

U1000 TOOL COMPENSATION

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1.0 Overview

1.1 Introduction

The U1000's Tool Compensation Capability is designed to quickly get a machining process under control and maintain that control by automatically transferring tool offset data to the CNC control's offset tables. When the process starts, an offset is sent for each controlled feature when the 1st part from a particular source (e.g. lathe) is measured. It then maintains a statistical running average for each controlled feature and compares that average to configurable tool compensation limits. The tool receives an offset when the average exceeds a limit.

The statistical running average is used once the process is producing good parts to provide a stable method of correcting for variation. The goal is to ignore normal and unpredictable variations in the process while compensating for consistent variations such as tool wear.

1.2 Definitions

The terms defined in this section are a subset of all the definitions required for a comprehensive understanding of tool comp in the U1000. They represent the key terms that should be understood in order to understand the following section (1.3) which describes the general U1000 Tool Comp Algorithm

Full details of all properties that may be configured to control Tool Comp in the U1000 are specified in section 2.0 (Setup).

1.2.1 Tool Comp Source

A Source is a specific machine responsible for the final machining of particular features on a part. A Source is typically one of several possible machines that may perform a given operation. For example, a part may have certain features machined on one of 3 lathes, designated lathe A, B, or C.

If there is more than one operation in which controlled features are machined, there may be more than one type of source. For example a part may have some features machined in one of three lathes at op 10, then other features machined in one of two spindles in a turning center at op 20. In this example there are 5 sources and each part is affected by two of them, one particular lathe (op 10) and one particular turning center spindle (op 20).

A Source is uniquely identified in the U1000 using a combination of attribute name (e.g. "Lathe") along with one of the possible values for that attribute (e.g. A, B or C).

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Brief definitions of important Source properties:

Max Comp Possible

This specifies the maximum offset value that may be sent to the particular CNC for this source. If the absolute value of the computed offset value is larger than this value, the offset is set to this max value. This value must be no larger than the largest offset the CNC can accept, but may be set smaller. Note that if a CNC is set up to alarm when a large offset is received, Max Comp Possible must be set large enough to allow such a value through.

Comp On Reject

Determines whether a measurement which exceeds the tolerance limits will be used in the compensation algorithm. If set to false, values that exceed the tolerance limits are simply ignored and not included in the running average.

Use Reasonable Limits

If Comp On Reject is set to true, Use Reasonable Limits may also be set to true so a wider set of limits can be used to filter unreasonable measurements so they are not used in the compensation algorithm. If Use Reasonable Limits is set to true, then measurements exceeding the Comper object's Reasonable Limits are ignored by the algorithm.

Skip After TC Offset

During the normal process algorithm an offset is sent to the CNC when the running average exceeds the upper or lower comp limits of the comper (see 1.2.2 below). At startup and after a tool change an offset is always sent based on the first measurement regardless of the comp limits. We call the special offset a "Tool Change Offset" (TC Offset) to distinguish it from the normal process offsets. If Skip After TC Offset is set to true, then the Comper's Skip number of parts (see 1.2.2 Comper) is ignored after a TC Offset as they are during normal processing. If false, then no parts are skipped after a TC Offset is sent.

NOTE: When Skip After TC Offset is false it is generally assumed that after a tool change the CNC creates only one part and then waits for the TC Offset resulting from that part before creating any more parts.

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1.2.2 Comper

A Comper is the software object in the U1000 that maintains the data for a particular feature machined by a specific source. It maintains the statistical running average and is responsible for determining when an offset should be sent based on its upper and lower compensation limits. A Comper is uniquely identified in the U1000 by the Test ID for the feature combined with a unique Source ID (AttributeName + AttributeValue).

Brief definitions of important Comper properties:

Upper and Lower Compensation Limits

These limits specify the value (of the running average) that must be reached before an offset is sent to the CNC controlling the comper's source. During the normal process algorithm for tool comp, when the running average exceeds one of these limits, an offset is computed based on the Comp Target and sent to the CNC.

Comp Target

The Comp Target is the desired feature size to be machined after an offset is sent. It may be set to the nominal value for the feature but is often set to a value slightly less than or greater than the nominal depending on the normal direction of variation caused by tool wear. For example, for an O.D. which increases in size as the tool wears the Target may be set slightly less than the nominal to get more use out of the tool between comps.

Max Comp

Max Comp specifies the maximum absolute value for normal offsets generated by the Normal Process Algorithm. Note that this value is ignored for TC Offsets and the source object's Max Comp Possible limits the size of the comp (see 1.2.1 Skip After TC Offset and 1.3.1)

Skip

Skip specifies the number of parts from a specific source that exist in the queue between the source creating the controlled feature and the gage. This is the number of parts that will be gaged after a comp before the first part affected by the comp reaches the gage. These parts are ignored (skipped) by the tool comp algorithm because they were created before the offset was sent.

Trend

The Trend specifies the number of recent measurements used to compute the average value for comparison with the comp limits during the normal process algorithm. A common value for trend is 3. In this case the 3 most recent measurements of the Comper's feature from its specific source will be averaged for comparison with the limits.

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ResetSkip

ResetSkip specifies the number of parts from a specific source that should exist in the queue between the source creating the controlled feature and the gage at the time a Trend Reset signal is received by the gage (see 1.2.3). Determines how many parts from the specific source will be ignored before the algorithm begins again.

Upper and Lower Reasonable Limits

When allowing measurements exceeding the tolerance limits to be used by the tool comp algorithm, these “reasonable” limits may be used to specify wider limits that may not be exceeded for a measurement to be included in the comp algorithm.

1.2.3 Trend Reset

A Trend Reset causes a Comper to reset to its initial state. Its data buffer is cleared and its state is set to “Reset” so it will start the Algorithm (see 1.3) from its initial state. One or more specific Compers or all Compers for a specific Source may be reset using an Input line.

Note that if a Comper’s ResetSkip value is greater than zero, that number of parts will be skipped after a Trend Reset signal is received before the algorithm begins.

1.2.4 TC Offset (Tool Change Offset)

A special case offset that is always sent at startup and after a Trend Reset. The offset is computed based on the 1st part measured and is always sent regardless of what the tool comp limits are. The size of the offset is not limited by the Comper’s MaxComp value (however its size is limited by the Source’s MaxCompPossible value).

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1.3 Algorithm

The tool comp algorithm described in detail in the next few sections is designed to compensate for normal tool wear with a stable response to variation by comparing upper and lower compensation limits to a statistical running average of recent measurements. This allows the normal smaller and unpredictable variations in the process to be ignored while still responding to tool wear. It is also designed to adapt to periods of less stability, such as during machine warm up or after a tool change, by providing a faster response until the process stabilizes.

1.3.1 Initial State

When the U1000 initially begins measuring parts with Tool Comp active, the 1st part measured from each source will always cause compensations to be generated for each controlled feature (unless the reading is zero). Tool comp limits are not considered and the size of the offset is not limited by the Comper's MaxComp value (however its size is limited by the Source's MaxCompPossible value). This special offset is called the TC (tool change) Offset because it also always occurs after a Trend Reset (typically a tool change). The initial state at startup is essentially the same as the state after a tool change. After this initial part causes a TC Offset, the normal process algorithm will start.

If the source object's Skip After TC Offset option is set to true, the Skip number of parts will be ignored before the normal process algorithm starts. This will only be the case if there are already parts produced by the source that are queued to be measured when the TC Offset is sent. The skipped parts were not affected by the TC Offset already sent and therefore should not influence the algorithm.

NOTE: It is considered best practice not to use Skip After TC Offset and instead refrain from producing parts at startup or after a tool change until the 1st part produced is measured and the TC Offset is sent. This helps minimize the production of scrap parts and stabilize the process more quickly. Allowing one "sacrificial" part to be made followed by the automatic TC Offset adjustment can also be used to reduce the time it takes to change a tool.

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1.3.2 Normal Process Algorithm

When the algorithm begins, the trend value is always set to one. The first measurement is compared to the programmed upper and lower compensation limits and a comp is sent if it exceeds either limit based on the single measurement. If no comp is generated, the trend is incremented by one. After the next measurement, if the average of these two points exceeds either limit a comp is sent and the normal process algorithm begins again.

As long as no limits are exceeded (and therefore no comps are sent), the trend is increased by one on each measurement until it reaches the programmed trend value (N). It then remains at that value and each new measurement causes the statistical running average of the last N measurements to be updated and compared to the limits.

Whenever a comp occurs, the trend value is set back to one and the process starts over. If the Skip value is greater than zero, that number of part measurements will be ignored before the normal process algorithm begins again. This is because the skipped parts were not affected by the compensation already sent and therefore should not influence the algorithm.

A comp usually brings the process well within the compensation limits, allowing the trend to increment up to its programmed value. However, when the process is inherently less stable, such as during machine warm up or after a tool change, the trend may remain low to provide a faster response to process changes. As the process stabilizes the trend will eventually index to its programmed value.

1.3.3 Trend Reset (Tool Change)

When a Trend Reset signal is received, the algorithm is essentially reset to its initial state and the algorithm starts over (see 1.3.1). However, if the Reset Skip value is greater than zero, that number of parts will be ignored before the algorithm begins again as described in 1.3.1 (Initial State).

The Reset Skip value should only be greater than zero if there will already be parts produced by the source that are queued to be measured when the Trend Reset signal is received by the U1000. These parts should be ignored because they were produced before the tool change and therefore should not affect the algorithm.

NOTE: When Reset Skip is being used (value > 0), there is a difference between the initial state at startup and the state after a Trend Reset signal is received. At startup, Reset Skip is ignored because the very 1st part should cause a TC Offset to be sent. It is possible to reinitialize compers to their initial state using an input line using the InitTCSOURCE or InitTCCOMPER event in the IO Editor (see 2.4)

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2.0 Setup

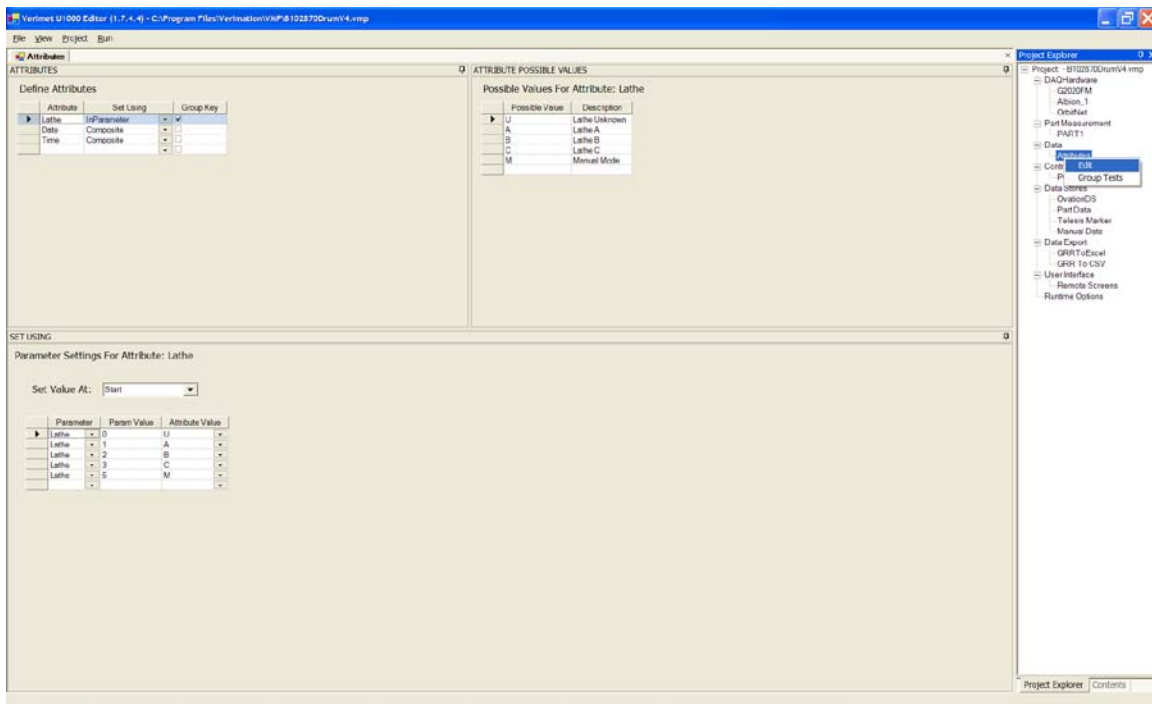
2.1 Group Key Attributes

An Attribute in the U1000 is a named data field generally used to tag part test results. For example, attributes such as Shift, SerialNo, GageID could be defined and a value for each would be stored with the test results for each part gaged.

An attribute designated as a Group Key causes the part data to be grouped by the values of the attribute. There are several U1000 runtime screens that automatically generate an instance of the screen for each group. This is most commonly used to display results on a per-source basis, such as all test results from a particular lathe. There must be at least one attribute marked as a group key that has at least one possible value in order to use the integrated tool compensation. This is because a Tool Comp Source (e.g. lathe) is uniquely identified using the attribute value of a group key attribute.

2.1.1 Attribute Screen

To get to the Attributes screen, right click on the Attributes node in the Project Explorer and choose Edit.



Note the Set Using column for the Lathe attribute in the above screen shot. It uses an InParameter to select the value. An InParameter is a binary number formed using one or more input lines (see 2.1.2). When the Lathe row is selected in the attribute grid above, the “Set Using” definition for the attribute is shown in the lower part of the screen.

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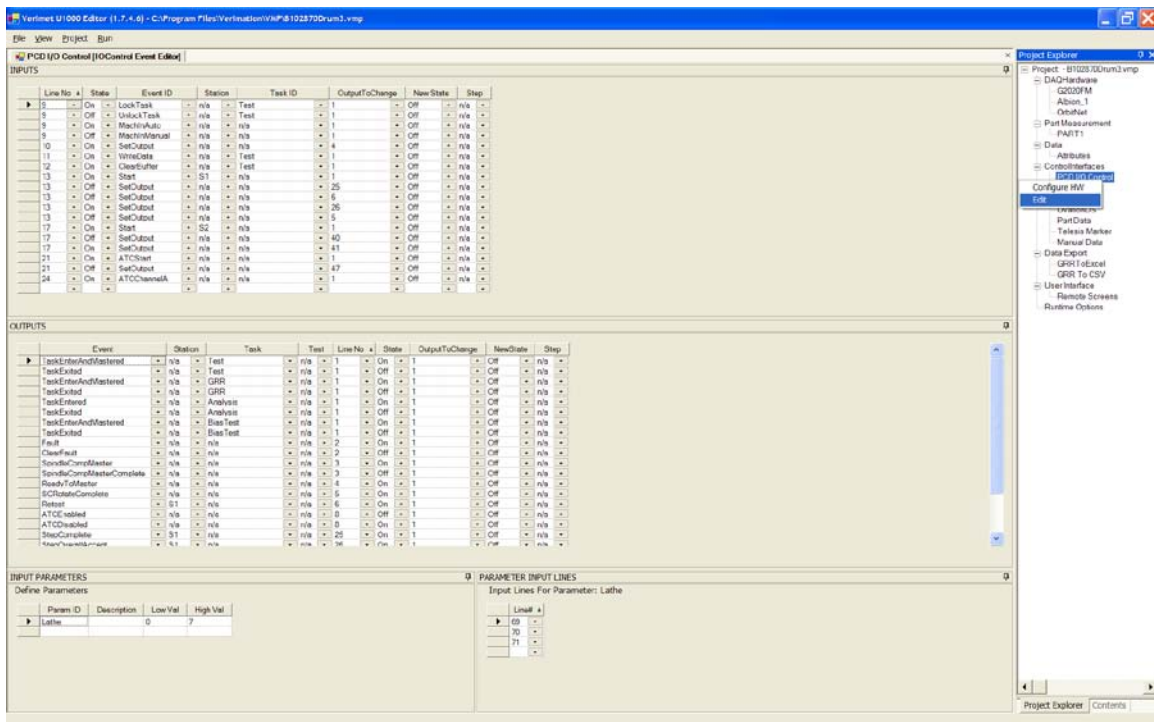
Set Value At

This field determines when the value of the InParameter is read from the input lines. If “Start” is selected the lines are read at the start of the measurement cycle at the 1st station. If “StepSolved” is selected the values are read when the 1st cycle completes.

The grid below the Set Value At field specifies which values of the InParameter select each possible value of the attribute being set.

2.1.2 Input Parameters

To show the I/O Event Editor screen, right click on the named node for the ControlInterface for IO in the Project Explorer and choose Edit.



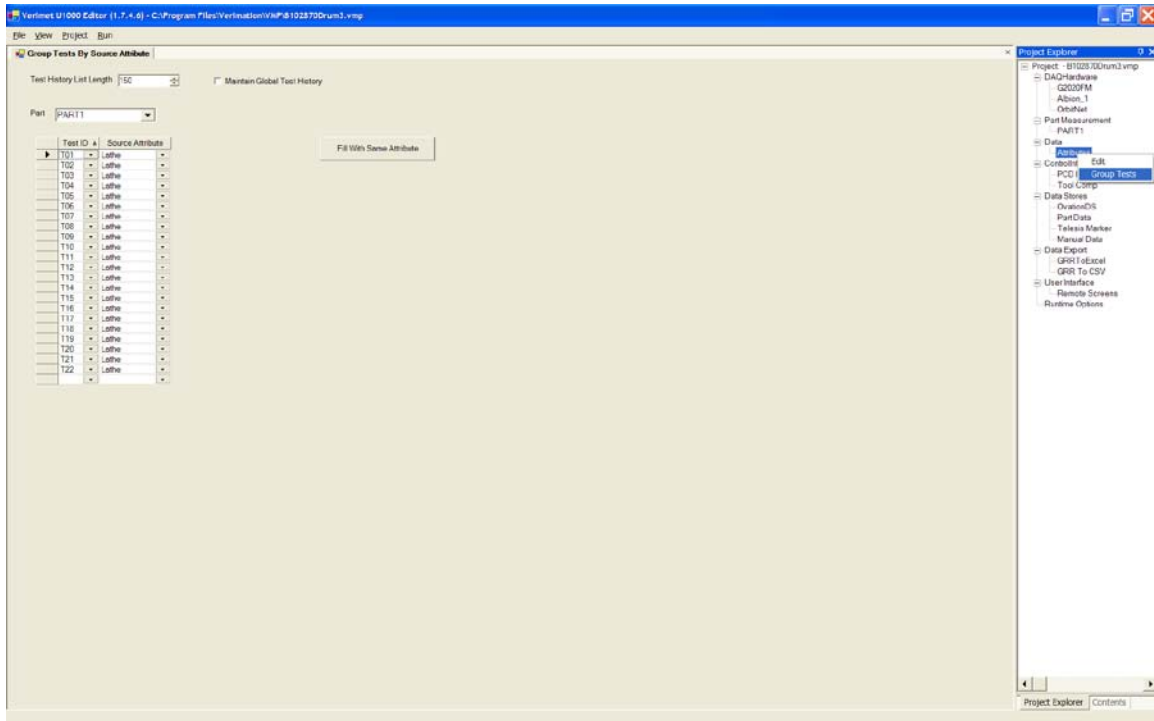
Note the two grids in the bottommost portion of the screen. An Input Parameter with an ID of “Lathe” has been defined. Three inputs lines have been added to the grid on the right to define a binary input parameter with possible values 0 – 7 (3 bits). The lowest numbered input line is the lowest-order bit. So if line 69 is the only one set, the value will be 1 – if line 70 is the only one set the value will be 2.

Input Parameters are used in the Attribute Editor to specify how to set the values of attributes having a Set Using type of “InParameter” at runtime (see 2.1.1.)

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2.2 Uncomped Tests / Multiple Operations

To show the Group Tests By Source Attribute screen, right click on the Attributes node in the Project Explorer and choose Group Tests.



There are several reasons we need a screen to specify which Tests are grouped by a particular Attribute:

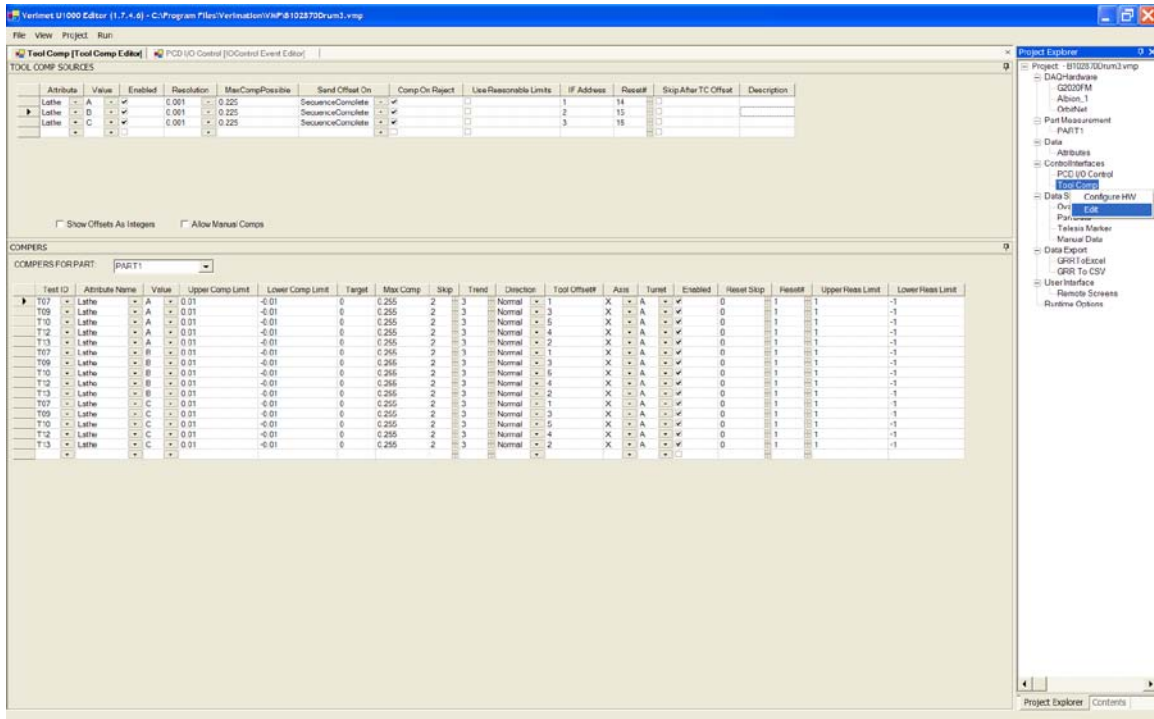
- When using Tool Comp, not all Tests are compensated. However, we do want these tests grouped by their source attribute so we can observe their trend history in the runtime Trend screen.
- If there is more than one operation (more than one Source Attribute) we need to map each Test not being comped to its source operation so the trend data is grouped accurately for those tests.
- A Source Attribute may have values that don't map to a particular Tool Comp Source. For example, a Lathe attribute may have possible values U – Unknown or M – Manual. These values will not have a corresponding Tool Comp Source but the Test results should be grouped by the values anyway so these results do not end up in the data for a legitimate lathe.

Note in the above example there is only one operation (the Lathe Source Attribute). In this case simply map the 1st Test to the group key attribute, and then click the “Fill With Same Attribute” button to map all the remaining tests.

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2.3 Tool Comp Editor

To show the Tool Comp Editor screen, right click on the named node for the ControlInterface for Tool Comp in the Project Explorer and choose Edit.



The fields in the Tool Comp Sources grid are described in detail in section 2.3.1 below.

Show Offsets As Integers

When this checkbox is checked, the offsets being sent are displayed on the runtime screens as an integer rather than a floating-point value. For example 0.012 would be displayed as +12 on the screen. This is done primarily to save space.

Allow Manual Comps

When this checkbox is checked, an offset value field and two buttons show up on the runtime Trend screen to provide the capability to enter and send offsets for a particular Test from a particular Source manually. This capability is provided primarily for test and debug purposes so this box should probably be unchecked once the machine is going into normal production.

The fields in the Compers grid are described in detail in section 2.3.2 below.

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2.3.1 Tool Comp Sources

2.3.1.1 Attribute

The attribute representing a particular operation (e.g. a set of lathes performing the op). This attribute should be a group key attribute (see 2.1)

2.3.1.2 Value

The possible value of the attribute specified in the 1st column used to designate a particular source (e.g. a specific lathe).

2.3.1.3 Enabled

When checked the source is active and receives offsets from related Compers.

2.3.1.4 Resolution

The Resolution field specifies the size of the increment expected by the CNC controller. For example, if the resolution is .001 (1 micron), and +12 is sent to the CNC, the tool (e.g. for a diameter) will be moved .012 away from the center of the spindle.

2.3.1.5 Max Comp Possible

This should be set to the maximum size of a comp that the CNC is capable of receiving. All comps are limited by this value. If the absolute value of the computed offset value is larger than this value, the offset is set to this max value. (Note than normal offsets (not TC Offsets) resulting from the normal process algorithm may be further limited by the Comper's Max Comp setting).

2.3.1.6 Send Offset On

This setting determines when an Offset is sent to the CNC. If set to SequenceComplete, all offsets resulting from a part being measured are sent at the end of the part cycle after the part has visited all gage stations and all measurements are completed. If set to StepComplete, offsets are sent after each measurement cycle completes.

2.3.1.7 Comp On Reject

If set to false, measurements that exceed specification (reject) limits are simply ignored by the normal process algorithm. If true, reject measurements are included unless limited by the Reasonable Limits.

2.3.1.8 Use Reasonable Limits

If set to true, then the Comper's Upper and Lower Reasonable Limits should be specified with values larger than the specification limits. If a measurement then exceeds either limit it is ignored by the normal process algorithm. This allows reject measurements to be considered within a larger set of "reasonable" limits.

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2.3.1.9 IF Address

The Interface(IF) Address is a value used to identify an interface to a particular CNC controller. For example, if using Ovation EZComp units to interface with CNC controllers, this should be set to an integer that matches the EZComp's Interface ID setting to specify a specific EZComp device (see section 2.5.3).

2.3.1.10 Reset#

The Reset# specifies the Input Line number that will cause the Source to do a Trend Reset on all its Compers. NOTE: There must be an Input specified in the IO Editor that uses event "ResetTCSOURCE" having the same line# as specified by Reset# (see section 2.4).

2.3.1.11 Skip After TC Offset

If checked then the Comper's Skip number of parts (see Compers 2.3.2.8) is ignored after a Tool Change (TC) Offset as they are during normal processing. If false, then no parts are skipped after a TC Offset is sent. Recall that a TC Offset is the special offset always sent after a Trend Reset signal is received.

NOTE: When Skip After TC Offset is false it is generally assumed that after a tool change the CNC creates only one part and then waits for the TC Offset resulting from that part before creating any more parts. This is the recommended practice.

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2.3.2 Compers

2.3.2.1 TestID

Specifies the Test that will be comped.

2.3.2.2 Attribute

The attribute representing a particular operation (e.g. a set of lathes performing the op). This attribute should be a group key attribute (see 2.1)

2.3.2.3 Value

The possible value of the attribute specified in the 1st column used to designate a particular source (e.g. a specific lathe).

NOTE: The TestID+Attribute+Value combine to form the unique identifier for a specific Comper.

2.3.2.4 Upper Comp Limit

The upper value (of the running average) that must be reached before an offset is sent to the CNC controlling the comper's source. During the normal process algorithm for tool comp, when the running average exceeds this limit, a negative offset is computed based on the Comp Target and sent to the CNC.

2.3.2.5 Lower Comp Limit

The lower value (of the running average) that must be reached before an offset is sent to the CNC controlling the comper's source. During the normal process algorithm for tool comp, when the running average exceeds this limit, a positive offset is computed based on the Comp Target and sent to the CNC.

2.3.2.6 Target

The Target value is used to compute the offset using $Avg - Target$ then multiplying by -1 (this supports the most common use of offsets to control lathe ID and OD sizes – e.g. a positive offset moves the tool away from the center of the lathe spindle). The Target is often set to a value on the opposite side of the nominal value from the normal trend resulting from tool wear. This minimizes the frequency of comps resulting from normal tool wear.

2.3.2.7 Max Comp

Max Comp specifies the maximum allowed offset used during the normal process algorithm. If the absolute value of an offset exceeds this value, the offset will be set to the magnitude of this value (regardless of sign).

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2.3.2.8 Skip

Used to specify the number of parts from a specific source that exist in the queue between the source creating the controlled feature and the gage. This is the number of parts that will be gaged after a comp is sent but before the first part affected by the comp reaches the gage. These parts are ignored (skipped) by the tool comp algorithm because they were created before the offset was sent.

2.3.2.9 Trend

Used to specify the number of recent measurements to be used to compute the average value for comparison with the comp limits during the normal process algorithm. A common value for trend is 3. In this case the 3 most recent measurements of the Comper's feature from its specific source will be averaged for comparison with the limits once the algorithm is running normally (see 1.3.2 Normal Process Algorithm).

2.3.2.10 Direction

When set to Normal this field has no effect. When set to Reverse it simply reverses the sign of the normal comp value (see 2.3.2.6 Target).

2.3.2.11 Tool Offset#

This field is used for different purposes depending on what Gage Type is being used. If Gage Type 32 is being used with an EZComp unit, this field should specify the actual CNC Tool Offset Number used to identify the particular tool that will receive comp data. If Gage Type 21 is being used with an EZComp unit, this field should specify a particular EZComp channel.
(See section 2.5.3)

2.3.2.12 Axis

If Gage Type 32 is being used with an EZComp unit, this specifies which axis of the tool programmed in Tool Offset# will receive the tool compensation value.
If Gage Type 21 is being used this parameter has no effect.

2.3.2.13 Turret

If Gage Type 32 is being used with an EZComp unit this parameter specifies the turret on which the tool resides. It is used on 4 axis lathe application (upper turret / lower turret or left turret / right turret). It may also be used on twin spindle machines.
If Gage Type 21 is being used this parameter has no effect.

2.3.2.14 Enabled

Indicates whether this Comper is currently being used or not.

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2.3.2.15 Reset Skip

Used to specify the number of parts from a specific source that will exist in the queue between the source creating the controlled feature and the gage at the time a Trend Reset signal is received by the gage (see 1.2.3). Determines how many parts from the specific source will be ignored before a part causes a TC Offset to be sent.

2.3.2.16 Reset#

The Reset# specifies the Input Line number that will cause this Comper to perform a Trend Reset (NOTE: There must be an Input specified in the IO Editor that uses event “ResetTCComper” having the same line# as specified by Reset#). Use Comper Reset# when you want to control the Trend Reset of individual Compers within a Source (To reset all Compers in a Source use ResetTCSOURCE – see 2.3.1.10 Reset#).

2.3.2.17 Upper Reasonable Limit

Used to specify a maximum upper limit on values that will be included in the normal process algorithm. If a measurement exceeds this limit it is simply ignored by the algorithm.

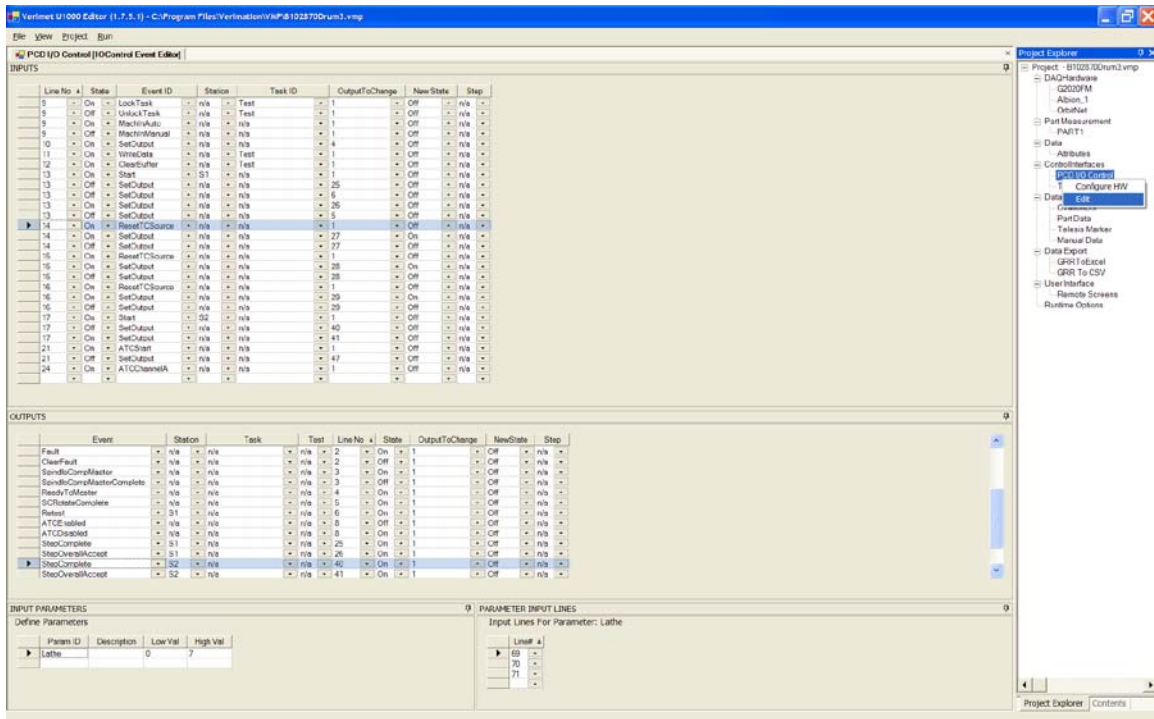
2.3.2.18 Lower Reasonable Limit

Used to specify a minimum lower limit on values that will be included in the normal process algorithm. If a measurement is less than this limit it is simply ignored by the algorithm.

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2.4 IO Setup for Trend Reset

To show the I/O Event Editor screen, right click on the named node for the ControlInterface for IO in the Project Explorer and choose Edit.



To set up the I/O to signal a Tool Comp Source to do a Reset Trend on all its Compers, use the input line specified in the Source's Reset# field (see 2.3.1.10) and specify the ResetTCSource event. Note the highlighted Input row in the above screen shot. Line 14 On sends the ResetTCSource event to whatever Tool Comp Source has its Reset# set to 14. Note that inputs 15 and 16 are being used for the other two Sources.

Acknowledging the Reset Trend Signal

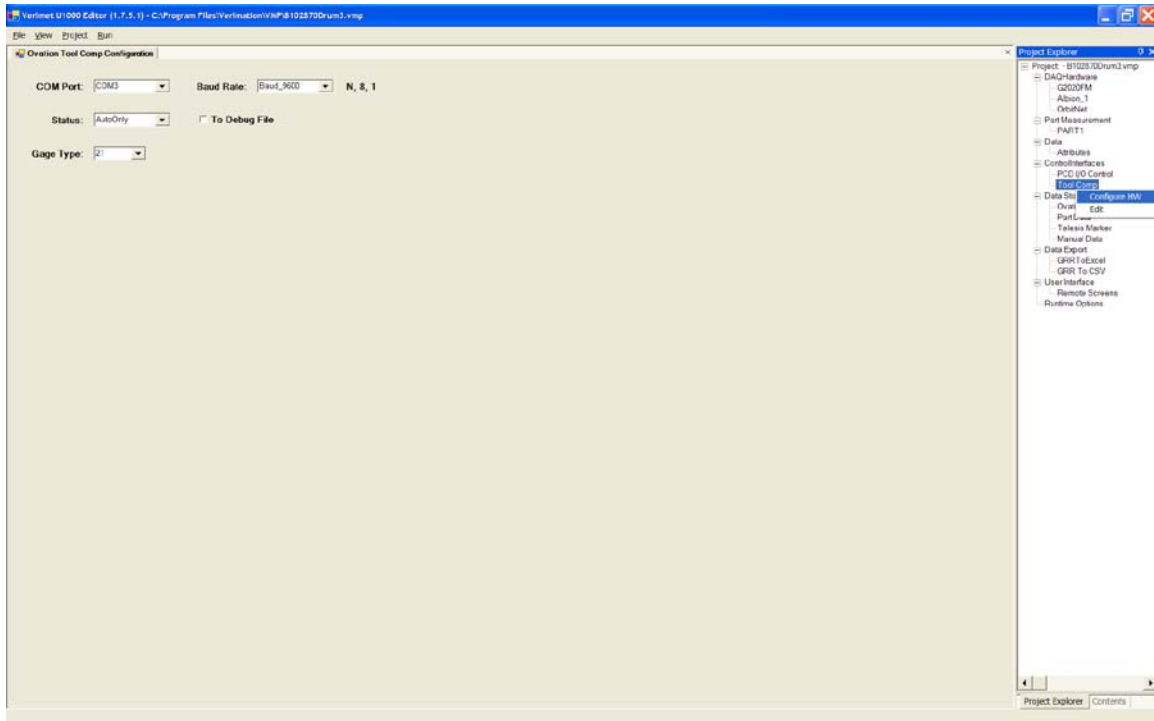
If you need to set an output line to acknowledge that the ResetTCSource input signal was received, use the SetOutput event with the same input line. Note the two input rows in the grid above using line 14 with the SetOutput event. When using the SetOutput event, the OutputToChange column is used to specify which output line to change and the NewState column is used to specify what state to change it to. In the example above, when Line 14 comes on output line 27 goes on to acknowledge, then when input line 14 goes off, output line 27 is set off so it is ready for the next acknowledgment.

NOTE: If Reset Skip is being used (value is > 0), the InitTCSource event may be used to reset to the initial state if necessary. Use of Reset Skip is the only difference between an initial startup state and the state after a Trend Reset using ResetTCSource (see 1.3.3 and 2.3.2.15).

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2.5 Tool Comp Hardware Setup

To show the Tool Comp Hardware Configuration screen, right click on the named node for the ControlInterface for Tool Comp in the Project Explorer and choose Configure HW.



The Ovation Tool Comp hardware uses RS485 to receive command strings from the U1000. Specify the COM port used for the 485 connection to EZComp devices and the baud rate being used by the devices (the default is 9600). The N, 8, 1 indicates parity = none, data bits = 8, and stop bits = 1.

2.5.1 Status

Status can be set to On, Off, or AutoOnly. When AutoOnly is specified, Tool Compensation will only be active the the gage is in Auto mode. For this to work the I/O must use an input line coming from the PLC that uses the MachInAuto event to signal to the U1000 that the gage is in auto mode, and the MachInManual event to signal that the gage is in manual mode. If you look at the I/O screen shot at the beginning of section 2.4 above, you can see input line 9 being used with these events to signal the gage (On = MachInAuto, Off = MachInManual).

2.5.2 To Debug File

If this box is checked, the command strings being sent out the COM port to the EZComp devices will also be appended to file: C:\ToolCompDebugData.txt.

IMPORTANT: If this file is used during debug, be sure to uncheck the box when the gage goes into production or this file will continue to grow.

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2.5.3 Gage Type

Gage Type determines the information contained in and format of the command string send out the COM port when offsets are being sent. The EZComp devices must be set to the same Gage Type as specified here to work properly.

2.5.3.1 Gage Type = 21

When set to Gage Type 21, the command string has the following format:
{IF Address}EZComp Channel, Offset, EZComp Channel, Offset<cr><lf>

Example: {1}1,+0.0021,3,-0.0015<cr><lf>

The number of channel, offset pairs in the string is determined by how many offsets have been generated by the algorithm. The IF Address is determined by the value in the Tool Comp Source grid's IF Address column, and the EZComp Channel is determined by the value in the Comper grid's Tool Offset# column (see section 2.3 Tool Comp Editor).

EZComp Setup for Gage Type 21

Normally when an EZComp is being used with Gage Type 21, the deviation from nominal measurement for each feature being comped is sent every time part is measured. When used with the U1000's integrated tool comp the EZComp must be configured for what we call "Pass-Through" mode. The EZComp will now only be receiving offsets so each EZComp Channel being used must be set up as follows:

Upper Comp Limit	= 0
Lower Comp Limit	= 0
Target	= 0
Trend	= 1
Skip	= 0

NOTE:

The **CNC Type** set in the EZComp unit determines how the command string coming from the U1000 is used to communicate with a specific CNC and its program.

Please contact Ovation Engineering, Inc. at (586) 336-1590 for more information.

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2.5.3.1 Gage Type = 32

When set to Gage Type 32, the command string has the following format:

```
{IF Address}[No. of Features]Axis,Turret,Offset Number,Comp Value<cr>  
Axis,Turret,Offset Number,Comp Value<cr>  
Axis,Turret,Offset Number,Comp Value<cr>  
(Checksum)<cr><lf>
```

Example: {2}[3]X,A,5,+12<cr>X,A,7,-101<cr>Z,B,4,-5<cr>(18)<cr><lf>

The number of features (offsets) being sent in the string is determined by how many offsets have been generated by the algorithm. The IF Address is determined by the value in the Tool Comp Source grid's IF Address column, and the Offset Number is determined by the value in the Comper grid's Tool Offset# column (see section 2.3 Tool Comp Editor). Note also that the offsets are expressed as positive or negative integers which are the number of increments of the resolution. For example, if the resolution is .001 (micron), +12 means .012.

EZComp Setup for Gage Type 32

When an EZComp is set up for Gage Type 32, the EZComp channels are not configured; however the resolution of the EZComp must match the resolution of the Tool Comp Source in the U1000 software. Gage Type 32 is a special mode we call "Emulation Mode". All the information is specified in the U1000 software. For example, the Axis and Turret are specified and the actual Tool Offset# is specified in the Comper grid rather than an EZComp Channel number (see section 2.3 Tool Comp Editor).

IMPORTANT NOTE

It is likely the EPROM containing the operating software in the EZComp units will need to be upgraded before Gage Type 32 can be used. The EZComp software for Gage Type 32 emulation mode was not completed until February of 2007. Also, note that the CNC Type set in the EZComp unit determines how the command string coming from the U1000 is used to communicate with a specific CNC and its program. Please contact Ovation Engineering, Inc. at (586) 336-1590 for more information.