QC-SORT

User's Guide
by

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Version 1.0

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1. Introduction

QC-SORT is a stand alone program used to quickly identify bad parts inspected on automatic inspection equipment. This program is not statistical but instead is used to sort good parts from bad parts. It assumes you have fixtured multiple parts on a stage or fixture in rows and columns and you inspect the parts using the step and repeat method of the particular equipment you purchased. This multi-part configuration is usually run un-manned to save time while you inspect 100% of the parts looking to separate the good parts from the bad.

Because QC-SORT only works in conjunction with QC-CALC, as the inspection progresses, QC-CALC displays each feature of every part in raw graphical form. QC-SORT displays your parts physically layed out just as the fixture is made so you can locate any bad part in the fixture. A part is considered bad when one or more features are out of tolerance. It does not matter how many features you inspect, if any features are bad on the part, QC-SORT displays that part as red.

Most fixtures are designed in rows and columns so when the parts are loaded and inspected it becomes difficult to locate the bad part. QC-SORT shows your parts in the same pattern as the physical fixture so you can quickly identify the good from the bad.

2. Installation

You install QC-SORT on your computer using the SETUP.EXE program found on the supplied CD-ROM. The Setup program automatically installs QC-SORT and other product components from the distribution disk to your hard disk. Since this is an extra program that few customers use, it must be installed manually from the distribution CD. You can find the QC-SORT installation software on the CD in:

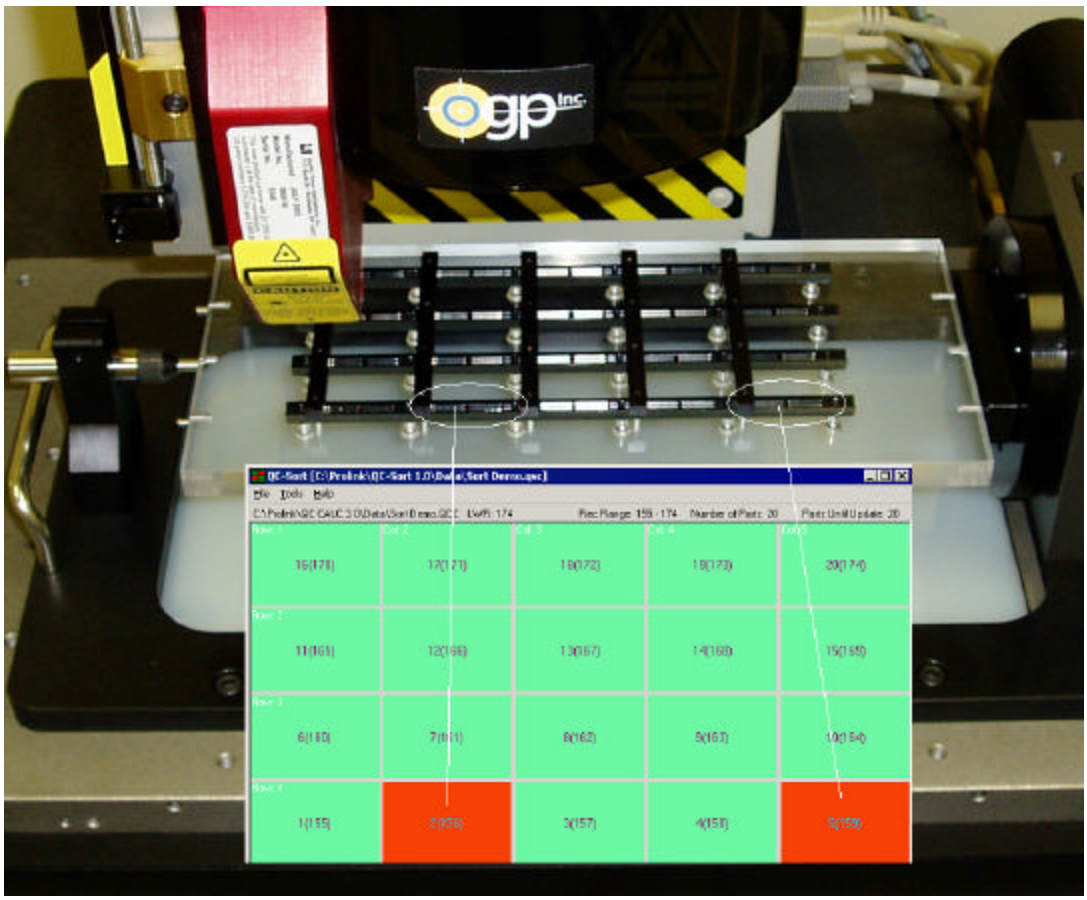
`D:\Programs\QC-Sort\QC-SortSetup.EXE`

Run this program and QC-SORT will install automatically.

3. Overview

More detail is needed to fully understand the QC-SORT concept. Here are the basic steps you must perform to obtain usable results:

- Create a fixture that holds parts in rows and columns. Let's assume for example you create a fixture that has 4 rows of 5 parts or 20 parts total.
- Write a part program to inspect the parts using a repeat statement
- Load the fixture with 20 parts
- Run the part program to inspect all 20 parts.
- As inspection occurs, QC-CALC displays the measurement results.
- At the completion of 20-part inspection, QC-SORT reads the data of newest 20 parts in the QC-CALC file and displays the good parts as green and the bad parts as red.
- Remove and separate the bad parts (red) based on their position in the fixture shown in QC-SORT's matching layout. The photograph below shows a fixture of 20 parts in 4 rows of 5 parts. QC-SORT displays 2 red blocks in row 1 indicate parts 2 and 5 are bad and all others are good.



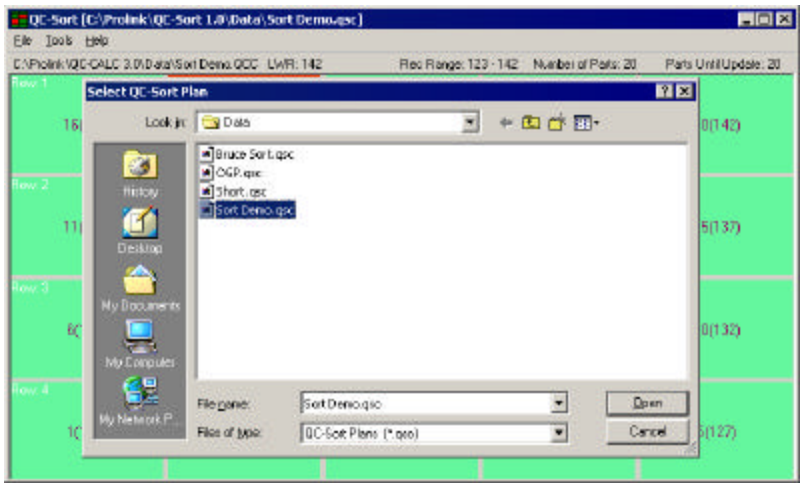
4. Setup for Use

QC-SORT is a self-contained program that communicates with QC-CALC databases. You must first setup QC-CALC to collect data and then setup QC-SORT to determine which file you wish to "watch".

4.1 Create New Setup

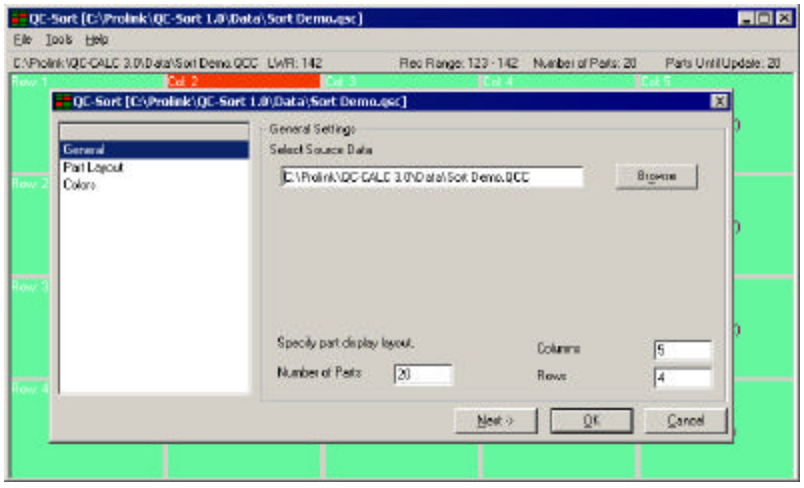
4.1.1 File New

You must first establish a configuration using the **File** – **New** menu of QC-SORT. Use the same file name as your part program.



4.1.2 Number of Parts

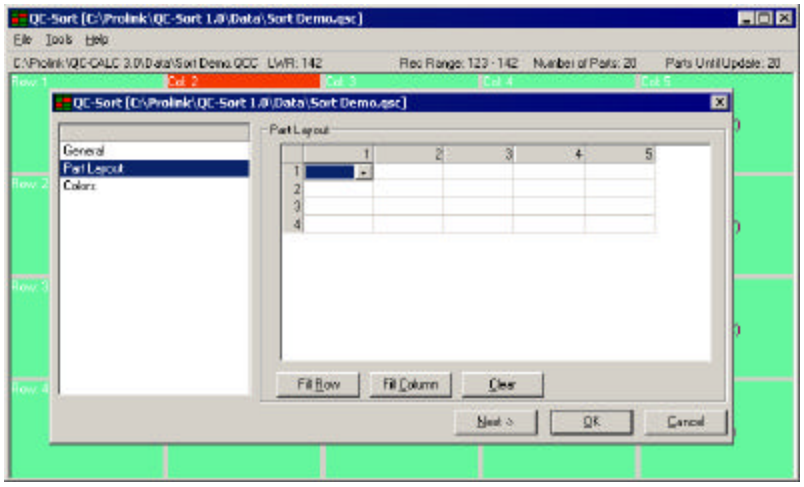
Next, select the .QCC file you wish to monitor. Select the **Number of Parts** on the stage and the number of **Rows** and **Columns**.



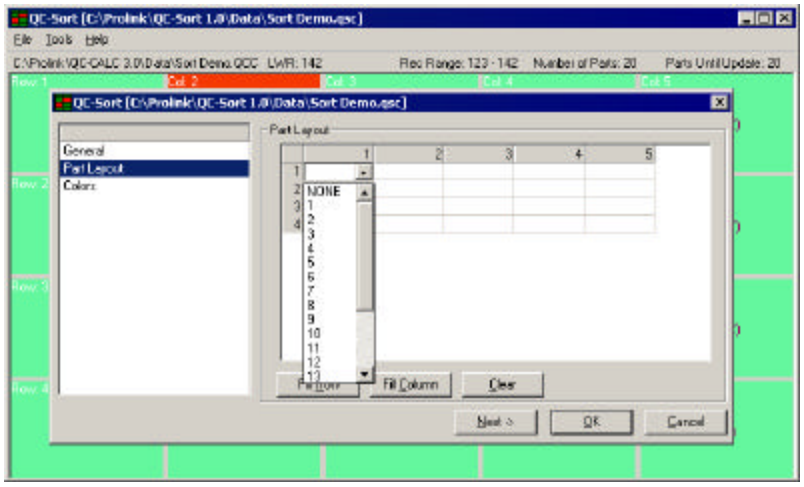
This tells QC-SORT how many parts are on your fixture as well as the number of rows and columns. Click the **Next >** button.

4.1.3 Inspection Direction

The physical layout is now understood but the direction of inspection is also required. The next screen shows your layout in a grid but everything is blank. Place yourself in front of the machine and picture the parts layed out in these 20 positions.



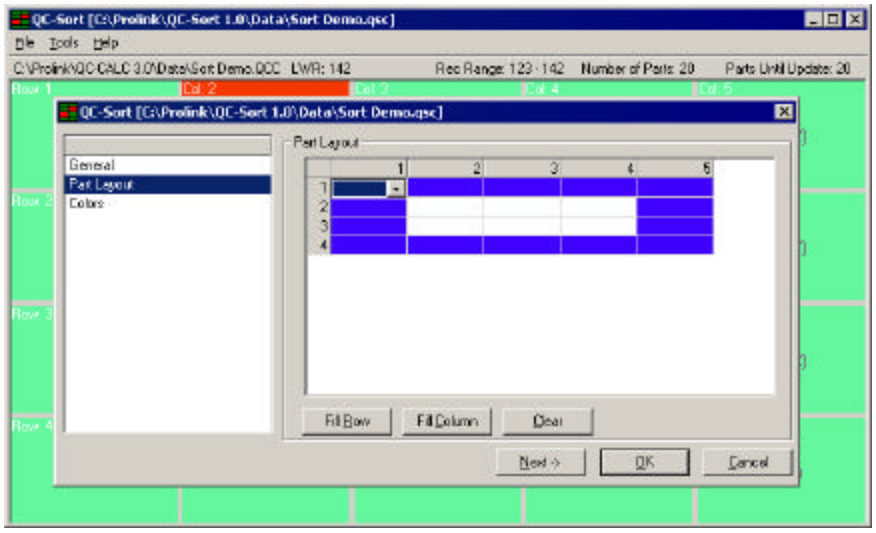
Now manually fill in the numbers in the direction of inspection. Start with part #1 and fill the grid with numbers that represent the order the CMM will travel from part 1 to 20 (in this case). QC-SORT maintains a list of valid numbers and will not let you enter the same number twice.



4.1.4 AutoFill Option

If the inspection sequence starts in the upper left corner of the CMM stage and moves left to right, click the upper left cell and an empty dropdown list box is displayed. Now click the **Fill Row** button and all numbers are entered automatically for you from left to right. Clicking in any of the border cells (shown in blue – gray) allows you to automatically fill:

- A row from left to right or from right to left
- A column from top to bottom or from bottom to top



Should you click in the cell at Row 4, Column 5 and click the **Fill Row** button, the row is automatically filled in reverse.

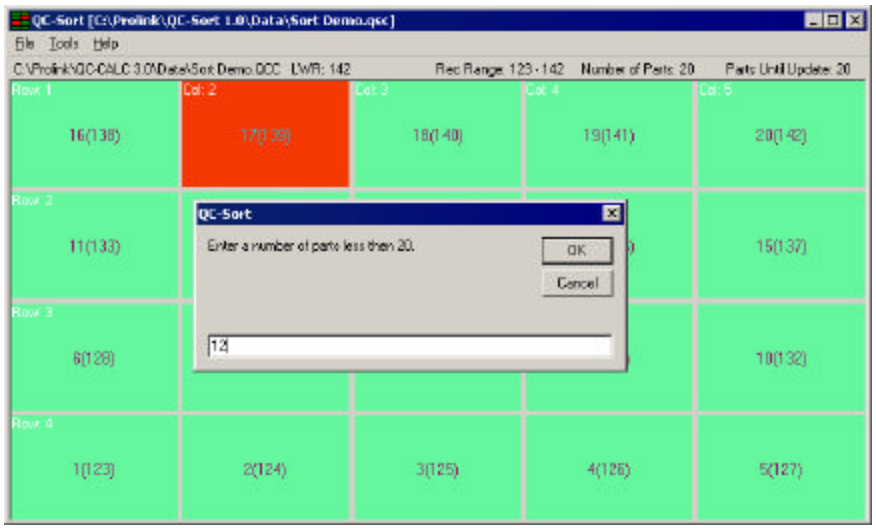
TIP: Clear Button
If you fill the grid incorrectly and want to start over, press the **Clear** button and the grid is emptied allowing you to start over. This makes all numbers available again. Remember, you can only use each number once.

4.1.5 Partial Run

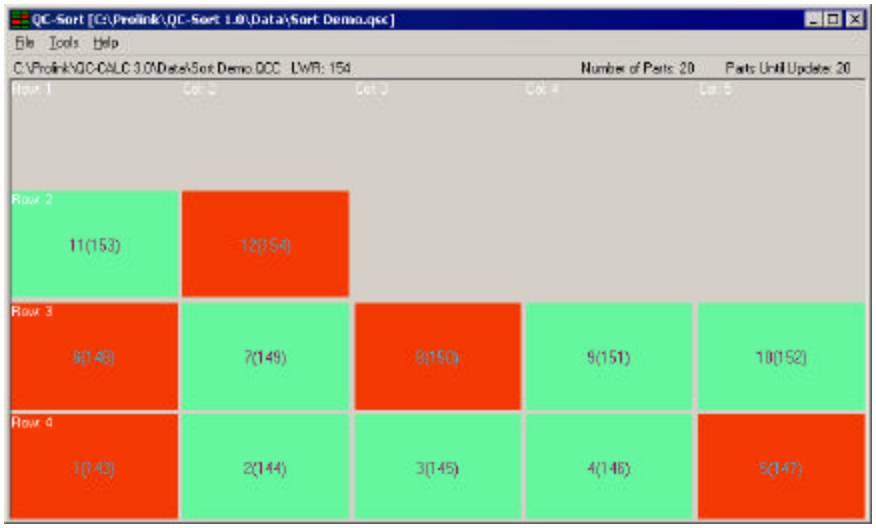
When you use a fixture to hold many parts on the inspection stage, it can be difficult to inspect a partially filled fixture. QC-SORT knows how many parts to expect since you setup the total number of parts, the number of rows, and the number of columns on your fixture. In our example, we chose 20 parts in 4 rows of 5. QC-SORT watches parts being added to the QC-CALC file you selected in your configuration. When a full fixture is detected, QC-SORT updates the screen showing the status of each part using red and green colors.

Let's assume you have 1012 parts to inspect on a fixture that holds 20 parts. Clearly, there are 12 parts left over after running 50 full fixtures of 20. Menu **Tools** – **Partial Run** allows you to enter 12 parts as the final run and QC-SORT updates its screen early showing only 12 parts in red and green and graying out the other 8 positions on the stage. This setting is temporary and is only remembered once.

Selecting **Tools** – **Partial Run** yields the following question:

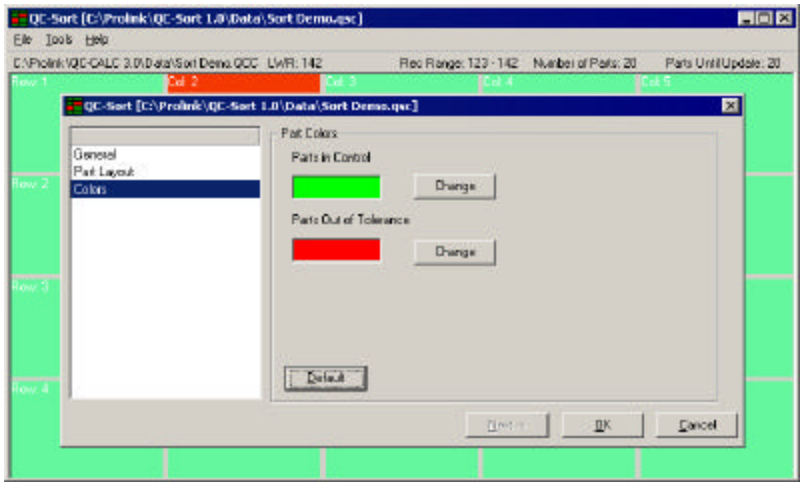


As inspection continues, the screen update occurs but only the partial positions on the fixture are updated after the 12 parts are received. The extra 8 positions are grayed out indicating a partially filled fixture.



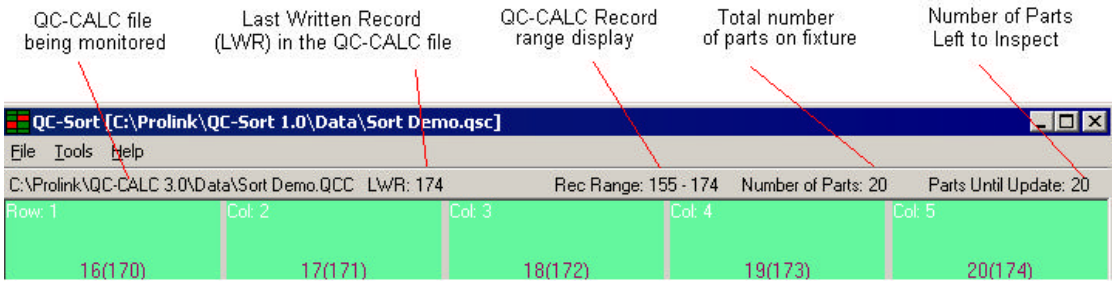
4.1.6 Grid Colors

The last step is to select the colors of the cells that represent good and bad parts. The default is red and green but you can select any combination. Caution: do **NOT** select the same color for both! Color is the only method of distinguishing the difference between good and bad parts!!



4.2 About QC-SORT's Screen

Now that you've programmed the options and are running QC-SORT, some screen detail is needed. QC-SORT has several areas of information you should understand. The status bar under the menu contains useful information to help you understand how the program is running and its current state.



4.2.1 Active QC-CALC File

This shows the QC-CALC file that your plan is monitoring. This ensures you are monitoring what you think you setup. If the screens do not update check to be sure this is the correct file name

4.2.2 Number of Parts

This shows the number of parts you expect to be inspected before the screen updates. Again this is a setting you made in your current plan options.

4.2.3 Record Range

This displays the actual record numbers in the QC-CALC file. This is listed here for reference only but you can match up these numbers with the QC-CALC record range on the Real-Time plot screen.

4.2.4 Last Written Record

The LWR is a special pointer in the QC-CALC database that tells you where the last inspected part was saved. Again, this is for reference only

4.2.5 Parts Until Update

This is a count down value to show you how many parts must be inspected before QC-SORT updates its screen. In our example, this number will start at 20 and drop to 0. When 0 is hit, the screen is updated with all part status.

4.2.6 Exit

The **File** – **Exit** menu item shuts down QC-SORT. All items are remembered so QC-SORT will start in the same position it was left.

4.2.7 Reset Part Count

This menu item found in **Tools** – **Reset Part Count** is used to reset the QC-SORT counter. When QC-SORT is started, the last active plan is loaded and the part counter is set to the total number of parts in the fixture. QC-SORT then reads back through the QC-CALC database and populates its screen with the last known run. You will see red and green squares.

If you inspect several parts and realize you want to start over, selecting this menu will set the counter to the maximum number of parts as if the QC-SORT was just launched.

4.2.8 A Word of Caution

Be careful to keep QC-SORT synchronized with your inspection. If you are unsure whether or not everything is synchronized, wait until the inspection is complete and then use the **Reset Part Count** option.

4.3 Flip Fixture Implications

This special section is intended for OGP MeasureMind and MeasureX equipment only. If you are using QC-SORT on any other machine, you need not read this section.

"Flip Fixture" programming involves programming the CMM in a way that allows the user to inspect one side of many parts before flipping them over and inspecting the reverse side. Flip Fixture inspection speeds up the process of inspection by measuring the same side of all parts before turning the parts over and continuing with the inspection on the reverse side.

Prior to flip fixture inspection, the only method of inspecting flip fixtures was to inspect all dimensions on side one of part one and then flip it over and complete the individual part inspection on the reverse side. This process is slow and requires constant operator "flipping" for each part.

Because the Flip Fixture option was originally designed to be used in 1 routine, QC-SORT will not work correctly across multiple routines tied together with the Flip Fixture function Assume we have 3 part programs that will inspect your parts. Here's what you must change and why:

1. The first part program to generate inspection results must contain the flip fixture commands in the following order. (see short routines on following pages)
   FLIPFIXTURESTART
   NOOFPARTS
   NOOFSIDES
2. You must create 3 sets of OGP STAT Templates. I made the templates for each routine and colored the text red for each of the routines. Basically, we need a Beginning of Run (BOR) with the routine name and Data statements for the first routine. The second routine just needs the DATA statement and the last routine needs the DATA and the END statement. Now assign these templates to each of the 3 part programs.

Prolink Side 1.CFG

```
STATS STATS_BOR NAME|@R^JDATE|@V^JTIME|@B^J
STATS STATS_TEMPLATE DATA|@C|@T|@E|@F|@G|@D|@P^J
STATS STATS_EOT (no End of run needed here)
```

Prolink Side 2.CFG

```
STATS STATS_BOR (no Beginning of run needed here)
STATS STATS_TEMPLATE DATA|@C|@T|@E|@F|@G|@D|@P^J
STATS STATS_EOT (no End of run needed here)
```

Prolink Side 3.CFG

```
STATS STATS_BOR (no Beginning of run needed here)
STATS STATS_TEMPLATE DATA|@C|@T|@E|@F|@G|@D|@P^J
STATS STATS_EOT @H1^J@H2^J@H3^J@H4^J@H5^JEND!^J
```

3. If you are using a part repeat to inspect 20 parts you must remove the checkbox for **Finish Run Before Next Part**. This is normally used to separate the parts on a stage but with Flip Fixtures this option will cause data collection to fail so un-check it! Remember, the NEXTPART statement in your 3 routines tells QC-CALC where thing begin and end.
4. When using the **Part Repeat**, you must start the repeat at a step number below any FLIP statements. We only want one of each command in the file for the whole run. The **NEXTPART** statement is still at the end of the routine.

The following 3 routines were run manually one after the other and everything works nicely. This might seem complicated but it actually got easier.

4.3.1 MeasureMind Inspection Program #1

```
FlipFixture Side 1.RTN
================================================================================
--------------------------------------------------------------------------------
Setup:
================================================================================
Step:  1          Inch       Cart      Decimal Degree    Construct
Comment:
FLIPFIXTURESTART
 Math                      Actual      Nominal    Upper Tol.  Lower To
   s  Result             +00.00000    +00.00000    +0.00000    +0.00000
Expression:
0
--------------------------------------------------------------------------------
Step:  2          Inch       Cart      Decimal Degree    Construct
Comment:
NOOFPARTS
 Math                      Actual      Nominal    Upper Tol.  Lower To
   s  Result             +02.00000    +00.00000    +0.00000    +0.00000
Expression:
2
--------------------------------------------------------------------------------
Step:  3          Inch       Cart      Decimal Degree    Construct
Comment:
NOOFSIDES
 Math                      Actual      Nominal    Upper Tol.  Lower To
   s  Result             +03.00000    +00.00000    +0.00000    +0.00000
Expression:
3
--------------------------------------------------------------------------------
Step:  4          Inch       Cart      Decimal Degree    Construct
Comment:
Side 1
 Circle                    Actual      Nominal    Upper Tol.  Lower To
      Diameter           +00.50833    +00.50833    +0.10000    -0.10000
   s  X Location         +00.00000    +00.00000    +0.00000    +0.00000
   s  Y Location         +00.04583    +00.04583    +0.00000    +0.00000
      Z Location         +00.00000    +00.00000    +0.00000    +0.00000
      XY Angle           +000.0000    +000.0000    +00.0000    +00.0000
      Elevation          +090.0000    +090.0000    +00.0000    +00.0000
      2D Circularity     +00.00000                 +0.00000
                      True Position Tolerance     +0.00000    RFS
Features:     3
Reference Feature(s):        5    6    4
--------------------------------------------------------------------------------
Step:  5          Inch       Cart      Decimal Degree    Construct
Comment:
NEXTPART
 Math                      Actual      Nominal    Upper Tol.  Lower To
   s  Result             +00.00000    +00.00000    +0.00000    +0.00000
Expression:
0
--------------------------------------------------------------------------------
```

Stat Template called Prolink Side 1.CFG assigned to this routine.

```
STATS STATS_BOR NAME|@R^JDATE|@V^JTIME|@B^J
STATS STATS_BOF
STATS STATS_TEMPLATE DATA|@C|@T|@E|@F|@G|@D|@P^J
STATS STATS_EOM
STATS STATS_EOT
```

4.3.2 MeasureMind Inspection Program #2

```
FlipFixture Side 2.RTN
================================================================================
--------------------------------------------------------------------------------
Setup:
================================================================================
Step:  1          Inch       Cart      Decimal Degree    Construct
 Point                        Actual      Nominal    Upper Tol.  Lower To
      X Location          +00.25000    +00.25000    +0.00000    +0.00000
      Y Location          +00.00000    +00.00000    +0.00000    +0.00000
      Z Location          +00.00000    +00.00000    +0.00000    +0.00000
--------------------------------------------------------------------------------
Step:  2          Inch       Cart      Decimal Degree    Construct
 Point                        Actual      Nominal    Upper Tol.  Lower To
      X Location          -00.25000    -00.25000    +0.00000    +0.00000
      Y Location          +00.00000    +00.00000    +0.00000    +0.00000
      Z Location          +00.00000    +00.00000    +0.00000    +0.00000
--------------------------------------------------------------------------------
Step:  3          Inch       Cart      Decimal Degree    Construct
 Point                        Actual      Nominal    Upper Tol.  Lower To
      X Location          +00.00000    +00.00000    +0.00000    +0.00000
      Y Location          +00.30000    +00.30000    +0.00000    +0.00000
      Z Location          +00.00000    +00.00000    +0.00000    +0.00000
--------------------------------------------------------------------------------
Step:  4          Inch       Cart      Decimal Degree    Construct
Comment:
Side 2
 Circle                       Actual      Nominal    Upper Tol.  Lower To
      Diameter            +00.50833    +00.50833    +0.10000    -0.10000
   s  X Location          +00.00000    +00.00000    +0.00000    +0.00000
   s  Y Location          +00.04583    +00.04583    +0.00000    +0.00000
      Z Location          +00.00000    +00.00000    +0.00000    +0.00000
      XY Angle            +000.0000    +000.0000    +00.0000    +00.0000
      Elevation           +090.0000    +090.0000    +00.0000    +00.0000
      2D Circularity      +00.00000                 +0.00000
                       True Position Tolerance     +0.00000    RFS
Features:     3
Reference Feature(s):         2    3    1
--------------------------------------------------------------------------------
Step:  5          Inch       Cart      Decimal Degree    Construct
Comment:
NEXTPART
 Math                         Actual      Nominal    Upper Tol.  Lower To
   s  Result              +00.00000    +00.00000    +0.00000    +0.00000
Expression:
0
--------------------------------------------------------------------------------
```

Stat Template called Prolink Side 2.CFG assigned to this routine.

```
STATS STATS_BOR
STATS STATS_BOF
STATS STATS_TEMPLATE DATA|@C|@T|@E|@F|@G|@D|@P^J
STATS STATS_EOM
STATS STATS_EOT
```

4.3.3 MeasureMind Inspection Program #3

```
FlipFixture Side 3.RTN
================================================================================
Setup:
================================================================================
Step:  1          Inch       Cart      Decimal Degree    Construct
 Point                        Actual      Nominal    Upper Tol.  Lower To
      X Location          +00.25000    +00.25000    +0.00000    +0.00000
      Y Location          +00.00000    +00.00000    +0.00000    +0.00000
      Z Location          +00.00000    +00.00000    +0.00000    +0.00000
--------------------------------------------------------------------------------
Step:  2          Inch       Cart      Decimal Degree    Construct
 Point                        Actual      Nominal    Upper Tol.  Lower To
      X Location          -00.25000    -00.25000    +0.00000    +0.00000
      Y Location          +00.00000    +00.00000    +0.00000    +0.00000
      Z Location          +00.00000    +00.00000    +0.00000    +0.00000
--------------------------------------------------------------------------------
Step:  3          Inch       Cart      Decimal Degree    Construct
 Point                        Actual      Nominal    Upper Tol.  Lower To
      X Location          +00.00000    +00.00000    +0.00000    +0.00000
      Y Location          +00.30000    +00.30000    +0.00000    +0.00000
      Z Location          +00.00000    +00.00000    +0.00000    +0.00000
--------------------------------------------------------------------------------
Step:  4          Inch       Cart      Decimal Degree    Construct
Comment:
Side 3
 Circle                       Actual      Nominal    Upper Tol.  Lower To
      Diameter            +00.50833    +00.50833    +0.10000    -0.10000
   s  X Location          +00.00000    +00.00000    +0.00000    +0.00000
   s  Y Location          +00.04583    +00.04583    +0.00000    +0.00000
      Z Location          +00.00000    +00.00000    +0.00000    +0.00000
      XY Angle            +000.0000    +000.0000    +00.0000    +00.0000
      Elevation           +090.0000    +090.0000    +00.0000    +00.0000
      2D Circularity      +00.00000                 +0.00000
                       True Position Tolerance     +0.00000    RFS
Features:     3
Reference Feature(s):         2    3    1
--------------------------------------------------------------------------------
Step:  5          Inch       Cart      Decimal Degree    Construct
Comment:
NEXTPART
 Math                         Actual      Nominal    Upper Tol.  Lower To
   s  Result              +00.00000    +00.00000    +0.00000    +0.00000
Expression:
0
--------------------------------------------------------------------------------
```

Stat Template called Prolink Side 3.CFG assigned to this routine.

```
STATS STATS_BOR
STATS STATS_BOF
STATS STATS_TEMPLATE DATA|@C|@T|@E|@F|@G|@D|@P^J
STATS STATS_EOM
STATS STATS_EOT @H1^J@H2^J@H3^J@H4^J@H5^JEND!^J
```

End of QC-SORT Document