

Hi DAQ+GPS users,

The US GPS system broke the reported date beginning on 6apr19. All QuarkNet DAQ users are no longer able to upload data files to e-Lab until their GPS cards are updated.

New firmware on the GPS card needs to be downloaded. Until then, the dates in your raw data will remain in 1999. If critical, data is recoverable by editing the dates in the raw data files directly. The dates are wrong, however the time of the day is fine. Terry Kiper at Fermilab has developed a procedure with which to upload new firmware to your GPS board, that Dave and I have tested and describe to you in this note.

Background details:

Dates can be in different states during the first week after 6apr19, but should be stable at 1999 in the second week and beyond. In the first week I saw 2020, 2006, 1980 and 1999; all have different complicated recovery paths. The issue is that the GPS hardware was built with 10 bits counting the weeks. After 1024 weeks, the counter rolls over. GPS time began Jan 1980, rolled over in 1999 and again in 2019. I'm pretty happy that weren't too many self-driving cars operating on the 6th.

This also hit the neutrino experiments at Fermi, so we are in good company.

Here is a generic warning about the GPS hardware. Plug the antenna into the GPS card (held in the beige box) only if the RJ45 cable is disconnected from the DAQ card. This cable carries power to the GPS card and we want the power off when the receiver is plugged into its gold connector to avoid accidental shorts.

### **Procedure for Uploading Firmware to the GPS Card**

Firmware is uploaded to the GPS card by a complicated process that asks you first to download a firmware file onto your PC and then to the GPS card via the DAQ, which must be set in a special mode. It would be good to have two people. We list the steps and even more details and pictures below:

1. Get the firmware from Connor Winfield (the GPS manufacturer) and store on your PC. Yes, your PC, since Connor Winfield does not have files for the Mac.
2. Unzip the firmware .rar file. WinZip will probably work but Dave and I downloaded and used PeaZip.
3. GPS card – carefully remove the beige cover (4 screws) and get your tool to short across two jumper points on the card (paper clip or small tweezers?).
4. Because EQUIP cannot change baud rates easily, download the Terminal App Tera Term to your PC.
5. Connect the DAQ to the PC using 115K baud rate; set baud rate on DAQ to 38K.
6. Now you cannot talk to the DAQ card, so change baud rate to 38K on Tera Term.
7. Issue DAQ command 'UL 123' to allow DAQ to act as a "USB to GPS link" in download mode.
8. Disconnect Tera Term from the com port.
9. On your PC, open UPD\_WI125.exe and select the correct com port.

10. Disconnect the RJ45 cable from the GPS to the DAQ.
11. On the GPS board, short out between the two jumper points (marked JP5) and hold.
12. Immediately re-connect the RJ45 cable to DAQ; wait 5 seconds and click Update on UPD\_WI125.
13. You can remove the short after “writing flash memory” appears on PC.
14. Download will take about a minute and PC will let you know when “firmware update complete”.
15. Reset the DAQ using the button on the DAQ card.
16. Use Tera Term to talk to the DAQ; issue a DG command and check if the date and time are correct. Initially the date may be 1980 until you get 4 satellites and a valid lock occurs and the data updates to 2019.
17. Wasn't that easy? You are now collecting good data again!

Alternatively, you can send your GPS board (inside its beige clamshell) to Fermilab and we can perform the above update for you. Keep the RJ45 cable, GPS receiver and temperature sensor, we only need the GPS box with the board inside.

Instructions for Sending to Fermilab:

Put your GPS box in a padded envelope and mail to:

Dave Hoppert  
Fermilab MS226  
Kirk Road and Pine Street.  
Batavia, IL 60510

Please include your return address.

**Same Procedure as above with more details and hints:**

Programming the QNET GPS NavSync CW25 Module  
Fermilab  
Terry Kiper  
April 15, 2019

### **Download Firmware Update**

1. On a PC, download the update files at <http://www.conwin.com/support.html>
2. The file name is “wi125\_update\_v1.79.00.29.14.rar”.
3. Unpack all files to a local working directory. (password: navsync). WinZip may work to unpack, but Dave and Mark downloaded PeaZip.

### Setup for GPS Card

1. Access GPS card by removing plastic case cover.
2. Note the location of JP5 (Figure 1). Older versions have R9 surface mount pads instead.
3. Done with the GPS card for now.

### Setup for DAQ Card

1. Connect DAQ to PC usb port and run your Terminal App (i.e. Tera Term). Download Tera Term because EQUIP can't configure the required baud rate easily.
2. Set DAQ baud rate to 38K (command 'SB 123 2').
3. Now Configure your Terminal App to communicate at 38K baud – select Setup; serial port; set speed.
4. Enter DAQ command 'UL 123'. DAQ will report "This is a USB to GPS link"
5. If at any point the DAQ card is reset, repeat steps 1-4.
6. DAQ is now in download mode, ready to send incoming data to the GPS board.
7. Now **disconnect** the RJ45 cable from the GPS to DAQ at the DAQ card.
8. Disconnect Terminal App from the com port. If Tera Term – select File and disconnect.
9. Do not reset the DAQ card.

### Using Win32 GUI Application to update GPS

1. Open application upd\_wi125.exe in your local working directory.
2. In the NavSync Firmware Update Window, select DAQ COM Port (same as above).
3. On the GPS board short out JP5. (tweezers, paper clip) (If you have an older GPS card and there is no JP5, short out R9)
4. **Connect** the GPS to DAQ using a RJ45 cable. A download timer has now started. Wait 5 seconds.
5. Now on UPD\_WI125 app click 'Update' within 15 seconds else download fails.
6. Programming will take about 90 seconds. upd\_wi125 will show status information and report "Writing flash memory", "Verifying flash", and "Firmware update complete". You can remove the short out jumper on the GPS card after "Writing flash memory" appears.
7. If programming fails disconnect the GPS RJ45 cable and repeat step 3- 5.
8. Reset DAQ board.
9. Use command 'DG' to check GPS time and date (only valid after satellite lock).

### Using DOS Batch File Application to update GPS

1. Use Win32\_GUI steps 3 and 4.
2. Enter command '**dw #**'. (# is port number of DAQ same as above)
3. If programming failed disconnect the GPS RJ45 cable and retry from step 1.

**dw.bat** has the following command.  
 pc\_loader -Loader.hex -B38400 -Ccom%1 -A60000 -D2  
 ns20\_v1.79.00.29.14.bin'  
 batch command dw.bat is followed by a port number as dw 3 (for Qnet port 3)

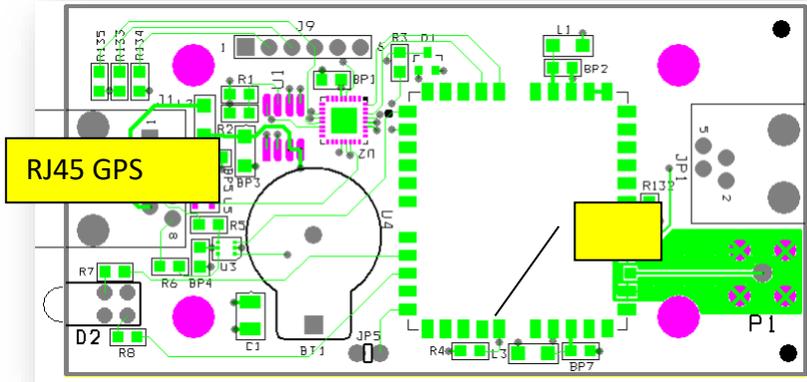


Figure 1, Qnet GPS CARD

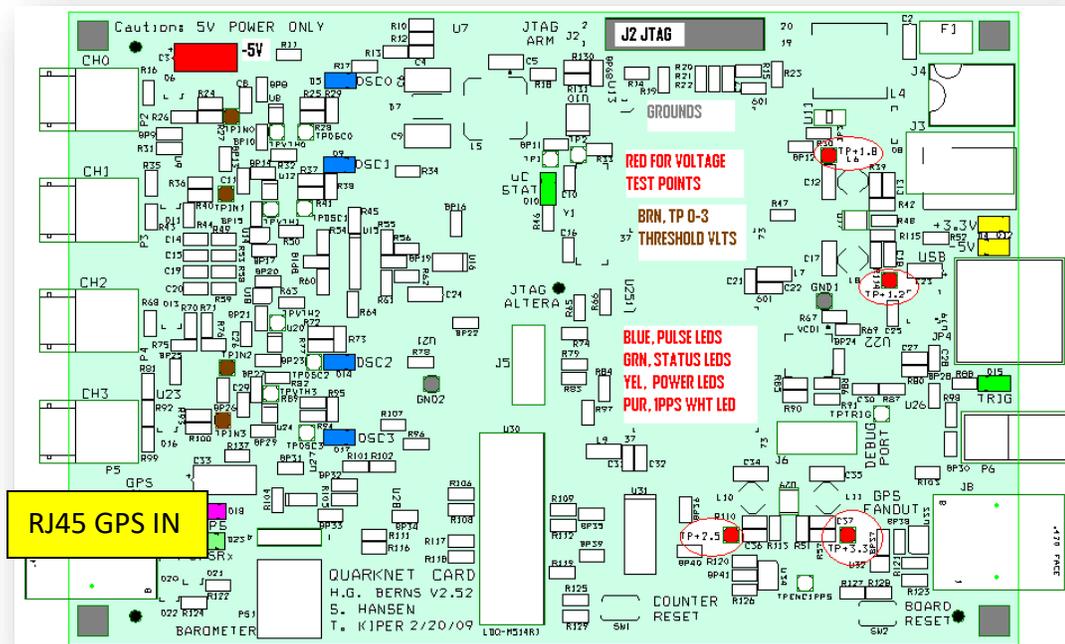


Figure 2, Qnet DAQ CARD