

QC-CALC Real-Time

Flip Fixture Inspection

For use
with

MeasureX, BasicX,
& MeasureMind

Flip Fixture Program Support

Overview

The concept of "Flip Fixture" inspection is not a new one. QC-CALC has not supported flip fixture inspection due to a general lack of interest and the complex task of data handling during the inspection process. However, increased interest has prompted Prolink to add this new inspection capability. This supplemental document defines what flip fixture inspection is and how it might be used with OGP\QVI inspection equipment.

"Flip Fixture" programming involves programming the OGP machine in a way that allows the user to inspect one side of many parts before flipping them over and inspecting the reverse side. This 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 is 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.

Flip Fixture Limitations

Number of parts = unlimited

Number of sides per fixture = 10

Number of dimensions per side = 1250 all sides

Example

Before getting into the details of how to use flip fixture inspection, we will explain the expected data flow based on a simple example. We will limit the discussion to a two sided fixture (side A and side B) but keep in mind that up to ten sided fixtures are supported.

In our example, let's assume that you have a fixture that holds 4 parts and the fixture can be flipped over from side A to side B. Further, let's assume that side A has 3 dimensions to inspect on each part and 2 dimensions per part on side B. The OGP programmer wants to inspect the first three dimensions on side A on all four parts then flip the fixture over to side B and inspect the other two features on all four parts. The OGP machine will generate the inspection data in the following order:

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Example output:

```
Part 1 Side A
Dim #1
Dim #2
Dim #3
Part 2 Side A
Dim #1
Dim #2
Dim #3
Part 3 Side A
Dim #1
Dim #2
Dim #3
Part 4 Side A
Dim #1
Dim #2
Dim #3
Part 1 Side B
Dim #4
Dim #5
Part 2 Side B
Dim #4
Dim #5
Part 3 Side B
Dim #4
Dim #5
Part 4 Side B
Dim #4
Dim #5
```

Normally, QC-CALC would have problems with receiving information in this order. Historically, all data must be received on an entire part before moving to the next part. When you use the Flip Fixture option QC-CALC temporarily saves side A's data and later joins it with side B's data forming a complete part and then saves each part in the usual way.

Details

The task of inspecting can be achieved with no OGP machine operator involvement during inspection but the programmer must setup the OGP part routine to "tell" QC-CALC four (4) important things. QC-CALC must know:

- START of Flip Fixture Command
- The number of parts on the fixture
- The number of sides on the fixture
- Where one part ends and the next part begins
- Finished – the “normal” end of a part routine

These five parameters are programmed into the OGP part routine, eliminating operator involvement with QC-CALC and are now explained.

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Communicating Your Message

The chosen method of communication is the MeasureX Math Step found in the MeasureX **Construct – Math...** menu. As you recall, a Math step is a method of performing mathematical calculations and reporting the results. We only use the label and the expression value of this step to communicate the Flip Fixture details to QC-CALC. The Actual, Nominal, Upper Tol, and Lower Tol are not used.

Here are the general instructions for using the Math step:

MeasureX and BasicX:

- Insert a Math step (**Construct – Math...**).
- Click the **Prompt / Text** Button.
- Add **COMMANDLABEL** as the **Report Text** (label) and click **OK**.
- Add the **VALUE** to the **Expression** area.
- Check the **SPC** checkbox.
- Click **OK**.

MeasureMind:

- Insert a Math step (**Construct – Others – Math...**).
- Click the **Nom.** Button.
- Add **COMMANDLABEL** as the **Report Text** (label) and click **OK**.
- Add the **VALUE** to the **Result** by clicking **Num Pad** – value – **Calc** buttons.
- Check the **Result** checkbox.
- Click the **Stats** button (this will add an * to the label on the button).
- Click **OK**.

Only the specific values for the **Report Text** and **Expression/Result** areas will be shown for the instructions later in the document.

START of Flip Fixture Command

You must add a special Math Step with a Report Text of "FLIPFIXTURESTART" as the first step to produce Stats output in your part routine. The value of the expression is not used, only the label. All upper case letters are required.

Report Text	=	FLIPFIXTURESTART
Expression/Result	=	0

The Number of Parts on the Fixture

Next, QC-CALC looks for the number of parts. The OGP part routine must contain another Math Step with a Report Text of "NOOFPARTS" immediately after the number of sides expression just discussed. The value of the expression must equal the total number of parts on the fixture. This value (4) is passed to QC-CALC during each inspection. Again, all upper case letters are required.

Report Text	=	NOOFPARTS
Expression/Result	=	4 (# of parts in fixture)

If you wish to change the number of parts during inspection, simply edit this number to the exact number of parts on the fixture. You could also use a USER INPUT to obtain

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this value and include the answer as the result in the Math step. You may NOT adjust the number of sides after a database is created.

The Number of Sides on the Fixture

To achieve flip fixture programming, the OGP part routine must contain a Math Step with a Report Text of "NOOFSIDES" at the beginning of the program. The value of the expression must equal the total number of sides on the fixture. Tolerance information is ignored.

Report Text = **NOOFSIDES**
Expression/Result = **2 (# of sides per part)**

This Math Step causes the OGP to transmit a measurement result of 2.0000 with a Report Text of NOOFSIDES. It is this eight letter string of characters that QC-CALC responds to during inspection. Once QC-CALC has found the NOOFSIDES string, it knows you want to do a Flip Fixture inspection.

QC-CALC reads the QC.STA file and is looking for a measurement result containing a Report Text with the exact string of characters = NOOFSIDES. The characters MUST be in upper case letters. When this label is found, the value of the measurement tells QC-CALC how many sides to expect. This is how the information is passed to QC-CALC during each inspection. Here is a partial listing of a MeasureMind routine to show you the needed statements at the beginning of the routine.

```
=====
Step: 1          Inch          Cart          Decimal Degree          Construct
Comment:
FLIPFIXTURESTART
  Math          Actual          Nominal          Upper Tol.          Lower Tol.
  s  Result          +0000.0000          +0000.0000          +000.0000          +000.0000
Expression:
0
-----
Step: 2          Inch          Cart          Decimal Degree          Construct
Comment:
NOOFPARTS
  Math          Actual          Nominal          Upper Tol.          Lower Tol.
  s  Result          +0002.0000          +0000.0000          +000.0000          +000.0000
Expression:
4
-----
Step: 3          Inch          Cart          Decimal Degree          Construct
Comment:
NOOFSIDES
  Math          Actual          Nominal          Upper Tol.          Lower Tol.
  s  Result          +0003.0000          +0000.0000          +000.0000          +000.0000
Expression:
2
-----
```

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Where One Part Ends and the Next Part Begins

Next, the OGP part routine must contain a programmed step with a Report Text of "NEXTPART" at the end of the Step & Repeat loop just before moving to the next part. QC-CALC counts the number of dimensions on each part by watching for the NEXTPART label. When QC-CALC receives the expected number of parts it prepares to receive the next side.

Report Text = NEXTPART
Expression/Result = 0

QC-CALC only uses the presence of the label to determine when the part routine is moving from one part to the next. It should be obvious that the number of dimensions within a side must be identical on all parts but the number of dimensions from one side to another can be different. QC-CALC saves all data from all sides and reassembles the data into individual parts at the conclusion of inspecting all parts. As with the number of sides and number of parts, the Report Text must be in upper case letters. i.e.

```
-----  
Step: 8          Inch      Cart      Decimal Degree  Construct  
Comment:  
NEXTPART  
Math              Actual      Nominal      Upper Tol.  Lower Tol.  
s  Result          +0000.0000  +0000.0000  +000.0000   +000.0000  
Expression:  
0
```

With these 4 additional parameters added to the OGP part routine, the setup and running of a flip fixture part routine eliminates the need for any question & answering while running QC-CALC during normal inspection.

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Pseudo Example

These two columns provide an insight into QC-CALC's flip fixture operation. The D's indicate measured dimensions. The output shows the dimensions out of order and the internal QC-CALC flip fixture software rearranges the data back into correctly sorted data.

In our earlier example, we assumed that you have a fixture that holds 4 parts and the fixture can be flipped over from side A to side B. Further, we assumed that side A has 3 dimensions to inspect on each part and 2 dimensions per part on side B. The OGP programmer wants to inspect the first three dimensions on side A on all four parts then flip the fixture over to side B and inspect the other two features on all four parts. The OGP machine will generate the inspection data in the following order:

OGP Output to QC-CALC	QC-CALC Internal Flip Fixture interpretation
DBSWITCH (optional)	Part routine name changes
FLIPFIXTURESTART	FLIPFIXTURESTART
NOOFSIDE = 2	NOOFSIDE = 2
NOOFPART = 4	NOOFPART = 4
D1	D1
D2	D2
D3	D3
NEXTPART	D4
D1	D5
D2	NEXTPART
D3	D1
NEXTPART	D2
D1	D3
D2	D4
D3	D5
NEXTPART	NEXTPART
D1	D1
D2	D2
D3	D3
NEXTPART	D4
D4	D5
D5	NEXTPART
NEXTPART	D1
D4	D2
D5	D3
NEXTPART	D4
D4	D5
D5	NEXTPART
NEXTPART	
D4	
D5	
NEXTPART	

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Creating a QC-CALC Flip Fixture Database

There is no extra action required when creating a QC-CALC database. By now you realize the four types of measurement features just discussed are used to tell QC-CALC about your special flip fixture setup and have no statistical value.

Running QC-CALC with Flip Fixture Option

As mentioned earlier, the operator has nothing extra to do when an OGP part routine contains flip fixture statements.

Using Flip Fixture Across Files

Adding these special commands allows the system to bridge across files – more than one part routine to perform all of the inspections. QC-CALC will read one file and if it does not find all of the parts and sides needed to complete the inspection it waits for additional file(s). Once all data is received it processes the file(s) and your part data is plotted. This means you could use multiple part routines to accomplish the entire inspection but we recommend one part routine.

Aborting the Part Routine

QC-CALC will not be aware if the part routine is shutdown early since it is waiting for all of the data. When you begin running again and it receives another FLIPFIXTURESTART it assumes any unsaved data is to be discarded and it starts over.

Using DBSWITCH with Flip Fixtures

If you are using the DBSWITCH option to change the name of the QC-CALC file it must be appear as the first DATA record in the QC.STA file. This means you must add the DBSWITCH Math Block at the beginning of your part routine. The example file below shows you how it must be arranged.

```
NAME|12020760Top.mxi
DATE|02/27/2003
TIME|01:17:31
DATA|USER|DBSWITCH|1202_setUp|RES|+000.000|+0.000|+0.000|+000.000|
DATA|FlipFixtureStart|RES|+000.000000|+0.000000|+0.000000|+000.000000|
DATA|NoOfParts|RES|+000.000000|+0.000000|+0.000000|+003.000000|
DATA|NoOfSides|RES|+000.000000|+0.000000|+0.000000|+003.000000|
DATA|Insul wing width|RES|+003.500000|+0.200000|-0.200000|+004.281115|
DATA|Core wing width|RES|+002.100000|+0.200000|-0.200000|+002.242324|
DATA|Core wing width|RES|+002.100000|+0.200000|-0.200000|+002.239228|
...
```

QC-CALC uses this new name “1202_setUp” instead of the part routine name when it creates the .QCC file.

This concludes this special section on Flip Fixtures used on OGP MeasureX & MeasureMind machines when data results are sent to QC-CALC.

-- End of Flip Fixtures --