JUN 2 1 1999

STA# 4 4 **ENGINEERING DATA TRANSMITTAL**

Page 1 of 1

1. EDT 623356

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
LMHC Characterization Engineering	Characterization Engineering	N/A
5. Proj./Prog./Dept./Div.:	6. Design Authority/Design Agent/Cog. Engr.:	7. Purchase Order No.:
Characterization Project	GP Janicek/BL Coverdell/RN Dale	N/A
8. Originator Remarks: Supporting document submitted for review and approval prior to release.		9. Equip./Component No.: N/A
		10. System/Bldg./Facility: 200G
11. Receiver Remarks:	11A. Design Baseline Document? [X] Yes [] No	12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date: ASAP

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	HNF-4389	N/A	0	DOWN FORCE CALIBRATION STAND TEST REPORT	SQ	1	1	

16. KEY

Approval Designator (F)	Reason for Transmittal (G)		Disposition (H) & (I)	
E, S, Q, D or N/A (see WHC-CM-3-5, Sec. 12.7)	1. Approval	4. Review	1. Approved	4. Reviewed no/comment
	2. Release	5. Post-Review	2. Approved w/comment	5. Reviewed w/comment
	3. Information	6. Dist. (Receipt Acknow. Required)	3. Disapproved w/comment	6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION
(See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name (K) Signature (L) Date (M) MSIN	(G) Reason	(H) Disp.	(J) Name (K) Signature (L) Date (M) MSIN
1	/	Design Authority GP Janicek 6/18/99 S7-12	1		CE Mgr. RM Boger Mahoney for RMB 6/18/99 S7-12
1	/	Design Agent BL Coverdell 6/4/99 S7-12	1	1	J.L. SMALLEY. 6/14/99 S7-12
1	/	Cog. Eng. RN Dale 6/4/99 S7-12			
1	/	Cog. Mgr. JS Schofield 6/14/99 S7-12			
1	/	QA JS Sparks 6/18/99 S7-07			
1	/	Safety JA Ranschau 6/10/99 S7-07			
		Env.			

18.	19.	20.	21. DOE APPROVAL (if required)
BL Coverdell 6/4/99	MA Lacey for 6/18/99	JS Schofield 6/14/99	Ctrl No.
BL Coverdell	RM Boger	JS Schofield	[] Approved
Signature of EDT Originator — Date	Authorized Representative For Receiving Organization — Date	Design Authority/ Cognizant Manager — Date	[] Approved w/comments
			[] Disapproved w/comments

BD-7400-172-2 (05/96) GEF097

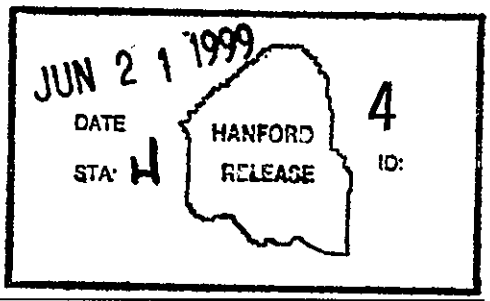
S

DOWN FORCE CALIBRATION STAND TEST REPORT

R. M. Boger
Prepared by Lockheed Martin Hanford Company
2400 Stevens
Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: 623356 UC: 2070
Org Code: 74900 Charge Code: CACN: 102250 COA: EI00
B&R Code: EW3120074 Total Pages: ~~59~~ 60
PF 6-21-99
Key Words: Calibration, Rotary Mode Core Sample Truck (RMCST), Down Force, Drill String, Drill Rig

Abstract: The Down Force Calibration Stand was developed to provide an improved means of calibrating equipment used to apply, display and record Core Sample Truck (CST) down force. Originally, four springs were used in parallel to provide a system of resistance that allowed increasing force over increasing displacement. This spring system, though originally deemed adequate, was eventually found to be unstable laterally. For this reason, it was determined that a new method for resisting down force was needed.



6/21/99

Approved for Public Release

DOWN FORCE CALIBRATION STAND TEST REPORT

Prepared for Lockheed Martin Hanford Corporation
Characterization Engineering Group
By
B. L. Coverdell
COGEMA Engineering Corporation

June 1999

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF GRAPHS

1.0 INTRODUCTION

In order to calibrate equipment used to determine and display down force on core sample trucks some type of down force calibration stand is required. This calibration stand must be able to allow approximately eleven inches of drill string displacement as the drill string down force increases. Originally, four springs were used in parallel to provide a system of resistance that allowed increasing force over increasing displacement. This spring system, though originally deemed adequate, was eventually found to be unstable laterally when loaded.

A new Down Force Calibration Stand was fabricated to provide an improved means of calibrating equipment used to measure, display and record Core Sample Truck (CST) down force. The Down Force Calibration Stand is used to transmit force from the drill string to a calibrated scale while allowing displacement of the drill head.

Testing of the Down Force Calibration Stand was completed using two approaches, both operational tests and qualification tests were completed. Qualification testing of the new Down Force Calibration Stand was completed to ensure that it will give precise, accurate and repeatable results (i.e. no binding will occur in the system). Operational testing was conducted to demonstrate the stability of the calibration stand when used with a CST.

2.0 DESCRIPTION OF OPERATION

The down force calibration stand uses a bellows type air spring to provide the required resistance. Four rods are used to support an aluminum plate that is used to secure the top and bottom of the air spring (see Figure 1). Both the top and bottom plates are allowed to move vertically up and down the four rods by the use of linear bearings at all four corners of both plates. The linear bearings allow the spring to expand and contract depending on the applied down force and it also allows movement of a calibrated scale (see Figure 2) that is placed underneath the lower plate. A small thrust bearing is installed on the upper plate. The thrust bearing combined with a cap is used to secure the drill string laterally, resist the down force and allow rotation of the drill string. The total amount of displacement of the air spring and upper plate depends on the pressure in the air spring. The air spring is required to have a minimum of 2.5 psig to 6 psig. During down force calibration the operating pressure is set to 5 psig. For safety reasons, the maximum pressure of 90 psig is limited by a pressure relief valve.

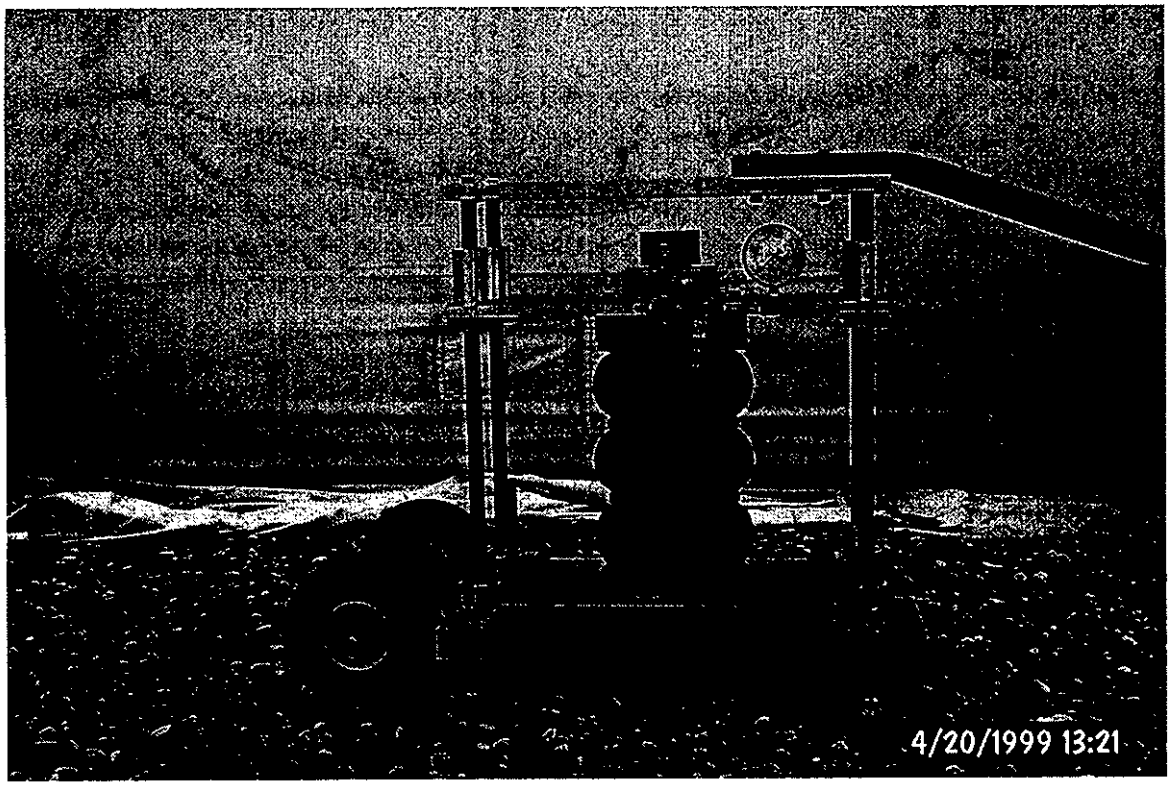


Figure 1: Down Force Calibration Stand

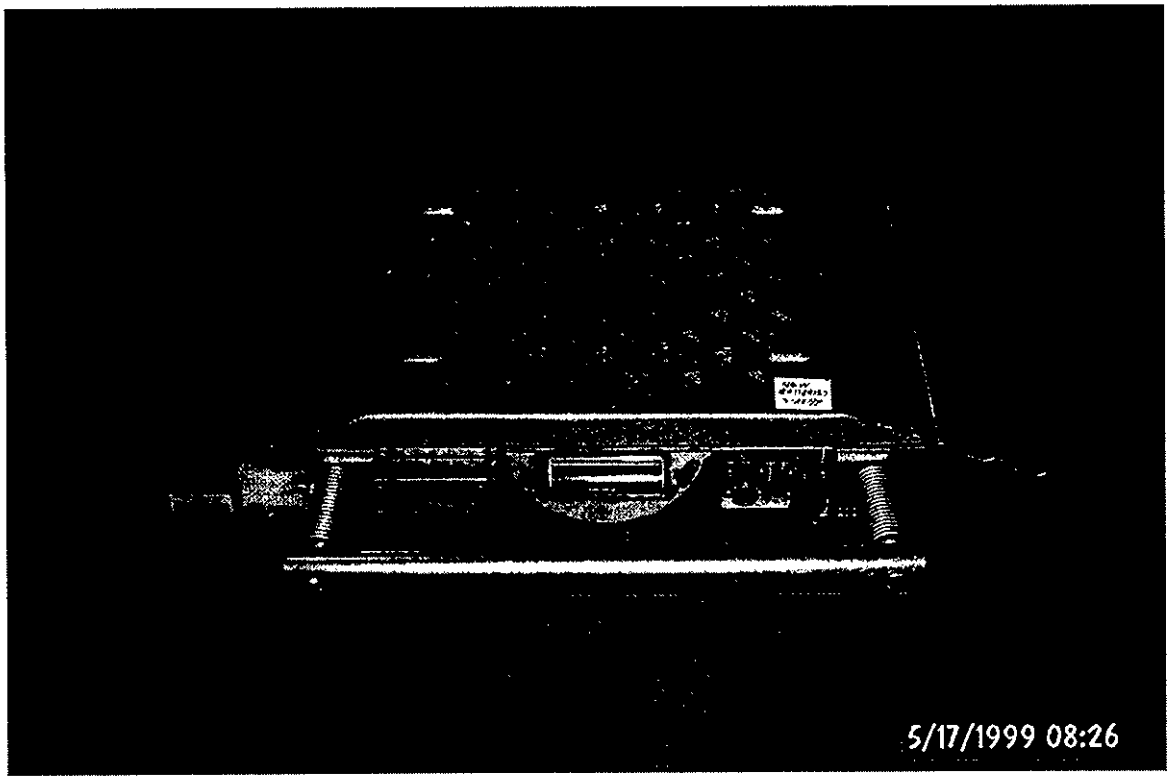


Figure 2: Calibrated Scale

3.0 TEST DESCRIPTION AND EQUIPMENT

3.1 QUALIFICATION TESTING

Qualification testing of the down force calibration stand was completed using a SATEC Systems, Inc. Universal Testing Machine. This machine can apply up to 120,000 lb. of tensile or compressive force and is large enough to allow the Down Force Calibration Stand to fit inside, however, the SATEC is not calibrated. For this reason, the initial test from the test plan (see Appendix A) was to verify that the indicated force by the SATEC Testing Machine matched the applied force on a calibrated scale which was placed inside the SATEC Testing Machine. The calibration date on the scale is 2/5/99 and the calibration number is 776-66-01-00 (see Appendix B, Page B-2).

The second qualification test was to add 5 psig to the air spring and a known weight (in this case three 26 lb. weights) to the calibration stand and let all the air out of the air spring. This test was performed to ensure early in the qualification testing that the air spring would completely deflate and that no binding of the bearings would occur.

The final qualification tests are all similar the only difference between them is the amount of pressure in the air spring. Each test was to inflate the air spring to 2 psig, 5 psig or 7 psig ± ½ psig and then add compressive force by the SATEC Testing Machine in increments of 200 lb. up to 3000 lb. total. After each 200 lb. increment, the force indicated by the SATEC and the calibrated scale were recorded. Each test was repeated five times for each pressure, however, the pressure in the air spring was varied from test to test.

3.2 OPERATIONAL TESTING

Appendix D contains the operational test procedure used during testing of the down force calibration stand. This test procedure was performed by Characterization Project Operations Maintenance personnel and witnessed by Characterization Engineering personnel. The down force calibration stand was tested in three ways: The first test was to ensure that the stand transmitted a known weight to the scale accurately. The second test was to use a CST to apply down force in push mode only (no rotation of the drill string) up to a maximum down force of 3000 lb. The final test was to use a CST to slowly apply down force in rotary mode up to a maximum down force of 1200 lb.

The first test used multiple weights which were weighed using a recently calibrated scale. The weights were placed on the Down Force Calibration Stand and then weight readings were taken from the scale. The actual weight of the weights was compared to the transmitted weight as read from the calibrated scale. This was done to ensure that the Down Force Calibration Stand would transmit force without any binding occuring

causing a loss in transmitted force. This information is recorded on the data sheets in Appendix E, Page E-2.

The second test was completed to ensure that the Down Force Calibration Stand would transmit the down force from a CST in push mode to a calibrated scale in a safe, stable and accurate manner. In push mode, 0 lb. to 3000 lb. of force on the CST was slowly applied to the top of the Down Force Calibration Stand and as the force was applied data was read from the calibrated scale and WI-1 (Weight Indicator). This data is recorded in Appendix E, Page E-3.

The third test was completed to ensure that the Down Force Calibration Stand would transmit the down force from a CST in rotary mode to a calibrated scale in a safe, stable and accurate manner. In rotary mode, 0 lb. to 1200 lb of force was slowly applied to the top of the Down Force Calibration Stand and as the force was applied data was read from the calibrated scale and WI-1.

4.0 TEST RESULTS

4.1 QUALIFICATION TESTING

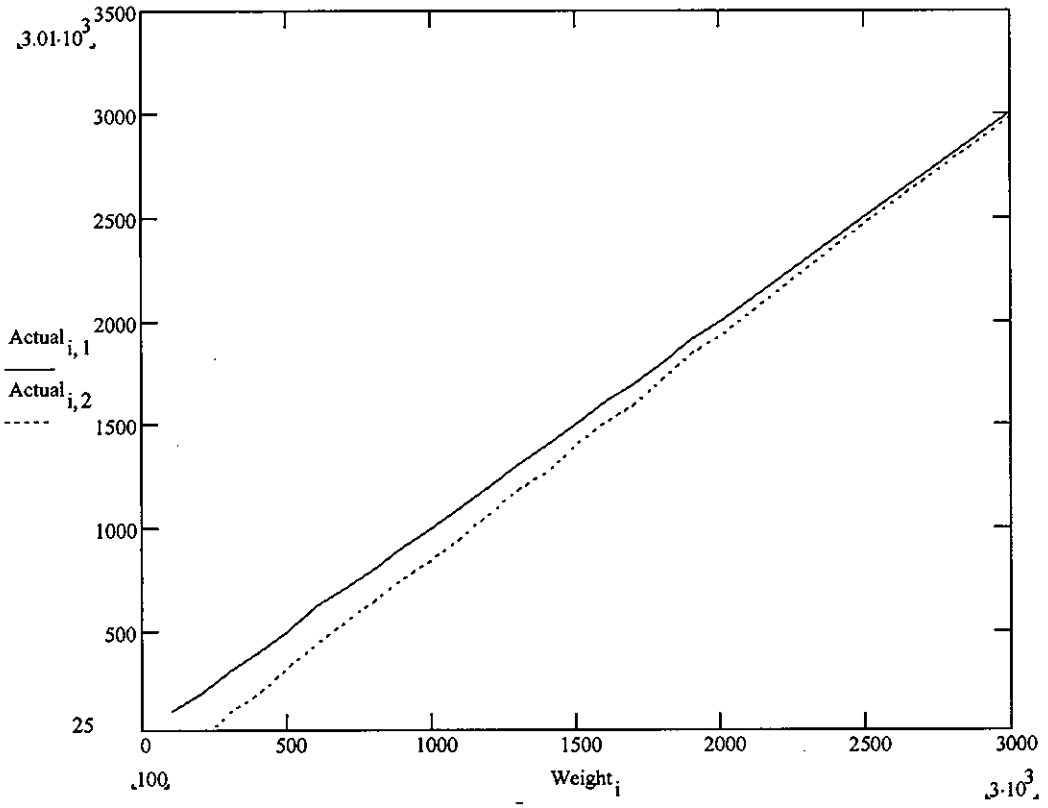
The data from Test 1 is contained in Appendix B, Page B-2 and B-5. This data verifies that the compressive force readout of the SATEC Universal Testing Machine corresponds to that of the calibrated scale to which the compressive force is being applied. Appendix C puts the data from Appendix B in a spreadsheet so statistical calculations could be completed on the data. The deviation between the calibrated scale and the SATEC Universal Testing Machine is calculated for each of the 200 lb. increments. The maximum and minimum deviation for the data set was determined to be 22 lb. and 1 lb. respectively. The overall standard deviation was also calculated for the data set and was determined to be 10.03 lb.

For Test 2 three weights were first weighed on the calibrated scale. The three weights were determined to weigh 70 lb. ±10 lb. The scale was then inserted into the Down Force Calibration Stand and the weights were placed on top of the air spring top plate. The weight was then read from the calibrated scale and was determined to be 90 lb. ±10 lb.

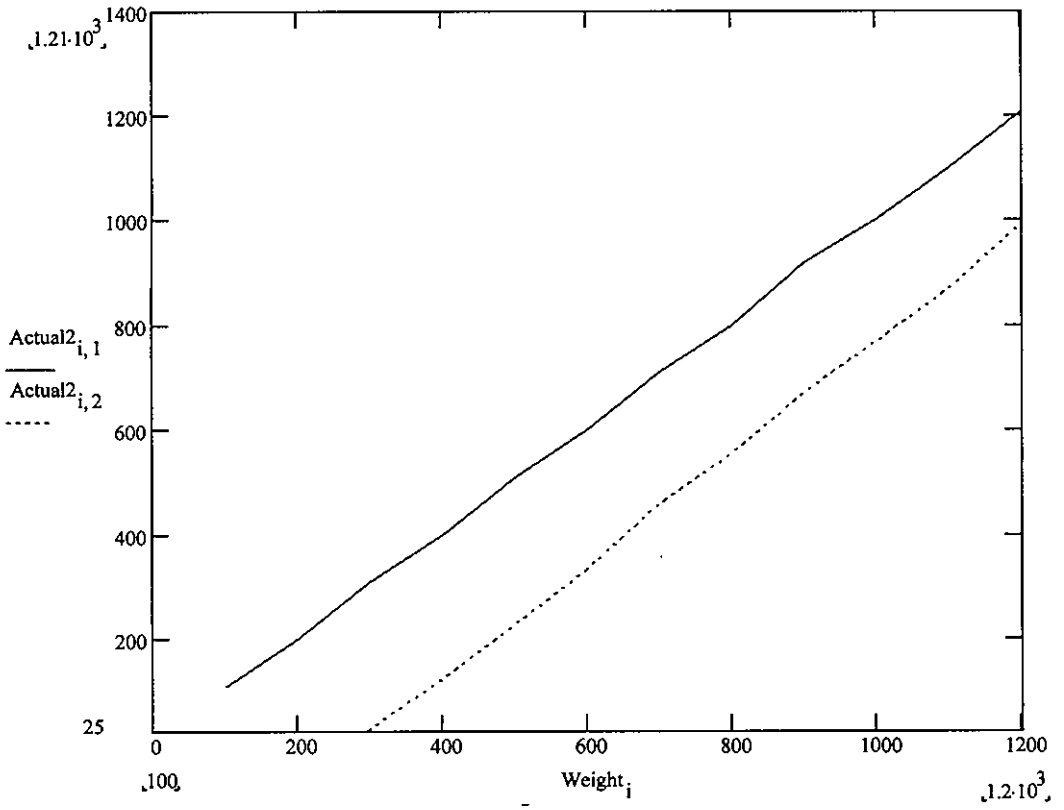
The remaining tests were all similar, only the pressure in the air spring was varied. The pressure in the air spring was varied between 2 psig, 5 psig and 7 psig. This results in different deflections of the air spring given the same loads. Each of three pressure tests was repeated five times randomly. The results of these tests are located in Appendix B and summarized in Appendix C. The maximum and minimum deviation was determined 40 lb. and 1 lb. respectively. The standard deviation for all fifteen tests was determined to be 10.2 lb. (the initial load of 0 lb. not considered when computing the standard deviation).

4.2 OPERATIONAL TESTING

The push mode test data is recorded in Appendix E, Page E-3 and E-4 and is displayed in Graph 1. The rotary mode test data is recorded in Appendix E, Page E-5 and is displayed in Graph 2. $Actual_{i,1}$ represents data from the calibrated scale and $Actual_{i,2}$ represents data from weight indicator one.



Graph 1: Scale and WI-1 Force vs. Theoretical Down Force (Push Mode)



Graph 2: Scale and WI-1 Force vs. Theoretical Down Force (Rotary Mode)

5.0 CONCLUSIONS AND RECOMMENDATIONS

The Down Force Calibration Stand completed all qualification and operational testing satisfactory. During qualification testing, minor deviations were noted between the SATEC Universal Testing Machine and the calibrated scale. This is likely due to the calibrated scale's ability to display in only 10 lb. increments and its high load rating (25,000 lb.). In addition, a couple readings occurred after the SATEC Universal Testing Machine applied a loading over the expected 200 lb. increment. After the overloading occurred, the SATEC was unloaded to the expected loading. This resulted in erroneous readings from either the calibrated scale or the SATEC or possibly both.

Operational testing resulted in the Down Force Calibration Stand being shown adequate for both push mode calibration and rotary mode calibration. The stand remained highly stable throughout all phases of operational testing and no noticeable binding of the stand occurred.

Since the calibrated scale has such a high load rating and that it is only accurate to ±10 lb. it is recommended that the calibrated scale be replaced with a new scale. The new scale should have a smaller load rating (0 lb. to 5000 lb.). A smaller load rated scale would give more accurate and precise readings for the loads applied during calibration of the CSTs load of 0 lb. to 3000 lb.

6.0 DISPOSITION OF TEST ITEM

Operational and qualification testing has shown that the Down Force Calibration Stand provides an accurate, stable and safe means of transmitting down force to a calibrated scale in both rotary and push mode. For this reason, the Down Force Calibration Stand is released to perform both push mode and rotary mode calibration of a CST down force equipment.

7.0 REFERENCES

None

APPENDIX A: DSI TO M. J. SCHLIEBE

TESTING OF DOWN FORCE CALIBRATION STAND

DON'T SAY IT — *Write It!*

DATE: May 10, 1999

TO:	M. J. Schliebe	L6-13
cc:	R. M. Boger	S7-12
	G. P. Janicek	S7-12
	R. N. Dale	S7-12
	J. S. Schofield	S7-12

FROM: G. P. Janicek S7-12

Telephone: 376-2225

SUBJECT: Testing of Down Force Calibration Stand

Characterization Engineering requests that the tests listed below be performed on the down force calibration stand per the following statement of work. This work may be charged to CACN 102250.

General Note: Before applying down force to the down force calibration stand, ensure that ball valve is closed.

TEST 1: Verification of Satec down force.

- Record calibration number and last calibration date of truck scale _____/_____.
- Using Satec, apply 200 lbs of down force to the top of the calibrated truck scale. Record readout of Satec and truck scale in data sheet 1.
- Continue applying and recording down force in 200 lb increments up to 3000 lb maximum.

TEST 2:

- Insert truck scale in down force calibration stand.
- Zero truck scale.
- Inflate down force calibration stand to 5 psig ±1/2 psig.
- Use a calibrated scale to verify weights to be used in the following step.
- Record air spring inflation height _____.
- Add approximately 50 lb. of weights to the top of the upper air spring plate.
- Record the scale weight _____.
- If the indicated scale weight and the calibrated weights match ±10 lbs, continue with test.
- Slowly release air spring pressure and let deflate.
- Record final deflated air spring deflection _____.
- Record final indicated scale weight _____.

TEST 3:

- Verify truck scale reads zero.
- Inflate down force calibration stand air spring to 2 psig ± 1/2 psig.
- Using Satec, apply 200 lbs of down force to the top of the calibrated truck scale. Record readout of Satec and truck scale in data sheet 2.

- Continue applying and recording down force in 200 lb increments up to 3000 lb maximum.

TEST 4:

- Verify truck scale reads zero.
- Inflate down force calibration stand air spring to 5 psig ± 1/2 psig.
- Using Satec, apply 200 lbs of down force to the top of the calibrated truck scale. Record readout of Satec and truck scale in data sheet 3.
- Continue applying and recording down force in 200 lb increments up to 3000 lb maximum.

TEST 5:

- Verify truck scale reads zero.
- Inflate down force calibration stand air spring to 7 psig ± 1/2 psig.
- Using Satec, apply 200 lbs of down force to the top of the calibrated truck scale. Record readout of Satec and truck scale in data sheet 4.
- Continue applying and recording down force in 200 lb increments up to 3000 lb maximum.

Table 1: VERIFICATION OF SATEC DOWN FORCE Inflation Pressure _____	
DOWN FORCE READOUT	
Truck Scale (LB)	SATEC (LB)

Table 2: Down Force Inflation Pressure _____	
DOWN FORCE	
SATEC	TRUCK SCALE

Table 3: Down Force Inflation Pressure _____	
DOWN FORCE	
SATEC	TRUCK SCALE

Table 4: Down Force Inflation Pressure _____	
DOWN FORCE	
SATEC	TRUCK SCALE

APPENDIX B: TEST PROCEDURE DATA SHEETS

DON'T SAY IT — *Write It!*

DATE: May 10, 1999

TO:	M. J. Schliebe	L6-13
cc:	R. M. Boger	S7-12
	G. P. Janicek	S7-12
	R. N. Dale	S7-12
	J. S. Schofield	S7-12

FROM: G. P. Janicek S7-12

Telephone: 376-2225

SUBJECT: Testing of Down Force Calibration Stand

Characterization Engineering requests that the tests listed below be performed on the down force calibration stand per the following statement of work. This work may be charged to CACN 102250.

General Note: Before applying down force to down force calibration stand, ensure that ball valve is closed.

TEST 1: Verification of Satec down force.

- Record calibration number and last calibration date of truck scale 2/5/99 776-66-01-00
- Using Satec, apply 200 lbs of down force to the top of the calibrated truck scale. Record readout of Satec and truck scale in data sheet 1.
- Continue applying and recording down force in 200 lb increments up to 3000 lb maximum.

TEST 2: 79 #

- Insert truck scale in down force calibration stand.
- Zero truck scale.
- Inflate down force calibration stand to 5 psig ±1/2 psig.
- Use a calibrated scale to verify weights to be used in the following step. 70 #
- Record air spring inflation height 7 1/4" Bottom to Top
- Add approximately 50 lb. of weights to the top of the upper air spring plate. 70 #
- Record the scale weight 70# 90#
- If the indicated scale weight and the calibrated weights match ±10 lbs, continue with test.
- Slowly release air spring pressure and let deflate.
- Record final deflated air spring deflection 9 1/4" / 1.7 15/16 "
- Record final indicated scale weight 90# / 90 #

TEST 3:

- Verify truck scale reads zero.
- Inflate down force calibration stand air spring to 2 psig ± 1/2 psig.
- Using Satec, apply 200 lbs of down force to the top of the calibrated truck scale. Record readout of Satec and truck scale in data sheet 2.

- Continue applying and recording down force in 200 lb increments up to 3000 lb maximum.

TEST 4:

- Verify truck scale reads zero.
- Inflate down force calibration stand air spring to 5 psig ± 1/2 psig.
- Using Satec, apply 200 lbs of down force to the top of the calibrated truck scale. Record readout of Satec and truck scale in data sheet 3.
- Continue applying and recording down force in 200 lb increments up to 3000 lb maximum.

TEST 5:

- Verify truck scale reads zero.
- Inflate down force calibration stand air spring to 7 psig ± 1/2 psig.
- Using Satec, apply 200 lbs of down force to the top of the calibrated truck scale. Record readout of Satec and truck scale in data sheet 4.
- Continue applying and recording down force in 200 lb increments up to 3000 lb maximum.

Table 1: VERIFICATION OF SATEC DOWN FORCE

~~Inflation Pressure~~ N/A BLC 5/10/99

DOWN FORCE READOUT	
Truck Scale (LB)	SATEC (LB)
190	188
370	392
590	591
800	801
1010	~~1002~~ 992 BJC
1200	1201
1410	1409
1610	1599
1820	1805
2010	1994
2200	2199
2400	2389
2600	2586
2810	2797
~~29~~ 3000 BJC	2994

Test #2
Repeat @ 5psig

Spitec	Truck	dist
80	60	8"
80	60	10"
80	60	12"
80	60	14"
80	60	16"
80	60	18"
80	60	19"

Table 2: Down Force Inflation Pressure 2 ½ psig	
DOWN FORCE	
SATEC	TRUCK SCALE
0	0
193	180
384	370
585	570
784	790
787	1010
1222	1240
1391	1406
1591	1610
1789	1800
out of travel	

#2

Table 3: Down Force	Inflation Pressure 5 psig	
DOWN FORCE		
SATEC	TRUCK SCALE	
0	0	
195	180	
394	370	
588	580	
788	780	
989	1000	
1180 BJC	1190	
1385	1380	
1588	1590	
1783	1790	
1980 78 BJC	1980	Note unload & adjusted satec
2185	2190	
2390	2391	
2612	2640	over ram
2802	2810	
2977	2990	

#3

Table 4: Down Force Inflation Pressure 7 psi'g	
DOWN FORCE	
SATEC (lb)	TRUCK SCALE (lb)
0	~~190~~ 0
197	190
390	380
600	600
796	800
986	1000
1197	1190
~~1405~~ 1390 BJC	1480
1570	1590
1785	1790
1990	1990
~~2199~~ 2186 BJC	2190
2390	2390
2575	2580
2800	2800
2995	2990

• readjust SATEC

Table 4: Down Force Inflation Pressure 7 psig	
DOWN FORCE	
SATEC	TRUCK SCALE
0	0
200	180
391	370
592	580
794	790
988	1000
1188	1196
1394	1380
1584	1590
1797	1790
1980	1980
2189	2190
2393	2390
2580	2580
2794	2790
2980	2980

Table 4: Down Force Inflation Pressure 2½psig	
DOWN FORCE	
SATEC	TRUCK SCALE
0	0
194	120
392	370
590	570
788	780
978	990
1220	~~1240~~ 1226 BTC
1390	+5 1390
1590	1580
1780	1796
Out of Travel	

Table 4: Down Force Inflation Pressure 5 psig	
DOWN FORCE	
SATEC	TRUCK SCALE
0	0 -20 before zeroing
195	180
392	390
594	590
794	810
1000	1010
1196	1200
1440	1460
1668	1670
1780	1800
2003	2000
2203	2210
2402	2400
2615	2610
2805	2810
3020	3015

Table 4: Down Force Inflation Pressure 7 psig	
DOWN FORCE	
SATEC	TRUCK SCALE
0	0 +20 reversed
204	200
400	400
602	590
803	810
985	1000
1202	1200
1400	1400
1604	1610
1800 blc	1800
2003	2010
2239 blc	2230
2398	2400
2597	2600
2805	2810
3003	3000

3

Table 4: Down Force Inflation Pressure 5 psig	
DOWN FORCE	
SATEC	TRUCK SCALE
0	0
204	190
400	390
598	590
806	810
1006	1010
1217	1220
1421	1420
1609	1610
1813	1800
2008	2010
2195	2190
2397	2400
2597	2600
2805	2800
3009	3000

9

Table 4: Down Force	Inflation Pressure 2 ½ psig
DOWN FORCE	
SATEC	TRUCK SCALE
0	0
202	190
405	400
~~610~~ 609 BSC	600
804	810
1003	1010
1251	1250
1397	1400
1624	1630
1810	1800
out of travel	

#10

Table 4: Down Force	Inflation Pressure 5psig
DOWN FORCE	
SATEC	TRUCK SCALE
0	0
201	180
406	400
602	590
802	800
1008	1010
1196	1200
1401	1400
1596	1590
1798	1800 Readyjust
~~203~~ 2104 Bye	2160
2212	2220
2395	2400
2599	2600
2797	2790
3034	3030

#11

Table 4: Down Force Inflation Pressure 7 psig	
DOWN FORCE	
SATEC	TRUCK SCALE
0	0
206	190
411	400
610	590
809	810
1000	1010
1203	1200
1415	1420
1596	1590
1813	1820
2015	2010
2202	2200
2447	2440
2594	2590
2798	2790
3016	3010

#12

Table 4: Down Force Inflation Pressure 2½	
DOWN FORCE	
SATEC	TRUCK SCALE
0	0
206	200
406	400
610	590
832	830
1020	1010
1202	1200
1393	1400
1627	1610
1817	1820

#13

Table 4: Down Force Inflation Pressure 5	
DOWN FORCE	
SATEC	TRUCK SCALE
0	0
202	170
404	390
40	590
800	790
994	1000
1199	1200
1439	1430
1608	1600
1824	1820
2020	2010
2219	2210
2393	2390
2632	2632
2834	2830
3006	3000

#14

Table 4: Down Force Inflation Pressure 2 1/2	
DOWN FORCE	
SATEC	TRUCK SCALE
0	0
204	190
401	390
607	590
826	810
1003	1010
1198	1200
1404	1410
1598	1600
1801	1801

Table 4: Down Force Inflation Pressure 7	
DOWN FORCE	
SATEC	TRUCK SCALE
0	0
201	190
402	400
612	610
~~800~~ 798 B2e	800
1010	1010
1215	1200
1399	1390
1603	1610
1803	1800
2003	1990
2201	2200
2399	2400
2593	2580
2850	2840
3009	3000

APPENDIX C: TEST DATA AND CALCULATIONS

TABLE 1

Truck Scale	SATEC	Difference	Deviation	Standard Deviation
0	0	0	0	10.03
190	188	2	2	
370	392	-22	22	Maximum Deviation
590	591	-1	1	22
800	801	-1	1	
1010	992	18	18	Minimum Deviation
1200	1201	-1	1	0
1410	1409	1	1	
1610	1599	11	11	
1820	1805	15	15	
2010	1994	16	16	
2200	2199	1	1	
2400	2389	11	11	
2600	2586	14	14	
2810	2797	13	13	
3000	2994	6	6	

Test #2 @ 5 psig.

Truck Scale (lb.)	SATEC (lb.)	Distance (in.)
90	N/A	9 1/4
90	N/A	17 15/16

Test #2 @ 5 psig. (Repeat)

Truck Scale (lb.)	SATEC (lb.)	Distance (in.)
60	80	8
60	80	10
60	80	12
60	80	14
60	80	16
60	80	18
60	80	19

Standard Deviation (all tests)	Maximum Deviation
10.20	40.00
Maximum Standard Deviation	Minimum Deviation
14.33	1.00
Minimum Standard Deviation	
6.32	

Test Number	SATEC	Truck Scale	Difference	Deviation	Standard Deviation
Sheet #1	0	0	0	0	14.33
2.5 psig	193	180	13	13	
	384	370	14	14	
	585	570	15	15	
	784	790	-6	6	
	987	1010	-23	23	
	1222	1240	-18	18	
	1391	1400	-9	9	
	1591	1610	-19	19	
	1789	1800	-11	11	
Sheet #2	0	0	0	0	12.59
5 psig	195	180	15	15	
	394	370	24	24	
	588	580	8	8	
	788	780	8	8	
	989	1000	-11	11	
	1188	1190	-2	2	
	1395	1380	15	15	
	1588	1590	-2	2	
	1783	1790	-7	7	
	1978	1980	-2	2	
	2185	2190	-5	5	
	2391	2390	1	1	
	2612	2640	-28	28	
	2802	2810	-8	8	
	2977	2990	-13	13	
Sheet #3	0	0	0	0	12.26
7 psig	197	190	7	7	
	390	380	10	10	
	600	600	0	0	
	796	800	-4	4	
	986	1000	-14	14	
	1197	1190	7	7	
	1390	1430	-40	40	
	1570	1590	-20	20	
	1785	1790	-5	5	
	1990	1990	0	0	
	2186	2190	-4	4	
	2390	2390	0	0	
	2575	2580	-5	5	
	2800	2800	0	0	
	2995	2990	5	5	

Test Number	SATEC	Truck Scale	Difference	Deviation	Standard Deviation
Sheet #4	0	0	0	0	8.94
7 psig	200	180	20	20	
	391	370	21	21	
	592	580	12	12	
	794	790	4	4	
	988	1000	-12	12	
	1188	1190	-2	2	
	1394	1380	14	14	
	1584	1590	-6	6	
	1797	1790	7	7	
	1980	1980	0	0	
	2189	2190	-1	1	
	2393	2390	3	3	
	2580	2580	0	0	
	2794	2790	4	4	
	2980	2980	0	0	
Sheet #5	0	0	0	0	12.84
2.5 psig	194	170	24	24	
	392	370	22	22	
	590	570	20	20	
	788	780	8	8	
	978	990	-12	12	
	1220	1220	0	0	
	1390	1390	0	0	
	1590	1580	10	10	
	1780	1790	-10	10	
				0	
Sheet #6	0	0	0	0	9.71
5 psig	195	180	15	15	
	392	390	2	2	
	594	590	4	4	
	794	810	-16	16	
	1000	1010	-10	10	
	1196	1200	-4	4	
	1440	1460	-20	20	
	1668	1670	-2	2	
	1780	1800	-20	20	
	2003	2000	3	3	
	2203	2210	-7	7	
	2402	2400	2	2	
	2615	2610	5	5	
	2805	2810	-5	5	
	3020	3015	5	5	

Test Number	SATEC	Truck Scale	Difference	Deviation	Standard Deviation
Sheet #7	0	0	0	0	6.52
7 psig	204	200	4	4	
	400	400	0	0	
	602	590	12	12	
	803	810	-7	7	
	985	1000	-15	15	
	1202	1200	2	2	
	1400	1400	0	0	
	1604	1610	-6	6	
	1800	1800	0	0	
	2003	2010	-7	7	
	2239	2230	9	9	
	2398	2400	-2	2	
	2597	2600	-3	3	
	2805	2810	-5	5	
	3003	3000	3	3	
Sheet #8	0	0	0	0	6.32
5 psig	204	190	14	14	
	400	390	10	10	
	598	590	8	8	
	806	810	-4	4	
	1006	1010	-4	4	
	1217	1220	-3	3	
	1421	1420	1	1	
	1609	1610	-1	1	
	1813	1800	13	13	
	2008	2010	-2	2	
	2195	2190	5	5	
	2397	2400	-3	3	
	2597	2600	-3	3	
	2805	2800	5	5	
	3009	3000	9	9	
Sheet #9	0	0	0	0	7.14
2.5 psig	202	190	12	12	
	405	400	5	5	
	609	600	9	9	
	804	810	-6	6	
	1003	1010	-7	7	
	1251	1250	1	1	
	1397	1400	-3	3	
	1624	1630	-6	6	
	1810	1800	10	10	

Test Number	SATEC	Truck Scale	Difference	Deviation	Standard Deviation
Sheet #10	0	0	0	0	7.08
5 psig	201	180	21	21	
	406	400	6	6	
	602	590	12	12	
	802	800	2	2	
	1008	1010	-2	2	
	1196	1200	-4	4	
	1401	1400	1	1	
	1596	1590	6	6	
	1798	1800	-2	2	
	2104	2100	4	4	
	2212	2220	-8	8	
	2395	2400	-5	5	
	2599	2600	-1	1	
	2797	2790	7	7	
	3034	3030	4	4	
Sheet #11	0	0	0	0	7.86
7 psig	206	190	16	16	
	411	400	11	11	
	610	590	20	20	
	809	810	-1	1	
	1000	1010	-10	10	
	1203	1200	3	3	
	1415	1420	-5	5	
	1596	1590	6	6	
	1813	1820	-7	7	
	2015	2010	5	5	
	2202	2200	2	2	
	2447	2440	7	7	
	2594	2590	4	4	
	2798	2790	8	8	
	3016	3010	6	6	
Sheet #12	0	0	0	0	11.82
2.5 psig	206	200	6	6	
	406	400	6	6	
	610	590	20	20	
	862	830	32	32	
	1020	1010	10	10	
	1202	1200	2	2	
	1393	1400	-7	7	
	1627	1610	17	17	
	1817	1820	-3	3	

Test Number	SATEC	Truck Scale	Difference	Deviation	Standard Deviation
Sheet #13	0	0	0	0	9.05
5 psig	202	170	32	32	
	404	390	14	14	
	610	590	20	20	
	800	790	10	10	
	994	1000	-6	6	
	1199	1200	-1	1	
	1439	1430	9	9	
	1608	1600	8	8	
	1824	1820	4	4	
	2020	2010	10	10	
	2219	2210	9	9	
	2393	2390	3	3	
	2632	2632	0	0	
	2834	2830	4	4	
	3006	3000	6	6	
				0	
Sheet #14	0	0	0	0	9.35
2.5 psig	204	190	14	14	
	401	390	11	11	
	607	590	17	17	
	826	810	16	16	
	1003	1010	-7	7	
	1198	1200	-2	2	
	1404	1410	-6	6	
	1598	1600	-2	2	
	1801	1801	0	0	
Sheet #15	0	0	0	0	6.52
7 psig	201	190	11	11	
	402	400	2	2	
	612	610	2	2	
	798	800	-2	2	
	1010	1010	0	0	
	1215	1200	15	15	
	1399	1390	9	9	
	1603	1610	-7	7	
	1803	1800	3	3	
	2003	1990	13	13	
	2201	2200	1	1	
	2399	2400	-1	1	
	2593	2580	13	13	
	2850	2840	10	10	
	3009	3000	9	9	

APPENDIX D: DOWN FORCE CALIBRATION STAND TEST PROCEDURE

DOWN FORCE CALIBRATION STAND TEST PROCEDURE

By: B. L. Coverdell

COGEMA Engineering Corporation

March 19, 1999

TABLE OF CONTENTS

1.0 INTRODUCTION

This procedure provides instruction for verifying that the Down Force Calibration Stand operates correctly and to verify that the combination of Down Force Calibration Stand and Core Sample Truck function together properly.

2.0 OBJECTIVES

This procedure verifies the adequacy of the Down Force Calibration Stand to be used as a tool for calibration of down force on Core Sample Trucks #3 & #4. The optimum bellows inflation pressure shall also be verified.

3.0 SAFETY

3.1 Ensure the pressure relief valve has been set to 90 psi.

3.2 This test to be performed in the dean dome only.

3.3 Ensure that bellows does not bottom out during test.

3.4 If pressure relief valve vents, discontinue this test immediately and notify Dave Haring.

4.0 PREREQUISITES

4.1 Special Tools, Equipment and Supplies

The following equipment is needed to perform this test:

[ ] Down Force Calibration Stand.
[ ] Approximately 50 lbs of verified weights
[ ] Core Sample Trucks 3 or 4 (with recent down force calibration).
[ ] Air Compressor.
[ ] Portable Scale, 0 to 5000 lb. minimum, calibrated.

4.2 Performance Documents

[ ] TO-080-518, Core Sampling With Trucks 3 & 4 (Rotary Bit)
[ ] TO-080-519, Core Sampling With Trucks 3 & 4 (Push Bit)

5.0 TEST

5.1 Verify Transmission of Down Force to Scale as follows:

5.1.1 OPEN pressure gauge isolation valve, V-1.

5.1.2 ADD/BLEED air from bellows until pressure gauge, P-1, indicates 5.0 psig to 6.0 psig. Record this pressure in the location provided in Table-1. NOTE: This pressure may be varied at the engineer's discretion.

5.1.3 CLOSE pressure gauge isolation valve, V-1.

5.1.4 ADD approximately 50 lbs of verified weight to the Down Force Calibration Stand upper bearing plate. NOTE: Exact placement of weight and total applied weight shall be at the engineer's discretion.

5.1.5 RECORD the weight of the verified weight. Record this data in Table 1.

5.1.6 RECORD the as read from the portable scale. Record this data in Table-1.

5.1.7 DISCONTINUE test if portable scale reads ±10 lbs more than the verified weights.

5.2 Prepare Down Force Calibrations stand for 3000 lb. load test as follows:

5.2.1 OPEN pressure gauge isolation valve, V-1.

5.2.2 ADD/BLEED air from bellows until pressure gauge, P-1, indicates 5.0 psig to 6.0 psig. Record this pressure in location provided in Table-2. NOTE: This pressure may be varied at the engineer's discretion.

5.2.3 CLOSE pressure gauge isolation valve, V-1.

5.2.4 APPLY down force at greater than ¾" of an inch per minute.

5.2.5 RECORD the down force (as read from the portable scale and weight indicator 1) and the deflection every 100 lbs. up to 2000 lbs. And every 500 lbs. up to 3000 lbs. Record this data in Table-2.

5.2.6 Return RAM to full up position.

5.3 Prepare Down Force Calibrations stand for 1200 lb. rotary mode load test as follows:

5.3.1 OPEN pressure gauge isolation valve, V-1.

5.3.2 ADD/BLEED air from bellows until pressure gauge, P-1, indicates 5.0 psig to 6.0 psig. Record this pressure in location provided in Table-3. NOTE: This pressure may be varied at the engineer's discretion.

5.3.3 CLOSE pressure gauge isolation valve, V-1.

5.3.4 APPLY down force at greater than ¾" of an inch per minute.

5.3.5 RECORD the down force (as read from the portable scale and weight indicator 1) and the deflection every 100 lbs. up to 1200 lbs. Record this data in Table-3.

5.3.6 Return RAM to full up position

6.0 REFERENCES

Drawing H-2-690124, *Down Force Calibration Stand Assembly*, H-2-690125 Rev. 0, COGEMA Engineering Corporation, Richland, Washington.

Table 1: Down Force and Deflection	**Inflation Pressure _____**
DOWN FORCE (lbs.)	
VERIFIED WEIGHTS	PORTABLE SCALE

Table 1: Down Force and Deflection	**Inflation Pressure _____**
DOWN FORCE (lbs.)	
VERIFIED WEIGHTS	PORTABLE SCALE

Table 2: Down Force and Deflection		**Inflation Pressure** _____
DOWN FORCE (lbs.)		DEFLECTION (in.)
PORTABLE SCALE	WI-1	

Table 3: Rotary Mode Down Force and Deflection
Inflation Pressure _____

DOWN FORCE (lbs.)		DEFLECTION (in.)
PORTABLE SCALE	WI-1	

APPENDIX E: TEST PROCEDURE DATA SHEETS

Table 1: Down Force and Deflection	**Inflation Pressure** 4.25 psig
DOWN FORCE (lbs.)	
VERIFIED WEIGHTS	PORTABLE SCALE
50# BJC 3/18/99	50# BJC 3/18/99

Table 1: Down Force and Deflection	**Inflation Pressure** 4.25 psig
DOWN FORCE (lbs.)	
VERIFIED WEIGHTS	PORTABLE SCALE
70# BJC 3/18/99	70# BJC 3/18/99

Table 2: Down Force and Deflection		**Inflation Pressure** 5 1/4 psig
DOWN FORCE (lbs.)		DEFLECTION (in.)
PORTABLE SCALE	WI-1	
110	120	1 5/16
200	25	1 3/4
310	105	2 1/2
400	200	3 1/4
500	325	3 15/16
620	441	4 9/16
710	545	5 1/16
800	645	5 9/16
910	755	6 1/16
1000	845	6 7/16
1100	955	~~7 3/16~~ 6 13/16
1200	1075	7 3/16
1310	1190	7 1/2
1400	1276	7 12/16
1500	1400	8
1610	1510	8 3/16
1700	1598	8 3/8
1800	1718	8 9/16
1910	1840	8 3/4
2000	1930	8 15/16

Table 2: Down Force and Deflection (cont.)
Inflation Pressure 5 1/4 psig

DOWN FORCE (lbs.)		DEFLECTION (in.)
PORTABLE SCALE	WI-1	
2510	2475	9 5/8
3010	2990	10 1/4

Table 3: Rotary Mode Down Force and Deflection
Inflation Pressure 5 1/4 psig

DOWN FORCE (lbs.)		DEFLECTION (in.)
PORTABLE SCALE	WI-1	
110	-120 ?	3/4
200	-75	1 10/16
310	29	2 1/2
400	124	3 1/8
510	227	3 15/16
600	335	4 7/16
710	460	5 1/16
800	556	5 1/2
920	670	6
1000	768	6 6/16
1100	871	6 13/16
1210	995	7 3/16