

SOUTHWEST RESEARCH INSTITUTE
Department of Quality Assurance
Calibration Laboratory • 522-5215

WORK ORDER

CERTIFICATE # 22375 ASSET # 1443 DATE 14 Aug 96

ITEM DATA:

Manufacturer Pioto Model 6103

Description Torque screwdriver Serial # #2

Accessories _____

ACTION REQUESTED Cal

CUSTODIAN Parrell Dunn Div 20

Turned in by: _____ Phone _____

CHARGE # 20-5708-573 Date Required _____

INSTRUMENT USED ON: NUCLEAR DOD NASA GLP SPPE

OTHER _____

COPY OF CALIBRATION CERTIFICATE Yes No

- CONDITION RECEIVED:
- Out of tolerance, repaired to specifications
 - In tolerance, minor adjustments/repairs made
 - In tolerance, no adjustments/repairs
 - Out of tolerance, adjusted to specifications
 - Received into system, introduced or reactivated
 - Calibration internal
 - Realibility code

22375

ACTION TAKEN: (Calibration/Repair/Parts) SH 288004

CAL ENVIRONMENT:
Temperature 70 °F Humidity _____ %RH

CALIBRATED/REPAIRED:
By Gulf Coast, Houston, TX Cal Procedure GGG-W-6860
Date 8-19-96 Accuracy +/-4% FS.
Cal Interval 6 mos. Time to complete: _____
Next Cal due 2-19-97 Cal _____ Repair _____
Standards used (Asset#) Vonder

DATE COMPLETED _____
DATE PICKED UP 8/27/96 PICKED UP BY [Signature]

GULF COAST CALIBRATION

7999 Hansen, Suite 321
Houston, TX 77061
(713) 944-3139

Certificate Of Calibration

REPORT # 96-05351/1

Customer SOUTHWEST RESEARCH INSTITUTE Date 08-19-1996
SAN ANTONIO, TEXAS Expires 02-19-1997

Customer P.O. 02120 SHIPPING #288004

Type and Size of Gauge PROTO 0-100 IN. OZ. TORQUE WRENCH

Serial No. 2 Tolerance 4%

WRENCH SET	AS RECEIVED	FINAL READING
20	20	20
40	40	40
60	60	60
80	80	80
100	102	102

DONE IN ACCORDANCE WITH Q.A. MANUAL, REV-3; DATED: 12/01/1995. 10CFR21 APPLIES.

Test Equipment GCC-174 Date of Cal. 12/01/1995 Expires 12/01/1996

This is to certify that the calibration above meets the requirement for accuracy of applicable Federal Specification GGG-W-686D. Our Test Equipment use for calibration is traceable to the NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY. Maintained in accordance with conditions as noted by ANSI Z540-1. Temperature during calibration 70°F.

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
No. 40093

Technician Michael Ha

This certificate of calibration shall not be reproduce except in full without written approval by GULF COAST CALIBRATION.

SOUTHWEST RESEARCH INSTITUTE
Department of Quality Assurance
Calibration Laboratory • 522-5215

WORK ORDER

CERTIFICATE # 25194 ASSET # 001143 DATE 17 Apr 97

ITEM DATA:
Manufacturer Polo Model 610-3
Description 10.9110 ~~torque~~ screwdriver Serial # 2
Accessories _____

ACTION REQUESTED OK

CUSTODIAN Div. 20, Danell Dunn

Turned in by: _____ Phone 6090

CHARGE # 20-508561 Date Required RUSH

INSTRUMENT USED ON: DOD/NASA NUCLEAR GLP SPPE ISO
 OTHER _____

COPY OF CALIBRATION CERTIFICATE Yes No

NEW WORK Yes No If yes, an evaluation shall be made to verify capabilities.

By _____ Date _____

CONDITION RECEIVED: _____ (F) Out of tolerance, repaired to specifications
_____ (G) In tolerance, minor adjustments/repairs made
 (J) In tolerance, no adjustments/repairs
_____ (K) Out of tolerance, adjusted to specifications
_____ (S) Received into system, introduced or reactivated

ACTION TAKEN: (Calibration/Repair/Parts) Gulf Coast out/for STA 304517

CAL ENVIRONMENT: Temperature 68 °F Humidity _____ %RH

CALIBRATED/REPAIRED:
By Gulf Coast Cal Procedure GGG-105086D
Date 04-23-97 Accuracy +/-4%
Cal Interval 1005 Reliability Code: _____
Next Cal due 07-23-97 Cal Time _____ Repair Time _____
Standards used (Asset#) Vendor

DATE COMPLETED 25 Apr 97
DATE PICKED UP 5/8/97 PICKED UP BY [Signature]

25194

GULF COAST CALIBRATION

7999 Hansen, Suite 321
Houston, TX 77061
(713) 944-3139

Certificate Of Calibration

REPORT # 98-16349/1

Customer SOUTHWEST RESEARCH INSTITUTE Date 05/14/1998
SAN ANTONIO, TEXAS Expires 11/14/1998

Customer P.O. 02120 SHIPPING #326070

Type and Size of Gauge PROTO 0-100 IN. OZ. TORQUE WRENCH

Serial No. #2 Tolerance ±4%

WRENCH SET	AS RECEIVED	FINAL READING
20	20	20
40	40	40
60	60	60
80	80	80
100	102	102

DONE IN ACCORDANCE WITH Q.A. MANUAL, REV-3; DATED: 12/01/1995.
10CFR21 APPLIES.

PER PROCEDURE: #M190-1379

Test Equipment GCC-174 Date of Cal. 11/20/1997 Expires 11/20/1998

This is to certify that the calibration above meets the requirement for accuracy of applicable Federal Specification GGG-W-686D. Our Test Equipment use for calibration is traceable to the NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY. Maintained in accordance with conditions as noted by ANSI Z540-1. Temperature during calibration 69°F. HUMIDITY: 50%

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
No. 40093

Technician Michael Ha

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SOUTHWEST RESEARCH INSTITUTE
Department of Quality Assurance
Calibration Laboratory • 522-5215

WORK ORDER

CERTIFICATE # 34565 ASSET # 00143 DATE 21 May 99

ITEM DATA:

Manufacturer Proto Model 6103
Description Torque screwdriver Serial # 2
Accessories _____

ACTION REQUESTED cal

CUSTODIAN Dr. D. David Dunn

Turned in by: _____ Phone 6090

CHARGE # 20.04 Date Required QUSH

INSTRUMENT USED ON: (DOD/NASA) (NUCLEAR) (GLP) (SPPE) (ISO)
 OTHER _____

COPY OF CALIBRATION CERTIFICATE (Yes) (No)

NEW WORK Yes No If yes, an evaluation shall be made to verify capabilities.

By MAJ Date 05-21-99

Work involves proprietary/confidential information or equipment (Yes) (No)

CONDITION RECEIVED: _____ (F) Out of tolerance, repaired to specifications
_____ (G) In tolerance, minor adjustments/repairs made
 (J) In tolerance, no adjustments/repairs
_____ (K) Out of tolerance, adjusted to specifications
_____ (S) Received into system, introduced or reactivated

ACTION TAKEN: (Calibration/Repair/Parts) 05/25 Gulf Coast st# 349347

CAL ENVIRONMENT:
Temperature 71 °F Humidity 51 %RH

CALIBRATED/REPAIRED:
By Gulf Coast Calibration Cal Procedure M190-1379
Date 06/01/99 Accuracy ±4% F.S.
Cal Interval 12 months Reliability Code: 8
Next Cal due 12/01/99 Cal Time _____ Repair Time _____
Standards used (Asset#) _____ Vendor _____

DATE COMPLETED 06/07/99
DATE PICKED UP 6/7/99 PICKED UP BY [Signature]

34565

GULF COAST CALIBRATION

7999 Hansen, Suite 321
Houston, TX 77061
(713) 944-3139

Certificate Of Calibration

REPORT # 99-68892

PAGE 1 OF 1

Customer SOUTHWEST RESEARCH INSTITUTE Date 06/01/1999
SAN ANTONIO, TEXAS Expires 12/01/1999

Customer P.O. 02120 SHIPPING #349347

Type and Size of Gauge PROTO 0-100 IN. LB. TORQUE WRENCH

Serial No. #2 Tolerance ±4%

WRENCH SET	AS RECEIVED	FINAL READING
20	20	20
40	40	40
60	61	61
80	81	81
100	102	102

DONE IN ACCORDANCE WITH Q.A. MANUAL, REV-3; DATED: 12/01/1995.
10CFR21 APPLIES.

PER PROCEDURE: #M190-1379

Test Equipment Date of Cal. Expires
GCC-174 11/12/1998 11/12/1999

This is to certify that the calibration above meets the requirement for accuracy of applicable Federal Specification GGG-W-686D. Our Test Equipment use for calibration is traceable to the NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY. Maintained in accordance with conditions as noted by ANSI Z540-1. Temperature during calibration 71°F. HUMIDITY: 51%.

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
No. 39569-179355-40093/241548/1

Technician Michael Ha

This certificate of calibration shall not be reproduce except in full without written approval by GULF COAST CALIBRATION.

SOUTHWEST RESEARCH INSTITUTE
Department of Quality Assurance
Calibration Laboratory • 522-5215

WORK ORDER

WORK ORDER # 37058 ASSET # 001143 DATE 08 Dec. 99

ITEM DATA:

Manufacturer Proto Model 6103
Description 1/2" 1/4" Serrandrive Serial # #2
Accessories _____

ACTION REQUESTED Cal

CUSTODIAN Dr. B. D. Danell Gunn

Turned in by: _____ Phone 6096

CHARGE # 20-04 Date Required 13 Dec. 99

INSTRUMENT USED ON: (DOD/NASA) (NUCLEAR) (GLP) (SPPE) (ISO)
 OTHER _____

COPY OF CALIBRATION CERTIFICATE (Yes) (No)

NEW WORK Yes No If yes, an evaluation shall be made to verify capabilities.

By MMAS Date 12.08.99

Work involves proprietary/confidential information or equipment (Yes) (No)

CONDITION RECEIVED: Out of tolerance
 In tolerance
 Damaged (Contact customer)
 Contact _____ Date _____
 Received into system, introduced or reactivated

ACTION TAKEN: (Calibration/Repair/Parts) 12/09 Gulf Coast ST# 558616

CAL ENVIRONMENT:
Temperature 70 °F Humidity _____ %RH

CALIBRATED/REPAIRED:
By Gulf Coast Houston, TX Cal Procedure 466 W. 0860
Date 12.15.99 Accuracy ±.4% F.S.
Cal Interval 1 mos Reliability Code 9
Next Cal Due 12.15.00 Cal Time _____ Repair Time _____
Standards used (Asset #) Vendor

DATE COMPLETED 10 Dec. 99
DATE PICKED UP 12/31/99 PICKED UP BY Paul D

37058

GULF COAST CALIBRATION

7999 Hansen, Suite 321
Houston, TX 77061
(713) 944-3139

Certificate Of Calibration

REPORT # 99-56950/1

PAGE 1 OF 1

Customer SOUTHWEST RESEARCH INSTITUTE Date 12-15-1999

SAN ANTONIO, TX Expires 12-15-2000

Customer P.O. 01533R/358612

Type and Size of Gauge PROTO 0-100 INOZ. TORQUE WRENCH

Serial No. #2 Tolerance ±4%

WRENCH SET	AS RECEIVED	FINAL READING
20 INOZ.	20	20
40 INOZ.	40	40
60 INOZ.	61	61
80 INOZ.	82	82
100 INOZ.	102	102

DONE IN ACCORDANCE WITH Q.A. MANUAL REV. 3 DATED 12/1/1995.
10CFR21 APPLIES.

Test Equipment
GCC-174

Date of Cal.
11-2-1999

Expires
11-2-2000

This is to certify that the calibration above meets the requirement for accuracy of applicable Federal Specification GGG-W-686D. Our Test Equipment use for calibration is traceable to the NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY. Maintained in accordance with conditions as noted by ANSI Z540-1. Temperature during calibration 70°F.

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
No. 40093

Technician Michael Ha

This certificate of calibration shall not be reproduce except in full without written approval by GULF COAST CALIBRATION.

RUSH

SOUTHWEST RESEARCH INSTITUTE

Calibration Laboratory

WORK ORDER

Processed by RCRUZ at 9:05:38AM on 10/24/00

I4213

||||| ||||| ||||| ||||| ||||| ||||| |||||

Work Order No 444041098

Arrived 10/24/00

Asset No. 001443 Manufacturer PROTO

Model 6103

Instrument Type/Class TORQUE SCREWDRIVER

Serial No. #2

Accessory No. Calibration Procedure CL-15, 5/99

Location B57

Div/Client DIV20

Custodian DARRELL DUNN

Mail Stop B57

Tel. 6090

Charge/Project No. 20.00751.006

Delivered By / Telephone

RUSH

Special Instructions _____

WORK NOTES

Date	Hours	Remarks/Notes
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

REPAIR PARTS

Date	Hours	Part Name	Part Number	Failure Description	Cost
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

WORK SUMMARY

Failure Description _____

Repair Action _____

Calibration Procedure CL-15 ASME B107.14-01, 94 Temp 70 F Hum. 58 %

Tech SAL Totals Cal Hours 2 Repair Hours _____ Parts Cost _____

Standards Used 6407, 7010

Date Picked Up 10/26/2000

Picked Up By Darrell D

41098



Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238
(210) 522-5215
Department of Quality Assurance
Calibration Laboratory



Certificate #
0972-01

Certificate of Calibration

25 October 2000

Issued to: DARRELL DUNN DIV20 B57
Manufacturer/Model: PROTO 6103
Description: TORQUE SCREWDRIVER
Serial Number: #2
Asset Number: 001443

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. The results of this calibration relate only to the individual item as described above. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results of this calibration certificate were determined in accordance with the terms of accreditation unless stated otherwise below.

The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

Ambient Conditions: Temperature: 70.0 Degrees Fahrenheit Humidity: 58 % RH


Calibration Date: 25 Oct 00 **Calibration Procedure:** ASME B107.14M, 94

Condition as Received: IN TOLERANCE

Condition as Released: IN TOLERANCE

Remarks:

Approved by:


Jim Patterson, Supervisor, or Walt Hill, Metrologist

Measurements performed by:


Ken Harp, Technician

Certificate # 444041098

m:\a2la.rpt Rev date 22 May 00

Page 1 of 1

SOUTHWEST RESEARCH INSTITUTE

Calibration Laboratory

WORK ORDER

Processed by RCRUZ at 2:38:38PM on 4/26/01



Work Order 444043360

Arrived 4/26/01

Asset No. 001443 Manufacturer PROTO

Model 6103

Instrument Type/Class TORQUE SCREWDRIVER

Serial No. #2

Accessory No. Calibration Procedure ASME B107.14M, 94

Location B57

Div/Client DIV20

Custodian DARRELL DUNN

Mail Stop B57

Tel. 6090

Charge/Project No. 20.00751.006

Delivered By / Telephone DARRELL DUNN

IN4CAL

Special Instructions 20.00751.006

WORK NOTES

Date	Hours	Remarks/Notes
5-4-01		Buff Case Cal # 2800 T.P.T. Inc.
		S.T. # 380592 Shipped

REPAIR PARTS

Date	Hours	Part Name	Part Number	Failure Description	Cost

WORK SUMMARY

Failure Description N/A

Repair Action _____

Calibration Procedure MFG. Temp 70F Hum. —%

Tech Buff Case Totals Cal Hours _____ Repair Hours _____ Parts Cost _____

Standards Used Vendor

Date Picked Up 5/18/2001

Picked Up By [Signature]

444043360

GULF COAST CALIBRATION

7999 Hansen, Suite 321
Houston, TX 77061
(713) 944-3139

Certificate Of Calibration

REPORT # 105-7591

PAGE 1 OF 1

Customer SOUTHWEST RESEARCH INSTITUTE Date 5-11-2001

SAN ANTONIO, TX Expires 5-11-2002

Customer P.O. _____

Type and Size of Gauge PROTO 0-100 INOZ. TORQUE WRENCH

Serial No. #2 Tolerance ±4%

WRENCH SET	AS RECEIVED	FINAL READING
20 INOZ.	20	20
40 INOZ.	41	41
60 INOZ.	62	62
80 INOZ.	82	82
100 INOZ.	102	102

Test Equipment
GCC-174

Date of Cal.
11-1-2000

Expires
11-1-2001

This is to certify that the calibration above meets the requirement for accuracy of applicable Federal Specification GGG-W-686D. Our Test Equipment use for calibration is traceable to the NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY. Maintained in accordance with conditions as noted by ANSI Z540-1. Temperature during calibration 70°F.

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
No. 40093

Technician Michael Ho

This certificate of calibration shall not be reproduce except in full without written approval by GULF COAST CALIBRATION.

**SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM**

May 18, 2001

To: DARRELL DUNN DIV20 B57

From: Walt Hill, Supervisor *WH*
Institute Calibration Laboratory

Subject: Calibration by an approved supplier

Manufacturer/Model: PROTO 6103
Description: TORQUE SCREWDRIVER
Serial Number: #2
Asset Number: 001443
Work Order Number: 444043360
Date Calibrated: May 11, 2001
Remarks: GULF COAST CERT #105-7591

Supplier: GULF COAST CALIBRATION INC., HOUSTON, TX

The above item was sent to an approved supplier who is listed on the SwRI Approved Suppliers List (ASL). This supplier is qualified to supply a product or service in support of project activities that require the use of approved suppliers. Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

SOUTHWEST RESEARCH INSTITUTE

Calibration Laboratory

WORK ORDER

RUSH

Received by RCRUZ, 12/6/01 2:25:38PM

Arrived 12/6/01

Work Order **444046376**

Asset No. 001443 Manufacturer PROTO

Model 6103

Equipment Type TORQUE SCREWDRIVER

Serial No. #2

Accessory No.

Interval 6 M

Calibration Procedure ASME B107.14M, 94

Location B57

Div/Client DIV20

Custodian DARRELL DUNN

Mail Stop B57

Tel 6090

IN4CAL

Special Instructions 20.00751.006

Notify before adjustments or repairs. (Provide data with certificate) Certificate Typ _____

Charge/Project No. 00751.006 1.20

Requester / Telephone _____

This information is correct for the work requested.

WORK NOTES

Date	Hours	Remarks/Notes
<u>12/7/01</u>		<u>Torque wrench setting was at 100 in oz. reduce to lowest setting</u>

Date	Hours	Part Name	Part Number	Failure Description	Cost

WORK SUMMARY

Failure Description _____

Repair Action _____

Tech _____ Cal Hrs. _____ Repair Hrs _____ Parts Cost _____ Temp _____ F Hum. _____ %

Standards Used _____

Date Picked Up 12/12/01

Picked Up By Darrell Dunn

444046376



Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238
(210) 522-5215
Department of Quality Assurance
Calibration Laboratory

Certificate of Calibration

10 December 2001

Issued to: DARRELL DUNN DIV20 B57
Manufacturer/Model: PROTO 6103
Description: TORQUE SCREWDRIVER
Serial Number: #2
Asset Number: 001443
Work Order Number: 444046376

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

Ambient Conditions: Temperature: 68.0 Degrees Fahrenheit Humidity: 32 % RH


Calibration Date: 10 Dec 01 **Calibration Procedure:** HAND TORQUE TOOLS, NOV 2000

Condition as Received: IN TOLERANCE

Condition as Returned: IN TOLERANCE

Remarks:

Approved by:



Walt Hill, Supervisor
Institute Calibration Laboratory

Measurements performed by:



Vince Morales, Technician

Calibration Results

SwRI Calibration Laboratory

UUT: PROTO 6103
 TORQUE SCREWDRIVER
 Serial No: #2
 Asset No. 001443

Result: **PASS**
 Performed on: 12/10/01 at 10:48:25
 Performed by: Vince Morales
 Environment: Temp. 68.0°F Humid. 32 %
 Condition F/L: FOUND-LEFT
 Procedure Completed:

Notes:

Standards Used

Asset	Mfg	Model	Description	Cal. Date	Due Date
006407	CDI	950-DT	DIGITAL READOUT	27-Jun-01	27-Dec-01
006408	CDI	TTPM-41	TORQUE TRANSDUCER	5-Sep-01	5-Mar-02

Test Data

TEST#	STD PARAMETER	TRUE VALUE	UNIT UNDER TEST			ERROR in (% of Tol)	NOTIFY TUR USER
			READING	TOLERANCE	UUT ERROR		
CLOCKWISE							
20% F.S.							
44	20.000in/oz		19.970	1.2in/oz	-0.03in/oz	3	
45	20.000in/oz		20.190	1.2in/oz	0.19in/oz	16	
46	20.000in/oz		20.130	1.2in/oz	0.13in/oz	11	
60% F.S.							
47	60.000in/oz		61.580	3.6in/oz	1.58in/oz	44	
48	60.000in/oz		61.330	3.6in/oz	1.33in/oz	37	
49	60.000in/oz		60.430	3.6in/oz	0.43in/oz	12	
100% F.S.							
50	100.000in/oz		100.400	6in/oz	0.4in/oz	7	
51	100.000in/oz		101.600	6in/oz	1.6in/oz	27	
52	100.000in/oz		99.860	6in/oz	-0.14in/oz	2	
COUNTER CLOCKWISE							
20% F.S. CCW							
105	20.000in/oz		19.980	1.2in/oz	-0.02in/oz	2	
106	20.000in/oz		19.520	1.2in/oz	-0.48in/oz	40	
107	20.000in/oz		19.790	1.2in/oz	-0.21in/oz	18	
60% F.S. CCW							
108	60.000in/oz		57.320	3.6in/oz	-2.68in/oz	74	M
109	60.000in/oz		60.570	3.6in/oz	0.57in/oz	16	
110	60.000in/oz		57.420	3.6in/oz	-2.58in/oz	72	M
100% F.S. CCW							
111	100.000in/oz		99.670	6in/oz	-0.33in/oz	5	
112	100.000in/oz		100.500	6in/oz	0.5in/oz	8	
113	100.000in/oz		99.960	6in/oz	-0.04in/oz	1	

End of Test Data

A/N 1443 W/O# 444046376, Cal. Date 10 Dec. 01

Torque Wrench (TI)	Units	Range	Acc. +/-	Resolution
	in/oz	0-100	1.2	0.01
Source of Uncertainty	Value ft/lb	Distribution	Divisor	Std. Uncert. Ft/lb
Standard @ 20 in/oz	0.05	Normal	2	0.025
*Reproducibility	0.066	Normal	1	0.066
Resolution (STD)	0.01	Rectangular	Sqrt 3	0.0058
Combined Uncertainty	RSS			0.071
Expanded Uncertainty	k=2			0.14
Test Accuracy Ratio (TAR)	TI Acc./STD Acc.		Clockwise.	
	24	to 1		
Test Uncertainty Ratio (TUR)	TI Acc./Muk=2			
	8.5	to 1		

Torque Wrench (TI)	Units	Range	Acc. +/-	Resolution
	in/oz	0-100	3.6	0.01
Source of Uncertainty	Value ft/lb	Distribution	Divisor	Std. Uncert. Ft/lb
Standard @ 60 in/oz	0.15	Normal	2	0.075
*Reproducibility	0.349	Normal	1	0.349
Resolution (STD)	0.01	Rectangular	sqrt 3	0.003
Combined Uncertainty	RSS			0.357
Expanded Uncertainty	k=2			0.71
Test Accuracy Ratio (TAR)	TI Acc./STD Acc.		Clockwise.	
	24	to 1		
Test Uncertainty Ratio (TUR)	TI Acc./Muk=2			
	5.1	to 1		

Torque Wrench (TI)	Units	Range	Acc. +/-	Resolution
	in/oz	0-100	6	0.01
Source of Uncertainty	Value ft/lb	Distribution	Divisor	Std. Uncert. Ft/lb
Standard @ 100 in/oz	0.25	Normal	2	0.13
*Reproducibility	0.514	Normal	1	0.51
Resolution (STD)	0.01	Rectangular	Sqrt 3	0.003
Combined Uncertainty	RSS			0.53
Expanded Uncertainty	k=2			1.1
Test Accuracy Ratio (TAR)	TI Acc./STD Acc.		Clockwise.	
	24	to 1		
Test Uncertainty Ratio (TUR)	TI Acc./Muk=2			
	5.5	to 1		

*Reproducibility provided was divided by sqrt of 3

A/N 1443 W/O# 444046376, Cal. Date 10 Dec. 01

Torque Wrench (TI)	Units	Range	Acc. +/-	Resolution
	in/oz	0-100	1.2	0.01
Source of Uncertainty	Value ft/lb	Distribution	Divisor	Std. Uncert. Ft/lb
Standard @ 20 in/oz	0.05	Normal	2	0.025
*Reproducibility	0.133	Normal	1	0.133
Resolution (STD)	0.01	Rectangular	Sqrt 3	0.0058
Combined Uncertainty	RSS			0.135
Expanded Uncertainty	k=2			0.27
Test Accuracy Ratio (TAR)	TI Acc./STD Acc.		Counter Clockwise.	
	24	to 1		
Test Uncertainty Ratio (TUR)	TI Acc./Muk=2			
	4.4	to 1		

Torque Wrench (TI)	Units	Range	Acc. +/-	Resolution
	in/oz	0-100	3.6	0.01
Source of Uncertainty	Value ft/lb	Distribution	Divisor	Std. Uncert. Ft/lb
Standard @ 60 in/oz	0.15	Normal	2	0.075
*Reproducibility	1.067	Normal	1	1.067
Resolution (STD)	0.01	Rectangular	sqrt 3	0.003
Combined Uncertainty	RSS			1.070
Expanded Uncertainty	k=2			2.14
Test Accuracy Ratio (TAR)	TI Acc./STD Acc.		Counter Clockwise.	
	24	to 1		
Test Uncertainty Ratio (TUR)	TI Acc./Muk=2			
	1.7	to 1		

Torque Wrench (TI)	Units	Range	Acc. +/-	Resolution
	in/oz	0-100	6	0.01
Source of Uncertainty	Value ft/lb	Distribution	Divisor	Std. Uncert. Ft/lb
Standard @ 100 in/oz	0.25	Normal	2	0.13
*Reproducibility	0.243	Normal	1	0.24
Resolution (STD)	0.01	Rectangular	Sqrt 3	0.003
Combined Uncertainty	RSS			0.27
Expanded Uncertainty	k=2			0.5
Test Accuracy Ratio (TAR)	TI Acc./STD Acc.		Counter Clockwise.	
	24	to 1		
Test Uncertainty Ratio (TUR)	TI Acc./Muk=2			
	12	to 1		

*Reproducibility provided was divided by sqrt of 3

SOUTHWEST RESEARCH INSTITUTE

Calibration Laboratory

WORK ORDER

Received by AANDERSON, 7/3/02 10:42:34AM

Arrived 7/3/02

Work Order **444049290**

Asset No. 001443 Manufacturer PROTO

Model 6103

Equipment Type TORQUE SCREWDRIVER

Serial No. #2

Accessory No.

Interval 6 M

Calibration Procedure ASME B107.14M, 94

Location B57

Div/Client DIV20

Custodian DARRELL DUNN

Mail Stop B57

Tel 6090

IN LINE

Special Instructions 20.00751.006

Notify before adjustments or repairs. () Provide data with certificate () Certificate Typ _____

Charge/Project No. 00751.006 1.20

Requester / Telephone _____

This information is correct for the work requested. 

WORK NOTES

Date	Hours	Remarks/Notes
<u>July 5, 2002</u>		<u>Cal'brated</u>

Date	Hours	Part Name	Part Number	Failure Description	Cost

WORK SUMMARY

Failure Description 

Repair Action 

Tech  Cal Hrs. 1.0 Repair Hrs _____ Parts Cost _____ Temp 68 F Hum. 36 %

Standards Used 6424 7010

Date Picked Up 7/10/2002

Picked Up By 

44290
0626h

Calibration Results

SwRI Calibration Laboratory

TI: PROTO 6103
 TORQUE SCREWDRIVER
 Serial No: #2
 Asset No. 001443

Result: **PASS**

Performed on: 7/5/02 at 10:45:30
 Performed by: Thomas Hannon
 Environment: Temp. 68.0°F Humid. 36 %
 Condition F/L: FOUND-LEFT

Note: All TAR's are greater than 4:1 unless noted on TAR column.

Procedure Completed:

Work Order #: 444049290

Calibration Procedur HAND TORQUE TOOLS, NOV 2000 (0-100in.oz.)

Notes:

Standards Used

Asset	Mfg	Model	Description	Cal. Date	Due Date
007010	CDI	1001-0-TTTP	TORQUE TRANSDUCER	7-Feb-02	7-Aug-02

Test Data

TEST#	STD PARAMETER	TRUE VALUE	----- READING	TEST INSTRUMENT TOLERANCE	----- TI ERROR	ERROR in (% of Tol)	NOTIFY TAR USER
CLOCKWISE							
20% F.S.							
43	20.000in/oz		20.150	1.2in/oz	0.15in/oz	12	
44	20.000in/oz		20.460	1.2in/oz	0.46in/oz	38	
45	20.000in/oz		19.490	1.2in/oz	-0.51in/oz	43	
60%F.S.							
46	60.000in/oz		58.890	3.6in/oz	-1.11in/oz	31	
47	60.000in/oz		60.680	3.6in/oz	0.68in/oz	19	
48	60.000in/oz		60.180	3.6in/oz	0.18in/oz	5	
100%F.S.							
49	100.000in/oz		97.800	6in/oz	-2.2in/oz	37	
50	100.000in/oz		99.760	6in/oz	-0.24in/oz	4	
51	100.000in/oz		101.200	6in/oz	1.2in/oz	20	
COUNTER CLOCKWISE							
20%F.S. CCW							
100	20.000in/oz		19.650	1.2in/oz	-0.35in/oz	29	
101	20.000in/oz		19.970	1.2in/oz	-0.03in/oz	3	
102	20.000in/oz		20.450	1.2in/oz	0.45in/oz	37	
60%F.S. CCW							
103	60.000in/oz		61.270	3.6in/oz	1.27in/oz	35	
104	60.000in/oz		60.640	3.6in/oz	0.64in/oz	18	
105	60.000in/oz		58.370	3.6in/oz	-1.63in/oz	45	
100%F.S. CCW							
106	100.000in/oz		99.270	6in/oz	-0.73in/oz	12	
107	100.000in/oz		98.030	6in/oz	-1.97in/oz	33	
108	100.000in/oz		100.200	6in/oz	0.2in/oz	3	

End of Test Data



Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238
(210) 522-5215
Department of Quality Assurance
Calibration Laboratory

Certificate of Calibration

5 July 2002

Issued to: DARRELL DUNN DIV20 B57
Manufacturer/Model: PROTO 6103
Description: TORQUE SCREWDRIVER
Serial Number: #2
Asset Number: 001443
Work Order Number: 444049290

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

Ambient Conditions: Temperature: 68.0 Degrees Fahrenheit Humidity: 36 % RH

Calibration Date: 5 Jul 02 **Calibration Procedure:** HAND TORQUE TOOLS, NOV 2000 (0-100in.oz.)

Condition as Received: IN TOLERANCE

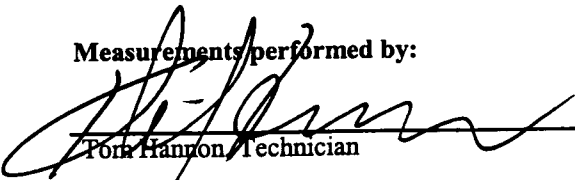
Condition as Returned: IN TOLERANCE

Remarks:

Approved by:


Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Measurements performed by:


Tori Hannon, Technician