

# CNC Machine Probing Simulation

**Eliminate the potential for error by simulating your probing operations in VERICUT... and save on the cost of your probing equipment!**

*By simulating the use of probing devices on a CNC machining center, you can detect errors that could break the probe... before your program even leaves for the shop!*

If you use your CNC for probing operations, VERICUT will help ensure that you will not destroy the probe or crash the machine during tasks such as:

- Locating the stock and/or fixture and adjusting offsets
- Measuring and adjusting for stock variations
- Identifying stock and/or fixture configuration or part number on the machine
- Measuring and adjusting tool or fixture offsets
- Detecting tool failure
- Inspecting critical machined features

## WHY SIMULATE PROBING OPERATIONS?

When using a CNC machine to perform probing operations a number of errors can occur. The probe tip/stem could contact another object while not in probe mode, likely breaking it. The probe body or other machine component could hit something when moving and destroy an expensive inspection probe. Or, an error in the probe cycle logic could cause unexpected machine motion – which could crash the machine, destroy the probe body, or break the probe tip!

*With VERICUT simulation, there is no reason your probing operations should ever cause a headache!*

It notifies you when the probe tip contacts an object while not in 'probe mode,' and detects any collisions. It even verifies that the probe cycle's logic (which alters machine motion based on information gathered during probing) will not cause an error!

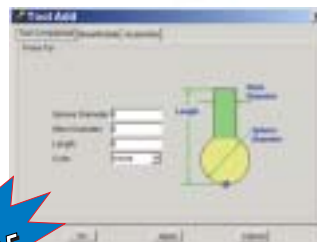
## HOW IT WORKS...

It's easy to create a probe tool in VERICUT. Simply specify the spherical "tip" diameter and shank diameter and length. Adding a holder completes the assembly and protects the entire inspection probe! VERICUT detects collisions when anything other than the probe tip contacts another object.

**AVOID BREAKING PROBES!  
SIMULATE CNC PROBING ON THE  
COMPUTER... BEFORE LOADING THE  
PROGRAM ON THE MACHINE!**

VERICUT then moves the simulated probe device along the specified path. Motion stops when the probe tip contacts an object, or when it reaches the end of the programmed motion. The probe motion results (such as machine axis locations) are applied in the probe sub-program with VERICUT's standard control emulation, just like on your CNC.

VERICUT simulates all aspects of probe cycle subroutines/programs, including complex logic and Type II formats used to set offsets and make decisions based on probe results. Contact CGTech to learn how VERICUT can simulate your custom probe cycles!



**VERICUT®**

Software Solutions for Manufacturing



9000 Research Drive  
Irvine, California 92618  
Phone (949) 753-1050  
FAX (949) 753-1053  
[www.cgtech.com](http://www.cgtech.com)

Call or  
visit our  
web site  
for more  
info



# WHAT KINDS OF OPERATIONS CAN YOU SIMULATE WITH VERICUT CNC MACHINE PROBING?

## LOCATING THE STOCK AND/OR FIXTURE AND ADJUSTING OFFSETS

The inspection probe is used to measure the location of certain features of the stock or fixture, prior to cutting, in order to determine exactly where the stock is on the machine and how it is oriented. Offsets are then automatically adjusted to make sure the NC program cuts the stock in the proper location. The probing activity detects and adjusts for small variations in the stock and/or fixture location due to variations in the operator clamping of the stock or fixture, from part to part.

## MEASURING AND ADJUSTING FOR STOCK VARIATIONS

This probe operation is usually done to adjust for small variations in the stock shape, such as a casting or forging. For example, from one casting to the next the amount of excess material may vary slightly. Using a probe, the NC program can detect this variation and adjust the roughing cuts accordingly, so the first roughing cuts do not overload the cutter, or unnecessarily "cut air."

## IDENTIFYING STOCK AND/OR FIXTURE CONFIGURATION OR PART NUMBER ON THE MACHINE

Occasionally machined parts belong to families of parts that differ only by slight variations: an additional instrument mounting surface, a different boss, hole, or floor location, etc. It is often desirable for the NC program to ensure that the proper part family member is loaded on the machine and matches the program about to run. In this situation the probe operation can verify the presence or absence of the extra mounting surface to identify which part family member is on the machine. If the correct part is loaded the program runs. If the wrong part is loaded, an operator message is displayed and the program ends.

## MEASURING AND ADJUSTING TOOL OR FIXTURE OFFSETS

Tools usually wear during use, changing the size or shape of the features they are cutting. Occasionally CNC machines are pushed to the limits of their repeatability or accuracy for specific part features. In these situations it is desirable to check the actual size being cut by a tool just prior to the "final" cut. For example, a turned part has a critical turned diameter that must be held to a very tight tolerance which is at the limit of the machine and tooling capability. It is possible to reliably hold this tolerance by first making a "test cut" at a known size slightly larger than the final size. The "test cut" area is probed to determine the actual size. If the actual physical size is different than the theoretical size, an offset is adjusted before the final cut is made. This helps make sure the tool cuts the final feature at exactly the correct size.

## DETECTING WEAR/FAILURE

Tools wear and break during use. Frequently the operator is unaware a



tool has worn beyond its limit, or that the cutting edge has chipped or broken, until the part is removed from the machine. Correcting this error requires costly rework of a part that has already been removed from the machine. By inspecting cut features it is possible to detect how far out of limit the features are, and notify the operator to check the responsible tools for failure.

## INSPECTING CRITICAL MACHINED FEATURES

Inspection during parts processing, where the process is already certified as 'good,' controls variations. Using an inspection probe on a CNC machine is another way to control process variations. By probing key or critical finished features to measure their proper shape and size, it is often possible to significantly reduce the amount of off-machine inspection. It is also possible to reduce the number of features manually inspected and the frequency of sampling previously required to insure a stable process. Inspection of finished features on a CNC machine is usually an integral part of an overall process control program.

