



B111

GNSS Receiver Board

Maintenance Guide



B111

Maintenance Guide

Part Number 1020733-01

Rev A

©Copyright Topcon Positioning Systems, Inc.

April, 2017

All contents in this manual are copyrighted by Topcon Positioning Systems, Inc. All rights reserved.

Table of Contents

.....

Preface	ii
Terms and Conditions	ii
About This Guide	iv
Getting Technical Assistance	v
Maintaining the B111	1
Accessing the Board	1
Sending Commands and Viewing Responses Using TRU	1
Displaying Firmware Version	2
Displaying Antenna Circuit Condition	2
Restoring Default Settings	3
Performing Hardware Reset	3
Clearing the NVRAM	4
Generating List of Receiver Settings	4
Unlocking a Port with Universal Break Sequence	5
Understanding and Managing Option Authorization File	5
Updating Firmware	6

Preface



Thank you for purchasing this Topcon product. The materials available in this Manual (the "Manual") have been prepared by Topcon Positioning Systems, Inc. ("TPS") for owners of Topcon products, and are designed to assist owners with the use of the receiver and its use is subject to these terms and conditions (the "Terms and Conditions").



Please read the terms and conditions carefully.

Terms and Conditions

Use

This product is designed to be used by a professional. The user should have a good knowledge of the safe use of the product and implement the types of safety procedures recommended by the local government protection agency for both private use and commercial job sites.

Copyrights

All information contained in this Manual is the intellectual property of, and copyrighted material of TPS. All rights are reserved. Do not use, access, copy, store, display, create derivative works of, sell, modify, publish, distribute, or allow any third party access to, any graphics, content, information or data in this Manual without TPS' express written consent and may only use such information for the care and operation of the receiver. The information and data in this Manual are a valuable asset of TPS and are developed by the expenditure of considerable work, time and money, and are the result of original selection, coordination and arrangement by TPS.

Trademarks

B111™, TRU™, Magnet™, Topcon® and Topcon Positioning Systems™ are trademarks or registered trademarks of TPS. Windows® is a registered trademark of Microsoft Corporation. The Bluetooth® word mark and logos are owned by Bluetooth SIG, Inc. and any use of such marks by Topcon Positioning Systems, Inc. is used under license. Other product and company names mentioned herein may be trademarks of their respective owners.

Disclaimer of Warranty

EXCEPT FOR ANY WARRANTIES IN AN APPENDIX OR A WARRANTY CARD ACCOMPANYING THE PRODUCT, THIS MANUAL AND THE RECEIVER ARE PROVIDED "AS-IS." THERE ARE NO OTHER WARRANTIES. TPS DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR USE OR PURPOSE. TPS AND ITS DISTRIBUTORS SHALL NOT BE LIABLE FOR TECHNICAL OR EDITORIAL ERRORS OR OMISSIONS CONTAINED HEREIN; NOR FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE FURNISHING, PERFORMANCE OR USE OF THIS MATERIAL OR THE RECEIVER. SUCH DISCLAIMED DAMAGES INCLUDE BUT ARE NOT LIMITED TO LOSS OF TIME, LOSS OR DESTRUCTION OF DATA, LOSS OF PROFIT, SAVINGS OR REVENUE, OR LOSS OF THE PRODUCT'S USE. IN ADDITION TPS IS NOT RESPONSIBLE OR LIABLE FOR DAMAGES OR COSTS INCURRED IN CONNECTION WITH OBTAINING SUBSTITUTE PRODUCTS OR SOFTWARE, CLAIMS BY OTHERS, INCONVENIENCE, OR ANY OTHER COSTS. IN ANY EVENT, TPS SHALL HAVE NO LIABILITY FOR DAMAGES OR OTHERWISE TO YOU OR ANY OTHER PERSON OR ENTITY IN EXCESS OF THE PURCHASE PRICE FOR THE RECEIVER.

License Agreement

Use of any computer programs or software supplied by TPS or downloaded from a TPS website (the "Software") in connection with the receiver constitutes acceptance of these Terms and Conditions in this Manual and an agreement to abide by these Terms and Conditions. The user is granted a personal, non-exclusive, non-transferable license to use such Software under the terms stated herein and in any case only with a single receiver or single computer. You may not assign or transfer the Software or this license without the express written consent of TPS. This license is effective until terminated. You may terminate the license at any time by destroying the Software and Manual. TPS may terminate the license if you fail to comply with any of the Terms or Conditions. You agree to destroy the Software and manual upon termination of the use of the receiver. All ownership, copyright and other intellectual property rights in and to the Software belong to TPS. If these license terms are not acceptable, return any unused software and manual.

Confidentiality

This Manual, its contents and the Software (collectively, the "Confidential Information") are the confidential and proprietary information of TPS. You agree to treat TPS' Confidential Information with a degree of care no less stringent than the degree of care you would use in safeguarding your own most valuable trade secrets. Nothing in this paragraph shall restrict you from disclosing Confidential Information to your employees as may be necessary or appropriate to operate or care for the receiver. Such employees must also keep the Confidentiality Information confidential. In the event you become legally compelled to disclose any of the Confidential Information, you shall give TPS immediate notice so that it may seek a protective order or other appropriate remedy.

Website; Other Statements

No statement contained at the TPS website (or any other website) or in any other advertisements or TPS literature or made by an employee or independent contractor of TPS modifies these Terms and Conditions (including the Software license, warranty and limitation of liability).

Safety

Improper use of the receiver can lead to injury to persons or property and/or malfunction of the product. The receiver should only be repaired by authorized TPS warranty service centers. Users should review and heed the safety warnings in an Appendix.

Miscellaneous

The above Terms and Conditions may be amended, modified, superseded, or canceled, at any time by TPS. The above Terms and Conditions will be governed by, and construed in accordance with, the laws of the State of California, without reference to conflict of laws.

About This Guide

The material in this document describes how to maintain the B111 OEM GNSS board using GRIL commands and TRU software.

Manual Conventions

This manual uses the following conventions:

Convention	Description	Example
Bold	Menu, or drop-down menu selection	File ▶ Exit (Click the File menu and click Exit)
	Name of a dialog box or screen	From the Connection screen...
	Button or key commands	Click Finish .
MONO	User supplied text or variable	Type <code>guest</code> , and click Enter .
<i>Italic</i>	Reference to another manual or help document	Refer to the <i>GRIL Reference Manual</i> .



Further information to note about system configuration, maintenance, or setup.



Supplementary information that can have an adverse affect on system operation, system performance, data integrity, measurements, or personal safety.



Notification that an action has the potential to result in system damage, loss of data, loss of warranty, or personal injury.

Intended Audience and Qualification

This guide is intended for system engineers, system designers, and programmers who are integrating the B111 board to their products to achieve GNSS positioning capabilities.

It is highly recommended that installation, commissioning, use, and maintenance of the B111 board is preformed by personnel trained in electronics.

Supported Hardware and Firmware Versions

Maintenance procedures given in this guide correspond to the following hardware revisions and firmware versions:

- B111 board hardware revision 6.7.
- GNSS firmware version 5.1p1
The configuration procedures and sample outputs in this guide are based on the functionality of the B111 running firmware 5.1p1. Your board might function differently depending on the firmware version you are running.

Additional Documentation

The following documentation can be useful while working with the B111 board:

- *B111 Hardware Integration Guide* (1018409-01) – describes the features, hardware components, installation, operation, and specifications of the B111 board.

- *GRIL Reference Manual* (27-040004-01) – contains an exhaustive description of the GNSS Receiver Interface Language (GRIL) used to communicate and control a TPS receiver, including the B111.
- *TRU Help* – explains how to install, set up, and use the TRU software on desktop computers and hand-held controllers.

Revision History

Revision	Date (yyyy-mmm-dd)	Changes
A	2017-Apr-10	Initial release of the guide.

Getting Technical Assistance

Should you have any questions about the B111 or experience any problems with this board, contact Topcon OEM Solutions technical support for immediate and comprehensive assistance.



Do not attempt to repair equipment yourself. Doing so will void your warranty and may damage the hardware.

Check This First!

Before contacting Topcon OEM Solutions technical support, check the following:

- Check all external board connections carefully to ensure correct and secure connections. Double check for worn or defective cables.
- Check all power sources to ensure their correct operation.
- Check that the most current software is downloaded onto the computer and that the most current firmware is loaded into the board. Check the Topcon [TotalCare](#) support website for the latest updates.
- Check that the desired OAF options are enabled in the board.

Then, try the following:

- Reset the board using TRU (**Tools ▶ Reset Receiver**) or a GRIL command (`set,/par/reset,yes`).
- Restore default settings using TRU (**Tools ▶ Reset Parameters**) or a GRIL command (`init,/setup/`).
- Clear the NVRAM using TRU (**Tools ▶ Factory Reset**) or a GRIL command (`init,/dev/nvm/a`).

If the problem persists, see the following section for contact information.

Contacting Technical Support

If the troubleshooting hints and tips in this guide fail to remedy the problem, contact Topcon OEM Solutions technical support.

E-mail

To contact Topcon OEM Solutions technical support via e-mail, use the [OEMsupport@topcon.com](mailto: OEMsupport@topcon.com) electronic mail address.

When e-mailing TPS technical support, provide the following information for better, faster service:

1. The board model and configuration settings. This information can be retrieved using TRU ▶ **Information ▶ Save to File**. Save the receiver's output to a text file. Attach this file to the email and submit it to Topcon OEM Solutions technical support.
2. The system/hardware specifications for the computer running TRU or a custom application; such as, operating system and version, memory and storage capacity, processor speed, etc.
3. The symptoms and/or error codes/messages that precede and follow the problem.

4. The activities being tried when the problem occurs. If possible, include the exact steps being taken up to when the error message or other problem occurs.
5. How regularly the problem occurs.

Generally, an OEM Solutions technical support representative will reply within 8 business hours or less, depending on the severity of the problem.

Website

The Topcon Positioning Systems website provides current information about Topcon's line of OEM products. For more information about OEM products, visit www.topconpositioning.com/oem.

Maintaining the B111

The following procedures are maintenance actions used to make sure that the B111 is ready for operation at all times. Perform these procedures regularly and carefully so that you get the best out of your board.

This chapter covers the following procedures:

- accessing the board on [page 1](#) and sending the GRIL commands on [page 1](#)
- displaying the board's firmware version on [page 2](#)
- displaying antenna circuit condition on [page 2](#)
- restoring the default settings on [page 3](#)
- performing a hardware reset on [page 3](#)
- clearing the NVRAM on [page 4](#)
- generating a complete listing of board's parameters on [page 4](#)
- using Universal Break Sequence on [page 5](#)
- understanding and managing Option Authorization Files on [page 5](#)
- updating firmware on [page 6](#)

Accessing the Board

The TPS OEM boards use the GNSS Receiver Interface Language (GRIL) to manage the various board parameters for optimum performance.

GRIL works by sending instructions, called commands, to the board. When you want to request an action or result from the board, you send commands to the board where they are parsed and executed by the command interpreter. In response to the executed commands, the board performs the requested action(s) and usually generates message(s) to report results.

For sending the commands to and receiving reply messages from the board, you can use a terminal program of your choice, including:

- TRU – Topcon's hardware configuration software, which allows you to control and monitor the board's behavior via the graphical interface (GI) or the GRIL commands. It is available for installation on desktop computers and hand-held controllers. See [Quick-Start to Run the B111 Installed on the Evaluation Board of the B111 Hardware Integration Guide](#) to understand how to connect to the B111 using TRU.
- third-party programs, e.g., HyperTerminal and PuTTY.
- user-written applications.

Sending Commands and Viewing Responses Using TRU

Background

The following procedures will show you how to work with Terminal in TRU. The **Terminal** window provides an interface to manually send commands to a connected board and view the responses. For a complete list of commands and messages the B111 board supports, refer to the [GRIL Reference Manual](#).

Typical Use

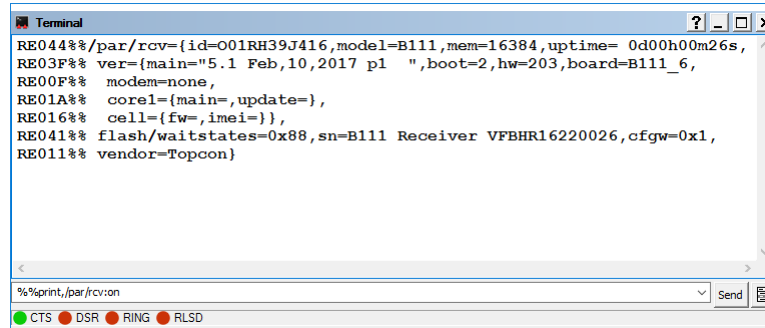
To send the commands to the board and view the responses.

To run scripts.

Procedure

The following procedure will show you how to configure the B111 using the GRIL commands from the **Terminal** window of the TRU software.

1. Connect the board and computer, start TRU on your computer, and establish a TRU connection with the board as described in [Quick-Start to Run the B111 Installed on the Evaluation Board](#) of the [B111 Hardware Integration Guide](#).
2. On the main screen, click **Terminal**. The dialog box appears.



```

Terminal
RE044%%/par/rcv={id=001RH39J416,model=B111,mem=16384,uptime= 0d00h00m26s,
RE03F%% ver={main="5.1 Feb,10,2017 p1 ",boot=2,hw=203,board=B111_6,
RE00F%% modem=none,
RE01A%% core1={main=,update=},
RE016%% cell={fw=,imei=}},
RE041%% flash/waitstates=0x88,sn=B111 Receiver VFBHR16220026,cfgw=0x1,
RE011%% vendor=Topcon)


>%print,/par/cv:on
CTS DSR RING RLSD

```

3. Type in the desired command in the command line and then click **Send** or hit **Enter** on the keyboard. TRU will send the entered command to the board and will show you the board's reply in the main window.



Before sending a command to the B111, make sure you know what it does. See the [GRIL Reference Manual](#) for the commands and messages available in the B111.

To close **Terminal**, click the **Close** button .

Displaying Firmware Version

Background

Each B111 board contains firmware, which controls and executes all operations in the board. All B111 boards in your project must be loaded with the same firmware version. Use the latest firmware version to ensure your board(s) have the most recent updates. If a new version of the firmware is released, you can load new firmware to the board using TRU. For details, see ["Updating Firmware" on page 6](#).

Typical Use

You may need to know the firmware version of the B111 board in certain situation, such as troubleshooting with TPS technical support or determining which new firmware to upload.

Procedure

Display the firmware version currently running on the board.

```
%print,/par/rcv/ver/main
```

Displaying Antenna Circuit Condition

Background

The B111 board incorporates antenna detection circuitry, which senses the amount of current supplied to the antenna's LNA. This circuitry indicates one of the two conditions:

- not overloaded – the antenna draws normal current or is not connected to the board.
- overload – the antenna draws current higher than expected. This condition occurs when the B111 board is subjected to a load (i.e., antenna) larger than it was designed for. It could also be reported when a short circuit occurs in the antenna, antenna cable, or the board.

When an overload condition is detected, the board maintains a constant, safe level of output current until the overload condition is removed. For overcurrent values used to trigger the overload condition, see [Board Specifications](#) in the [B111 Hardware Integration Guide](#).

Typical Use

To verify that the antenna is connected securely and draws normal amount of current.

Procedure

Check the current delivered to the antenna.

```
%%print,/par/ant/rcv/dc
```



Continuous monitoring of this command is a prudent maintenance practice to ensure your board and antenna system function properly.

Restoring Default Settings

Background

Most of the parameters in the B111 have default values, which you may change as needed for your particular application. You can always return the board to a known operating condition by restoring its default configuration.

Typical Use

To return the board to a known operating condition.

To avert any configuration conflicts.

Procedure

This command causes the board to reset the settings stored in the non-volatile memory to the factory defaults and then to reboot.

```
init,/setup/
```

Performing Hardware Reset

Background

You can reset the B111 without returning any configured settings to their default values. It may become necessary to reset the B111 to apply certain settings which require a hardware reset or as part of troubleshooting.

Typical Use

To apply certain settings which require a hardware reset.

Procedure

Reset the board.

```
%%set,/par/reset,yes
```

Clearing the NVRAM

Background

The board's Non-Volatile Random Access Memory (NVRAM) holds data required for satellite tracking, such as ephemeris data and position. The NVRAM also keeps the current board's settings, such as active antenna input, elevation masks, etc.

After clearing the NVRAM, your board will require around 15 minutes to collect new ephemerides and almanacs.

Clearing the NVRAM of your board will also reset the GRIL parameters to factory default settings.

Typical Use

To eliminate communication or tracking problems.

After loading firmware.

Procedure

You can clear the NVRAM in a number of ways.

- To clear the NVRAM using GRIL, send the command `%%init,/dev/nvm/a`.
- To clear the NVRAM using TRU, click **Tools ▶ Factory Reset** and then **Yes** to complete the procedure.
- To clear the NVRAM using the MINTER on the evaluation board:
 - a. Press the power key (SW101) to turn off the board.
 - b. Press and hold the **FN** (SW103) key.
 - c. Press and hold the power key for about one second. Release the power key while continuing to hold the **FN** key.
 - d. Wait until the STAT and REC LEDs are green.
 - e. Wait until the STAT and REC LEDs blink orange.
 - f. Release the **FN** key while the STAT and REC LEDs blink orange.

Generating List of Receiver Settings

Background

Sometimes problems with the B111 may be caused by using inappropriate or wrong configuration settings. Topcon support personnel may ask you to generate a file with the current board settings to check their values.

Typical Use

To troubleshoot any configuration problems.

Procedure

1. Generate the list of board settings.


```
%%print,/par:on
```
2. Copy the output to a text file. Give the file a name and save it in the location you want on your computer.
3. Using an email program, submit the file to TPS technical support along with an explanation of the problem you are experiencing.

Unlocking a Port with Universal Break Sequence

Background

The UBS is useful when you are unable to connect to your board over serial or network interfaces. You have attempted to connect using the desired port and the board does not answer the requests. In a majority of cases the board's port is not actually locked up. It may simply be in an input mode that is preventing it from recognizing the GRIL commands. Sending the UBS to this port will return it back to command mode and will make it available for commands and connection.

Typical Use

To fix an unresponsive serial port.

Procedure

Enable the board to recognize the UBS.

```
%set, /par/dev/cfg/ubs/mode, on
```

Create and send a UBS through the unresponsive port to return it to command mode from whatever mode it was before.

With default UBS parameters, the UBS will be a sequence of 128 bytes having a decimal value of unity. You can change UBS symbols and length using the GRIL parameters

`/par/dev/cfg/ubs/char` and `/par/dev/cfg/ubs/len`. For details, see the [GRIL Reference Manual](#).

Understanding and Managing Option Authorization File

Background

Topcon offers a very comprehensive set of receiver features that allows you to enable only the desired functionality within the available budget. As your needs grow, you can purchase additional features and capacities to maximize your investment and ensure future scalability. For example, you can increase the maximum position update rate on your B111 from 1 Hz to 50 Hz by loading the `_POS` option with a 50 Hz value using an Option Authorization File (OAF).

The B111 board typically ships with an OAF as per initial purchase of the board configuration. There are several upgrade options available with the board that can extend the board's functionality to better suit your job requirement.

Contact your Topcon dealer or a representative for a complete listing of available options and pricing information.

Options are stored in a NAND type of flash memory of the board and, once loaded, persist through power cycles, resets, clearing of NVRAM, firmware upgrades, and configuration changes. The options are unique to the receiver or OEM board and are not transferable.

Typical Use

To load an OAF with new capabilities.

To check the current status of the options.

Procedure

Loading an OAF

Use TRU to load the options to the B111.

1. Connect the board and computer, start TRU on your computer, and establish a TRU connection with the board as described in [Quick-Start to Run the B111 Installed on the Evaluation Board](#) of the [B111 Hardware Integration Guide](#).
2. Click the **Options** icon in the main screen. The **Receiver Options** screen displays.

3. Right-click in the **Receiver Options** screen, and select **Upload OAF**.
4. Navigate to the location of the new OAF.
5. Select the appropriate OAF, and click **Open**.
6. Click **Upload the File to the Receiver** to start loading the file.
7. Click **Yes** at the prompt to reset the B111 and to put new options into operation.

Viewing an OAF

Use TRU to view and check the options in the B111.

1. Connect the board and computer, start TRU on your computer, and establish a TRU connection with the board as described in [Quick-Start to Run the B111 Installed on the Evaluation Board](#) of the [B111 Hardware Integration Guide](#).
2. Click the **Options** icon in the main screen. The **Receiver Options** screen displays the following information:
 - Friendly Name – displays a name for the option in a user-friendly manner
 - Option ID – displays a name for the option in a GRIL convention (available in the Detailed view only)
 - Current – displays the currently effective value of the option
 - Permanent – displays if the option is purchased or not
 - Leased – displays if the option is leased or not
 - Exp. Date – displays the date the option will be disabled, if applicable (available in the Detailed view only)

Updating Firmware

Background

Topcon regularly releases firmware updates and patches. Generally, an update provides a major firmware revision that offers new features, enhancements and extended functionality. In between major revisions, patches provide bug fixes and adjust performance issues. Updating board firmware to the latest release version should be an integral part of your ongoing maintenance activities. With boards running current firmware you take advantage of the latest features, enhancements, and reliability improvements.

This procedure will help you take a smooth firmware update of your B111 board.

Carefully read the entire update procedure before you start the firmware update for the board.

Typical Use

To update the B111 to the latest firmware release.

Procedure

Obtaining Firmware File

You can download the firmware from [myTopcon](#).

Before you begin downloading firmware update, ensure that you have a myTopcon account. To obtain the account, complete the [registration form](#) at the myTopcon website. Then register your B111 board [here](#).

Once registered, go to <https://www.topconpositioning.com/support/updates/B111> and download the firmware for your board.

The firmware is released as a compressed file that you need to decompress before starting the update. This file contains the following two files:

- ramimage.ldr – the board RAM file
- main.ldp – the board Flash file

Updating Firmware

Before you start the firmware update, there are a few things to be aware of. Check them out in the following topic.

Reviewing Update Considerations

Topcon makes every effort to ensure that the firmware update process is easy, smooth, and reliable. However, on rare occasions the firmware update may fail. If you encounter any of the issues during the update, see [“Troubleshooting”](#). It is also desirable to have someone physically available at the board in case any interaction is required.

- Make sure a permanent power source is connected and supplies enough power to run the B111 during the entire update procedure.
- The firmware update causes temporary outages in satellite tracking.
- The update procedure takes about three minutes to complete. Ensure that you schedule a time for the board to be out of commission.
- Do not send any commands to the board during the firmware update.

Updating Firmware Using TRU in Firmware Loading Mode

To update the firmware with TRU running in **Firmware Loading** mode, take the following steps:

1. Connect the B111 to TRU using a serial connection as described in [Quick-Start to Run the B111 Installed on the Evaluation Board](#) of the [B111 Hardware Integration Guide](#).
2. In TRU, select **Device** ▶ **Application Mode** ▶ **Firmware Loading**.
3. Select **Device** ▶ **Connect**. In **Connect Using**, select **Serial Port**. In **Port Name**, select a serial port through which a computer is connected to the board.
4. Click **Connect**. Once a connection is established, you will see the COM port number in the status bar at the bottom of the window.
5. Click the **Firmware Loading** icon. The **Select Device** window appears. Make sure **Device Type** is set to Receiver and **Capture Method** is set to Soft Break, then click **Next**.
6. Check the board details on the **Information** window and then click **Next**.
7. On the **Select Files** window, navigate to the location of the firmware files. Select the files and click **Next**.
8. TRU will start the firmware update. After the firmware file is updated successfully, a prompt will appear informing you that the firmware update is complete.

You can verify the updated firmware version by sending the command `%%print,/par/rcv/ver/main`.

Troubleshooting

Should a firmware update fail for any reason, set Power On in **Capture Method** and repeat the firmware update.

Reverting to Previous Firmware

If you need to revert to the previously installed firmware version, follow steps in [“Updating Firmware Using TRU in Firmware Loading Mode”](#).



www.topconpositioning.com