1 Using Hyperterminal

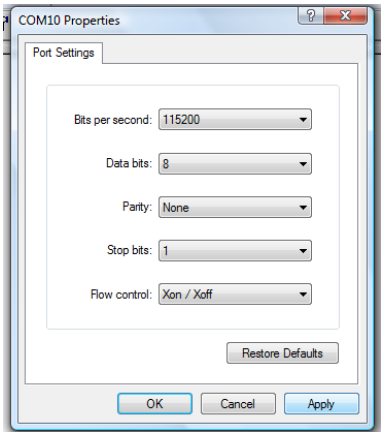
1.1 Introduction

Hyperterminal is a terminal emulator program which we can use to send commands to the DAQ board. This is our way of interacting with the counters, and allows us to manipulate settings and to record the events we are detecting.

1.2 Installing Hyperterm

Hyperterm is sometimes installed as standard on windows PCs. If it is then it can be found under "Accessories", "Communications". If it is not already installed, then we have a copy at the University of Birmingham which we can install for you. There may be a shortcut on your desktop for it.

1.3 Opening Hyperterminal

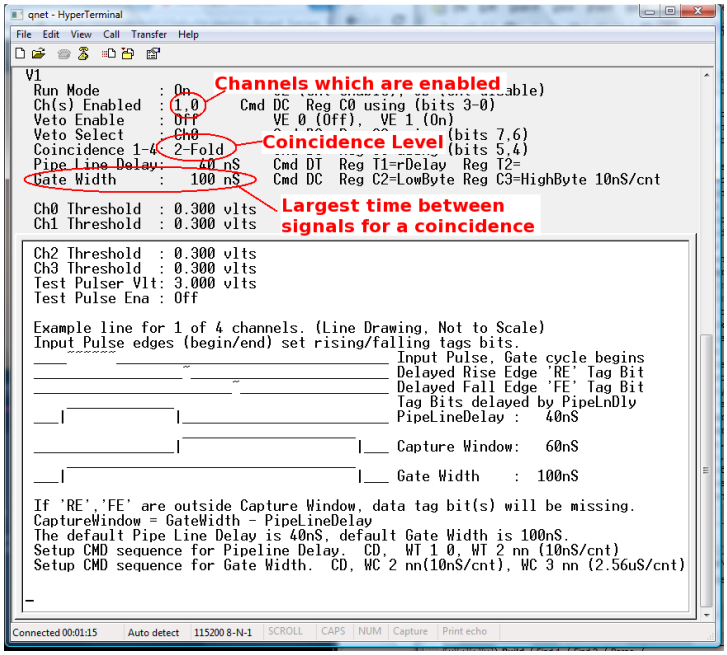


Open hyperterminal and type a name for the connection (for example 'qnet'). When asked to enter a phone number, change "Connect using" to the highest available port (usually COM10), and use the following settings:

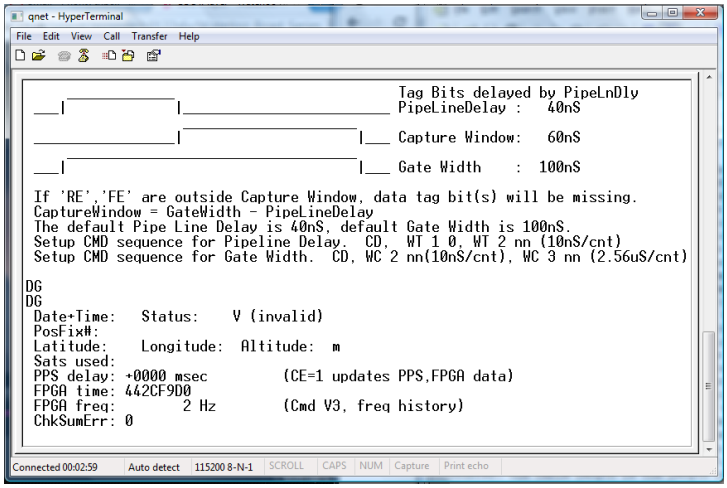
- Bits per second: 115200
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: Xon/ Xoff

You can now send commands to the DAQ board to view and manipulate the settings of the counters.

1.4 Hyperterminal Commands



You can use the commands V1 and V2 to view the current settings of the detector. This is useful to check whether the commands you used to change settings have had the desired efect.



Using the DG command will display the settings of the GPS unit. You shouldn't start taking data until PosFix# = 1. This means that the GPS module has managed to fix on to a satellite, and this is important to make sure that the data we are recording is valid.
Some useful commands are listed at the end of the sheet, and are also available by using the H1 and H2 commands.

1.5 Setting up the detector

The detector can be set up differently depending on the number of counters you are using, and the type of experiment you are doing.You can use Hyperterm to change the settings of the DAQ board to suit your experiment.

1.5.1 Channels and Coincidences

For example, if you are using only two counters, you can set up the board to only use the required channels. In order to detect muons, we want to look for a coincidence between the signals from the two counters, indicating that a particle travelled through them at almost the same time. So for this setup, we say you need a two-fold coincidence between channels 0 and 1. To do this you use the command WC 00 nm. 'n' sets up an n+1-fold coincidence, so for a two-fold coincidence we use n=1.
m is a hexadecimal number representing the channels which are enabled and disabled. The pattern of enabled channels form a 4-bit binary number, with a 1 representing an enabled channel and 0 a disabled channel. So to enable all 4 channels the binary number is 1111, which is 15 in decimal, or F in hexadecimal. To enable channels 0 and 1, the binary number is 0011, which is 3 in hexadecimal. So to set up a two-fold coincidence between channels 0 and 1, we use the command WC 00 13. You can check this has worked with the V1 command.

1.5.2 Threshold

You can also change the level of the threshold of the DAQ board. The DAQ board will only register signals with a voltage above a certain level, known as the threshold. By default this is set to 300mV, but it can be changed using the TL command. You can also change each channel individually. So TL n 300 set channel n to have a threshold of 300mV. Remember that the channels are labelled 0,1,2,3. Typing TL 4 300 will set the threshold of all 4 counters at once. Just typing TL will display the value of the threshold for each channel.

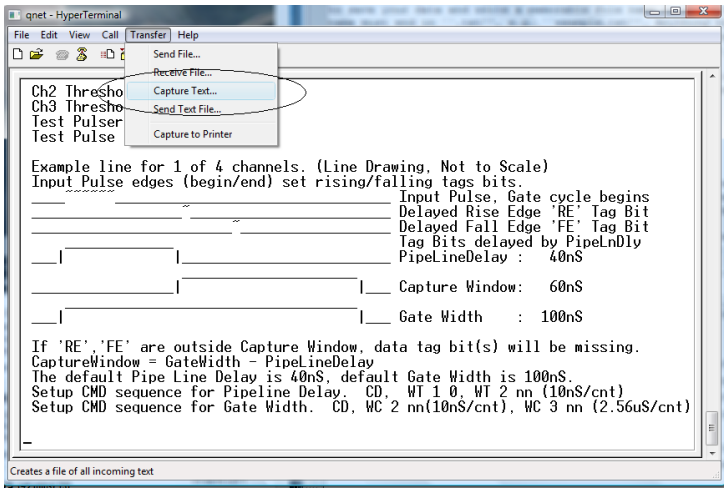
1.5.3 Gate Width

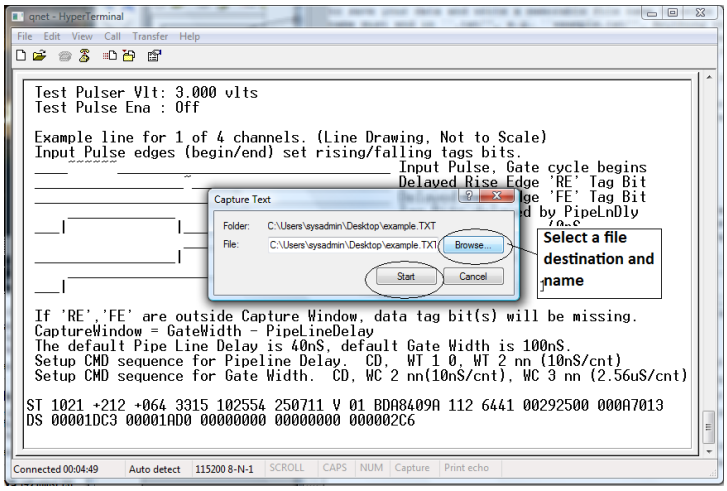
The gate width is the largest time between signals for it to still be considered a coincidence. By default, this is set to 100ns. To change it you need two commands WC 02 cd followed by WC 03 ab. The combination abcd is the number of clock ticks required for the gate width. 1 clock tick is 10ns, so that a 100ns gate width requires 10 clock ticks. In hexadecimal, 10 is 000A, so to set this gate width, you need to type the commands WC 02 00, WC 03 0A.

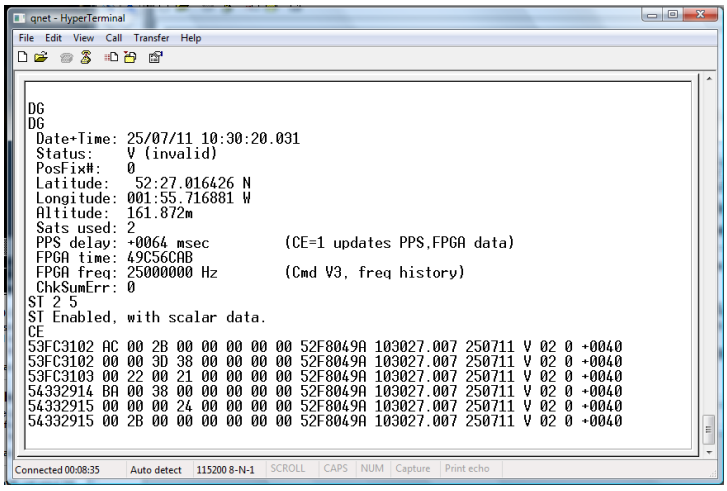
1.5.4 Save

To save the settings which you are using, typwe the command SA 1.

2 Recording Data







1. From the “Transfer” menu select “Capture Text”
2. Choose a file name ending with “.txt” and save your file somewhere memorable. Then select “Start”

3. Anything which now appears in the Hyperterminal window will also be written to the ".txt" file. Start by typing the commands V1, V2, DG, ST 2 5. This ensures your data file contains the necessary information about the detectors.

4. Type the command CE to enable the counters and start writing data to the ".txt" file. Leave this running for about 24 hours to collect enough data.Make sure that the computer you are using is set to never sleep, otherwise you will not continue to collect data.

5. Once you have collected enough data type the command CD to stop writing out data.

6. From the "Transfer" menu select "Capture Text" and "Stop".

Command	*Description*
H1, H2	**Help commands**
CD	**Counters Disabled:** Prevent event lines being written in hyperterm
DS	**Display Scalers:** shows the values of the scalers in a hexadecimal format
RB	**Reset Board:** resets the scalers
RE	**Reset Everything:** resets the whole board
TH	Shows values of the thermometer on the GPS module
BA	Read and adjust the baromoter on the GPS module
DG	Displays information about the GPS modue
V1, V2	View the registers
ST 3 5	Displays the staus line every 5 minutes with counts and resets the counts. Using ST 2 5 doesn't reset the counters
SA 1	Save any changes to the settings.
WT 01 00 WT 02 nm	**Sets the TMC delay, d:** nm is the value entered in hexadecimal, and this will set the value of d as nm in decimal. (d is actually the difference between register 01 and 02)
WC 00 nm	**Sets the coincidece level and enables the desired counters:** n sets an n+1-fold coincidence (i.e. an event is recorded if there is a coincidence in signals between n+1 counters.) m is the hexadecimal number representing the channels on the DAQ board which are enabled. 1 represents an enabled counter and 0 represents a disabled counter. So to have all the channels enabled would be 1111_{bin} or F_{hex}
WC 02 cd WC 03 ab	Sets the value of the gate width, w. abcd represents the number of clock ticks required for the gate width (1 clock tick is 10ns). For example, a gate width of 100ns requires 10 clock ticks, which is 000A in hexadecimal, so you would use the command WC 02 00 followed by WC 03 0A.
TL n 300	Sets the threshold of channel n to 300mV. Using n=4 changes the threshold of all 4 channels at once.