GaGe

APPLICATION NOTE
IF radar altimeter

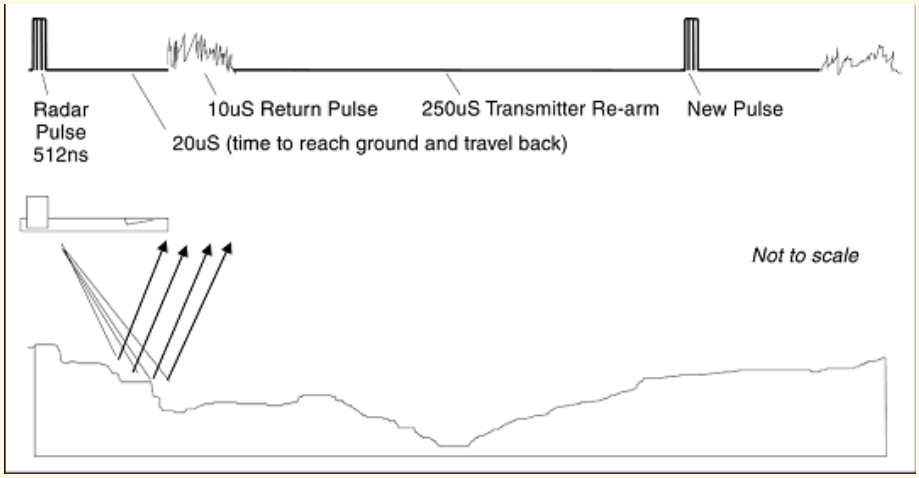
Challenge

The customer is using an offset IF radar to map forest terrain density. The equipment will be mounted in an aircraft, which will also be carrying a Global Positioning System (GPS) for reference.

The plane will fly at an altitude of 10,000 feet. A 512 ns radar pulse will be sent out and a return pulse will be received about 20 µs later, from which 10,000 samples will be acquired. After the pulse is received, there will be a relatively long re-arm time of about 250 to 300 µs for the radar.

The goal is to minimize the amount of data acquired so that each pulse and return can be digitized and processed before the next set of data arrives. This experiment will require the highest sample rate possible while maintaining a high Pulse Repeat Frequency (PRF).

Radar-based terrain recognition systems are critical to many modern weapons platforms, either as part of a guidance system or as a means to identify foes and friends in a battlefield situation. But such a technique can also be used in advanced sensing for archeological and geological studies to uncover ruins or natural resources.



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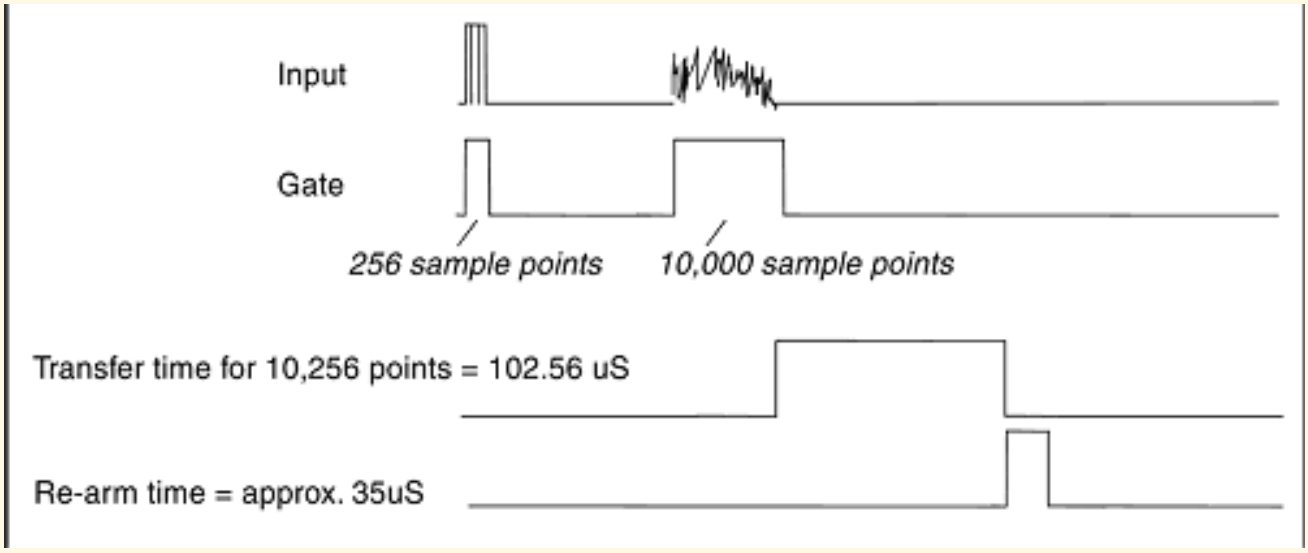
Solution

A valid solution to this specific problem is the CompuScope 8500 digitizer card which can capture data at 500 MS/s and can transfer data at up to 100 MB/s over the PCI bus.

On the CompuScope 8500, the time it takes to acquire one sample of data is calculated as 1 sample ÷ 500 MS/s or 2 ns. As waves travel at a rate of 1 foot per nanosecond, the distances can be resolved to within 2 feet.

The CompuScope 8500 will be equipped with 2 MegaSamples of on-board memory (the minimum for this card), which is more than enough for the customer's sampling requirement.

The card will also include the Gated Digitization option (to ensure data is only collected when necessary, as explained below) as well as the External Clock option (for synchronizing the CompuScope 8500 card with the customer's radar system).



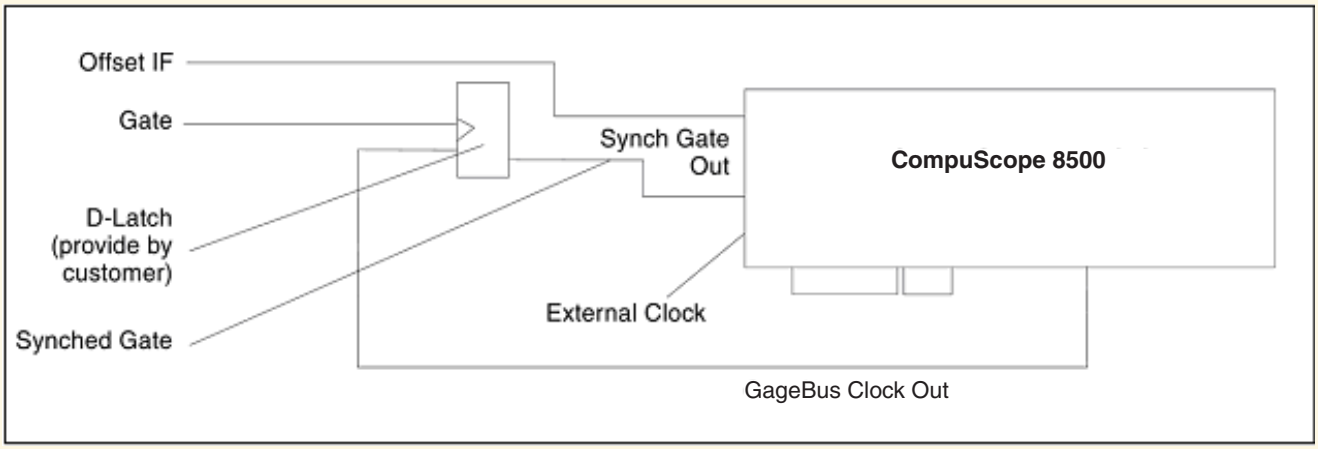
The initial burst from the radar will take 512 ns. The radar interface controls the gate, which will ensure that samples are collected only when it is high.

The next 20 µs are the send and return time for the pulse. Data is not acquired during this period of time as it is of no interest to the customer. Also, this 20 µs of data would only waste valuable time later on, when transferring data to the PC.

When the data is ready to be captured, the gate is brought high and the capture begins. The data is then transferred to the PC, and the card is re-armed for another capture.

This method fulfills the customer's time requirement, and in fact there will be another 100-150 µs left over before the next pulse comes in.

To ensure proper gate synchronization, GaGe will also provide a Synch Out signal called the GageBus Clock Out. This signal will allow the customer to synchronize the primary data latch clock with their gate signal to ensure that there will be no jitter due to an asynchronous gate.



Results

By using the GaGe's CompuScope 8500 Data Acquisition Card, the customer was able to minimize the amount of data acquired and therefore each pulse and return were digitized and processed before the arrival of the next set of data.

The Gated Digitization option ensured that data was only collected when necessary and therefore this method fulfilled the customer's time requirement.

The GageBus Clock Out option ensured that there would be no jitter caused by an asynchronous gate by synchronizing the primary data latch clock with the gate signal.

CompuScope 8500

CompuScope 8500 can sample one analog input at speeds up to 500 MS/s with 8-bit resolution and store the data in the very deep on-board memory.

The CS8500 uses a high-quality flash A/D converter which can digitize at 500 MS/s rate. In other words, a new sample is taken every 2 nanoseconds.

An on-board crystal-controlled timing circuit ensures timebase accuracy and long-term thermal stability of CompuScope 8500.

Features

- 500 MS/s Sampling
- 8-Bit Resolution
- Up to 2 GigaSamples On-Board Acquisition Memory
- PCI Bus Card with Bus Mastering Capability
- Fast Data Transfer Rate to System RAM
- 250 MHz Bandwidth
- 44 dB SNR
- Up to 8 Cards in a Master/Slave System for up to 8 Simultaneous channels at 500 MS/s
- Software Development Kits for C/C#, MATLAB, and LabVIEW under Windows

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