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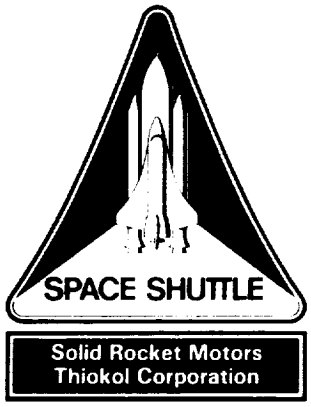

NOVA 201 Ultrasonic Thickness Gage (NOVA Gage) Final Test Report

August 1990

Prepared for:

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TWR-60533

NOVA 201 Ultrasonic Thickness Gage (NOVA GAGE) Final Test Report

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INTRODUCTION

The purpose of the test was to evaluate the measurement integrity of the NOVA 201 Ultrasonic Thickness Gage (NOVA Gage) when measuring redesigned solid rocket motor (RSRM) hardware per engineering test plans (ETP):

ETP-0681	Case/Steel NOVA 201 Gage Measurement Evaluation Test Plan
ETP-0682	Nozzle/Aluminum NOVA Gage Measurement Evaluation Test Plan
ETP-0684	Nozzle/Steel NOVA Gage Measurement Evaluation Test Plan

1.1 TEST ARTICLE DESCRIPTION

The NOVA 201 is a digital ultrasonic thickness gage. Short pulses (bursts) of high frequency (MHz) ultrasonic energy are introduced into the material to be gaged (via the transducer). The ultrasonic pulses travel through and reflect (echo) back from the opposite side of the material being gaged. The time for the echo to return is a function of the thickness of a given type of material. By setting up initial calibration samples of the material to be gaged, the instrument will read out the echo round trip time directly in terms of material thickness.

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OBJECTIVES

The objectives of the tests were to demonstrate the NOVA gage by:

a. Comparing the NOVA gage measurements to the thickness gage measurements.

b. Determining the bias and uncertainty of the NOVA gage when measuring RSRM hardware.

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EXECUTIVE SUMMARY

3.1 SUMMARY

The NOVA gage was tested by three different operators on steel and aluminum RSRM hardware for wall thickness. The test revealed the measurement bias and uncertainty of the NOVA gage on RSRM hardware.

The uncertainty that is presently applied to the system accuracy comes from Technical Order 33B-1-1, Table 6-3, which states that when measuring a surface finish (Ra) of 250 to 500 microinches, the measurement error is ±0.010 inch. The 10 mil subtraction is conservative on all components except aft exit cones. The adjustment factor for minimum wall thickness of aft exit cones is 11 mil.

3.2 CONCLUSIONS

a. The measurement bias is <u>not</u> consistent:
   1. From part to part of RSRM components with the same material
   2. From part to part of RSRM components of the same design
   3. From location to location of the same RSRM component

b. The uncertainty of the bias is caused by the heterogeneous material properties of the RSRM components that influence the time of flight of ultrasonic waves (material velocity).

c. The measurement uncertainty inherent to the design and operation of the NOVA gage is less in comparison to the uncertainty of the bias.

d. The total measurement uncertainty cannot be substantially reduced by taking more than one measurement.

e. There is no correlation between bias and the surface finish range of this test (the worst case was 310 Ra) unless 3-in-One oil is used as a couplant, in which case there appears to be a slight trend. The bias increases as the surface finish roughness increases.

f. There is no correlation between uncertainty and the surface finish range of this test (the worst case was 310 Ra). This corresponds with the results of earlier ultrasonic testing using the NOVA gage (see TWR-60740).

g. The measurement uncertainty of the NOVA gage can be reduced using 3-in-One oil as a couplant.

3.3 RECOMMENDATIONS

a. Implement the adjustment factors of this test report instead of the 10 mil subtraction from all NOVA readings now being practiced.

b. Replace the NOVA gage with the improved Automated Ultrasonic Thickness Gage (see TWR-60532).

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INSTRUMENTATION

All test instruments were electrically zeroed and operationally verified per MIL-STD-45662. The following instruments were used:

Instrument	Make	Model No.	Serial No.
Thickness Gage	Dyer	613-025	SL47337

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RESULTS AND DISCUSSION

Each component was tested in an identical manner. The following components were tested:

Quantity	Component	Part Number
10	Cylinder	1U50717
3	Forward dome	1U51473
3	Aft dome	1U50129
5	Forward exit cone	1U52837
4	Aft exit cone	1U52842
5	Nose inlet housing	1U75398
5	Throat housing	1U75547
5	Fixed housing	1U52945

Each component was located at Clearfield; grease was removed at the measurement locations. The locations were chosen based on the 12-in. reach of the Dyer gage. A minimum of four locations were chosen for each component. The locations were marked by templates made of masking tape. The locations of each component were measured in the following manner:

1) Each location was measured for surface finish.
2) Each measurement location was measured four times with the Dyer gage.
3) The NOVA gage was calibrated using methylchloroform as a couplant.
4) Each location was measured with the NOVA gage using methylchloroform as a couplant.
5) Step 4 was repeated.
6) Steps 3 through 5 were repeated two additional times.
7) Steps 3 through 6 were repeated using 3-in-One oil as a couplant.

Data was gathered per the above instructions for each component (see Appendices A through H for raw data). Data for each RSRM part was analyzed

statistically by "Analysis of Variance," a nested design. The standard deviations for the different components of variance are shown in Table 1. The values are reported in mils: 1 mil = 0.001 inch.

Each RSRM component shown in Table 1 was evaluated in the following manner: The average of the Dyer gage readings was subtracted from the average of the NOVA gage readings at each location. These figures were averaged to obtain the average overall bias. A positive "average bias" means that the average of the ultrasonic readings at each location is higher than the actual thickness (the average of the Dyer gage measurements) by the given amount. The bias must be subtracted for the ultrasonic measurement to accurately reflect the actual thickness.

Since the individual bias at each location is not consistent, the uncertainty due to the varying bias and the uncertainty of the Dyer gage is a component of variance. The "standard bias" is the standard deviation of the bias estimates.

Another component of variance is the measurement uncertainty inherent to the tool design. The measurement uncertainty is comprised of the calibration, the removal, and replacement of the transducer, and the couplant used. These are combined to determine the measurement uncertainty of a single measurement at a single location because that is the manner in which the NOVA is used on-line. The standard deviation of the measurement uncertainty is listed under "standard measurement."

The measurement uncertainty is root sum squared with the uncertainty of the bias estimates to produce the total uncertainty of a single measurement. The result is recorded under "standard overall". To be 99.9 percent confident (3-sigma), the standard overall value is multiplied by 3. This is reported under "3 x standard overall," and it is this value that is used for calculating adjustment factors. This means that if one reading is taken on a case steel component, there is a 99.9 percent population coverage that the reading is within (plus or minus) the 3 x standard overall value of the actual thickness after the average bias has been subtracted. However, it is not certain whether the reading is at the high or low end of the uncertainty range. Therefore, if the minimum wall thickness of the reading is desired, the uncertainty must be subtracted from the reading. For the maximum wall thickness of the reading the uncertainty is added:

Table 1. Summary of Uncertainty Components (in mils)

Methylchloroform as a Couplant

Part	Average Bias	Standard Bias	Standard Measure	Standard Overall	3 x Standard Overall
Aft Dome	3.051	1.281	0.479	1.368	4.103
Cylinder	4.136	1.588	0.911	1.831	5.492
Forward Dome	3.765	1.505	0.607	1.623	4.868
Fixed Housing	4.648	1.034	0.747	1.276	3.827
Forward Exit Cone	2.143	1.293	0.617	1.433	4.298
Throat Housing	3.260	1.375	0.887	1.636	4.909
Aft Exit Cone	1.915	2.394	1.420	2.783	8.350
Nose Inlet Housing	3.644	1.151	0.645	1.319	3.958

3-in-1 Oil as a Couplant

Aft Dome	2.037	0.912	0.620	1.103	3.308
Cylinder	3.585	1.267	0.643	1.421	4.262
Forward Dome	2.709	1.396	0.651	1.540	4.621
Fixed Housing	3.940	1.134	0.716	1.341	4.023
Forward Exit Cone	0.935	1.017	0.668	1.217	3.650
Throat Housing	2.065	0.883	0.566	1.049	3.146
Aft Exit Cone	1.978	2.638	0.782	2.751	8.254
Nose Inlet Housing	2.710	1.038	0.528	1.165	3.494

Average Bias = average of (NOVA gage measure - Dyer gage measure)
Standard Bias = standard deviation of bias estimates (1-sigma, includes the uncertainty of the Dyer gage and material velocity variation)
Standard Measure = uncertainty in a single gage measurement (1-sigma)
Standard Overall = uncertainty (1-sigma) for calculation of: root sum square of standard bias and standard measure
3 x Standard Overall = 3 times standard overall

Minimum Wall Thickness = Reading - Average Bias - 3 x Standard Overall
= Reading + (-Average Bias - 3 x Standard Overall)

Maximum Wall Thickness = Reading - Average Bias + 3 x Standard Overall
= Reading + (-Average Bias + 3 x Standard Overall)

if

(-Average Bias - 3 x Standard Overall) = Minimum Adjustment Factor and
(-Average Bias + 3 x Standard Overall) = Maximum Adjustment Factor

then

Minimum Wall Thickness = Reading + Minimum Adjustment Factor and
Maximum Wall Thickness = Reading + Maximum Adjustment Factor

Example: What are the minimum and maximum adjustment factors for a NOVA gage reading on cylinders when methylchloroform is used as a couplant?

Minimum adjustment factor = -Average Bias - 3 x Standard Overall
= -4.136 - 5.492
= -9.628
= -10 mil or 0.010 in. after rounding down

Maximum adjustment factor = -Ave. Bias + 3 x Standard Overall
= -4.136 + 5.492
= 1.356
= 2.0 mil or 0.002 in. after rounding up

Note: The minimum adjustment factor needs to be rounded down, and the maximum adjustment factor needs to be rounded up, to the nearest thousandth of an inch (1 mil). This is because the NOVA gage does not have the resolution of 10 thousandth of an inch, and the rounding must be in a conservative direction to maintain or increase a 99.9 percent population coverage.

All the adjustment factors using the NOVA gage are summarized below:

Adjustment Couplant	Part	Minimum Adjustment Factor (in.)	Maximum Factor (in.)
Methyl	Aft dome	-0.008	0.001
	Cylinder	-0.010	0.002
	Forward dome	-0.009	0.002
	Fixed housing	-0.009	0.000
	Forward exit cone	-0.007	0.003
	Throat housing	-0.009	0.002
	Aft exit cone	-0.011	0.007
	Nose inlet housing	-0.008	0.001
3-in-One	Aft dome	-0.006	0.002
	Cylinder	-0.008	0.001
	Forward dome	-0.008	0.002
	Fixed housing	-0.008	0.000
	Forward exit cone	-0.005	0.003
	Throat housing	-0.006	0.001
	Aft exit cone	-0.011	0.007
	Nose inlet housing	-0.007	0.001

NOTE: It is NOT accurate to say that the NOVA gage adjustment factor is the gage's bias. Neither is the adjustment factor an uncertainty. To predict minimum or maximum wall thickness of the reading, the adjustment factor is a combination of both bias and uncertainty.

Example: When using the NOVA gage on forward domes, methylchloroform is used as the couplant. If the reading is 0.421 in., what are the minimum and maximum NOVA gage wall thickness predictions?

Minimum Wall Thickness = Reading + (Minimum Adjustment Factor)

= 0.421 in. + (- 0.009 in.)

= 0.412 in.

Maximum Wall Thickness = Reading + (Maximum Adjustment Factor)
= 0.421 in. + 0.002 in.
= 0.423 in.

Using the example data, Engineering would be at least 99.9 percent confident that the actual wall thickness at that location of the forward dome is not less than 0.412 in. or greater than 0.423 inch.

Figures 1 through 8 show the correlation between bias and uncertainty with component surface finish. If either were affected by surface finish there would be an upward trend on any of the figures. The figures show that there is a random scatter of the bias data versus surface finish unless 3-in-One oil is used as the couplant, in which case there is a slight trend. The slight trend does not mean that the data will need to be analyzed as a function of surface finish when using 3-in-One oil. The uncertainty of the bias (standard bias) takes into consideration the worst condition.

The figures also indicate a random scatter of the measurement uncertainty data versus surface finish. This indicates that the measurement uncertainty at smooth surfaces is no better or worse than the measurement uncertainty at rough surfaces.

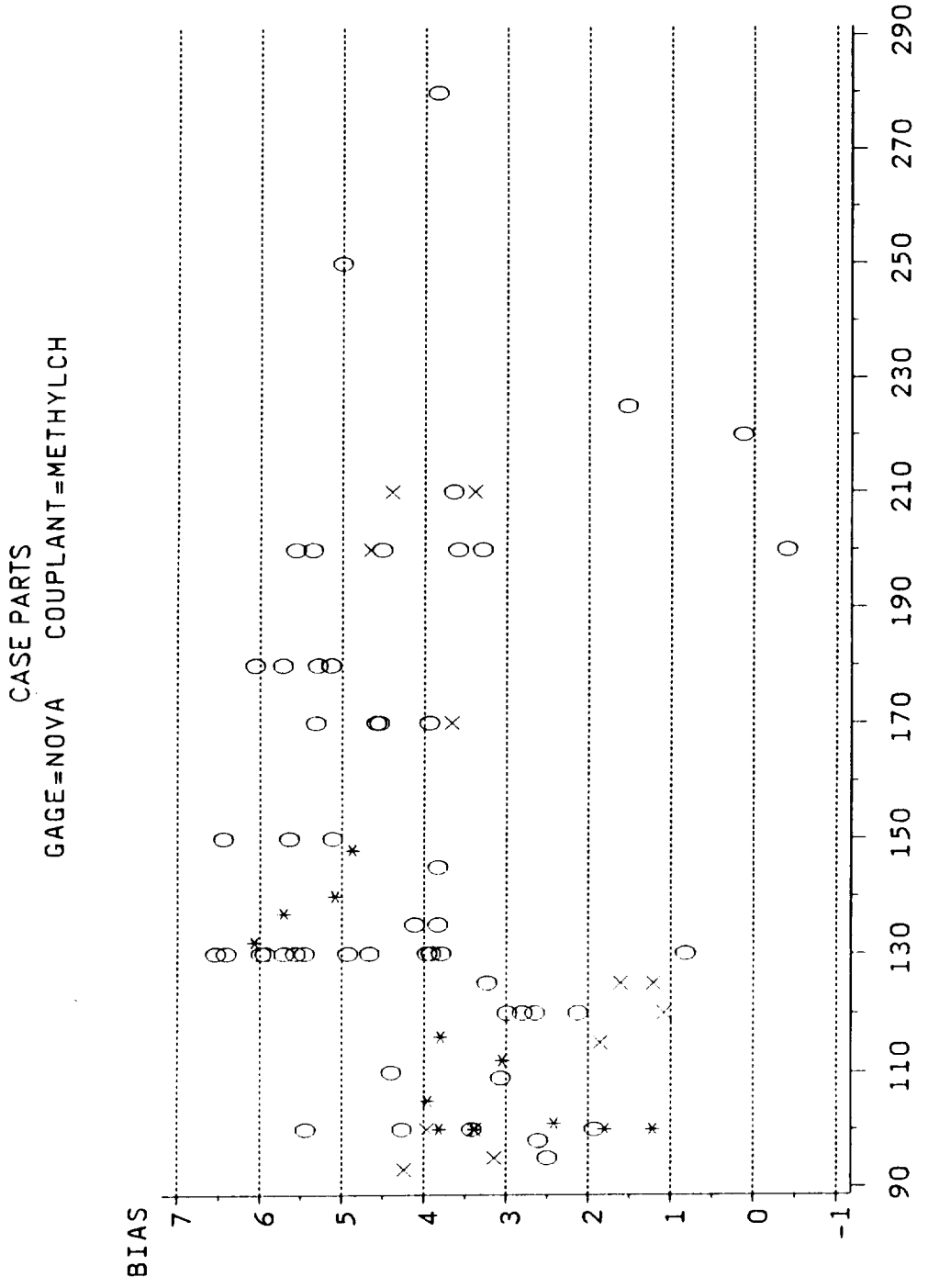

Figure 1. Bias Versus Surface Finish (Ra) Case Parts Couplant = Methylchloroform

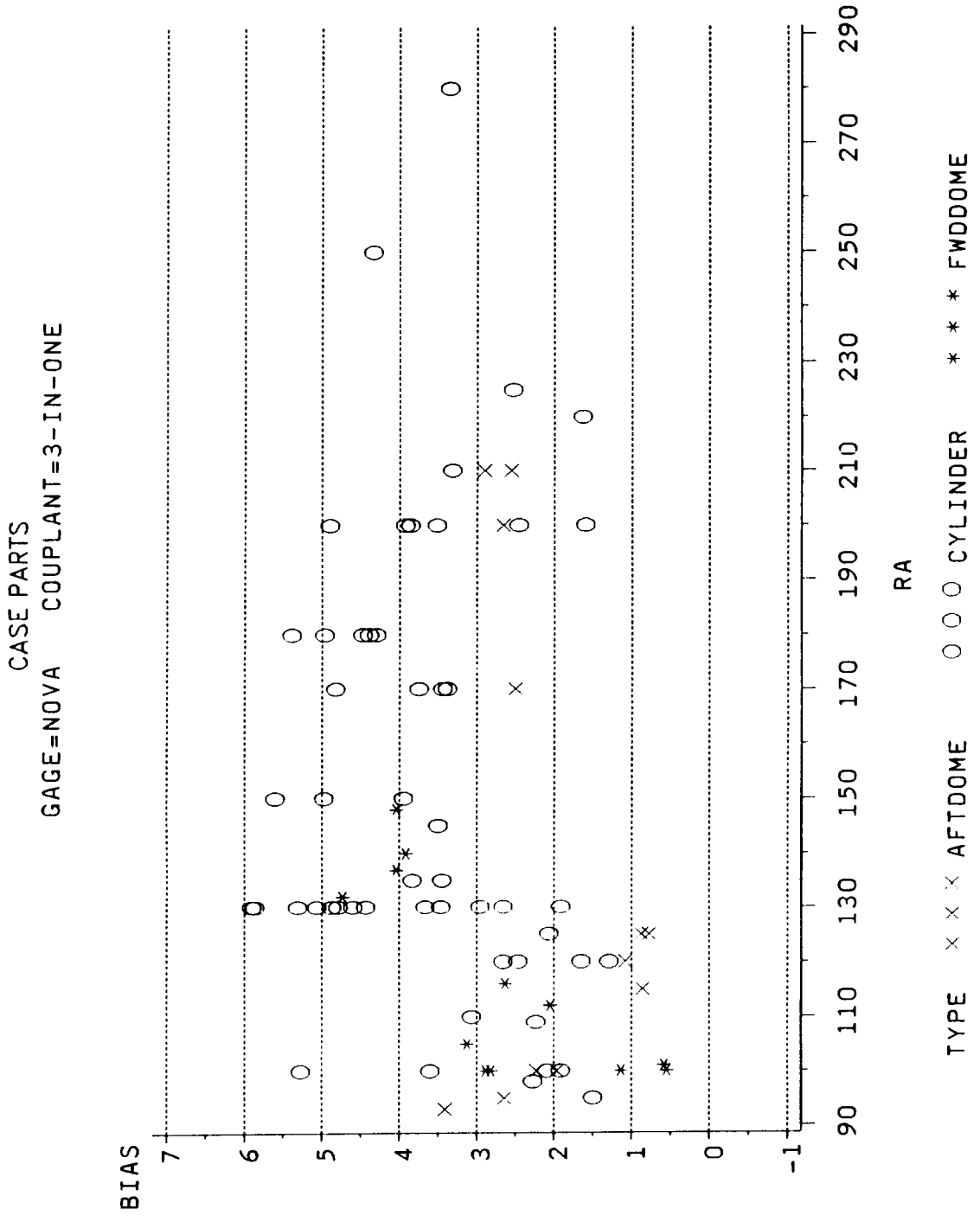

Figure 2. Bias Versus Surface Finish (Ra) Case Parts Couplant = 3-in-One Oil

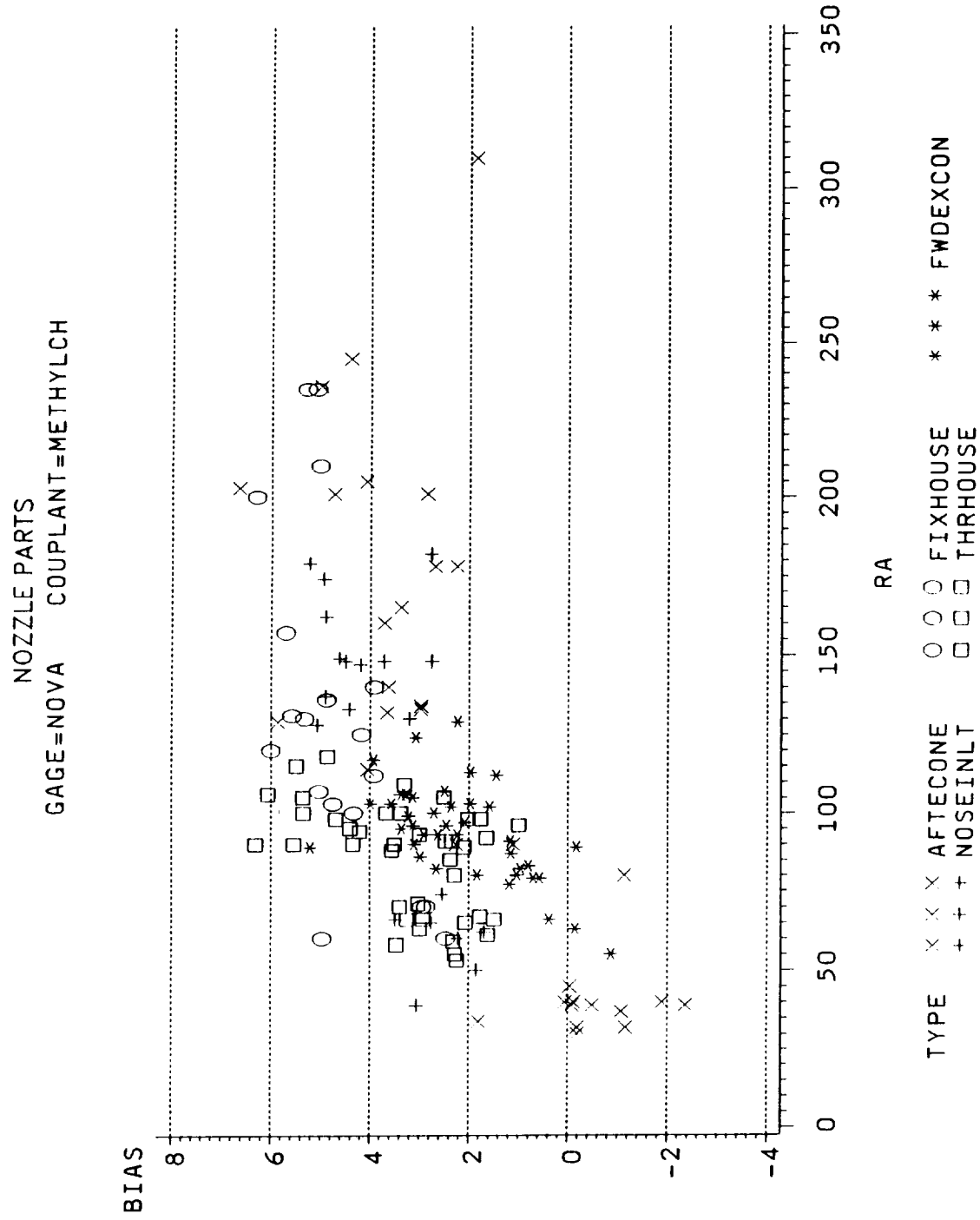

Figure 3. Bias Versus Surface Finish (Ra) Nozzle Parts Couplant = Methylchloroform

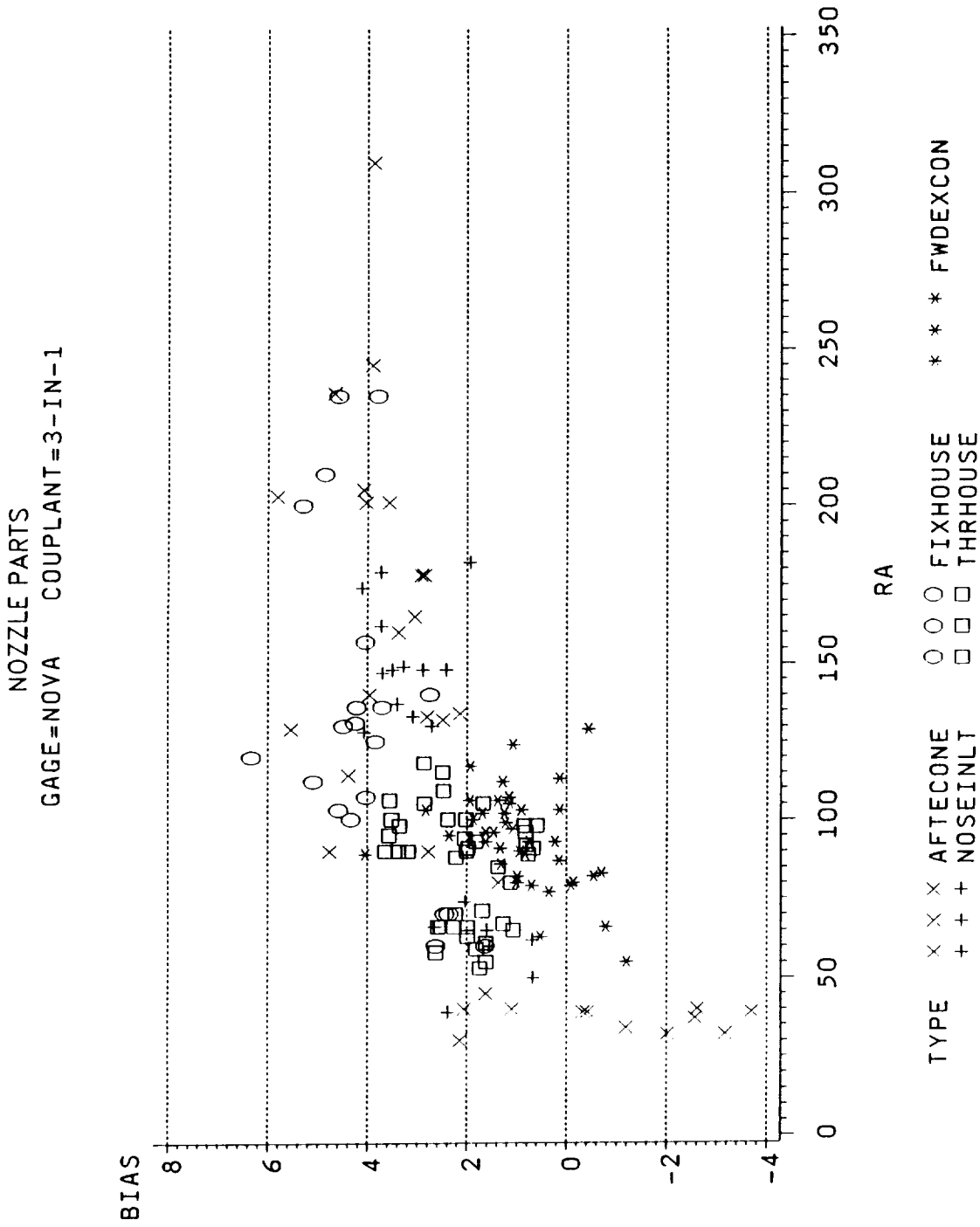

Figure 4. Bias Versus Surface Finish (Ra) Nozzle Parts Couplant = 3-in-One Oil

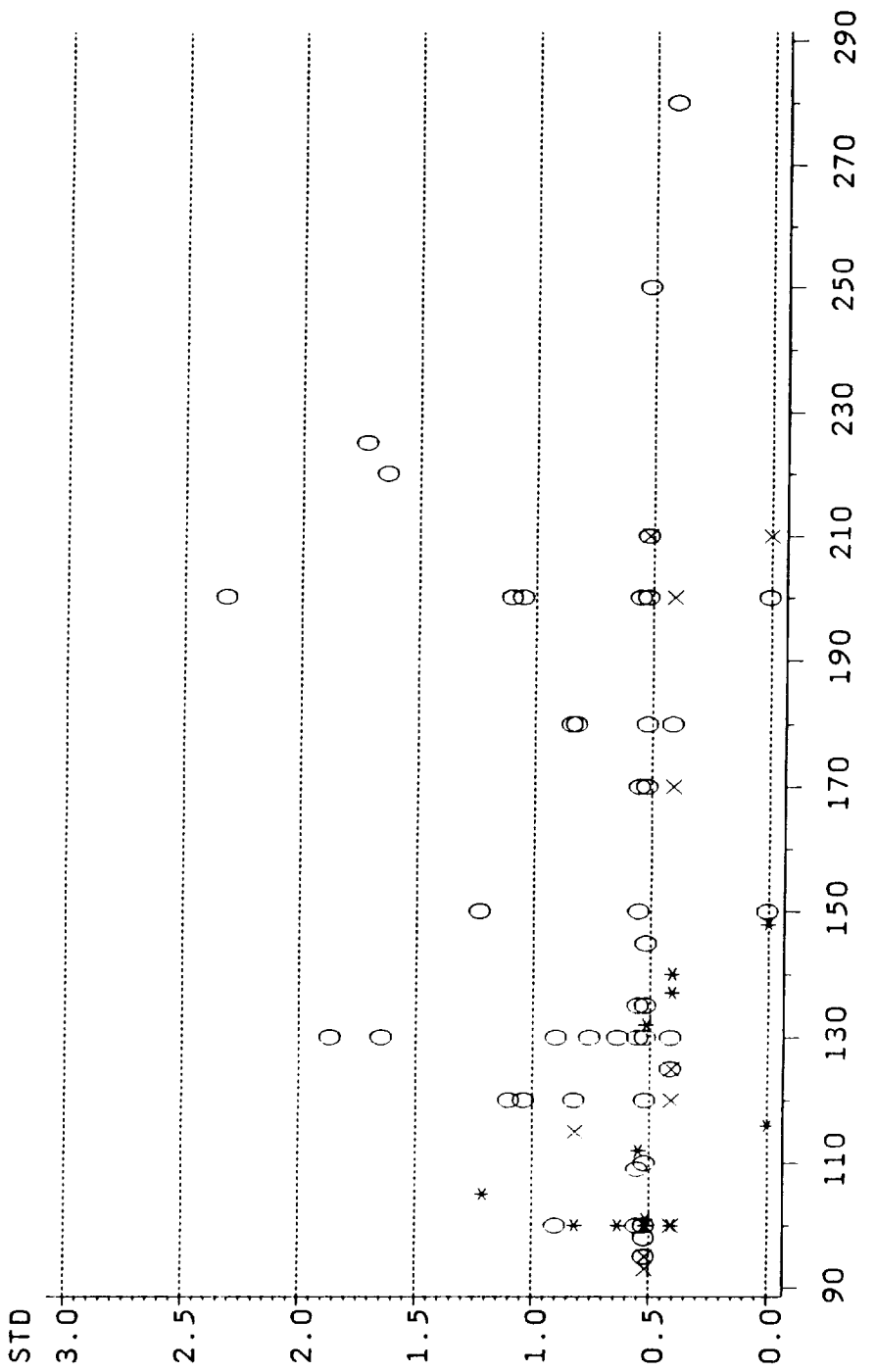

Figure 5. Measurement Uncertainty (Std) Versus Surface Finish (Ra) Case Parts Couplant = Methylchloroform

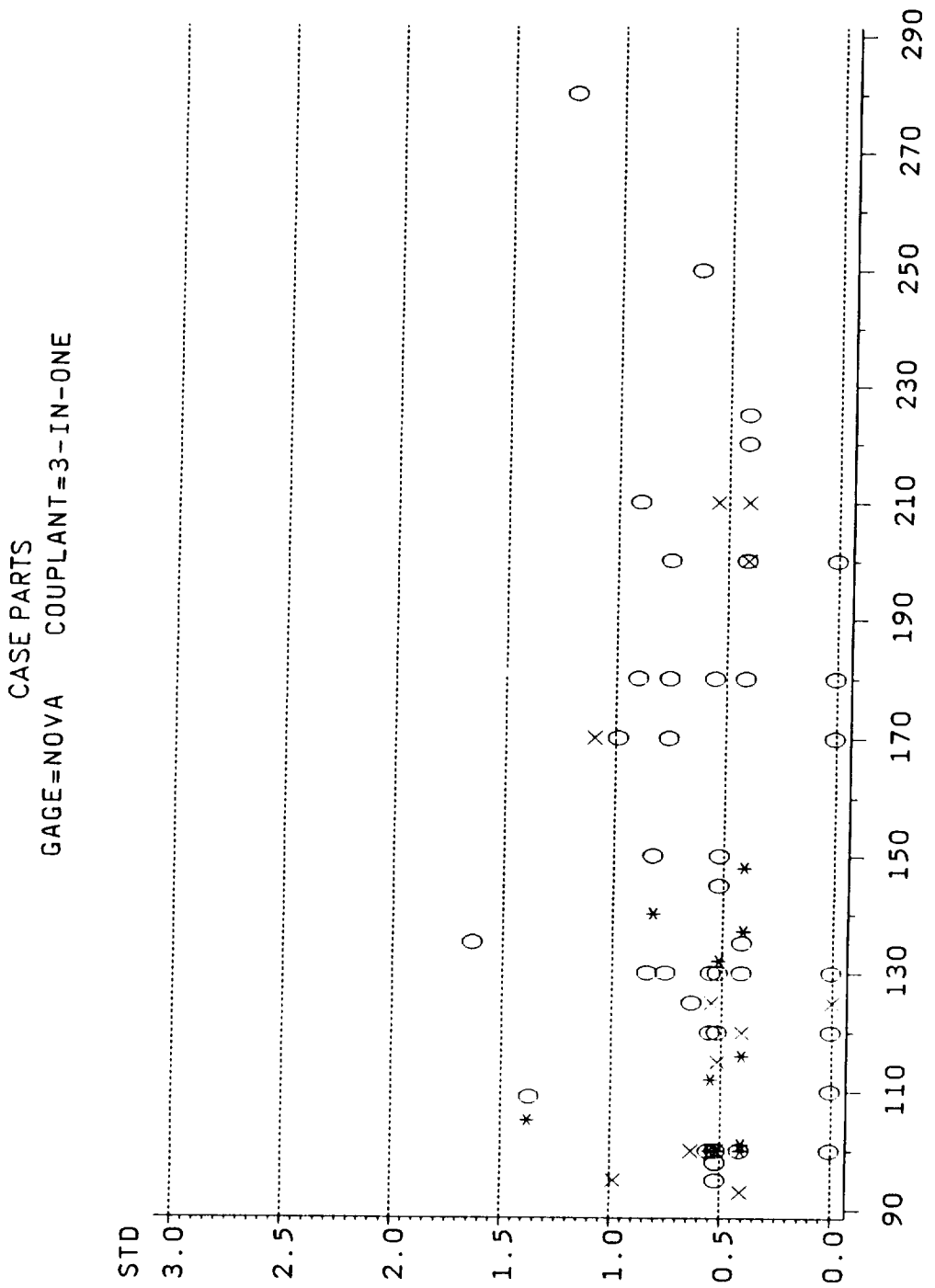

Figure 6. Measurement Uncertainty (Std) Versus Surface Finish (Ra) Case Parts Couplant = 3-In-One Oil

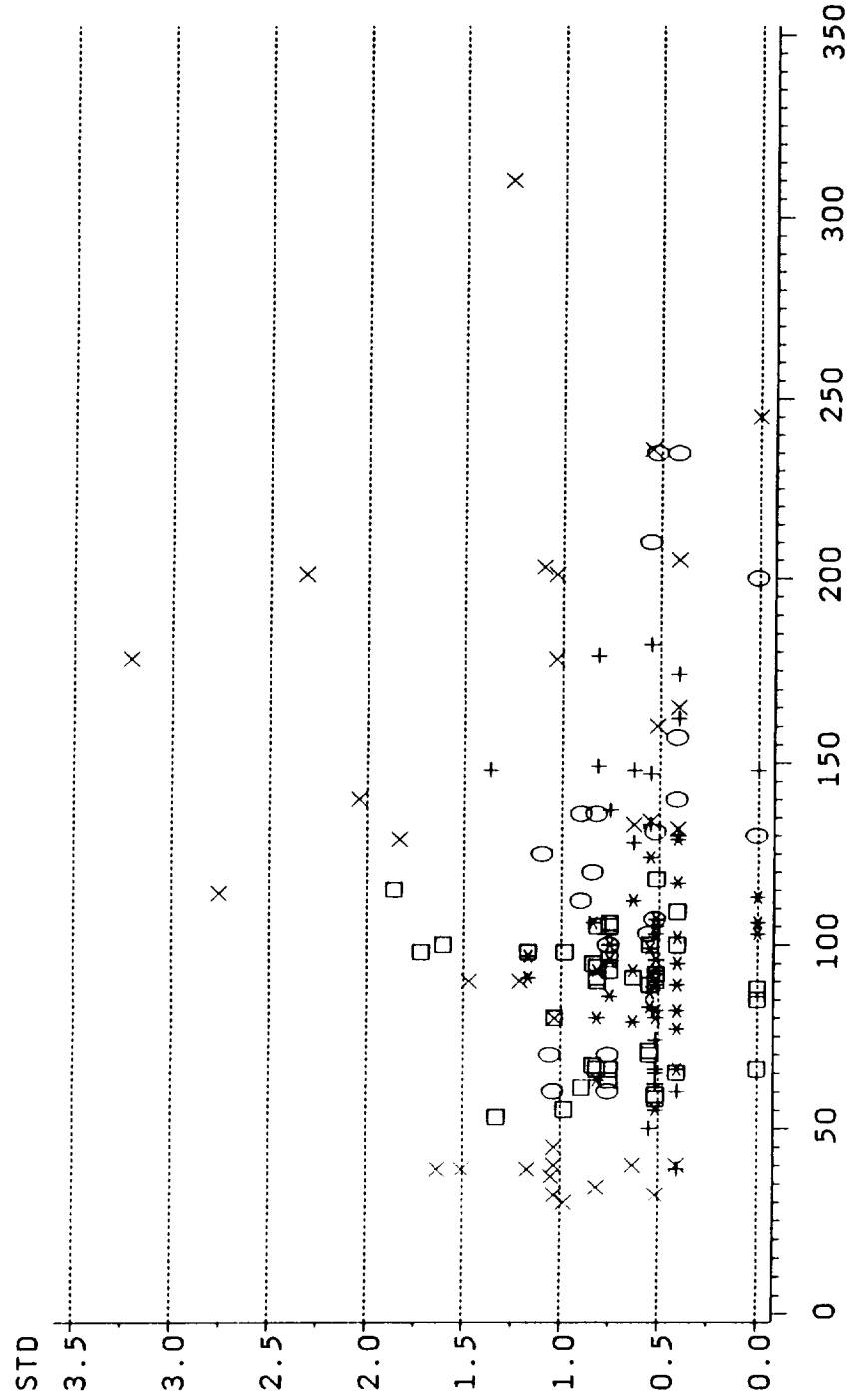

Figure 7. Measurement Uncertainty (Std) Versus Surface Finish (Ra) Nozzle Parts Couplant = Methylchloroform

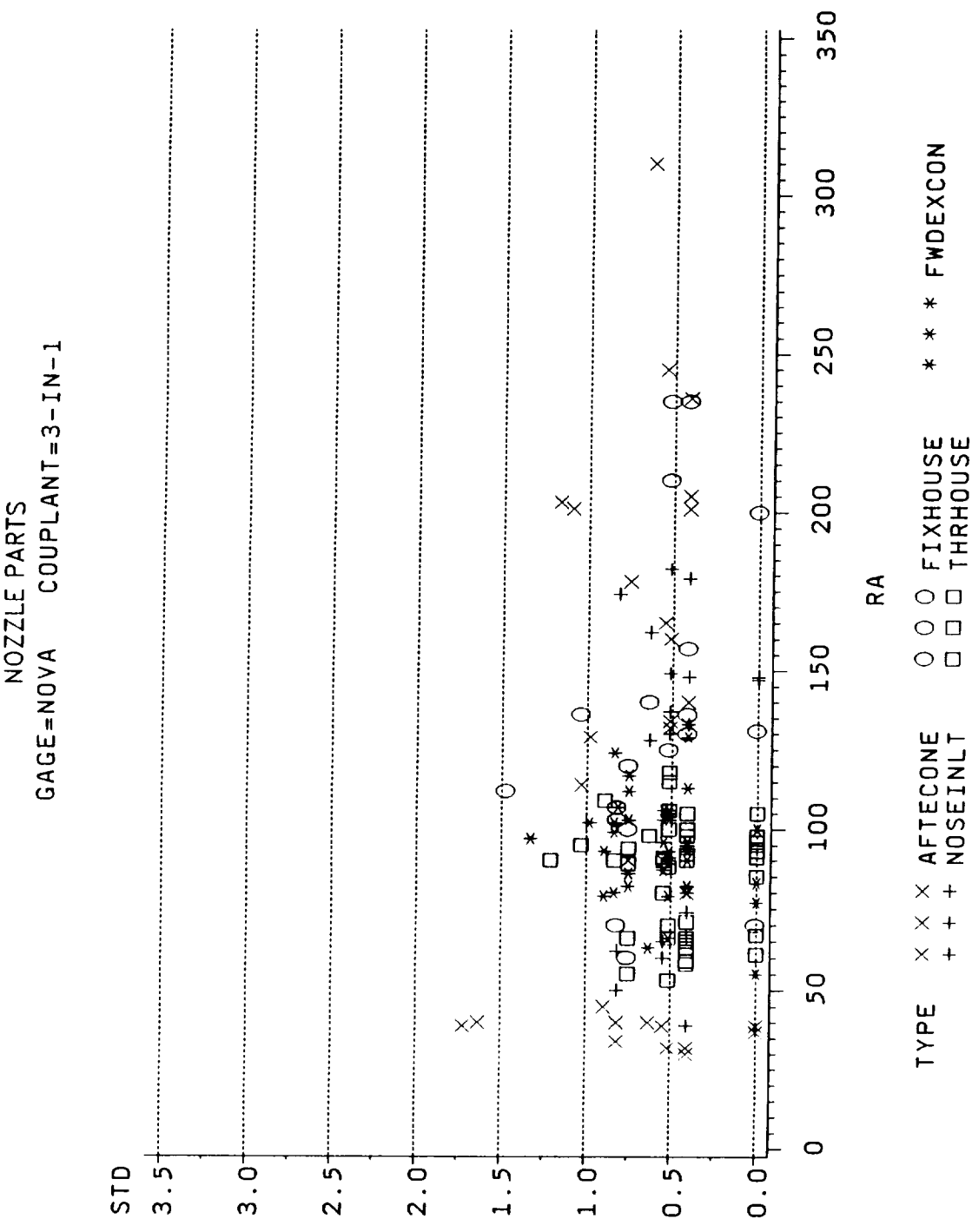

Figure 8. Measurement Uncertainty (Std) Versus Surface Finish (Ra) Nozzle Parts Couplant = 3-in-One Oil

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TEST DEVIATIONS

The cylinders were to be measured at both the tang and clevis ends, but there was no access to the top end where the cylinders were located. The bottom end of each cylinder was measured at eight locations for the first three cylinders and four locations for the remaining. The switch to four was because a preliminary review of the data revealed that four locations would produce the material velocity variation as well as eight. A mixture of tang and clevis ends, as well as cylinder types, were used for the test.

Five forward and aft domes were to be measured at the forward and aft ends. There were only three forward and aft domes available for NOVA gage measurements. Also, the forward ends of both domes were not measured because the wall was tapered within the reach of the Dyer gage. The aft ends were measured at four locations.

The fixed housing was to be measured at both the forward and aft ends. However, it was decided that since the part was so short, eight locations were not needed. The fixed housings were measured at four locations, two toward the forward end and two toward the aft end.

It was originally planned to measure five aft exit cones, but there were only four available. The four aft exit cones were measured according to the engineering test plan.

There were no photographs taken for NOVA gage testing.

7

REFERENCES

ETP-0535	Evaluation of the NOVA 201 Gage
ETP-0685	Case/Steel Auto Gage Measurement Evaluation Test Plan
ETP-0681	Case/Steel NOVA 201 Gage Measurement Evaluation Test Plan
ETP-0682	Nozzle/Aluminum NOVA Gage Measurement Evaluation Test Plan
ETP-0684	Nozzle/Steel NOVA Gage Measurement Evaluation Test Plan
TWR-60532	Auto Gage Test Results
TWR-60740	Evaluation of the NOVA 201 Gage Test Results

Appendix A

Cylinder Measurements

CYLINDER #1

(All DYER and NOVA measurements are in inches.)

SURFACE FINISH

Position A	Position B	Position C	Position D
200 Ra	130 Ra	170 Ra	200 Ra
Position E	**Position F**	**Position G**	**Position H**
180 Ra	150 Ra	180 Ra	180 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.5096	0.5068	0.5078	0.5104
Position E	**Position F**	**Position G**	**Position H**
0.5108	0.5089	0.5060	0.5084

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.5106	0.5075	0.5080	0.5088
Position E	**Position F**	**Position G**	**Position H**
0.5105	0.5073	0.5057	0.5095

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.5109	0.5073	0.5086	0.5085
Position E	**Position F**	**Position G**	**Position H**
0.5102	0.5077	0.5052	0.5095

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.5109	0.5074	0.5068	0.5081
Position E	**Position F**	**Position G**	**Position H**
0.5110	0.5084	0.5056	0.5101

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.515	0.512	0.512	0.514
Position E	**Position F**	**Position G**	**Position H**

0.516	0.514	0.512	0.515

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.517	0.513	0.513	0.515
Position E	**Position F**	**Position G**	**Position H**
0.517	0.515	0.512	0.515

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.514	0.512	0.512	0.514
Position E	**Position F**	**Position G**	**Position H**
0.516	0.514	0.511	0.513

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.514	0.512	0.512	0.514
Position E	**Position F**	**Position G**	**Position H**
0.516	0.514	0.511	0.514

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.515	0.512	0.513	0.515
Position E	**Position F**	**Position G**	**Position H**
0.517	0.515	0.512	0.515

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.515	0.512	0.512	0.515
Position E	**Position F**	**Position G**	**Position H**
0.516	0.515	0.512	0.515

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.514	0.512	0.512	0.514

Position E	Position F	Position G	Position H
0.515	0.514	0.512	0.514

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.514	0.512	0.512	0.514

Position E	Position F	Position G	Position H
0.515	0.514	0.511	0.514

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.514	0.512	0.512	0.514

Position E	Position F	Position G	Position H
0.515	0.514	0.512	0.514

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.514	0.512	0.511	0.514

Position E	Position F	Position G	Position H
0.515	0.514	0.511	0.514

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.514	0.511	0.510	0.514

Position E	Position F	Position G	Position H
0.515	0.513	0.510	0.514

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.514	0.511	0.510	0.513

Position E	Position F	Position G	Position H
0.515	0.513	0.510	0.513

CYLINDER #2

SURFACE FINISH

Position A	Position B	Position C	Position D
130 Ra	145 Ra	130 Ra	150 Ra

Position E	Position F	Position G	Position H
135 Ra	135 Ra	130 Ra	130 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.5134	0.5140	0.5156	0.5150
Position E	Position F	Position G	Position H
0.5136	0.5173	0.5137	0.5157

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.5121	0.5139	0.5140	0.5139
Position E	Position F	Position G	Position H
0.5122	0.5159	0.5139	0.5156

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.5135	0.5139	0.5149	0.5148
Position E	Position F	Position G	Position H
0.5134	0.5159	0.5146	0.5149

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.5136	0.5136	0.5144	0.5139
Position E	Position F	Position G	Position H
0.5122	0.5165	0.5146	0.5136

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.520	0.518	0.519	0.521
Position E	Position F	Position G	Position H
0.517	0.521	0.521	0.521

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.520	0.518	0.519	0.521
Position E	Position F	Position G	Position H

0.517	0.521	0.520	0.521

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.520	0.518	0.519	0.519
Position E	**Position F**	**Position G**	**Position H**
0.517	0.521	0.521	0.520

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.520	0.518	0.518	0.519
Position E	**Position F**	**Position G**	**Position H**
0.517	0.520	0.519	0.521

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.519	0.517	0.518	0.519
Position E	**Position F**	**Position G**	**Position H**
0.516	0.520	0.520	0.520

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.519	0.517	0.518	0.518
Position E	**Position F**	**Position G**	**Position H**
0.516	0.520	0.520	0.520

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.519	0.518	0.518	0.518
Position E	**Position F**	**Position G**	**Position H**
0.516	0.520	0.520	0.520

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.519	0.518	0.518	0.519

Position E	Position F	Position G	Position H
0.516	0.520	0.520	0.520

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.519	0.517	0.517	0.519
Position E	Position F	Position G	Position H
0.516	0.520	0.518	0.520

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.519	0.517	0.518	0.518
Position E	Position F	Position G	Position H
0.520	0.519	0.520	0.520

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.519	0.517	0.517	0.518
Position E	Position F	Position G	Position H
0.516	0.520	0.519	0.520

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.519	0.517	0.518	0.518
Position E	Position F	Position G	Position H
0.516	0.520	0.520	0.520

CYLINDER #3

SURFACE FINISH

Position A	Position B	Position C	Position D
100 Ra	100 Ra	120 Ra	100 Ra
Position E	Position F	Position G	Position H
110 Ra	130 Ra	130 Ra	130 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.5076	0.5062	0.5059	0.5095

Position E	Position F	Position G	Position H
0.5061	0.5076	0.5046	0.5058

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.5063	0.5050	0.5053	0.5084
Position E	Position F	Position G	Position H
0.5056	0.5075	0.5047	0.5061

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.5073	0.5052	0.5052	0.5086
Position E	Position F	Position G	Position H
0.5061	0.5078	0.5055	0.5063

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.5072	0.5059	0.5058	0.5085
Position E	Position F	Position G	Position H
0.5060	0.5080	0.5054	0.5072

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.511	0.512	0.509	0.514
Position E	Position F	Position G	Position H
0.511	0.514	0.510	0.512

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.511	0.512	0.509	0.513
Position E	Position F	Position G	Position H
0.511	0.514	0.509	0.512

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.511	0.511	0.508	0.512

Position E	Position F	Position G	Position H
0.510	0.513	0.509	0.511

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.510	0.510	0.508	0.513
Position E	Position F	Position G	Position H
0.510	0.513	0.509	0.511

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.510	0.510	0.508	0.514
Position E	Position F	Position G	Position H
0.510	0.512	0.508	0.510

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.510	0.511	0.508	0.512
Position E	Position F	Position G	Position H
0.510	0.513	0.509	0.510

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.509	0.511	0.508	0.513
Position E	Position F	Position G	Position H
0.509	0.512	0.508	0.510

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.509	0.510	0.508	0.513
Position E	Position F	Position G	Position H
0.509	0.512	0.508	0.510

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.509	0.511	0.508	0.512

Position E	Position F	Position G	Position H
0.509	0.513	0.509	0.510

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.509	0.511	0.508	0.512

Position E	Position F	Position G	Position H
0.509	0.513	0.509	0.510

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.509	0.511	0.508	0.512

Position E	Position F	Position G	Position H
0.509	0.512	0.508	0.510

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.509	0.511	0.508	0.512

Position E	Position F	Position G	Position H
0.509	0.513	0.509	0.510

CYLINDER #4

SURFACE FINISH

Position A	Position B	Position C	Position D
225 Ra	200 Ra	130 Ra	220 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.4834	0.4834	0.4822	0.4841

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.4841	0.4832	0.4824	0.4846

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.4832	0.4828	0.4832	0.4846

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.4839	0.4836	0.4823	0.4849

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.483	0.480	0.481	0.483

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.483	0.480	0.481	0.483

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.485	0.484	0.487

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.484	0.484	0.486

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.485	0.485	0.485

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.487	0.483	0.485	0.484

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.485	0.486	0.486

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.487	0.486	0.485	0.486

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.484	0.485	0.487

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.485	0.485	0.486

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.484	0.485	0.486

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.485	0.485	0.486

CYLINDER #5

SURFACE FINISH

Position A	Position B	Position C	Position D
180 Ra	210 Ra	280 Ra	200 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.4818	0.4825	0.4814	0.4814

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.4812	0.4826	0.4809	0.4818

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.4815	0.4826	0.4810	0.4819

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.4817	0.4831	0.4807	0.4818

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.486	0.485	0.485

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.486	0.485	0.485

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.488	0.486	0.485	0.485

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.487	0.485	0.485

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.487	0.486	0.484	0.485

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.487	0.487	0.485	0.485

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.485	0.485	0.483	0.483

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.485	0.486	0.484	0.484

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.487	0.486	0.486	0.485

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.487	0.485	0.485

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.485	0.483	0.484

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.487	0.485	0.484

CYLINDER #6

SURFACE FINISH

Position A	Position B	Position C	Position D
180 Ra	250 Ra	120 Ra	200 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.4804	0.4804	0.4816	0.4815

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.4810	0.4810	0.4820	0.4823

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.4805	0.4808	0.4816	0.4817

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.4803	0.4805	0.4816	0.4822

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.486	0.486	0.486

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.485	0.484	0.487

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.485	0.486	0.484	0.485

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.486	0.483	0.485

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.485	0.485	0.486

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.486	0.484	0.484

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.485	0.486	0.484	0.486

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.485	0.483	0.486

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.485	0.483	0.485

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.485	0.484	0.483	0.486

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.485	0.483	0.486

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.485	0.485	0.484	0.486

CYLINDER #7

SURFACE FINISH

Position A	Position B	Position C	Position D
109 Ra	120 Ra	125 Ra	130 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.5197	0.5185	0.5210	0.5178

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.5195	0.5183	0.5209	0.5174

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.5192	0.5182	0.5209	0.5175

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.5194	0.5179	0.5210	0.5177

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.522	0.520	0.524	0.520

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.523	0.520	0.524	0.521

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.523	0.520	0.524	0.521

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.523	0.520	0.525	0.520

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.522	0.520	0.524	0.524

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.522	0.522	0.524	0.523

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.520	0.519	0.523	0.519

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.524	0.519	0.523	0.520

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.522	0.520	0.524	0.520

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.522	0.520	0.523	0.520

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.521	0.520	0.522	0.519

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.521	0.519	0.523	0.519

CYLINDER #8

SURFACE FINISH

Position A	Position B	Position C	Position D
098 Ra	100 Ra	120 Ra	095 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.5960	0.5952	0.5962	0.5934

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.5963	0.5972	0.5957	0.5941

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.5963	0.5972	0.5960	0.5943

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.5957	0.5961	0.5962	0.5936

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.599	0.598	0.601	0.597

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.599	0.598	0.599	0.597

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.599	0.599	0.599	0.596

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.599	0.599	0.598	0.596

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.598	0.598	0.598	0.596

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.598	0.598	0.599	0.596

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.599	0.598	0.599	0.596

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.599	0.599	0.599	0.596

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.598	0.598	0.598	0.595

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.598	0.598	0.598	0.595

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D

0.598	0.599	0.599	0.595

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.598	0.599	0.599	0.595

CYLINDER #9

SURFACE FINISH

Position A	Position B	Position C	Position D
130 Ra	170 Ra	130 Ra	130 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.5072	0.5095	0.5075	0.5089

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.5068	0.5095	0.5071	0.5087

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.5069	0.5096	0.5073	0.5084

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.5070	0.5097	0.5072	0.5090

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.513	0.514	0.514	0.515

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.513	0.514	0.514	0.515

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.512	0.513	0.513	0.514

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.513	0.513	0.513	0.514

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.512	0.513	0.514	0.515

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.513	0.514	0.514	0.515

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.512	0.513	0.513	0.513

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.512	0.513	0.513	0.514

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.512	0.513	0.513	0.513

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.513	0.513	0.513	0.513

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.511	0.513	0.513	0.513

SECOND MEASUREMENT

Position A	Position B	Position C	Position D

0.511	0.513	0.514	0.514

CYLINDER #10

SURFACE FINISH

Position A	Position B	Position C	Position D
200 Ra	170 Ra	170 Ra	150 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.4808	0.4818	0.4822	0.4809

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.4821	0.4827	0.4816	0.4816

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.4815	0.4817	0.4823	0.4814

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.4809	0.4819	0.4823	0.4816

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.487	0.487	0.487

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.487	0.487	0.486	0.487

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.487	0.486	0.487

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.487	0.487	0.487	0.487

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.487	0.488	0.487	0.487

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.487	0.488	0.487	0.487

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.485	0.486	0.485	0.486

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.485	0.486	0.486	0.487

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.485	0.487	0.485	0.485

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.486	0.487	0.487	0.487

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.485	0.487	0.486	0.486

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.485	0.488	0.486	0.487

Appendix B

Forward Dome Measurements

FORWARD DOME #1

(All DYER and NOVA gage measurements are in inches.)

SURFACE FINISH

Position A	Position B	Position C	Position D
116 Ra	105 Ra	112 Ra	101 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.4114	0.4110	0.4147	0.4075

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.4112	0.4107	0.4144	0.4073

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.4114	0.4099	0.4145	0.4069

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.4108	0.4099	0.4142	0.4073

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.415	0.414	0.418	0.410

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.415	0.413	0.417	0.409

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.415	0.413	0.418	0.410

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.415	0.415	0.418	0.410

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.415	0.415	0.417	0.410

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.415	0.416	0.417	0.409

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.413	0.412	0.417	0.407

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.414	0.413	0.416	0.408

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.414	0.414	0.417	0.408

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.414	0.412	0.417	0.408

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.414	0.415	0.416	0.408

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.414	0.415	0.416	0.408

FORWARD DOME #2

SURFACE FINISH

Position A	Position B	Position C	Position D
100 Ra	100 Ra	100 Ra	100 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.4194	0.4160	0.4127	0.4158

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.4190	0.4160	0.4130	0.4162

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.4193	0.4162	0.4128	0.4158

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.4191	0.4156	0.4129	0.4160

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.422	0.417	0.417	0.420

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.421	0.417	0.417	0.420

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.421	0.417	0.417	0.419

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.420	0.418	0.417	0.419

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.421	0.417	0.417	0.419

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.421	0.417	0.415	0.419

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.420	0.417	0.415	0.419

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.421	0.417	0.416	0.419

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.420	0.416	0.415	0.419

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.420	0.416	0.416	0.418

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.420	0.416	0.416	0.419

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.421	0.417	0.416	0.419

FORWARD DOME #3

SURFACE FINISH

Position A	Position B	Position C	Position D
148 Ra	132 Ra	137 Ra	140 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.4201	0.4207	0.4256	0.4250

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.4199	0.4210	0.4251	0.4244

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.4200	0.4203	0.4249	0.4247

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.4205	0.4204	0.4249	0.4249

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.425	0.427	0.431	0.430

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.425	0.427	0.431	0.430

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.425	0.426	0.431	0.430

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.425	0.426	0.430	0.429

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.425	0.427	0.431	0.430

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.425	0.427	0.431	0.430

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.424	0.425	0.429	0.427

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.425	0.426	0.430	0.429

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.424	0.425	0.429	0.429

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.424	0.426	0.429	0.429

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.424	0.425	0.429	0.429

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.424	0.425	0.429	0.429

Appendix C

Aft Dome Measurements

AFT DOME #1

(All DYER and NOVA gage measurements are in inches.)

SURFACE FINISH

Position A	Position B	Position C	Position D
115 Ra	120 Ra	125 Ra	125 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.3693	0.3628	0.3654	0.3682

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.3693	0.3620	0.3652	0.3669

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.3697	0.3630	0.3651	0.3672

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.3696	0.3632	0.3652	0.3682

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.371	0.364	0.367	0.369

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.371	0.364	0.367	0.369

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.371	0.364	0.367	0.369

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.373	0.363	0.366	0.368

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.371	0.364	0.367	0.369

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.371	0.364	0.367	0.369

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.371	0.364	0.366	0.369

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.370	0.363	0.366	0.368

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.370	0.364	0.366	0.369

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.370	0.364	0.366	0.368

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.370	0.364	0.366	0.368

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.371	0.364	0.366	0.369

AFT DOME #2

SURFACE FINISH

Position A	Position B	Position C	Position D
210 Ra	210 Ra	200 Ra	170 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.3719	0.3700	0.3663	0.3701

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.3717	0.3690	0.3658	0.3687

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.3704	0.3699	0.3668	0.3698

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.3711	0.3695	0.3658	0.3694

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.375	0.374	0.371	0.374

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.374	0.374	0.371	0.373

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.375	0.374	0.370	0.373

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.375	0.374	0.371	0.373

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.375	0.374	0.371	0.373

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.374	0.374	0.371	0.373

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.374	0.373	0.369	0.372

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.374	0.373	0.369	0.374

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.374	0.372	0.369	0.371

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.373	0.372	0.368	0.371

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	P16	0.3699	0.36690.3699

AUTO GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.3716	0.3699	0.3669	0.3699

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.3716	0.3700	0.3668	0.3700

AUTO GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.3716	0.3699	0.3668	0.3699

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.3715	0.3699	0.3669	0.3699

AFT DOME #3

SURFACE FINISH

Position A	Position B	Position C	Position D
100 Ra	095 Ra	100 Ra	093 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.3668	0.3657	0.3693	0.3670

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.3669	0.3649	0.3700	0.3656

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.3664	0.3658	0.3695	0.3664

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.3667	0.3657	0.3703	0.3667

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.371	0.369	0.373	0.370

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.371	0.369	0.373	0.371

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.370	0.369	0.373	0.370

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.371	0.369	0.374	0.371

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.371	0.368	0.373	0.371

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.370	0.368	0.373	0.371

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.368	0.367	0.371	0.370

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.368	0.368	0.372	0.370

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.369	0.368	0.372	0.370

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.369	0.368	0.373	0.369

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.369	0.368	0.372	0.370

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.369	0.370	0.372	0.370

Appendix D

Forward Exit Cone Measurements

FORWARD EXIT CONE #1

(All DYER and NOVA gage measurements are in inches.)

SURFACE FINISH

Position A 117 Ra	Position B 093 Ra	Position C 087 Ra	Position D 082 Ra
Position E 055 Ra	Position F 093 Ra	Position G 066 Ra	Position H 079 Ra

DYER GAGE MEASUREMENT #1

Position A 0.5023	Position B 0.5025	Position C 0.5048	Position D 0.5034
Position E 0.4014	Position F 0.4009	Position G 0.4014	Position H 0.4046

DYER GAGE MEASUREMENT #2

Position A 0.5021	Position B 0.5032	Position C 0.5045	Position D 0.5039
Position E 0.4026	Position F 0.4014	Position G 0.4015	Position H 0.4043

DYER GAGE MEASUREMENT #3

Position A 0.5017	Position B 0.5035	Position C 0.5040	Position D 0.5032
Position E 0.4026	Position F 0.4019	Position G 0.4016	Position H 0.4045

DYER GAGE MEASUREMENT #4

Position A 0.5015	Position B 0.5032	Position C 0.5041	Position D 0.5030
Position E 0.4022	Position F 0.4015	Position G 0.4013	Position H 0.4043

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A 0.506	Position B 0.506	Position C 0.506	Position D 0.505
Position E	Position F	Position G	Position H

0.402	0.405	0.402	0.405

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.506	0.506	0.506	0.505
Position E	**Position F**	**Position G**	**Position H**
0.402	0.405	0.401	0.406

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.505	0.505	0.505	0.504
Position E	**Position F**	**Position G**	**Position H**
0.401	0.404	0.402	0.405

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.506	0.505	0.505	0.504
Position E	**Position F**	**Position G**	**Position H**
0.401	0.405	0.402	0.405

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.506	0.505	0.506	0.504
Position E	**Position F**	**Position G**	**Position H**
0.401	0.403	0.402	0.404

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.506	0.505	0.505	0.504
Position E	**Position F**	**Position G**	**Position H**
0.401	0.404	0.402	0.405

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.504	0.503	0.505	0.503

Position E	Position F	Position G	Position H
0.401	0.402	0.401	0.404

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.505	0.504	0.504	0.503

Position E	Position F	Position G	Position H
0.401	0.402	0.401	0.404

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.503	0.503	0.504	0.502

Position E	Position F	Position G	Position H
0.401	0.403	0.400	0.404

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.504	0.503	0.504	0.502

Position E	Position F	Position G	Position H
0.401	0.402	0.400	0.404

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.504	0.503	0.505	0.503

Position E	Position F	Position G	Position H
0.401	0.402	0.401	0.405

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.503	0.504	0.505	0.504

Position E	Position F	Position G	Position H
0.401	0.402	0.401	0.405

FORWARD EXIT CONE #2

SURFACE FINISH

Position A	Position B	Position C	Position D
103 Ra	090 Ra	105 Ra	082 Ra

Position E	Position F	Position G	Position H
103 Ra	113 Ra	129 Ra	124 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.4971	0.4942	0.4962	0.4963
Position E	Position F	Position G	Position H
0.3980	0.3958	0.3989	0.3958

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.4969	0.4935	0.4957	0.4969
Position E	Position F	Position G	Position H
0.3972	0.3962	0.3988	0.3969

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.4972	0.4948	0.4962	0.4972
Position E	Position F	Position G	Position H
0.3974	0.3962	0.3986	0.3963

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.4969	0.4944	0.4980	0.4983
Position E	Position F	Position G	Position H
0.3971	0.3959	0.3981	0.3967

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.499	0.497	0.500	0.500
Position E	Position F	Position G	Position H
0.401	0.398	0.401	0.400

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.499	0.498	0.500	0.500
Position E	Position F	Position G	Position H

0.401	0.398	0.400	0.400

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.499	0.497	0.500	0.499
Position E	**Position F**	**Position G**	**Position H**
0.401	0.398	0.401	0.399

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.499	0.497	0.499	0.500
Position E	**Position F**	**Position G**	**Position H**
0.401	0.398	0.401	0.399

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.499	0.497	0.499	0.500
Position E	**Position F**	**Position G**	**Position H**
0.401	0.398	0.401	0.399

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.499	0.498	0.500	0.500
Position E	**Position F**	**Position G**	**Position H**
0.401	0.398	0.401	0.400

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.496	0.495	0.498	0.498
Position E	**Position F**	**Position G**	**Position H**
0.398	0.396	0.398	0.397

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.497	0.496	0.498	0.499

Position E	Position F	Position G	Position H
0.399	0.397	0.398	0.397

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.497	0.495	0.497	0.498
Position E	Position F	Position G	Position H
0.398	0.396	0.398	0.399

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.498	0.495	0.498	0.498
Position E	Position F	Position G	Position H
0.399	0.396	0.398	0.397

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.497	0.495	0.497	0.498
Position E	Position F	Position G	Position H
0.398	0.396	0.399	0.397

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.498	0.495	0.498	0.498
Position E	Position F	Position G	Position H
0.398	0.396	0.398	0.398

FORWARD EXIT CONE #3

SURFACE FINISH

Position A	Position B	Position C	Position D
091 Ra	080 Ra	079 Ra	063 Ra
Position E	Position F	Position G	Position H
102 Ra	080 Ra	112 Ra	100 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.4996	0.5029	0.4987	0.5027

Position E	Position F	Position G	Position H
0.4035	0.4043	0.4017	0.4039

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.4997	0.5031	0.4994	0.5035
Position E	Position F	Position G	Position H
0.4035	0.4044	0.4016	0.4043

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.4998	0.5034	0.4992	0.5039
Position E	Position F	Position G	Position H
0.4032	0.4044	0.4013	0.4042

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.5009	0.5046	0.4999	0.5038
Position E	Position F	Position G	Position H
0.4028	0.4041	0.4016	0.4041

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.499	0.504	0.499	0.502
Position E	Position F	Position G	Position H
0.404	0.405	0.404	0.408

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.501	0.505	0.500	0.503
Position E	Position F	Position G	Position H
0.405	0.405	0.403	0.407

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.501	0.506	0.500	0.503

Position E	Position F	Position G	Position H
0.405	0.406	0.403	0.406

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.502	0.506	0.500	0.504

Position E	Position F	Position G	Position H
0.405	0.405	0.403	0.406

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.502	0.505	0.500	0.504

Position E	Position F	Position G	Position H
0.405	0.406	0.403	0.407

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.502	0.506	0.501	0.504

Position E	Position F	Position G	Position H
0.405	0.405	0.402	0.407

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.502	0.505	0.501	0.504

Position E	Position F	Position G	Position H
0.404	0.404	0.403	0.406

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.502	0.506	0.501	0.505

Position E	Position F	Position G	Position H
0.405	0.405	0.403	0.406

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A 0.501	Position B 0.504	Position C 0.499	Position D 0.503
Position E 0.404	Position F 0.404	Position G 0.403	Position H 0.406

SECOND MEASUREMENT

Position A 0.501	Position B 0.504	Position C 0.499	Position D 0.504
Position E 0.404	Position F 0.404	Position G 0.404	Position H 0.406

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A 0.501	Position B 0.504	Position C 0.500	Position D 0.504
Position E 0.406	Position F 0.404	Position G 0.402	Position H 0.406

SECOND MEASUREMENT

Position A 0.501	Position B 0.504	Position C 0.500	Position D 0.504
Position E 0.404	Position F 0.404	Position G 0.402	Position H 0.406

FORWARD EXIT CONE #4

SURFACE FINISH

Position A 102 Ra	Position B 096 Ra	Position C 093 Ra	Position D 107 Ra
Position E 106 Ra	Position F 086 Ra	Position G 106 Ra	Position H 099 Ra

DYER GAGE MEASUREMENT #1

Position A 0.4984	Position B 0.5001	Position C 0.4986	Position D 0.4995
Position E 0.4047	Position F 0.4037	Position G 0.4010	Position H 0.4021

DYER GAGE MEASUREMENT #2

Position A 0.4986	Position B 0.4997	Position C 0.4982	Position D 0.4993

Position E 0.4045	Position F 0.4039	Position G 0.4011	Position H 0.4023

DYER GAGE MEASUREMENT #3

Position A 0.4986	Position B 0.5002	Position C 0.4981	Position D 0.4988
Position E 0.4051	Position F 0.4037	Position G 0.4015	Position H 0.4021

DYER GAGE MEASUREMENT #4

Position A 0.4983	Position B 0.4995	Position C 0.4986	Position D 0.4991
Position E 0.4046	Position F 0.4041	Position G 0.4009	Position H 0.4026

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A 0.501	Position B 0.502	Position C 0.501	Position D 0.502
Position E 0.408	Position F 0.407	Position G 0.405	Position H 0.406

SECOND MEASUREMENT

Position A 0.501	Position B 0.502	Position C 0.501	Position D 0.502
Position E 0.408	Position F 0.408	Position G 0.405	Position H 0.405

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A 0.501	Position B 0.503	Position C 0.502	Position D 0.502
Position E 0.408	Position F 0.407	Position G 0.405	Position H 0.406

SECOND MEASUREMENT

Position A 0.501	Position B 0.503	Position C 0.501	Position D 0.502

Position E	Position F	Position G	Position H
0.408	0.407	0.405	0.406

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.500	0.502	0.501	0.501

Position E	Position F	Position G	Position H
0.408	0.406	0.404	0.405

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.501	0.502	0.500	0.501

Position E	Position F	Position G	Position H
0.408	0.406	0.403	0.405

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.499	0.501	0.499	0.500

Position E	Position F	Position G	Position H
0.406	0.405	0.402	0.402

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.499	0.501	0.499	0.500

Position E	Position F	Position G	Position H
0.406	0.405	0.402	0.403

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.501	0.502	0.501	0.501

Position E	Position F	Position G	Position H
0.407	0.406	0.403	0.404

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.501	0.502	0.500	0.501

Position E	Position F	Position G	Position H
0.407	0.406	0.403	0.404

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.500	0.501	0.500	0.499

Position E	Position F	Position G	Position H
0.407	0.405	0.402	0.404

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.501	0.502	0.501	0.501

Position E	Position F	Position G	Position H
0.407	0.404	0.403	0.404

FORWARD EXIT CONE #5

SURFACE FINISH

Position A	Position B	Position C	Position D
096 Ra	097 Ra	077 Ra	089 Ra

Position E	Position F	Position G	Position H
095 Ra	103 Ra	083 Ra	089 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.5026	0.5026	0.4963	0.5005

Position E	Position F	Position G	Position H
0.4004	0.4032	0.3987	0.4017

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.5027	0.5027	0.4969	0.5006

Position E	Position F	Position G	Position H
0.4008	0.4040	0.3990	0.4015

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.5033	0.5032	0.4975	0.5006

Position E	Position F	Position G	Position H
0.4001	0.4036	0.3982	0.4019

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.5022	0.5025	0.4959	0.5003

Position E	Position F	Position G	Position H
0.4006	0.4039	0.3989	0.4014

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.506	0.505	0.497	0.500

Position E	Position F	Position G	Position H
0.404	0.408	0.400	0.407

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.507	0.504	0.498	0.501

Position E	Position F	Position G	Position H
0.404	0.408	0.399	0.406

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.506	0.504	0.498	0.500

Position E	Position F	Position G	Position H
0.404	0.408	0.400	0.407

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.506	0.507	0.498	0.501

Position E	Position F	Position G	Position H
0.404	0.408	0.399	0.407

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.505	0.504	0.498	0.500
Position E	Position F	Position G	Position H
0.403	0.407	0.399	0.407

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.505	0.505	0.498	0.500
Position E	Position F	Position G	Position H
0.404	0.407	0.400	0.407

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.504	0.503	0.497	0.501
Position E	Position F	Position G	Position H
0.403	0.406	0.398	0.405

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.504	0.503	0.497	0.501
Position E	Position F	Position G	Position H
0.403	0.406	0.398	0.406

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.504	0.503	0.497	0.501
Position E	Position F	Position G	Position H
0.403	0.407	0.398	0.406

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.505	0.503	0.497	0.501
Position E	Position F	Position G	Position H
0.403	0.407	0.398	0.406

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.504	0.505	0.497	0.502
Position E	**Position F**	**Position G**	**Position H**
0.403	0.407	0.398	0.406

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.504	0.506	0.497	0.502
Position E	**Position F**	**Position G**	**Position H**
0.402	0.406	0.398	0.405

Appendix E

Aft Exit Cone Measurements

AFT EXIT CONE #1

(All DYER and NOVA gage measurements are in inches.)

SURFACE FINISH

Position A	Position B	Position C	Position D
205 Ra	134 Ra	201 Ra	165 Ra
Position E	**Position F**	**Position G**	**Position H**
236 Ra	245 Ra	133 Ra	160 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.3817	0.3854	0.3684	0.3769
Position E	**Position F**	**Position G**	**Position H**
0.3874	0.3865	0.3858	0.3900

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.3817	0.3854	0.3688	0.3756
Position E	**Position F**	**Position G**	**Position H**
0.3875	0.3866	0.3860	0.3899

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.3821	0.3855	0.3686	0.3765
Position E	**Position F**	**Position G**	**Position H**
0.3876	0.3870	0.3861	0.3900

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.3815	0.3858	0.3686	0.3768
Position E	**Position F**	**Position G**	**Position H**
0.3875	0.3863	0.3862	0.3899

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.386	0.388	0.373	0.379
Position E	**Position F**	**Position G**	**Position H**

0.392	0.391	0.389	0.394

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.385	0.388	0.372	0.380
Position E	Position F	Position G	Position H
0.392	0.391	0.388	0.393

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.386	0.389	0.374	0.380
Position E	Position F	Position G	Position H
0.393	0.391	0.390	0.394

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.386	0.389	0.375	0.380
Position E	Position F	Position G	Position H
0.393	0.391	0.389	0.394

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.386	0.389	0.373	0.380
Position E	Position F	Position G	Position H
0.392	0.391	0.389	0.393

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.386	0.388	0.373	0.380
Position E	Position F	Position G	Position H
0.393	0.391	0.389	0.394

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.386	0.388	0.372	0.379

Position E	Position F	Position G	Position H
0.392	0.391	0.389	0.394

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.386	0.388	0.373	0.380

Position E	Position F	Position G	Position H
0.393	0.390	0.389	0.394

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.386	0.387	0.372	0.380

Position E	Position F	Position G	Position H
0.392	0.391	0.389	0.393

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.386	0.388	0.372	0.380

Position E	Position F	Position G	Position H
0.392	0.391	0.389	0.393

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.386	0.387	0.372	0.379

Position E	Position F	Position G	Position H
0.392	0.390	0.388	0.393

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.385	0.388	0.372	0.379

Position E	Position F	Position G	Position H
0.392	0.390	0.389	0.393

AFT EXIT CONE #2

SURFACE FINISH

Position A	Position B	Position C	Position D
114 Ra	129 Ra	140 Ra	132 Ra

Position E	Position F	Position G	Position H
178 Ra	201 Ra	178 Ra	203 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.3751	0.3727	0.3916	0.3688
Position E	Position F	Position G	Position H
0.3912	0.3956	0.3890	0.3847

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.3749	0.3725	0.3912	0.3690
Position E	Position F	Position G	Position H
0.3912	0.3961	0.3902	0.3841

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.3748	0.3721	0.3909	0.3690
Position E	Position F	Position G	Position H
0.3908	0.3954	0.3897	0.3839

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.3750	0.3719	0.3911	0.3699
Position E	Position F	Position G	Position H
0.3918	0.3968	0.3910	0.3847

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.376	0.377	0.391	0.372
Position E	Position F	Position G	Position H
0.390	0.397	0.391	0.391

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.375	0.375	0.394	0.373
Position E	Position F	Position G	Position H

0.389	0.395	0.392	0.392

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.381	0.379	0.396	0.373
Position E	**Position F**	**Position G**	**Position H**
0.395	0.400	0.394	0.391

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.380	0.379	0.396	0.373
Position E	**Position F**	**Position G**	**Position H**
0.397	0.400	0.393	0.391

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.381	0.380	0.396	0.373
Position E	**Position F**	**Position G**	**Position H**
0.395	0.401	0.393	0.389

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.381	0.379	0.396	0.373
Position E	**Position F**	**Position G**	**Position H**
0.395	0.400	0.393	0.392

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.381	0.379	0.395	0.372
Position E	**Position F**	**Position G**	**Position H**
0.395	0.400	0.393	0.390

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.380	0.379	0.396	0.371

Position E	Position F	Position G	Position H
0.395	0.402	0.393	0.390

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.378	0.377	0.395	0.371
Position E	Position F	Position G	Position H
0.394	0.399	0.393	0.389

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.379	0.377	0.395	0.372
Position E	Position F	Position G	Position H
0.393	0.399	0.392	0.389

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.379	0.378	0.395	0.372
Position E	Position F	Position G	Position H
0.394	0.400	0.394	0.392

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.379	0.377	0.395	0.372
Position E	Position F	Position G	Position H
0.394	0.400	0.392	0.391

AFT EXIT CONE #3

SURFACE FINISH

Position A	Position B	Position C	Position D
310 Ra	090 Ra	080 Ra	040 Ra
Position E	Position F	Position G	Position H
090 Ra	045 Ra	040 Ra	030 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.3596	0.3769	0.3854	0.3823

Position E	Position F	Position G	Position H
0.4022	0.4032	0.3912	0.4029

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.3609	0.3769	0.3847	0.3816
Position E	Position F	Position G	Position H
0.4026	0.4032	0.3917	0.4034

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.3599	0.3762	0.3850	0.3812
Position E	Position F	Position G	Position H
0.4020	0.4037	0.3912	0.4029

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.3601	0.3769	0.3841	0.3825
Position E	Position F	Position G	Position H
0.4015	0.4034	0.3910	0.4029

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.364	0.380	0.384	0.380
Position E	Position F	Position G	Position H
0.405	0.405	0.392	0.403

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.363	0.379	0.384	0.380
Position E	Position F	Position G	Position H
0.406	0.403	0.391	0.402

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.361	0.377	0.383	0.380

Position E	Position F	Position G	Position H
0.403	0.404	0.390	0.402

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.361	0.376	0.382	0.379
Position E	Position F	Position G	Position H
0.403	0.402	0.391	0.402

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.361	0.377	0.385	0.381
Position E	Position F	Position G	Position H
0.404	0.403	0.391	0.404

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.362	0.378	0.384	0.380
Position E	Position F	Position G	Position H
0.405	0.403	0.393	0.404

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.365	0.380	0.386	0.383
Position E	Position F	Position G	Position H
0.407	0.405	0.394	0.405

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.364	0.380	0.387	0.383
Position E	Position F	Position G	Position H
0.408	0.406	0.393	0.406

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.364	0.380	0.386	0.383
Position E	Position F	Position G	Position H
0.407	0.406	0.394	0.405

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.364	0.379	0.386	0.382
Position E	Position F	Position G	Position H
0.407	0.405	0.393	0.405

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.363	0.379	0.386	0.384
Position E	Position F	Position G	Position H
0.406	0.404	0.394	0.405

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.364	0.379	0.386	0.383
Position E	Position F	Position G	Position H
0.406	0.404	0.392	0.405

AFT EXIT CONE #4

SURFACE FINISH

Position A	Position B	Position C	Position D
040 Ra	034 Ra	037 Ra	039 Ra
Position E	Position F	Position G	Position H
032 Ra	032 Ra	039 Ra	039 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.3794	0.3836	0.3899	0.3873
Position E	Position F	Position G	Position H
0.3817	0.3855	0.3826	0.3929

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.3787	0.3836	0.3902	0.3869

Position E	Position F	Position G	Position H
0.3823	0.3853	0.3819	0.3930

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.3792	0.3837	0.3891	0.3869
Position E	Position F	Position G	Position H
0.3811	0.3860	0.3825	0.3930

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.3785	0.3832	0.3891	0.3857
Position E	Position F	Position G	Position H
0.3823	0.3852	0.3820	0.3924

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.379	0.385	0.389	0.383
Position E	Position F	Position G	Position H
0.382	0.384	0.381	0.390

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.379	0.385	0.387	0.383
Position E	Position F	Position G	Position H
0.381	0.385	0.381	0.392

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.378	0.385	0.388	0.384
Position E	Position F	Position G	Position H
0.382	0.383	0.382	0.392

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.379	0.387	0.388	0.384

Position E	Position F	Position G	Position H
0.381	0.386	0.382	0.392

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.379	0.385	0.390	0.387
Position E	Position F	Position G	Position H
0.382	0.384	0.383	0.395

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.379	0.385	0.389	0.385
Position E	Position F	Position G	Position H
0.382	0.384	0.384	0.393

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.377	0.384	0.387	0.383
Position E	Position F	Position G	Position H
0.380	0.383	0.384	0.392

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.377	0.382	0.387	0.383
Position E	Position F	Position G	Position H
0.380	0.382	0.381	0.393

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.377	0.382	0.387	0.383
Position E	Position F	Position G	Position H
0.380	0.383	0.384	0.393

SECOND MEASUREMENT

Position A 0.377	Position B 0.382	Position C 0.387	Position D 0.383
Position E 0.380	Position F 0.382	Position G 0.381	Position H 0.393

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A 0.373	Position B 0.382	Position C 0.387	Position D 0.383
Position E 0.380	Position F 0.382	Position G 0.380	Position H 0.392

SECOND MEASUREMENT

Position A 0.377	Position B 0.382	Position C 0.387	Position D 0.383
Position E 0.379	Position F 0.382	Position G 0.381	Position H 0.392

Appendix F

Nose Inlet Housing Measurements

NOSE INLET HOUSING #1

(All DYER and NOVA gage measurements are in inches.)

SURFACE FINISH

Position A	Position B	Position C	Position D
050 Ra	039 Ra	074 Ra	065 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.7475	0.7446	0.7482	0.7438

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.7477	0.7448	0.7478	0.7441

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.7478	0.7450	0.7482	0.7439

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.7476	0.7447	0.7483	0.7438

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.750	0.747	0.750	0.746

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.749	0.748	0.750	0.747

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.749	0.748	0.751	0.747

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.749	0.748	0.751	0.747

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.750	0.748	0.751	0.747

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.750	0.748	0.751	0.746

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.749	0.747	0.750	0.746

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.749	0.748	0.751	0.746

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.749	0.747	0.750	0.745

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.748	0.747	0.750	0.746

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.747	0.747	0.750	0.745

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.748	0.747	0.750	0.745

NOSE INLET HOUSING #2

SURFACE FINISH

Position A	Position B	Position C	Position D
128 Ra	179 Ra	174 Ra	162 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.7579	0.7590	0.7612	0.7582

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.7579	0.7591	0.7613	0.7584

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.7580	0.7591	0.7611	0.7584

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.7579	0.7592	0.7613	0.7581

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.763	0.765	0.766	0.763

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.763	0.765	0.766	0.763

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.764	0.764	0.766	0.764

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.763	0.763	0.766	0.763

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.763	0.765	0.767	0.763

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.762	0.764	0.766	0.763

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.761	0.762	0.764	0.761

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.762	0.763	0.766	0.762

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.762	0.763	0.766	0.762

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.763	0.763	0.765	0.762

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.762	0.763	0.766	0.763

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.762	0.763	0.765	0.762

NOSE INLET HOUSING #3

SURFACE FINISH

Position A	Position B	Position C	Position D
066 Ra	147 Ra	137 Ra	060 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.7760	0.7752	0.7780	0.7769

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.7762	0.7753	0.7778	0.7771

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.7762	0.7752	0.7780	0.7769

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.7763	0.7755	0.7779	0.7769

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.780	0.780	0.784	0.780

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.780	0.779	0.783	0.779

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.780	0.779	0.782	0.779

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.779	0.780	0.782	0.779

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.779	0.780	0.783	0.779

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.780	0.779	0.783	0.779

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.779	0.779	0.782	0.778

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.779	0.779	0.781	0.779

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.779	0.779	0.782	0.779

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.779	0.779	0.781	0.779

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.778	0.779	0.781	0.778

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.779	0.779	0.781	0.778

NOSE INLET HOUSING #4

SURFACE FINISH

Position A	Position B	Position C	Position D
148 Ra	130 Ra	062 Ra	133 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.7497	0.7447	0.7439	0.7453

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.7495	0.7446	0.7441	0.7450

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.7496	0.7445	0.7439	0.7447

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.7495	0.7447	0.7440	0.7453

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.754	0.748	0.746	0.750

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.753	0.748	0.746	0.750

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.750	0.747	0.745	0.749

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.752	0.748	0.745	0.749

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.753	0.748	0.746	0.750

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.752	0.748	0.746	0.749

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.752	0.747	0.746	0.748

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.752	0.748	0.745	0.749

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.752	0.747	0.744	0.748

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.752	0.748	0.744	0.748

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.752	0.747	0.744	0.748

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.752	0.747	0.745	0.748

NOSE INLET HOUSING #5

SURFACE FINISH

Position A	Position B	Position C	Position D
182 Ra	148 Ra	149 Ra	148 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.7467	0.7445	0.7440	0.7444

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.7468	0.7444	0.7441	0.7442

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.7466	0.7446	0.7441	0.7442

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.7468	0.7445	0.7440	0.7443

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.750	0.749	0.750	0.748

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.750	0.749	0.749	0.748

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.749	0.749	0.749	0.748

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.749	0.749	0.748	0.747

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.750	0.749	0.748	0.749

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.749	0.749	0.748	0.748

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D

0.748	0.748	0.748	0.747

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.749	0.748	0.747	0.747

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.749	0.748	0.748	0.748

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.749	0.748	0.747	0.747

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.748	0.748	0.747	0.747

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.749	0.748	0.747	0.747

Appendix G

Throat Housing Measurements

THROAT HOUSING #1

(All DYER and NOVA gage measurements are in inches.)

SURFACE FINISH

Position A	Position B	Position C	Position D
098 Ra	090 Ra	118 Ra	105 Ra
Position E	**Position F**	**Position G**	**Position H**
090 Ra	115 Ra	106 Ra	100 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.5085	0.5061	0.5126	0.5119
Position E	**Position F**	**Position G**	**Position H**
0.5106	0.5060	0.5114	0.5129

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.5080	0.5059	0.5114	0.5121
Position E	**Position F**	**Position G**	**Position H**
0.5100	0.5074	0.5113	0.5137

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.5089	0.5057	0.5118	0.5124
Position E	**Position F**	**Position G**	**Position H**
0.5100	0.5065	0.5101	0.5131

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.5085	0.5064	0.5114	0.5115
Position E	**Position F**	**Position G**	**Position H**
0.5099	0.5088	0.5103	0.5137

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.514	0.511	0.517	0.517
Position E	**Position F**	**Position G**	**Position H**

0.516	0.511	0.517	0.519

SECOND MEASUREMENT

Position A 0.514	Position B 0.513	Position C 0.517	Position D 0.518
Position E 0.516	Position F 0.512	Position G 0.516	Position H 0.519

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A 0.512	Position B 0.512	Position C 0.516	Position D 0.516
Position E 0.516	Position F 0.512	Position G 0.516	Position H 0.518

SECOND MEASUREMENT

Position A 0.512	Position B 0.512	Position C 0.516	Position D 0.518
Position E 0.515	Position F 0.511	Position G 0.518	Position H 0.518

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A 0.514	Position B 0.513	Position C 0.517	Position D 0.518
Position E 0.516	Position F 0.515	Position G 0.517	Position H 0.518

SECOND MEASUREMENT

Position A 0.513	Position B 0.513	Position C 0.517	Position D 0.517
Position E 0.515	Position F 0.515	Position G 0.517	Position H 0.519

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A 0.512	Position B 0.510	Position C 0.515	Position D 0.515

Position E	Position F	Position G	Position H
0.514	0.510	0.515	0.517

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.512	0.512	0.515	0.515

Position E	Position F	Position G	Position H
0.514	0.510	0.515	0.517

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.512	0.509	0.515	0.515

Position E	Position F	Position G	Position H
0.513	0.509	0.514	0.517

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.511	0.509	0.514	0.514

Position E	Position F	Position G	Position H
0.513	0.509	0.514	0.516

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.512	0.509	0.514	0.515

Position E	Position F	Position G	Position H
0.513	0.510	0.514	0.517

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.512	0.509	0.515	0.515

Position E	Position F	Position G	Position H
0.514	0.510	0.514	0.516

THROAT HOUSING #2

SURFACE FINISH

Position A	Position B	Position C	Position D
066 Ra	053 Ra	055 Ra	061 Ra

Position E	Position F	Position G	Position H
066 Ra	070 Ra	091 Ra	066 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.5040	0.5045	0.4983	0.5034
Position E	**Position F**	**Position G**	**Position H**
0.4932	0.4905	0.4888	0.4938

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.5045	0.5039	0.4983	0.5034
Position E	**Position F**	**Position G**	**Position H**
0.4932	0.4902	0.4882	0.4939

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.5044	0.5041	0.4988	0.5034
Position E	**Position F**	**Position G**	**Position H**
0.4926	0.4899	0.4885	0.4942

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.5038	0.5032	0.4988	0.5033
Position E	**Position F**	**Position G**	**Position H**
0.4926	0.4898	0.4886	0.4931

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.505	0.508	0.500	0.504
Position E	**Position F**	**Position G**	**Position H**
0.495	0.493	0.492	0.497

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.505	0.507	0.501	0.505
Position E	**Position F**	**Position G**	**Position H**

0.495	0.494	0.491	0.497

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.507	0.505	0.500	0.504
Position E	Position F	Position G	Position H
0.496	0.493	0.490	0.497

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.506	0.505	0.500	0.505
Position E	Position F	Position G	Position H
0.496	0.493	0.491	0.497

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.505	0.505	0.502	0.506
Position E	Position F	Position G	Position H
0.496	0.494	0.491	0.497

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.506	0.507	0.502	0.506
Position E	Position F	Position G	Position H
0.497	0.494	0.491	0.497

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.507	0.506	0.499	0.505
Position E	Position F	Position G	Position H
0.495	0.492	0.490	0.497

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.506	0.506	0.500	0.505

Position E	Position F	Position G	Position H
0.495	0.492	0.491	0.496

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.505	0.505	0.500	0.505

Position E	Position F	Position G	Position H
0.495	0.492	0.490	0.496

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.506	0.505	0.500	0.505

Position E	Position F	Position G	Position H
0.495	0.492	0.490	0.497

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.507	0.506	0.501	0.505

Position E	Position F	Position G	Position H
0.496	0.493	0.491	0.496

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.506	0.506	0.501	0.505

Position E	Position F	Position G	Position H
0.495	0.493	0.491	0.496

THROAT HOUSING #3

SURFACE FINISH

Position A	Position B	Position C	Position D
090 Ra	100 Ra	100 Ra	109 Ra

Position E	Position F	Position G	Position H
085 Ra	090 Ra	105 Ra	088 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.5005	0.4970	0.5023	0.4971

Position E	Position F	Position G	Position H
0.4977	0.4934	0.5012	0.5007

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.4998	0.4973	0.5024	0.4978
Position E	Position F	Position G	Position H
0.4993	0.4928	0.5015	0.5004

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.4995	0.4969	0.5026	0.4977
Position E	Position F	Position G	Position H
0.4991	0.4928	0.5015	0.5004

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.4995	0.4974	0.5025	0.4975
Position E	Position F	Position G	Position H
0.4984	0.4943	0.5011	0.5003

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.503	0.500	0.506	0.501
Position E	Position F	Position G	Position H
0.501	0.498	0.504	0.504

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.503	0.500	0.506	0.500
Position E	Position F	Position G	Position H
0.501	0.497	0.503	0.504

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.503	0.504	0.506	0.501

Position E 0.501	Position F 0.498	Position G 0.504	Position H 0.504

SECOND MEASUREMENT

Position A 0.504	Position B 0.500	Position C 0.506	Position D 0.501
Position E 0.501	Position F 0.498	Position G 0.505	Position H 0.504

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A 0.504	Position B 0.501	Position C 0.505	Position D 0.501
Position E 0.501	Position F 0.498	Position G 0.503	Position H 0.504

SECOND MEASUREMENT

Position A 0.503	Position B 0.500	Position C 0.506	Position D 0.501
Position E 0.501	Position F 0.497	Position G 0.504	Position H 0.504

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A 0.502	Position B 0.499	Position C 0.504	Position D 0.499
Position E 0.500	Position F 0.496	Position G 0.503	Position H 0.502

SECOND MEASUREMENT

Position A 0.502	Position B 0.499	Position C 0.505	Position D 0.499
Position E 0.500	Position F 0.496	Position G 0.503	Position H 0.503

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.501	0.499	0.505	0.501
Position E	Position F	Position G	Position H
0.500	0.497	0.503	0.503

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.502	0.500	0.505	0.501
Position E	Position F	Position G	Position H
0.500	0.498	0.503	0.503

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.502	0.499	0.505	0.500
Position E	Position F	Position G	Position H
0.500	0.496	0.503	0.502

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.502	0.499	0.505	0.500
Position E	Position F	Position G	Position H
0.500	0.496	0.503	0.503

THROAT HOUSING #4

SURFACE FINISH

Position A	Position B	Position C	Position D
071 Ra	065 Ra	067 Ra	092 Ra
Position E	Position F	Position G	Position H
058 Ra	094 Ra	059 Ra	063 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.4985	0.4995	0.4965	0.4925
Position E	Position F	Position G	Position H
0.4935	0.4973	0.4958	0.4907

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.4983	0.4999	0.4963	0.4914

Position E	Position F	Position G	Position H
0.4935	0.4973	0.4958	0.4907

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.4989	0.5006	0.4972	0.4921
Position E	Position F	Position G	Position H
0.4941	0.4970	0.4955	0.4914

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.4982	0.5004	0.4969	0.4921
Position E	Position F	Position G	Position H
0.4957	0.4969	0.4943	0.4919

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.501	0.502	0.500	0.494
Position E	Position F	Position G	Position H
0.498	0.501	0.498	0.495

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.502	0.502	0.499	0.494
Position E	Position F	Position G	Position H
0.498	0.502	0.498	0.495

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.502	0.502	0.498	0.494
Position E	Position F	Position G	Position H
0.497	0.502	0.498	0.494

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.502	0.503	0.498	0.494

Position E	Position F	Position G	Position H
0.498	0.502	0.498	0.494

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.501	0.502	0.498	0.493
Position E	Position F	Position G	Position H
0.498	0.501	0.497	0.494

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.501	0.502	0.498	0.493
Position E	Position F	Position G	Position H
0.497	0.500	0.497	0.493

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.500	0.501	0.498	0.493
Position E	Position F	Position G	Position H
0.497	0.498	0.497	0.493

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.500	0.501	0.498	0.493
Position E	Position F	Position G	Position H
0.497	0.499	0.497	0.493

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.500	0.501	0.498	0.493
Position E	Position F	Position G	Position H
0.497	0.500	0.498	0.493

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.501	0.501	0.498	0.493
Position E	Position F	Position G	Position H
0.497	0.500	0.497	0.494

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.500	0.501	0.498	0.492
Position E	Position F	Position G	Position H
0.497	0.499	0.497	0.493

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.500	0.502	0.498	0.493
Position E	Position F	Position G	Position H
0.496	0.499	0.497	0.493

THROAT HOUSING #5

SURFACE FINISH

Position A	Position B	Position C	Position D
093 Ra	091 Ra	080 Ra	098 Ra
Position E	Position F	Position G	Position H
089 Ra	096 Ra	095 Ra	098 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.4852	0.4876	0.4862	0.4855
Position E	Position F	Position G	Position H
0.4956	0.4980	0.4967	0.4954

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.4854	0.4871	0.4858	0.4844
Position E	Position F	Position G	Position H
0.4950	0.4985	0.4975	0.4960

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.4850	0.4871	0.4869	0.4850

Position E	Position F	Position G	Position H
0.4951	0.4980	0.4974	0.4950

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.4851	0.4875	0.4866	0.4857

Position E	Position F	Position G	Position H
0.4959	0.4982	0.4968	0.4952

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.489	0.491	0.490	0.488

Position E	Position F	Position G	Position H
0.498	0.500	0.502	0.499

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.489	0.490	0.490	0.490

Position E	Position F	Position G	Position H
0.498	0.500	0.502	0.498

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.488	0.489	0.488	0.487

Position E	Position F	Position G	Position H
0.498	0.499	0.501	0.497

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.488	0.490	0.488	0.487

Position E	Position F	Position G	Position H
0.497	0.499	0.502	0.497

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.488	0.489	0.488	0.485
Position E	Position F	Position G	Position H
0.497	0.498	0.502	0.496

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.487	0.489	0.488	0.486
Position E	Position F	Position G	Position H
0.497	0.499	0.500	0.496

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.487	0.488	0.488	0.486
Position E	Position F	Position G	Position H
0.495	0.499	0.499	0.496

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.487	0.488	0.488	0.487
Position E	Position F	Position G	Position H
0.496	0.499	0.501	0.496

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.487	0.488	0.487	0.486
Position E	Position F	Position G	Position H
0.496	0.499	0.501	0.496

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.487	0.488	0.488	0.486
Position E	Position F	Position G	Position H
0.497	0.499	0.502	0.496

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.487	0.488	0.487	0.486
Position E	**Position F**	**Position G**	**Position H**
0.496	0.499	0.501	0.496

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.487	0.488	0.487	0.485
Position E	**Position F**	**Position G**	**Position H**
0.497	0.499	0.500	0.496

Appendix H

Fixed Housing Measurements

FIXED HOUSING #1

(All DYER and NOVA gage measurements are in inches.)

SURFACE FINISH

Position A	Position B	Position C	Position D
136 Ra	112 Ra	103 Ra	120 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.6728	0.6576	0.6530	0.6767

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.6728	0.6574	0.6523	0.6765

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.6717	0.6567	0.6530	0.6766

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.6726	0.6567	0.6528	0.6763

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.677	0.661	0.657	0.682

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.677	0.660	0.658	0.682

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.678	0.662	0.658	0.683

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.678	0.662	0.658	0.684

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.678	0.660	0.657	0.682

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.676	0.661	0.657	0.682

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.677	0.664	0.658	0.684

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.677	0.662	0.658	0.683

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.678	0.663	0.657	0.683

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.676	0.663	0.658	0.683

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.675	0.660	0.656	0.682

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.677	0.661	0.657	0.682

FIXED HOUSING #2

SURFACE FINISH

Position A	Position B	Position C	Position D
136 Ra	107 Ra	100 Ra	125 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.6577	0.6650	0.6532	0.6678

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.6570	0.6651	0.6537	0.6679

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.6570	0.6652	0.6533	0.6679

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.6569	0.6660	0.6539	0.6678

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.663	0.671	0.658	0.673

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.663	0.671	0.659	0.673

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.662	0.670	0.658	0.672

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.661	0.670	0.658	0.672

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.662	0.670	0.657	0.672

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.661	0.670	0.657	0.670

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.661	0.670	0.658	0.672

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.661	0.670	0.658	0.672

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.661	0.669	0.659	0.672

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.661	0.670	0.658	0.672

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.660	0.669	0.657	0.671

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.661	0.668	0.657	0.671

FIXED HOUSING #3

SURFACE FINISH

Position A	Position B	Position C	Position D
235 Ra	210 Ra	235 Ra	200 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.6597	0.6628	0.6620	0.6613

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.6597	0.6623	0.6628	0.6625

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.6599	0.6626	0.6626	0.6613

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.6598	0.6623	0.6622	0.6618

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.665	0.668	0.668	0.668

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.665	0.668	0.668	0.668

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.665	0.668	0.668	0.668

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.665	0.667	0.667	0.668

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.664	0.667	0.667	0.668

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.665	0.667	0.668	0.668

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.664	0.667	0.666	0.667

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.665	0.667	0.667	0.667

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.664	0.668	0.666	0.667

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.665	0.667	0.666	0.667

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.664	0.668	0.666	0.667

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.664	0.667	0.666	0.667

FIXED HOUSING #4

SURFACE FINISH

Position A	Position B	Position C	Position D
140 Ra	131 Ra	130 Ra	157 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.7016	0.7138	0.7115	0.7117

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.7015	0.7142	0.7105	0.7109

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.7008	0.7137	0.7102	0.7107

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.7012	0.7134	0.7106	0.7113

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.705	0.720	0.716	0.717

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.706	0.719	0.716	0.717

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.705	0.719	0.716	0.716

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.705	0.720	0.716	0.717

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.705	0.719	0.716	0.717

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.705	0.719	0.716	0.717

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.703	0.718	0.715	0.715

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.704	0.718	0.715	0.715

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.705	0.718	0.716	0.715

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.704	0.718	0.715	0.716

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.704	0.718	0.715	0.715

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.704	0.718	0.715	0.715

FIXED HOUSING #5

SURFACE FINISH

Position A	Position B	Position C	Position D
070 Ra	070 Ra	060 Ra	060 Ra

DYER GAGE MEASUREMENT #1

Position A	Position B	Position C	Position D
0.7166	0.7350	0.7029	0.6967

DYER GAGE MEASUREMENT #2

Position A	Position B	Position C	Position D
0.7163	0.7356	0.7032	0.6969

DYER GAGE MEASUREMENT #3

Position A	Position B	Position C	Position D
0.7174	0.7353	0.7029	0.6958

DYER GAGE MEASUREMENT #4

Position A	Position B	Position C	Position D
0.7160	0.7354	0.7039	0.6955

METHYLCHLOROFORM AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.720	0.739	0.707	0.702

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.721	0.739	0.707	0.701

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.720	0.738	0.705	0.702

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.719	0.738	0.705	0.701

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.718	0.738	0.705	0.701

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.719	0.737	0.705	0.700

3-IN-ONE OIL AS A COUPLANT

NOVA GAGE CALIBRATION #1

FIRST MEASUREMENT

Position A	Position B	Position C	Position D

0.719	0.738	0.705	0.699

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.719	0.737	0.705	0.700

NOVA GAGE CALIBRATION #2

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.719	0.737	0.704	0.699

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.719	0.737	0.704	0.698

NOVA GAGE CALIBRATION #3

FIRST MEASUREMENT

Position A	Position B	Position C	Position D
0.719	0.739	0.705	0.699

SECOND MEASUREMENT

Position A	Position B	Position C	Position D
0.719	0.738	0.706	0.698

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