Gage Tech™

User's Guide

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Introduction

Gage Tech™ is a measurement system validation tool that calculates Gage Repeatability and Reproducibility (Gage R&R) for ISO 9000, QS9000, and other quality systems. This program follows the recommended analysis by the AIAG group, using the $\overline{X}$ and R (average and range) method. Gage Tech™ is a Palm Powered Solution™ that requires PalmOS® 2.0 or greater and a minimum of 256k RAM.

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Features

Gage Tech™ features include:

Standard Gage R&R analysis as recommended by the AIAG group.
Supports up to three operators, three trials, and ten parts per data set.
Stores data for up to 50 gages each with up to 100 data sets.
Unique status display of all data on one screen helps evaluate and improve the quality of data collected.
Automatic exclusion of insufficient and out-of-limit data.
Real-time calculation of reports and graphs.
Color or monochrome $\overline{X}$ and R Charts.
Auto-ranging, auto-scaling charts zoom in on graph details.
Displays intermediate results once the minimum data has been collected.
Automatic backup of data during HotSync® operation.
Up to 5 decimal places of accuracy.
Ergonomically designed:
Tabbed windows for greater ease of use.
High-contrast charts for easier viewing in suboptimal conditions.
Buttons for quickly cycling through data when collecting or inspecting data.
Fingertip operation of pushbuttons.
Numbers displayed in large font for easier reading.
Supports Palm OS 2.0 and greater including 5.0 (Garnet) and Cobalt.
Support for both monochrome and color devices.
Low operating system and memory requirements (minimum OS 2.0 w/ 256k RAM).
A Palm Powered Solution™.

Applications

Here are some examples of where Gage Tech™ can be useful:

Standard Gage R&R studies.
On-the-spot validation of setups and procedures.

Software License

The very first time that you launch the program, the License Agreement screen will appear. Before using the software, you must read, understand, and agree to the software license. The software license is available online and is included in the software package downloaded from the Creative Algorithms website.

Trial Period

The program may be evaluated for 30 days from the date of installation. After which, you must purchase a registration key to unlock the program and continue using it. Every time the program is launched, you will be shown the number of evaluation days remaining. This display will not appear once the program is registered.

Using the Program

When you launch the program, you will see the main screen:
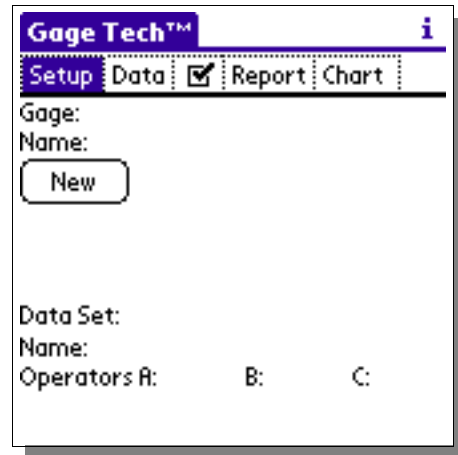
The tabs across the top of the screen allow you to switch between the functions of the program. You may change tabs at any time.

The "Setup" tab is for defining and managing gages and their data sets.

The "Data" tab is for collecting and viewing data.

The check-box tab is for evaluating and improving the quality of the data collected.

The "Report" tab shows the result of the Gage R&R study.

The "Chart" tab shows charts for the averages and ranges of the data.

The pop-up lists near the top of each screen allows you to select a gage and its data. If no data sets have been created for the selected gage, then all controls except the gage list will be hidden. If no gages exist, then the gage list will be hidden also.

Setup Tab

The "Setup" screen is divided into gage setup on the top and data set setup on the bottom. The "Data Set" portion will be hidden until you define your first gage.

You can select an existing gage with the "Gage:" pop-up list. If no gages exist, all gage and data controls will be hidden except for the "New" gage button.

The gage "Name:" field shows the name of the selected gage and allows changes to the name.
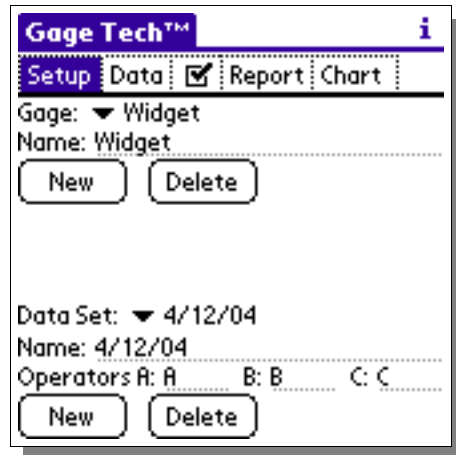
The "New" gage button creates a new gage. Remember to set the name of the new gage in the "Name:" field.

The "Delete" gage button deletes the selected gage after first asking you to verify the operation.

After you have selected a gage, the "Data Set:" pop-up list can be used to select an existing data set for the gage. If no data for the selected gage exists, all data controls will be hidden except for the "New" data button.

The data "Name:" field shows the name of the selected data set and allows changes to the name.

The "Operators" fields show the initials of the operators measuring the data.

The "New" data button creates a new empty data set for the gage and assigns the current date to the name of the data. It also sets the operators initials to A, B, C, respectively. The name and initials can be changed by modifying the corresponding field.

The "Delete" data button deletes the data set associated with the gage after first asking you to verify the operation."

Data Tab

The "Data" screen has pushbuttons for selecting the operator, trial, and part for data collection and viewing.

The left and right arrow buttons cycle through the measurements one at a time.

The "Measurement" field allows you to view and edit the measurement for the selected operator, trial, and part.

A minimum of eight measurements are required to complete the study (two operators, two trials per operator, two parts per trial). More measurements may be required if some of the data is excluded because it exceeds the control limits.

Check-box Tab

The "Check-box" screen contains a matrix showing the status of the data for each operator, trial, and part. The parts are ordered across the top and the operator and trials are organized along the side. This image shows valid data for three operators, two trials, and ten parts. Tapping a symbol in the matrix will switch to the "Data" tab with appropriate data preselected.

Symbols:

X	Excluded Data
-	Range exceeds LCL
+	Range exceeds UCL
?	No data
Check	Data OK

Data is excluded from the study reports and graphs if it meets any of the following conditions:

ï   Measurements taken by an operator for fewer than 2 parts.

ï   Measurements of a part for which an operator measured fewer than 2 times (trials).

ï   Measurements of a part taken by fewer than 2 operators.

ï   Measurements of a single part taken by a single operator for which the resulting range exceeds the UCL or LCL.

When data is excluded from the study, the original measurements are never changed or deleted by the program – the aberrant data is simply ignored.

Report Tab

The "Report" tab shows the results of the Gage R&R study:

EV	Equipment Variation
AV	Appraiser Variation
R&R	Repeatability & Reproducibility Variation
PV	Part to Part Variation
TV	Total Variation
UCL	Upper Control Limit
LCL	Lower Control Limit

THE SUM OF THE PERCENTAGES WILL NOT EQUAL 100%.

All values are % error. Lower scores are better.

Guidelines for R&R acceptance:

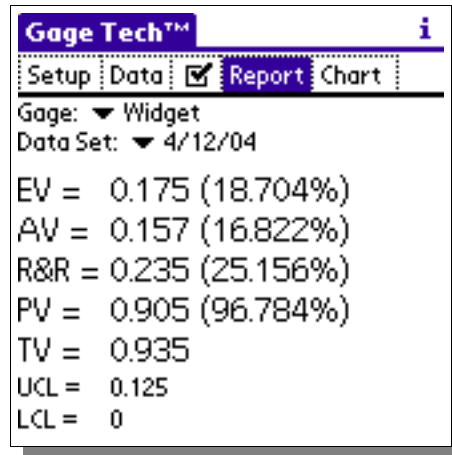|	
< 10%	OK
10-30%	Marginal
> 30%	Needs Improvement

Chart Tab

The "Chart" screen provides a graphical representation of the averages and ranges calculated by the program. Insufficient data or data belonging to a range exceeding the UCL are excluded from the study and are not shown on the charts.

There are two kinds of charts available from the "Chart:" pop-up list:

The "Average" chart shows the averages in measurement units vs. parts. It has one line per operator that depicts the average measurement of each part, as well as 1 line for the average measurement of all operators for each part.

The "Range" chart shows the ranges in measurement units vs. parts. It has one line per operator that depicts the difference between the highest and lowest measurement (range) of each part for that operator, a horizontal line for the UCL (Upper Control Limit), and a horizontal line for the average range of all parts.
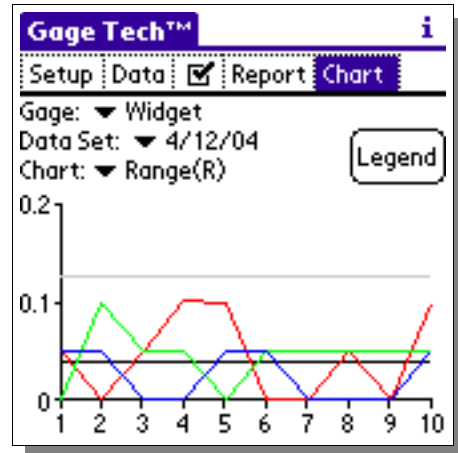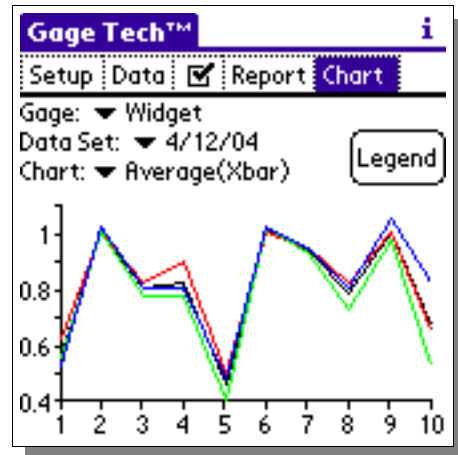
Drop-down Menu Items

These screen shots illustrate the drop-down menu items accessible from the program:
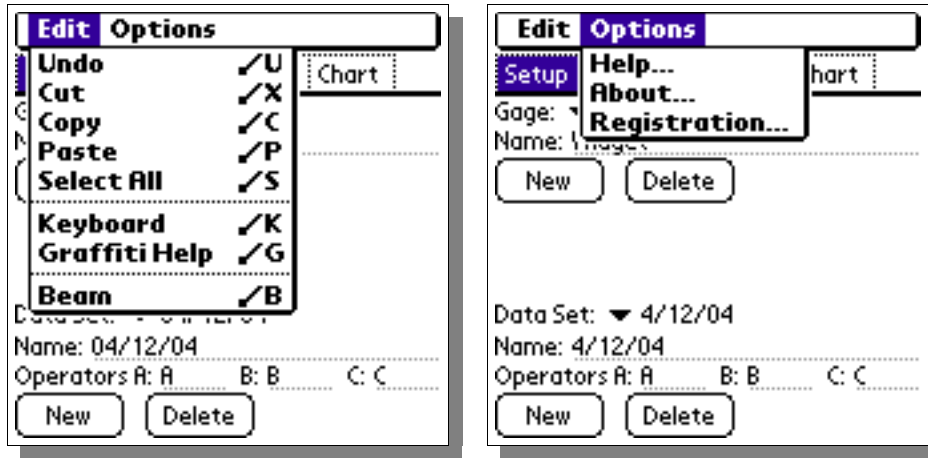
Undo/Cut/Copy/Paste/SelectAll/Keyboard/Graffiti Help:
Performs the selected action on the active field.

Beam:
Beams the program to other user's via the infrared port. See the "Sharing the Program" section for more information.

Help...:
Shows general help information about how to use the program. Help specific to the current tab is located in the "i" icon in the top right corner of the screen.

About...:
Displays the program version.

Registration...:
If registered, this displays information about to whom the program is registered. Otherwise, it displays instructions for registering the program and accepting the registration key.

Performing a Gage R&R Study

The best method:

1. Select the ten parts for the study randomly. If possible, the parts should be a representation of the full range of the process.

2. The gage should be calibrated prior to conducting the study.

3. Number the parts 1 to 10, but do not allow the operators to see the numbering.

4. Operator A should measure the parts in random order. Another person should record the results in the PDA. Operators B and C should perform their measurements on the same ten parts without seeing the other recordings.

5. Step #4 should be repeated, with a different random order.

Acceptable alternate methods:

If parts are large or otherwise unavailable, the parts can be measured by each operator in the same order.

If operators are on different shifts, each operator can measure all 10 parts for all three trials prior to the other operators measuring their parts.

If time is a constraint, a minimum of two trials is adequate.

Data is excluded from the study reports and graphs if it meets any of the following conditions:

ï   Measurements taken by an operator for fewer than 2 parts.
ï   Measurements of a part for which an operator measured fewer than 2 times (trials).
ï   Measurements of a part taken by fewer than 2 operators.
ï   Measurements of a single part taken by a single operator for which the resulting range exceeds the UCL or LCL.

If the latter occurs, the readings may be retaken using the original operator and part. The special cause that produced the out of control condition should be corrected.

When data is excluded from the study, the original measurements are never changed or deleted by the program – the aberrant data is simply ignored.

As the data is entered, the program will calculate the report and chart results, as well as determining data that meets exclusion criteria. A review of the check box tab will give an overview of the data in the report.

Guidelines for R&R acceptance:
< 10%   OK
10-30%   Marginal
> 30%   Needs Improvement

To begin a Gage R&R study, define your gage and create new data for it with the "Setup" tab. Then collect the data for the gage using the "Data" tab. You need a minimum of two operators, two trials, and two parts to conduct the study.

Next, evaluate the data using the table found under the check-box tab as a guide. If your data is acceptable, the "Report" and "Chart" tabs will show the results of the study.

Registering

Registration keys may be purchased on-line at http://www.creativealgorithms.com.

To begin the registration process, Launch the program. If the program has already expired, you will see the registration screen automatically. Otherwise, you will need to tap the menu button and select the "Registration..." menu item from the "Options" drop-down menu. The "Registration Instructions" screen will appear.

Note your PDA HotSync® user name displayed at the bottom. You will need to enter your user name exactly when purchasing and registering the program. Tap the "Done" button and then the "Cancel" button.

Open the following URL in your Internet browser: http://www.creativealgorithms.com/products.html.
Then add the program to your shopping cart. Follow the PayPal™ instructions for checking out. Be careful to enter your PDA HotSync® user name exactly when checking out. Otherwise, the registration key will not work. After PayPal™ has confirmed your payment, your registration key will be emailed to you.

Once you have your registration key, launch the program. If the program has already expired, you will see the registration screen automatically. Otherwise, you will need to select "Registration..." from the drop-down menu.

Tap the "Done" button. The registration key entry screen will appear. Enter the code that was emailed to you. Be careful to enter the code exactly as it appears in the email. Tap the "OK" button when you are finished. If you have entered the code correctly you will see the confirmation screen. The program is now unlocked and registered to you.

Sharing the Program

You can share the program with another Palm user either by "beaming" the program to them or by emailing it to them. You may not, however, share any registration key codes or coupon codes with them.
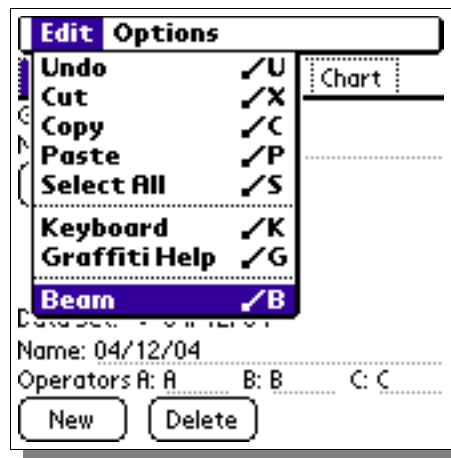
Beaming the Program

Press the "APPLICATIONS" button on the Palm™ device. The application launcher screen should appear. Tap the menu button to activate the drop-down menu. Select the "Beam" menu item.

Then, select the program from the list of available programs. Follow the manufacturer's instructions for beaming programs.

You can also beam the program while it is running by selecting the "Beam ..." menu item from the drop-down menu:

Emailing the Program

The best way to email the program is to email a link to the program. Copy the following link and paste it into your email:

http://www.creativealgorithms.com/gagetech.html