Topcon GB-1000 - Technical Notes

3 Freddy Blume October 20, 2008 Topcon GB-1000 26606

Topcon GB-1000 GPS receivers and PG-A1 antennas were selected by UNAVCO for exclusive use in the EarthScope/PBO Campaign Equipment Pool in 2004. This hardware was subjected to extensive testing and evaluation along with competitors that responded to an RFP, and was selected on the basis of outstanding data quality and overall value.

Click here to link to a seperate knowledge base article containing the 2004 Earthscope campaign system test report

Since delivery was taken on the first units by UNAVCO, the GB-1000 systems have been used on a variety of projects of different styles and conditions, from telemetered permanent/continuous installations to traditional campaigns to RTK applications, in both extreme heat and extreme cold. In the course of these uses a number of problems have been discovered in the hardware, firmware, and user interfaces, the majority of which have been addressed by Topcon through updates and revisions, although solutions to some are still pending.

1. Hardware issues. There have been two major hardware issues with the GB-1000 receivers that have been addressed by Topcon through revisions and upgrades. You should confirm, either through your Topcon representative or by checking yourself, that both of these revisions have been applied to your systems.

a) Insufficient Internal Memory. The RFP for EarthScope/PBO Campaign equipment specified that the receiver should be able to hold over 12 months worth of data in the on-board memory, and test units had both 1 GB of internal memory attached to the receiver board and a 1 GB CF card. However, in the time between the selection of the GB-1000 by PBO and the delivery of the first units Topcon made an undocumented change to the board type in order to slightly reduce power consumption. The tradeoff in this was that the new board was also larger and reduced the amount of memory that could be attached to it to only 128 MB. This tradeoff was never mentioned to us, and it was not until receiver memory unexpectedly filled up following their first use on a field project in early 2005 that we realized that the GB-1000's only had 128 MB of memory.

Topcon's response to this was twofold. They changed the receiver board type in the GB-1000 to the style tested during the RFP (called 160T) with 1 GB of onboard memory. They also changed the controller board to a smaller model in order to make them slightly more efficient and allow redundant data logging and remote access to an additional 1 GB of memory on a removable CF card that they began providing with the receivers.

All GB-1000's manufactured/delivered in July 2005 or later were delivered with 1GB of internal memory on a 160T board with an industrial grade 1GB CF card in the external slot, and all receivers that had been previously delivered to UNAVCO and others were (or should have been) upgraded with 160T boards with 1 GB on board. You can verify the internal memory capacity from the menu on the receiver's LCD panel (Hardware Information/Internal Memory). If you find only 128MB please contact Steve Briggs at Topcon to arrange for an expedited upgrade at no cost. Beware that this will increase the power

consumption of your receiver by approximately 1/2 watt, from 3.4 to 3.9 watts.

Finally, following these board upgrades and subsequent firmware releases it became possible to log simultaneously and redundantly to both internal and external memory cards, and to remotely control, communicate with and download data from the external memory card on a limited basis. This will be discussed in the Firmware section below.

b) LCD Display Failures. The LCD displays on the GB-1000 receivers were observed to fail when exposed to high temperatures shortly after we began to use them in the field. Sometimes the displays would resume functioning when the cooled down to room temperature but often they would fail permanently and need to be replaced, only to fail again thereafter. Over the course of nearly two years Topcon tried and failed to identify the proper cause of the issue until they finally identified a faulty chip on the controller board in late 2006. All receivers manufactured and delivered in 2007 or later should have properly functioning LCD displays, which still may be blank or unreadable at extremely high temperatures but recover quickly at by the time they reach ~110°F. If your unit is older than this please contact Steve Briggs to arrange an RMA. These repairs must be done in Japan and can take up to 3 months; Topcon may arrange for the loan of a receiver during this time if necessary. If you're not sure whether your unit has a good LCD system contact Topcon as there is no obvious way to determine this yourself except to test the receiver in an oven.

c) "COMMUNICATION DATA WAITING" mode on receivers. Occasionally a receiver will be found to be unresponsive with the message :COMMUNICATION DATA WAITING" displayed on the front screen when normal operation is expected (this message is also properly displayed during firmware upgrades). This means that firmware instructions in the NVRAM were corrupted (by unknown reasons), and that the receiver must be restarted completely. Unplug the external power cable if it is connected AND remove both internal batteries, then reinstall and reconnect. If the receiver does not resume normal operation at this point it should be returned to UNAVCO/Topcon for repair.

2. Firmware Issues. There are two different firmwares that reside inside the GB-1000, one for the Controller (a.k.a. Main) board and one for the Receiver (a.k.a. GPS) board. The latest versions of these firmwares that have been tested and accepted for use by UNAVCO as of Jan 15, 2008: Controller board firmware 3.02U and Receiver board firmware 3.1p2, both released in April, 2007. Release notes for the latest firmware releases are included in a separate KB articles. All users should install the latest tested firmware versions right away, as they contain some very important fixes and capabilities discussed in the release notes linked below. The current tested releases as of Jan 15, 2008 include correct TPS file size and BINEX message formats, SV tracking improvements, external CF card control, and simultaneous logging to internal/external memory. The firmware versions on your receiver can be checked through the main menu on the receiver's LCD front panel (Hardware Information/Firmware menu). Firmware can be downloaded from this Knowledgebase.

Receiver board version 3.1p3 was released in July, 2007 but was not tested as it had only inconsequential improvements . Receiver board version 3.2 was released in January, 2008 and will be tested in mid-January 2008, check back here soon for more information or contact support@unavco.org for more information. Release notes for both of these are included in the Knowledgebase.

a) Excessive file size in TPS format.In March 2005 Topcon released controller board firmware 2.11U

which implemented scheduled session programming from the LCD front panel menu among other improvements that UNAVCO had requested during and subsequent to RFP testing in 2003/04. 2.12U was released following the "Internal Memory" board replacement episode discussed above in July, 2005 to implement remote access to the external CF card. During the first subsequent field use of the GB-1000 in August-October 2005 it was discovered that the size of a 24-hour long .TPS file at 30 sec sampling would sometime sincrease from 2.2 to 7.5 MB, wasting large amounts of memory over the course of an untelemetered 3-month campaign. The extra data in these files consisted of ASCII metadata and messages that were being written following every GPS epoch instead of only once at the beginning of each file as expected. Topcon finally identified the problem as being in the controller board firmware and released a fix in the form of CB firmware version 3.01U in October, 2006, restoring the size of a daily 30-sec file to ~2.2 MB. 3.02U released in April, 2007 fixed a minor but potentially important issue with remote CF card access and should be installed on all units.

b) Unexpected/unprogrammed change to 1 Sec sample rate in the middle of a survey. Also discovered in the fall 2005 campaign was that a couple of units had spontaneously changed from 30 sec to 1 sec. sampling in the middle of a survey, filling memory quickly and causing surveys to end prematurely. This rare but troublesome behavior was also fixed by the 3.01U controller board firmware release.

3. User Interface Issues. There are two methods of programming/controlling a GB-1000 receiver: through a Windows-only GUI application called PC-CDU MS, or through command-line scripts or commands in a proprietary language called GRIL (GPS Reciever Interface Language). The PC-CDU interface was originally written for older Javad receiver boards and modified only slightly to work with the GB-1000. As such the application contains many non-functional tabs and options, as well as options for hardware buttons that no longer exist on the GB-1000. Also, new functionality that has been added to recent GB-1000 firmware releases (e.g. programming and accessing the external memory) cannot be implemented with PC-CDU, and we've found that the interface also cannot be entirely trusted (the receiver may sometimes be doing something other than the GUI presently indicates if it was programmed in the past through the command line!). Thus we do not recommend using PC-CDU for programming the receiver, only for file management, basic communication, or the application of GRIL scripts for programming purposes.

The alternative, GRIL, is a very unintuitive and complex language that is very difficult to master and cannot be realistically used by anyone but a frequent and expert Topcon user. The commands and sequences used for accessing the external memory are especially difficult to use. We currently can provide GRIL scripts for basic campaign or continuous receiver programming and file management. Contact support@unavco.org with your specific needs, and if we cannot meet them we will refer the questions to the Topcon software engineers in Moscow until a new cross-platform GUI is developed specifically for the GB-1000.

a) Current PC-CDU MS version. The latest version of PC-CDU MS is2.1.18.5, released in November, 2007. Improvements to this release over the 2003 version consist of only listing new antenna models and a small but important change to allow communication over CDMA IP-based modems. All users should download and use this version here (software and release notes are contained in a separate KB article).

b) Cross-platform dedicated GB-1000 GUI application under development. Topcon is currently working on a long-promised and delayed GUI application that will properly control all functions of the GB-1000

without the need to learn GRIL. We expect beta versions of the software to be available during the spring of 2008 and finalized during the second half of the year. Check back here or contact support@unavco.org for news and updates.

c) Slow response in accessing ftp or telnet interfaces through the ethernet port. The CPU processor of the GB-1000 is fairly slow and the ethernet interface primitive. It sometimes takes up to a minute for an ethernet connection to be established once the receiver and router/computer are connected. Also note that if you have changed the ethernet settings of the GB-1000 through the front panel, PC-CDU, or command line the changes do not take effect until the receiver is power-cycled. If the interface does not respond to your commands after one minute turn the receiver off and back on.

4. Real-Time Kinematic Survey Issues. Up to date instructions, tutorials, and processing software can be obtained from the Knowledgebase and more information obtained by contacting support@unavco.org.

Online URL: https://kb.unavco.org/article/topcon-gb-1000-technical-notes-3.html