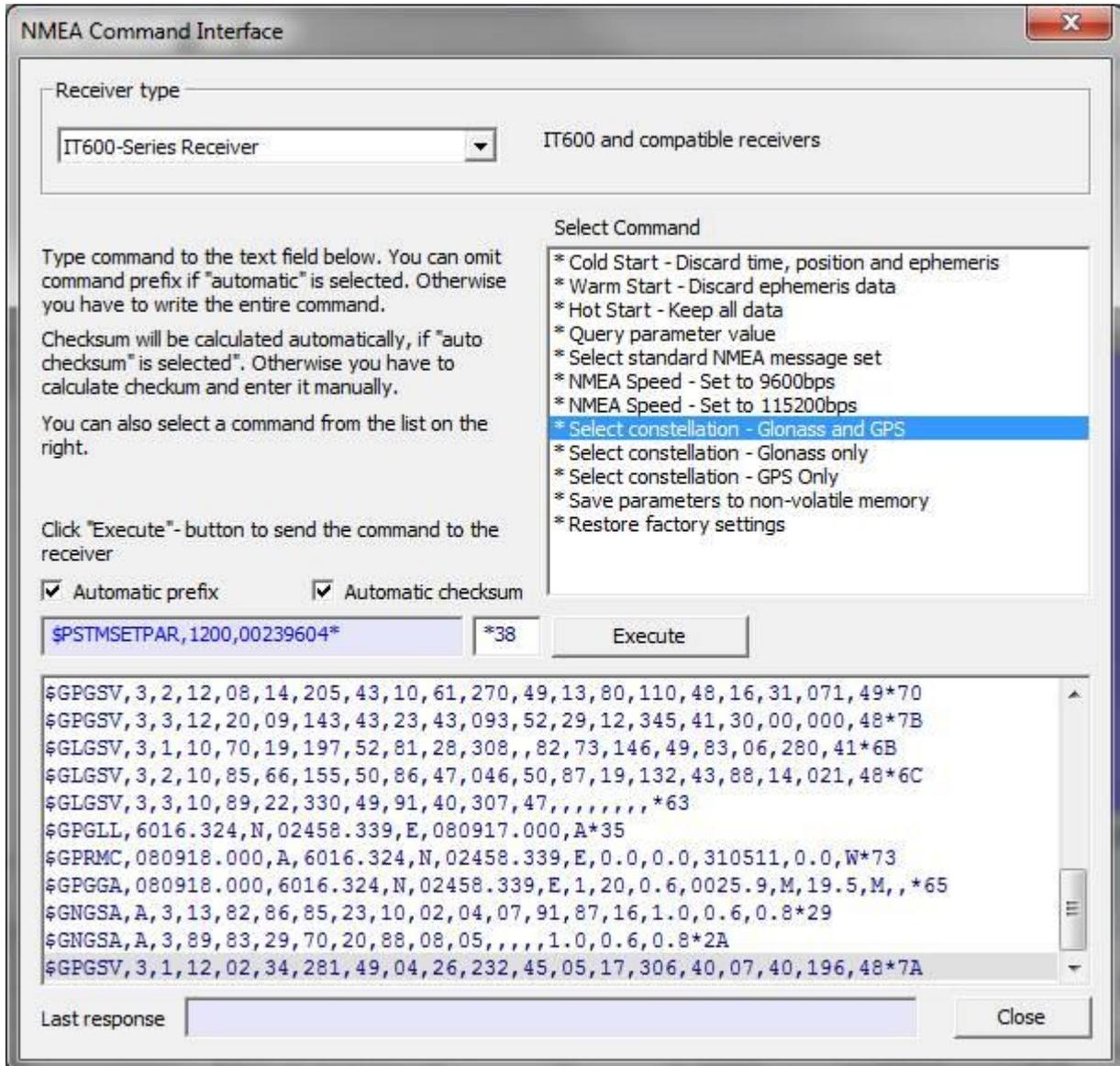
- \$PSTMSETPAR,1200,00219604
- \$PSTMSAVEPAR
- <RESET> - pull-out IT600 application boards and re-insert

Glonass only mode:

- \$PSTMSETPAR,1200,00229604
- \$PSTMSAVEPAR
- <RESET> - pull-out IT600 application boards and re-insert

GPS and Glonass mode:

- \$PSTMSETPAR,1200,00239604
- \$PSTMSAVEPAR
- <RESET> - pull-out IT600 application boards and re-insert



2.4 FAQ's – I/O's and Power supply

Q: The I/O voltages are 3.3V CMOS levels and Core voltage is 1.8V CMOS levels. Does it mean that the supply voltage is 3,3 Volt nominal? Can a 3 to 4.2 Volt be used like with IT520? Switched Mode DC/DC converter inside?

A: The I/O voltages are 3.3V +/-10%. Upper limit is thus 3.6V for the supply voltage. All internal regulators are LDO's.

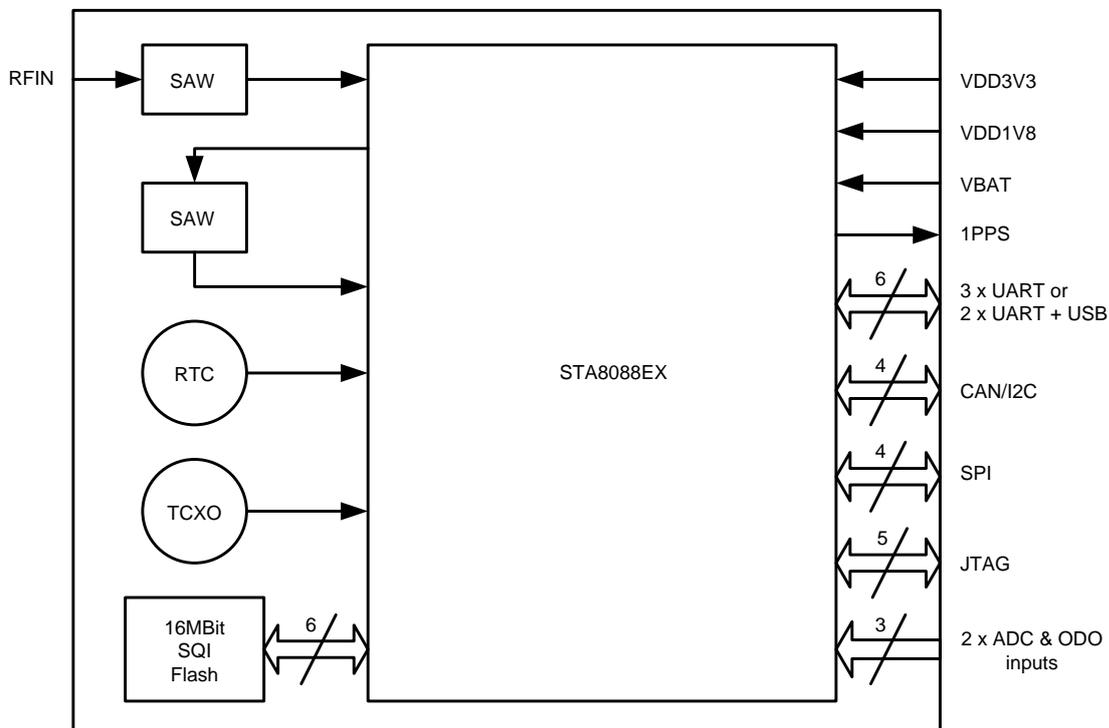
Q: What peripherals are available on IT600?

A: IT600 has a versatile set of peripherals available.

- Three UART ports. One of the UART ports (Port1) can also be USB. Port 2 is reserved for NMEA output and Port 0 for RTCM input.
- I2C interface. This is used on the Application board for MEMS sensors and EEPROM
- SPI interface
- CAN interface
- 1PPS output
- JTAG port

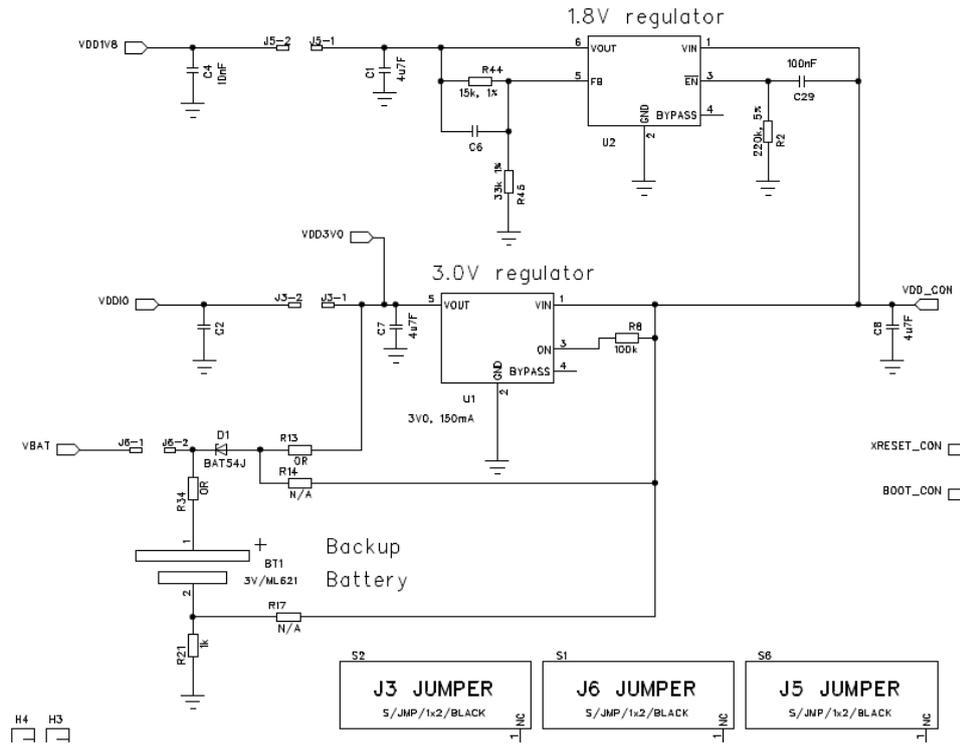
Q: Is there a SAW filter inside? One or two SAW filters? Internal LNA?

A: There are two wideband SAW filters inside, one at the RF input and one after the internal LNA of the STA8088EX single chip IC. See block diagram below.



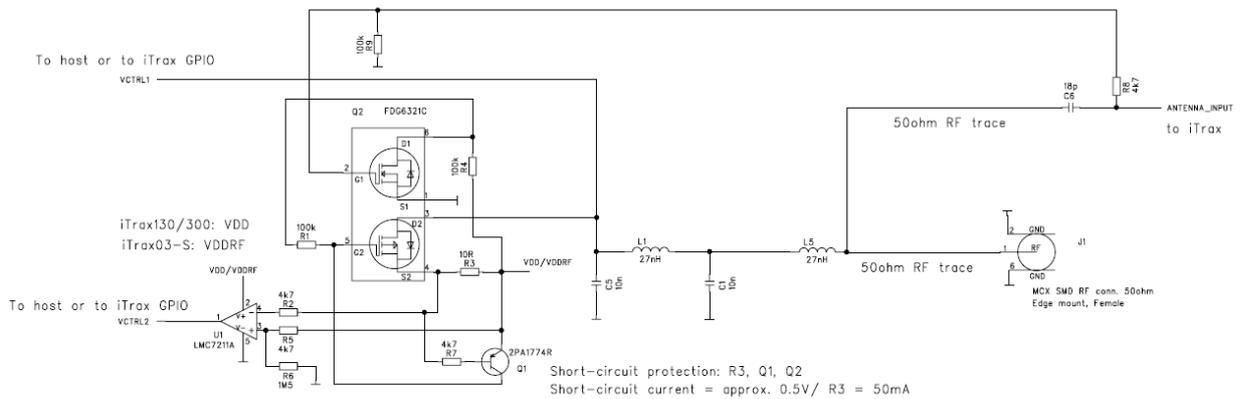
Q: How to handle proper power-up sequencing?

A: VDD1V8 must be delayed with respect to VDD3V3. It can be conveniently achieved with the reference implementation on AP600 Application Board.



Q: Does IT600 support antenna detection feature?

A: No, antenna detection can be handled with our reference design



This reference design has the following features:

- Detects short and open antenna bias
- Antenna bias short-circuit protection
- Antenna bias shut-down in battery backup mode
- With the component values shown, ant bias detection threshold is <2mA
- With the component values shown, ant bias short circuit current is about 50mA

Notes:

- Bias voltage drop = (active antenna current) * R3
- Bias current threshold = 2 * (U1 input offset voltage) / R3 = 2 * 10mV/10 = 2mA
- Input offset voltage (U1) can be +/-10mV, which is compensated by R5/R6

- Other comparators (U1) will do as well, adjust R5&R6 according to max offset voltage at input

Bias detection states can be read using VCTRL1 and VCTRL2 outputs:

| STATUS | VCTRL1 | VCTRL2 |
|--------|--------|--------|
| OK | High | High |
| SHORT | Low | High |
| OPEN | High | Low |

2.5 FAQ's – NMEA & RTCM protocols

Q: Are there any new NMEA sentences due to combined GPS and Glonass?

A: Yes, the following NMEA data capture shows what new sentences are introduced:

```
$GPRMC,075323.000,A,6016.322,N,02458.327,E,0.0,0.0,040511,0.0,W*74
$GPGGA,075323.000,6016.32222,N,02458.32659,E,1,14,0.7,025.96,M,19.5,M,,*69
$GPVTG,0.0,T,,M,0.0,N,0.1,K*61
$GNGSA,A,3,30,24,02,20,68,10,25,31,04,13,32,12,1.1,0.7,0.9*29
$GNGSA,A,3,23,17,,,,,,,,,1.1,0.7,0.9*25
$GPGSV,4,1,13,02,08,325,33,04,39,297,44,10,09,287,31,12,00,338,18*77
$GPGSV,4,2,13,13,36,228,43,17,11,252,31,20,66,141,47,23,71,201,49*78
$GPGSV,4,3,13,24,14,169,39,25,13,011,38,30,07,096,34,31,34,052,44*7B
$GPGSV,4,4,13,32,42,115,45,,,,,,,,,*48
$GLGSV,3,1,09,65,09,013,18,68,84,053,30,69,33,280,,71,39,146,*62
$GLGSV,3,2,09,72,42,053,,73,28,100,16,75,25,340,,76,09,231,*6A
$GLGSV,3,3,09,84,00,172,,,,,,,,,*54
```

\$GPRMC and \$GPGGA shows the navigation results combining GPS and Glonass.

In hybrid mode \$GPGSA is replaced with two \$GNGSA messages; one for GPS and one for Glonass

\$GLGSV's are new messages showing Glonass PRN's and signal strengths.

Q: What tools are needed to decode GPS and Glonass NMEA signals?

A: Fastrax GPS Workbench version 4.21.0009.beta can be used.

2.6 FAQ's – MEMS & DR

Q: What about MEMS support?

A: Support for MEMS sensors can be done by the customer using the SDK.

Q: How will IT600 handle Dead Reckoning support?

A: First Dead Reckoning firmware release using 1-axis analog Gyro and Odometer signal from car is schedule for July 2011. Final release planned for October 2011. The support for 3-axis digital gyro and Odometer is scheduled after October release. Support for DWP-based Dead Reckoning is scheduled for Q4 2011. DWP requires connectivity to the CAN-bus of the car.

Q: What MEMS sensors are supported?

A: Fastrax has an Application board (AP600) and a Development Board (DB600) available. They are identical PCB's but using different assembly options. The Application Board has only 3-axis gyro assembled. The Development Board has all the other sensor variants and other peripherals assembled including:

- 3-axis Gyroscope (I2C-bus, ST L3G5200D, Device address: 110 1000)
- 3-axis Accelerometer (I2C-bus, ST LIS3DH, Device address: 001 1000)
- 3-axis Gyroscope (I2C-bus, VTI CMR3000, Device address: 001 1110)
- 3-axis Accelerometer (I2c-bus, VTI CMA3000, Device address: 001 1100)
- CAN driver (CAN bus, TI SN65HVD231)
- Pressure Sensor (I2C-bus, Bosch BMP085, Device address: 111 0111)
- E2PROM (I2C-bus, ST M24M01, Device address: 101 0000)
- 3-axis Magnetometer (I2C-bus, Aichimi AMI304, Device address: 000 1110)
- JTAG header for Lauterbach ICE

2.7 FAQ's – SDK

Q: Can the embedded ARM9 be used for running customer code? If so what are the supported software development tools?

A: Yes, the embedded ARM9 can be used. There is an SDK available with following support:

- ARM Realview 3.1 compiler, GNU compiler support is later, schedule is TBD
- OS20 RTOS Operating system
- Lauterbach JTAG ICE (optional)
- Codeblocks IDE
- About half of the internal SQI Flash is free with 7.1.8.28 firmware (>8MBit is free).
- About half of the SRAM is free with 7.1.8.28 firmware (>128kByte is free)
- Complete backup RAM is also free (8kByte)

Q: What Low Level Drivers are supported currently in SDK?

A: I2C and SPI are currently supported. Support for CAN, ADC, USB will be available in later SDK releases.

2.8 FAQ's – AGNSS

Q: Does IT600 support AGNSS? GPS and Glonass?

A: Yes, IT600 supports both Self-Trained Assisted GPS technology (ST-AGPS™) and a server based predictive assistance GPStream™ provided by RX Networks. ST-AGPS can do full autonomous Ephemeris prediction up to 5 days without server assistance. ST-AGPS can propagate the Ephemeris for those satellites it has seen and decoded live Ephemeris. GPStream™ on the other hand requires server access to retrieve the 'seed' for all satellites. A total of 2kB payload must be downloaded. AGNSS technology applies for both GPS and Glonass.

2.9 FAQ's – CAN

Q: Does IT600 support CanBus J1939 and J1708?

A: TBD

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