

Scotty

1. Compiling Scotty and getting it ready to work

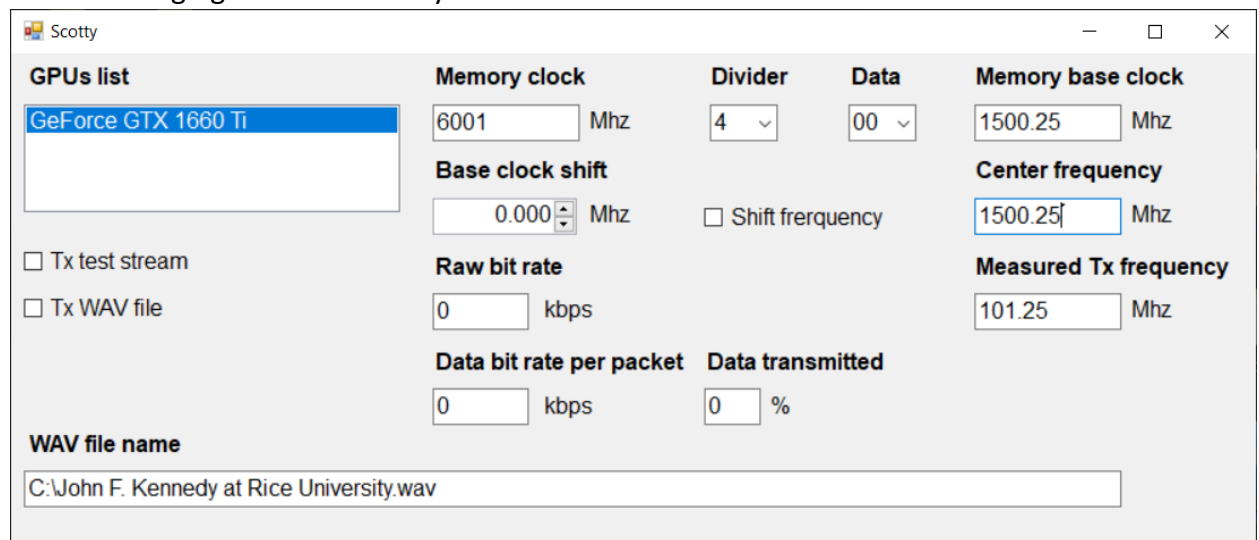
Scotty was developed using Microsoft Visual Studio Community 2017 with CUDA 11.1 and NVAPI installed.

After compiling Scotty, I copied the following files to the folder containing Scotty's executable file:

- cudart64_110.dll from C:\Program Files\NVIDIA GPU Computing Toolkit\CUDA\v11.1\bin
- nvapi.dll from C:\Windows\SysWOW64
- nvapi64.dll from C:\Windows\System32

2. Operating Scotty

The following figure shows Scotty's form:



The screenshot shows the Scotty application window with the following settings:

GPUs list	Memory clock	Divider	Data	Memory base clock
GeForce GTX 1660 Ti	6001 Mhz	4	00	1500.25 Mhz

Additional settings and checkboxes:

- ☐ Tx test stream
- ☐ Tx WAV file
- Base clock shift: 0.000 Mhz
- ☐ Shift frequency
- Raw bit rate: 0 kbps
- Center frequency: 1500.25 Mhz
- Measured Tx frequency: 101.25 Mhz
- Data bit rate per packet: 0 kbps
- Data transmitted: 0 %
- WAV file name: C:\John F. Kennedy at Rice University.wav

Figure 1: Scotty's Form

GPUs list

The GPUs list shows the list of available nVIDIA cards installed in the computer. Scotty should work with the selected card.

NOTE: I didn't do any tests on a computer that contains more than one graphics card. I do not know if card selection and usage code work as I intended.

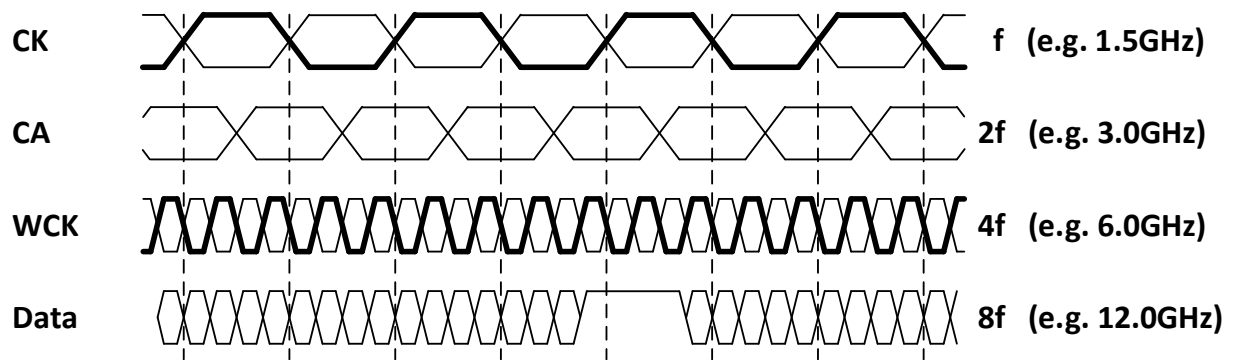


Figure 2: GDDR6 timing diagram

Memory clock

The Memory clock is the memory clock frequency (See WCK in Figure 2), as stated by NVAPI.

Divider

The Divider is the ratio between the Memory clock (See WCK in Figure 2) and the base clock of the memory (See CK in Figure 2). For GDDR3, 4, 5 the divider equals 2. For GDDR5x and GDDR6, the divider equals 4. The user can manually set Divider.

Memory base clock

The Memory base clock is the memory base clock frequency (See CK in Figure 2). It is calculated by dividing the Memory clock by Divider.

Base clock shift

The Base clock shift is a control, enabling to shift the memory clock frequency. When its value is updated, the target frequency result is shown in Center frequency.

NOTE: I learned how to use the memory frequency shift by reading unofficial code and documentation online. I got different frequency shift behavior on different cards. The frequency setting code should be investigated and improved, to get the same shifting behavior on all cards. The actual frequency is shown in Measured Tx frequency, when Scotty is transmitting data.

Shift frequency check box

When the shift frequency check box is checked, Scotty uses NVAPI to shift the frequency.

NOTE: I learned how to use the memory frequency shift by reading unofficial code and documentation online. I got different frequency shift behavior on different cards. The frequency setting code should be investigated and improved, to get the same shifting behavior on all cards. The actual frequency is shown in Measured Tx frequency when Scotty is transmitting data.

Center frequency

The Center frequency equals Memory base clock plus Base clock shift.

Measured Tx frequency

Memory base clock frequency as measured by NVAPI, divider by Divider. The value is valid when the data is transmitted.

NOTE: I learned how to use the memory frequency shift by reading unofficial code and documentation online. I got different frequency shift behavior on different cards. The frequency setting code should be investigated and improved, to get the same shifting behavior on all cards. The actual frequency is shown in Measured Tx frequency, when Scotty is transmitting data.

Tx test stream checkbox

When the Tx test stream checkbox is checked, Scotty transmits synthetic data it generates for a few cycles.

Tx WAV file checkbox

When the Tx WAV file checkbox is checked, Scotty transmits the file to which the link appears in WAV file name. If the WAV file name is empty, then Scotty will open a file selection window.

WAV file name

The WAV file name contains the link to the WAV file that will be transmitted when the Tx WAV file checkbox is checked. If WAV file name is empty and the Tx WAV file checkbox is checked, then Scotty will open a file selection window.

Raw bit rate

The Raw bit rate shows the average of measured packet bit rate.

Data bit rate per packet

The Data bit rate per packet show the average bit rate of the data payload (audio data).

Data transmitted

Shows how much of the WAV file was transmitted.

Data

The data selector gives the user the option to select the data that is transferred in every memory transfer.

NOTE: I added it because I wanted to explore the idea of generating frequency patterns by using different data, but haven't had the time yet to work on it.