Multiple Record mode

Although the PCI bus allows very fast data throughput to system RAM, there are still applications in which waveform repetition rates are so high that waveforms cannot be offloaded between acquisitions without missing triggers. For these applications, CompuScope Multiple Record mode is recommended.

Multiple Recording allows CompuScope cards to capture waveform data from successive triggers and stack them in on-board CompuScope memory. Between acquisitions of successive waveforms in Multiple Record mode, trigger circuitry is re-armed in hardware with no communication required from the host CPU. Re-arming in Multiple Record mode is, therefore, very fast and is also deterministic, which means that it always takes the same amount of time. By contrast, trigger re-arming in Single Record mode requires CPU intervention so that its execution time is slower and may vary with the multi-tasking load on the operating system.

While CompuScope Single Record mode allows waveform repetition rates up to 6,000 waveforms per second, Multiple Record mode allows waveform repetition rates of 1,000,000 waveforms per second and more. Furthermore, because the trigger re-arm is deterministic in Multiple Record mode, some customers use Multiple Record mode in applications with relatively low waveform repetition rates if trigger loss, which may occur in Single Record mode due to the non-real-time nature of the Windows operating system, is catastrophic in the application.

Multiple Record mode is ideal for applications where triggers occur in bursts or frames so that there is a natural break in data acquisition between frames, during which accumulated Multiple Record data may be downloaded. Examples of these applications include radar, ultrasonics, lidar, lightning monitoring, imaging signals and the acquisition of particle detection pulses.

GageScope supports acquisition in Multiple Record mode and allows the user to flip through individually-acquired records after acquisition. All CompuScope Software Development Kits provide an example of CompuScope usage in Multiple Record mode.

There are two types Multiple Record circuitry architectures that are available on different CompuScope models. One architecture does not allow accumulation of pre-trigger data in Multiple Record mode (or only allows a very limited number of pre-trigger data points). CompuScope models that use this architecture are the CS8500, CS12100, CS1220, CS14100, CS1610 and CS1602. The second architecture allows accumulation of a large amount of pre-trigger data in Multiple Record mode. CompuScope models that use this architecture are the CS82G, CS12400, CS14200, CS14105 and all Octopus CompuScope models. Operation details for both architectures are given in the following sub-sections.

Multiple Record for the CS8500, CS12100, CS1220, CS14100, CS1610 and CS1602

See next section titled: "Multiple Record for the CS82G, CS12400, CS14200, CS14105 and all Octopus CompuScope models" for details on Multiple Record usage with other CompuScope models.

For all CompuScope models covered by this section, with the exception of the CompuScope 1602, only post-trigger data may be captured in Multiple Record mode. For the CompuScope 1602, 20 pre-trigger points may be captured in Multiple Record mode; all other data is post-trigger data.

Figure 1 below illustrates how signals are acquired in Multiple Record Mode for CompuScope models covered by this section (with no pre-trigger data shown). Memory usage is well optimized in Multiple Record mode in that only the short illustrated pulse after the trigger is stored to CompuScope memory. Memory is not wasted in the acquisition of the entire signal between triggers, most of which may not be of interest.

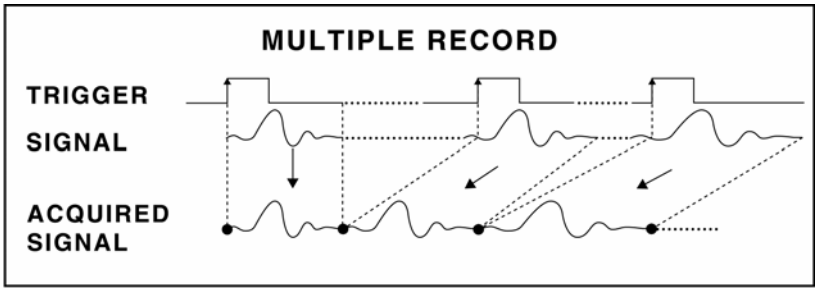

Figure 1: Multiple Record mode

Once a CompuScope card has finished capturing a Multiple Record segment, the trigger circuitry is automatically re-armed within a certain number of sample clock cycles to await the next trigger event. No software intervention is required.

The table below shows the number of sample clock cycles required in Multiple Record Mode for re-arming the CompuScope models covered in this section.

	Re-arm time in sample clock cycles
CompuScope 8500	24
CompuScope 12100	16
CompuScope 1220	5

	Re-arm time in sample clock cycles
CompuScope 14100	9 in single channel 18 in dual channel
CompuScope 1610	5
CompuScope 1602	5

Multiple Record for the CS82G, CS12400, CS14200, CS14105 and all Octopus CompuScope models

The CS82G, CS12400, CS14200, CS14105 and all Octopus CompuScope models are capable of capturing pre-trigger data in Multiple Record mode. Software can configure these cards to capture a pre-determined amount of pre-trigger data (see table below).

Figure 2 below illustrates how signals are acquired in Multiple Record Mode for CompuScope models covered by this section with pre-trigger data shown. Memory usage is well optimized in Multiple Record mode in that only the short illustrated pulse after the trigger is stored to CompuScope memory. Memory is not wasted in the acquisition of the entire signal between signals, most of which may not be of interest.

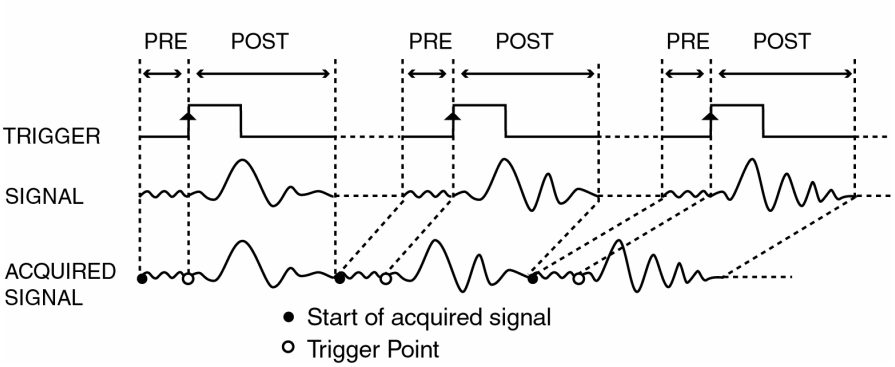

Figure 2: Multiple Record mode with Pre-Trigger data

Once the CompuScope card has finished capturing a Multiple Record segment, the trigger circuitry is automatically re-armed within a pre-determined amount of time to start looking for the next trigger. No software intervention is required.

From a Software Development Kit, Multiple Record mode may further be exploited for the CompuScope models covered in this section. In addition to adjustment of the post-trigger depth, SDKs allow adjustment of the Trigger Delay, the Trigger HoldOff and the Segment Size. Usage of these variables is described within each of the SDK manuals.

The table below shows the maxim number of pre-trigger points and the number of sample clock cycles required for re-arming in Multiple Record Mode for the CompuScope models covered in this section.

	Pre-trigger data size	**Re-arm time**
CompuScope 82G	0 to 32K	Single: 304 points Dual: 152 points
CompuScope 12400	Up to virtually full record length	< 2.1 µs
CompuScope 14200	Up to virtually full record length	< 2.1 µs
CompuScope 14105	Up to virtually full record length	< 2.1 µs
Octopus CompuScope models	Up to virtually full record length	< 2.1 µs

In fact, for the CS12400, CS14200, CS14105, and the Octopus family, the worst case re-arm time values are listed. Because re-arming is partially done during the acquisition, for larger acquisitions the re-arm time drops significantly to a minimum of a few clock cycles for acquisitions of more than 16 kiloSamples.