Data Collection with Hand Tools

QC-Gage®
Training
Manual & Workbook

Version 3.4.0

Notices

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Table of Contents

Table of Contents

3. Welcome to QC-Gage Training

3.1 Introduction

QC-Gage® is a PC-based Windows software program that collects inspection data from hand gages or keyboard entry. The data can come directly from electronic gages, multiplexers, or entered via a keyboard by the operator. The physical electronic interface can be RS232 or USB. QC-Gage displays the data in both tabular and graphical format and is designed to work with QC-CALC, our SPC analysis program. This training manual is intended to familiarize you with the features and methods of QC-Gage's data collection.

3.2 Course Prerequisites

To ensure your success with this training, we recommend that you do the following **before** you come to class:

- Install QC-Gage on your inspection equipment
- Study the electronic gages you wish to use with QC-Gage
- Read the special section on any wireless or wired multiplexers
- Review this manual assuming you purchased before attending

You should have a working knowledge of the following topics, which are **not** covered in this training:

- Limited knowledge of some SPC terms
- A working knowledge of the Windows operating system
- A working knowledge of QC-CALC Real-Time

3.3 Course Objectives

The objective of this training is to familiarize the student with the operation of QC-Gage's data collection as well as programming new specification plans (spec plans). After the basic overview of the program and its operation, you can skip sections that are not relevant to your operation and concentrate on sections you'll need.

Many customers require basic operating knowledge of the data collection portion of the software while others require advanced detail to maximize QC-Gage's ability to interface with new gages. Therefore, this course is made up of three sections

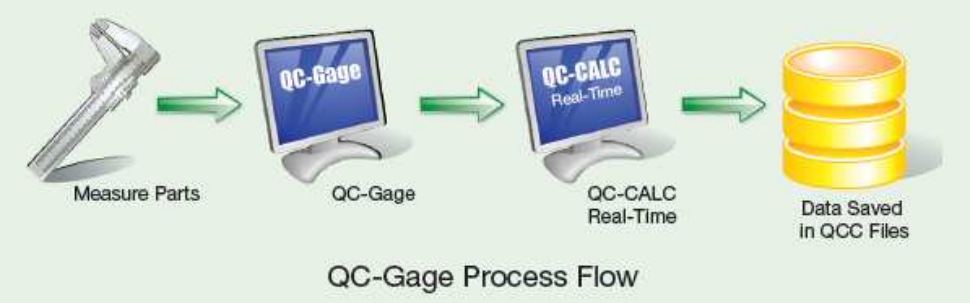
- Inspecting Parts
- Writing Spec Plans
- Interfacing New Gages

Advanced users will learn to write spec plans and interface new gages within QC-Gage.

4. QC-Gage

QC-Gage® is a PC-based Windows software program that collects inspection data from wired gages, wireless hand gages, or operator entered (typed) values read off the dial of mechanical gages. QC-Gage displays the data in both tabular and graphical format to help show the feature's condition and is designed to work with QC-CALC.

QC-CALC is a statistical program capable of analyzing and charting typical SPC functions. QC-CALC was designed to gather data from intelligent devices such as CMMs and Video CMMs. These “smart” gages report more than simple numbers such as labels, nominal, & tolerance information. Hand gages usually report a simple number which is not enough to tell QC-CALC what to do with the results. For this reason, QC-Gage was written to gather simple numbers and add the necessary nominal and tolerance information so QC-CALC will know how to store the results. All of this information is passed to QC-CALC much like the output of a CMM.



QC-Gage Process Flow

An inspector simply inspects a variable number of parts and features using hand tools and when completed, the data packet is sent to QC-CALC. QC-CALC displays the results in real-time graphs, compares the data to control and specification limits, and provides data storage and sophisticated analysis & reporting capabilities. The diagram above shows this relationship of QC-Gage and QC-CALC keeping in mind that QC-Gage and QC-CALC run in the same computer. You may have purchased a product called GageStation which is simply a combination of both QC-CALC and QC-Gage.

This training manual covers the understanding of QC-Gage’s operation and not QC-CALC. Please review the QC-CALC training manual for additional information about its capabilities.

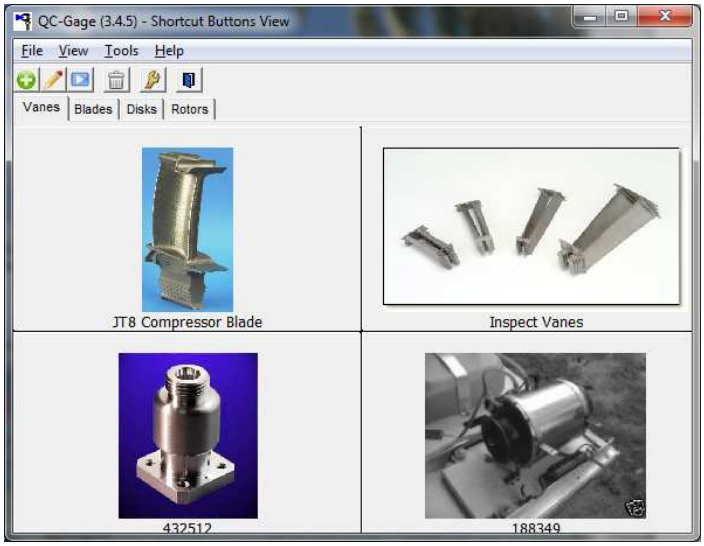
5. Layout Orientation

5.1 Start QC-Gage

Simply double click the QC-Gage icon on your desktop or select the Windows **START** button and choose **All Programs** – **Prolink** – **QC-Gage**. The main QC-Gage screen is displayed.

5.2 Overview of Screen

The picture to the right is an example of the Main QC-Gage screen. There are four large buttons in this picture but your screen may have more or less buttons depending on your current settings. Data collection occurs when you run a Specification Plan (Spec Plan) by pressing one of these buttons. The menus also give you access to the gage interface section and other advanced features such as writing Spec Plans.



5.3 Menu

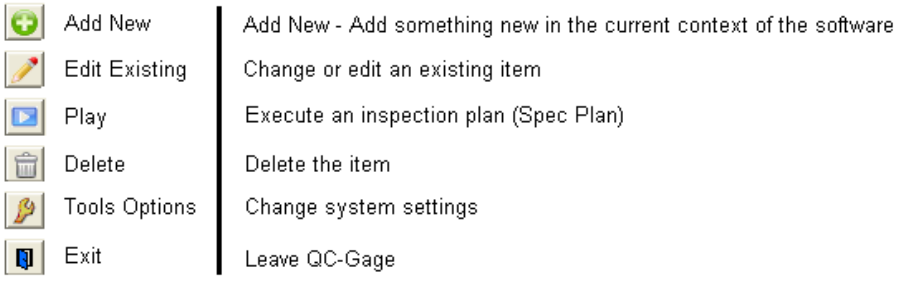
The QC-Gage menu bar controls the overall operation of the software including writing and running of Spec Plans, adding new gage interfaces, and setting up the options.

5.4 Tabs

Tabs are used to separate your Spec Plans buttons into groups. Tab management is discussed later in this document.

5.5 Toolbar Buttons

You'll find Toolbars containing short-cut buttons throughout all of Prolink's software. The button's functions are all the same throughout our software and are intended to save time by not having to navigate and select a menu.



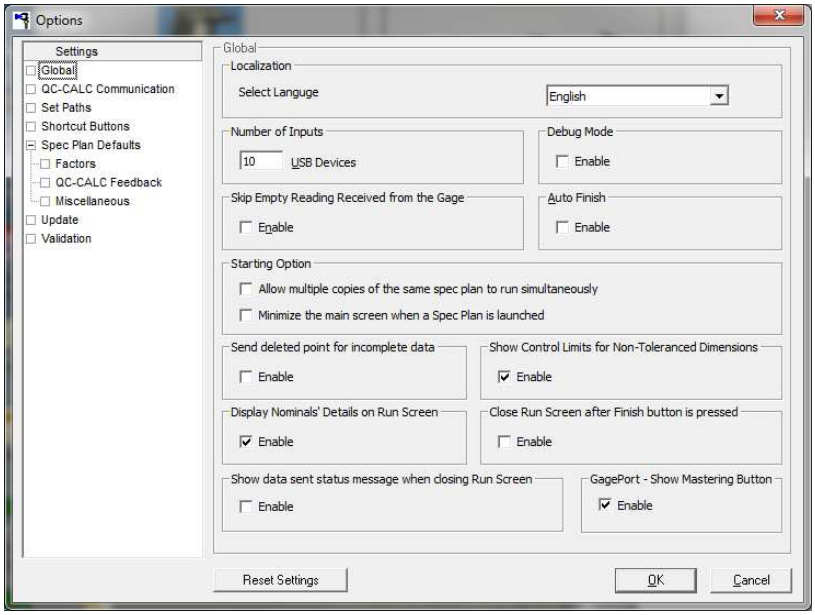
6. QC-Gage Conventions

6.1 Introduction

Like most Windows programs, QC-Gage's operation follows a convention that requires discussion. ALL settings are changed using the **Tools – Options** menu. Also, the right mouse click has an effect when clicked on a button. More on these options follows.

6.2 Tools – Options – Settings

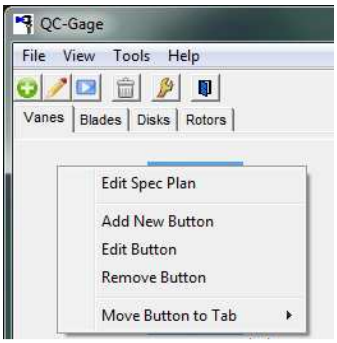
When the **Tools** – **Options** menu is selected, you see the **Settings** window. You can change QC-Gage's operation from this multi-purpose window. When you click on the groups located on the left side of this window, the right side changes showing the available options for the group selected. You select and change the option that best suits your needs. This is an important screen in QC-Gage and you will use it often during this training.



6.3 Pop Up Menu

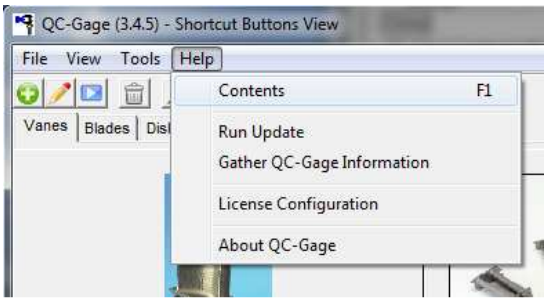
6.3.1 The Right Mouse Button

As with many Windows programs, the right mouse button usually has hidden options. If you Right click any button on the QC-Gage screen, a special menu pops up with several choices. We will discuss each of these options throughout this course so be aware of the right mouse click.



6.4 Help Menu

6.4.1 Help Contents



The help system is context sensitive meaning help is provided based on your current location in the software when the F1 key is pressed. All Windows programs use the F1 key to initiate the Help system. QC-Gage is no different so whenever you need help, simply press the F1 key.

6.4.2 Run Update

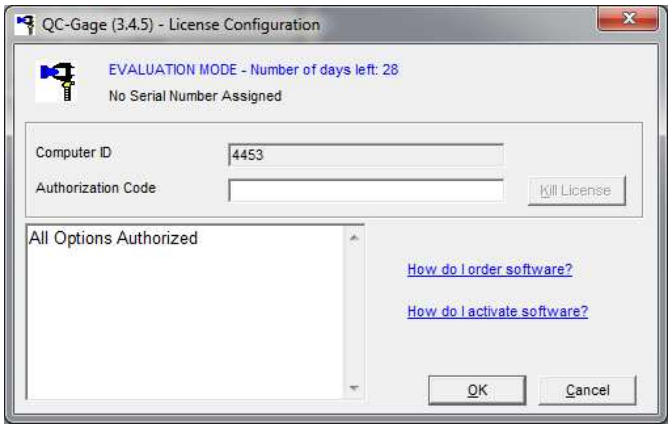
This menu option allows you to locate and run the update patch required to update your current version of QC-Gage when a newer version is available. This feature requires the QC-Gage PC to be connected to your local area network and possibly the Internet. For detailed instructions, see the Spec Plan Defaults section on page 68.

6.4.3 Gather QC-Gage Information

If there is a problem with your software that cannot be solved by using the help system or the manual, you can call Prolink for technical support. We may ask you to choose this menu option which will automatically collect all of the information about your settings that we will need to assess the problem. You must email the information to us after QC-Gage stores it in a file. You can open a support ticket on our website and include it there as well. A short wizard guides you through the steps.

6.4.4 License Configuration

Both QC-CALC and QC-Gage are distributed as demonstration copies. If you purchased either package, you must obtain the Activation Code from Prolink to activate your software to the full registered version. The **Help** - **License Configuration** menu option is used to access QC-Gage's license information.



Status Area

The Status Area shows the current license configuration. If you are running a demo copy it will tell you how many days remain until the demo period expires. If it is a full unlocked purchased copy it says **Software Activated**.

How to Unlock Your Software

All software shipped by Prolink is a demo copy. If you have purchased the software you will need to follow these steps to unlock your software:

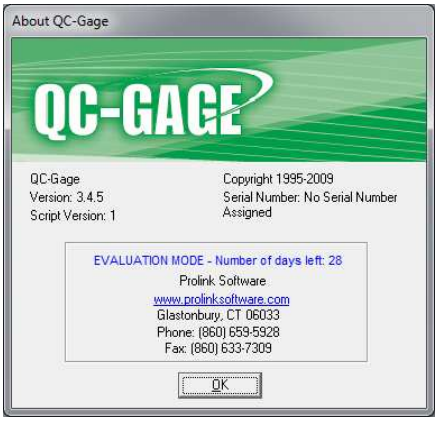
1. Download and install the latest version of QC-Gage.
2. Run the software and click on the **Help - License Configuration** menu. On this window you will see a **Computer ID** box with a 4-digit number, and also an empty **Activation Code** box.
3. Launch an Internet Brower and go to www.prolinksoftware.com. Login using your email and password.
4. Click on **My Account** at the top of the screen and locate the correct copy of software in the **My Software** section by the PSN (Prolink Serial Number).
5. Click on the **Activate** link below this item. If you do not see an **Activate** link, then halt these steps at this point and contact Prolink for assistance by opening a Support Ticket from the **Support – Open a Help Ticket** page.
6. After clicking the **Activate** link you will be asked to enter the **Computer ID** that was mentioned in Step 2. Go back to your software to find this 4-digit number and enter it in this box.
7. Click the **Get Activation Code** button and a large 25 digit number is displayed in the browser i.e. 206D 0FA9 0E79 6A30 6140 1CAA 2
8. Copy this number back into the **Activation Code** box in the **Help – License Configuration** screen of QC-Gage mentioned in Step 2.
9. Click on the **OK** button and your software is activated.

Kill License

This option is used to disable any license remaining for the running software. This includes the licenses for fully registered software. You are asked to confirm this is what you want to before the Kill License process actually continues.

6.4.5 About QC-Gage

This menu shows information about the copy of QC-Gage currently running. If you contact Prolink for support you will typically be asked to go to this screen to provide information about your specific installation of QC-Gage.



7. Running a Spec Plan (Inspect Parts)

7.1 Introduction

QC-Gage is divided into two major functions; writing and running Spec Plans. You may be the same person that performs both functions but some companies have two distinct job descriptions such as an inspector and a programmer. In either case both topics are discussed. We will begin this training with an exercise involving the running of a Spec Plan.

7.2 What is a Spec Plan

A Spec Plan is a set of instructions that describe a part similar to a Coordinate Measurement Machine (CMM) part program. It includes a list of all features to measure, the nominal and tolerance values for each feature, pictures and special instructions, what gages to use on each feature, and settings for the gages. All Spec Plans are stored in files and have a file extension of .SPL.

7.3 Running a Spec Plan

This quick example is intended to acquaint you with the look and feel of running a Spec Plan. The following steps describe the order of operation to make this topic clear. Keep in mind we are going to run a training Spec Plan supplied with QC-Gage that requires you to type the inspected values by hand. You will have a chance to write your own Spec Plan later in this training. You will:

1. Start QC-Gage & QC-CALC.
2. Run a Spec Plan by pressing a button.
3. Hand type inspection results into QC-Gage.
4. Enter the Factor information.
5. Complete the inspection and send the results to QC-CALC
6. View Data in QC-CALC

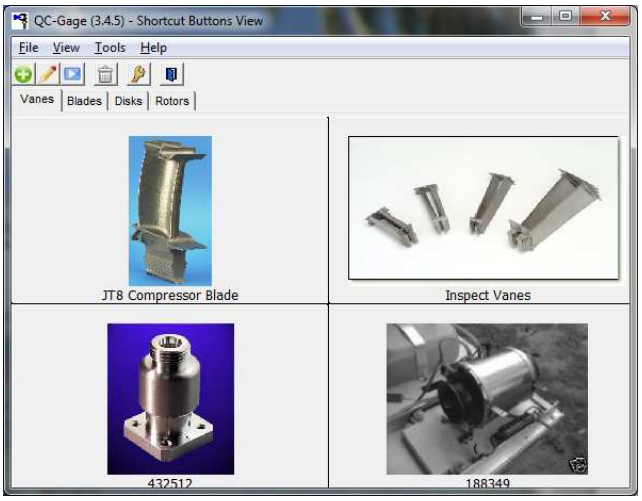
7.3.1 Step #1 – Start QC-Gage & QC-CALC

A. Double click the QC-Gage icon to start the program. If the icon is missing, press the Windows **START** – **All Programs** – **Prolink** – **QC-Gage** menu.

B. Double click the QC-CALC Real-Time icon to start it. If the icon is missing, press the Windows **START** – **All Programs** – **Prolink** – **QC-CALC** menu.

7.3.2 Step #2 – Run a Spec Plan

C. Your main QC-Gage screen may vary from the one shown here.

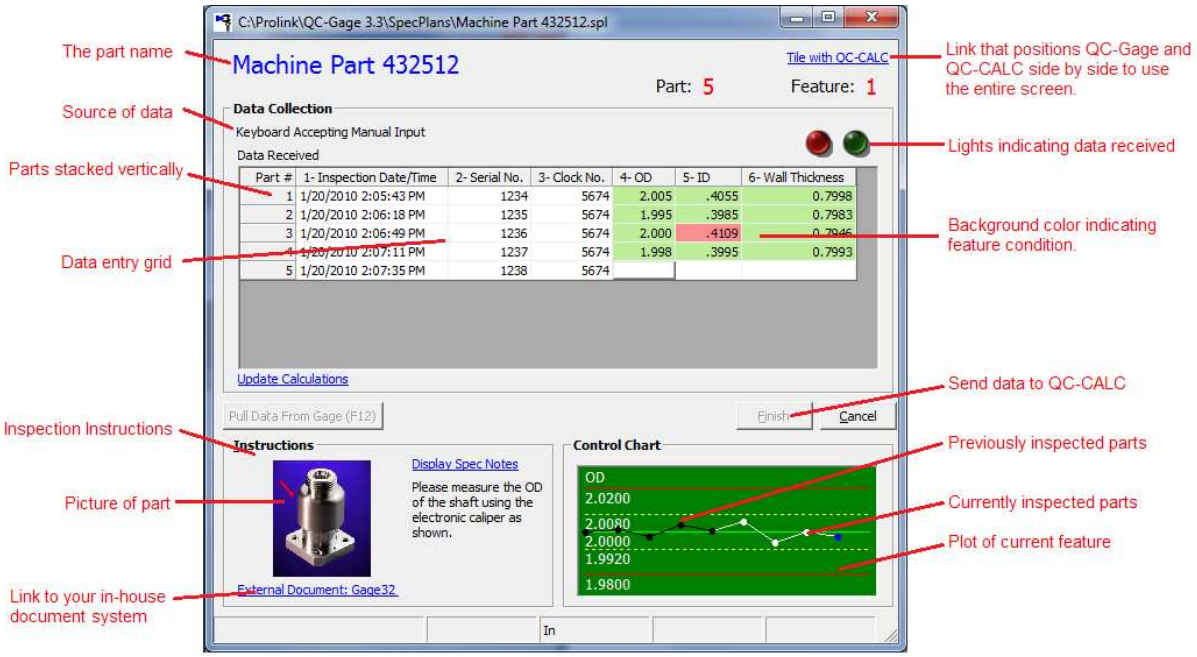


D. Click the button labeled 432512 to start the inspection.

E. The **Run Screen** can be displayed in either **Horizontal** or **Vertical** view. There are advantages to both and as you write your own Spec Plans, you can display the data entry screen in either orientation. Data is entered in the grid wherever the blinking cursor is located.

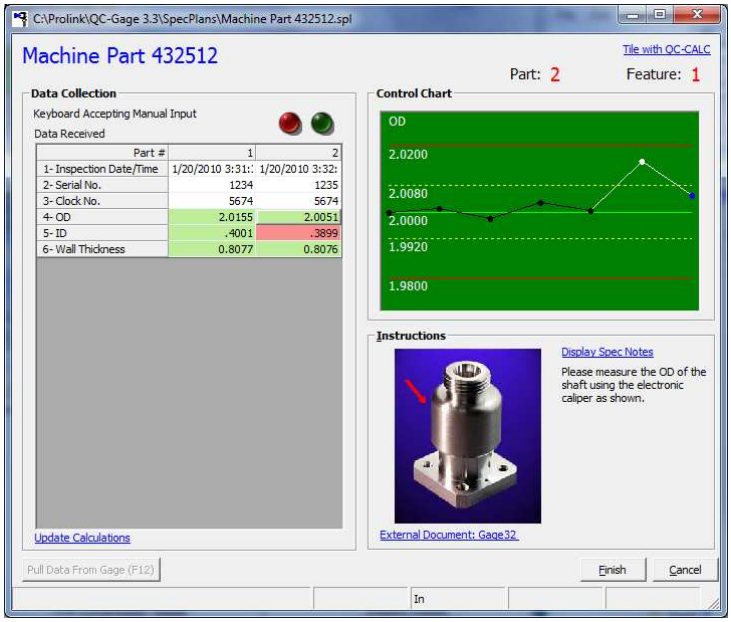
Horizontal View

The horizontal view offers a convenient view and data entry when there are many parts or a few dimensions to enter. The use of screen space is maximized under either of these conditions. The term horizontal refers to the direction of the dimensions being measured. In this case, each dimension follows one another in a horizontal direction within the grid. The ID label follows OD in this example.



Vertical View

The vertical view offers a convenient view and data entry when there are few parts or many dimensions. The use of screen space is maximized under either of these conditions. When more than 4 parts are inspected the columns become squeezed. You can use a larger computer monitor and stretch QC-Gage to fit more columns. The term vertical refers to the direction of the dimensions being measured. In this case, each dimension follows one another in a vertical direction down the grid. In this example only two parts are being measured so the cursor moves down the column as you type causing the ID to follow the OD.

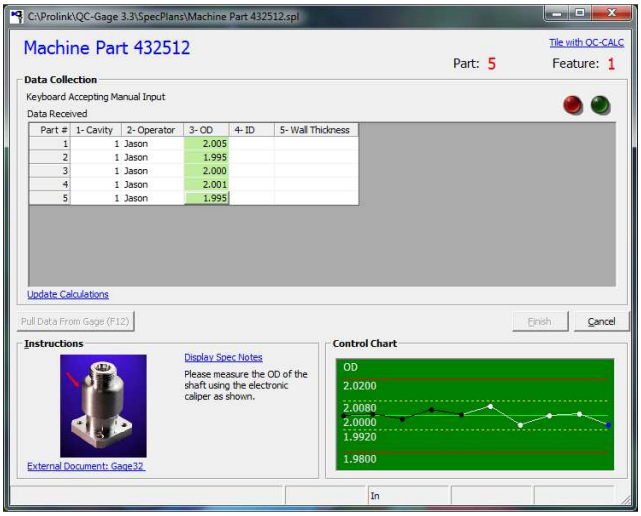


7.3.3 Step #3 – Hand Type Data

Enter the following list of numbers in this horizontal view example. Remember, you can enter the data first and then the Factor information or vice versa.

F. Enter the following list of numbers by simply typing on the keyboard. These values could be coming from an electronic gage but for purposes of this class, we will enter them by hand.

2.005
1.995
2.000
2.001
1.995



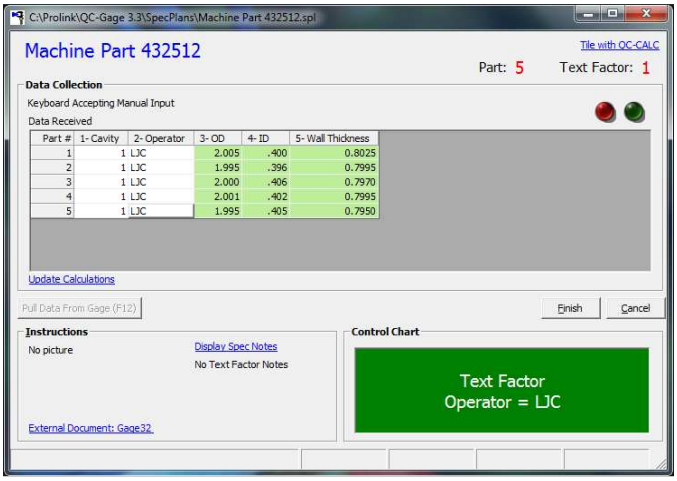
G. Now enter the following list of numbers by simply typing on the keyboard. These values represent the ID.

0.400
0.396
0.406
0.402
0.405

7.3.4 Step #4 – Enter the Factors

H. Now click the mouse on the Cavity value for part 1 and change it to 2. Type over all cavity values and change them to 2.

I. Now change all Operator names from Jason to your initials.

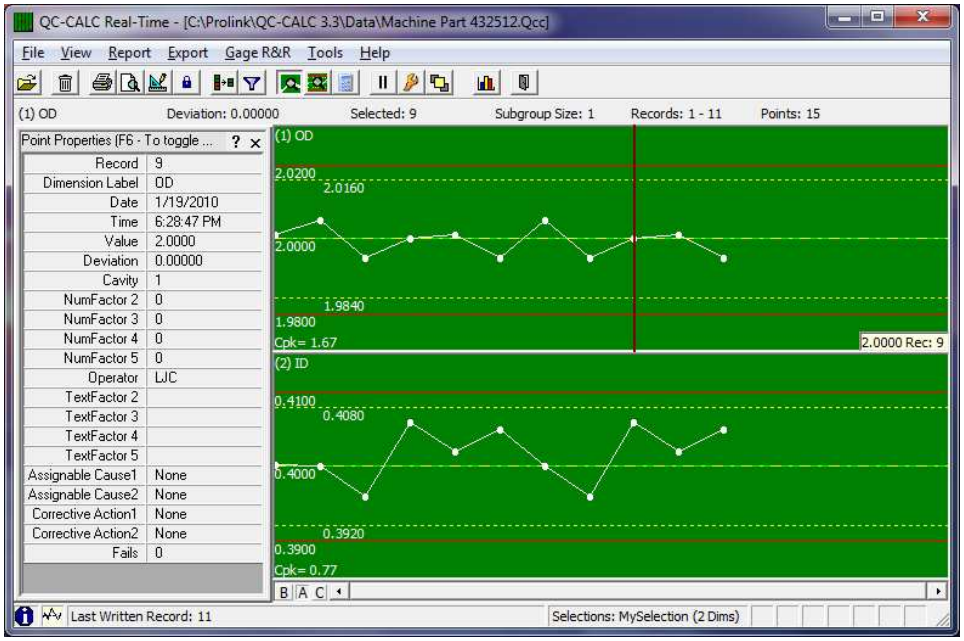


7.3.5 Step #5 – Finish

J. Your inspection plan is complete. Any data entry errors can be re-measured and re-entered before clicking the **Finish** button.

7.3.6 Step #6 – View QC-CALC Data

The **Finish** button sends your data to QC-CALC so please activate QC-CALC and see your data in two live plots. The QC-CALC screen below will vary but you should recognize your data. This brief introduction to entering data in the QC-Gage run screen is complete.



8. Writing a Spec Plan (Programmers)

8.1 Introduction

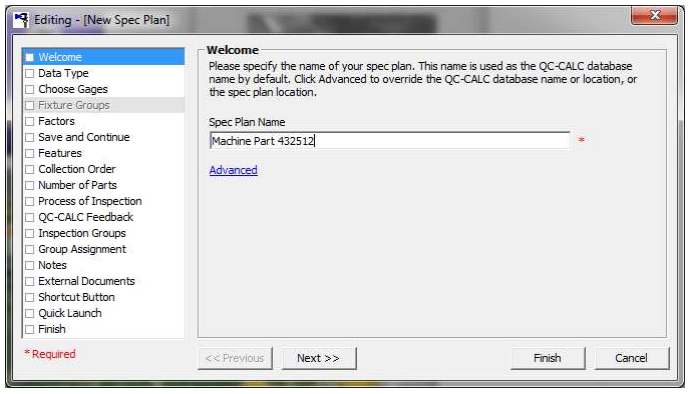
Now that you've successfully run a Spec Plan, it's time to learn how the Spec Plans are written. In this section we will write a new Spec Plan and describe each step of the process. QC-Gage has simplified the process of writing a new Spec Plan by including a step-by-step wizard to help you.

The wizard guides you through all steps to create a new Spec Plan. This same wizard is also used to edit any existing Spec Plan (described later in this manual). The wizard lets you move forward and backward through questions and lets you cancel at any time. Use the **Finish** button when you have answered all the questions.

In this example we will re-create the Spec Plan we just ran but will give it a different name. This way you will see how our original plan was created.

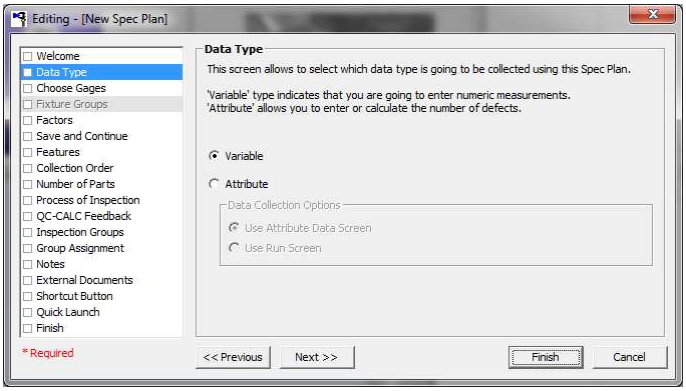
8.1.1 Step #1 – Create a New Spec Plan

From the main QC-Gage window, select the **File** – **New Spec Plan** menu and answer the database name with "**Machined Part 432512**". When your inspection results are sent to QC-CALC, this is database name QC-CALC uses. The Advanced link is discussed in Overriding File Names on page 50.



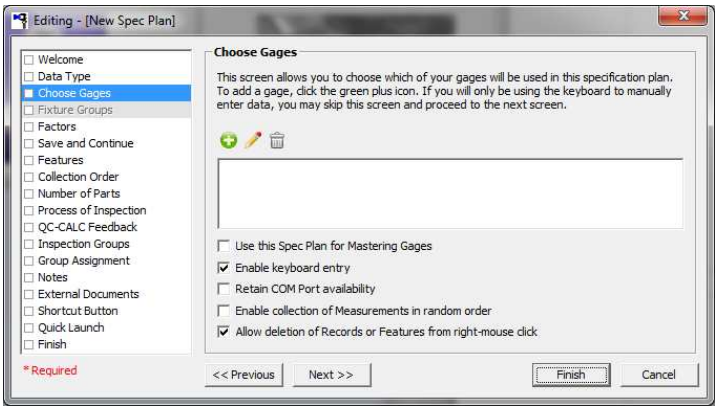
8.1.2 Step #2 – Choose the Data Type

QC-Gage can collect two different types of data: Variable or Attribute. Choosing Variable here indicates you will be entering numeric measurements and choosing Attribute allows you to enter or calculate the number of defects. For more information about collecting Attribute Data see page 40.



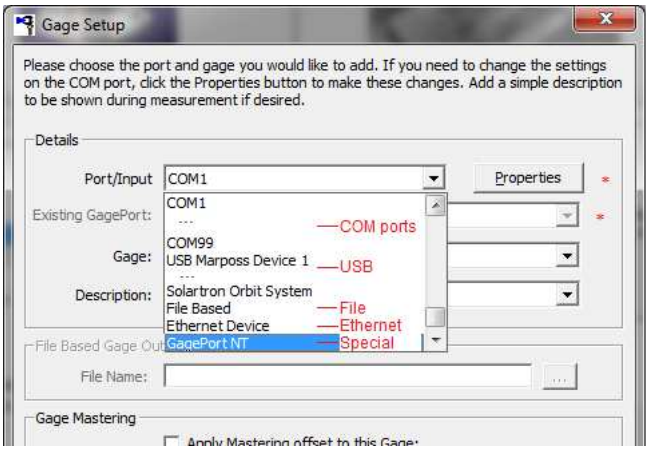
8.1.3 Step #3 – Choose the Gages

This step tells QC-Gage what gages are connected to the COM ports of this computer. If you have a gage or multiplexer connected to this computer, click the **Add Gage** button.



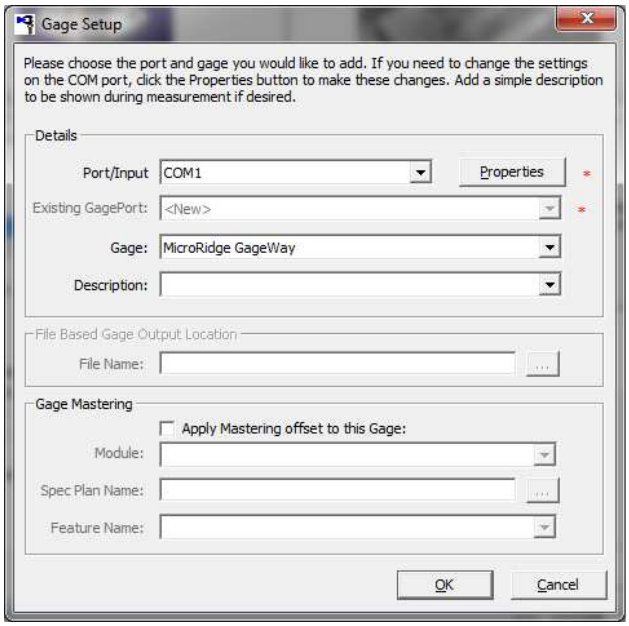
Select the COM port, the gage type, and give the gage or multiplexer a friendly name.

NOTE: QC-Gage accepts data from more than COM ports. This version of QC-Gage has many interfaces so scroll down the list to see the choices.



- COM1 - COM99
- USB ports
- File Based
- Ethernet Based
- GagePort NT & Solartron

Repeat this procedure for all gages used in this Spec Plan. If you do not see your gage name in the list, you can add it by choosing the **Tools** – **Gage Definitions** from the main QC-Gage menu. In this example we show a MicroRidge Gageway connected to COM1.



The default gage settings such as Baud Rate, Parity, etc. are stored in the Gage Definitions but you can override the settings in each Spec Plan by pressing the **Properties** button. Most likely you will never need this capability.

In this exercise, you will enter all data using the keyboard and therefore we will not discuss the details of adding a gage. Please see Connecting Gages on page

75 where we detail this screen. If you added a gage, you can remove it by pressing the trash can on the previous screen.

Use this Spec Plan for Mastering Gages

This functionality is discussed in the Gage Mastering section on page 61.

Enable Keyboard Input

Checking this option allows operators to type the values as well as use the electronic gage. You cannot use the keyboard to enter values without this option enabled in your Spec Plan.

Retain COM Port Availability

Checking this option allows 2 gages to run on the same COM port within the same Spec Plan. When this option is used, the Spec Plan **must** be completed in the proper order. QC-Gage normally matches the feature to the COM port from which it received the data regardless of the order it was received. In this mode the data is saved as the next feature in the Spec Plan regardless of which COM port sent it.

Enable collection of Measurements in random order

When a value is received from the gage, this option uses the COM Port and Channel to assign the reading to the corresponding feature in the Spec Plan. This means features can be run in any order as long as the COM Port and Channel are only used for a single feature within the Spec Plan.

Allow deletion of Records or Features from right-mouse click

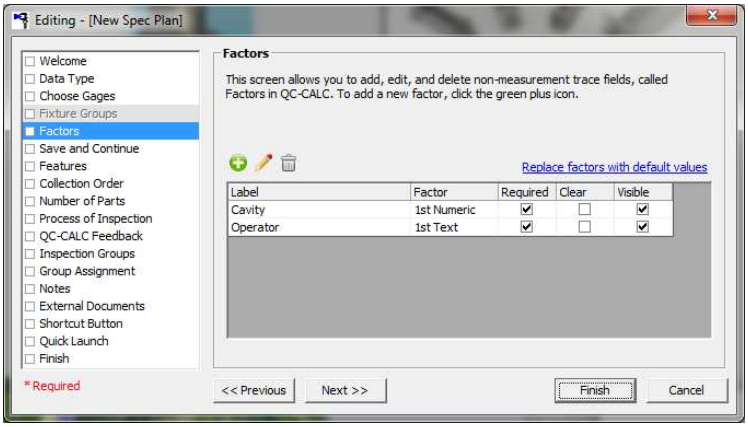
This option changes the menu that appears on a right-mouse click in the **Run Screen**. When this is enabled the **Delete/Undelete Point** and **Delete/Undelete Part** menus appear and the operator can choose to signal values that will never be measured within the current **Run Screen**. This is handy for Blocked Cavities so the Cavity Numbers can continue to be numbered correctly even if one particular number needs to be skipped.

8.1.4 Step #4 – Fixture Groups

You can join multiple probes into a Group of probes. When you press the foot switch or click a button to read the probes, all probing data is sent and received at once. We will skip this feature in this exercise to maintain simplicity. Fixture Groups are only available with CimWorks' GagePort NT gages and therefore more detail is available in Fixture Groups on page 137.

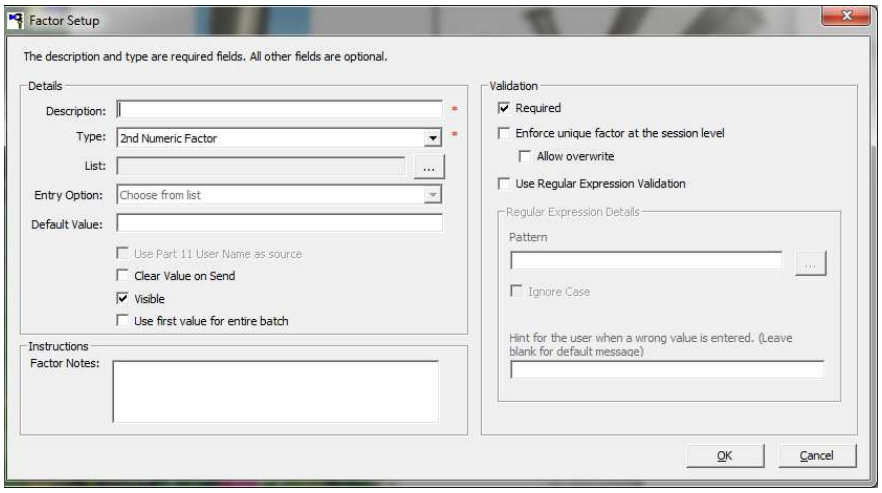
8.1.5 Step #5 – Factors

The Factor screen allows you to add extra, non-measurement data to each measured part. Tagging each part with this type of data allows you to filter your data in QC-CALC for detailed analysis. You can use up to 60 Factors (30 Numeric and 30 Text).



Add Factors

Click the green **Add Factor** button to start the process of defining your Factor. Each Factor has several properties that require discussion.



Description

Enter an identifying label to help identify the item to be measured. Typical labels are Lot No, Cavity, Machine, Vendor, Operator, etc. Here we entered Cavity for the label.

Type

There are Text and Numeric Factors available from the dropdown list. Select the Factor type and the number. In this example, select 1st Numeric Factor since our cavities values are numbers.

Lists

You can optionally create/use a list of Factor values which causes the entries to be consistent since there is no typing. For instance, if you have an operator (Joe Smith) and you want him to enter his name, he may enter it several different ways such as Joe, JS, J. Smith, etc. This could cause difficulties in filtering the

data later. By using the list, Joe chooses his name from the list ensuring that the data is entered the same each time.

Factor Lists Explained

As you write new Spec Plans, you can create a list of Factor values to choose from which means the entered values are picked from a list instead of typed. For example, you might create a list of Cavity numbers 1-8. By pressing the **…** button, a list-builder screen is displayed.

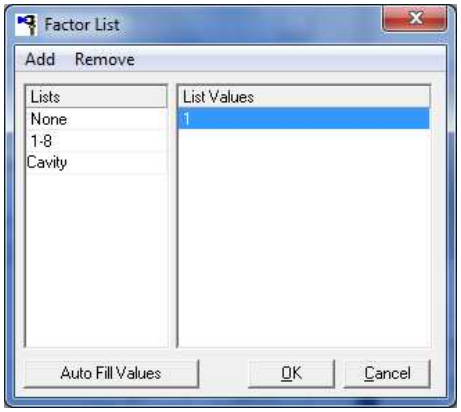
When using lists in Spec Plans the operator will see the list you specified with a default value if you have designated one. Set the default value to be blank tp force the operator to choose their name from the list.

Add

The **Add** menu brings you to the **Add List** or **Add Values**.

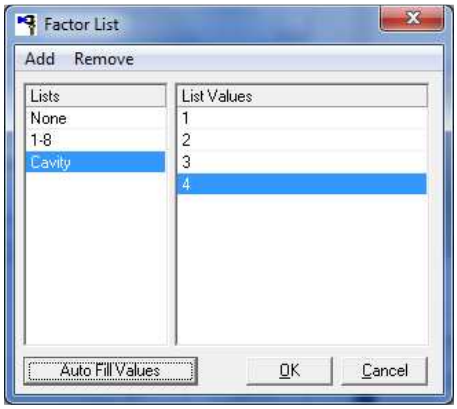
Add – List

Choosing this menu adds a new list name to the **Lists** column and waits for you to name it. It has also added a 1 in the list. The new list values can be changed by clicking on them and typing in the appropriate box.



Add – Value

This adds another entry in the **List Values** column of the currently selected list.



Remove

The **Remove** menu shows you the **List** or **Value**.

Remove List

This is a quick way to delete the selected list.

Remove Value

This will remove the currently selected value in the **List Values** column. There must be more than two values in the list for this operation to be available.

Auto Fill Values

This button gives you a quick method of entering a range of numbers without having to type them. Just enter the starting and ending values for your range of numbers and the list is created. Be sure to use the **Replace** option to create a new list, the **Append** option to add to an existing list, or the **Replace Selected** to fill in the highlighted values.

Exercises:

Complete the following exercises to become familiar with creating and editing factors:

1. Add a Numeric Factor called Cavity that will clear after the data is sent to QC-CALC.
2. Add a Text Factor called Operator that is picked from a list. Its value will apply to every part after being entered once, and it will persist into the next batch of parts.
3. Create a list of Operators from which to choose your Text Factor value. Enter: Jason, Bruce, Laura, and Your Name.

Exercise 1: Add One Numeric Factor and Assign the Properties

Add the 1st Numeric Factor called “Cavity” and set it to clear each time data is sent to QC-CALC Real-Time.

1. Click the green **Add Factor** button.
2. Enter a **Description** for this factor of “Cavity”.

3. For the **Type** of the factor select “1st Numeric Factor” from the list.
4. Enable the **Clear Value on Send** option.

Exercise 2: Add One Text Factor and Assign the properties

Add the 1st Text Factor called “Operator”. Assign its values to a list. The entered value should be assigned to all parts in the batch, then persist to the next batch.

1. Click the green **Add Factor** button.
2. Enter a **Description** for this factor of “Operator”.
3. For the **Type** of the factor select “1st Text Factor” from the list.
4. At this point we will pause in this exercise and perform **Exercise 3**.
5. Now that you’ve finished **Exercise 3**, click the **…** button to launch the **Factor List** screen and select Operator as the list to assign to this Factor and click **OK**.
6. For the **Entry Option** we will **Allow values other than those in the list**.
7. Now enable the **Use first value for entire batch** option.

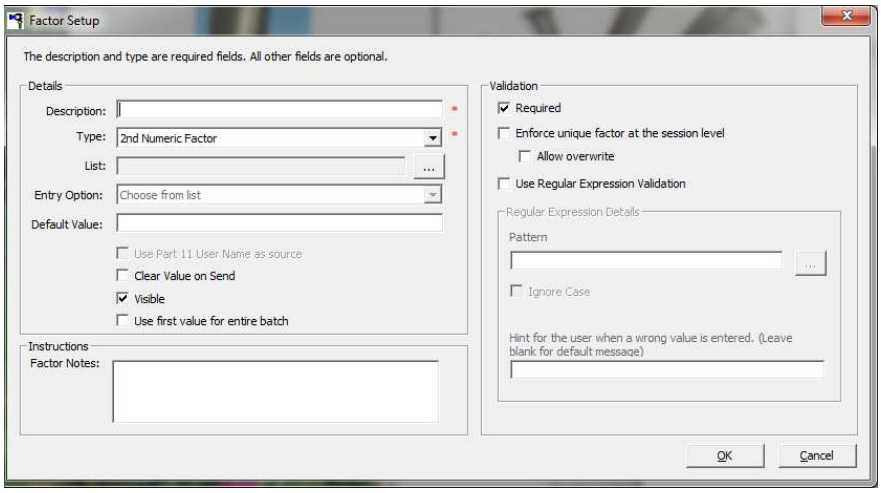
Exercise 3: Create a List of Operators for Text Factor 1

Setup a new list named Operators. Enter the following four values in the list: Jason, Bruce, Laura, and Your Name.

1. Select the **…** button to launch the **Factor List** screen.
2. Click the **Add – List** menu and label it “Operator”.
3. With the Operator list selected click the **Add – Value** menu. This can also be triggered by the **CTL + Insert** keys.
4. After adding a value to the list, you can edit and typing while the value is still selected. Or double clicking the name and edit it.
5. Add four values and label them as follows: Jason, Bruce, Laura, Your Name.
6. Now select “None” in the **Lists** column and click **OK**.
7. Now return to step 5 of **Exercise 2**.

Continuing the Factor Setup

The Factor Setup screen is repeated below as we continue discussing this topic.



Entry Option

Choose from list

With this option the operator is only allowed to choose from the values displayed in the list.

Allow values other than those in the list

With this option the operator can either choose a value from the list, or type a new value into the box.

Type value and validate from list

With this option the operator will be required to type in their answer, then that answer will be compared to the chosen list to make sure it is a valid value.

Add typed items to the list

The list is extended to include any new values you allow the inspector to type. This option allows the list to grow.

Pre-fill with entries from list

This option adds each list item to the data entry screen. It saves the inspector from manual typing or picking a value.

Default Value

The value entered or chosen here will be shown to the operator automatically. This is useful if, for example, your Lot Numbers always start with LT8 and the remaining characters are different from lot to lot. You would enter LT8 into the **Default Value** area and the operator would only have to enter the remaining characters that change each time.

Use Part 11 User Name as source

QC-Gage can be run in the medical industry's 21 CFR Part 11 standard. When Part 11 is enforced the names found as part of that system are displayed here and therefore disable most of this section. Please see section Administrative Tool on page 114 for more details.

Clear Value on Send

Use this option to force QC-Gage to clear the entered value when the inspection is completed. This ensures the inspector does not accidentally leave an old value in the Factor.

Visible

You may want the Factor to be invisible making it impossible to accidentally change the value. If you choose to make it invisible, make sure you enter a value in the **Default Value** area. Otherwise, you will have no value for that factor in QC-CALC.

Use first value for entire batch

If you inspect more than one part you may want the factor value to be applied to all values. This saves data entry time when you inspect 10 parts made with the same lot number. You would not use this for entering serial numbers.

Factor Notes

Enter any special instructions the operator should know about while entering this Factor value. After a short time, an experienced operator probably won't read these instructions but the instructions serve to train new employees. Having consistent methods of inspecting parts is part of any good standard so write instructions assuming a new operator will use them.

Note 1:

When writing a new Spec Plan, you can set up default Factors and values that are included in each new Spec Plan. You establish a baseline of Factor names, values, and options which are automatically inserted in your new Spec Plan as you move through the wizard. Establishing this baseline is described in Spec Plan Defaults on page 68. If you want to replace the entire Factor list with the default values press the Replace Factors with default Values link. You will receive an "Are you sure?" warning.

Validation

Required

This checkbox forces the inspector to enter a value before allowing him to send the data to QC-CALC. If checked, the factor value is not optional and must be entered. Required values are only checked if they are visible.

Enforce unique Factor at the session level

If the Spec Plan calls for measuring 5 parts and you added a serial number to a factor, you might not want your inspectors entering the same SN for multiple parts. If this is the case, use the **"enforce unique factors"** checkbox.

Allow overwrite

If you check **Allow Overwrite** you are saying your inspectors can overwrite any of the values but the values must remain unique.

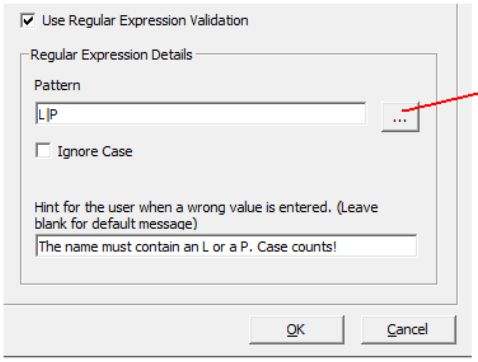
Use Regular Expression Validation

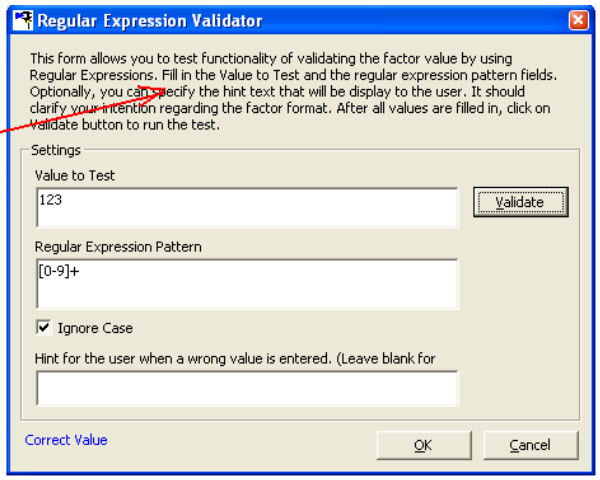
A regular expression is a pattern describing a certain amount of text. This option is used to validate that your inspector has entered the Factor value in the correct pattern. For example, if you want to ensure your inspector always enters a value that contains the letter L, l, P or p. One such pattern would be L|P. Here are more examples to ensure the entered values follow rules:

[0-9]+	allows + or - numbers only and digits zero through nine

[A-D]+	entered value must contain letters A, B, C, D, a, b, c, or d
^\d$	matches exactly 1 digit
^(\+|-)?\d+$	matches any signed integer
(^\d*\.?\d*[0-9]+\d*$)\|(^[0-9]+\d*\.\d*$)	This matches all positive decimal values.

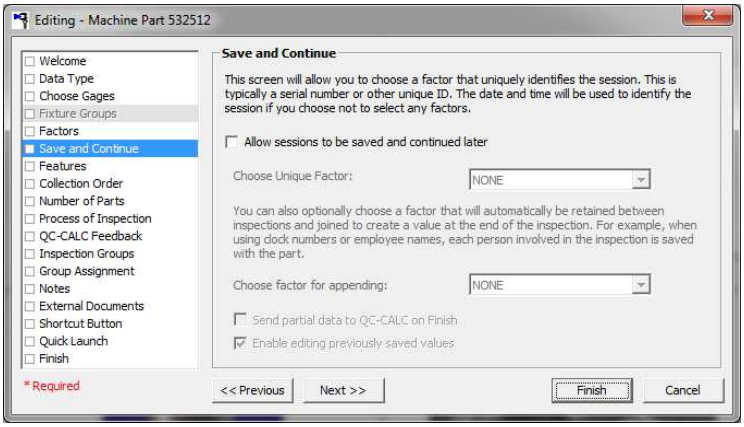
For more details on Regular Expressions, please search the Internet since these patterns can be quite extensive. The button with 3 dots displays the **QC-Gage Expression Validator** where you can enter your Regular Expression, the text to test, and click Validate. You will receive a message indicating if the expression is correct or not.





8.1.6 Step #6 – Save and Continue

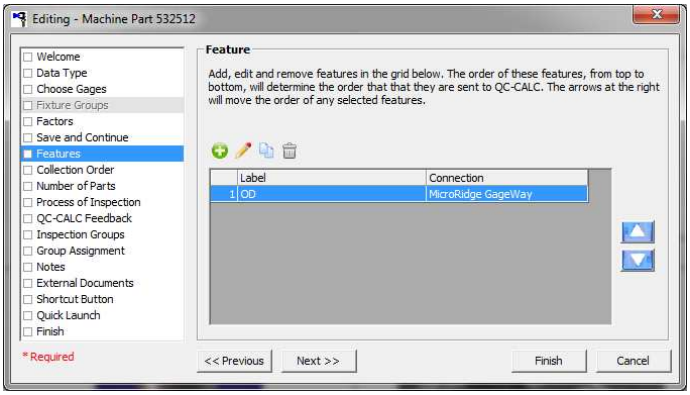
During the measurement process there are situations where some of the measurements in your Spec Plan are not available. For example, say you want to record the initial thickness of a part and then re-measure it sometime after a coating is added. The inspection may occur over several days at which point you'll enter the second reading and QC-Gage will compute the thickness of the coating. The **Allow Session to be saved and continue later** option is used for this purpose. We will skip this step now but continue the discussion later.



For more details for saving the contents of a partially inspected Spec Plan please see Partial Inspection on page 47.

8.1.7 Step #7 – Features

A Feature or dimension is any aspect of a part you wish to measure and record. This screen lets you add features and describe the properties of the each. You can add as many features as needed by clicking the **Add Feature** () button.



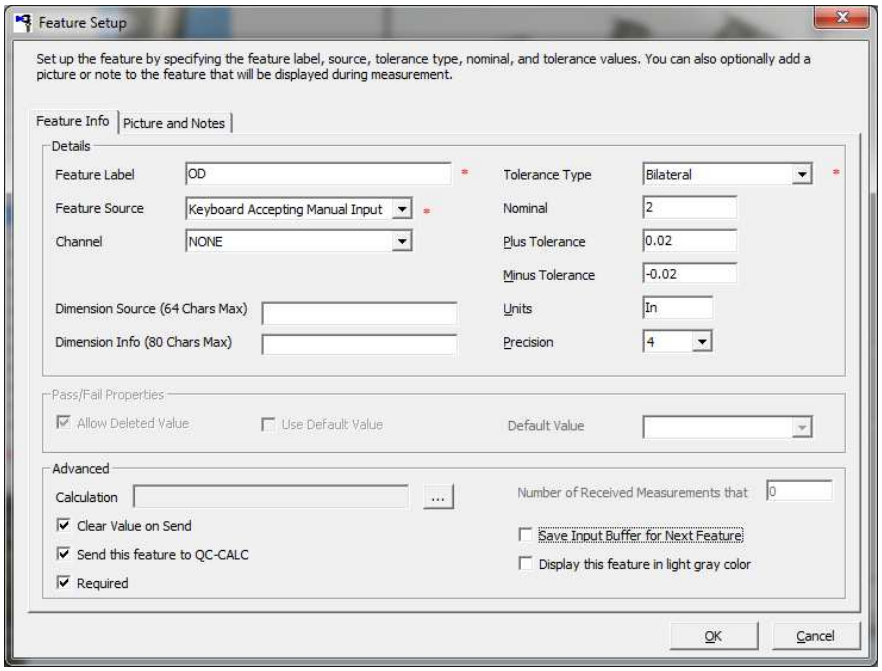
Feature Info Tab

Feature List

The feature list in the middle of this screen shows a list of all defined features. You can add, edit, or delete these features by using the three buttons shown as green Plus Sign (), a yellow Pencil (), and gray Trash Can ().

Clicking the Add Feature () button or selecting a feature and clicking the pencil () brings you to the **Feature Setup** screen.

Spec Plans must have at least one feature. For each feature, you must specify a label, the source of the data, a tolerance type, and the Tolerance Type. Items shown with a red asterisk are required and all others are optional.



Feature Label

Use this label to describe the feature. Up to 32 alpha-numeric characters can be entered. The default value is '**New Feature Name**'. In this example type **OD**. You will add another with a label of **ID**.

Feature Source

The **Feature Source** list tells QC-Gage from where the data will come. If you specified any connections in the **Choose Gages** screen they appear in this list. "**Keyboard Accepting Manual Input**" is always available and is the option we will choose here.

Channel

Many gage interface devices (Multiplexers) connect several gages to the computer simultaneously. These gage interface devices usually assign a channel to each gage. You can select a specific gage in the Spec Plan by picking the channel. Not all gage interface devices use 1, 2, 3 etc. for their channels, but you should be able to figure out the order or the channels without much difficulty. For example, if a gage interface device has channels A, B, and C QC-Gage would refer to them as 1, 2, and 3 respectively. Similarly, if a gage interface device has channels 0, 1, and 2, QC-Gage would refer to channel 0 as 1, channel 1 as 2, and channel 2 as 3.

Tolerance Type

The tolerance type tells QC-Gage what to expect in the upper and lower tolerance area. The possible tolerances are: **Bilateral**, **Single Sided Upper**, **Single Sided Lower**, **Not Toleranced**, and **Pass/ Fail** (attribute charts). By choosing **Pass/Fail** during the setup of a feature, the operator will choose from a list containing "Pass" and "Fail" instead of typing in a value. For our example choose **Bilateral**.

Nominal Value

This is the expected value of the feature being inspected. Enter a 2.00 for this example.

Plus Tolerance

This tells QC-CALC the degree to which the part is acceptable above the nominal value set above. Enter 0.01 for this example.

Minus Tolerance

This tells QC-CALC the degree to which the part is acceptable below the nominal value. If a bilateral tolerance is used be sure to add a minus sign in the Lower Tolerance. **Note:** If both tolerance values are on one side of the nominal, both may be positive or both may be negative. See the example below.

Nominal	Lower Tol	Upper Tol	Good parts
1.00	+.001	+.005	1.001 to 1.005
1.00	-.005	-.001	0.995 to 0.999
1.00	-.002	+.003	0.998 to 1.003

Units

Enter the units of measurement for this feature. This label can be any text you want. If the gage reports the units and you specify units here, QC-Gage will compare the units and display an error message if they do not match. The comparison is not case sensitive. Some gages send a mode, like MAX or TIR, instead of units. For these gages, you should either specify the mode in the Units field of the Spec Plan, or leave the Units field blank in the Spec Plan.

Precision (Decimal Places)

Enter the number of decimal places (to the right of the decimal point) to display for this feature. QC-Gage uses this parameter when outputting and displaying data and analysis results for this feature. Each feature has a separate parameter for the number of decimal places used to format displayed results.

Dimension Source (64 Chars Max)

This area is used to store the information about the machine or gage associated with making or measuring the feature. This text is available in all report templates to detail the situation. You can store up to 64 characters describing the Dimension Source.

Dimension Info (80 Chars Max)

Similar to the Dimension Source this area is used to store the information about the feature itself. Again, the text is available in all reports. You can store up to 80 characters describing the Dimension Info.

Allow Deleted Value

This option is only available when the Pass/Fail **Tolerance Type** is selected. When this option is selected there will be 3 choices for the value for the Pass/Fail feature: Pass, Fail, and Deleted. The Deleted item should be used if there is not going to be a value for that feature. When the point is received in QC-CALC Real-Time it will be marked as deleted automatically.

Use Default Value

This option is only available when the Pass/Fail **Tolerance Type** is selected. For example if most of your part features a PASS you can check Use Default Value and set it to PASS. It saves time on selecting one of the two options.

Calculation

This button brings you to the equation builder where you add constants to measured values, perform temperature compensation, perform math functions, etc. See Calculated Dimensions on page 50 for more details.

Clear Value on Send

Checking this option tells QC-Gage to clear the cells in the grid corresponding to this feature once the data is sent to QC-CALC Real-Time.

Send this Feature to QC-CALC

In all likelihood you will want each feature's data sent to QC-CALC. There are times you will use a feature in a calculation and will not want to save the intermediary values. Uncheck this option should this occur.

Required

This option controls the completion of the **Run Screen** session. If any features have the **Required** flag set and value have not been received for those features, the operator will not be allowed to send the data to QC-CALC Real-Time.

Number of Received Measurements that will be Ignored (Default 0)

This feature should be used with gages that send streams or multiple readings. The number set here tells QC-Gage how many readings to ignore before saving the next reading.

Save Input Buffer for Next Feature

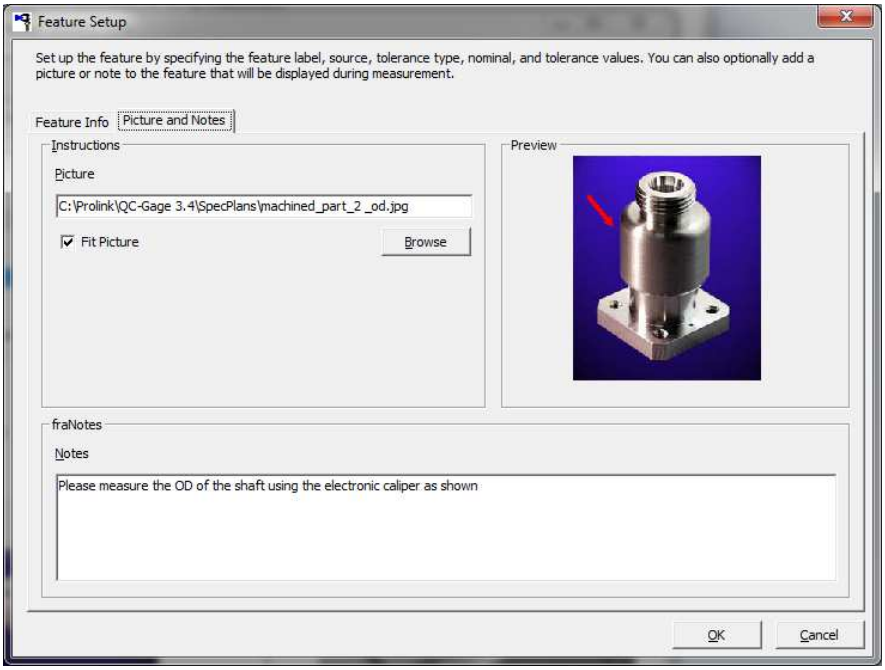
Checking this option tells QC-Gage to keep the RS232 buffer contents for the next feature. This is useful when multiple values are sent from the gage within a single RS232 reading. The gage parser can be written to look for particular values within the buffer in order to get the correct reading.

Display this feature in light gray color

This option is used for less important features. Instead of those values being shown with the regular font color a lighter font is used so the operator's eyes will not be drawn to these features. You may want to use this for calculated dimensions that the operator will not have to measure. Their eyes will stay focused on the features they need to measure and skip over the features that will be automatically calculated for them.

Picture and Notes

A picture is worth a thousand words so we advise adding a photograph of the part being measured with the exact gage you are discussing. This graphic along with the notes should make it extremely clear how you want the inspector to perform his job.



In the picture above we show a different picture to indicate where to inspect the OD of the part. Digital cameras have made the process of documentation much easier.

Fit Picture

By checking **Fit Picture** you will see your entire picture in the box in the upper right corner of this window. If your picture is too big for the window QC-Gage will shrink it down in size so that it “fits” into the window area.

HINT: Click the picture to Zoom in and out.

Notes

Enter any special instructions the operator should know about while making this reading. After a short time, an experienced operator probably won’t read these instructions but the instructions serve to train new employees. Having consistent methods of inspecting parts is part of any good standard, so write instructions assuming a new operator will use them.

Exercises:

Create two features and assign all settings.

1. Create a feature called OD and assign Nom, Tols, and a picture.
2. Create a feature called ID and assign Nom, Tols, and a picture.

Exercise 1: Create the feature OD and assign all of the settings

Create a feature named OD. Assign a nominal, tolerances, a picture, and notes.

1. Click the green **Add Feature** button.
2. Set the **Feature Label** to “OD”.
3. Set the **Nominal** to “2”.
4. Set the **Plus Tolerance** to “0.01” and the **Minus Tolerance** to “-0.01”.
5. In the **Instructions** box at the bottom left corner of this screen, click the **Browse** button for the **Picture**. The file dialog should open directly to the “C:\Prolink\QC-Gage 3.4\SpecPlans\” folder and show you pictures to choose. Select “machined_part_2 _od.jpg” and click **Open**.
6. Click the **Fit Picture** option to fix the sizing of your selected picture.
7. Click in the **Notes** box and highlight all text within.
8. Now enter the text “Please measure the OD of the shaft using the electronic caliper as shown.”
9. Click **OK** and you are finished creating this feature.

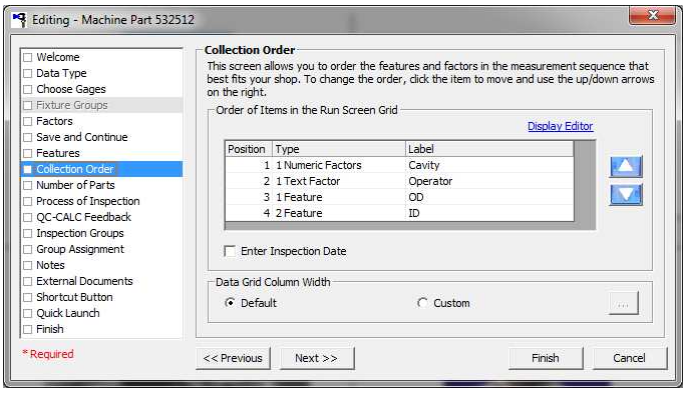
Exercise 2: Create the feature ID and assign all of the settings

Create a feature named ID. Assign a nominal, tolerances, a picture, and notes.

1. Click the green **Add Feature** button.
2. Set the **Feature Label** to “ID”.
3. Set the **Nominal** to “0.4”.
4. Set the **Plus Tolerance** to “0.01” and the **Minus Tolerance** to “-0.01”.
5. In the **Instructions** box at the bottom left corner of this screen, click the **Browse** button for the **Picture**. The file dialog should open directly to the “C:\Prolink\QC-Gage 3.4\SpecPlans\” folder and show you pictures to choose. Select “machined_part_2 _id.jpg” and click **Open**.
6. Click the **Fit Picture** option to fix the sizing of your selected picture.
7. Click in the **Notes** box and highlight all text within.
8. Now enter the text “Use the pull gage to measure the ID where shown.”
9. Click **OK** and you are finished creating this feature.

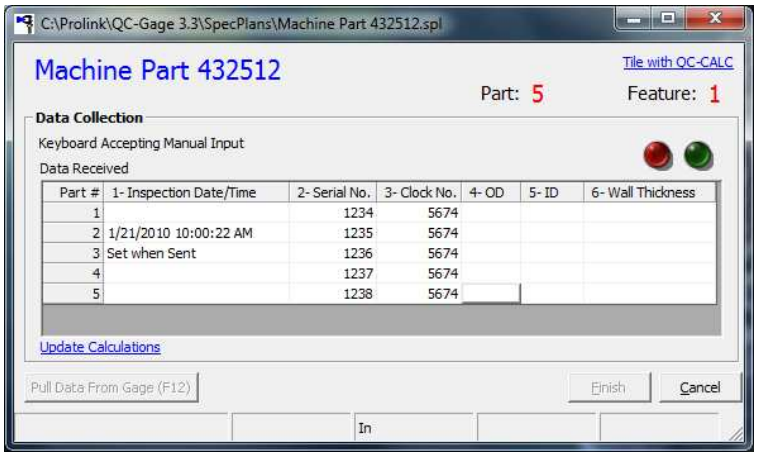
8.1.8 Step #8 – Collection Order

The measured Features and Factors you just established appear in a row or column when the Spec Plan is run. You can change the order they are displayed in the run screen by using this screen. Simply select the item from the list and use the up and down arrow buttons to move items around.



Enter Inspection Date

Normally, QC-Gage saves the computer's date and time with your measured parts at the instant you click the **Finish** button. You can override QC-Gage's normal recorded date by checking the **Enter Inspection Date** checkbox. The date and time saved in QC-CALC will be whatever you enter. This can be used if you want to add the manufactured date instead of the inspection date.



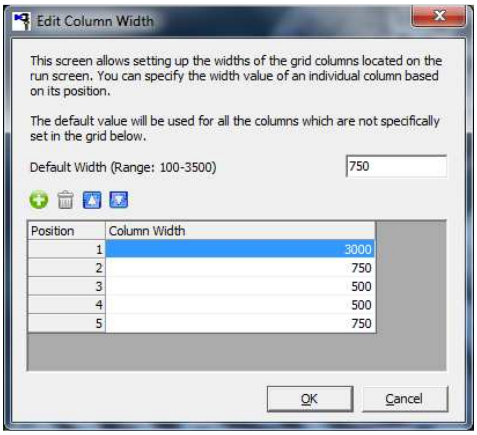
During the inspection you can type your own date and time, select the current date, or pick **Set when Sent** from the list. Be careful when typing the date and time. Type a <space> character between the date and time as shown.

i.e. 5/1/2009 10:07:05 AM

Data Grid Column Width

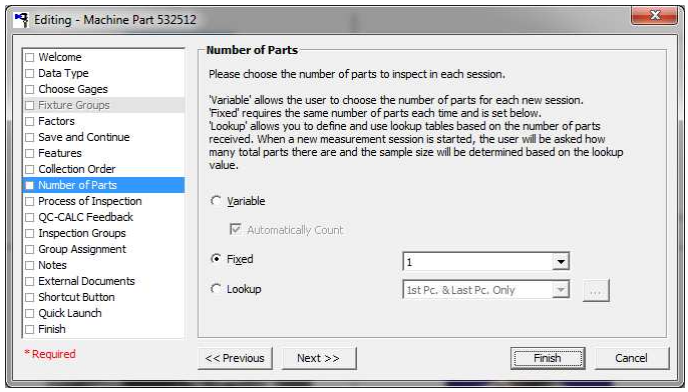
When using the **Default** option QC-Gage uses the width of the column label or the **Default Width** set by clicking the **…** button as a minimum column width.

With the **Custom** choice, use the **…** button to set the column width for any specific columns you wish. Any columns not specifically set will use the **Default Width**. The column positions must be continuous, so if you would like to control the width of column 3, you must also set the widths of columns 1 and 2.



8.1.9 Step #9 – Number of Parts

The number of parts to inspect during each session can be **Variable, Fixed,** or a **Lookup** table can be used.



Variable

If the number of parts changes frequently, use the **Variable** option and QC-Gage will prompt the operator for the number of parts to inspect at the beginning of each session.

Automatically Count *(Attribute Data Only)*

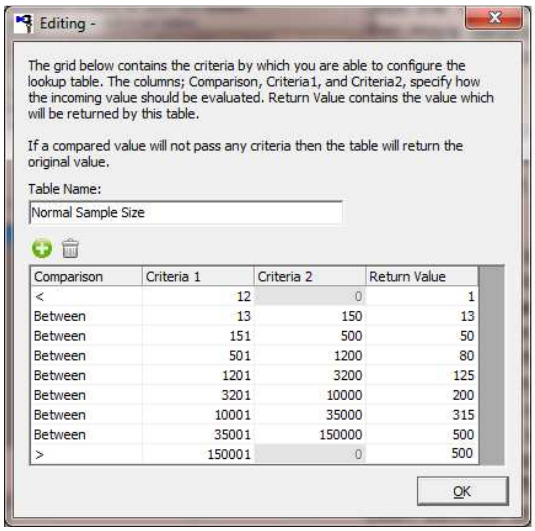
This option is only available when you chose **Attribute** and **View Attribute Data Collection Screen** on the **Data Type** step of the Wizard. When this option is checked the operator will just enter the number of scratches for each part (or click the **Defects** button) and QC-Gage will keep track of the total number of parts entered. For more details about Attribute Data Collection please see the Attribute Data section on page 40.

Fixed

The number of parts per session usually reflects the subgroup size or some other convenient number. If the number of parts to measure in each session is not going to change, then **Fixed** is the option to use.

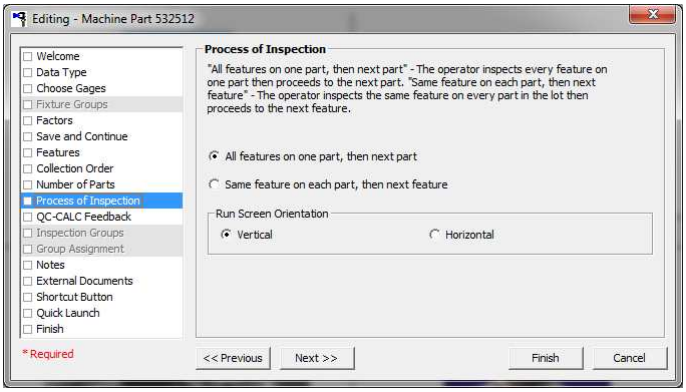
Lookup

The **Lookup** option allows you to define and use lookup tables based on the total number of parts received or produced. When a new measurement session is started, the user will be asked how many total parts there are and the sample size will be determined based on the lookup value. The **…** button allows you to choose a **Sample Size Lookup Table** that has already been defined, or to define a new table. For more information on editing Tables see the Lookup Tables section on page 58.



8.1.10 Step #10 – Process of Inspection

Select the **All features on one part then next part** option if you want the operator to inspect all features on one part then proceed to the next part. Select the **Same feature on each part then next feature** option if you want the operator to inspect the same feature on each part then measure the next feature on all parts, etc.



You can always measure any feature of any part at any time by moving to that cell with the mouse or arrow keys. This option determines the direction QC-Gage moves next after a reading is made.

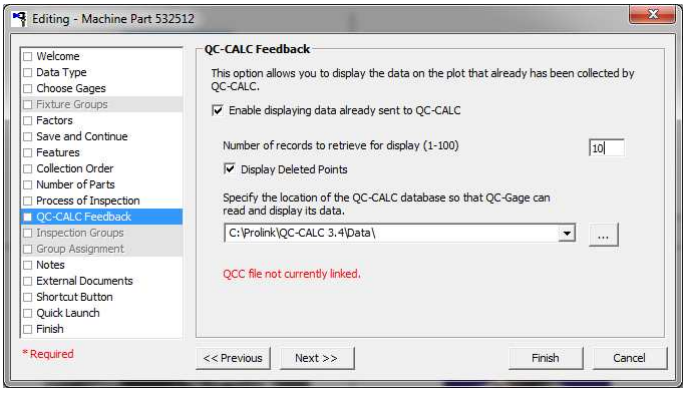
In general, if it is easier to put down one gage and pick up the next gage while keeping the same part in your hand, then you should use **All Features on one part**. You will also use this if you are using a fixture. In our example, we chose **Same feature on each part then next feature**.

Run Screen Orientation

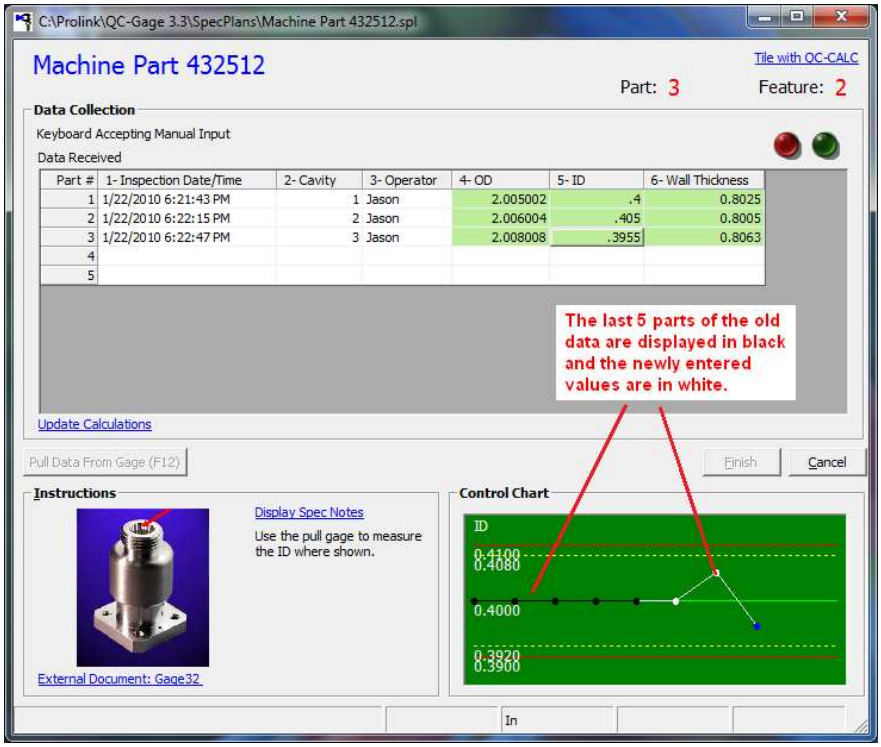
You can request QC-Gage to orient the data entry grid in row or column format. When the orientation is Horizontal, the features are seen across the top row and the parts are displayed down the columns. This is the default method. When you write Spec Plans that only contain 1 part, usually the Vertical view is best. You can see an example of these screens in Step #2 – Run a Spec Plan on page 8.

8.1.11 Step #11 – QC-CALC Feedback

Each session of QC-Gage is considered a stand-alone session where the inspector only sees the data they are entering. There are times you may want historical data viewed by the inspector giving them feedback to the size and condition of previous parts. This step of the Wizard allows you to link the old data with the new.



When you click the **Enable displaying data already sent to QC-CALC** option, the rest of the form is suddenly enabled. Click the **…** button to locate the QC-CALC folder containing your historical data. You can "look back" from 1 to 100 parts. Enter your look back value in the **Number of records to retrieve for display** box. The historical data is shown in black while the new data is displayed in white. This helps you separate the new from the historical data.



8.1.12 Step #12 – Inspection Groups

When inspecting batches of parts, there are times when you inspect all features on 1 part and less features on the remaining parts. This option allows you to assign each feature to a specific **Inspection Group** then assign that Inspection Group to specific parts. This will blank out some of the data cells in the Run Screen for features that do not need to be measured.

The **Default Group** is the normal inspection method which means all features are inspected. QC-Gage allows you to create groups of features to control which features are skipped for each part that is inspected. In our example we only use the **Default Group.** More detail is found in Inspection Groups on page 111.

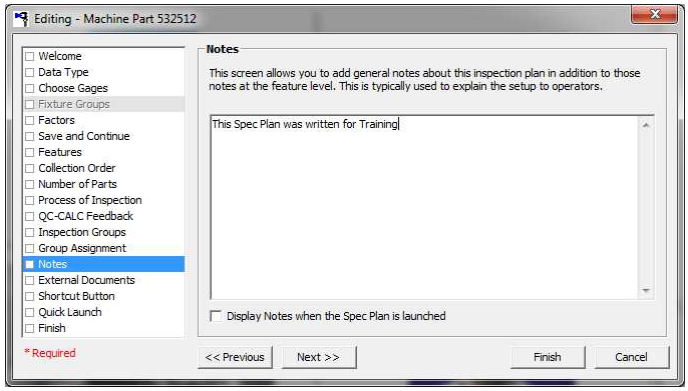
NOTE: At this time this functionality is only available when a fixed number of parts is chosen in the **Number of Parts** step. If this step and the **Group Assignment** step is grayed out it means you did not select a fixed number of parts in Step #9 – Number of Parts found on page 29.

8.1.13 Step #13 – Group Assignment

This function is associated with Inspection Groups and is also skipped here but more detail is available in the Group Assignment section on page 112.

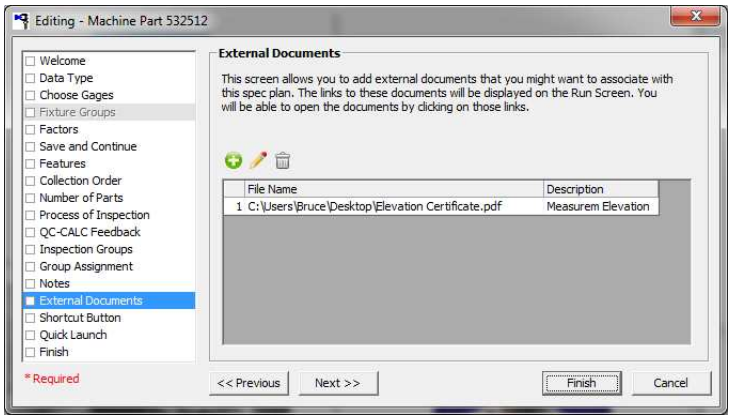
8.1.14 Step #14 – Notes

These notes are used to describe the entire Spec Plan. Enter a description that might help the inspector understand how to measure the part or any thoughts you may have.



8.1.15 Step #15 – External Documents

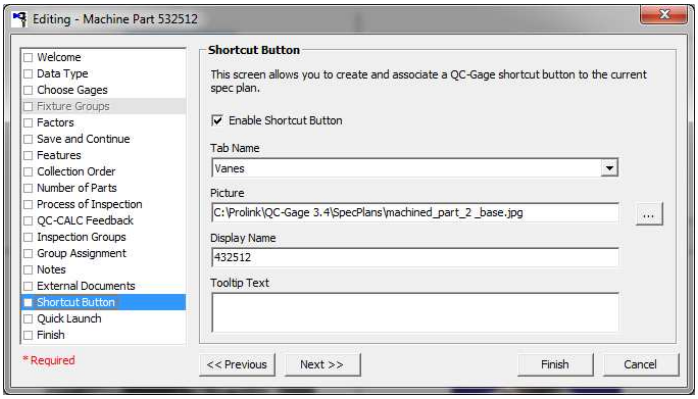
Some companies have their own worksheets written in Microsoft Word, Excel, or another application. If you want your inspectors to have access to these work instructions, use the **Browse** button to locate the instructions.



For example, you might browse to a Word document for this inspection plan and save the link in the Spec Plan. During inspection, the inspector can view your "standard work instructions" by clicking the link where all of your instructions are presented. You remove the connection to your document by selecting the document in the list and clicking the trash can .

8.1.16 Step #16 – Shortcut Button

Adding a shortcut button to the main QC-Gage screen makes it easier to launch a Spec Plan. Instead of selecting the **File** – **Run Spec Plan** menu and then selecting a file, you simply press the button with a picture of your part to begin the inspection.

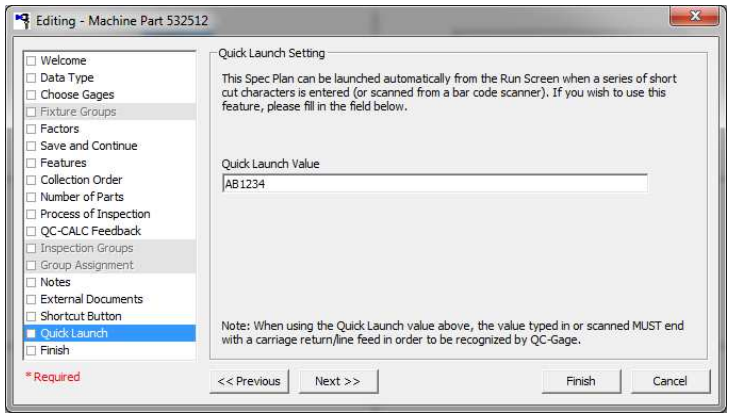


You can add buttons to any number of tabs to organize your Spec Plans into logical groups. You can also a **Picture** to display by clicking the **…** button and specifying the text you would like shown on the button in the **Display Name** area. Lastly, add the **Tooltip Text** to be displayed when the mouse floats over the button. See Shortcut Buttons on page 35 for more information about managing buttons.

8.1.17 Step #17 – Quick Launch

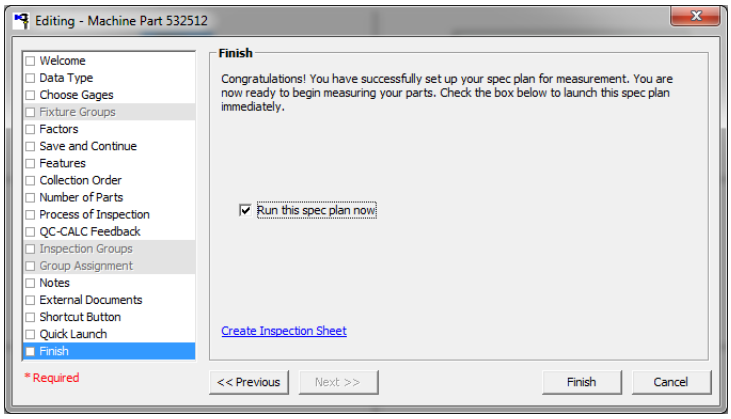
The **Quick Launch Value** entered during this step is used as a shortcut for running this particular Spec Plan. You start the Spec Plan by either scanning a barcode that returns this value with a CRLF or type the value on the keyboard

followed by the Enter key. If QC-Gage's main screen has focus when this value is typed the Spec Plan will launch immediately.



8.1.18 Step #18 – Finish

This concludes the creation of a new Spec Plan. You can optionally run the plan by checking **Run this Spec Plan now** option.



Create Inspection Sheet

This option creates a .csv file containing information about all Factors and Features included in this Spec Plan. The Feature Labels, and Nominals and Tolerances for all items will be sent to the .csv file.

9. Advanced Software Options

9.1 Introduction

Now that you've successfully run and written a Spec Plan for inspectors to use, you must consider some of the advanced features that make QC-Gage's operation unique. In this section we will detail the items we skipped over in the previous section.

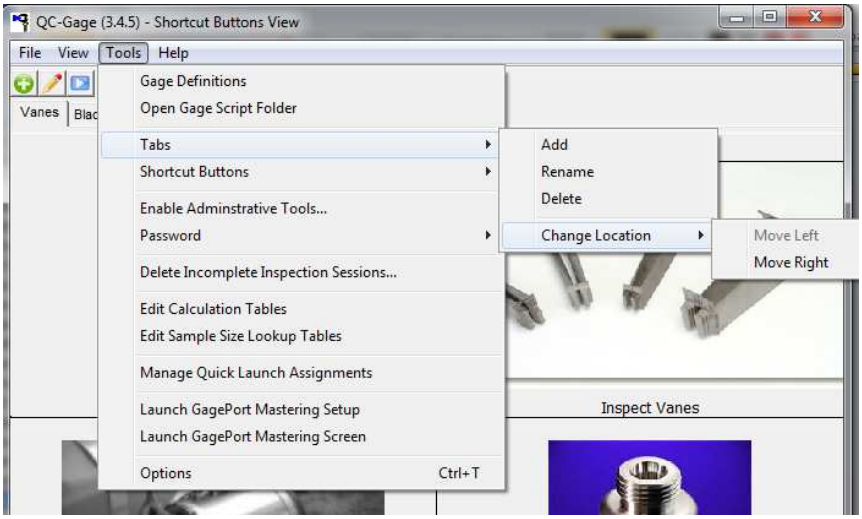
9.2 Shortcut Buttons

9.2.1 Introduction

The QC-Gage main screen has quick launch buttons for each Spec Plan you wish to add. The main screen is actually a tabbed Window, meaning when many buttons are needed, you add Tabs to separate and group similar Spec Plans. For example you may want all Rotors on one tab and all Disks on another.

9.2.2 Tab Management

Tab management is performed from the **Tools** menu shown below. You can also right-click on the label of any Tab to access the same menu. Be careful not to right-click on a button since each button has its own popup menu. You can add more tabs by choosing **Tools – Tabs – Add**. This immediately adds a Tab with the name Tab 2, 3, 4, etc. As you might suspect, you can **Rename**, **Delete**, and **Move** the tabs around. We recommend naming the tabs with recognizable names. HINT: right click on any existing Tab yields this menu for quick access.



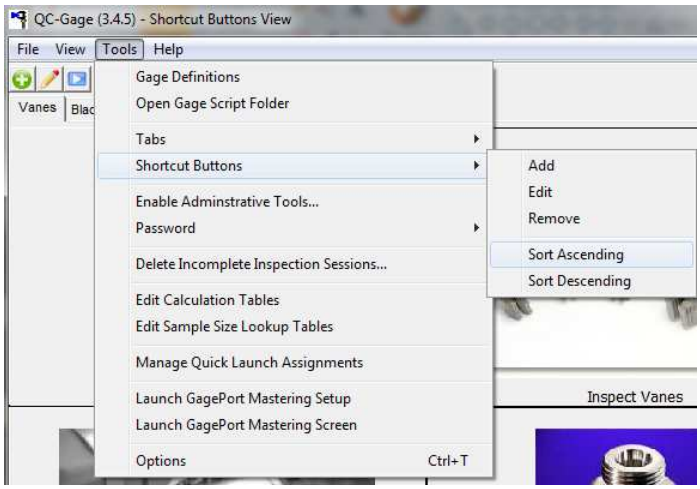
9.2.3 Button Management

Introduction

The QC-Gage main screen can contain many quick launch buttons – one for each added Spec Plan. As you add new buttons with words and pictures you might realize you need to reposition the buttons within the tabbed sheet they are on. You have several options for moving buttons:

Moving buttons within a Tabbed Sheet

While holding down the CTRL key, you can click and drag any button and drop it in a new position. The entire screen is rearranged based on where you drop the button.

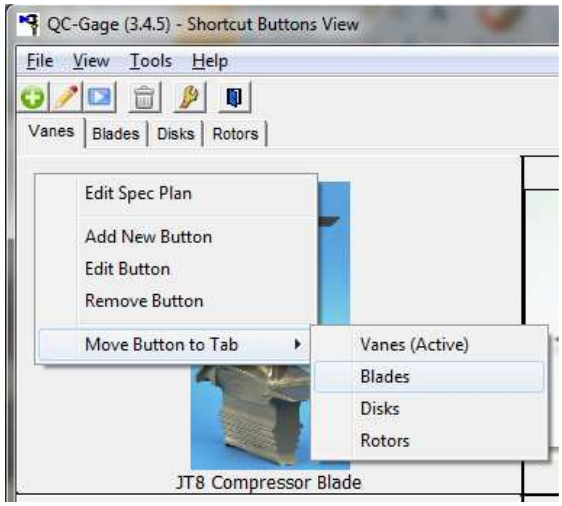


Sorting buttons on a Tabbed Sheet

Each button has an optional picture and text. As you add new Spec Plans the button is added to the last position of the last row. This may be desirable but in many cases the buttons become out of order and hard to find. Use consistent part numbers so QC-Gage can sort the buttons based on the text. These two menus sort the buttons alphabetically based using the **Text to Display**. Once you click **Yes**, the buttons are re-arranged in alphabetical order and the previous order is lost.

9.2.4 Moving buttons to a New Tab

When many buttons are needed, you add more and more Tabs to separate and group similar Spec Plans as discussed in the previous section. Should you decide later a button needs to be moved from one tab to another, simply right click on the button and select the new tab via the **Move Button to Tab** menu. All available tabs are shown in the menu. Here we show button "JT8 Compressor Blade" being moved to the "Blades" tab.



Exercises:

Add a second **Tab** and move the new button for your spec plan onto the new tab. Then shift the new tab to the left.

1. Add a second **Tab** called “My New Tab.”
2. Move the button for your new Spec Plan to the new Tab.
3. Shift the new Tab to the Left.

Exercise 1: Add a second Tab called My New Tab

Add a second **Tab** called “My New Tab” so you can add buttons to it.

1. Right-click on the label of the tab in the middle of the text “Default Tab 1” and choose **Add** from the menu.
2. Right-click on the label of the new tab and select **Rename**.
3. Rename the tab to “My New Tab”.

Exercise 2: Move the button for your new Spec Plan to the new Tab

Move the button for your new Spec Plan to the new **Tab**.

1. Click on the “Default Tab 1” tab.
2. Right-click on the button for your new Spec Plan and select **Move Button to Tab**.
3. A sub-menu will appear listing the two tabs. Select “**My New Tab**”

Exercise 3: Shift the new Tab to the Left

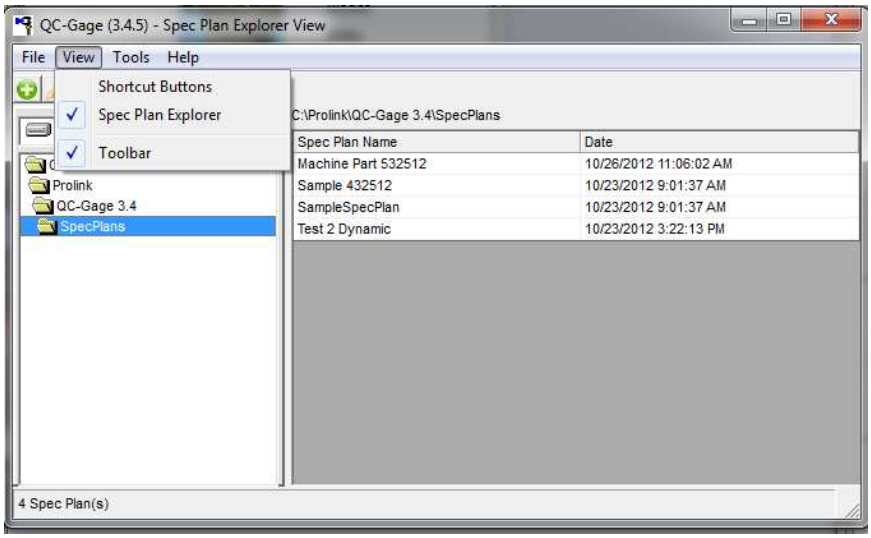
Shift the new Tab to the Left to be the first Tab.

1. Click on the “My New Tab” tab.
2. Right-click on the label of the tab and choose **Move Left**.
3. “My New Tab” should now be to the left of “Default Tab 1”.

9.3 Spec Plan Explorer View

9.3.1 Introduction

The button view of QC-Gage is used to quickly launch Spec Plans in a convenient “one click” way. Some people prefer a completely different view of their Spec Plans so QC-Gage has an Explorer View. You can toggle between the two different views by selecting the **View – Spec Plan Explorer** menu and the **View – Shortcut Buttons** menus.



9.3.2 Folder Considerations

When using the Spec Plan Explorer View be sure to organize your Windows folders by using recognizable names. Move the Spec Plans selecting the **File – Copy Spec Plan** menu, pick the Spec Plan, and then select the destination folder. Likewise, you can use the Windows Explorer to copy the Spec Plan files like any other file. Just remember the Spec Plans have an extension of .SPL.

Exercises:

Create a new Spec Plan for attribute data. This plan will count scratches and the number of failed parts.

1. Create a new Spec Plan for attribute data.
2. Add two defects to count scratches and Fails.

Exercise 1: Create a new Spec Plan for attribute data

Create a new Spec Plan for attribute data instead of variable data.

1. Click the **File – New Spec Plan** menu and enter the name “Attribute Data”.
2. Choose **Attribute** for your **Data Type** and select **Use Attribute Data Screen**.
3. Set the **Number of Parts** to **Variable** with the **Automatically Count** option enabled.
4. Choose **All features on one part, then next part** for your **Process of Inspection**.

Exercise 2: Add two Defects to the Spec Plan to count Scratches and Fails

Add one Defect that allows multiple defects per part, and one that does not. The first will count all scratches found and the second will count parts that fail.

1. Click the green **Add Defect** button.
2. Enter “Scratches” for the **Feature Label** and choose **Allow multiple defects per part**.
3. Enter a **Note** for the Defect as “Count the number of scratches on the part”. Then click **OK**.
4. Click the green **Add Defect** button.
5. Enter “Broken” for the **Feature Label** and click **OK**.

9.4 Attribute Data

Attribute data is the lowest level of data and is purely binary in nature. Attribute data is in the form of Good or Bad / Yes or No / Pass or Fail. Attribute data is qualitative data that can be counted for recording and analysis. Examples include the scratches on a product, missing parts, number of dents in a door, etc. Control charts based on attribute data are percent charts, number of affected units charts, count charts, count-per-unit charts, etc.

QC-Gage has the ability to collect Attribute Data in addition to the Variable data that has already been discussed. This section describes what Attribute Data is and the different options available within QC-Gage to handle the different types of Attribute Data.

9.4.1 Attribute Data Chart Types

The **p Chart** tracks the percentage of nonconforming items. It monitors the percent of samples having the event, relative to either a fixed or varying sample size, when each sample can either have this event, or not have this event. For our example, we might choose to look at all the objects that were produced in the week (since this number would vary each week), or a set number of samples, whichever we prefer. From this sample, we would count the number of objects that had one or more faults. We would then chart the percent of objects with faults per week.

An **np-chart** is an attribute control chart used with subgroups of the same size. Np-charts show how the process changes over time. The process attribute is always described in a yes/no, pass/fail, go/no go form. For our example, we could sample a set number of objects each week from all the objects that were produced. From this sample we count the number of objects that had one or more faults. We then chart the total number of objects with faults per week.

The purpose of a **u chart** is to determine stability of "counted" data when there can be more than one defect per unit and the sample size varies.

The **c Chart** monitors the number of times an event occurs, relative to a constant sample size. A given sample can have more than one instance of the event, in which case we count all the times it occurs in the sample.

Now that you understand what types of Attribute Data are supported, here are the different options within QC-Gage that allow you to collect Attribute Data.

9.4.2 Attribute Data Setup

When creating a new Spec Plan for Attribute Data a few of the screens of the Wizard have options just for Attribute Data.

Data Type Screen

The **Attribute** option on the **Data Type** step of the Wizard should be chosen when entering Attribute data into QC-Gage. Once that option is enabled there are 2 choices in the **Data Collection Options** area that become available:

Use Attribute Data Screen

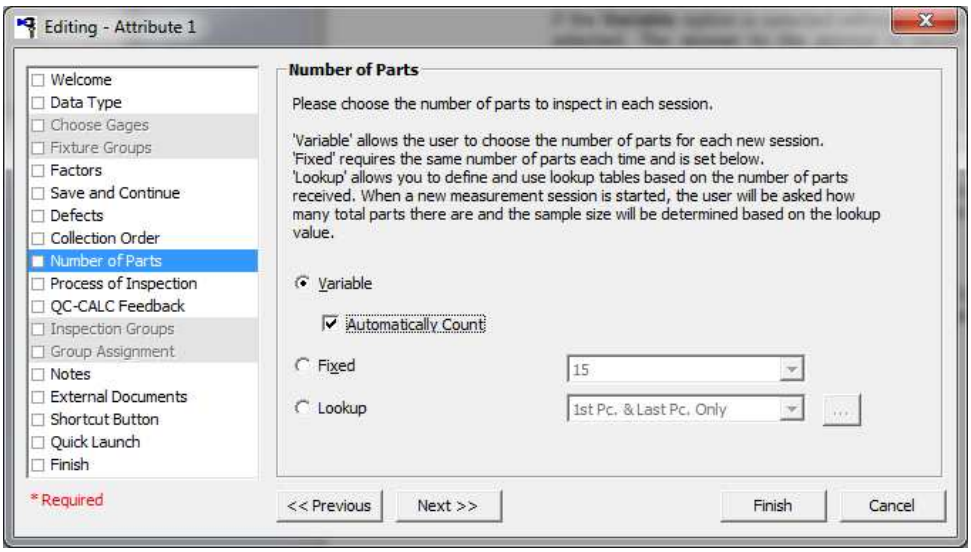
The **Use Attribute Data Screen** option should be used if the defects have not yet been counted. This option enables you to enter the data into a screen that will count the number of defects for you. You type in a number for each part and the total number of defects will be passed back to the Run Screen when all values have been entered. You will also have an option for QC-Gage to count the total number of parts in later steps of the Wizard. Attribute Data Collection is explained on page 44.

Use Run Screen

This option allows you to enter data directly into the Run Screen instead of using the special Attribute Data Collection Screen. This is typically only used if the total number of defects has already been counted. You will enter the total number of defects along with the Sample Size directly into the **Run Screen**.

Number of Parts Screen

Most items on this screen are the same for Attribute or Variable data. However, the Attribute screen saves the number of parts in the Sample Size.



Variable

The operator will be prompted to enter the Sample Size as the Run Screen starts if the **Variable** option is selected without the **Automatically Count** option being selected. The answer to the prompt is saved into the Sample Size feature automatically.

Automatically Count

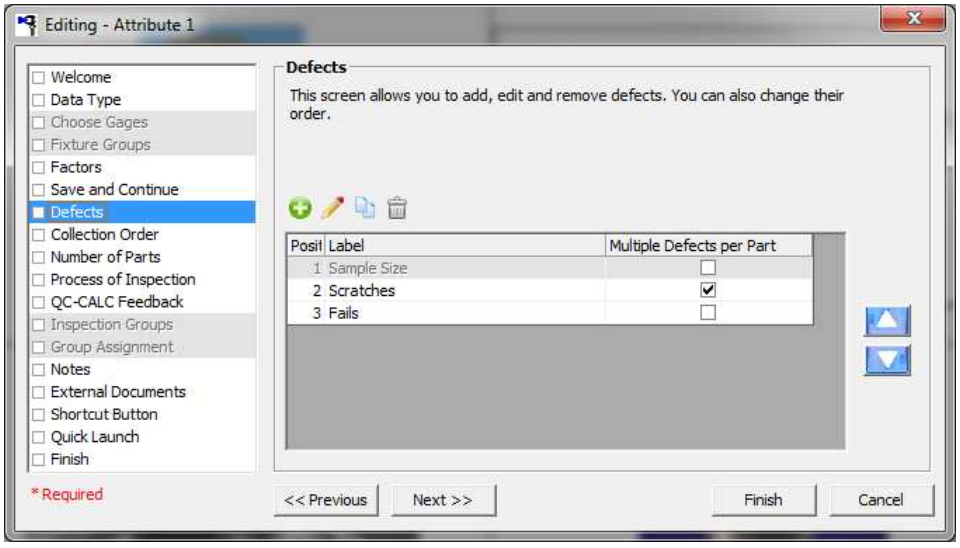
The **Automatically Count** option is available on this screen if the **Use Attribute Data Screen** was chosen for the **Data Type**. With this option the operator will either enter the number of scratches for each part or choose a Pass or Fail option in the **Attribute Data Collection Screen** for each part. QC-Gage will keep track of the total number of parts entered and the resulting value will be saved in the Sample Size feature.

Fixed or Lookup

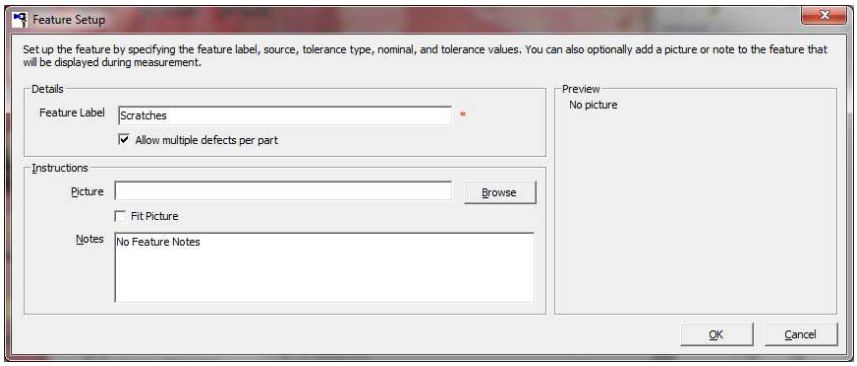
These options are the same with Attribute and Variable data but the values are saved into the **Sample Size** feature instead of being used to control the number of parts displayed in the Run Screen.

Defects Screen

The **Features** screen in the Wizard becomes the **Defects** screen when you choose **Attribute** as the **Data Type**. The main functionality of this screen does not change for Defects vs. Features except Sample Size has already been created for you and cannot be removed. Add the Attribute features using the **Add** ( ) button and the **Feature Setup** screen appears.



When entering defects the **Feature Setup** screen below has few options with only the **Feature Label** being required. The **Multiple Defects per Part** checkbox is used for a U or C Chart feature (allowing more than one instance of the event). Leaving this option unchecked is used for data for P and nP Charts (each sample can either have this event, or not have this event). The remaining items on this screen are the same as Variable data.

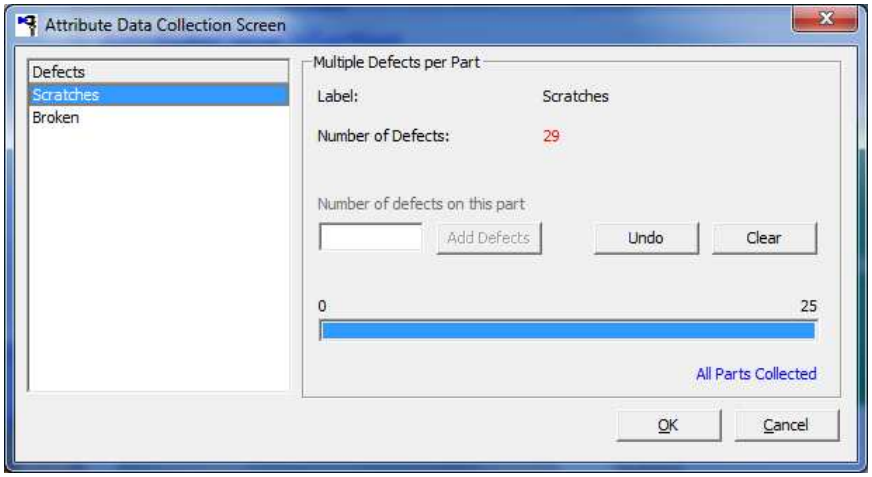


9.4.3 Attribute Data Collection

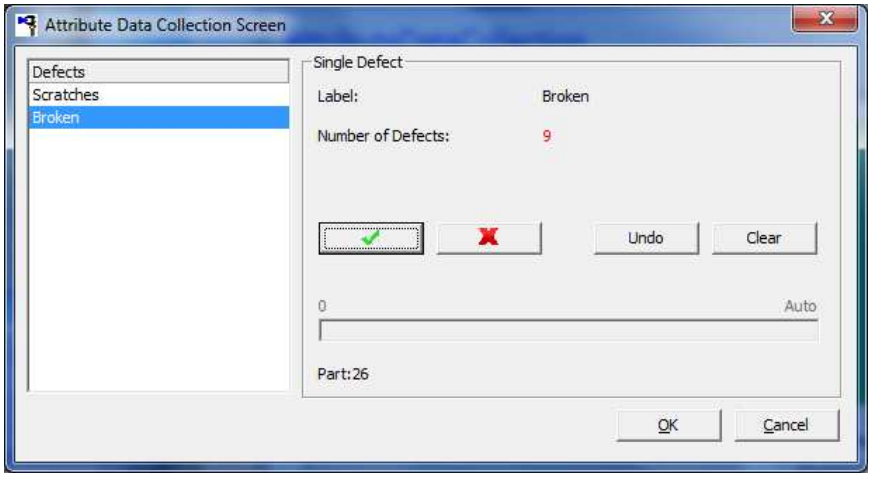
When collecting Attribute Data the screen used to enter the data is different depending on the option chosen in the **Data Type** step of the Wizard.

Attribute Data Collection Screen Entry

If the **Use Attribute Data Screen** option was chosen in the **Data Type** step of the wizard, instead of entering the defects counted directly into the **Run Screen** a **…** button is available for each feature. Clicking the **…** button displays the **Attribute Data Collection Screen** shown below. In the picture below the screen is setup to receive the data for 25 parts and as the graphic shows, all 25 parts have already been entered. This means the **Automatically Count** option was not being used.

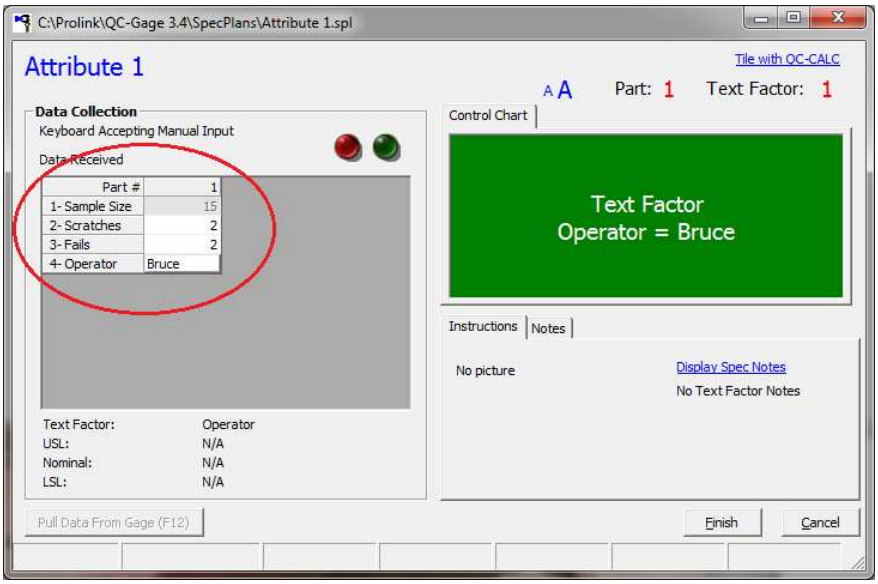


When the **Automatically Count** option is used the graphic to show how many parts are remaining is not displayed. In the picture below the parts are being counted as the data is entered and for each part that is NOT defective (Broken in this example) the  button is pressed. The  button is pressed for each part that IS defective. You can also use the Enter key for good parts or hit the 'F' key for bad. The part number you are about to enter is shown at the bottom of the screen. This process is continued for each part until all parts have been counted.



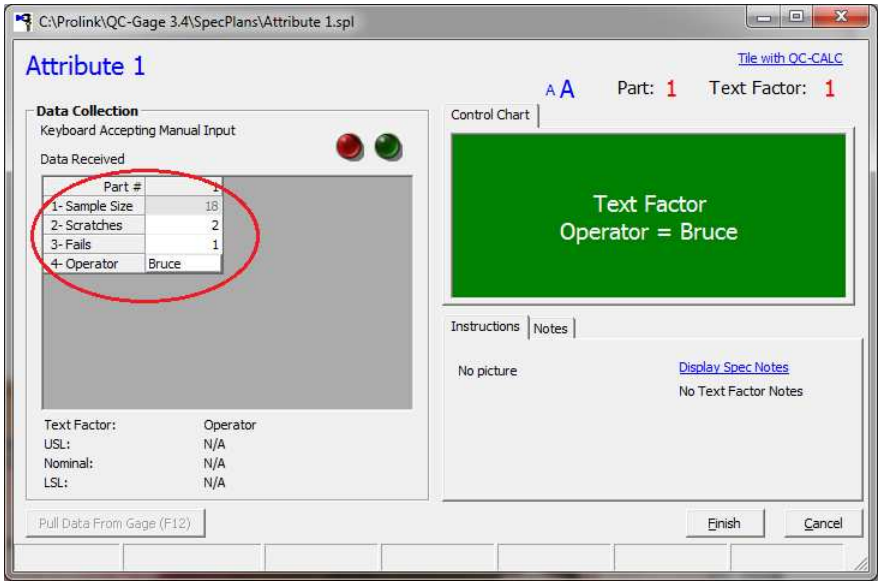
After collecting both types of data on the **Attribute Data Collection Screen** and clicking **OK**, the results from that screen are displayed for the appropriate

features within the **Run Screen**. You will notice that the Sample Size ended up being 25, but you can see **Part: 26** in the picture above. This is because the screen was ready for the 26th part data to be entered, but that data was never received. This means the counting stopped and the Sample Size was determined at that point.



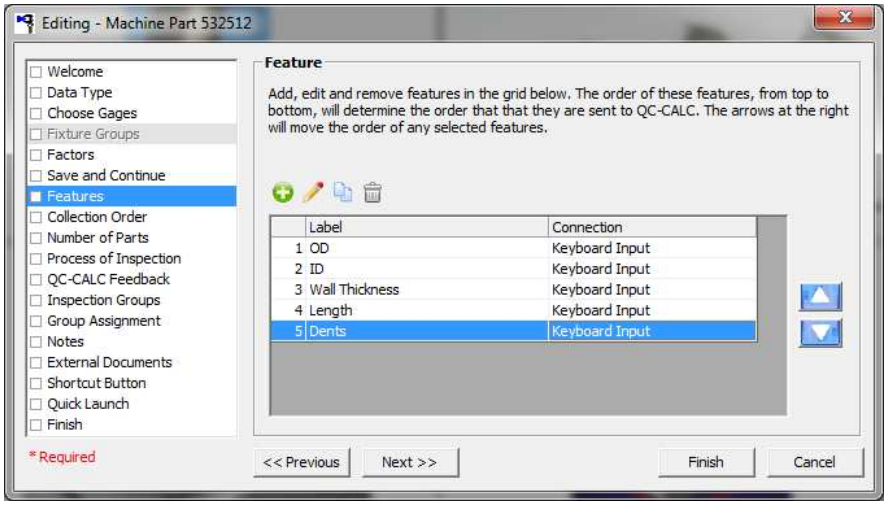
Run Screen Entry

If you chose the **Use Run Screen** option the Sample Size will be filled in for you when the Run Screen appears and number of defects counted should be entered directly into this screen for the appropriate features. Enter the total number of defects (Scratches for example) that were counted for a U or C chart. Count the number of parts that had a defect (were Broken for example) for a P or nP chart.

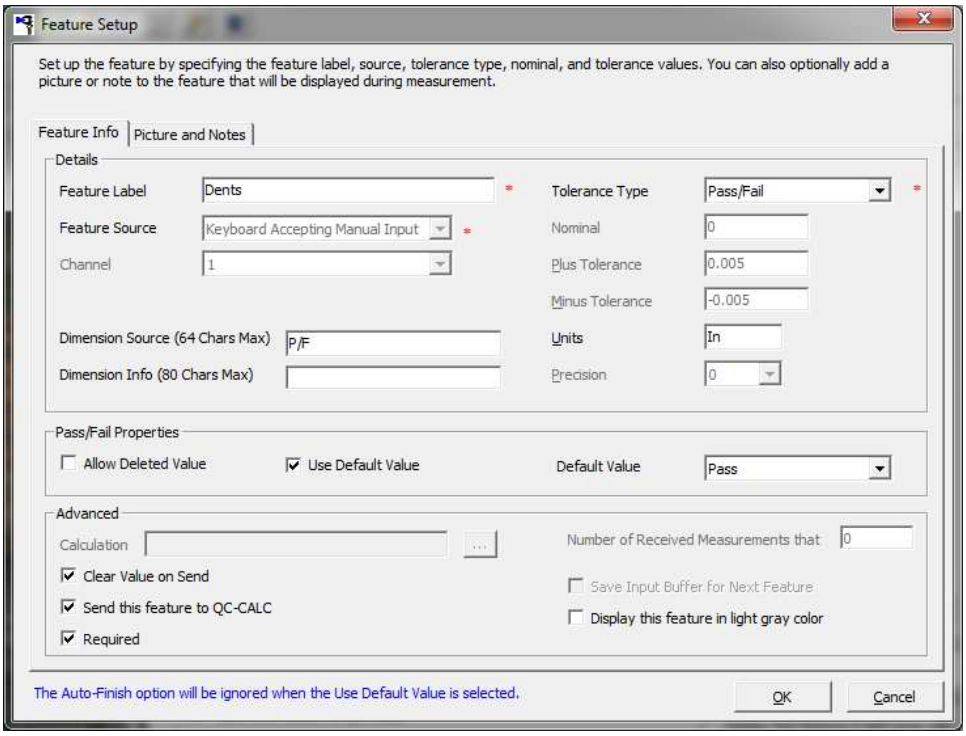


9.4.4 Attribute with Variable Data

QC-Gage allows you to mix variable and attribute data within the same Spec Plan. Our **Machine Part 532512** Spec Plan was written with only variable data but in this screen we added another feature called Dents.



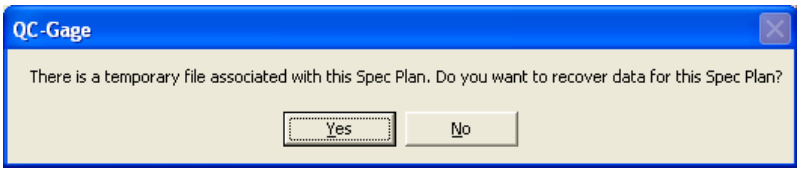
Reviewing the **Dents** feature shows the **Default Value** of our Pass/Fail features is set to Pass. This assumes most entries are Pass and requires the operator to enter an F for Fail which overrides the default value. This was added to saving time during data entry.



9.5 Auto Recovery

As you are measuring your parts, the data is held locally on the screen until you click the **Finish** button and commit the data to QC-CALC. During this time, as each reading is collected, the data is automatically saved locally in the main QC-Gage directory. If anything should go wrong and QC-Gage or Windows crashes,

you have not lost your data. The next time you attempt to measure that part, the following message will appear asking you if you would like to recover the existing session. Choosing **Yes** will load the run screen with your previous values. Choosing **No** will start a new measurement session and discard the previous data.



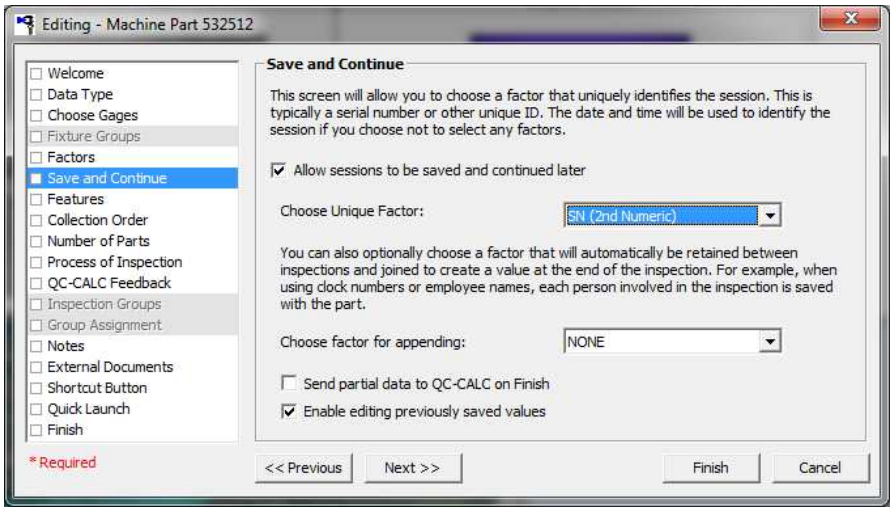
9.6 Partial Inspection

9.6.1 Introduction

During the measurement process there are situations where some of the measurements in your Spec Plan are not available. For example, you may want to record the initial thickness of a part and then re-measure it sometime after a coating is added. Maybe you'll do this inspection over several days and then have QC-Gage compute the thickness of the coating by subtracting the two readings. This section discusses the issues associated with saving the contents of a partially inspected Spec Plan.

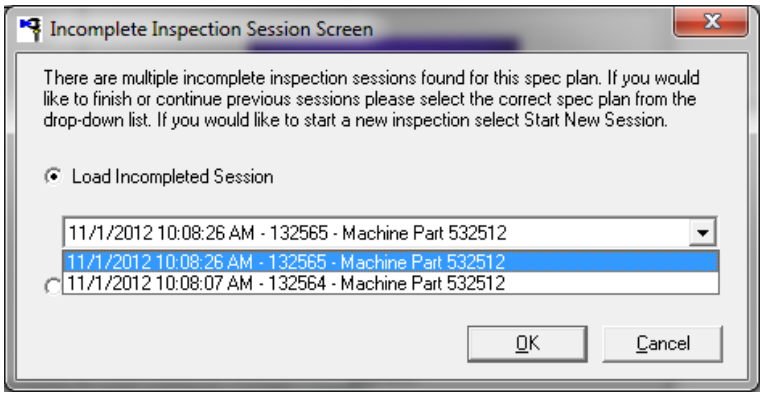
9.6.2 Choose Unique Factor

In our example Spec Plan we skipped Step #6 – Save and Continue which was on page 21. This option appears the same except the **Finish** button on the Run Screen enables you to stop in the middle of an inspection and continue at a later time. If you check **Allow sessions to be saved and continued later** you'll need to identify this partial inspection in the future. You choose either a Numeric or Text factor to tell QC-Gage which Factor you want to use to identify this partially completed session. Here we chose SN in Numeric Factor 2.



Continuing with a Previous Plan

When you continue the Spec Plan that has partially inspected data you are presented with a list of partial inspections containing the unique Factor value you chose in the previous step. The contents of the list helps you identify the data you wish to continue. In this example there are two partial sessions with 2 unique SN to identify the part.



The next time this Spec Plan is run, these two SN values are shown after the date and time. In this case we see 132565 and 132564. We selected "**Load Incomplete Session**" and clicked the **OK** button. When the run screen is displayed all previously entered values are filled in for you and the cursor is placed in the next needed value. The ability to edit these previously entered values is determined by the **Enable editing of previously saved values** discussed later.

NOTE: If no unique factor is chosen, partial sessions are identified by date and time only.

Start New Session

QC-Gage saves the incomplete (partial) inspection plans so you can continue where you left off at a later time. By choosing **Start New Session** you can have several sessions active at one time. For example, say you are inspecting a jet engine blade with a serial number of 333 but a co-worker is inspecting the same blade type with a serial number of 444. When your co-worker begins inspected his blade, he chooses **Start New Session** and enters 444 for his serial number. When either of you wish to resume the inspection of your blade, you will be asked to select the incomplete session. Of course the serial number is shown allowing you to pick the correct partial session.

Choose Factor for Appending

When you use partial inspection and more than one person is entering data you may want to tag the part with multiple clock or employee ID numbers. This helps you trace the people involved in the inspection of the part. **NOTE:** Only Text Factors can be appended.

When a Spec Plan is run and you choose not to append multiple clock numbers to the part because only one person is involved, previously entered clock numbers are displayed each time the Spec Plan is continued. If you choose to append clock numbers, the Text Factor is left blank to allow the new inspector to add their clock number.

Enable Editing of Previously saved values

Normally, the previously entered values should not be changed since the person who inspected these features may not be continuing this inspection. Therefore a

special option is available to block the editing of previous values. However, if you need access to the previously entered values you must check this option in order to change the values to an editable state. When this option is not checked all previous values are locked (grayed-out) as shown below. See Partial Inspection on page 47 to view the screen where this option is set.

Data Received

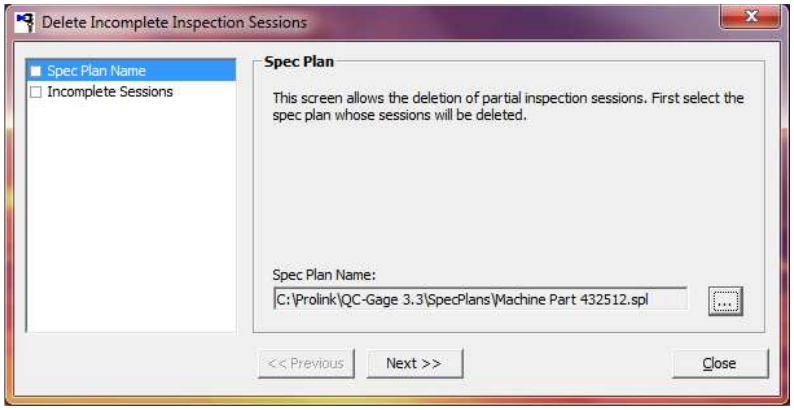
Part #	1- Serial No.	2- Clock No.	3- OD	4- ID	5- Wall Thickness
1	12345		2.001	0.4003	0.80035
2	12346		2.0002		
3					
4					
5					

Send partial data to QC-CALC on Save

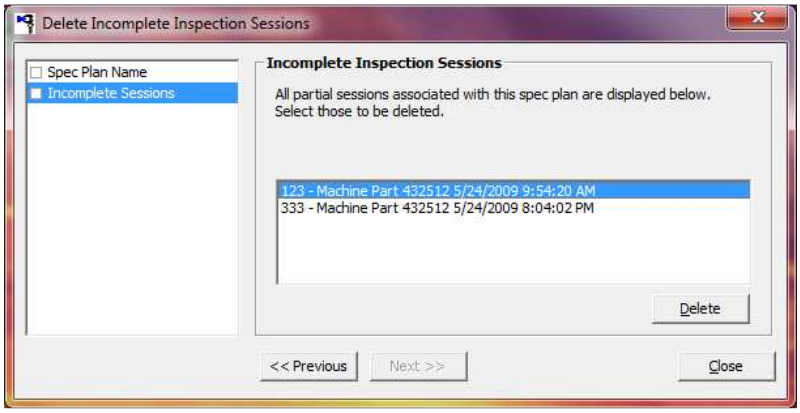
When this option is enabled the **Finish** button on the Run Screen will function as a "Save and Send" button. This allows the operators to measure just the features they need to measure at that time, then send the data that has been collected off to QC-CALC. If this option is not checked the **Finish** button will not send the data to QC-CALC until all data is entered.

9.6.3 Deleting Incomplete Inspection Sessions

Knowing many partial sessions can exist at any one time creates the need to remove unwanted, partial sessions that may never be finished. The **Tools – Delete Incomplete Inspection Sessions** menu allows you to choose the Spec Plan with the partial sessions as shown below.



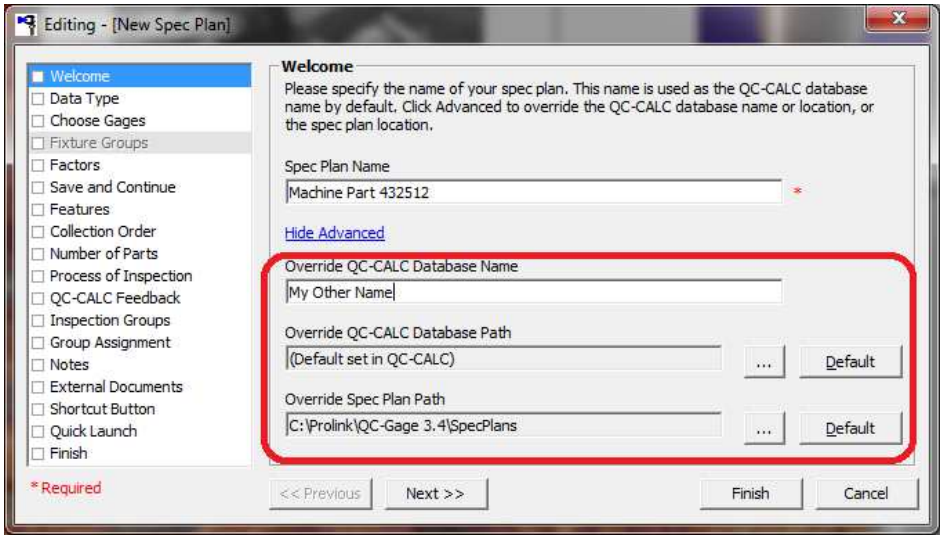
Now that the Spec Plan has been identified, click **Next >>** and a list of all incomplete sessions is displayed. Highlight the session(s) you wish to delete and click the **Delete** button.



9.7 Overriding File Names

9.7.1 Introduction

When writing or editing a Spec Plan, the first step in the process is to choose a name for the plan. The screen has an Advanced link you can click to reveal more detailed options for saving the Spec Plan as well as saving the measured results.



9.7.2 Override QC-CALC Database Name

Normally QC-CALC uses the name of the Spec Plan to name the .qcc file, but there are times when you need to name your Spec Plan differently than the resulting .qcc file. One instance where this is necessary is when you have two separate Spec Plans required to completely measure a part. You would definitely want to use the MultiSource functionality within QC-CALC to save the data into a single .qcc file, but the only way to do that is to make QC-CALC think the same Spec Plan is sending the data over. The **Override QC-CALC Database Name** option is used to send the matching name over to QC-CALC.

9.7.3 Override QC-CALC Database Path

Normally, QC-Gage allows QC-CALC to determine where to save the QCC databases. However, in certain cases you may want to instruct QC-CALC to use a particular override location for the measurement results rather than QC-CALC's default location. To do this, simply add the path to this box by clicking the ellipses (**…**) button and selecting the path. To revert back and allow QC-CALC to determine the database path, click the **Default** button.

9.7.4 Override Spec Plan Path

QC-Gage normally stores all Spec Plans in the local PC in the **C:\Prolink\QC-Gage 3.4\SpecPlans** folder but you might want to save and run your plans from a common file server. This makes all Spec Plans available to all copies of QC-Gage in your facility. Use the ellipses (**…**) button to change this path to meet your needs. The **Default** button resets the path to your local machine as shown.

9.8 Calculated Dimensions

9.8.1 Introduction

You can add Dimensions that are made up of calculations instead of actual measurements. These are useful for creating features that are not available from the gage. For example, if you have a Spec Plan that measures a feature before and after a coating process you might want QC-Gage to calculate the thickness

by subtracting the two dimensions. Because temperature compensation can be critical, you might want to build a temperature table based on material and adjust the readings based on the current temperature. Alternately, the calculations might be as simple as adding nominal to a reading that is zeroed out on a gage block.

This unique capability also means you can add separate features to your existing Spec Plan that cannot be measured using gages. This section focuses on how to extend QC-Gage's capability.

9.8.2 Adding the Calculated Dimension

Introduction

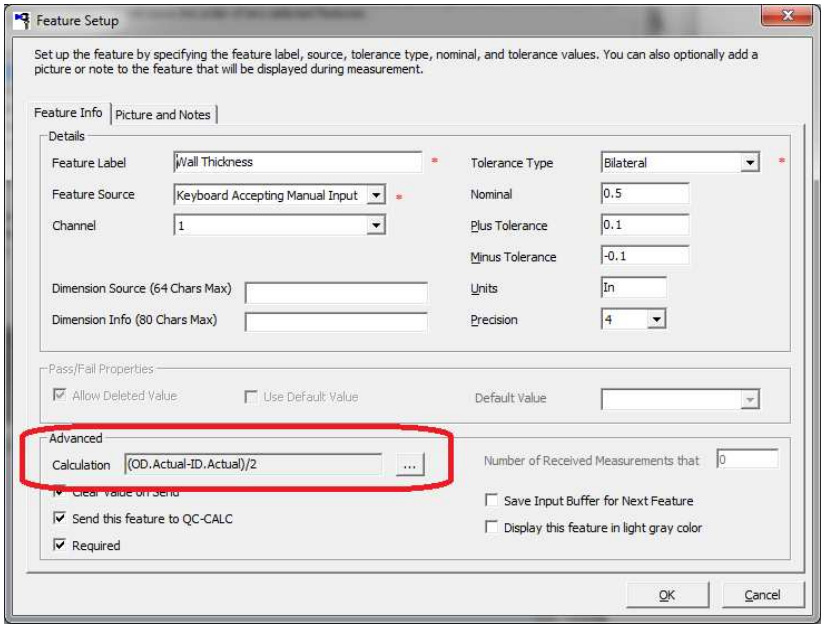
In Step #7 – Feature on page 22 we did not discuss adding **Calculated Dimensions** but this section details its use. Since we are measuring an OD and an ID in our continuing example, we will compute the wall thickness of the part. The basic equation for wall thickness is:

Wall Thickness = (OD – ID) / 2

Edit the Spec Plan and add another feature. We added a **Feature Label** of Wall Thickness, a **Nominal** of 0.8, and **Tolerances** of +/-0.03 below.

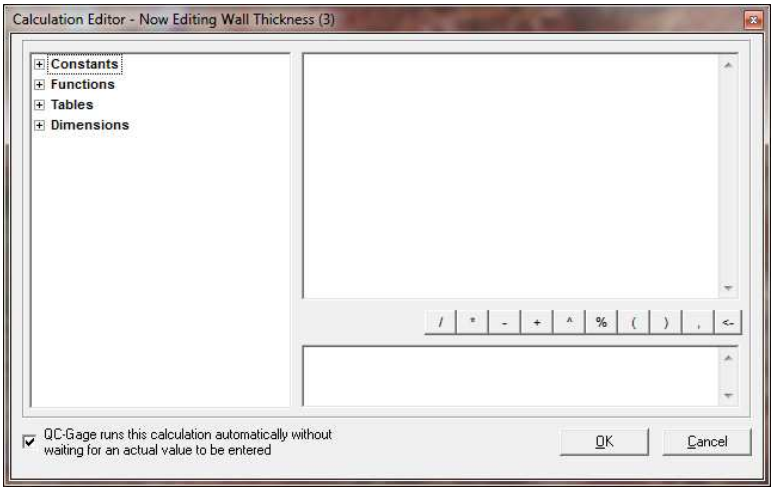
Adding the Equation

The lower right side of the **Feature Setup** screen has an **Advanced** section including an ellipses (**…**) button. Press this button to open the **Calculation Editor**.

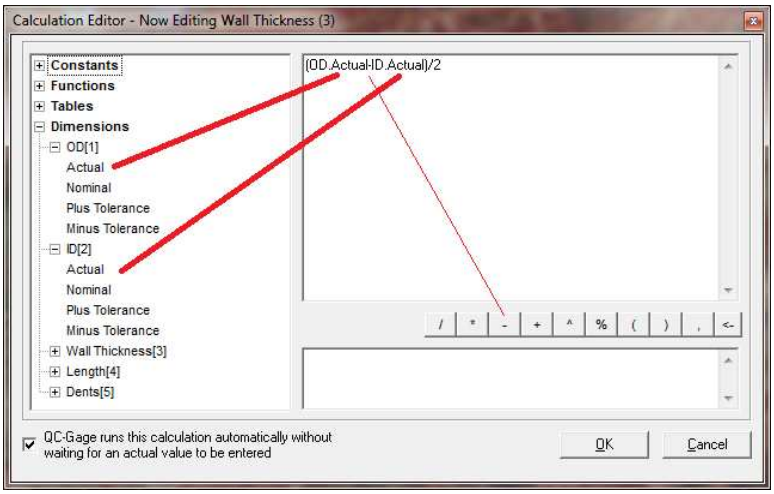


9.8.3 Edit the Equation

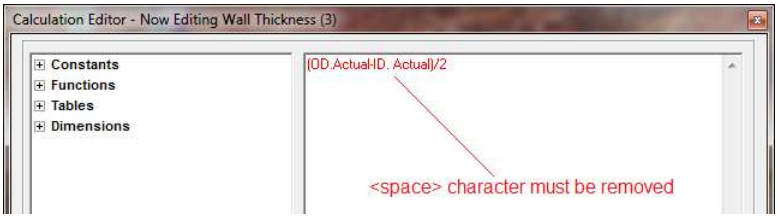
In the **Calculation Editor**, expand each **Dimension** by pressing the + sign in front of both the OD and the ID. This shows the properties of each feature.



To compute wall thickness double-click the **Actual** label under OD, type a minus sign followed by double clicking the **Actual** label under the ID label. Next, add a set of parentheses () around the entire equation and then divide everything by 2. If at any time the equation is red it means there is an error in the syntax of the equation.

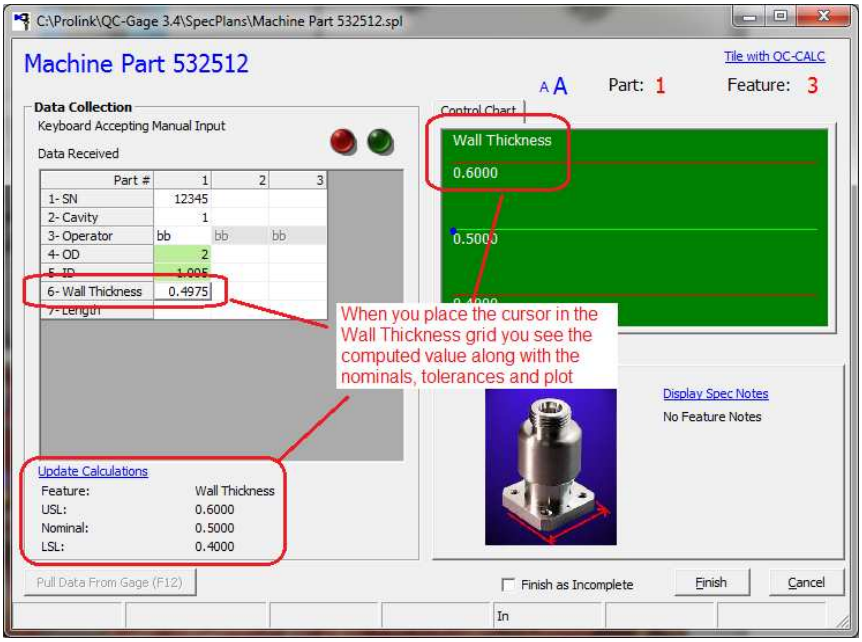


Tip: You **cannot** enter <spaces> in your equation. If you do, the equation is displayed in **red** letters and you cannot record or save your equation.



9.8.4 The Calculation during Inspection

As you enter the measured features during inspection (OD & ID), the wall thickness is automatically calculated and displayed when all needed values are present. You can enter the values in any order but once QC-Gage determines it has what it needs to compute the answer, the value is added to the grid and the plot is updated.



9.8.5 Auto-Calculation without Measurement

When "**QC-Gage runs this calculation automatically without waiting for an actual value to be entered"** option at the bottom of the **Calculation Editor** screen is checked (see Edit the Equation on page 52), the value of the feature is calculated automatically without the need for a measurement to be added to the table. In fact, if you attempt to type a value in the cell, QC-Gage won't let you. In the example above for wall thickness, this is the desired outcome since the calculation is relying upon two other features and not a literal measurement.

In the case where you wish to add the nominal to a zeroed gage block you will want to leave the "**QC-Gage runs this calculation automatically without waiting for an actual value to be entered"** option unchecked. Unchecked assumes you will need to enter a measurement in the cell and that this measurement will then be used in the equation to calculate the actual value. For instance, you may want to add 0.5 to the gage measurement to calculate an adjusted measurement value.

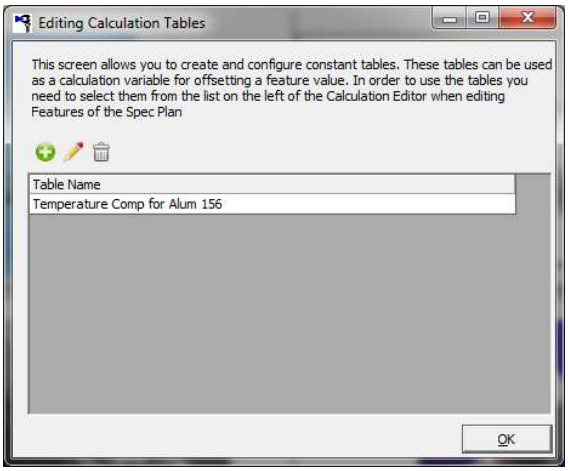
9.8.6 Calculation Tables

Introduction

Calculation Tables are simply lookup tables that allow you to create a list of numeric ranges that can be used to look up result values. One use of a Calculation Table is temperature compensation which is needed when parts are measured at various temperatures. Different materials have different coefficients of expansion so you might need to add several tables. You can add as many tables as you need for many reasons but in this example we will use temperature to explain the concept. Be sure to use a reasonable name so you'll recognize the purpose of the table.

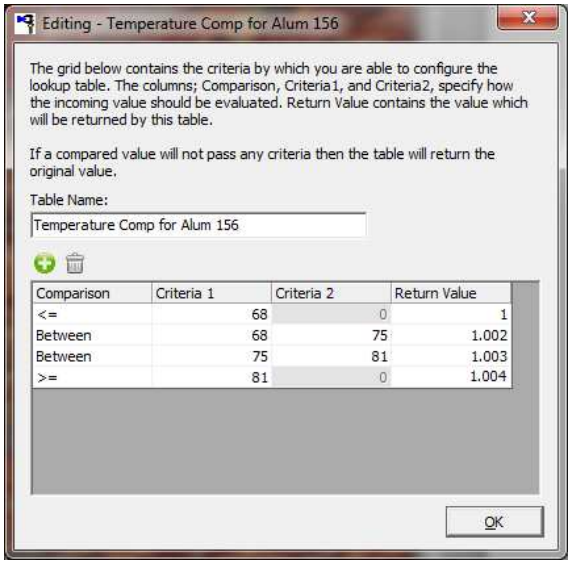
Create Calculation Table

Before we can use a calculation table, we must create one. After creation, we will use it in an example. Select the **Tools** – **Edit Calculation Tables** menu.



Add a new table by pressing the **Add** button. The **Editing** screen for a new table will automatically appear. Use the **Table Name:** area to change the name the table you are creating to **Temperature Comp for Aluminum 156**.

Click the **Add** button 4 times, and enter the values as shown. Notice how we are using a large range between temperatures. You can adjust as needed. The **Return Value** is based on the entered temperature. In our example, we'll multiply the return value by the measured value to arrive at a temperature adjusted size. Click **OK** to save your changes.



NOTES:

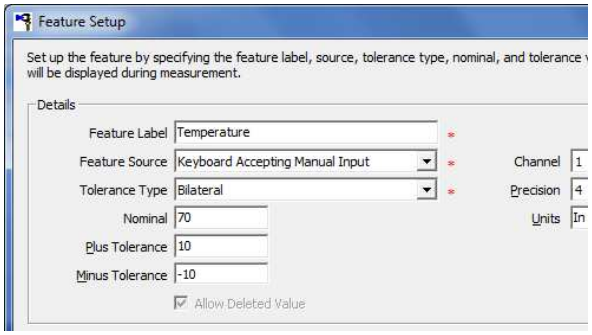
- The equations used in the list of comparisons are tested from top to bottom. Therefore, the first comparison that is satisfied returns its value. Notice how we overlapped 68 degrees in the first line with the second line. If the temperature is 68 degrees, 1.000 is passed back while 68.0000001 will pass back 1.002.
- If no comparison is satisfied, the returned value is the value passed in which in this example is the temperature. Therefore, you should always

ensure all cases are covered and never create a list of conditions with no answer.

- There are many Comparison operators available. Use them to completely satisfy all conditions.

Using a Calculation Table

Now that we have the table built, we will use it in our continuing Spec Plan example. Right-click on the Spec Plan button and add a new feature labeled Temperature with a nominal of 70 and tolerances of +/-10.



We will add the temperature compensation to the OD measurement only to show you how it works. Edit the OD feature and click the **Calculation** button in the lower right corner. There is no calculation since the OD was a typed-in value.

Adding the Calculation

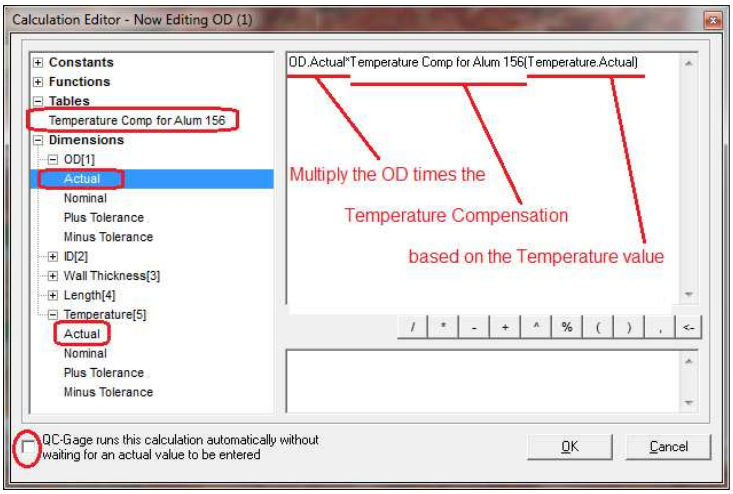
Now that we have a temperature table, we use it to compensate for the OD size based on the multiplier found in the table for the given temperature.

1. Uncheck the **QC-Gage runs this calculation…** checkbox (bottom left)
2. Double click **OD.Actual**
3. Type an asterisk *
4. Double click **Temp Comp for Aluminum 156** found under **Tables**
5. Type an open parenthesis (.
6. Double click **Temperature.Actual**
7. Type a close parenthesis).

Your resulting equation should look like the following:

OD.Actual * Temp Comp for Aluminum 156(Temperature.Actual)

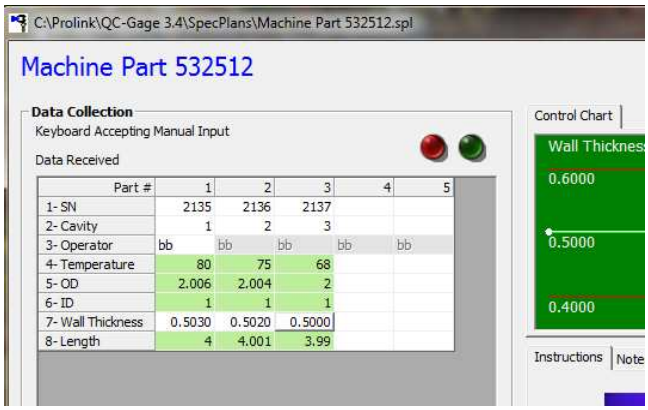
The entered equation says lookup the multiplier found in the **Temp Comp for Aluminum 156** table based on the entered temperature.



NOTE: Make sure the **QC-Gage runs this calculation…** checkbox is NOT checked in this case since we will be entering and acting upon the value. In other words, replacing what you type. Because we enter the actual measured OD and then apply a calculation to the entered value, this checkbox must be turned off. When a value is a pure calculation with no entered value, the checkbox is enabled. For more details please see Auto-Calculation without Measurement section on page 53.

Calculation During Inspection

During inspection we entered 3 temperatures followed by an OD value of 2.00 on the first 3 parts shown below. When we type 2.0 for the OD and pressed the ENTER key, QC-Gage looked up the multiplier in the table based on the given temperature value for that part and adjusted the actual reading. But notice how the first part was measured at 80° so our entered value was changed from 2.00 to 2.006 (2.0 * 1.003). The next part was scaled by 1.002, with a final value of 2.004, etc. QC-Gage added the compensation by overwriting our entered value of 2.0. This of course changed our Wall Thickness by a small amount since the OD is involved in that calculation as well.



Exercises:

Create a calculation table. Our example simulates temperature determining expansion rates of metal.

1. Add a new **Calculation Table**.
2. Fill this new table with Conditions.

Exercise 1: Add a new Calculation Table

Add a new Calculation Table for Aluminum 156

1. Click the **Tools – Edit Calculation Tables** menu.
2. Click the green **Add Table** button.
3. Enter “Temp Comp for Aluminum 156” as the **Table Name** and click **OK**.

Exercise 2: Fill this new table with Conditions

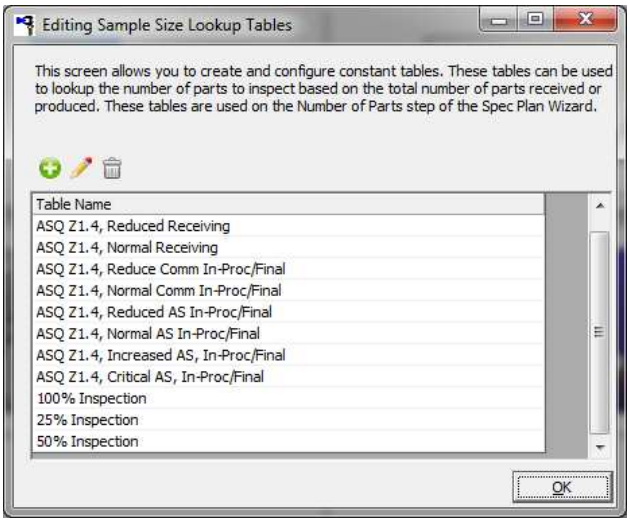
Fill the new table with values so that any temperature will have an appropriate expansion rate.

1. Select your new table and click the **Edit Table** button.
2. Click the green **Add Condition** button.
3. Click the **Add Condition** button three more times.
4. Now set the first Condition.
    a. Click the **Comparison** and choose “<=”, less than or equal to.
    b. Enter “68” in the **Criteria 1** area.
    c. Set the **Return Value** to “1.000”
5. Now set the second Condition.
    a. Set the **Comparison** to “Between”.
    b. Set Criteria 1 to “68” and set **Criteria 2** to “75”.
    c. Set the **Return Value** to “1.002”
6. Now set the third Condition.
    a. Set the **Comparison** to “Between”.
    b. Set **Criteria 1** to “75” and set **Criteria 2** to “81”.
    c. Set the **Return Value** to “1.003”
7. Now set the fourth Condition.
    a. Set the **Comparison** to “>=”, greater than or equal to.
    b. Enter “81” for **Criteria 1**.
    c. Set the **Return Value** to “1.004”
8. Click **OK**.

9.9 Lookup Tables

Lookup Tables are used to determine the number of parts to be inspected based on a lot size. For example, if 100 parts are received in a lot you might want your inspector to measure 5 of them. Or a batch size of 500 might require the inspector to measure 50 parts which represents the batch.

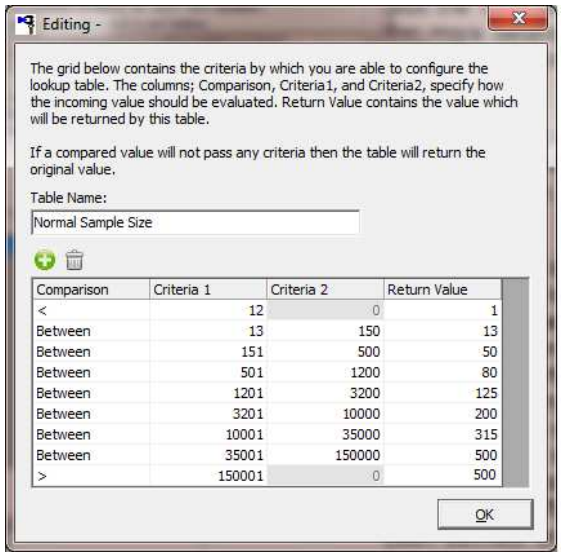
When a new measurement session is started, the user is asked for the total number of parts. They enter the total number and QC-Gage uses your specified Lookup table to determine the number of parts he should inspect.



Adding the Comparisons to the table

You create your own tables by selecting the **Tools** – **Edit Sample Size Lookup Tables** menu. Click the **Add New** button, give your table a name such as **Normal Sample Size**.

1. Click **Add New** button 9 times
2. Select the comparison operator for each row
3. Enter the Criteria1 & 2 and the Return Value



NOTE: If no comparison is satisfied, the returned value is the value passed to it. Therefore, you should always ensure all cases are covered and never create a list of comparison with no answer. See example above.

9.10 Shared Spec Plans – Networks

You can place all of your Spec Plans in a single directory on a shared network drive and have all copies of QC-Gage use the same Spec Plans. More than one copy of QC-Gage can have a Spec Plan open on a shared network drive, but be sure to edit a Spec Plan from only one location to ensure you do not lose changes.

9.11 Passwords

9.11.1 Introduction

Password protection is provided to limit the functionality of QC-Gage by unauthorized people. If you want to limit access to specific areas of QC-Gage simply lock the menu choice for each item. When a menu is locked, it appears "grayed out" in the menu list.

The **Tools** menu and the **Password** submenu cannot be locked. This is to ensure access to the password protection area at all times.

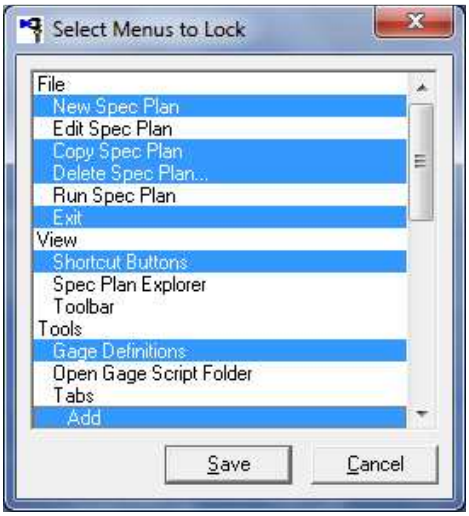
9.11.2 Establishing your initial Password

When QC-Gage is first installed, **Change Password** is the only menu option available in the **Password** menu. The first time this menu option is selected a dialog box appears asking for a password. Enter your 4 digit serial number for the copy of QC-Gage you are using. This number can be found by selecting **Help – About QC-Gage**. Once you successfully enter the serial number you must establish your own password by following the normal change password procedure. Once a password is established the serial number no longer applies to any of the requests for a password. This procedure prevents inadvertent setting of the initial password by unauthorized personnel. If No Serial Number exists, use 0.

9.11.3 Lock/Unlock Menus

The **Tools** - **Password** - **Lock Menus** option toggles between "Lock Menus" and "Unlock Menus." When this option is selected a dialog box appears asking for the password. Enter your password in the space provided and click the **OK** button. A message will appear indicating the appropriate action was successfully completed. When you choose to **Lock Menus**, all menus you chose to lock in the **Configure Menus to Lock** area still appear but are grayed out so they cannot be accessed. When you choose **Unlock Menus**, the entire QC-Gage program is available to all users no matter which menus were locked. It should be noted that if you activate the **Lock Menus** option and do not select individual menus to lock out, the entire program is still completely open.

9.11.4 Configure Menus to Lock



This menu option is used to establish which menus you want disabled when the **Lock Menus** option is chosen. This option is not available while the menus are locked. When you select **Configure Menus to Lock** a dialog box appears prompting you for a password. Enter the password and click the **OK** button. Next, a dialog box appears with a list of menus available to lock. Use the mouse to select the items you wish to be disabled by clicking on the items in the list. Multiple items are selected by holding down the CTRL or SHIFT keys while clicking. Once all desired menus are selected click the **Save** button to commit your selection. Clicking the **Cancel** button will retain the previous selection.

One thing to remember when you lock the menus is the **File** – **Exit** menu. The **File** - **Exit** menu may be disabled to prevent an inadvertent exit, but the Windows Control Menu (The "x" in the upper right hand corner of the form) is still available. Click the "x" button when the **Exit** menu is disabled and QC-Gage will prompt you for the password. Unless you know the password, you cannot exit.

9.11.5 Change Password

When this menu item is selected a dialog box appears prompting you for the existing password. Enter your password in the space provided and click the **OK** button. A second dialog box appears to confirm your new password. Enter your new password in both places and click the **OK** button. A message appears indicating you successfully changed your password. Clicking the **Cancel** button at any point in the procedure brings you back to the main QC-Gage screen and the old password remains in effect.

9.12 Gage Mastering

These are the basic instructions for using the **Use this Spec Plan for Mastering Gages** option within the **Choose Gages** screen of the Spec Plan Wizard.

First, you need to create a Spec Plan for mastering Gages:

1. Create a new Spec Plan.
2. Select the **Use this Spec Plan for Mastering Gages** option located on **Choose Gages** screen of the Spec Plan Wizard.
3. Add the gages you want to master.
4. Add a feature to the Spec Plan for each of the gages to be mastered.
5. The Nominal value for the Feature should contain a known or expected size (golden part, size block, etc.).
6. Run the Spec Plan,
7. Collect values from the gages.
8. Click the **Save** Button. This computes and saves an offset for each gage based on the Nominal (expected) size and the Actual value received.

Next, create a regular Spec Plan which references the Mastered:

1. Add a gage that you want to use to this new spec plan.
2. While adding the gage, on the **Gage Setup** form, choose the **Apply Mastering offset to this Gage** option. This allows you to link this gage to the mastering offset you have already computed.
3. Select the mastering spec plan that contains mastering information for that gage.
4. Select the feature that is used to calibrate that particular gage from the Mastering spec plan.
5. If the gage is linked to a mastering spec plan and a feature, then the offset which has been calculated for that gage will be applied to any measurements taken.

10. Tools – Options

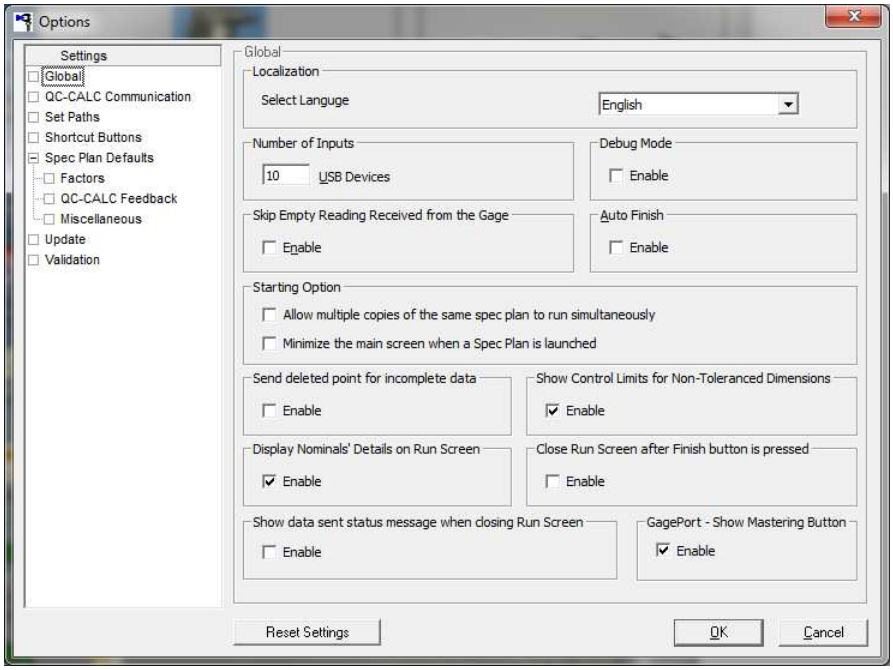
10.1 Introduction

The **Tools – Options** menu is the central location where you make most of QC-Gage's changes. Each group on the left should indicate what items are available for change in the right panel.

10.2 Global

10.2.1 Language

QC-Gage stores all messages and captions in an external file. You can change the language QC-Gage uses by picking a different file. Language files have an extension of .LNG and a name that indicates the language, such as English.lng (the default language file). If you change languages you must restart QC-Gage for the change to take effect.



10.2.2 Number of Inputs

USB Devices

This setting should only be used for specific USB gages. The majority of the USB gages actually create virtual COM Ports and this option is not needed to use those gages. At this time the only USB Gage that uses this setting is the Marposs EasyBox U4F gage. If you are using the EasyBox U4F you must set this value to be the number of those gages you are connecting to the computer via USB.

10.2.3 Debug Mode

This option is normally un-checked, but if you start experiencing problems when running QC-Gage tech support may ask you to enable this option in order to generate a file with more information. You will receive specific instructions from tech support for where to find the file and what email address to use to send it out.

10.2.4 Skip Empty Reading Received from the Gage

Occasionally, you may find a gage that can produce empty readings and therefore send you a simple Carriage Return with no reading. This will cause QC-Gage to skip to the next reading, leaving a 0.00 for the reading. If you want QC-Gage to ignore this type of "empty" reading, check this option and QC-Gage will wait for a non-empty reading.

10.2.5 Auto Finish

Use the **Auto Finish** checkbox to enable or disable Auto Finish. If Auto Finish is enabled, QC-Gage automatically presses the **Finish** button on the Run Screen when the last column of the last row in the table of numbers on the run screen is received. This works for all running Spec Plans.

10.2.6 Allow multiple copies of the same Spec Plan…

You can run two or more copies of the same Spec Plan at once within the same computer. This is useful if you have a large complex gage or inspection machine with a long cycle time or have 2 complex inspection machines attached to a single computer. Check the **Allow multiple copies of the same Spec Plan to run simultaneously** option in order to enable this feature.

10.2.7 Minimize the main screen when a Spec Plan is launched

With this option checked each time a Spec Plan is launched the main QC-Gage screen will be minimized to the Taskbar.

10.2.8 Send deleted point for incomplete data

When this option is **Enabled** QC-Gage sends a signal to QC-CALC Real-Time for any incomplete data so those values will be set to Nominal and marked as Deleted within the QC-CALC database. This is necessary if QC-CALC Real-Time is using the "Rename existing QCC file, and create new file" mode. This would mean that QC-CALC Real-Time would receive all dimensions it expects, so the .qcc file would continue to collect data normally. Without this option QC-CALC Real-Time would receive too few dimensions causing the .qcc file to be renamed and the data to be saved to a completely new .qcc file.

10.2.9 Show Control Limits for Non-Toleranced Dimensions

Control Limits will be displayed in the graph on the **Run Screen** for any non-toleranced dimensions when this option is **Enabled**.

10.2.10 Display Nominal Details on Run Screen

With this option **Enabled** a new section appears on the **Run Screen** that shows the Nominal and Tolerance information for the dimension being entered at that time.

10.2.11 Close Run Screen after Finish button is pressed

When this option is not enabled clicking the **Finish** button on the **Run Screen** will automatically start the next session for the same Spec Plan that was running. With this option **Enabled** clicking the **Finish** button on the **Run Screen** will end the collection process and return to the QC-Gage main screen.

10.2.12 Show data sent status message when closing Run Screen

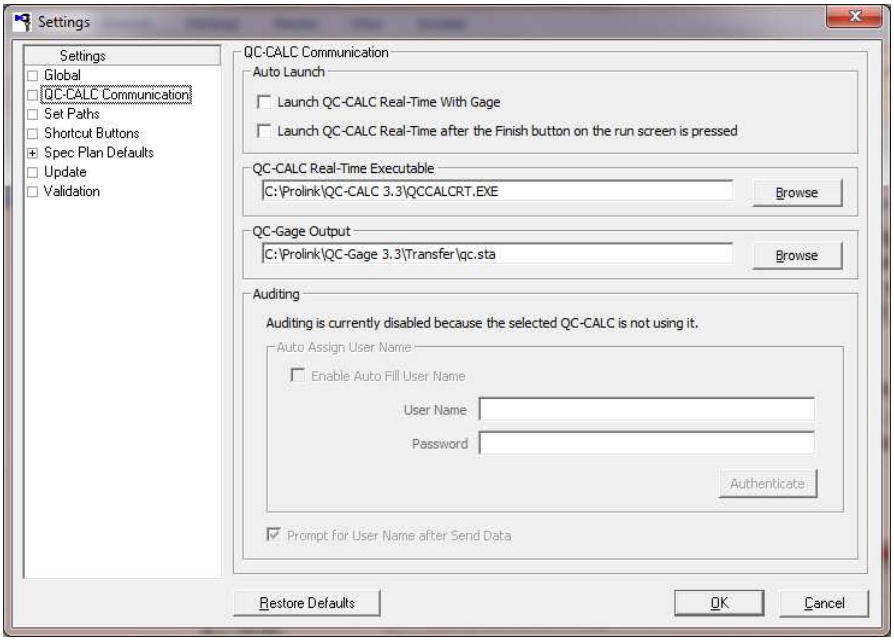
This option pops a dialog box saying the data was sent to QC-CALC.

10.2.13 GagePort – Show Mastering Button

10.3 QC-CALC Communication

10.3.1 Launch QC-CALC Real-Time with QC-Gage

Checking this option will launch QC-CALC Real-Time whenever you open QC-Gage. You cannot launch QC-CALC Real-Time through the network on another computer, so QC-CALC Real-Time must be installed on your local PC.



10.3.2 Launch QC-CALC Real-Time after the Finish button…

Checking this option will launch QC-CALC Real-Time when the **Finish** button on the Run Screen is pressed. This means if anyone has shut off QC-CALC Real-Time it will automatically be started and data collection will happen immediately.

10.3.3 QC-CALC Real-Time Executable

Choose the path and file name of QC-CALC Real-Time. The default value shown is the default installation location for QC-CALC Real-Time. If you have not installed QC-CALC Real-Time to this path and you would like to have QC-CALC Real-Time start whenever you start QC-Gage you must browse to the folder and select the **QCCALCRT.EXE** file.

10.3.4 QC-Gage Output

Choose the path and file name of the output file for QC-Gage. QC-CALC Real-Time will read this value and will use this file to collect the data and create the graphs you expect. You can change name and location, but be sure that QC-CALC Real-Time and QC-Gage are both restarted after this change is made in order to keep the two programs in sync.

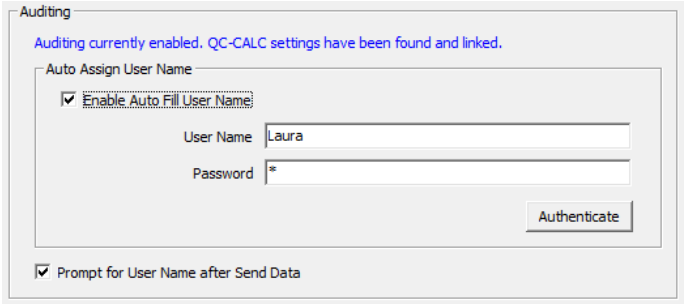
10.3.5 Auditing

The Auditing option is available for the 21 CFR Part 11 compliance. This option is automatically enabled if the QC-CALC Real-Time is collecting the data from QC-

Gage (referenced in the **Tools – Options – QC-CALC Communication – QC-CALC Real-Time Executable** area) has the same option enabled. When this option is used the operator will be asked to enter their User Name and Password when launching a Spec Plan. If they do not enter this information correctly, they will not be able to run the Spec Plan. Any parts that are collected during that session will be attributed to the operator that entered their information at the start of that session.

Auto Assign User Name

With this option operators will not be asked to enter their User Name and Password each time a Spec Plan starts. Instead, the User Name and Password entered here will be used every time to tag all data that is collected.

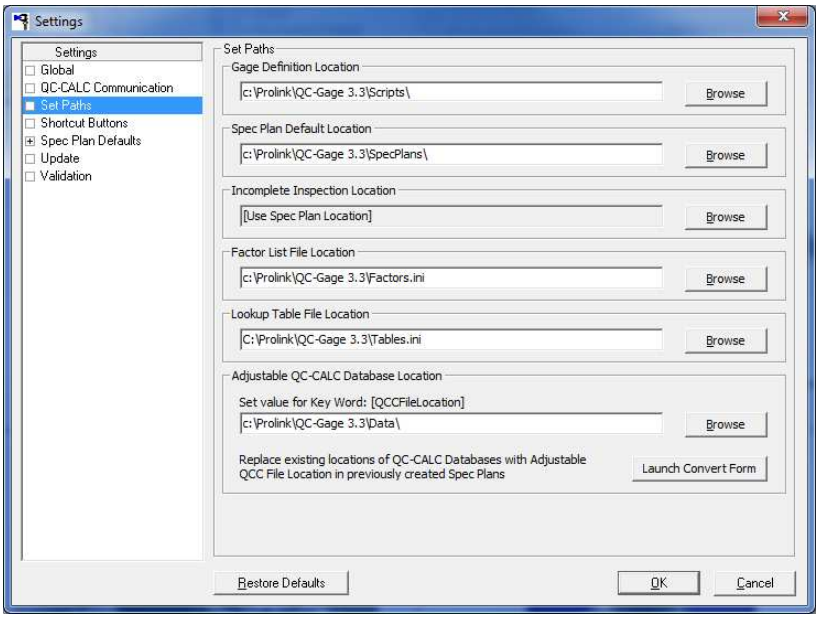


Prompt with Each new session for User Name after Finish

With this option enabled the operator will be asked for their User Name and Password when the Run Screen appears again after hitting the **Finish** button. When this option is not enabled the last operator to enter their User Name and Password will be the User Name tagged to any data that is collected.

10.4 Set Paths

QC-Gage has several file paths you can change. All of these paths are set by default but are presented in this setting screen enabling you to override the standard settings.



10.4.1 Gage Definition Location

Your gage definitions are stored locally but you might want to store all the Gage Definition (Script) files on a server. By setting this folder to a network location all QC-Gage copies within your company can share the Gage Scripts. This location is also the default location in the **Advanced** section of the **Welcome** screen in the Spec Plan Wizard. If you would like to move any Gage Definitions from one folder to another or share these files, you can access the Script files directly by using the **Tools – Open Gage Script Folder** menu. The Explorer view shows all the Script files and you can use typical Windows commands to move these files around.

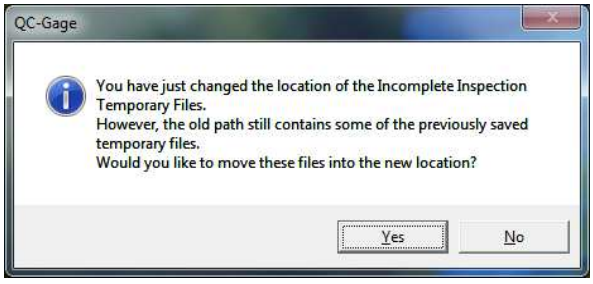
10.4.2 Spec Plan Default Location

The Spec Plan Default Location is used when creating or editing a Spec Plan. The **Advanced** options on the **Welcome** screen of the wizard allow you to **Override the Spec Plan Path** for the Spec Plan you are editing. If that option is not set, this path will be used instead.

10.4.3 Incomplete Inspection Location

When using the **Allow sessions to be saved and continued later** option within a Spec Plan the partial runs are saved in a temporary file. This setting controls the location of those files. If the temporary files are saved in a network location you can continue a partial run from anywhere that has access to that network location and the corresponding Spec Plan.

If you change the location of the Incomplete Inspection files and there are files in the previous location you will be asked if you would like to move the old files as shown in the picture below.



10.4.4 Factor List File Location

This file holds all of your factor lists. If multiple copies of QC-Gage are using the same Spec Plans, then this file should be saved in a central location and all copies of QC-Gage should reference that location here. Factor Lists are created and edited from the **Tools – Options – Spec Plan Defaults – Factors** area or during the Spec Plan Wizard.

10.4.5 Lookup Table File Location

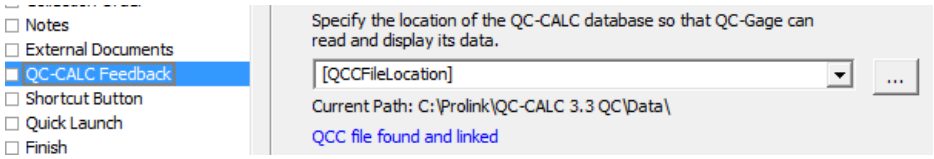
This is the location of the file that holds any Sample Size Lookup or Calculation Tables that have been created. If multiple copies of QC-Gage are using the same Spec Plans, then this file should be saved in a central location and all copies of QC-Gage should reference that location here. Both types of tables are edited from the Tools menu along with the step in the Spec Plan Wizard where they are used.

10.4.6 Adjustable QC-CALC Database Location

Set value for Key Word: [QCCFileLocation]

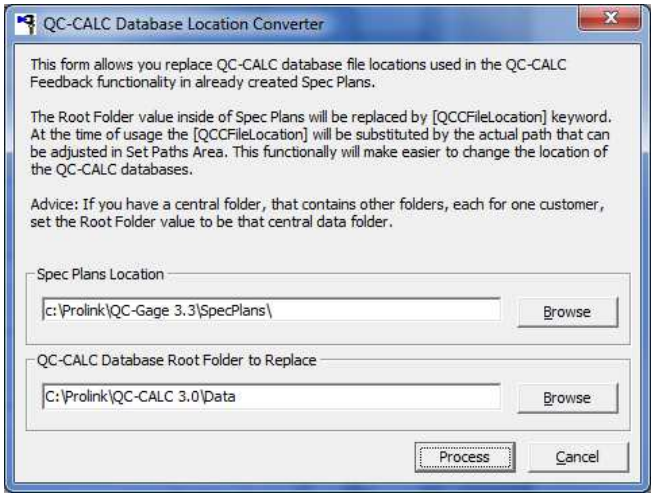
With this option you can use a variable for the location of the .qcc file within each Spec Plan as shown below, then if the main location the .qcc files are being

stored moves you can change the single setting in the Tools – Options area instead of needing to change the .qcc file location within each separate Spec Plan you have written.



Launch Convert Form

Since the [QCCFileLocation] option was developed over time you may have many Spec Plans that were written before this option was available. We provided a utility that will change a hard-coded file location inside your Spec Plans to the [QCCFileLocation] value.



Spec Plans Location

Choose the folder containing your Spec Plans in this area. The processing will find any .spl files within that location.

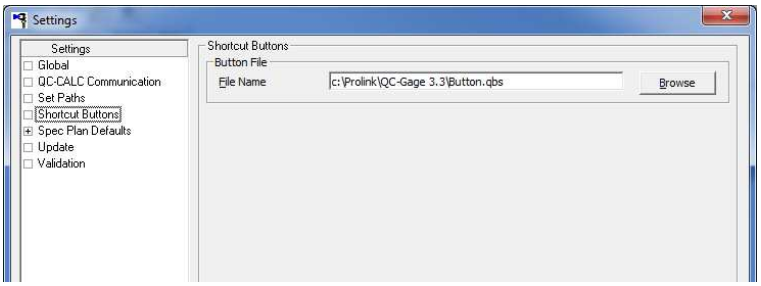
QC-CALC Database Root Folder to Replace

The folder selected in this area is the path that will be replaced by the [QCCFileLocation] variable inside any Spec Plans.

10.5 Shortcut Buttons

10.5.1 Button File

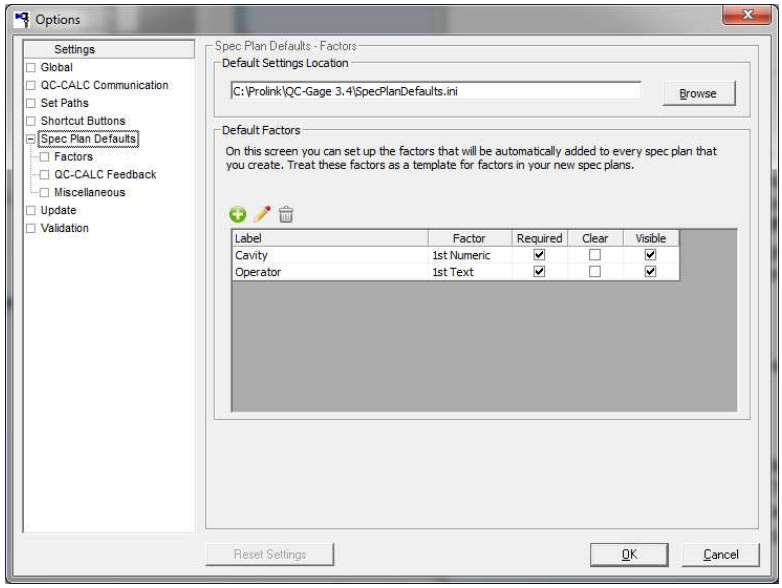
The Button File contains all of the button information. If you choose a common network location for all copies of QC-Gage then location of QC-Gage will look the same. Set up the buttons on a single copy of QC-Gage and all other copies will use the same buttons as long as all copies use that same button file. Often customers will set up several button files for each logical group in their organization that measures the same types of parts.



10.6 Spec Plan Defaults

10.6.1 Factors

When writing a new Spec Plan, you can setup default Factors and values that are included in each new Spec Plan. This means you establish a baseline of Factor names, values, and options which are automatically inserted in your Spec Plan as you move through the wizard. This default Factor option was added to speed up the process of writing Spec Plans and ensure consistent Factor usage. For best and consistent operation, set them up as soon as possible.



Default Settings Location

The file specified here holds the contents added in this screen. If you have more than one QC-Gage station and wish to share the same Factor settings across all copies, point each copy of QC-Gage to this common file. For example, set **Default Settings Location** to **K:\Factors\SpecPlanDefaults.INI**, enter all of your values, and point all other copies of QC-Gage to this common file. All QC-

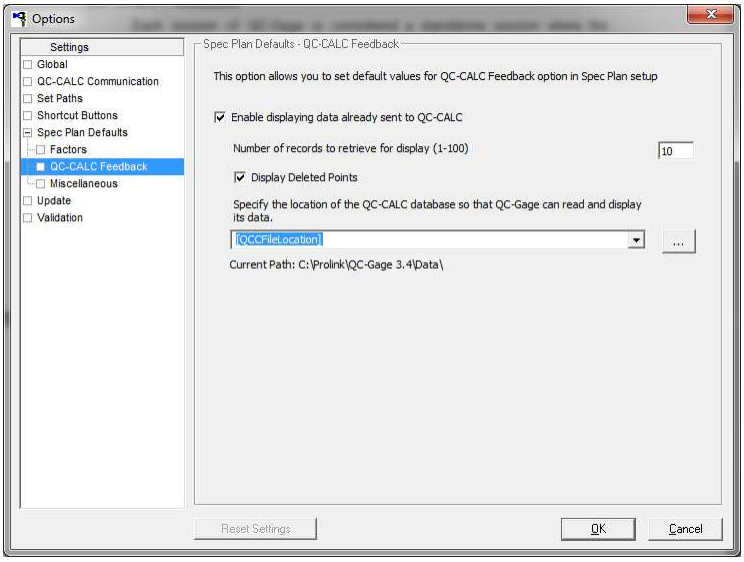
Gage stations will now have the identical values available during the writing of a new Spec Plan.

Default Factors

This area is similar to the one discussed during the writing of a Spec Plan in the Step #5 – Factors section on page 15. By adding a standard set of Factors in this default area you ensure each new Spec Plan is written with the same number of Factors in the same order.

10.6.2 QC-CALC Feedback

Each session of QC-Gage is considered a standalone session where the inspector only sees the data they are entering. There are times you may want historical data viewed by the inspector giving them feedback to the size and condition of previous parts. This concept was discussed in the Step #11 – QC-CALC Feedback section on page 31.

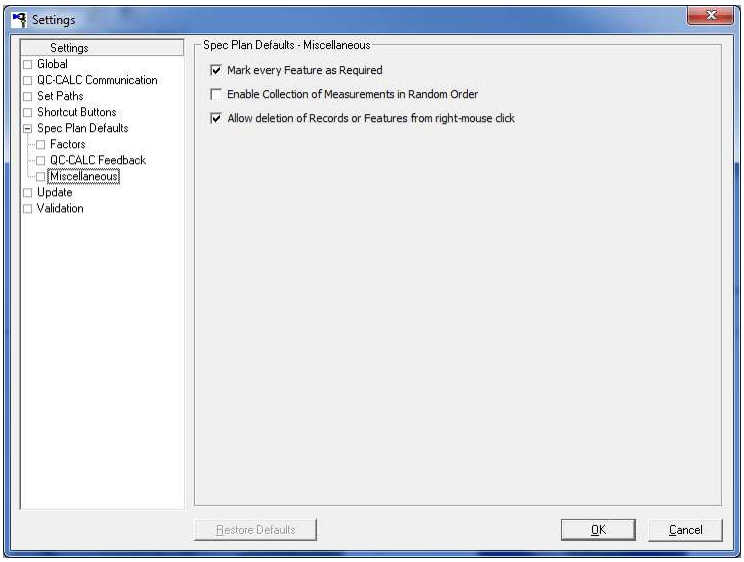


If you check the **Display Deleted Points** option any individual points deleted in QC-CALC are shown in the feedback chart. Also, if you are storing your QC-CALC data on a network, you may have to adjust the file path to so QC-Gage can display the historic data. Using the down arrow on the right side of the box allows you to choose [QCCFileLocation] instead of using a specific path. This is the recommended option in this area and the [QCCFileLocation] setting is discussed in the Adjustable QC-CALC Database Location section on page 66.

10.6.3 Miscellaneous

Mark every Feature as Required

With this option checked each new Feature that is added to a Spec Plan will have the **Required** flag checked automatically. The **Required** flag on each feature can be changed within the Spec Plan, so this is just the value all new features will start with.



Enable Collection of Measurements in Random Order

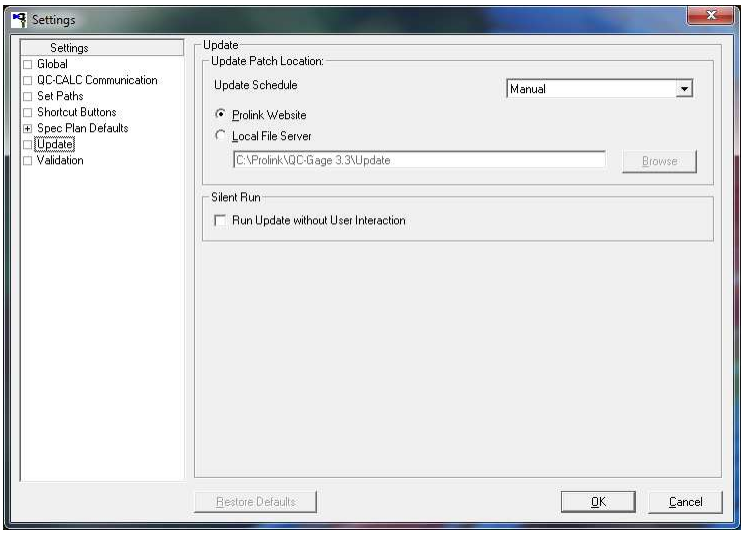
This setting is used as the default setting for the **Enable collection of Measurements in random order** option on the **Choose Gages** screen of the Spec Plan Wizard for any new Spec Plans. The final value used can be changed within the Spec Plan, so this is just a starting point.

Allow deletion of Records or Features from right-mouse click

This setting is used as the default setting for the **Allow deletion of Records or Features from right-mouse click** option on the **Choose Gages** screen of the Spec Plan Wizard for any new Spec Plans. The final value used can be changed within the Spec Plan, so this is just a starting point.

10.7 Update

QC-Gage has the ability to automatically check for updates for the latest version. There are two methods of updating the software: From the **Prolink Website** (www.ProlinkSoftware.com) or from a **Local File Server**.



10.7.1 Update Schedule

If you do not want QC-Gage to check for updates automatically, then set the frequency to **Manual**. With this setting at **Manual**, the **Help – Run Update** menu will be the only method of performing the update operation. The other choices for this are to check for updates **Every Time QC-Gage Starts**, **Once Every Day**, **Once Every Week**, or **Once Every Month**.

10.7.2 Update Patch Location

QC-Gage can be configured to look in 1 of 2 locations for the update patch. By default QC-Gage checks the Prolink website to see if a new patch is available but you can also choose a location on your local network if that is preferable.

If you want to update individual copies using a central location (meaning you control when the updates are downloaded and installed), then you need to visit the Prolink website to download the update to a location where it will be accessible to everyone. After the update has been downloaded, configure all QC-Gages to check for available updates from that location by setting the **Update Patch Location** to the path where the update is stored.

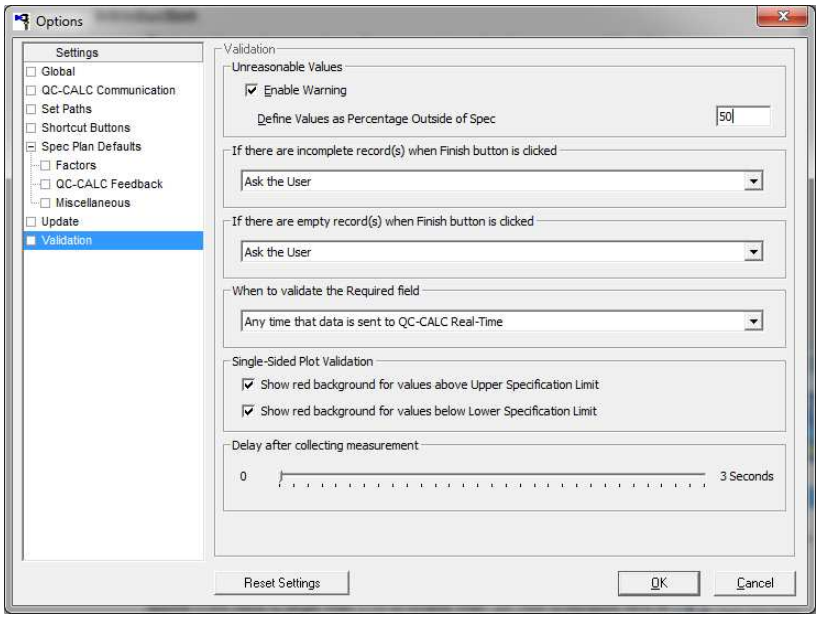
10.7.3 Silent Run

Using the **Run Update without User Interaction** option along with the automatic updating will keep QC-CALC up to date without the operators having to do anything at all. If a needed update was detected when the program started, the update will be downloaded and installed, then the program will start automatically when the updating process is finished.

10.8 Validation

10.8.1 Introduction

There are times when you know for sure you've entered an unreasonable value. To ensure these types of errors are detected, QC-Gage can be programmed to watch for very large or very small numbers. The warning limit is based on a percentage of total tolerance such as 150% of the upper or lower spec limit. You can choose the percentage by selecting **Tools** – **Options** – **Validation**.



10.8.2 Unreasonable Values

The **Enable Warning** checkbox turns on the system while the **Percentage Outside of Spec** is the percentage that will generate a warning message. When a value is received, a warning appears if it exceeds the spec limits by the percentage shown. The user can then choose to re-enter the value or accept it as is. In the example above, the unreasonable value percentage is set to 50% outside spec. Therefore, if the feature nominal is 1 +/- 0.5, then a warning will appear if the value is larger than 1.75 or smaller than .25. This is because 50% of the spec limits is 0.25.

10.8.3 If Incomplete Record(s)…

If you miss the measurement of a feature on any of the parts that you are supposed to measure this option will do one of four things:

Send the Incomplete Record(s)

If you select to send the incomplete record(s) then the data you have entered will be sent to QC-CALC Real-Time. If you have missed a feature QC-CALC Real-Time will show it as a deleted point on the graph.

Discard the Incomplete Record(s)

This selection will throw away all of the data for the inspect part(s) that have not been completed. This option does not ask you before discarding.

Save Incomplete Inspection if it is enabled in the Spec Plan

Any Spec Plan that you enabled partial inspection as discussed in the Partial Inspection section on page 39 shows a **Save** button on the **Run Screen**. This

button is only shown when partial inspection is active. All entered data is saved in a temporary location until you continue inspecting this part or parts.

Ask the User

With this option a window pops up to ask you to send the data that has been collected or to continue running the Spec Plan in order to finish Spec Plan.

10.8.4 If Empty Record(s)…

If your spec plan is set up to measure a certain number of parts but you do not have that many parts to measure you can use this option. There are two choices with this option:

Send the Complete Record(s)

With this option, any records (parts) that have been fully measured will be sent to QC-CALC Real-Time without any questions being asked about the empty row(s). If you couple this option with **Send the Incomplete Record(s)** option from above the inspector will have no questions asked and whatever features on whatever parts are inspected will be passed through to QC-CALC Real-Time.

Ask the User

With this option the operator is asked if they want to send the parts they have finished or if they want to continue to measure so they can complete the spec plan.

10.8.5 When to validate the Required field

Each feature in a Spec Plan has a **Required** flag associated with that feature. This flag controls weather or not the operator can Finish running the Spec Plan without a value being entered for that feature. There are different times that QC-Gage can check to see if all **Required** features have been entered and this setting controls when QC-Gage does that checking.

Any time that data is sent to QC-CALC Real-Time

It is possible to send a partially finished Spec Plan to QC-CALC Real-Time with the intention that the operator would return to finish inspecting the part later. With this choice features that have a Required flag enabled in them MUST be entered before the data can be sent to QC-CALC Real-Time.

Only when a partial part is Finished for the final time

With this option it is probable the **Save and Continue** functionality is being used. The operators are saving the partially inspected Spec Plan (without sending the data to QC-CALC Real-Time) and will return to finish the inspection at a later time. In this case QC-Gage will not check to make sure all **Required** features have entered values until the session is finished for the final time (not the Save and Continue operation) and the data is being sent to QC-CALC Real-Time.

10.8.6 Single-Sided Plot Validation

Show Red background for values above USL

This option merely allows the background color to change to red for values above the upper spec limit. This is the normal operation.

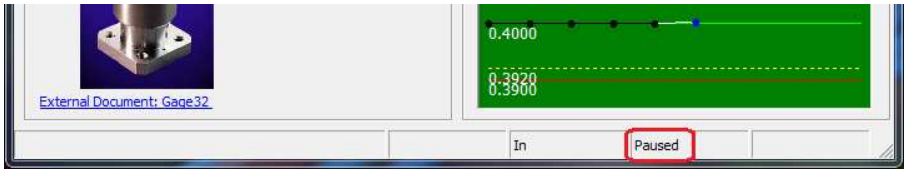
Show Red background for values below LSL

This option merely allows the background color to change to red for values below the lower spec limit. This is the normal operation.

10.8.7 Delay after Collecting Measurement

QC-Gage moves quickly to the next feature being measured thereby making it difficult to see the last value entered. By adding a delay after taking a measurement you will see the plotted point along with its background color of red

or green for a short time. The default delay is 0 seconds and therefore QC-Gage moves to the next feature without delay. You will see a **Paused** message in the lower tray during the time the plot is delayed.

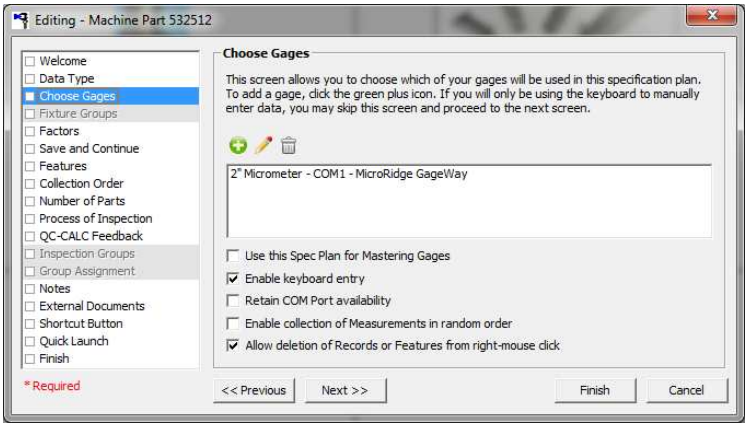


11. Connecting Gages

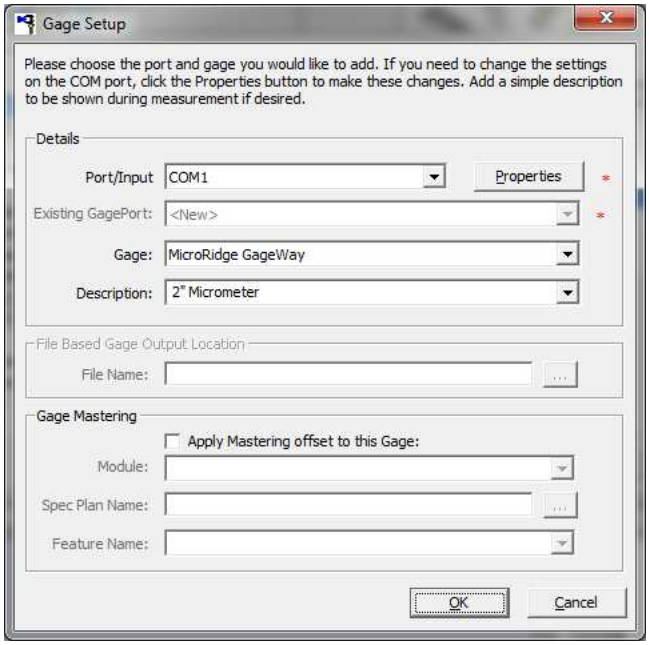
11.1 Introduction

We briefly discussed adding a gage to your Spec Plan in the wizard section of this training manual but the details of this process are discussed in this section.

Connecting a gage to your Spec Plan can be as simple as selecting the COM port to use, picking the gage, and giving it a friendly name. When you connect a gage to the Spec Plan you make any inspection results available via an electronic button. If you have a gage or multiplexer connected to this computer, click the **Add Gage** button( ). Add as many gages to the Spec Plan as needed.



In this example we show a MicroRidge Gageway connected to COM1. You select the COM port in which the gage is connected, the gage, and a description. You can add more descriptions as needed. If you do not see your gage name in the list, you can add it by choosing the **Tools** – **Gage Definitions** from the main QC-Gage menu.



11.2 Description

The **Description** is used to identify a gage by using a simple message. Use a name that makes it easy for you to distinguish one gage from another. You will see a dropdown list of all descriptions used for the Gage type selected.

11.3 Gage Port Properties

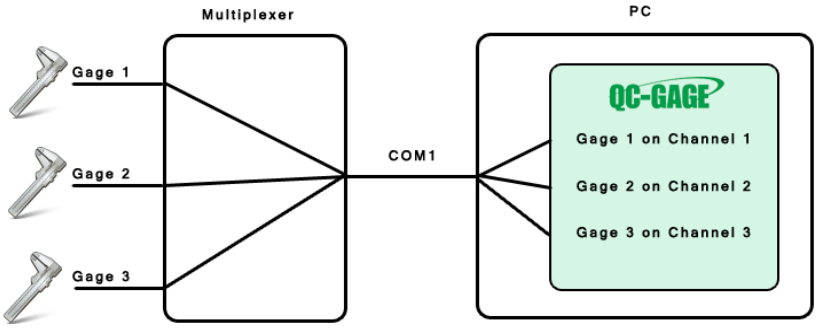
The default **Properties** such as Baud Rate, Parity, etc. are stored in the Gage Definitions but you can override the settings in each Spec Plan. Most likely you will never need this capability but it is available.

11.4 Connection Considerations

When you click **OK** the gage is now attached to this Spec Plan and all references to the gage are by its name. You can use this gage for 1 or more features within the Spec Plan. In other words, if the gage is a caliper on COM1 it can be used to measure one or more diameters on the same part within the same Spec Plan.

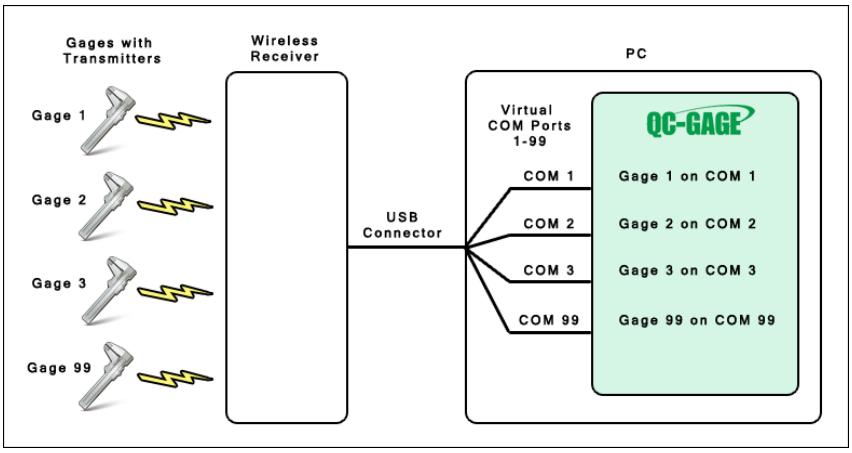
11.5 Multiplexers

Originally, COM ports were scarce and multiplexers were designed to share a single COM port with multiple hand gages. The Mitutoyo Mux-10 is an example of this older technology. This simple diagram shows how 3 gages share a single COM port by sending channel numbers with each measurement. The QC-Gage Spec Plan must interpret the channel to ensure proper data storage.

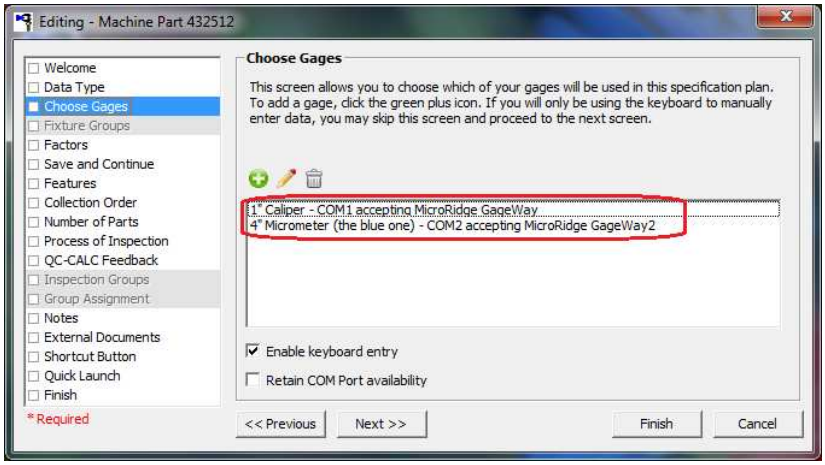


11.6 USB Virtual COM Ports

With the advent of USB ports, most wireless suppliers provide software to create virtual COM ports for each transmitter purchased. The base unit (receiver) is connected to the computer via a USB port. Instead of being limited to COM1 or COM2, the virtual software simulates up to 100 COM ports. This gives you direct access to the gage's data without sharing a multiplexer. The USB port essentially acts as the multiplexer. Writing Spec Plans becomes easier and more understandable since each gage is directly connected to its own "COM" port.



If you are using a MicroRidge wireless gage or any multi-port device connected to virtual COM1 and another MicroRidge on virtual COM2 you should add a description that indicates which gage is attached to which port. MicroRidge separates each attached gage by using a virtual COM port which means you can add a caliper to COM1 and micrometer to COM2. Here we connected 2 gages but notice the descriptive names used. This helps you while writing new Spec Plans.



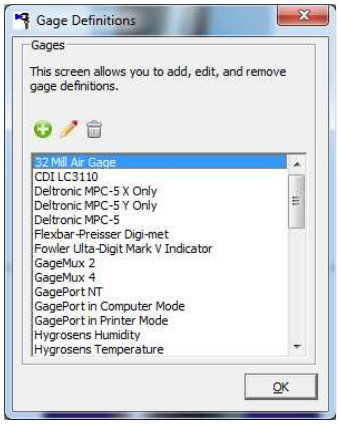
11.7 Gage Definitions

11.7.1 Introduction

In order for QC-Gage to recognize a gage and accept data from it, QC-Gage must have a Gage Definition for that gage. Without a definition, you cannot add the gage to a Spec Plan because it uses a combination of settings and scripts to define the gage. The settings contain information such as the serial port the gage is connected, the baud rate at which it transmits, and what if any, parity it uses. The settings can also change for different gages of the same type and model number. The scripts, on the other hand, should never change. They tell QC-Gage how to interpret the output of the gage – what data it should ignore and where the reading is located. The gage script recognizes and interprets all possible gage outputs.

A large number of gage definitions are provided with this software. These gage definitions are available on our web site, www.ProlinkSoftware.com. If your gage is not in the list of supported gages and is not on our website, you can call us to see if it is under development.

11.7.2 Write a Gage Definition



Gage definitions are created or edited by selecting **Tools** – **Gage Definitions** from the QC-Gage menu. The list of gages displayed were provided with the software or you may have downloaded them from our website or written them yourself.

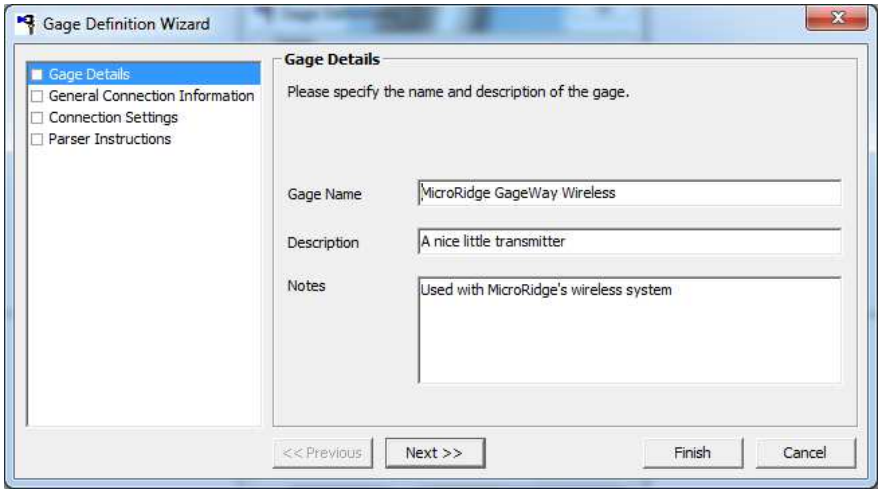
11.7.3 Creating a New Gage Definition

Press the **Add** button to begin the process of creating a new definition. The first step involves the Gage Name, Author, Company, and Date. Press this Add button and we'll go through the steps one at a time.

- Step #1 – Add New Gage
- Step #2 – General Connection Information
- Step #3 – Connection Settings
- Step #4 – Parser Instructions

Step #1 – Add New Gage

A simple wizard is displayed walking you through the steps of interfacing a new gage. Enter a reasonable gage name that is a recognizable, a brief description, and any helpful notes that others may find useful. Click **OK**.

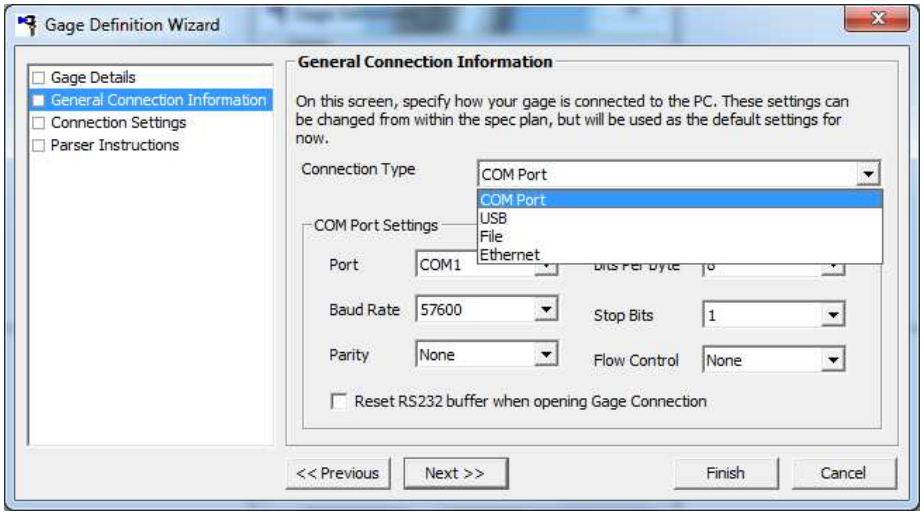


Step #2 – General Connection Information

QC-Gage stores the port settings in two locations. The port settings are part of this Gage Definition and also part of a Spec Plan. The settings stored within the Gage Definition are the default settings for the gage.

Connection Type: COM Port

QC-Gage now supports data arriving from an RS-232 communication port, USB, a File, or a directly connected Ethernet. The settings described below are the COM Port settings only.



Port

For each gage you can select the COM port and setup the port characteristics. The list labeled Port determines which port the device is connected to.

Baud Rate

Specify the transfer rate of your gage device. Some interfaces can transmit at more than one baud rate so check the hardware manual and select the speed that matches the current speed.

Parity

Some gages send a parity bit for error checking. If your device sends parity, select 7 data bits and then specify which type of parity required. Odd, Even, Mark or Space. If you selected 8 data bits in the previous option, select None here.

Bits per Byte

Specify the number of data bits in the data packets sent from the gage.

Stop Bits

Specify the time that elapses between transmitted characters. Normally this should be 1. Only early teletype devices used 2 bits.

Flow Control

How should QC-Gage tell the gage that the receive buffer is too full to receive more data. Flow control prevents lost data. QC-Gage can use either method of flow control or ignore flow control and risk overflow. Use whatever method of flow control the gage supports.

Software

QC-Gage sends an XOFF character when the buffer is almost full and an XON when the buffer is almost empty. This is the most common method. If you don't know which flow-control method the gage uses, try this one.

Hardware

QC-Gage uses two of the wires in the serial cable to tell the gage when it can send data. This method is not recommended unless the gage specifies it is required.

None

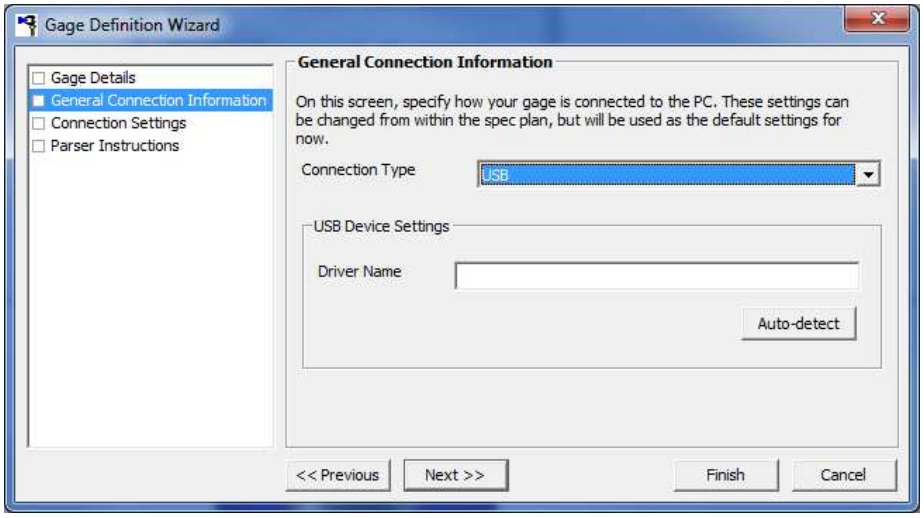
Throw away the data if too much comes in. Choose this option only if the gage cannot use flow control.

Reset RS-232 Buffer when opening Gage Connection

This checkbox option forces the COM port to reset itself thereby clearing out any leftover data in the computer. Normally you should use this option it case the gage sends junk during the opening of the COM port.

Connection Type: USB

QC-Gage now supports data arriving from an RS-232 communication port, USB, a File, or a directly connected Ethernet. At this time, the only USB device configured using this area is the Marposs Easybox.



Driver Name

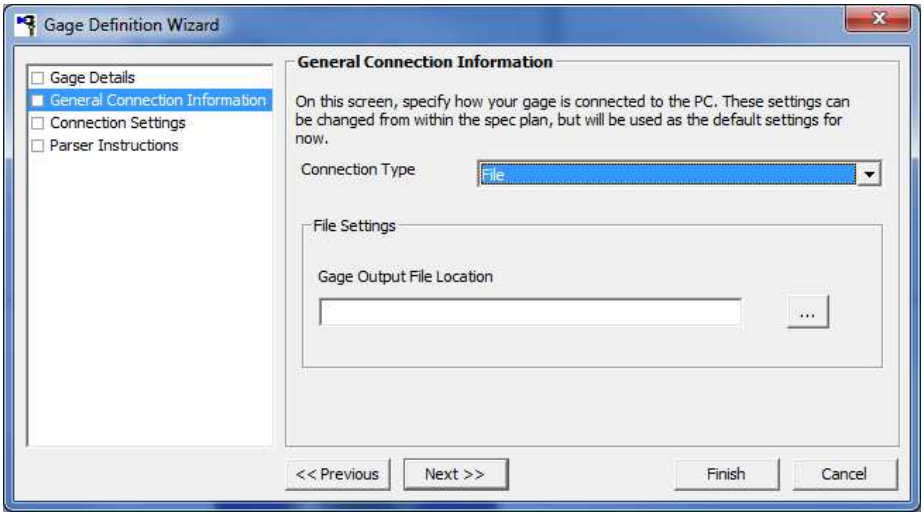
This is the driver that QC-Gage will use to communicate with the Marposs Easybox via USB.

Auto-detect

This button is used to search all attached USB devices looking for a Marposs Easybox.

Connection Type: File

QC-Gage now supports data arriving from an RS-232 communication port, USB, a File, or a directly connected Ethernet. The settings described below are the File settings only.

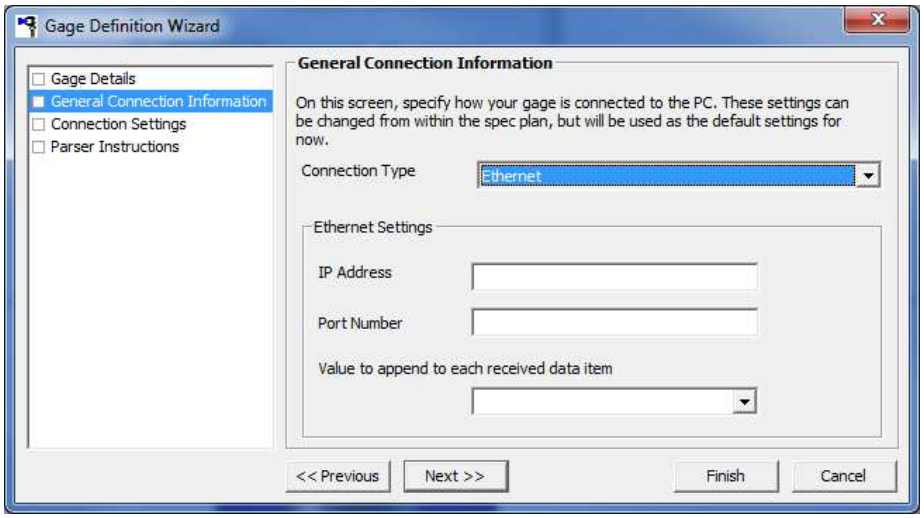


Gage Output File Location

This is the location of the text file that QC-Gage will read to collect data.

Connection Type: Ethernet

QC-Gage now supports data arriving from an RS-232 communication port, USB, a File, or a directly connected Ethernet. The settings described below are the ethernet settings only.



IP Address

This is the IP Address QC-Gage needs use to communicate with the Ethernet-based gage.

Port Number

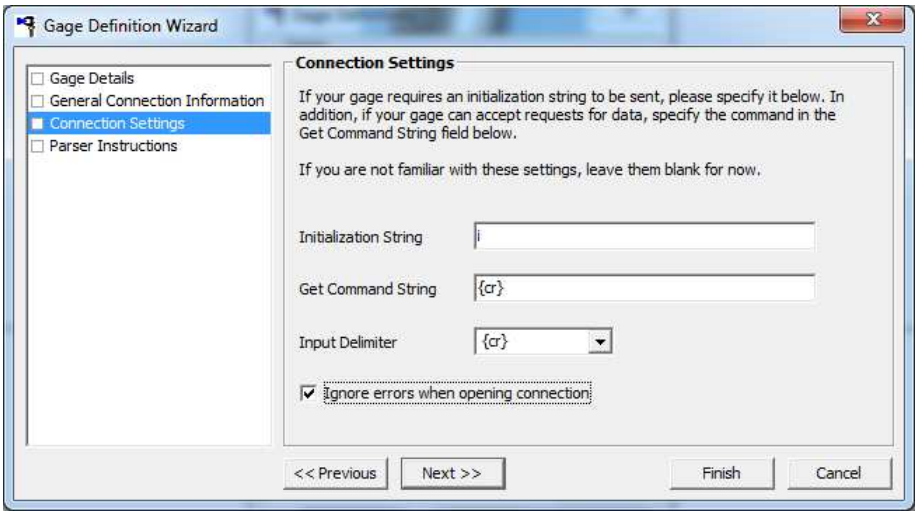
This is the port QC-Gage needs use to communicate with the Ethernet-based gage.

Value to append…

Many Ethernet-based gages do not send any value to indicate where one value ends and the next one begins. QC-Gage needs to have something to signify to the parse that the reading is finished, so adding a value here gives the parser something to use later.

Step #3 – Connection Settings

The third step is for initializing and controlling the gage. If your gage can receive commands from the computer, enter them here.



Initialization

Many gages require or accept an initialization string which is a set of commands that prepare the gage for use. For example, you could command the gage to send data in inches, to send long or short output format, or add carriage returns to the end of each line. QC-Gage sends the initialization string when an operator runs a Spec Plan and only happens once at the start of each inspection. Initialization strings are written in the same language used for gage scripts.

Get Command String

A “get command string” is a command QC-Gage sends to a gage to request data. Not all gages accept a “get” command string. QC-Gage parses this string and sends it to the gage every time the user presses the **Pull Data from Gage** button on the Run Screen.

Input Delimiter

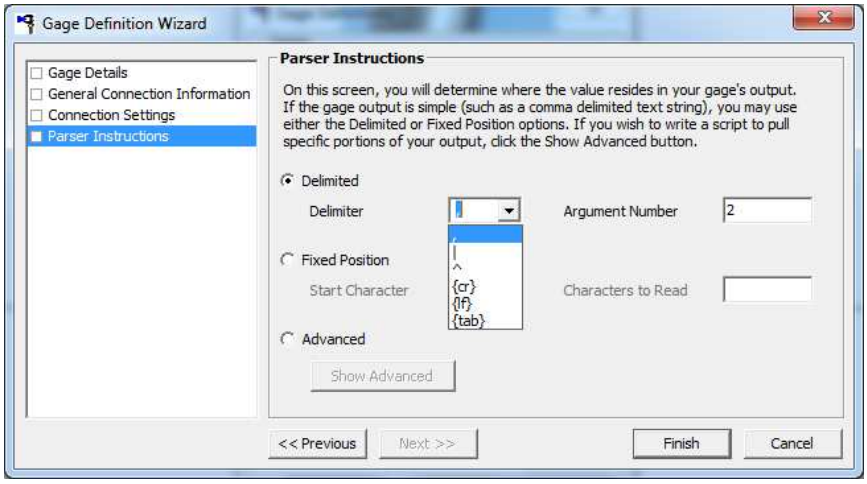
The input delimiter is the character that divides incoming text into multiple readings. The carriage return ({cr} usually separates the readings but you can select a linefeed {lf} or a tab {tab} character if required.

Ignore Errors when Opening Connection

This checkbox option is used when your operating system creates an I/O error when the port is opened. In most cases, this option is not needed, but if you see errors or strange characters in your input stream, use this option to clear the junk.

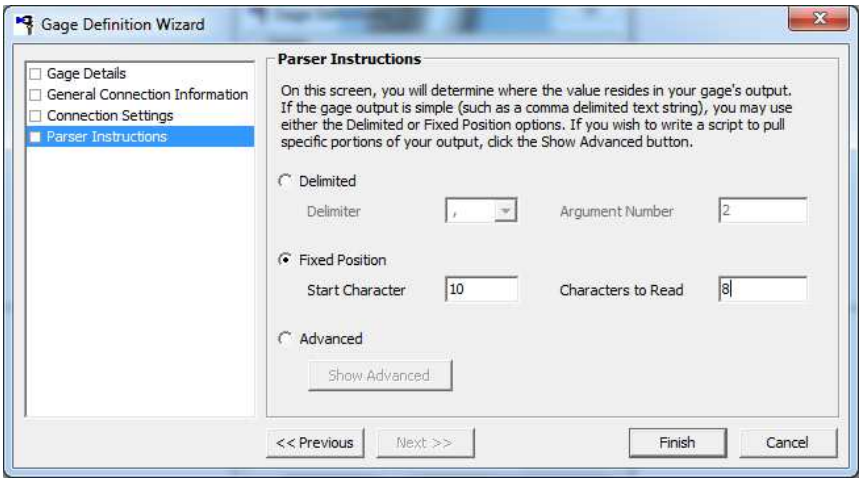
Step #4 – Parser Instructions

The concept of parsing a string of characters generated by a gage and received by QC-Gage is not too difficult to understand. If the gage simply sends the measured value such as +1.2345 then no parsing is necessary since the character received have no junk to skip.



Delimited Text

However, what if the gage sends "**ChanA, -1.2345, no errors**"? Notice the value of interest is in the middle of a bunch of letters all separated by commas. In this case an easy method of parsing the string of text is option 1 below labeled "**Delimited**". In this example you would simply select a comma for the delimiter and then specify 2 for the **Argument Number** meaning the second item found. If your gage sends comma separated values or Pipe (|) or semicolons (;) the process is the same.



Fixed Position

If you gage always sends its readings in the same column location you can specify the start location and the number of characters to read. For example, if your gage sends **Channel 6-1.2345 Mode 2** you can select "**Fixed Position**" and specify Start Character position 10 (the minus sign) with a length of 8. These two parsing methods will solve 90% of your gaging needs.

Advanced

The most difficult part of setting up a new gage is understanding the built-in parsing language of QC-Gage. If the last two parsing methods did not satisfy your needs you'll have to use the advanced method.

Pressing the **Show Advanced** button brings you to a special screen where you "chop up" the string of characters that arrive from the gage when the gage transmit button is pressed. We refer to the parser as QC-Parse or the Gage Script Editor. See the Gage Script Editor section on page 90 for details.

11.7.4 Parsing Script

The Parsing Script, or Gage Script, is the heart of a Gage Definition. It tells QC-Gage how to interpret the gage's output. QC-Gage uses a special language designed to break strings of characters into component parts. As a New Gage Author, you will write scripts in this language. The language is described in detail in Gage Script Language starting on page 95.

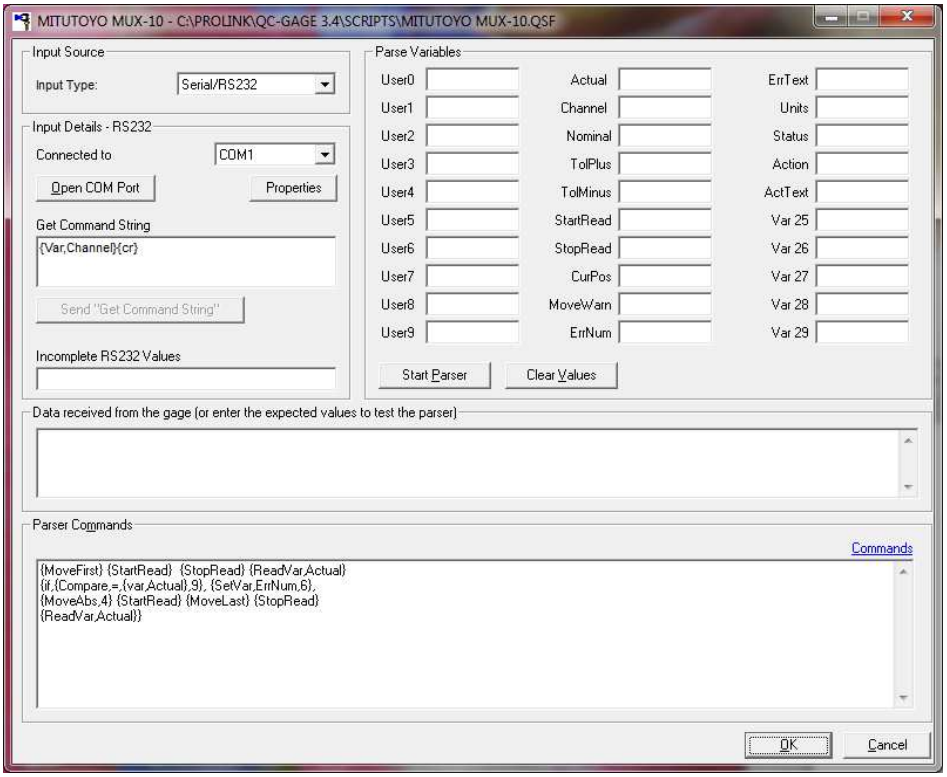
The Parsing Script tells QC-Gage which of characters sent from the gage are the actual measurements and which characters are useless junk. Most gages transmit very simple strings and therefore have simple Parsing Scripts, but others send strings 100 characters along with optional fields, requiring complex scripts. The following two examples are possible output from a gage:

```
e.g  1.23456          ← gage sent just the value
e.g  ch2  1.23456  mm  ← channel 2 followed by the value and units
```

The **Gage Script Editor** or QC-Parse provides you with a mechanism to test the gage interface with the computer and develop working Gage Scripts. Run it from QC-Gage by clicking the **Advanced** button.

QC-Parse Screen Components

The QC-Parse screen has several areas and items that need to be discussed. As you view the screen you see many labeled items. We will skip the definition for now but instead we will step you through a simple example and then define the QC-Parse Screen Components on page 90.



Data received from Gage

Data received from the serial port is placed at the top of the **Data** box. If no gage is present and you know what the gage will actually send when you connect it, you can the type or paste text directly into this box and write the parsing strings.

Remember, you haven't tested the physical connection, only the parser instructions. Please enter 1.2345 as shown above.

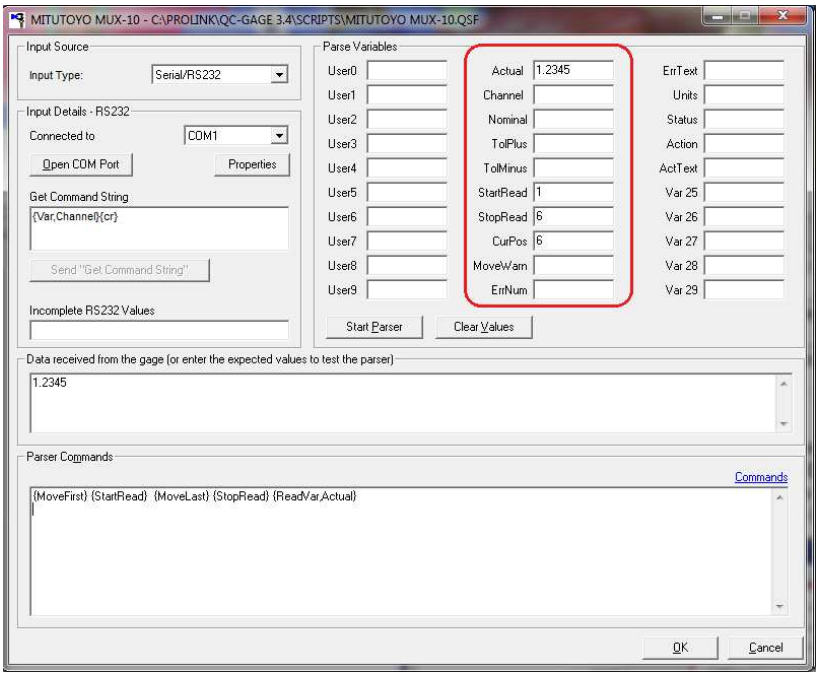
Parser Commands

These are the actual commands the parser will perform on the data in the **Data received from gage** box. All commands are framed in curly brackets { }. Because most gages are very simple, the Parser adds these commands for you. If these commands are not present, please enter them.

{MoveFirst}	This command puts the imaginary cursor at the beginning of the line and prepares it to move.
{StartRead}	We now tell the parser to begin from the beginning of the line. Everything between the {StartRead} and the {EndRead} will be moved to the Actual value.
{MoveLast}	The cursor is placed at the end of your text which is to the right of the 5.
{StopRead}	Now we stop the reading at the last position and capture all characters in our buffer.
{ReadVar,Actual}	And finally, we move what we moved over into the Actual reading variable.

Start Parser

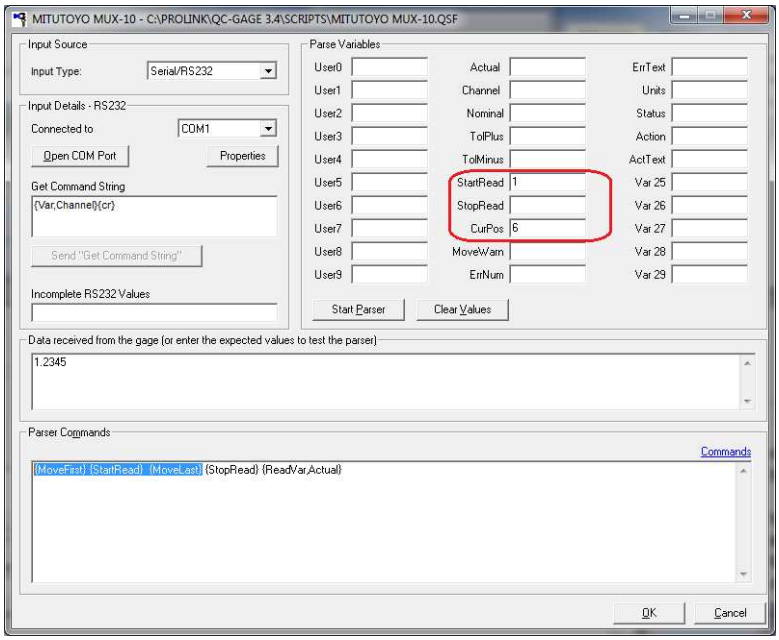
Clicking this button starts QC-Parse executing. It parses the first line of text in the **Data Received from Gage** box (1.2345). All **Parser Commands** are executed when you click the **Start Parser** button. Notice how the value of 1.2345 is shown in the **Actual** area? Three other values are also shown based on the parser.



If you select a portion of the Parser commands using the mouse to highlight it, you can reduce what is executed in the **Parse Commands** box. The results are placed several of the 30 variable text boxes for you to review. This is used to single-step the parser so you can tell if you achieve the expected results.

As an example, let's click the **Clear** button to start over and highlight the first three commands as shown. Now press the **Start Parser** button and notice how

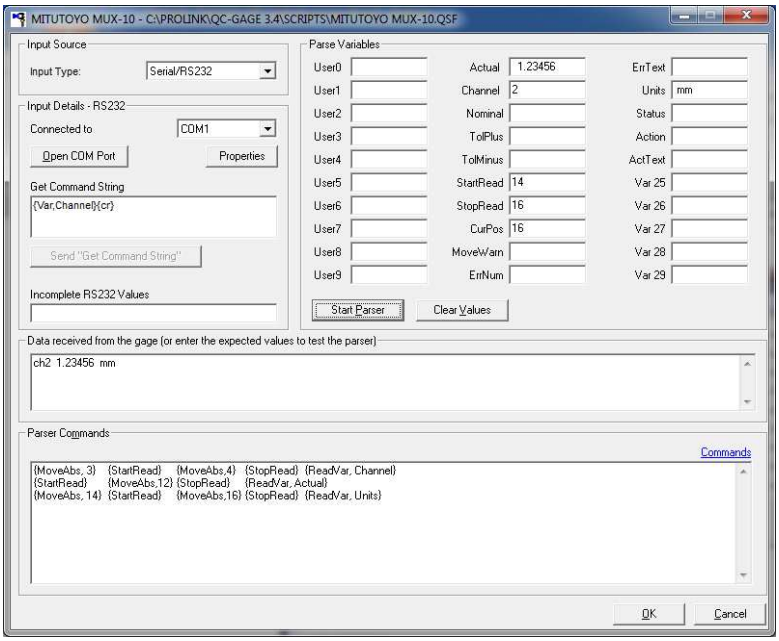
the parser stops short by leaving us at CurPos = 6. You can continue highlighting sections of your parser commands to test each section in a single-step fashion.



In all examples, the value sent to QC-Gage is the value found in the **Actual** box of this screen. Press **OK** to save your changes which brings you back to the **Gage Definition** screen.

Example #2

In this example we see the gage transmits three pieces of information including the measurement value in the middle. Let's assume you want to ensure the value comes from channel #2 and the gage is set in millimeters.



The received text from the gage is: **`ch2 1.23456 mm`**

We need to write a script to read and gather all three pieces of information and send it back to QC-Gage. The following three lines do exactly what we need.

```
{MoveAbs, 3} {StartRead} {MoveAbs,4} {StopRead} {ReadVar, Channel}
{StartRead} {MoveAbs,12} {StopRead} {ReadVar, Actual}
{MoveAbs, 14} {StartRead} {MoveAbs,16} {StopRead} {ReadVar, Units}
```

11.7.5 Working with Gage Definitions

Each Gage Script is stored in C**:\Prolink\QC-Gage 3.4\Scripts** in a separate file with a file extension of .QSF. You can import and export these files by simply copying the files from one computer to another.

11.7.6 Editing a Gage Definition

From QC-Gage's Main menu select **Tools** – **Gage Definition**. Select the gage to modify from the Gage Name list box and make your changes. To change the parsing script, click the **Advanced** button. Remember that you can change the COM port and the communications parameters for a gage in a Spec Plan without changing the defaults. Changing the defaults does not affect any existing Spec Plans. Changing the parsing script, Initialization string, or the **Get Command** string does affect existing Spec Plans.

11.7.7 Deleting a Gage Definition

Delete a gage definition by selecting the gage in the **Gage Name** list then clicking the **Delete** button. Make sure no Spec Plans use the gage before you delete it.

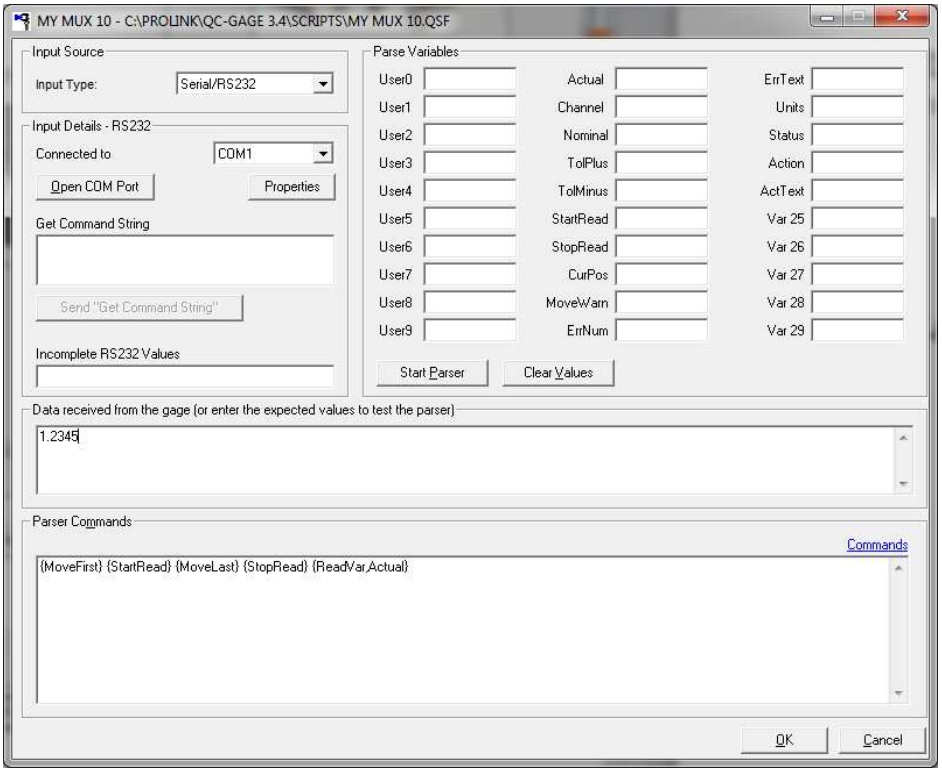
12. Gage Script Editor

12.1 Introduction

The Gage Script Editor, QC-Parse, provides you with a mechanism to test the gage interface with the computer and develop working Gage Scripts. QC-Parse uses the Gage Script Language defined on page 95. You should read the language definition before you start defining a gage. You should also connect the gage to the computer and make sure it can send data to Microsoft HyperTerminal. Using HyperTerminal verifies the gage and cable work correctly.

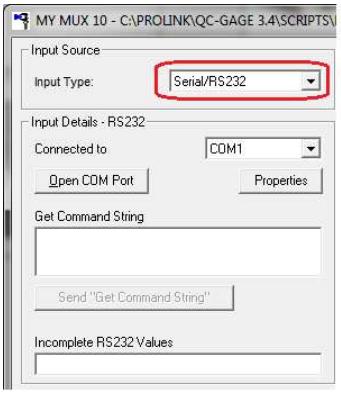
12.2 QC-Parse Screen Components

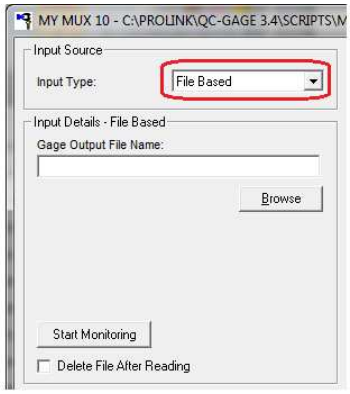
The QC-Parse screen has several areas and items that need to be discussed. As you view the screen you see the following labeled items.



12.2.1 Input Source

You can choose between both **Serial/RS232** source and **File Based** source of data. When you select either of these input sources, the "Input Details" frame changes. This allows you can make the changes needed for your unique selection. Here are the differences between RS232 and File.





12.2.2 Input Details – RS232

Opens or Closes the RS232 serial port designated by the hardware screen. It uses all settings found on that screen. If communications fails, go back and set the values until the gage and computer match. Once the serial port is open, the **Send** button is enabled and you can send and receive data. This is the COM port that will be opened when you click the **Open COM Port** button.

Get Command String

The text in this box is sent to the Gage for testing when the **Send "Get Command String"** button is clicked. Changes you make here are not saved so if you make changes be sure to edit this string in the **Gage Definition**.

Send "Get Command String"

Interprets the selected text (or the first line of text if none is selected) in the **Get Command String** box and sends it to the serial port. The **Send** button is enabled only if the serial port is open. Remember, you can highlight (select) text and send only that amount as oppose to everything found in the box.

Data received from Gage

Data received from the serial port is placed at the top of the **Data** box. If no gage is present and you know what the gage will actually send when you connect it, you can the type or paste text directly into this box and write the parsing strings. Remember, you haven't tested the physical connection, only the parser instructions.

Incomplete RS232 Values

This area shows you the contents of the RS232 input buffer. Changing it does not change the buffer. Clear it by opening and closing the serial port. This buffer only shows you data pending. Because most strings are short and computers are fast, you normally won't see anything here.

12.2.3 Input Details – File Based

This input source assumes the gage outputs a file after inspecting a part. Use the **Browse** button to locate the file or type the file name in the textbox provided. When you press the **Start Monitoring** button QC-Gage begins looking for output files from the gage. It will read them when the file suddenly exists. You should **Delete File After Reading** to limit double reading of the results.

12.2.4 Data Received from the Gage

This large textbox is where all received data is placed. Either RS232, File based, or just typed by you. If you mimic the gage output by typing the expect string of characters, you can test your parser without a connected gage.

12.2.5 Parser Commands

These are the actual commands the parser will perform on the data in the **Data Received from the Gage** textbox. These commands are detailed later.

12.2.6 Parse Variables

Typing values into any of the 30 variable boxes before you press the **Start Parser** button makes the parser start with those values. This allows you to step through parse instructions adding flexibility to your troubleshooting technique. See the Variable Table on page 95.

12.2.7 Start Parser

Clicking this button starts QC-Parse executing. It parses the selected values (or the first line of text if none is selected) in the **Data Received from Gage** box. All **Parser Commands** in the box are executed when you click the **Start Parser** button unless you select a portion of the text. In other words, using the mouse you can select (highlight) any portion of the **Parser Commands** to reduce what is executed in the **Parse Commands** box. The results are placed some of the 30 variable boxes for you to review. If you achieve the expected results, save your work and exit.

12.2.8 Clear Values

This button clears all 30 variable text boxes to null. You can set them before clicking the **Start Parser** button. Note that in normal QC-Gage operation, not all variables are null when you start, variables like **Nominal** and **Units** get their initial values from the Spec Plan.

12.2.9 Debugging

If you are having trouble opening the serial port you can start QC-Parse with /DEBUG:RS232 in the command line. In Windows, choose **Start > Run** and type:

“c:\Prolink\QC-Gage 3.4\Parse32.exe” /DEBUG:RS232

This will automatically open the QC-Parse screen to the last script you were working on and create a DEBUG.TXT file as you pull data from the gage. This will show you the settings used and the raw data received.

12.3 Using QC-Parse

12.3.1 Introduction

There are two main functions QC-Parse was designed to perform, testing an existing Gage Script and writing a new Gage Script. No book can give you the trouble shooting and design skills needed for these tasks, but the sections below give some suggested steps and a few helpful tips. Remember, both are creative functions.

12.3.2 Parsing Script

The Parsing Script, or Gage Script, is the heart of a Gage Definition. It tells QC-Gage how to interpret the gage’s output. QC-Gage uses a special language designed to break strings of characters into component parts. As a gage author, you will write scripts in this language. The language is described in detail in the Gage Script Language section starting on page 95.

A Parsing Script is different from a Port Configuration because a Port Configuration tells QC-Gage how to transmit characters to and receive characters from a gage, but the Parsing Script tells QC-Gage which of those characters are the actual measurements and which are useless junk. Most gages transmit very simple strings and therefore have simple Parsing Scripts, but others send strings 100 characters long with optional fields, requiring complex scripts.

12.3.3 Testing an Existing Gage Script

If a Spec Plan is not giving you the results you expect, you may want to test the Gage Script. The gage settings may be incorrect, or the gage may be a different version than the one the Gage Script was written for. Here is a sample debugging session:

1 Make sure the gage can send data to HyperTerminal, if it can, proceed with this test.
2 Edit the Spec Plan that doesn't work. Make a note of the Channel and Units of the feature that has problems.
3 In QC-Gage, go to the gage definition screen, select the gage to test, and click the **Advanced** button to enter QC-Parse.
4 Open the COM port.
5 Click the **Clear Values** button and type in the Units and Channel values in their respective boxes.
6 Click the **Send** button on the gage. The data should now flow from the gage into the **Data From Gage** box. If it gets stuck in the RS232 buffer, the gage is not sending carriage returns or line feeds. You must set the gage to send CR since QC-Gage requires all readings to end in CR or CRLF.
7 Step through the Gage Script by highlighting the line of data to parse and a block of commands in the **Commands** box and clicking the **Start Parser** button. Look at the values in the variables. Are they what you expected?
8 Select the next block of commands by highlighting them, and click the **Start Parser** button again. Keep stepping through and watching the variables for unexpected results.

Tips:

- Leftover values in **User** variables can be very difficult to spot, if you use **User** variables, look at what might be in them from the previous run or previous feature.
- Look for extra spaces or mismatched case in strings, especially in Compare statements.

12.3.4 Writing a New Gage Script

Before you start writing a Gage Script, gather as much information about the gage as you can. What types of output does it provide? What errors does it report? Does it have different modes of operation? Can you distinguish one mode from another by any given line of data? Does it accept commands? Use Terminal or HyperTerminal to capture as many different examples of output as you can.

1. Make sure the gage can send data to HyperTerminal, if it can, you can proceed.
2. Look for ways of distinguishing error lines, irrelevant lines, and data lines.
3. In QC-Gage, go to the **Gage Definition** screen follow these instructions:
    - Click the **Add** button.
    - Fill in the information requested and click **OK**.
    - Ignore the **Get Command String** for now.

- Set the **Channels Available** list to the number of channels.
- Set the **Connected to COM port** to the settings you used with HyperTerminal.
- When you finish these settings, click the **Advanced** button.

4. In QC-Parse, click the **Open COM Port** button.
5. If your gage must receive a string before it sends data, type the string in the **Get Command String** box and click the **Send** "**Get Command String"** button. Don't worry about writing commands to specify channel, etc. yet. If there are several commands to send, you can highlight some text, click **Send** then highlight different text and click **Send** again. If your gage uses switches or pedals to take a reading, take several now. You want at least one example of each style of output or error your gage produces.
6. You should now have several examples of data in the **Data received from Gage** box.
7. In the **Parser Commands** box start writing the test for "Is this valid data?". This probably involves an "IF" test. In the "Yes" part of the "IF" test, put commands to read the data into the **Actual** variable. In the "No" part of the "IF" test, put commands to test for an error.
8. In the "Yes" part of the error "IF" test, set the **ErrNum** and **ErrText** variables. In the "No" part of the error "IF" test, set the **Action** variable to 1 (Ignore).
9. Set the **Channel** and **Units** variables. If you use **Nominal** or **Tolerance** variables, set them also.
10. Test the parts of the Gage Script by highlighting different sections of the script and clicking the **Start Parser** button. Look at the values in the variables to make sure the sections of script are functioning as you expect.
11. When you think the whole script works, remove the highlight and click the **Start Parser** button to run the entire script.
12. Highlight a different line in the **Data received from Gage** box and repeat the test.
13. When the parse script works, save your work.
14. If your gage requires a send string, write that script now. The **Get Command String** box gets processed just like the **Parser Commands** box. Remember that changes to the **Get Command String** box are not saved in QC-Parse, you can only save changes in the Gage Definition screen! When you have the **Get Command String** script written and tested, copy it into the **Gage Definition** screen.
15. Click the **OK** button to save your work.
16. In the **Gage Definition** screen click **OK** to save the new gage definition.
17. Test your new Gage Script by writing a Spec Plan that uses the gage and running the Spec Plan.

Tips:

- When highlighting commands, make sure you highlight both the opening and closing curly braces, especially on IF commands.
- Use spaces and line breaks to make your script more readable, but avoid spaces in string arguments - `{Asc,A}` is 65 but `{Asc, A}` is 32 because of the space!
- You can type values in CurPos, StartRead, etc. while you are debugging. This allows you to jump around and experiment easily. You should not set these values in your script because invalid values can cause serious errors.

13. Gage Script Language

13.1 Introduction

The Parsing Language is a primitive string processing language. A set of parsing instructions is referred to as a Gage Script. The parser uses a Gage Script, an output string from the gage, and 30 predefined variables. When a gage sends an output string to QC-Gage, QC-Gage loads values into some of the variables (like expected units of measure, and expected channel number), then applies the Gage Script to the output string. The script should set either the Error variable or the Actual variable. The Actual variable means the number the gage actually sent, as opposed to the expected value. Actual is synonymous with Observed in this context.

13.2 Variables

There are 30 variables in QC-Gage. Some are used by the parser, some contain information about the Spec Plan, and some are available for your general use. The table below shows the exact name you should reference in your parse strings when reading or writing them.

13.2.1 Variable Table

Name	Direction	Meaning
User0 to User9	In/Out	Available for your use. Pre-load them with special numbers or strings you want to send to the parser and use them within the parser to store intermediate results. Note that these variables are shared with other sections of the program.
Actual	Out	The reading returned from the parser
Nominal	In	Nominal
TolPlus	In	Add to Nominal to give upper specification limit
TolMinus	In	Add to Nominal to give lower specification limit
Channel	In/Out	The channel to look for the reading on, the channel the reading was on.
Units	In/Out	The units the gage is measuring in. You may want to set an error if units don't match
StartRead	Local	Absolute position of the start of the block of text to read.
StopRead	Local	Absolute position of the end of the block of text to read.
CurPos	Local	Current absolute position of the pointer within the string
MoveWarn	Local	QC-Gage sets MoveWarn to -1 if a command would move the pointer past the end of the string. See Movement and Pointers on page 98.
ErrNum	Out	You must set this if the received string indicates a problem. The list of standard errors is below
ErrText	Out	Set this to provide additional information about an

		error. See “Errors” table below
Action	Out	Used to handle special cases. See “Actions” table
ActText	Out	Used with Action when an extended command is required
Var26 to Var30		Reserved for future expansion

QC-Gage sets variables marked “IN” before the Gage Script runs, and reads the value of variables marked “OUT” after the Gage Script ends. QC-Gage clears variables marked “Local” before the Gage Script runs and ignores their values after the Gage Script ends.

13.3 Errors

Many gage interfaces can indicate error conditions like “the gage is not on” or “the gage was not calibrated”. QC-Gage sets some errors, including “Wrong Channel” and Wrong Units”, but you set most error codes within Parse Scripts. QC-Gage sets “Wrong Channel” and Wrong Units” after your Script runs by comparing the channel and units in the Spec Plan to the values your Gage Script gave to the Channel and Units variables. When you write a parse string for a gage, be sure to set the error number (ErrNum) in your command so QC-Gage can report the error to the user (operator). Set an error with the SetVar command

`e.g. {SetVar,ErrNum,4}`

QC-Gage checks the contents of the ErrNum variable after processing a Parse Script. If the value of ErrNum is not zero, QC-Gage pauses data collection and displays a description of the error and the contents of the ErrText variable for the operator. When the operator acknowledges the message, data collection resumes. The recognized values of ErrNum are below

Err	Error Name	Comment
0	No Error	Setting ErrNum to 0 or “ ” clears any errors
1	Unspecified	Use this for gages that don’t report the error
2	User Defined	If your gage produces errors not covered here, use this error and provide ErrText that is as descriptive as possible.
3	Bad Checksum	Some gages include a checksum when transmitting results
4	Wrong Channel	The expected channel doesn’t match the one .received
5	Wrong Units	The expected units don’t match the received ones
6	Gage not On	If you are using a multiplexer, it might report problems with the gage
7	Gage not Zeroed	If the gage requires setting
8	Out of Data	For gages with data storage

13.4 Actions

Gages may send extraneous data in addition to measurement results. The Action variable lets your Gage Script tell QC-Gage what to do with a line of data. Unless your script tells QC-Gage otherwise, QC-Gage assumes the script set either the ErrNum variable or the Actual variable. If your gage sends information that are neither errors nor relevant data, set the Action variable to 0 for lines that contain errors or data and set the Action variable to 1 for lines that QC-Gage should ignore. You can set other variables while processing lines to ignore.

Act	Action Name	Comment
0	No Action	Normal state
1	Ignore	This does not pause the program or display anything to the user, it simply ignores the string and waits for the next one. No errors are displayed, no data is saved. This is obviously a dangerous one to misuse because the operator gets no instructions!

13.5 Commands

When a command is processed, it is replaced with a string. Some are replaced with empty strings, others with strings that represent the answer (i.e., "{Add, 5,3}" is replaced with "8"). Some commands also set variables. If use command "A" as the argument for command "B", a technique known as nesting, QC-Gage resolves command "A" first. The maximum depth is beyond any reasonable limit of the computer.

In brief:

1. Scripts are read from left to right.
2. Commands use and set the 30 predefined variables.
3. All commands and required arguments are contained in curly braces.
4. When a command is processed, it is replaced with a string.
5. Commands may be nested.

For example, {Div,{Add,1,{Subtract,5,3}}{Mult,2,3},4} becomes 9. Notice that the Add and the Mult are nested within the Div, and the Subtract is nested within the Add so the Subtract must be resolved first (deepest nesting) followed by the Add then the Mult (equal nesting so left to right) and last the Div. The Subtract becomes 2 so the Add becomes 3, the Mult command becomes 6 so both together become 36. Notice that there are no spaces between the Add and the Mult so the results are put together one after the other. Now that the arguments have been resolved, the Div command can be evaluated and 36/4=9.

13.5.1 Command Conventions and Syntax

In this document, string arguments end in $ and Numeric arguments end in #. If there is only 1 type of either, the name may be just $ or # but longer names may be used if the argument has special significance. The format for all commands is {Command} or {Command,Arg} or {Command,Arg1,Arg2}, etc. Commands are not case sensitive but arguments are. String and number results and arguments are interchangeable, but strings that don't start with numbers are treated as 0 and numbers are treated as a string of the number. Delimiters may be more than 1 character long. Including a curly bracket or a comma in an argument requires the Chr$ command.

13.5.2 Functional Groups

The functional groups are brief summaries of all the commands available. All the commands are fully explained in the Alphabetical Listing section. Examples are also included in the Alphabetical Listing section.

Movement and Pointers

These commands help you move to a specific point in the string you are parsing and tell QC-Gage the significance of the point. For example, “Go to the first character after the third comma, that’s the beginning of the reading”. The current position in the string is stored in the CurPos variable. Manually setting the variable moves the pointer to the new position. Generally, using the various Move commands is easier than working with the CurPos variable directly.

If a command would move the pointer past the end of the string QC-Gage sets the MoveWarn variable to -1 and does not move the pointer. You can check the MoveWarn variable to see if, for example, any more delimiters exist - issue the move command as if the string existed and then check MoveWarn. Successful moves do not clear MoveWarn, so you should clear it yourself if you use it to test for existence of strings.

Name	Arguments	Effect
MoveFirst		Moves the pointer to the beginning of the string.
MoveLast		Moves the pointer to the end of the string
MoveAbs	Position#	Moves the pointer to an absolute position in the string.
MoveRel	OffSet#	Moves the pointer OffSet# characters to the right or left.
MoveTo	CheckCase#, Num#, Delim$	Moves to the beginning of the Num#th occurrence of Delim$.
MovePast	CheckCase#, Num#, Delim$	Moves past the Num#th group of delimiters. Works with groups of delimiters.
PushPos		Saves the current position of the pointer on a stack.
PopPos		Gets the pointer position off the top of the stack.
StartRead		Marks the current pointer position as the start of selected text.
StopRead		Marks the current pointer position as the end of selected text.

Variables

These commands let you work with variables. You can work with all 30 variables, but exercise caution when setting variables like CurPos, StopRead, etc. In general you should use the Movement and Pointer commands to set those variables.

Name	Arguments	Effect
Var	VarName$	Returns the value of variable VarName$ (see “Variables” table).
ReadVar	VarName$	Puts the text selected by StartRead and StopRead (inclusive) into variable VarName$.
SetVar	Name$, Val$	Puts the text in Val$ into the variable specified by Name$
Len	String$	Returns the number of characters in String$

Conversion

Conversion commands let you work with ASCII codes and hexadecimal numbers.

Name	Arguments	Returns
Asc	$	The decimal ASCII code for the first character in $
Chr$	#	The character whose ASCII code is #.
UCase$	$	The variable $ in upper case.
Hex2Dec	Hex$	The decimal equivalent of the hexadecimal string.
Dec2Hex	Dec#	The Hexadecimal equivalent of Dec#
Quote	$	The string $. This is not generally needed, but is useful for clarity or to include text with commas in an argument list
cr		A Carriage Return, ASCII code 13
lf		A Line Feed, ASCII code 10

Math

Math commands operate on any variables, but treat not numeric values as zero.

Name	Arguments	Returns
Add	A#,B#	A# + B#
Subtract	A#,B#	A# - B#
Mult	A#,B#	A# * B#
Div	A#,B#	A# / B#

Decisions

Decision commands allow you to avoid some parts of a script under certain conditions, or choose actions appropriate to the line the gage sent.

Name	Arguments	Returns
If	Test#,A$,B$	If Test# is <> 0 or is T or Y then this command returns A$, otherwise it returns B$.
Compare	Test$,A,B	Returns 0 if the comparison is False, -1 if it is true.

13.5.3 Alphabetical Listing of Commands

This section provides a detailed explanation of each command. The explanation includes what arguments the command takes, what values the command returns, and what effect the command has on variables. If “Returns” section states “Null” the command returns an empty string.

13.5.4 Add

Arguments

A#	any number
B#	any number

Returns

A# + B#

Description

Works only on decimal numbers.

Example

{SetVar,User4,{Add,3,4}}	Puts “7” into the variable User4

13.5.5 Asc

Arguments

String$	any string

Returns

The decimal ASCII code for the first character in String$

Description

Make sure you don’t include spaces between the comma and String$, otherwise you will always get “32”, the ASCII code for a space, back from this function. See the ASCII codes in Decimal and Hexadecimal in Appendix A on page 110 for a list of characters and their codes.

Example

{SetVar,User5,{Asc,B}}	puts “66” into User5

13.5.6 Chr$

Arguments

#	where # is between 0 and 255, inclusive.

Returns

The character whose ASCII code is #

Description

Characters below 32 are control characters and Characters above 128 are part of the extended character set and display differently on different computers, depending on how the fonts are configured. All characters, including control characters and extended characters, can be placed in variables or sent to gages. See the ASCII codes in Decimal and Hexadecimal on page 110 for a list of characters and their codes.

Example

{SetVar,User5,{Chr$,65}}	Puts “A” in User5.

13.5.7 CR

Arguments

None

Returns

a carriage return, ASCII code 13

Description

This function is the same as {Chr$,13} but requires less typing.

Example

{cr}

13.5.8 Compare

Arguments

Test$	valid tests are =, >, <, #=, #> and #<
A$	reference value
B$	what to compare to the reference value

Returns

0 if the comparison is False, -1 if it is True.

Description

A # in Test$ means compare as numbers. String comparisons look first at the left most character of each string and proceed character by character until either a string ends or there is a difference between the strings. If the comparison ends with no differences, the strings are equal. If the strings are identical up to the length of one string, but the other string is longer, the shorter string is lesser than (the < test) the longer string.

If there is a difference between the strings before the end, the string whose differing character has a lower ASCII value is lesser. See the ASCII codes in Decimal and Hexadecimal in Appendix A on page 110 for a list of characters and their codes. Comparisons are case sensitive, so you may need to include the UCase$ command.

For example, 10 > 9 is False but 10 #> 9 is true and Dog = Cat is False but Dog #= Cat is True.

Example

{Compare,#>,10,9}	is True because 10 is larger than 9
{Compare,>,10,9}	is False because the character “1” comes before “9”
{Compare,=,Dog,Cat}	is False because the strings are different
{Compare,#=,Dog,Cat}	is True because when treated as numbers, both Dog and Cat are 0.

13.5.9 Dec2Hex

Arguments

Dec#	the Decimal number to convert

Returns

The Hexadecimal equivalent of Dec#

Description

Dec# must be an integer value between 0 and 2^16

Example

{SetVar,User4,{Dec2Hex,12}} Puts “C” into the variable User4

13.5.10 Div

Arguments

A#	any number
B#	any number

Returns

A# / B#

Description

This command mathematically divides the two decimal numbers into one another. It works only with decimal numbers.

Example

{SetVar,User4,{Div,7,2}} Puts “3.5” into the variable User4

13.5.11 Hex2Dec

Arguments

Hex$	the Hexadecimal number to convert

Returns

The decimal equivalent of the hexadecimal string.

Description

Hex$ must be an integer between 0 and 2^16.

Example

{SetVar,User4,{Hex2Dec,F}} Puts “15” into User4

13.5.12 If

Arguments

Test#	a True or False value
A$	string to return if Test is True
B$	string to return if Test is False

Returns

A$ or B$

Description

Test# is True under the following 3 conditions - Test# is a number not equal to 0, Test# is “T”, or Test# is “Y”. In all other cases, Test# is considered false. After QC-Gage evaluates Test# it will evaluate either A$ or B$, not both. This means that if you have commands that will produce errors in some circumstances and execute properly in others, you can put them in the A$ section of an IF test and use the test to see if the commands are valid.

Example

{ MoveAbs,4} {StartRead} {MoveAbs,10} {StopRead}
{SetVar,Action,{If,{Var,MoveWarn},1,0{ReadVar,Actual}}}

This tries to mark characters 4-10 for reading. If they exist, the Action variable becomes “0” and the contents of 4-10 are treated as the measurement. If the string from the gage is shorter than 10 characters, QC-Gage ignores the line (Action=1 means ignore the line).

13.5.13 Len

Arguments

String$ any string

Returns

The number of characters in String$

Description

Leading and trailing spaces are included in the count.

Example

{SetVar,User1,{Len,Hello World}} puts “11” in User1

13.5.14 LF

Arguments

None

Returns

a line feed, ASCII code 10

Description

This function is the same as {Chr$,10} but requires less typing.

Example

{lf}

13.5.15 MoveAbs

Arguments

Position# the desired position in the string from the gage

Returns

Null

Description

Moves to Position# in the string from the gage. The position is calculated from the beginning of the string. The first character in the string is Position 1, the second character Position 2, etc. If you request a position < 1 or a position greater than the length of the string, the position does not move but the variable MoveWarn is set to -1. A successful move does not clear MoveWarn.

Example

{MoveAbs,10}

13.5.16 MoveFirst

Arguments

None

Returns

Null

Description

Moves the pointer to the beginning of the string from the gage. This statement is the same as {MoveAbs,1}.

Example

{MoveFirst}

13.5.17 MoveLast

Arguments

None

Returns

Null

Description

Moves the pointer to the end of the string received from the gage.

Example

{MoveLast}

13.5.18 MovePast

Arguments

CheckCase#	0 means ignore case, otherwise check case
Num#	the number of delimiter groups to move past.
Delim$	The delimiter, can be one or more characters long.

Returns

Null

Description

Works with groups of delimiters, moves past the Num#th group of delimiters, relative to the current position. If Num# is negative, move left, if positive, move right. Num# = 0 is not valid. Multiple adjacent delimiters are considered a single group. If you request a move past more groups of delimiters than the file has, the position does not move but the variable MoveWarn is set to -1. A successful move does not clear MoveWarn. This function differs from MoveTo in that it works with groups of delimiters and does not count how many delimiters are in each group.

Example

{MovePast,0,1,Average}	Moves to the first character after the word Average.
{MovePast,0,-3,:}	Moves left past the 3rd group of colons.

13.5.19 MoveRel

Arguments

OffSet#	the number of characters to move

Returns

Null

Description

Moves the pointer OffSet# characters to the right or left. OffSet# = 0 is not valid. OffSet# < 0 moves the pointer to the left, OffSet# > 0 moves the pointer to the right. This function differs from MoveAbs in that this function counts position from the current position but MoveAbs counts position from the beginning of the string. If you request a move past the beginning or end of the string, the position does not move but the variable MoveWarn is set to -1. A successful move does not clear MoveWarn.

Example

{MoveRel,-1}	moves the pointer one character to the left

13.5.20 MoveTo

Arguments

CheckCase#	0 means ignore case, otherwise check case
Num#	the number of the occurrence of delimiter to move to.
Delim$	The delimiter. Can be one or more characters long.

Returns

Null

Description

Moves to the beginning of the Num#th occurrence of Delim$, relative to the current position. If Num# is negative, move left, if positive, move right. Num# = 0 is not valid. This function differs from MovePast in that it works with individual delimiters not groups of delimiters. A group of 4 delimiters would count as 4 steps for MoveTo but only 1 step for MovePast. If you request a move past the beginning or end of the string, the position does not move but the variable MoveWarn is set to -1. A successful move does not clear MoveWarn.

Example

If you have a string “A,,1.25,,,1.249,,-0.001”, you are at position 18 (the “-“), and you use {MoveTo,0,-3,,} you will be at position 10, the comma to the immediate left of “1.249”. In contrast, the command {MovePast,0,-1,,} would put you at position 15, the “9”.

13.5.21 Mult

Arguments

A#	any number
B#	any number

Returns

A# * B#

Description

This command mathematically multiplies the two decimal numbers together. It works only with decimal numbers.

Example

{SetVar,User4,{Mult,3,2.5}}	Puts “7.5” into the variable User4

13.5.22 PopPos

Arguments

None

Returns

Null

Description

Looks at the pointer position on the top of the stack, moves to that position, and removes that position from the stack. This is like saying “Go back to the last spot I told was special”. If there are no pointer positions on the stack, the pointer position does not change.

PushPos puts the pointer position on the stack. Together, these two functions provide a way to quickly and easily return to a significant position in the string from the gage. QC-Gage does not currently report an error if you attempt to pop a value off the stack when the stack is empty so you should avoid popping the

stack when it is empty. QC-Gage clears the stack for each gage string so you don't have to clean the stack before finishing the script. The stack can hold 100 or more positions.

Example

{MoveAbs,7} {PushPos}
{MoveAbs,32} {PushPos}
{MoveAbs,15} {PushPos}
{MoveAbs,47}

These four commands will put 15 at the top of the stack, 32 below it, and 7 at the bottom of the stack. The current position would be 47.

If you executed a {PopPos} the current position will be 15. A second {PopPos} would make the current position 32 and would leave only 7 on the stack.

13.5.23 PushPos

Arguments

None

Returns

Null

Description

Puts the current pointer position onto the stack. This tells QC-Gage "Remember this spot, it's special and I want to come back here later". Use PopPos to get back to a position that is on the stack. See PopPos for an explanation of the stack.

Example

{PushPos}

13.5.24 Quote

Arguments

String$	any string

Returns

The same string you put in.

Description

This is not generally needed, but is useful for clarity or to include text with commas in an argument list. Note that curly braces still get parsed, even in a Quote.

Example

{SetVar,ErrText,{If,{Var,User1},{Quote,This is a long, complicated, comma filled error message},{Quote,Words, words, words.}}}

13.5.25 ReadVar

Arguments

VarName$	the variable to put the text into

Returns

Null

Description

Puts the text selected by StartRead and StopRead into variable VarName$. The characters at positions StartRead and StopRead are included. StartRead and StopRead must both be set and StopRead must be greater than StartRead.

Example

If the gage sends the string “ChA3.134MM”

The following Gage Script would put the value 3.134 into the variable Actual.

{MoveAbs,4}{StartRead}{MoveAbs,8}{StopRead}{ReadVar,Actual}

13.5.26 SetVar

Arguments

Name$ the name of the variable to set
Val$ the value to put in the variable

Returns

Null

Description

Puts the text in Val$ into the variable specified by Name$

Example

{SetVar,ErrNum,6}

13.5.27 StartRead

Arguments

None

Returns

Null

Description

Marks the current pointer position as the start of selected text. You do not have to set StartRead before StopRead, but StartRead must be to the left of StopRead. You must set both StartRead and StopRead before you use ReadVar.

Example

{StartRead}

13.5.28 StopRead

Arguments

None

Returns

Null

Description

Marks the current pointer position as the end of selected text. You do not have to set StartRead before StopRead, but StartRead must be to the left of StopRead. You must set both StartRead and StopRead before you use ReadVar.

Example

{StopRead}

13.5.29 Subtract

Arguments

A#	any number
B#	any number

Returns

A# - B#

Description

This command mathematically subtracts the two decimal numbers from one another. It works only with decimal numbers.

Example

{SetVar,User4,{ Subtract,3,2.5}} Puts ".5" into the variable User4

13.5.30 UCase$

Arguments

String$	any string

Returns

The same string except all lower case letters are changed to upper case.

Description

This function only affects characters with ASCII codes 97-118

Example

{SetVar,User1,{UCase$,{Var, User1}}} converts User1 to all upper case.

13.5.31 Var

Arguments

VarName$	any variable

Returns

The value of variable VarName$

Description

See the Variable Table on page 95 for a list of all variables.

Example

{SetVar,Units,{Var,User1}} Copies the value of the variable User1 into Units

13.6 Script Examples

This section contains a few complete example Gage Scripts with comments. The examples increase in complexity.

13.6.1 Example 1

For this example, we have a gage that sends only the measurement. This is the simplest output a gage can have.

```
1. {MoveFirst}
2. {StartRead}
3. {MoveLast}
4. {StopRead}
5. {ReadVar,Actual}
```

Explanation and comments

1. Moves the current position pointer to the beginning of the string sent by the gage.
2. Marks the current position, the first character, as the first character to read.
3. Moves the current position pointer to the end of the string sent by the gage.
4. Marks the current position, the last character, as the last character to read.
5. Reads the entire string into the variable “Actual”. Actual is the variable QC-Gage looks in for the reading from the gage, it is the raw data.

13.6.2 Example 2

For this example, we have a gage that returns either an “F” for failure, or a measurement. We want our Gage Script to read the whole line and see if it is an “F” or an “f”. If it is an “F” or an “f”, set an error code, otherwise return the reading.

```
1. {MoveFirst} {StartRead} {MoveLast} {StopRead}
2. {ReadVar,User1}
3. {SetVar,User1,{UCase$,{Var,User1}}}
4. {If,{Compare,=,{Var,User1},F},
      5.   {SetVar,ErrNum,1},
      6.   {ReadVar,Actual}
7. }
```

Explanation and comments:

1. Marks the entire string for reading. Note that there are some extra spaces in this line to make it easier for humans to read. These spaces are not in an argument string, so QC-Gage will ignore them.
2. Reads the entire string into the variable User1.
3. Forces User1 to be all upper case. This line uses the fact that when you nest arguments, the deepest commands are evaluated first so we can set User1 based on its own contents. There are no spaces in the arguments here, they would be included in the contents of User1 and prevent it from ever equaling “F”.
4. Asks “Is the value in User1 an ‘F’”? Note that there is one more “{“ than “}” on this line. There is also a “,” at the end of the line to separate the test condition from the first possible action.
5. The “If” commands. There could be several, just put a “,” after the last command to process when the test is True. The indent is optional, it just makes the script easier for a human to read.
6. The “Else” commands. Here, just read the whole string into the “Actual” variable. The StartRead and StopRead pointers are still set from line 1.
7. Ends the “If” command.

13.7 ASCII codes in Decimal and Hexadecimal

nul	0	00	3	51	33	f	102	66	™	153	99	Ì	204	CC
_	1	01	4	52	34	g	103	67	š	154	9A	Í	205	CD
_	2	02	5	53	35	h	104	68	›	155	9B	Î	206	CE
_	3	03	6	54	36	I	105	69	œ	156	9C	Ï	207	CF
_	4	04	7	55	37	j	106	6A		157	9D	Đ	208	D0
_	5	05	8	56	38	k	107	6B		158	9E	Ñ	209	D1
_	6	06	9	57	39	I	108	6C	Ÿ	159	9F	Ò	210	D2
_	7	07	:	58	3A	m	109	6D		160	A0	Ó	211	D3
_	8	08	;	59	3B	n	110	6E	¡	161	A1	Ô	212	D4
tab	9	09	<	60	3C	o	111	6F	¢	162	A2	Õ	213	D5
lf	10	0A	=	61	3D	p	112	70	£	163	A3	Ö	214	D6
_	11	0B	>	62	3E	q	113	71	¤	164	A4	×	215	D7
_	12	0C	?	63	3F	r	114	72	¥	165	A5	Ø	216	D8
cr	13	0D	@	64	40	s	115	73	¦	166	A6	Ù	217	D9
_	14	0E	A	65	41	t	116	74	§	167	A7	Ú	218	DA
_	15	0F	B	66	42	u	117	75	¨	168	A8	Û	219	DB
_	16	10	C	67	43	v	118	76	©	169	A9	Ü	220	DC
_	17	11	D	68	44	w	119	77	ª	170	AA	Ý	221	DD
_	18	12	E	69	45	x	120	78	«	171	AB	Þ	222	DE
_	19	13	F	70	46	y	121	79	¬	172	AC	ß	223	DF
_	20	14	G	71	47	z	122	7A	-	173	AD	à	224	E0
_	21	15	H	72	48	{	123	7B	®	174	AE	á	225	E1
_	22	16	I	73	49	|	124	7C	¯	175	AF	â	226	E2
_	23	17	J	74	4A	}	125	7D	°	176	B0	ã	227	E3
_	24	18	K	75	4B	~	126	7E	±	177	B1	ä	228	E4
_	25	19	L	76	4C		127	7F	²	178	B2	å	229	E5
_	26	1A	M	77	4D		128	80	³	179	B3	æ	230	E6
esc	27	1B	N	78	4E		129	81	´	180	B4	ç	231	E7
“	28	1C	O	79	4F	‚	130	82	µ	181	B5	è	232	E8
”	29	1D	P	80	50	*ƒ*	131	83	¶	182	B6	é	233	E9
-	30	1E	Q	81	51	„	132	84	·	183	B7	ê	234	EA
	31	1F	R	82	52	…	133	85	¸	184	B8	ë	235	EB
sp	32	20	S	83	53	†	134	86	¹	185	B9	ì	236	EC
!	33	21	T	84	54	‡	135	87	º	186	BA	í	237	ED
"	34	22	U	85	55	ˆ	136	88	»	187	BB	î	238	EE
#	35	23	V	86	56	‰	137	89	¼	188	BC	ï	239	EF
$	36	24	W	87	57	Š	138	8A	½	189	BD	ð	240	F0
%	37	25	X	88	58	‹	139	8B	¾	190	BE	ñ	241	F1
&	38	26	Y	89	59	Œ	140	8C	¿	191	BF	ò	242	F2
'	39	27	Z	90	5A		141	8D	À	192	C0	ó	243	F3
(	40	28	[	91	5B		142	8E	Á	193	C1	ô	244	F4
)	41	29	\	92	5C		143	8F	Â	194	C2	õ	245	F5
*	42	2A	]	93	5D		144	90	Ã	195	C3	ö	246	F6
+	43	2B	^	94	5E	‘	145	91	Ä	196	C4	÷	247	F7
,	44	2C	_	95	5F	’	146	92	Å	197	C5	ø	248	F8
-	45	2D	`	96	60	“	147	93	Æ	198	C6	ù	249	F9
.	46	2E	a	97	61	”	148	94	Ç	199	C7	ú	250	FA
/	47	2F	b	98	62	•	149	95	È	200	C8	û	251	FB
0	48	30	c	99	63	–	150	96	É	201	C9	ü	252	FC
1	49	31	d	100	64	—	151	97	Ê	202	CA	ý	253	FD
2	50	32	e	101	65	˜	152	98	Ë	203	CB	þ	254	FE

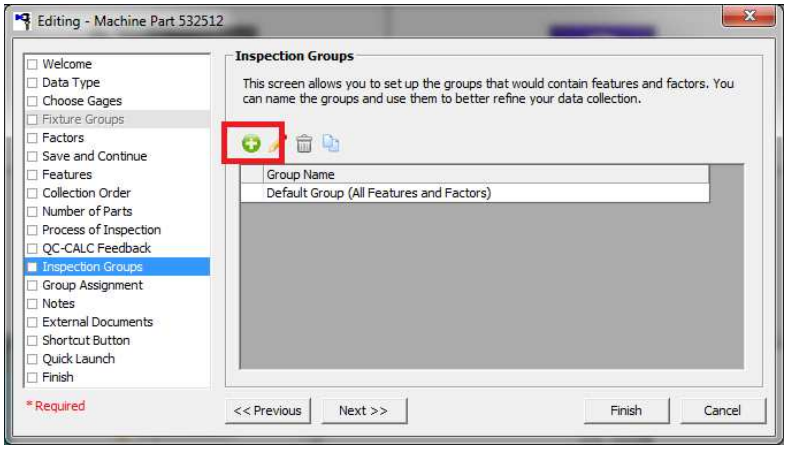
14. Inspection Groups

14.1 Introduction

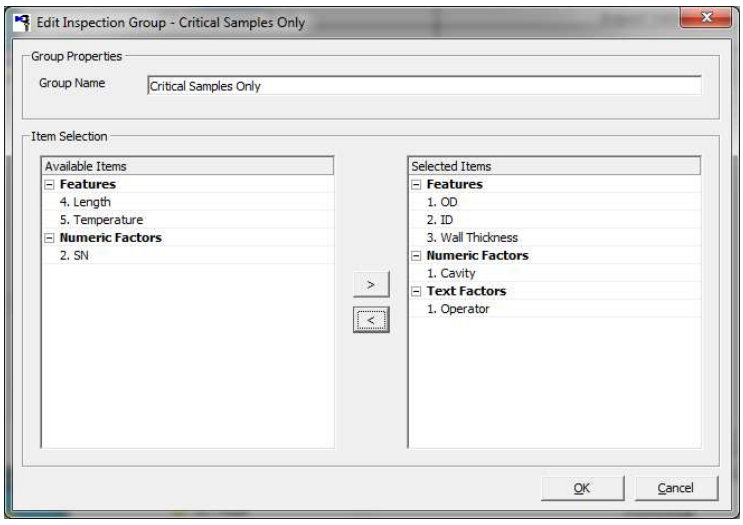
When inspecting batches of parts, there are times when you inspect all features on 1 part and less features on the remaining parts. This option allows you to assign each feature to a particular Inspection Group and blank out some of the data cells. The “Default Group” is the normal inspection method which means all features are inspected. QC-Gage allows you to create groups of features to control which features are skipped in the batch.

14.1.1 Create an Inspection Group

You create your own **Inspection Group** by clicking the green **Add** button.

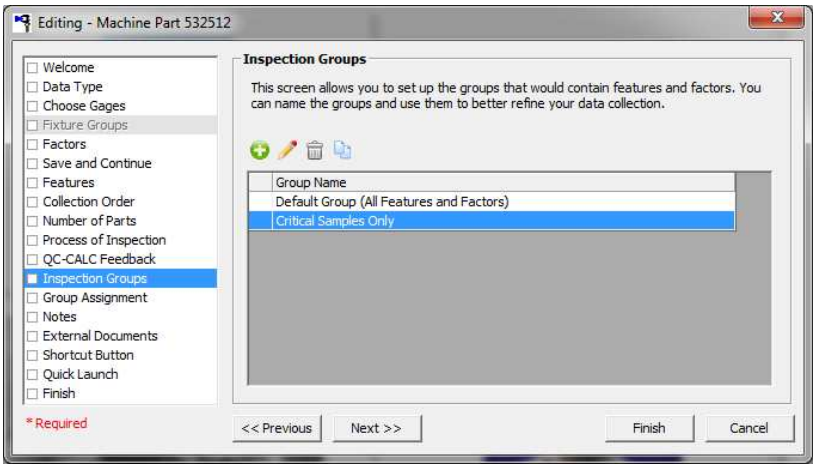


We entered a group name of “Critical Samples Only” below. All features in your Spec Plan are displayed in the left panel. Select as many items as you want included in this group and click the **>** button to move it to the right. All items in the right panel become the group and when used in your Spec Plan will require the inspector to enter data for each item.



Our “Critical Samples Only” **Inspection Group** contains OD, ID, and Wall Thickness but not the Length or Temperature. We also see the Cavity and Operator in the Factor lists.

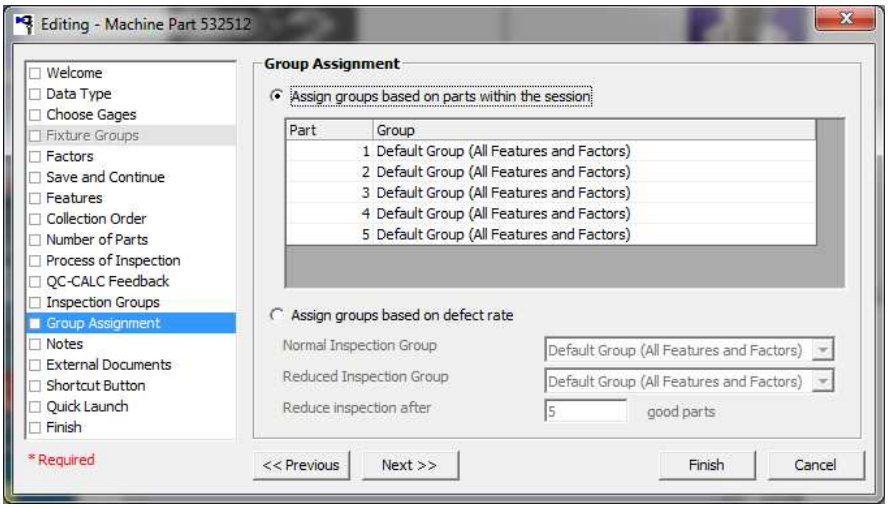
When your new **Inspection Group** is complete you see it in the list and it is ready for use in the next section called **Group Assignment**.



14.1.2 Group Assignment

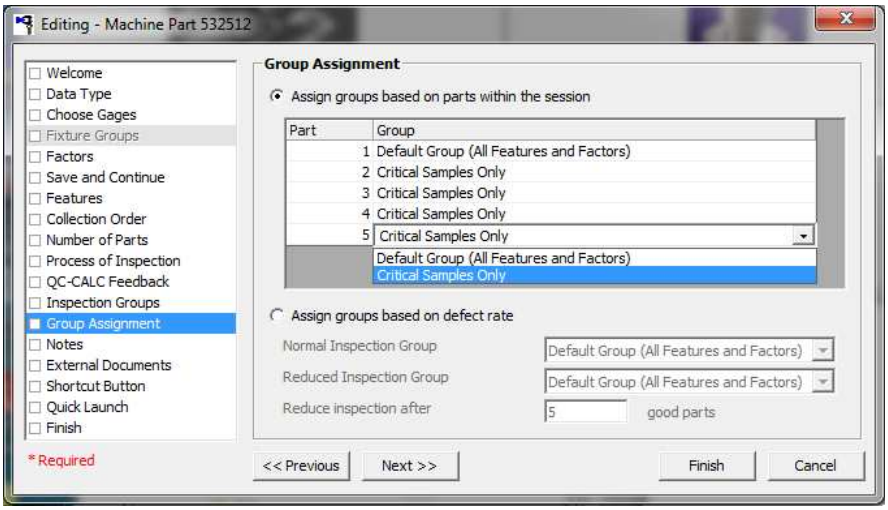
Introduction

You can have as many **Inspection Groups** as you want but none will be used until you assign each part in your batch of parts to a particular group. This step shows all of our 5 parts are assigned to the “Default Group”. This means all features of all parts must be entered by the operator.



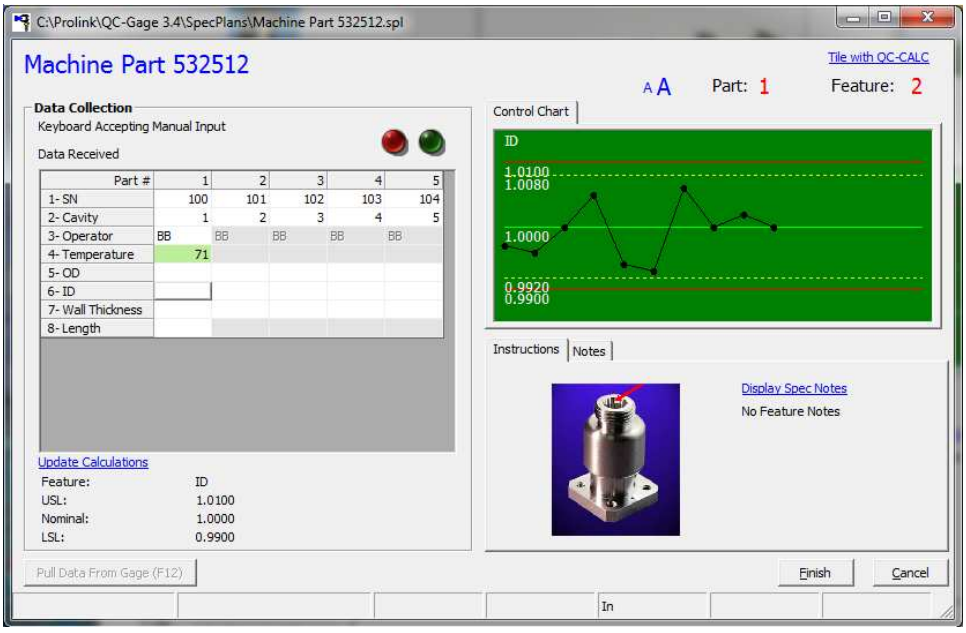
14.1.3 Reduced Inspection

We assign each part to an **Inspection Group** by using the dropdown list. By assigning part 1 to the "Default Group" we are saying we want all features measured on that part. By assigning parts 2 – 5 to the "Critical Samples Only" group we show we only want the operator to inspect OD, ID, and Wall Thickness. The Length and Temperature do not need to be entered for those parts.



14.1.4 Run Screen for Groups

The Run Screen for this Spec Plan shows the effect of the above **Group Assignment**. Notice how all measurements are needed in column 1 (part 1) and parts 2 – 5 do not require values for the Temperature or Length? The cells for these values are grayed out and this should save time for the operator.



Many patterns of inspection are possible and this is only one example.

15. Administrative Tool

15.1 Introduction

Historically, QC-Gage has been used within an individual inspection station as a single copy of software. Each person controlled and adjusted QC-Gage's operation individually. As networks became more prevalent, the inspection devices were connected to the network making data movement easier. This created the need to control the individual copies of QC-Gage running throughout the shop from a central location.

As of QC-Gage version 3.4, an Administrative Tool was added to help the Quality Department set up and control every copy of QC-Gage within the entire company. This tool can be activated and used from any of the QC-Gage copies on the network.

In addition, the medical supply companies must satisfy FDA title 21 Code of Federal Regulations (CFR21 Part 11) Electronic Records; Electronic Signatures, as it applies in a medical manufacturing environment. A special section has been added to this document which describes how QC-Gage can be configured to help you meet the requirements of Part 11.

15.2 Setup and Installation Instructions

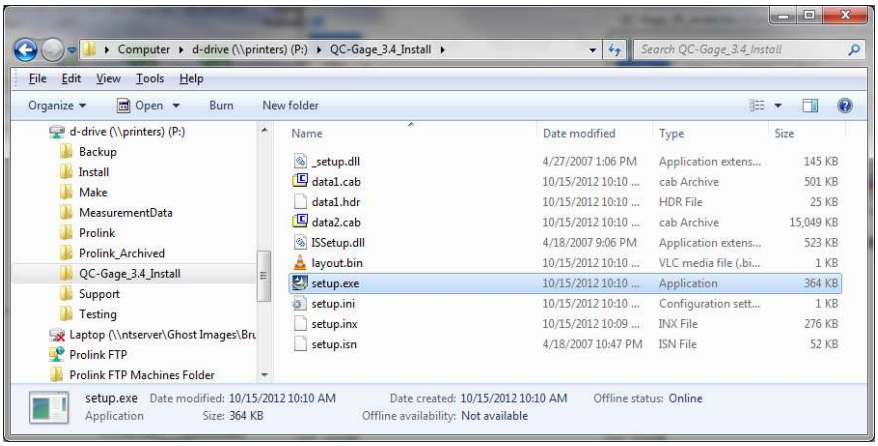
15.2.1 Introduction

There are several installation options for QC-Gage. You can install the standard QC-Gage or a QC-Gage Administrative copy. Installing the Administrator copy involves copying all setup files to a server and running the **setup.exe** from this location. This saves you from carrying a CD or USB Flash Drive. Furthermore, you can write a batch file to perform a silent install as well.

You can use a System Management Server such as **Microsoft's** SMS or **Altiris'** Service-Oriented Management solution. Both of these programs can be used to install multiple copies of QC-Gage throughout your company at the same time. By using our batch file commands, you can run these installations in silent mode or allow the user to see the installation on their local screen.

15.2.2 Install

Create a folder on a shared drive such as **P:\QC-Gage_3.4_Install**. This folder must be available to all computers that will use QC-Gage.



Note: If you use a mapped drive, the same drive letter must be used on all PCs.

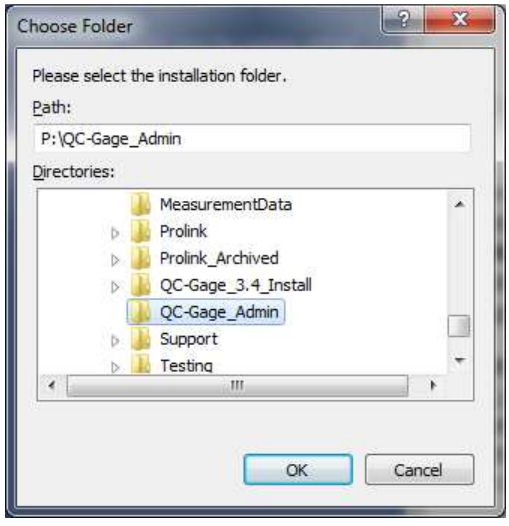
1. Download the QC-Gage Administrator file from our website.
2. Unzip the contents of this file into the **P:\QC-Gage_3.4_Install** folder just created on the shared drive.
3. From any computer use Windows Explorer to open the **P:\QC-Gage_3.4_Install** folder on the shared drive. (P: drive in our example)
4. Double-click the **Setup.exe** file.
5. During installation the Install Wizard shows 6 screens but take special note of the **Install Folder**. Installation screens are as follows:

   - The Welcome Screen
   - The License Screen
   - The Customer Screen
   - **The Install Folder**
   - The Destination Location
   - The Program Folder

   The **Install Folder** is an added screen to tell QC-Gage where to obtain the common settings for all QC-CALCs configured for common control. In this example we created:

   P:\QC-Gage_Admin

6. Browse to the **QC-Gage_Admin** folder on the shared drive, click **OK**, and finish the rest of the install process. Steps 3-6 are repeated for every PC on which you want QC-Gage installed.



15.3 Silent Install

The installation of QC-Gage (Administrative Copy) can be automated to a point where no questions are asked. Optionally, you can run the install in a silent mode

where no screens are displayed. This type of installation requires a batch file that contains instructions to tell QC-Gage what to do and how to do it.

Normally, this type of automated installation is used in companies where the IT department "rolls out" the installation from a central server. This type of install reduces time and increase control in physically large companies.

You can use a System Management Server such as **Microsoft's** SMS or **Altiris'** Service-Oriented Management solution. Both programs can be used to install multiple copies of QC-Gage throughout your company at the same time. By using our batch file commands, you can run these installations in silent mode or allow the user to see the installation on their local screen.

The silent install commands can be used with QC-CALC 3.4, QC-Gage 3.4, EDL 3.4, QC-AUDIT 3.0, and QC-SORT 3.0.

Note: In all cases, an installation screen will appear briefly during the installation process. Following this, a progress bar will be displayed. This is meant as a visual cue that the install is taking place.

15.4 Setup Batch File

15.4.1 The Batch File Location

The batch file needed to automate QC-Gage's installation should be located on a shared server that is accessible to all shop floor PCs. In our continuing example, let's assume you chose to store this batch file in the **P:\QC-Gage_3.4_Install** folder. Instead of running SETUP.EXE, you will run QC32.bat.

15.4.2 The Batch File Contents

The batch file consists of one line starting with the server path and **Setup.exe** followed by optional arguments. The following shows the contents of an example file called Gage34.BAT. Keep in mind this is one long command even though it appears on 3-lines. All arguments are separated by (;) semi-colons.

If you omit any of the arguments below, the corresponding installation screen will appear asking the user to provide this information. This is not desirable.

```
c:\QCGage34Install.exe /silent; destinationpath=c:\prolink\;
qcgageoutputpath= c:\Prolink\QC-Gage 3.4\Transfer;
adminpath= P:\QC-Gage_Admin\
;usergroup=Inspector;username=Joe; companyname=Prolink
```

Batch File Command Item	Comments
Q:\QC-CALC\SETUP.EXE	Command to install a Windows program. Must be first
/silent;	If this switch is present, the installation process is not visible on the target PC. If this switch is omitted, the InstallShield screen is displayed and someone will have to click the installation wizard's **Next >** button to continue the setup. The answers to the wizard's questions are filled in by the contents of the batch file but you should include the **/silent** switch.
destinationpath=c:\prolink\;	This is the installation path where QC-Gage will be installed in the gaging station. You can change it to whatever path you desire.

qcgageoutputpath =c:\prolink\QC-Gage 3.4\Transfer	This is the path where QC-Gage writes its output file for QC-CALC to read.
adminpath=P:\QC-Gage_Admin\	This is the folder used to control all QC-Gage's in your facility. All common settings are stored here. You should standardize on the location by using a batch file like this one.
usergroup= **Inspector**	This command sets the active user group when the installation is complete. This command will work if you set up one copy of QC-Gage on your desktop PC and created this user groups first.
username=Joe;	Sets the user name into QC-CALC. This name appears on some reports.
companyname=MyComp	Sets the company name into QC-CALC. This name appears on some reports.

15.5 Running QC-Gage

Now that you have QC-Gage installed in your office PC run the program by double clicking the **QC-Gage 3.4** icon on your Desktop.

15.6 Manage User Groups

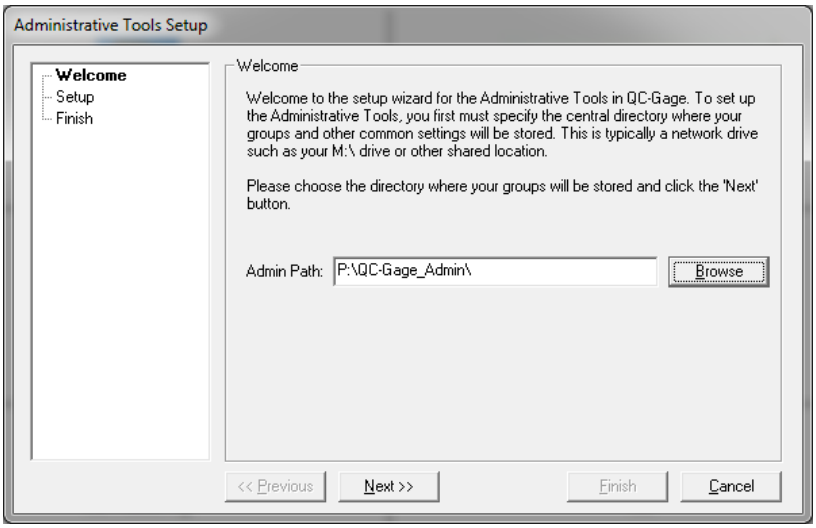
For simplicity reasons, QC-Gage does not save administrative settings at the user level. Instead, groups are created with default settings and locked from being changed. Copies of QC-Gage are then assigned to these groups. It is not necessary to log in as a particular user in order to obtain your group settings since groups are assigned at the PC level. It is assumed that all users using a particular PC are in the same group.

15.7 Establishing First Time Password

You must establish a password as **Administrator** the first time you run the Administrative Tool in QC-Gage. You are requested to enter this password twice as discussed in the next section.

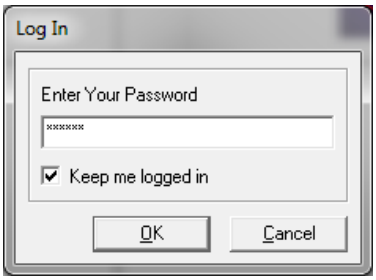
1. You are asked to set your password as the Administrator for the Administrative Tool. This Password is the key to logging in as the administrator from any copy of QC-Gage.

2. Enter the Administrative path. We entered the folder we've used in this example.

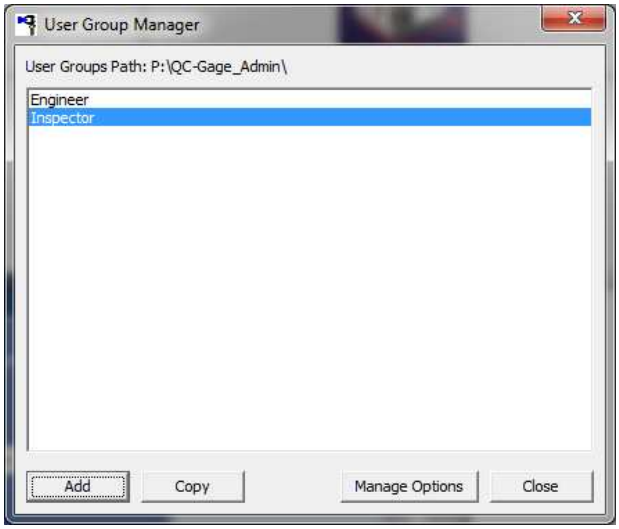


15.8 Create User Groups

Select the **Administrative Tools – Manage User Groups** menu and the password screen is seen only the first time you select this option. Enter the password and be sure to check the Keep me logged in checkbox so you won't have to keep entering the password at every step.



1. To create a new user group, click the **Add** button and enter a name for the first group. For our example we pressed Add twice and entered **Inspector and Engineer**.



2. Choose the settings you wish the **Inspector** to follow by clicking the **Manage Options** button. You can set the available features your users have access to and the features you want locked.

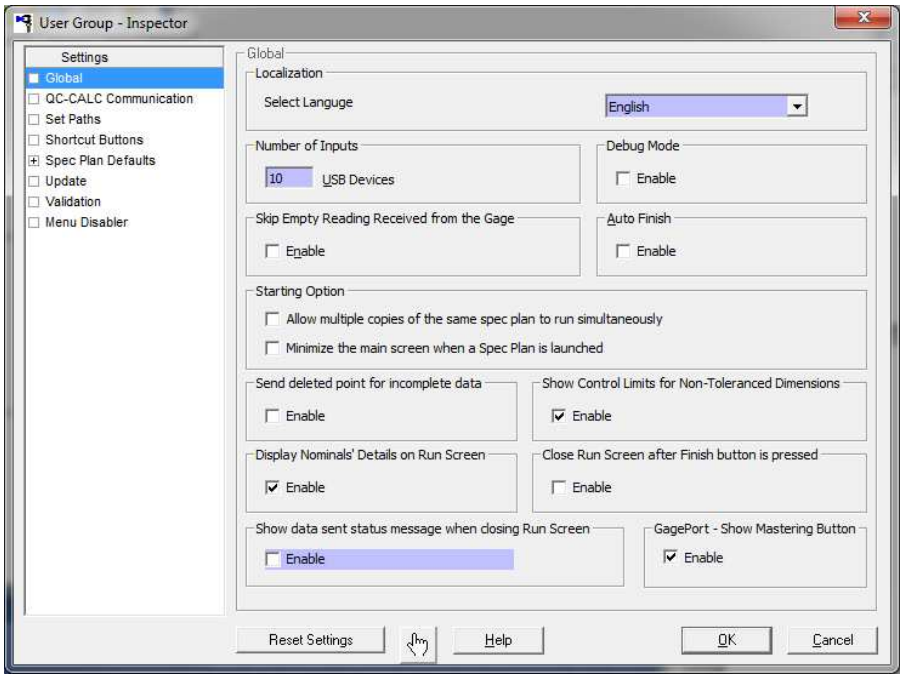
15.8.1 Manage Options

The **Manage Options** button is used to set the configurations applied to all computers within a group and therefore establish the look and feel of each QC-Gage in the group. The settings you choose can optionally be locked to ensure the operation of each QC-Gage is controlled. You can:

- Select Common Settings
- Lock the Settings

Select Common Settings

The **Settings** screen that appears is the same as the **Tools** – **Options** screen used in QC-Gage. There is an additional **Finger** button at the bottom of the window and a menu labeled **Menu Disabler**. When you click the finger button, it enables you to choose which settings are locked. You lock any option on the screen by clicking the Finger button and click the option. The option becomes purple indicating it is unavailable to the user.



Lock the Settings

When the **Finger** button is depressed and you float the mouse over any option, the item is temporarily outlined with a purple square. Clicking on the item while the purple square is shown causes the item to turn fully purple indicating it's locked.

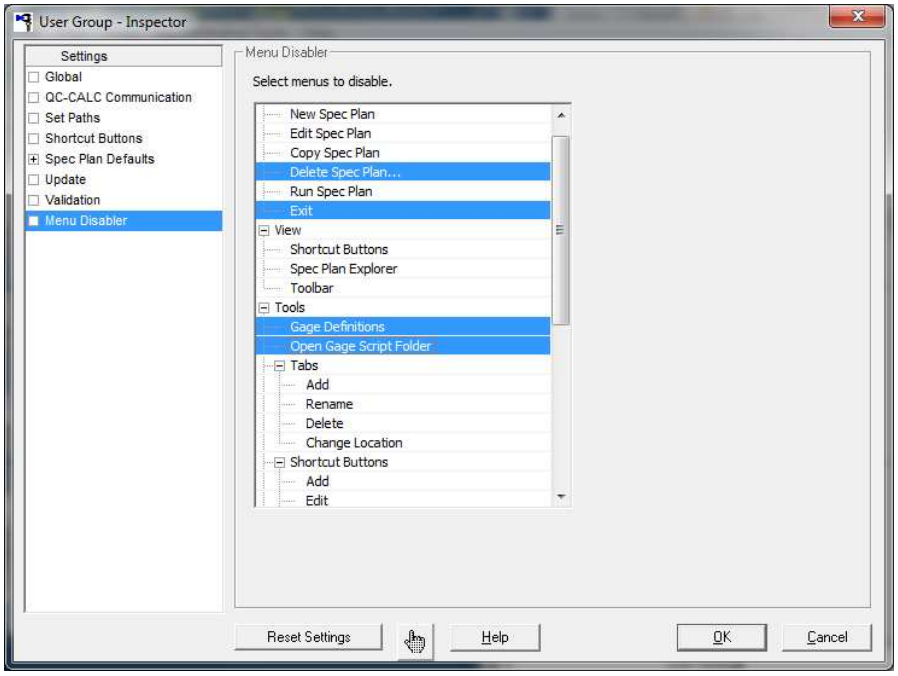
Grayed items indicate they change from part to part and therefore cannot be assigned globally in the Admin Tool.

TIP: By default, the **Finger** button stays depressed allowing you to multi-select many items. Once depressed, the button stays down until you click it again or you click on an item that is not lockable.

Note: Any file settings needing global access such as Assignable Causes, Corrective Actions, Filters, and the Update location should be set so that all computers use the same files. This ensures the entire company uses the same settings. You set these items in this configure window.

Menu Disabler

All normal menus can be disabled using the **Menu Disabler** in the **Manage Options** screen. There is no need to use the Finger button on this particular screen. Simply click the menus you want to disable for the particular group you're currently editing. All highlighted menus in the list are disabled for the entire group upon clicking **OK**. To re-enable a menu simply click it a second time.



TIP: Holding the SHIFT or CTRL key while selecting menus results in the usual Windows group and single selection of the menus.

15.8.2 Manage Menus

All QC-Gage "checkable" menus must be set to the desired state (checked or unchecked) before using the Administrative tool to locked them. For example, if you want QC-Gage to always show the **Short Cut** buttons under the View menu, you must turn-on the checkbox and then lock it.

15.8.3 Set Current User Group

Once the User Groups are created and the options are set for each group, you activate the group by choosing **Administrative Tools** – **Set Current User Group** menu. This should be a onetime change and QC-Gage will remain in this configuration until further notice.

15.9 Logout

If you checked the **Keep me logged in** checkbox at the beginning of this session the **Logout** menu is used to close out the edit feature. Closing QC-Gage and re-starting it cancels the login as well.

15.10 Disconnecting from Admin Path

In the Administrative Tools menu, there is the **Disconnect from Admin Path** option which allows you to leave the Administrative settings you're currently connected to. After disconnecting you will have the option to join on to a new path.

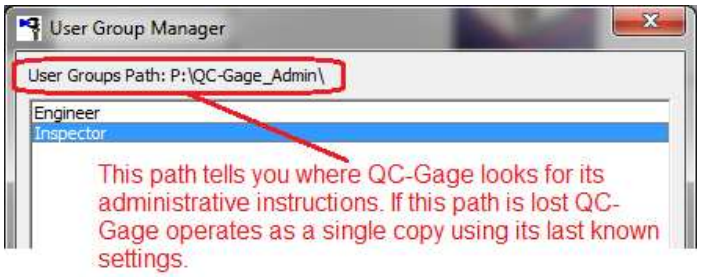
15.11 Troubleshooting

Administrative Tools Menu Not Visible

If you do not see the Administrative Tools menu when you start QC-Gage, it either means QC-Gage was not installed as an Admin copy (there are special installation instructions for this) or QC-Gage no longer has access to the central Admin settings folder. If QC-Gage was installed correctly then check the following:

- Check to make sure the user currently logged on has access to the central administrative folder.
- If you are using mapped drive letters, make sure the drive letter originally specified is still pointing to the same shared directory on the network.

The User Group Path is shown at the top of the User Group Manager window.



16. GagePort NT by CimWorks, Inc

16.1 Introduction

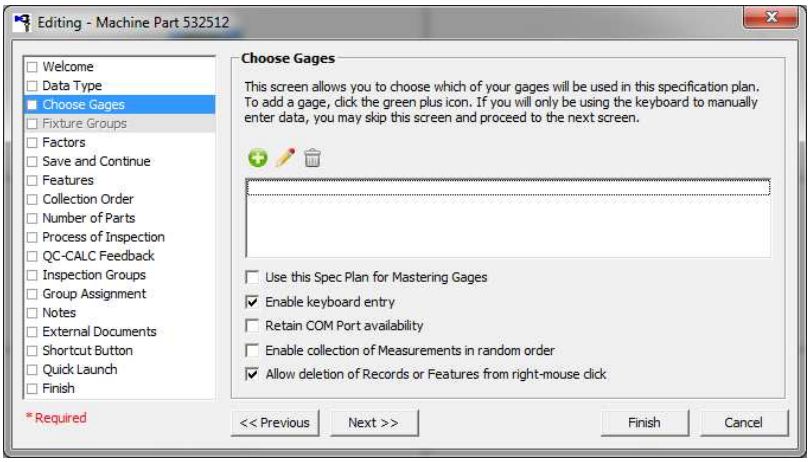
This section of the manual is dedicated to setting up and using QC-Gage with digital and analog probes connected to GagePorts NT. We discuss the details of connecting, using, and cabling considerations many other gages do not require. The connection to the GagePort NT is through the current USB port on your computer. Assuming you have your gages connected to the QC-Gage computer we'll detect and setup the gages.

16.2 Digital Gage Setup

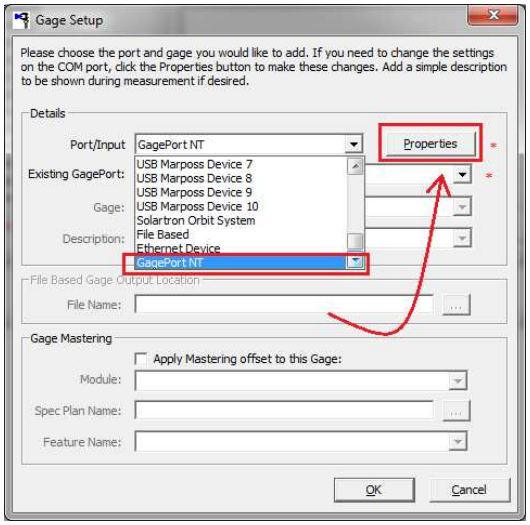
Using the QC-Gage Spec Plan wizard begin writing a new Spec Plan or edit an existing one. We skipped GagePort NT setup in previous sections of the manual but now we'll discuss this important topic. Keep in mind we are setting your GagePort NT system one time in one Spec Plan but it is useable in any Spec Plan you have.

16.2.1 Choose Gages

Click the green **Add** button when you've moved to the **Choose Gages** step in the wizard.



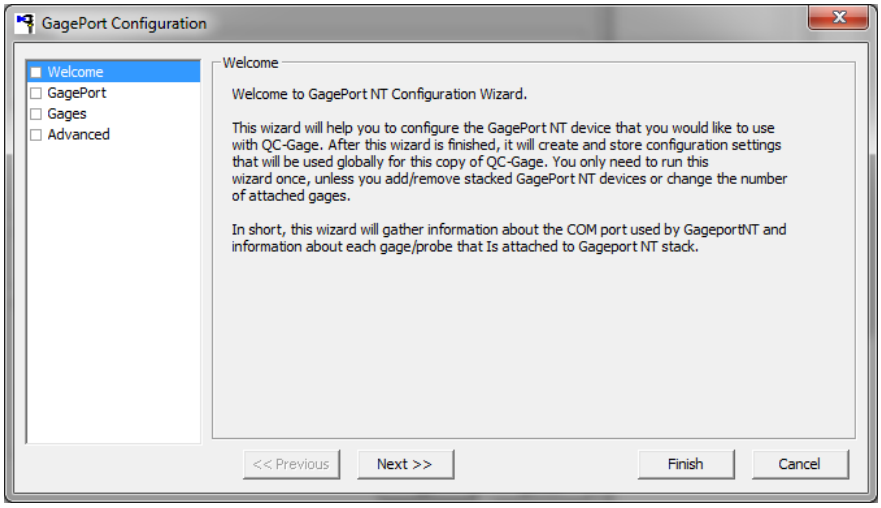
You must scroll down to the bottom is a long list to find the GagePort NT name as shown in the screen on the right.



16.3 GagePort NT Setup Wizard

16.3.1 Welcome

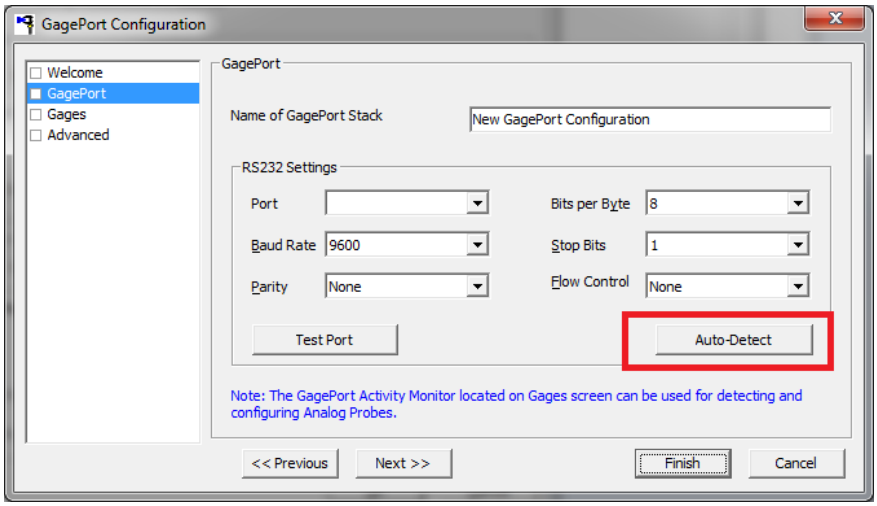
Once you choose GagePort NT on the above screen, click the **Properties** button to display GagePort NT setup wizard. You use this wizard to setup the devices you wish to connect to your QC-Gage Spec Plan. You will gather all the information about the COM port used by GagePort NT and information about each gage/probe in the GagePort NT stack. Whatever you setup in this wizard will become globally available to all Spec Plans. Click **Next >>**.



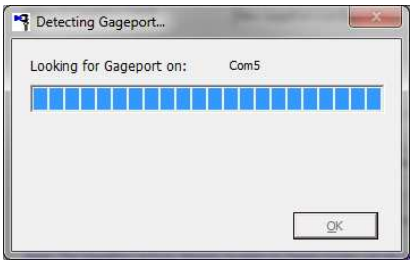
16.3.2 GagePort

Auto-Detect GagePort NT

This screen is used to setup the port number and the speed of the RS232 serial communication cable. Since QC-Gage can help you perform this task the first step should be to click the **Auto-Detect** button.



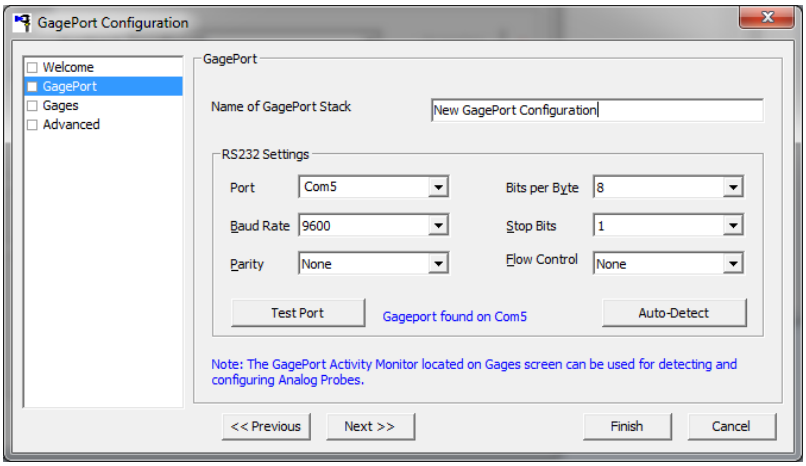
QC-Gage begins sending commands to the GagePort NT on various serial ports in an attempt to see if it recognizes any gages. You'll see a progress bar moving as the gages are scanned to determine what gages are attached to this computer.



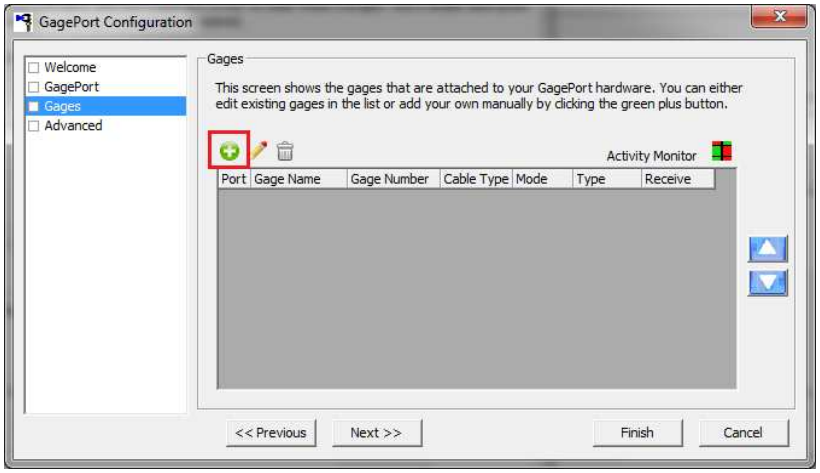
QC-Gage reports its findings and in this case indicates it found 10 ports. Be sure to wait until you see the **Detection Complete** message before you press the OK button.

The serial communication parameters are detected and saved in this screen.

In this case we see the GagePort NT system was found on COM port 5.



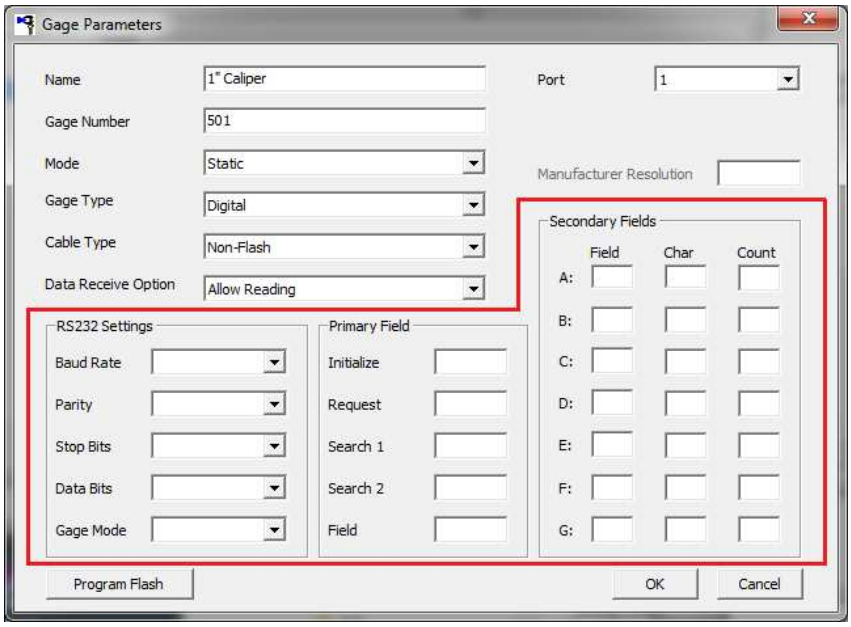
Click the **Next >>** button to add the gages to your Spec Plan. Now click the green **Add** button to add gages to you Spec Plan.



16.3.3 Gages – Gage Parameters

This screen is used to configure the gage and specify its name and how you wish to use it. The red outline area below contains the RS232 Settings, the Primary

Field group, and Secondary Fields group are rarely used. Most gages are connected to the GagePort already and have Smart cables ready to go.



Name

The name of each gage should be entered to help you identify the gage while writing your Spec Plans. Any text can be entered here.

Port

The GagePort NT can have from 1 to 32 physical connectors. The number listed here is the physical connection (port) in the GagePort stack.

Gage Number

For digital gages the gage number comes from the gage itself during detection and should not be changed. For analog gages this number is usually 0000 but in either case, these numbers should not be changed by user. There is a table in GagePort NT for each gage manufacturer and may include the resolution of the gage so we usually do not modify this number.

Mode

The two available modes are static and dynamic. When you set the mode to static the gage will send you 1 number for the reading. If dynamic is used, you will have 4 numbers available: Actual, Min, Max, & TIR. Dynamic mode is useful for determining the highs and lows of many readings. You can obtain dynamic readings from all gages because GagePort NT will provide the 4 readings even if the gage is not capable.

If you think you may need TIR in some Spec Plans, set the mode to dynamic. You can still use the actual reading only (static) in Spec Plans that only require a simple reading.

Gage Type

There are two supported gage types – **Digital** versus **Analog**. A digital gage is one that produces reading in engineering units such as a caliper. You press the gage button and the reading is sent to the computer. The reading is digital because to there is no mastering or calibration needed. The gage knows the value and transmits it. Analog is a steady stream of voltages that must be

converted to engineering units. This means a voltage must be converted to a useful distance measurement and reported a value such as 1.2345. Most people do not care about the voltage value, only the final measurement.

Cable Type

A Flash cable means the cable can be programmed with a particular set of commands to parse incoming data streams.

Data Received Option

Your choices are to **Allow Reading** or **Force Reading**. Forcing a reading simply means you can send a command to force the gage to report its current value. When you Allow Reading, the user can press a button or foot switch to send the value.

Manufacturer Resolution

This number is available from the maker of the gage and tells you the smallest increment the gage can report. If you do not have this number you must perform a two point mastering with QC-CALC where the count and value are recorded at two locations allowing QC-Gage to calculate the number of ticks moved over a known distance.

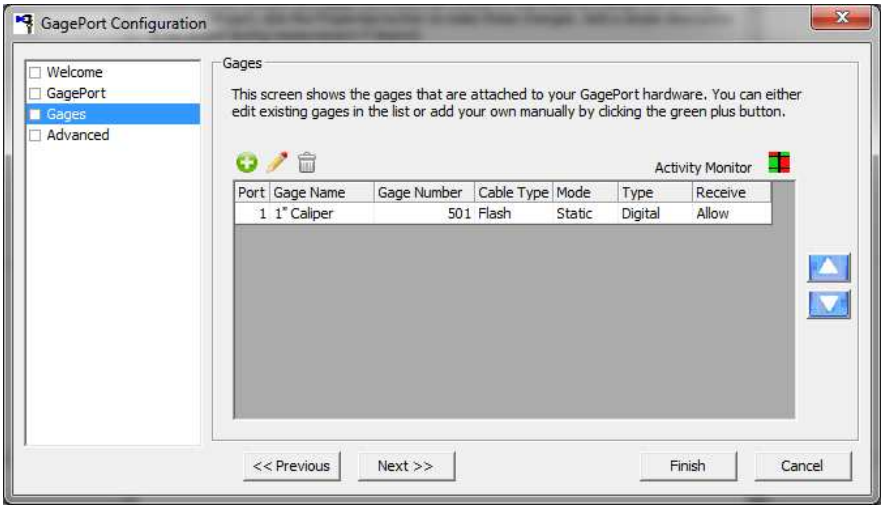
RS232

These are the serial communications parameters GagePort uses to talk with the individual connected gages.

Primary & Secondary Fields

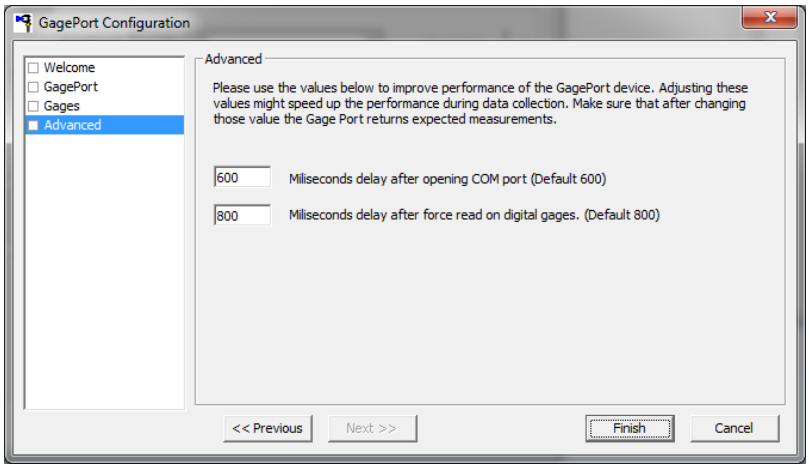
All Smart Cable use the Primary & Secondary Fields to control the parsing of the data stream received from the gage. Please read the GagePort NT user manual for more details on these cables.

Pressing **OK** on the **Gage Parameter** screen shows our gage added to the list of gages. Continue adding as many gages as desired.



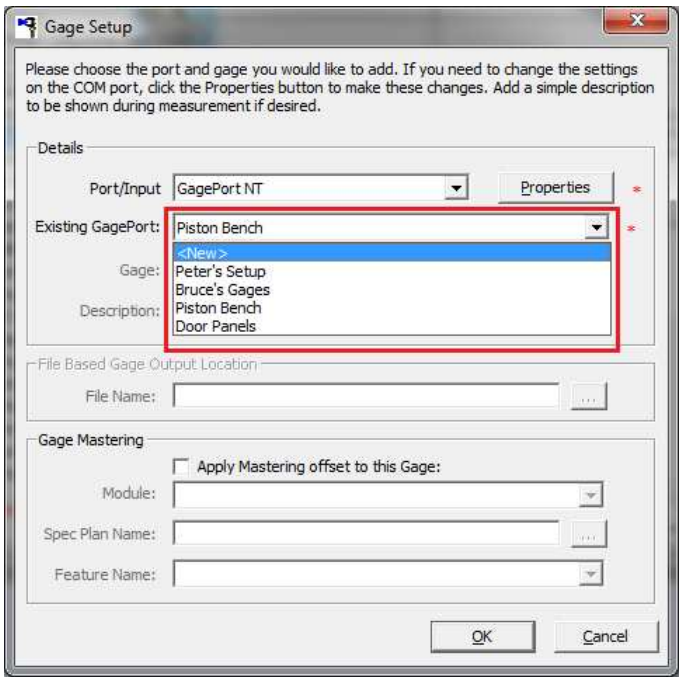
16.3.4 Advanced

The Advanced screen provides a method to insert a certain amount of time after opening the communication port before GagePort NT is ready to listen. The default setting is to wait 0.6 seconds after opening the port and 0.8 seconds after a reading is forced. These are safe settings. If you have many attached gages you may have to increase these values. Digital gages are slower than analog gages. Click the **Finish** button. You can increase performance by decreasing the time delay.



16.3.5 Gage Port Setup

Now that you've completed detecting and adding gages to your GagePort list, we see the growing list of available GagePort NT configurations. Notice that there are several configurations listed by a logical name. Although you can create multiple configurations as we have done here, typically you'll need just one. If you add all available gages to your configuration you can write many Spec Plans selecting just the gage or gages needed from the configuration.



16.4 Mastering Analog Gages

16.4.1 Introduction

Digital gages are simpler to use because they usually do not require mastering. They are self-calibrated and report in engineering units of inches or mm. Analog gages have an extra step required and therefore must be mastered against a known size. QC-Gage uses Feature Based Mastering meaning each measured feature must be mastered against a known size. Create your Spec Plan, enter all nominal & tolerance information, and then assign the gage. You will master each feature as often as your quality department recommends. Frequent mastering may be required to ensure accurate and repeatable readings from the gage.

16.4.2 Steps to Master

Keep in mind, as we add our feature to the Spec Plan and assign its source of data to the special GagePort NT system, extra steps may be required to define how the gage is calibrated. In fact, an extra screen (Tab) exists on the **Feature Setup** screen for GagePort NT features. Step 3 below sets up the analog port while step 5 is used to Master the analog gage.

Add a Feature to Spec Plan to begin the process of mastering:

1. Select **Feature Info** Tab
    a. Add Label
    b. Pick GagePort NT for Feature Source
    c. Add nominal, tolerance, etc.
2. Select **Picture and Notes** Tab
    a. Add a picture of the part
    b. Enter your notes
3. Select **GagePort Setup** Tab
    a. Pick Single Gage (Analog or Digital) button
    b. Pick your GagePort probe using Collection Properties
    c. Add Capture Orientation
    d. Select Type as Static
    e. Select Display Type
    f. Select Analog Gage for this feature
4. Save your Spec Plan
5. Launch the **GagePort Master Setup** screen – right click on button
    a. Read the **Welcome** screen – Press **Next >>**
    b. Select **Two-Point Mastering and Zeroing** – Press **Next >>**
    c. Select the Gage by placing a checkbox in the **Master** column
    d. Click the **Launch Mastering Screen** button
    e. Measure known Minimum Value and press **Master Gages(s)** button.
    f. Measure known Maximum Value and press **Master Gages(s)** button.
    g. Measure known Zero Value and press **Master Gages(s)** button.
    h. Check the **Display Engineering Units** checkbox to see your values
    i. Click **Finish**

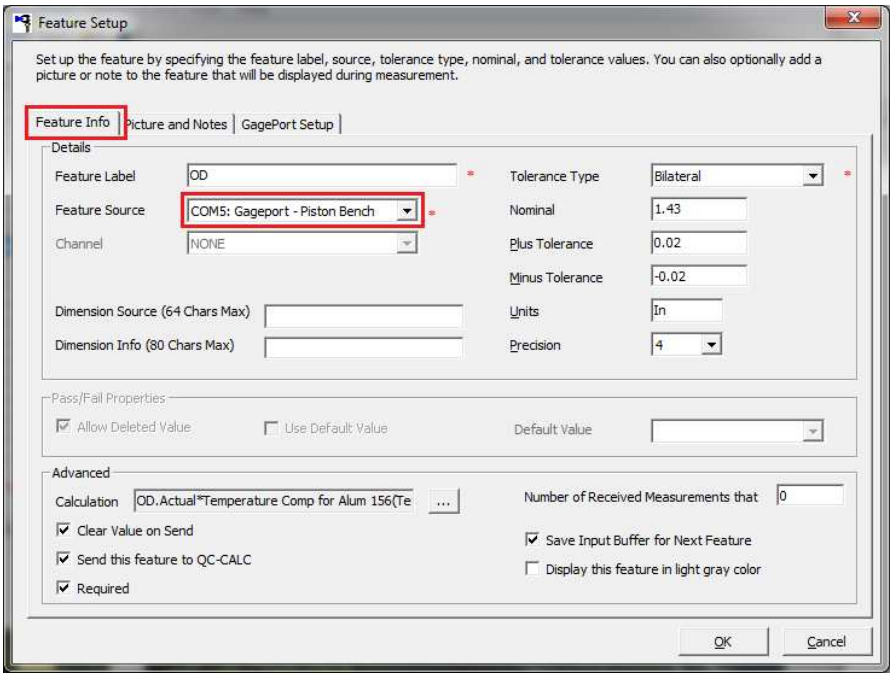
Your analog gage is Mastered and ready for use. The next section explains this process in more detail.

16.4.3 Steps to Master Detailed

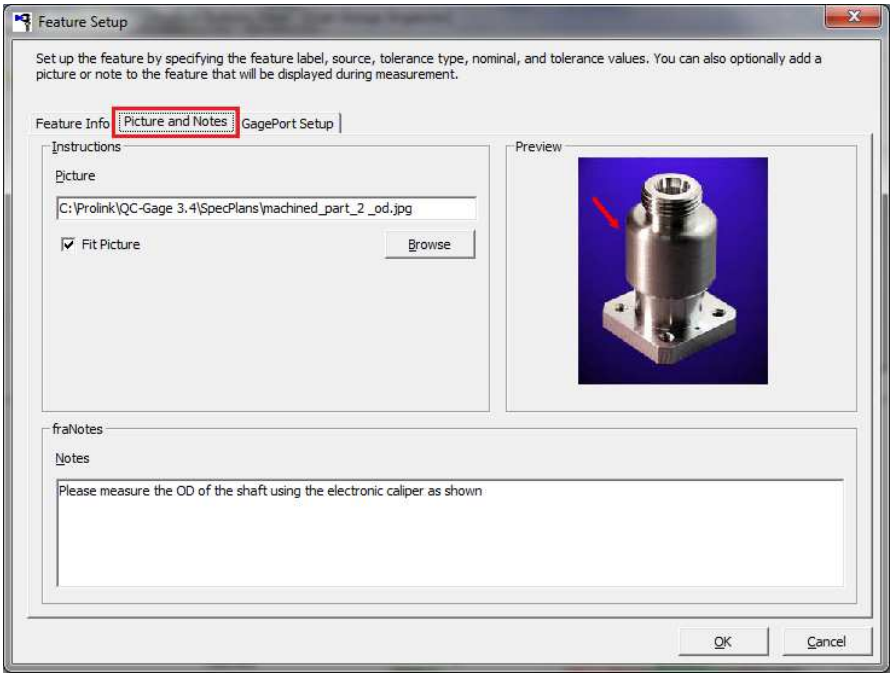
These step by step instructions should clarify the steps necessary to use a GagePort NT analog gage in your Spec Plan including mastering.

Master Setup – 1 Gage

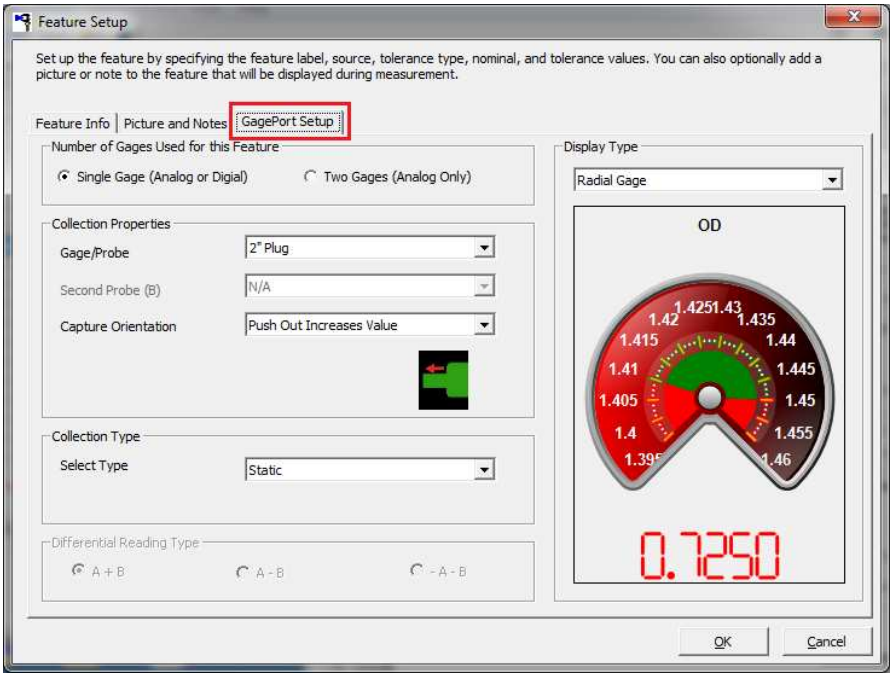
1. Enter the feature's detail and select the GagePort NT system. You'll see the **GagePort Setup** tab added when you select a GagePort NT gage.



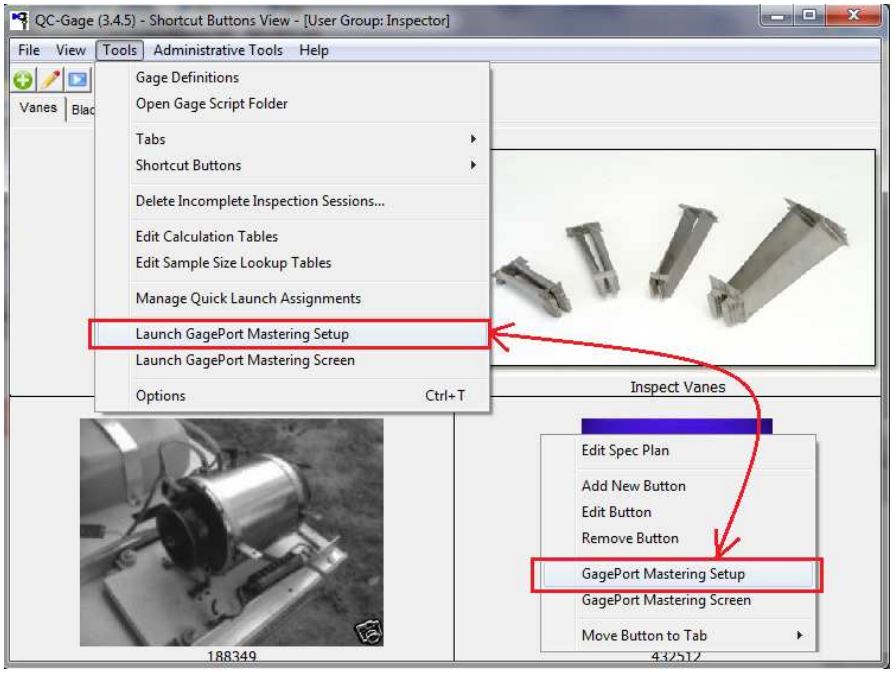
2. Add any pictures and notes as usual.



3. Select **Single Gage (Analog or Digital)**.
4. Select the particular gage from the **Gage/Probe** dropdown list. In our case we chose 2” Plug.
5. Determine the orientation of the gage (push out or in to increase value).
6. Choose a **Collection Type** of Static or Dynamic.
7. **Display Type** is a Radial or Column gage. Choose **Radial Gage**.
8. You GagePort gage is setup so click **OK** to save your Spec Plan.

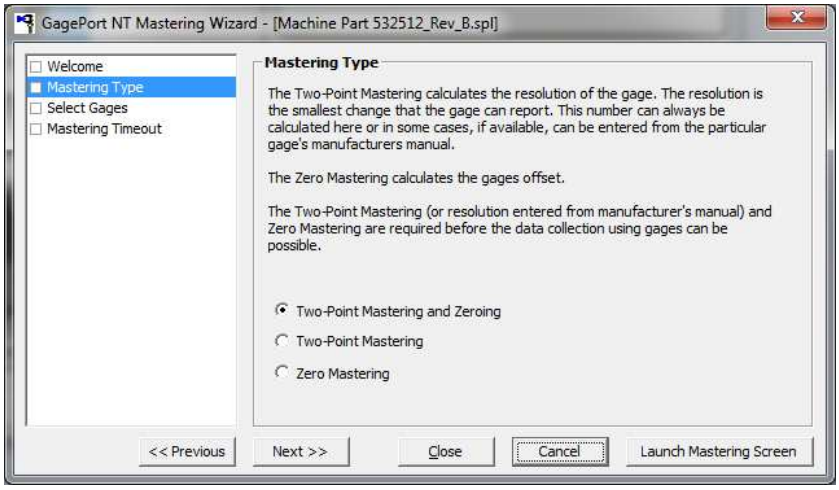


9. Right click on the Spec Plan button and selected **GagePort Mastering Setup** or use the **Tools** menu as shown below.
10. Select **GagePort Mastering Setup** menu.

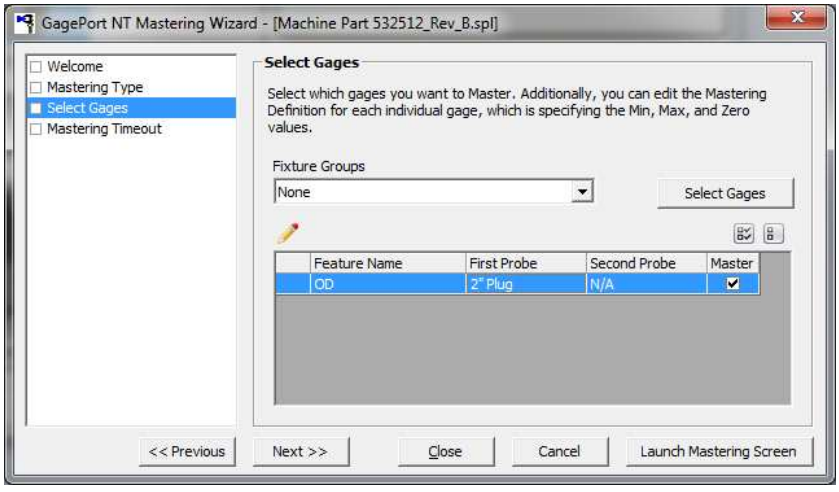


11. The Mastering Wizard walks you through the process of defining how to Master this gage. **Gage Mastering** follows the **Mastering Setup**.

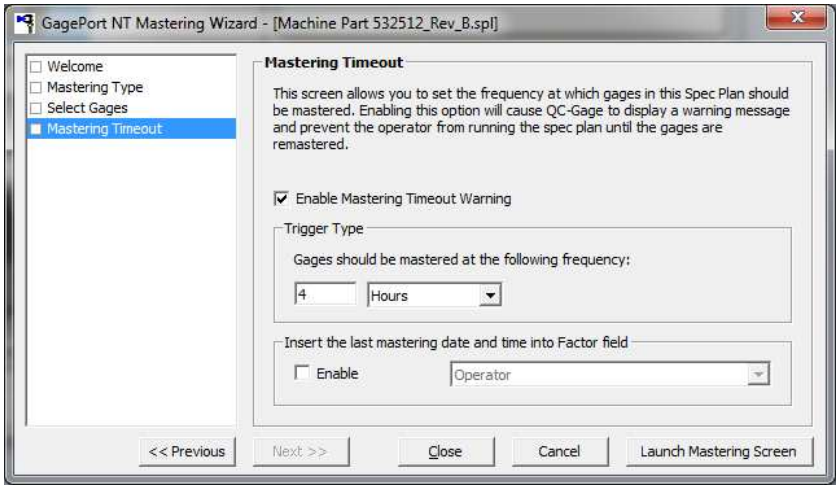
12. In this example we choose to use **Two-Point Mastering and Zeroing** because it demonstrates all three options in one example.



13. Select the Gage by adding a checkbox in the **Master** column. In this case we only have 1 to choose.

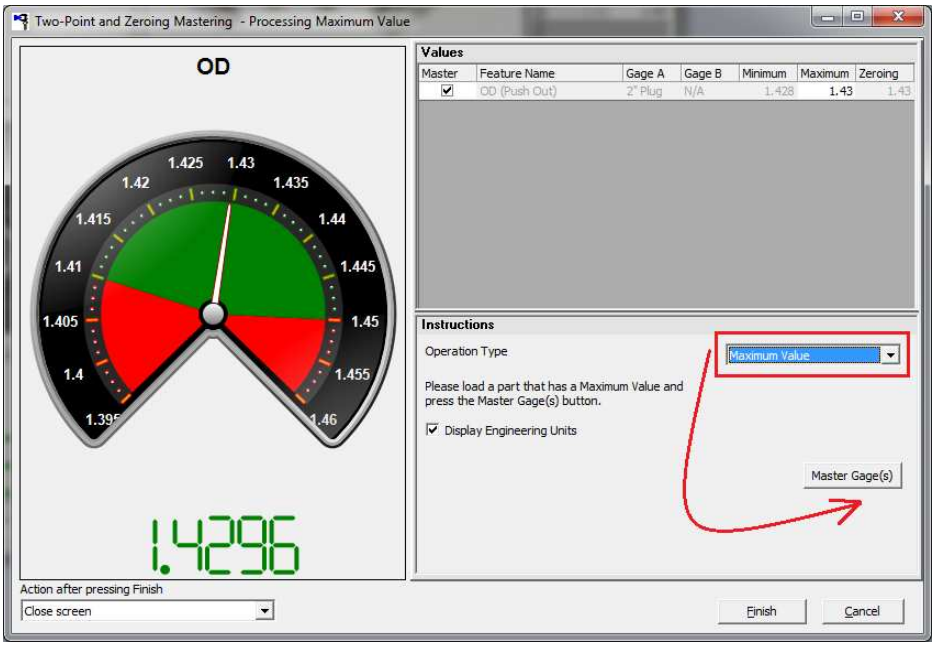


14. If your gage must be mastered on a periodic basis you can add a reminder to ensure your operators are forced to stop inspection and re-master the gage. Here we show the re-master will occur every 4 hours.

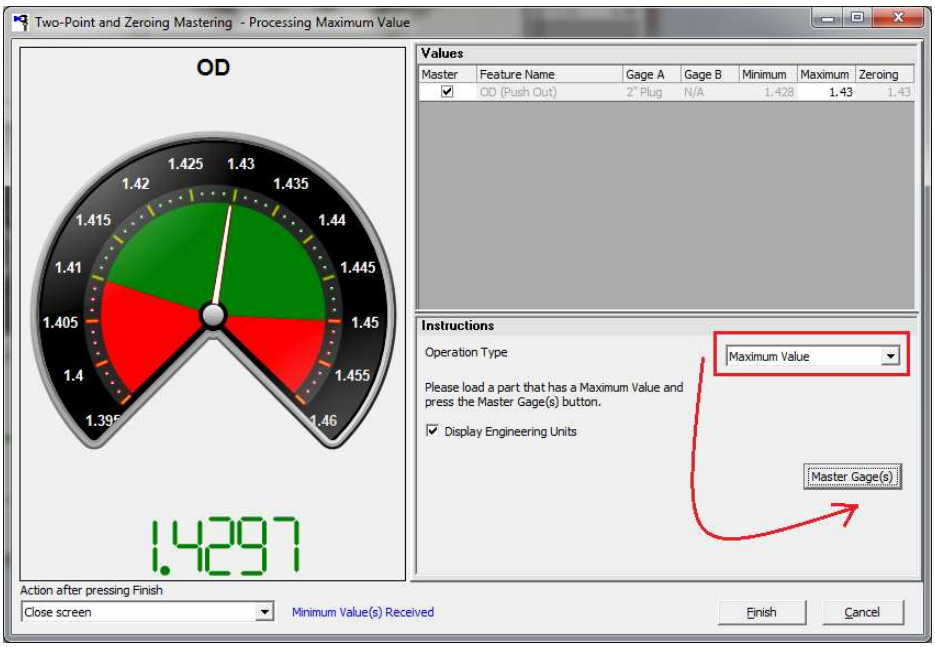


Mastering the Gage

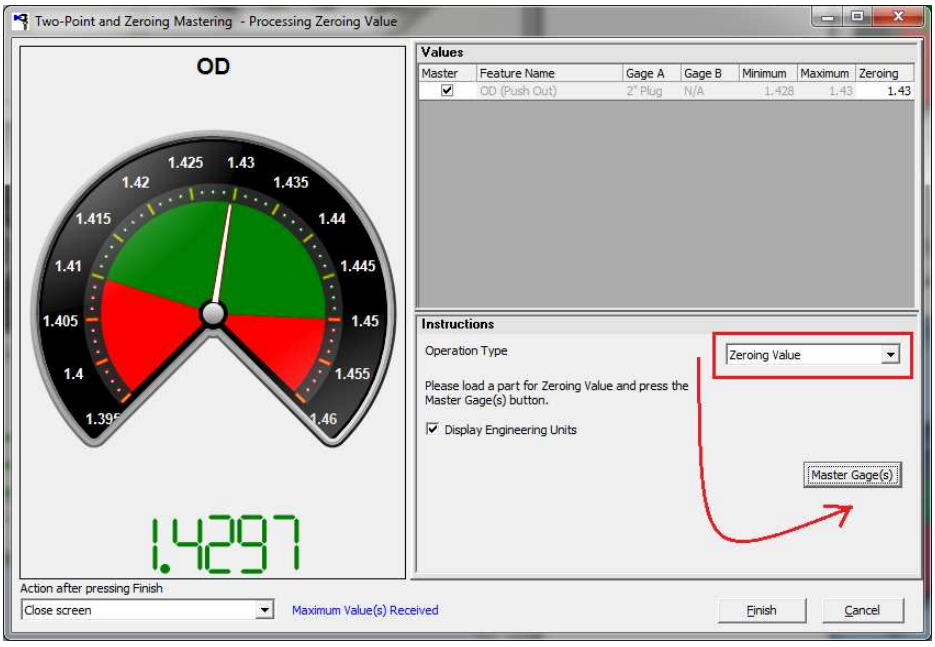
15. Click the **Launch Mastering Screen** button.
16. In this next sequence of screens we place our Plug gage into 2 ring gages of small and large to scale or master the gage to known sizes.
17. The Plug gage is now inserted into the smallest ring gage (**Minimum**) and we press the **Master Gage(s)** button.



18. Next, the screen moves us to the **Maximum** ring gage and we insert our Plug gage into the largest ring gage. We press the **Master Gage(s)** button.



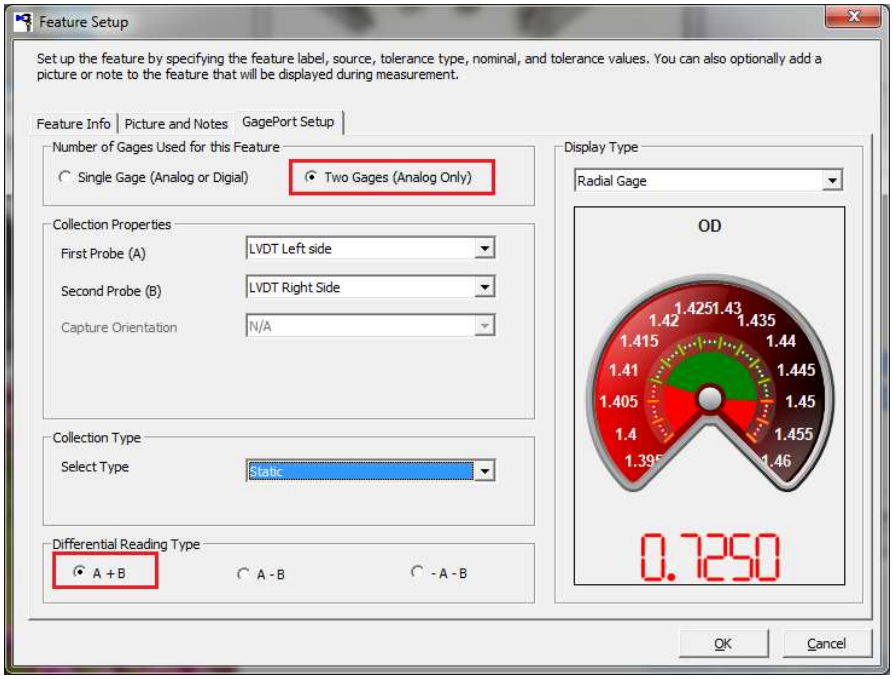
19. And finally, we are requested to measure the **Zeroing** ring gage from which all reading are based. Press the **Master Gage(s)** button.



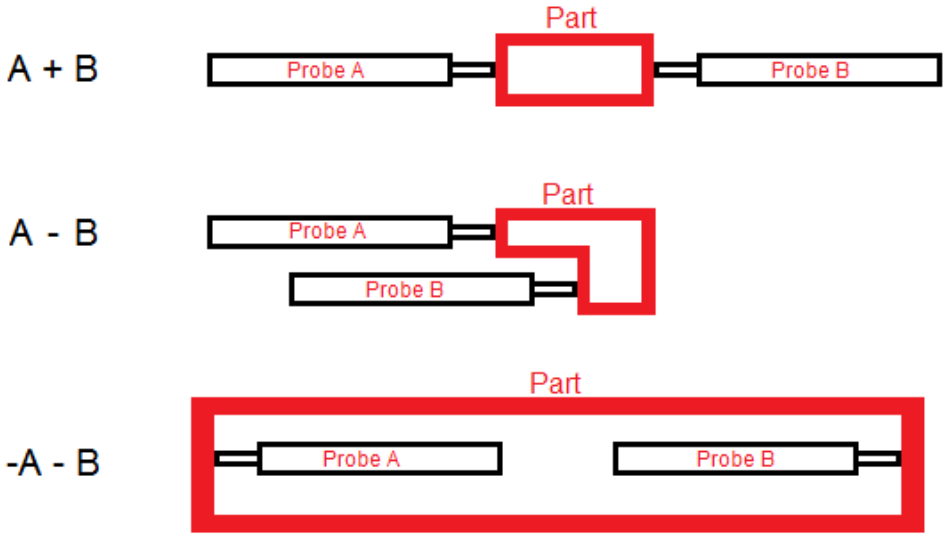
Your GagePort NT analog gage is now ready for use!

Master Setup – 2 Gages

There are times when you will use two probes to measure 1 feature. Selecting the **Two Gages (Analog Only)** option shown below provides this functionality.



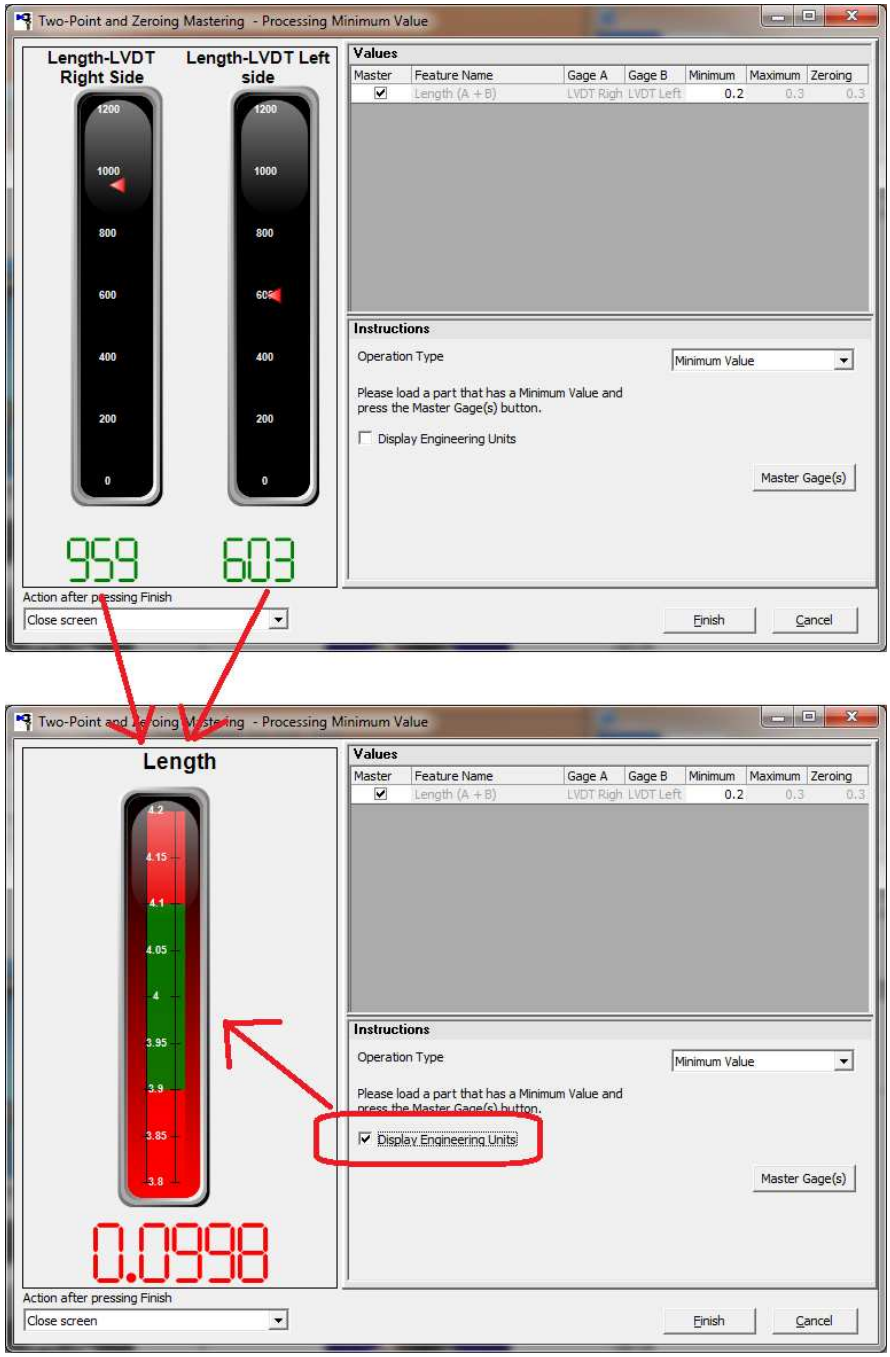
There are three possible configurations for the probes. You must understand the method QC-Gage uses to determine the Differential Reading between the probes. Be sure to master and measure the parts using the same configuration.



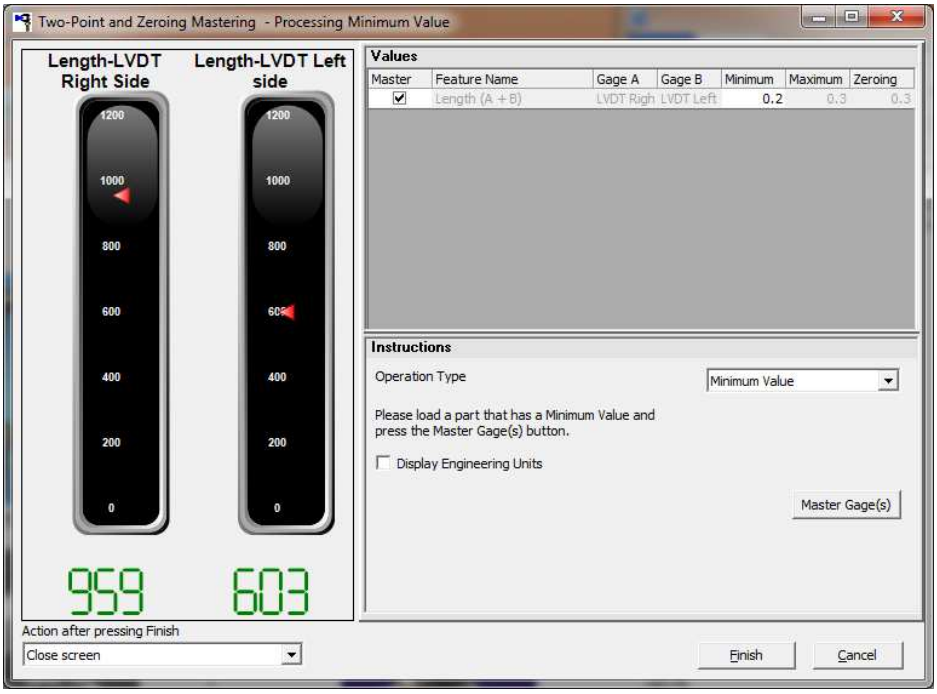
TIP: All probes must be of the same resolution.

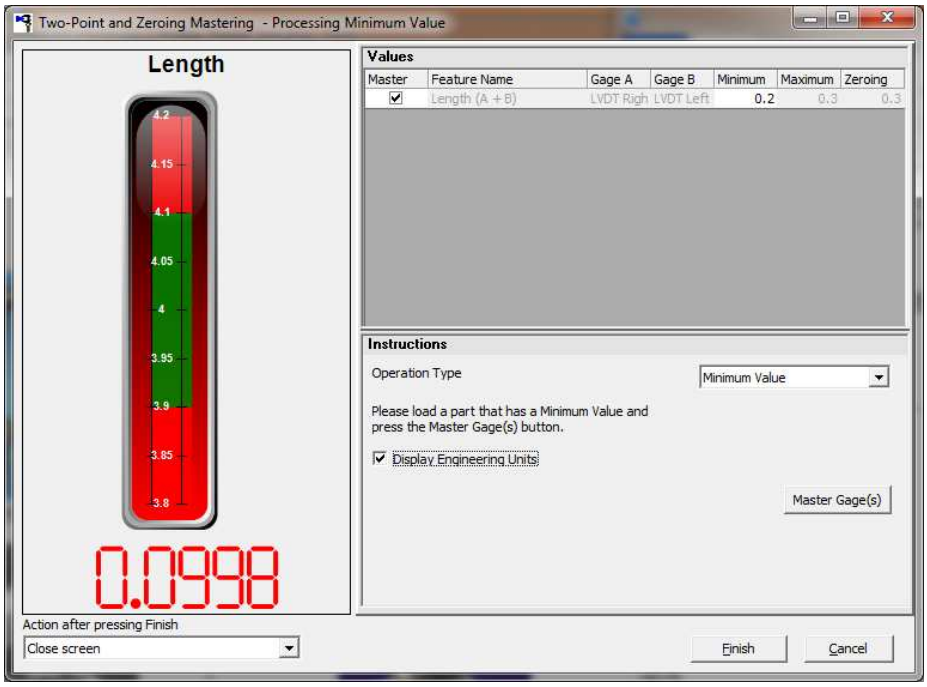
Master Screen – 2 Gages

Right click on your Spec Plan button and select **GagePort Mastering Setup**. When mastering two probes QC-Gage displays both probe readings side-by-side. Below these gages are showing you the counts within each probe.



It is difficult to understand the actual value when counts are displayed so a **Display Engineering Units** checkbox is provided. Checking this box joins the two probes together displaying the differential reading in engineering units. Using your golden part master the Min, Max, Zero values just as before.


Two-Point and Zeroing Mastering - Processing Minimum Value
Length-LVDT Right Side
Length-LVDT Left side
1200
1000
800
600
400
200
0
959
603
Values
Master
Feature Name
Gage A
Gage B
Minimum
Maximum
Zeroing
Length (A + B)
LVDT Righ
LVDT Left
0.2
0.3
0.3
Instructions
Operation Type
Minimum Value
Please load a part that has a Minimum Value and press the Master Gage(s) button.
Display Engineering Units
Master Gage(s)
Action after pressing Finish
Close screen
Finish
Cancel

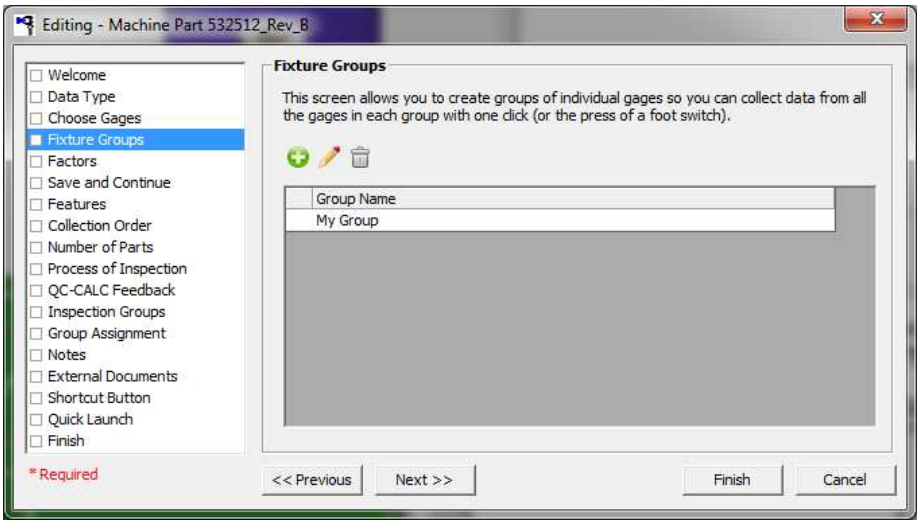

Two-Point and Zeroing Mastering - Processing Minimum Value
Length
4.2
4.15
4.1
4.05
4
3.95
3.9
3.85
3.8
0.0998
Values
Master
Feature Name
Gage A
Gage B
Minimum
Maximum
Zeroing
Length (A + B)
LVDT Righ
LVDT Left
0.2
0.3
0.3
Instructions
Operation Type
Minimum Value
Please load a part that has a Minimum Value and press the Master Gage(s) button.
Display Engineering Units
Master Gage(s)
Action after pressing Finish
Close screen
Finish
Cancel

16.5 Fixture Groups

16.5.1 Introduction

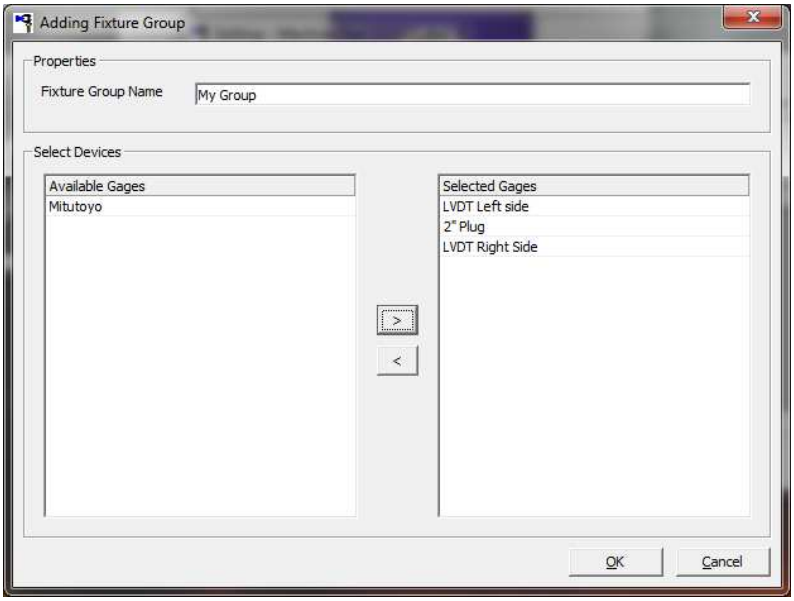
When you use several analog probes or LVDTs in a large fixture you may need to read all gages at once. Typically, this occurs when the user presses a button or foot switch. You create a Fixture Group and add the probes into the group that you wish measure all at once. Keep in mind you do not have to add all probes to the same group and you can create several groups within a Spec Plan.

If you have at least 1 feature in your Spec Plan the **Fixture Groups** item is displayed. Press the **Add** button to create a Fixture Group.



16.5.2 Create the Group

First, enter a **Fixture Group Name** at the top of the screen ("My Group" was used in the example below). Next highlight three of the four probes and move them to the **Selected Gages** list on the right side by using the **>** button. Once all of the correct gages have been selected, click **OK**.



16.5.3 Using the Fixture Group at Run Time

The fixture group is represented in the Run Screen as blue rectangles. When you press ENTER, F12, or a foot switch all readings are requested and filled in as shown in the first column below. The second column below shows where the fixture group readings are still waiting to be received.

16.5.4 Live Data Tab

You can view the live data by clicking on the **Live Data Collection** tab and make adjustments before the ENTER key is pressed and the numbers are committed. This screen shows you the current value coming from the analog probe.