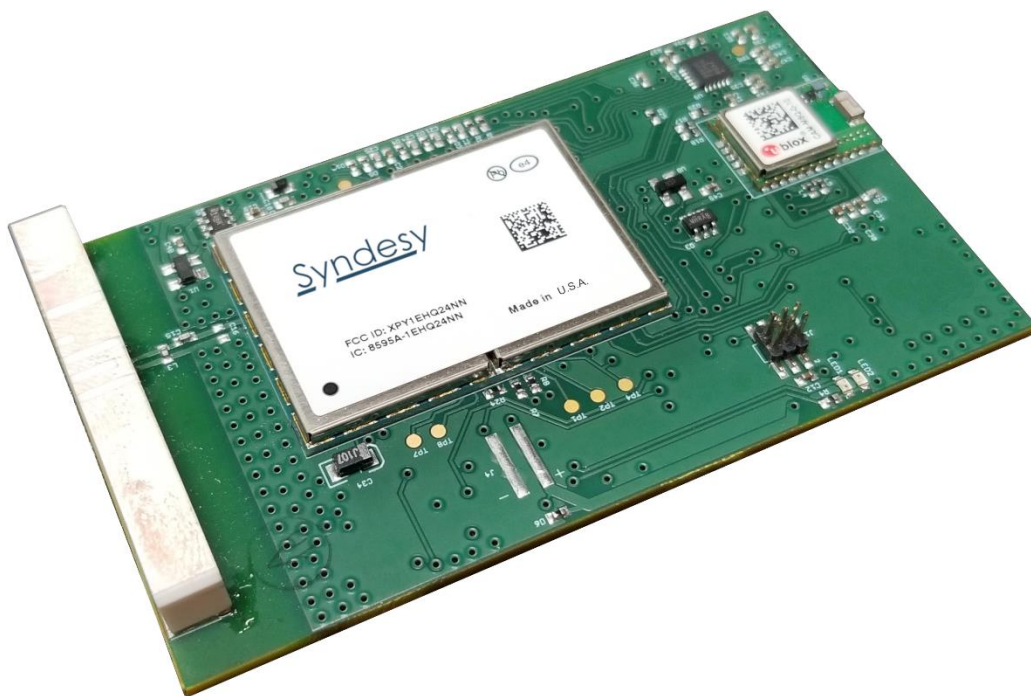


Connecting Everything.™



# SynTRAC™ PLx Family

## Production Test Procedure



## Document Information

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## 1. Syndesy Firmware programming process

### 1.1 Getting Started

You will need Atmel ICE in order to complete the Syndesy firmware programming process.

You can find this from Digi-Key the model is [ATATMEL-ICE](#).

Syndesy FW is available upon request from [www.syndesyttech.com](http://www.syndesyttech.com)

For your own custom FW please note that Syndesy cannot support this and testing procedures will no longer function as per this document.

Please download and install the following software:

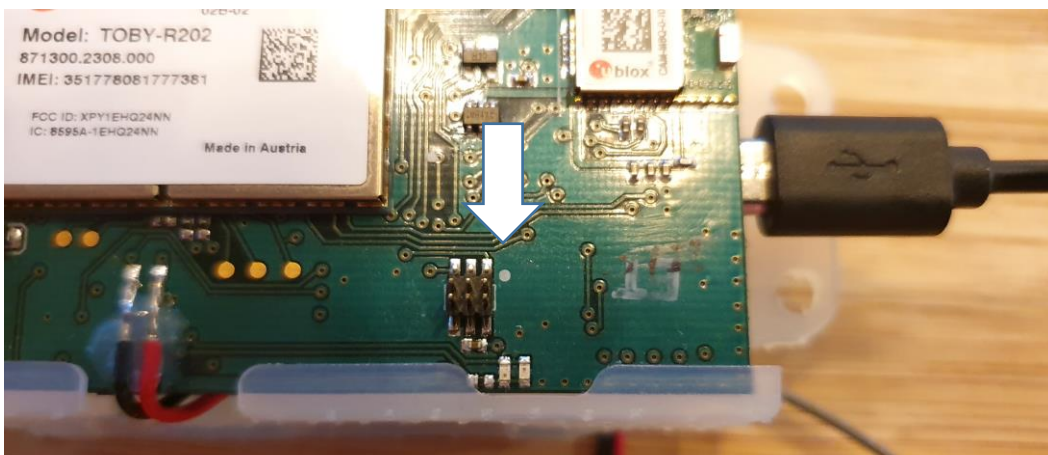
- Atmel design Studio 7
- m-Center and any u-blox drivers(optional)

Setup your workspace: you will need 2 USB ports. Do not attach to the device at this point.



### 1.2. Connecting the device:

Locate the 6-pin programming header (see below, arrow points at pin1)



1. Connect the ICE programmer (see below)
2. Connect the USB (See below)



### 1.3. In Atmel Studio:

Once you have connected the device you will need to do the following in Atmel ICE Studio 7.

1. CTRL-SHIFT-P - Device Programming
2. Select Tool - Atmel ICE
3. Select Device –
  - a. ATxmega32D4 (blue dot)
  - b. ATxmega128D4 (red dot)

Interface- PDI

Press Apply, then Read

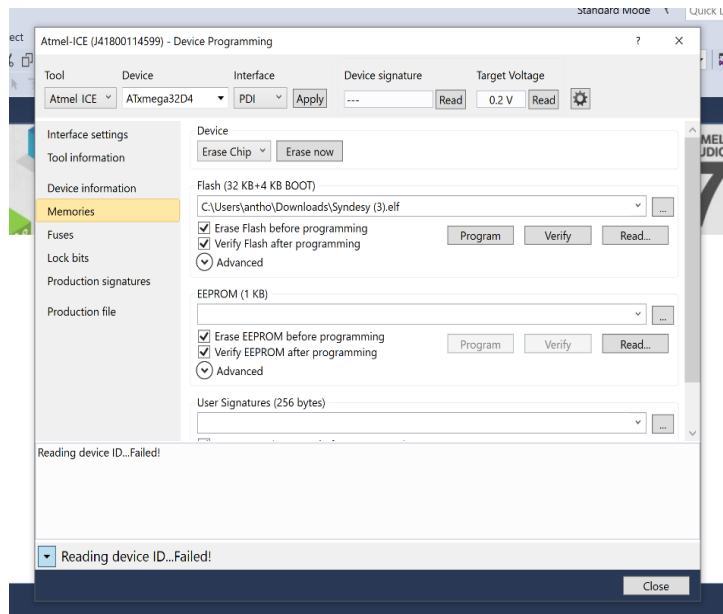
Select **Memories** on the left

**DEVICE:** Drop down

**Erase Chip** then click **Erase now**

**Erase Application** then click **Erase now**

**Erase Boot** then click **Erase now**



In the **FLASH (32kb+4kb BOOT)(128kb)**:

Select the file (**xxxxxxx.elf**) from your download folder, Erase and Verify checked. Press **program**.

Remove ICE programmer from the board

Device LED will turn solid **RED**, then blink a few times, then turn SOLID **GREEN**.

Once **GREEN**, remove power from device.

Programming is completed.

**Verifying:**

In the FLASH section

Select the file (**xxxxxxx.elf**) from your download folder. Press **Verify**.

In the section below you should see...

Verify... passed

## 2. Test Procedure

SynTRAC™PLx family of embedded cellular modem's which enable solutions providers, OEMs and others to harness the potential of the Internet of Things, making their products connected end devices. More than just a modem, the PLx family of devices are complete, fully featured, pre-certified edge devices, with cellular connectivity, GNSS/ GPS receivers and fully-integrated antenna systems. The PLx family of products support a wide range of applications, including tracking, location data, connectivity for sensors, digital signage, instrumentation and other applications that require wireless connectivity. With an integrated IP stack, the module is designed to support a wide range of data-centric applications. The unique combination of performance, flexibility, and global coverage make the module ideally suited for M2M applications, such as a cellular modem, smart energy gateways, remote access video cameras, digital signage, telehealth and telematics. When power saving mode is enabled, it reduces energy consumption and allows battery-powered modules a longer operation time.

SynTRAC™ has self-test routines integrated in its microprocessor. The self-test routines ensure the main components are functioning after manufacturing. The self-test routine only works with SynTRAC™ Syndesy firmware. This document describes the test procedure and how to identify certain errors, should they appear after production.

### 2.1. Syndesy Self-Test Overview

When first powered up after production or after downloading a Syndesy firmware, SynTRAC™ performs a self-test running through a number of sophisticated self-test routines to ensure that its main components are working properly.

In particular, the self-test routines test the main components and items, in the order below, making sure that the components have not been damaged, either in transport or production, and that they have been soldered properly during manufacturing. The self-test is expected to also detect shorts or bad connections between the components.

1. GNSS Receiver  
Ensures that the GNSS receiver communicates and provides navigation information, even if the positions may be invalid due to bad reception.
2. Accelerometer  
Ensures that the accelerometer responds to processor commands.
3. Modem  
Ensures the modem respond to commands from the processor.
4. SIM and SIM Holder  
Ensures that the modem can properly communicate with the SIM, and that there are no shorts underneath the SIM holder.
5. Antenna and Antenna Connection  
Ensures that the antenna has been placed properly on the board and that the modem has a good connection to the RF signal coming in from the antenna.

Should any one of the self-test routines encounter a problem, SynTRAC™ indicates which test failed via the **RED** LED.

## 2.2. Test Procedure

As the SynTRAC™ steps through the five self-test routines, it records which tests have been performed successfully.

The entire self-test may require between 20 seconds and several minutes, depending on how long a certain test takes. The modem test (Test 3) and the antenna test (Test 5) may be the most unpredictable ones, because of the current state machine of the modem and the cellular signal strength of the test location.

Once SynTRAC™ successfully passes the self-test routine, it does not enter the self-test mode again until new firmware is downloaded onto the device.

If SynTRAC™ finds that at least one of the self-tests does not pass, it will go through the self-test process again with each power up. Until all self-test routines are passed successfully, SynTRAC™ will not continue into “operation mode”.

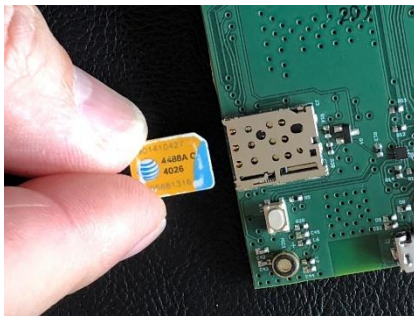
### Note:

*Since the GNSS self-test does not require a valid position fix, it is irrelevant whether the production location provides a GNSS simulator or repeater, or has a good “view of the sky”.*

### 2.2.1. Test Preparation

The next steps should be followed:

- Insert Nano SIM firmly into the SIM holder until it is locked; see pictures for the proper orientation of the SIM and what the fully inserted and locked SIM looks like



Proper SIM Orientation



SIM not Entirely Inserted



SIM Entirely Inserted and Locked



- Connect a USB cable to a power source, e.g. computer, phone charger, etc.
  - A PC is preferable, note that a PC will begin to setup an unknown device.
- Insert the mini-USB side of the USB cable into the SynTRAC™ USB connector. This powers SynTRAC™, which starts the self-test.



### 2.2.2. Successful Test (PASS)

Upon self-test start, the red LED turns on and stays solidly on while the test is running. If all test routines are successful, the red LED turns off and the green LED turns on solid until the USB cable is disconnected (power is removed).



LED Solid RED during Test



LED Solid GREEN after Successful Test

An example of a successful test in this short video:



Good Test  
IMG\_4571.MOV

Solid Red, then Solid Green: Successful Test

Final test would be to verify the USB connection. Plug the device into a PC and verify that it detects a new device. If this occurs note as a pass.

### 2.2.3. Unsuccessful Test (FAIL)

If SynTRAC™ detects a failure in any of the self-test routines, it stops after the failed test and indicates which test failed by the blinking red LED. The number of blinks indicates which test failed: 1 blink means GNSS failed, 2 blinks means Accelerometer test failed, etc. See Appendix A.



LED Solid RED during Test



LED Blinking RED after Failed Test



An example of a failed test in this short video:



Bad Test  
IMG\_4570.MOV

4 blinks: SIM Test Failed

The blinking red LED will briefly pause, then repeat the blinking pattern as long as SynTRAC™ is powered.

When power is removed and restored, e.g. via USB cable, SynTRAC™ will restart the self-test routine. If the problem has not been corrected, the test will fail again with the same result.

To Verify the USB connection. Plug the device into a PC and verify that it detects a new device. If the USB does not attempt to configure a new device, note this is a fail.

## Appendix. A: Unsuccessful Test Results Guidelines

If the device fails any of the events it will blink (x) times in progression. See the table below for values.

Blinks	Originator	Description
1	GNSS Receiver	Ensures that the GNSS receiver communicates and provides navigation information, even if the positions may be invalid due to bad reception.
2	Accelerometer	Ensures that the accelerometer responds to processor commands.
3	Modem	Ensures the modem respond to commands from the processor.
4	SIM and SIM Holder	Ensures that the modem can properly communicate with the SIM, and that there are no shorts underneath the SIM holder.
5	Antenna and Antenna Connection	Ensures that the antenna has been placed properly on the board and that the modem has a good connection to the RF signal coming in from the antenna.