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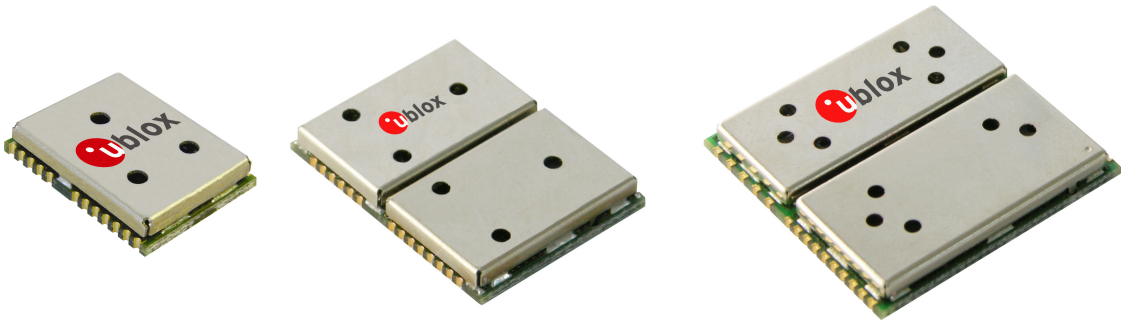
NEO-5, LEA-5, TIM-5H
u-blox 5 Receiver Modules

Migration from ANTARIS 4



Abstract

This document provides information for migration from ANTARIS 4 to u-blox5 modules.

Application Note

your position is our focus

Title	NEO-5, LEA-5, TIM-5H	
Subtitle	u-blox 5 Receiver Modules	Migration from ANTARIS 4
Doc Type	Application Note	Preliminary
Doc Id	GPS.G5-MS5-08070-D	

Revision Index	Date	Name	Status / Comments
B- initial version	18/04/2008	SV	Preliminary
C	09/06/2008	SV	Correct command to reconfigure u-blox5 Kickstart modules with firmware version 4.00 to "Eco Mode". Software Migration remarks for UBX-CFG-ANT and UBX-MON-HW Recommendation to use clean and stable power supply
D	15/07/2008	SV	With firmware 5.00, no acknowledge (ACK) is returned for the UBX-CFG-PRT message Recommendation to verify resistors used for antenna supervisor circuitry Recommendation to disable SBAS services to achieve 4Hz navigation

Data sheet status	
Objective Specification	This data sheet contains target or goal specification for product development.
Preliminary Specification	This data sheet contains preliminary data, revised and supplementary data may be published later.
Released	This data sheet contains the final product specification.

	Products marked with this lead-free symbol on the product label comply with the "Directive 2002/95/EC of the European Parliament and the Council on the Restriction of Use of certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS).
	This is an Electrostatic Sensitive Device (ESD). Observe precautions for handling.

1 Introduction

Migrating an ANTARIS 4 to u-blox5 u-blox module receiver is easy. Nonetheless, it pays-off to do a sanity check of the hardware and software designs. This application note lists the most important items to facilitate migration.

☞ Fulfilling the recommendations given in this document does not make a system test unnecessary.

This application note is extracted from the u-blox 5 module documentation *(*see section Related Documents referenced at the end of this application note*)*.

For regular updates to u-blox documentation and to receive product change notifications please register on our homepage: http://www.u-blox.com/

2 Checklist for migration

Have you chosen the optimal module?

- Although all u-blox 5 receivers outperform ANTARIS 4 acquisition (i.e. better sensitivity level and acquisition time) select a LEA-5**S**, LEA-5**H** or LEA-5**Q** for the advantage of KickStart performance.
- If KickStart performance is not required, choose a LEA-5**A** or LEA-5**M**. This saves the additional cost of a TCXO over a standard XTO crystal.

  Further information on KickStart can be found under:

  http://www.u-blox.com/technology/kickstart.html
- For passive antenna applications, choosing a LEA-5**Q** or LEA-5**M** can save the cost of Antenna power supervision.
- For the ability to upgrade the firmware or to permanently save configuration, choose a LEA-5**H**.
- For USB choose LEA-5**H**, LEA-5**M** or LEA-5**Q.**

  LEA-5**M,** LEA-5**Q,** LEA-5**S** and LEA-5**A** do not support USB Bus power connectivity yet (Planned for Q1/2009). LEA-5**M** or LEA-5**Q** support USB Self power mode.

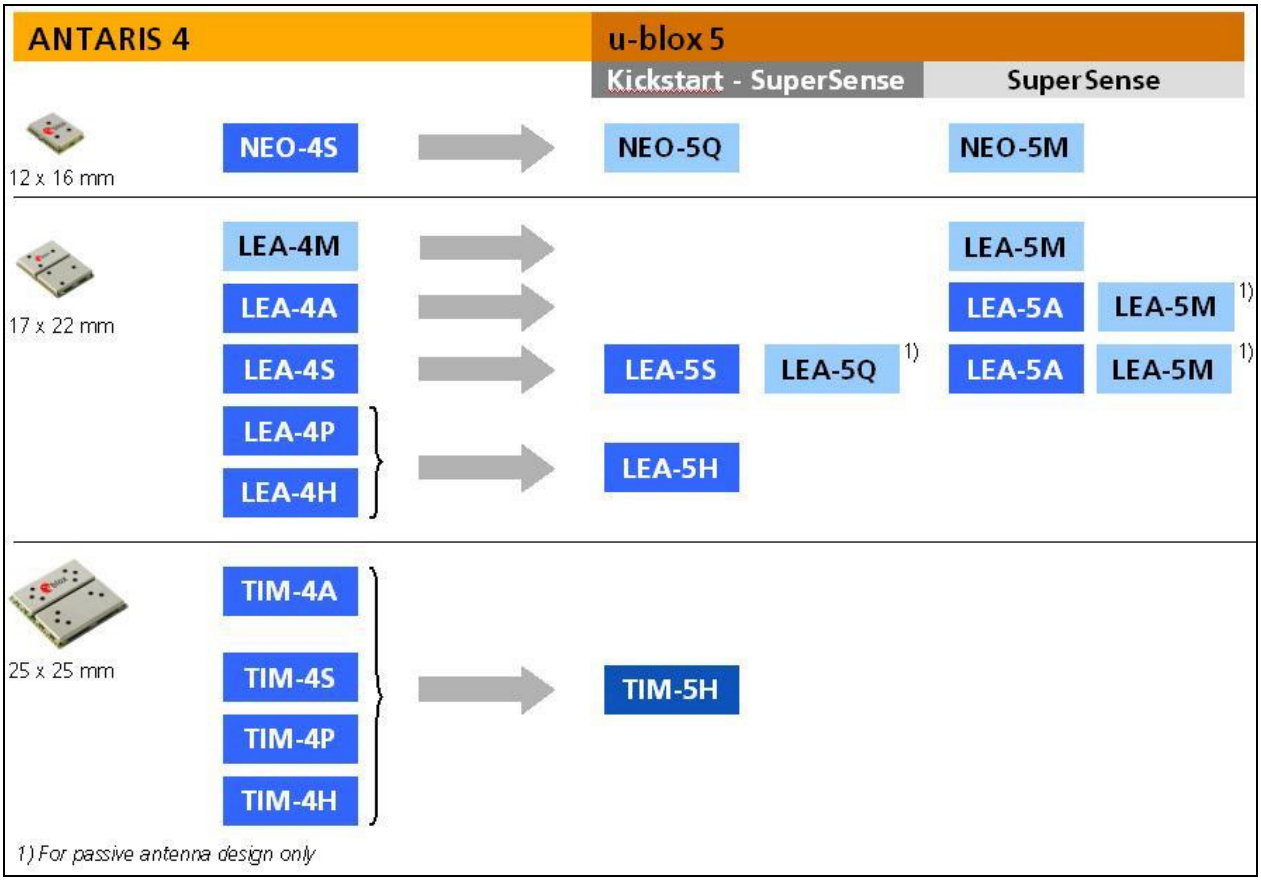


Figure 1 : u-blox5 module migration made easy

Check u-blox 5 Hardware Requirements:

- Check the battery power to supply the battery backup pin, since u-blox5 draws higher current in comparison to ANTARIS 4 receivers.
- Compare the u-blox5 module peak current consumption (150 mA) with the specification of the power supply.
- u-blox5 modules can be operated in two different power modes: "Max. Performance" or "Eco" mode. Select "Eco" mode for reduced current consumption.

  u-blox5 modules with KickStart (LEA-5**S**, LEA-5**H**, LEA-5**T**, LEA-5**Q** and TIM-5**H**) operate in "Max. Performance" mode by default. Standard u-blox5 modules (LEA-5**A** and LEA-5**M**) are set to "Eco" mode by default.

  LEA-5**H**, LEA-5**T** and TIM-5**H** with firmware V4.01 or later feature a configuration message (UBX-CFG-RXM) that allows switching between the two modes (refer to the *u-blox 5 Protocol Specification* [2]).

  Sending the appropriate command below can reconfigure all other receivers with ROM and firmware V4.00:

  - LEA-5**S**, LEA-5**Q**, LEA-5**H** to "Eco Mode":

    ```
    B5 62 06 25 10 00 00 00 00 00 D0 07 E8 03 F4 01 B0 04 E8 03 06 00 97 1F
    ```

  - LEA-5**A** and LEA-5**M** to "Max. Performance":

    ```
    B5 62 06 25 10 00 00 00 00 00 40 1F E8 03 98 3A B0 04 E8 03 03 00 F9 10
    ```

  - It is strongly recommended to save the modified settings to BBR and / or Flash (using the UBX-CFG-CFG command):

    ```
    B5 62 06 09 0D 00 00 00 00 00 FF FF 00 00 00 00 00 00 07 21 AF
    ```

LEA-5**Q** also features a Configuration Pin to switch between the power modes.

For more information on u-blox5 Power supply specifications and power modes, check our latest *LEA-5 Data Sheet* [4], *TIM-5 Data Sheet* [5] and *Power Management with u-blox5 application note*[6].

- If you need USB connectivity you need to check our *LEA-5 Hardware Integration Manual [1]*
- If you use an active antenna supervisor circuitry to detect open conditions, you need to verify resistor reference recommendations in our integration manuals.
- Check chapter "4 Hardware Migration".

Check u-blox 5 Software Requirements:

Not all of the functionalities available with ANTARIS 4 are supported by u-blox 5 Firmware version 4.00, 4.01 or 5.00. These include:

- No FixNow Mode. Low power modes are planned for 2009. Contact your local u-blox support team to discuss power saving options.
- No UTM (Universal Transverse Mercator Projection).
- No RTCM protocol for DGPS support.
- No Raw Data support with LEA-5**T** contrary to LEA-4T.

For more information on u-blox5 firmware version 4.00 or later, refer to:
http://www.u-blox.com/customersupport/ublox5_fw.html

- Check chapter "3 Software Migration".

3 Software migration

Software migration from ANTARIS 4 to a u-blox5 GPS receiver is a straightforward procedure. Nevertheless there are some differences to be considered with u-blox5 firmware version 4.00.

Like its ANTARIS 4 predecessor, u-blox 5 technology supports UBX and NMEA protocol messages. Backward compatibility has been maintained as far as possible. New messages have been introduced for new functions. Only minor differences have to be expected in the UBX-NAV and UBX-AID classes of the UBX protocol and for the standard NMEA messages such as GGA, GLL, GSA, GSV, RMC, VTG and ZDA.

ANTARIS 4	u-blox5	Remarks
UBX-CFG-NAV2	UBX-CFG-NAV5	UBX-CFG-NAV2 has been replaced by UBX-CFG-NAV5. The new message has additional features. • The default dynamic platform is "Portable". This platform is rather generic and allows the receiver to be operated in a wide dynamic range covering pedestrians, cars as well as commercial aircrafts. Automotive applications such as first-mount navigation systems may better utilize the "Automotive" platform, which is better geared to the dynamics of land vehicles but is only of limited use in airborne and high-dynamics environments. UBX-CFG-NAV5 does not support following features: • Almanac Navigation • Navigation Input filters UBX-CFG-NAV5 FixMode is set by default to "Auto 3D/2D" as for ANTARIS4. Check the u-blox 5 protocol specification [2] if this mode needs to be changed.
UBX-CFG-MSG	UBX-CFG-MSG	No support for multiple configurations in one UBX-CFG-MSG command
UBX-CFG-RXM	*N/A*	Contrary to ANTARIS 4, u-blox5 does not need selecting GPS acquisition sensitivity mode (Fast, Normal, High Sens and Auto mode) since the acquisition engine is powerful enough to search all satellite in one go. FixNow mode is not available anymore. Low power modes are planned for Q1/09. Contact your local u-blox support team should you need further information s.
PUBX,01	*N/A*	Other UBX or NMEA messages can be used to replace this message
UBX-NAV-POSUTM	*N/A*	
UBX-CFG-TP	UBX-CFG-TP	u-blox 5 offers the possibility to activate Timepulse signal without GPS fix.
UBX-CFG-ANT	UBX-CFG-ANT	Antenna Open Circuit Detection: The default setting for LEA-4S and LEA-4A was "enabled". With all LEA-5 modules the default setting is "disabled". Automatic Short Circuit Recovery: With ANTARIS 4 this was "disabled" by default. With u-blox 5 the default setting is "enabled".
UBX-MON-HW	UBX-MON-HW	Message length has changed as the number of pins is different with u-blox5.
0s Leap second by default	14s Leap second by default	
UBX-CFG-RATE	UBX-CFG-RATE	Disable SBAS services to achieve 4Hz navigation
UBX-CFG-PRT	UBX-CFG-PRT	With firmware V5.00, no acknowledge (ACK) is returned for the UBX-CFG-PRT message if the port that is being reconfigured is the same as the port being communicated over. This is true even in the event of a successful reception of this message.

Table 1: Main differences between ANTARIS 4 and u-blox 5 software for migration

The default NMEA message set for u-blox 5 is GGA, GLL, GSA, GSV, RMC and VTG. Contrary to ANTARIS 4, ZDA is disabled by default.

Firmware update is supported by all of these interfaces. The firmware update mechanism of u-blox 5 is more sophisticated than with ANTARIS 4. It is now based on UBX protocol messages. Customers, who implemented firmware download in their application processor, will need to replace the software. A template is available from your u-blox support team.

Please refer to the *u-blox 5 Protocol Specification* [2] for more information. This document is available on the ublox website.

4 Hardware Migration

u-blox 5 modules have been designed with backward compatibility in mind but some minor differences were unavoidable. These minor differences will however not be relevant for the majority of the LEA-4 and TIM-4 designs. Table 2 compares the modules and highlights the differences to be considered for LEA modules. The *TIM-5 Hardware Integration Manual* [3] documentation highlights the differences to be considered for TIM modules.

Good performance requires a clean and stable power supply with minimal ripple. Care needs to be exercised in selecting a strategy to achieve this. Placing a resistance at Vcc can negatively impact performance. For better performance, use an LDO to provide a clean supply at Vcc and consider the following:

- Wide power lines or even power planes are preferred.
- Place LDO near the module.
- Avoid resistive components in the power line (e.g. narrow power lines, coils, resistors, etc.).

Placing a filter or other source of resistance at Vcc can create significantly longer acquisition times.

4.1 Pin Comparison LEA-4 to LEA-5 modules

No	LEA-4		LEA-5		I/O	Description	Remarks for Migration
	Module	Pin Name	Module	Pin Name			
1	LEA-4P, LEA-4H, LEA-4T	NC	All	SDA2	I/O	DDC Data	
	LEA-4A, LEA-4S, LEA-4M	TxD2					Serial Port 2 is not available anymore but LEA-5 can be populated into LEA-4 designs without any electrical problems.
2	LEA-4P, LEA-4H, LEA-4T	NC	All	SCL2	I/O	DDC Data	
	LEA-4A, LEA-4S, LEA-4M	RxD2					Serial Port 2 is not available anymore but LEA-5 can be populated into LEA-4 designs without any problems.
3	All	TxD1	All	TxD1	O	Serial Port 1	
4	All	RxD1	All	RxD1	I	Serial Port 1	Pin not 5V tolerant anymore. Serial port input with internal pull-up to VCC. Leave open if not used. Don't use an external pull up resistor.
5	All	VDDIO	LEA-5H, LEA-5S, LEA-5A, LEA-5T	NC		Not Connected	Can be left open or connected to Vcc for backward compatibility . With LEA-5S, LEA-5A, LEA-5H and LEA-5T the I/O voltage is always VCC.
			LEA-5Q, LEA-5M	VDDIO	I	I/O voltage	No difference to LEA-4 modules
6	All	VCC	All	VCC	I	Supply voltage	Extended power supply range; higher peak supply current. Good performance requires a clean and stable power supply with minimal ripple. Care needs to be exercised in selecting a strategy to achieve this. Placing a resistance at Vcc can negatively impact performance. For better performance, use an LDO to provide a clean supply at Vcc and consider the following: o Wide power lines or even power planes are preferred. o Place LDO near the module. o Avoid resistive components in the power line
7	All	GND	All	GND	I	Ground (digital)	No difference
8	All	VDD18out	All	VCC_OUT	O	Output voltage	Internally connected to VCC on LEA-5 but used to be 1.8V output with LEA-4. If you have circuitry connected to this pin, check if it withstands the VCC voltage.
9	LEA-4A, LEA-4S, LEA-4M	GPSMODE6	LEA-5A, LEA-5S, LEA-5M	CFG_COM1	I	Configuration Pin	No difference to configure 9.6k and 4.8k Serial I/O baudrate if CFG_COM0 is not populated. Check Datasheet if CFG_COM0 is populated. Check NMEA messages activated by default. See section 4 of this document and LEA-5 datasheet [4] for more info.
			LEA-5Q	MISO CFG_COM1	I	SPI MISO Configuration Pin	
	LEA-4P, LEA-4H, LEA-4T	Reserved	LEA-5H, LEA-5T,	Reserved	I		No difference
10	All	RESET_N	All	RESET_N	I		Input only, do not drive high. Internal pull up to VCC.
11	All	V_BAT	All	V_BCKP	I	Backup voltage supply	Wider voltage range but increased backup current. Check your backup supply regarding the higher consumption.
12	All	BOOT_INT	All	Reserved	I		Polarity inversed. Do not drive low!!!! Bootmode pin is not supported on LEA-5. The boot mode can be entered by sending a SW command. See section 3 for more info.

13	All	GND	All	GND	I	Ground	No difference
14	All	GND	All	GND	I	Ground	No difference
15	All	GND	All	GND	I	Ground	No difference
16	All	RF_IN	All	RF_IN	I	GPS signal input	No difference
17	All	GND	All	GND	I	Ground	No difference
18	All	VCC_RF	All	VCC_RF	O	Output Voltage RF	No difference
19	LEA-4A, LEA-4S, LEA-4P, LEA-4H, LEA-4T	V_ANT	LEA-5H, LEA-5S, LEA-5A, LEA-5T	V_ANT	I	Antenna Bias voltage	No difference
	LEA-4M	NC	LEA-5Q, LEA-5M	NC		Not Connected	No difference
20	LEA-4A, LEA-4S, LEA-4P, LEA-4H, LEA-4T	AADET0_N	LEA-5H, LEA-5S, LEA-5A, LEA-5T	AADET0_N	I	Active Antenna Detect	If you use an active antenna supervisor circuitry to detect open conditions, you need to verify resistor reference recommendations in our integration manuals
	LEA-4M	NC	LEA-5Q	SCS1_N	O	SPI Chip Select	Drop-in compatible to LEA-4M
			LEA-5M	Reserved	O		No difference
21	LEA-4P, LEA-4H, LEA-4T	EXTINT1	LEA-5H, LEA-5S, LEA-5A, LEA-5T	NC		Not Connected	No difference
	LEA-4A, LEA-4S, LEA-4M	GPSMODE5	LEA-5Q	MOSI CFG_COM1	O	SPI MOSI Configuration Pin	Serial I/O baudrate at 19.2k cannot be configured through this pin anymore. Serial I/O baudrate at 38.4k and 57.6k can be configured but with another CFG_COM configuration set. Check LEA-5 Datasheet. LEA-5 can be populated into LEA-4 designs without any electrical problems.
			LEA-5M	CFG_COM1	O	Configuration Pin	
22	LEA-4P, LEA-4H, LEA-4T	Reserved	LEA-5H, LEA-5S, LEA-5A, LEA-5T	NC		Not Connected	No difference
	LEA-4A, LEA-4S, LEA-4M	GPSMODE2 GPSMODE23	LEA-5Q	SS_N	I	SPI Slave Select	Sensitivity settings not required with u-blox5 anymore.
			LEA-5M	Reserved	I		
23	LEA-4P, LEA-4H, LEA-4T		LEA-5H, LEA-5T, LEA-5A, LEA-5S, LEA-5M	NC		Not Connected	USB bus-powered configuration is not available anymore on this pin. Use a SW command instead.
	LEA-4A, LEA-4S, LEA-4M	GPSMODE7	LEA-5Q	CFG_GPS0 / SCK		Power Mode Configuration at start-up, SPI clock during operation	
24	All	All	All	VDDUSB	I	USB Supply	No difference. Do not leave open.
25	All	USB_DM	All	USB_DM	I/O	USB Data	No difference
26	All	USB_DP	All	USB_DP	I/O	USB Data	No difference
27	All	EXTINT0	All	EXTINT0	I	External Interrupt Pin	No difference
28	All	TIMEPULSE	All	TIMEPULSE	O	Time pulse (1PPS)	VDDIO level for ANTARIS 4 and VCC level for u-blox5. If you have 1.8V compliant circuitry connected to this pin, check if it withstands the VCC voltage.

: Pins to be checked carefully; NC: Not connected

Table 2: Typical Pin Assignment LEA modules

Pins designated Reserved should only be used with caution. For more information about Pinouts see the *LEA-5 Hardware Integration Manual [1]*

Related Documents

[1] LEA-5 Hardware Integration Manual, Docu. No GPS.G5-MS5-07005

[2] u-blox 5 Protocol Specification, Docu. No GPS.G5-X-07036

[3] TIM-5 Hardware Integration Manual, Docu. No GPS.G5-MS5-07015

[4] LEA-5 Data Sheet, Docu. No GPS.G5-MS5-07026

[5] TIM-5 Data Sheet, Docu. No GPS.G5-MS5-07014

[6] Power management considerations with u-blox5 designs, Docu. No GPS.G5-MS5-08022

All these documents are available on our homepage (http://www.u-blox.com).

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