

# Diagnostic Testing and the Medalist 5DX Automated X-ray Inspection System

## Application Note

### Introduction:

Users of the Medalist 5DX automated x-ray inspection (AXI) system can benefit from running diagnostic tests on a regular basis, and noting the results. There are many diagnostic procedures available. These procedures can be used more effectively if there is a history of good data available for each machine. Storing the historic data can help identify trends to assess system health and continuous measurement improvement.

### SELFTEST

When investigating a problem, one of the first items to check is often the selftest.log file (**C:\5DX\Rxx\log\selftest.log** where Rxx is the software revision in use).

This file is updated each time the system selftest is run, and can be used to find if a change has happened gradually over time or if there has been some sudden event.

The more data available in the file the more useful it is likely to be. The number of lines of data kept by this file is set in the selftest.cfg file (**C:\5dx\Rxx\calib\selftest.cfg**) and the first line is

```
@LOGFILE_SIZE 2500;  
Maximum number of  
log entries.
```

It is useful to verify that the number of log entries is set at 2500 as above.

As selftest is usually configured to run quite often, this data is usually available when required.

There are other diagnostic tests available which are seldom run (i.e. only once you are investigating a specific issue).

For these tests you may not have 'good' results against which to compare the current findings.

Two tests in particular are much easier to analyse if known good data is available for reference.

### Z-axis test

Z-axis Test is selected from the Service Menu (**Utilities>ServiceMenu>XYZ Stage>Z Stage Test**)

The C&A panel must be loaded to use this test, as the 5DX makes laser measurements at locations on the C&A panel near to each of the four Z-axis motors.

The results from the test are recorded in the lsmztest.log file (**C:\5DX\Rxx\log\lsmztest.log**) and are presented on screen in graphical format for easier viewing, Figure 1.



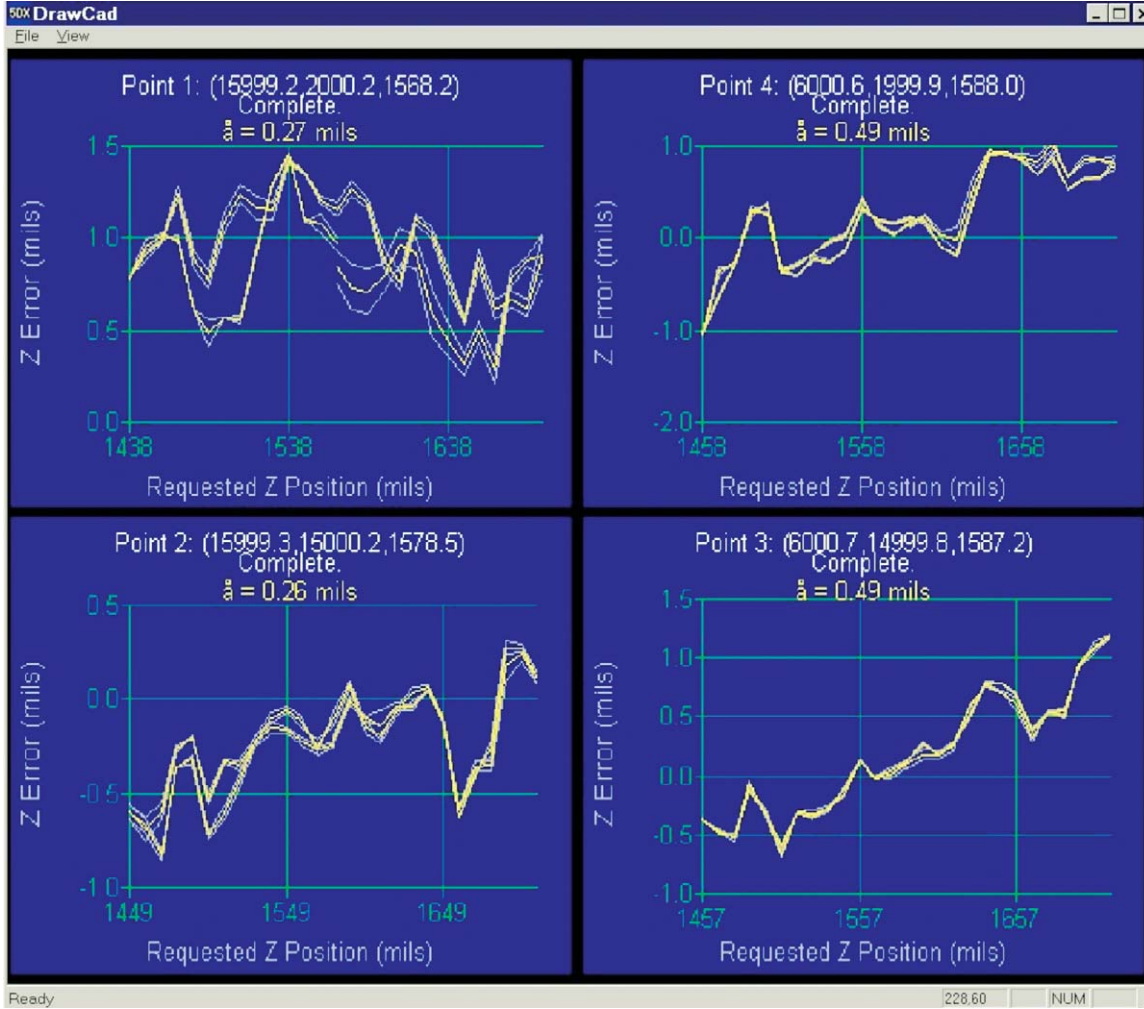


Figure 1. Graphical result from the Z-Axis Test

**BEWARE:** The graphs for each of the four motor locations are re-scaled to best fit the data for that location.

Example from LSMZTEST.LOG	S0 1488.53 1488.46 479.6 -0.1
# 06/08/08 13:30:55	S0 1498.53 1498.26 469.8 -0.3
Mode: Normal	S0 1508.53 1508.58 459.4 0.1
@ 15999.8 2000.1 (#1)	S0 1518.53 1518.46 449.6 -0.1
Z 1488.5 479.6 (1488.5)	.....
P TheoZ LaserZ Reading ErrorZ	S0 1468.53 1468.04 500.0 -0.5
- - - - -	S0 1478.53 1478.16 489.9 -0.4
	S0 1488.53 1488.45 479.6 -0.1
	.....
	a 0.27 .....

## Rotary axis test

The Rotary axis test is selected at Utilities>ServiceMenu>Rotary>Check Rotary Axis.

This test moves the rotary axis in '45 degree steps' at slow speed and reports the expected position / move together with the values obtained from the rotary motor encoder.

This data is recorded in the spinit.log file (C:\5DX\Rxx\log\spinit.log).

Example spinit.log

---

Requested 0.0 degrees  
starting position: (SyncPos: 28272).

---

Requested 45.0 degrees  
step size: (4096 sync-counts).

---

Current 360.0 degrees  
position: (SyncPos: 28270).

---

Moving to start position...

---

Current 360.0 degrees  
position: (SyncPos: 28270).

---

Begin test of 8 iterations...

Absolute Sync

Relative Sync

Accumulated Settle

Position

Change

Sync-counts

Time

It. (Actual)(Theo)(Error)(Actual)(Theo)(Error) (ms)

```

-----
0 28270 28270 0 0 0 0 0 0 312
1 32370 32366 4 4100 4096 4 4100 4096 312
2 3696 3694 2 4094 4096 -2 8194 8192 312
3 7792 7790 2 4096 4096 0 12290 12288 312
4 11886 11886 0 4094 4096 -2 16384 16384 313
5 15984 15982 2 4098 4096 2 20482 20480 313
6 20078 20078 0 4094 4096 -2 24576 24576 313
7 24176 24174 2 4098 4096 2 28674 28672 313
8 28272 28270 2 4096 4096 0 32770 32768 313

```

```

-----
Min: 0 -2
Max: 4 4
Mean: 1.75 0.25
StdDev: 1.28 2.25

```

## Conclusion

As selftest is usually configured to run quite often, this data is usually available when required. However, the Z-axis and Rotary axis tests are seldom run. If these two tests are run as part of the normal maintenance of the 5DX system, then this data will be available for comparison if a problem is suspected in the future. Storing the historic data can help identify trends to assess system health and continuous measurement improvement.



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