wyle laboratories

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REPORT NO.: T70274-01
WYLE JOB NO.: T70274
CLIENT P.O. NO.: 91150512
CONTRACT: N/A
TOTAL PAGES (INCLUDING COVER): 38
DATE: August 1, 2012

TEST REPORT
ENVIRONMENTAL AND DYNAMICS TESTING
ON TWO
RUGGEDIZED CASES (TYPE 4000)
FOR
B&W INTERNATIONAL
WYLE REPORT NO. T70274-01

B&W International
Junkendiek 5
Ibbenbueren, Germany D-49479

STATE OF ALABAMA
COUNTY OF MADISON }

David R. Bailey, Department Manager, being duly sworn, deposes and says: The information contained in this report is the result of complete and carefully conducted testing and is to the best of his knowledge true and correct in all respects.

David R Bailey

SUBSCRIBED and sworn to before me this 2nd day of August 2012

SEAL

Patricia A. Phillips
Notary Public in and for the State of Alabama at Large

My Commission expires Jan. 6, 2013

Wyle shall have no liability for damages of any kind to person or property, including special or consequential damages, resulting from Wyle's providing the services covered by this report.

TEST BY: 8-2-12
Tory Jones, Project Engineer Date

APPROVED BY: Randy L Cooper 8/2/12
for Anthony Munks, Engineering Supervisor Date

WYLE Q.A.: Brenda Mann 8/2/12
FOR Raul Terceno, Quality Assurance Manager Date

(pap)

TABLE OF CONTENTS

ATTACHMENTS

1.0 INTRODUCTION

1.1 Scope

This report documents the test procedures followed and the results obtained during an Environmental and Dynamics Test Program performed on two Ruggedized Cases (Type 4000) for B&W International. The Environmental Test Program consisted of Low Temperature and Dry Heat Testing. The Dynamics Test Program consisted of Sinusoidal Vibration (K) and Impact Testing. The Cases were received at Wyle Laboratories on June 19, 2012. The receiving inspection revealed the Cases were in good condition. The receiving inspection also revealed that the Cases arrived with no Serial Number Identification. Wyle personnel assigned two Serial Numbers (T70274-001 and T70274-002) for traceability purposes only. Testing was performed at Wyle Laboratories' Huntsville, Alabama, Test Facility from June 19 through June 27, 2012.

1.2 References

- B&W International Purchase Order No. 91150512
- Wyle Laboratories' Quotation No. 542/054667/MT, dated January 20, 2012
- Wyle Laboratories' Quality Manual, Latest Revision
- DEF STAN 81-41
- ANSI/NCSL Z540-1, "Calibration Laboratories and Measuring and Test Equipment, General Requirements"
- ISO 10012-1, "Quality Assurance Requirements for Measuring Equipment"

1.3 Test Specimen Description

The specimens tested were two Ruggedize Cases (Type 4000) identified by Serial Numbers T70274-001 and T70274-002. Both Cases measured approximately 16.5 inches long by 13 inches wide by 7.13 inches high and weighed approximately 5 pounds.

1.4 Summary

The Ruggedized Cases, were subjected to Low Temperature, Dry Heat, Sinusoidal Vibration (K), and Impact Testing in accordance with Wyle Quote No. 542/054667/MT, dated January 20, 2012. All Pre- and Post-Test Visual Inspections were conducted by Wyle Representatives. One Ruggedized Case (Serial No.T70274-001) showed evidence that its right latch was in the Open position after being subjected to the Dry Heat Test. However, there were no visible signs of damage, degradation or other physical damages to the Case. The Case opened and closed without difficulty. The Ruggedized Cases were successfully subjected to the Environmental and Dynamics Test Program. The Ruggedized cases were returned to B&W International's North American Facility at the completion of testing.

1.0 INTRODUCTION (Continued)

1.4 Summary (Continued)

The test results contained herein apply only to the Ruggedized Cases identified in this report.

2.0 TEST PROCEDURES AND RESULTS

2.1 Low Temperature Test

One Ruggedized Case (Serial No. T70274-001) was subjected to a Low Temperature Test in accordance with Wyle Quote No. 542/054667/MT dated January 20, 2012. DEF STAN 81-41 was used as a guide only.

The Ruggedized Case was subjected to the Low Temperature Test as follows:

The Ruggedized Case was placed inside a Temperature Chamber in its storage configuration. A Pre-Test Visual Inspection was conducted on the Case. No defects were noted. One thermocouple was placed on the Case to monitor its temperature characteristics and aide in temperature stabilization. A second thermocouple was used to monitor and record chamber conditions.

With the Case in its storage configuration, the chamber temperature was transitioned to -40 ± 2°C (-40°F ± 3.6°F) at a maximum transition rate of 3°C (5°F) per minute. This condition was maintained for a maximum of 16 hours upon reaching temperature stabilization.

The chamber temperature was transitioned to 20 ± 10°C (68 ± 18°F). A Post-Test Visual Inspection was conducted on the Case. No damages were noted. No anomalies were recorded. The Ruggedized Case was successfully subjected to the Low Temperature Test.

A photograph of the test setup is presented in Attachment A. The Low Temperature Test Data is presented in Attachment B. The Instrumentation Equipment Sheet for the test setup is presented in Attachment F.

2.2 Dry Heat Test

One Ruggedized Case (Serial No. T70274-001) was subjected to a Dry Heat Test in accordance with Wyle Quote No. 542/054667/MT dated January 20, 2012. DEF STAN 81-41 was used as a guide only.

2.0 TEST PROCEDURES AND RESULTS (Continued)

2.2 Dry Heat Test (Continued)

The Ruggedized Case was subjected to the Dry Heat Test as follows:

The Ruggedized Case was placed inside a Temperature Chamber in its storage configuration. A Pre-Test Visual Inspection was conducted on the Case. No defects were noted. One thermocouple was placed on the Case to monitor its temperature characteristics and to aide in temperature stabilization. A second thermocouple was used to monitor and record chamber conditions.

With the Case in its storage configuration, the chamber temperature was transitioned to 25 ±10°C (77°F ± 18°F) and 45 to 75% Relative Humidity at a maximum transition rate of 3°C (5°F) per minute. This condition was maintained for a maximum of 16 hours.

The chamber temperature was transitioned to a High Temperature of 55 ± 2°C (131 ± 3.6°F) at a maximum transition rate of 3°C per minute. This condition was held for 48 hours upon reaching temperature stabilization. The chamber temperature was transitioned back to 25 ±10°C at a maximum transition rate of 3°C per minute.

A Post-Test Visual Inspection was conducted on the Case. It was observed that the right latch was in the open position; however, no damages were noted. No anomalies were recorded. The Ruggedized Case was successfully subjected to the Dry Heat Test.

A photograph of the test setup is presented in Attachment A. The Dry Heat Test Data is presented in Attachment C. The Instrumentation Equipment Sheet for the test setup is presented in Attachment F.

2.3 Sinusoidal Vibration Test (K)

One Ruggedized Case (Serial No. T70274-002) was subjected to a Sinusoidal Vibration Test (K) in accordance with Wyle Quote No. 542/054667/MT dated January 20, 2012. DEF STAN 81-41 was used as a guide only.

The Case was installed on an electro-dynamic shaker that was, in turn, placed in a Temperature Chamber in its storage configuration. See photographs of the test setup in Attachment A. A Pre-Test Visual Inspection was conducted on the Case. No damages were noted. One control accelerometer was placed on the shaker to monitor vibratory input levels. The chamber temperature was transitioned to 25 ±10°C (77°F ±18°F) and 45 to 75% Relative Humidity at a maximum transition rate of 3°C (5°F) per minute. This condition was maintained until the Case reached temperature stabilization (approximately one hour).

2.0 TEST PROCEDURES AND RESULTS (Continued)

2.3 Sinusoidal Vibration Test (K) (Continued)

The Case was then subjected to a Sinusoidal Vibration Test at an amplitude of ± 0.23 inch peak (0.46 DA) from 5 to 9 Hz, then to a ± 2 g peak from 9 to 350 Hz, at a sweep rate of 0.75 ± 0.25 octave per minute, for two hours in each of three mutually perpendicular axes (Top-to-Bottom, Front-to-Back and Side-to-Side, respectively). A Post-Test Visual Inspection was conducted after each axis of test. No damages were noted. No anomalies were recorded. The Ruggedized Case was successfully subjected to the Sinusoidal Vibration Test (K).

A photograph of the test setup is presented in Attachment A. The Sinusoidal Vibration Test (K) Data is presented in Attachment D. The Instrumentation Equipment Sheet for the test setup is presented in Attachment F.

2.4 Impact Test (Vertical)

One Ruggedized Case (Serial No.T70274-002) was subjected to an Impact Test in accordance with Wyle Quote No. 542/054667/MT dated January 20, 2012. DEF STAN 81-41 was used as a guide only.

The Ruggedized Case was subjected to the Impact Test as follows:

A Pre-Test Visual Inspection was conducted on the Ruggedized Case. No damages were noted. The Case was attached to a quick-release hook and dropped on a non-deformable surface from a height of 39.4 ± 2 inches. The Bottom, Top, Left, Right, Near and Far Sides were sequentially subjected to this test. A Post-Test Visual Inspection was conducted after each impact. No damages were noted. No anomalies were recorded. The Ruggedized Case was successfully subjected to the Impact Test (Vertical).

A photograph of the test setup is presented in Attachment A. The Impact Test Data is presented in Attachment E. The Instrumentation Equipment Sheet for the test setup is presented in Attachment F.

3.0 TEST EQUIPMENT AND INSTRUMENTATION

All instrumentation, measuring, and test equipment used in the performance of this test program were calibrated in accordance with Wyle Laboratories' Quality Program, which complies with the requirements of ANSI/NCSL Z540-1 and ISO 10012-1. Standards used in performing all calibrations are traceable to the National Institute of Standards and Technology (NIST) by report number and date. When no national standards exist, the standards are traceable to international standards or the basis for calibration is otherwise documented.

4.0 QUALITY PROGRAM

All work performed on this test program was completed in accordance with Wyle Laboratories' Quality Program.

The Wyle Laboratories, Huntsville Facility, Quality Management System is registered in compliance with the ISO-9001:2008 International Quality Standard. Registration has been completed by Quality Management Institute (QMI), a Division of Canadian Standards Association (CSA).

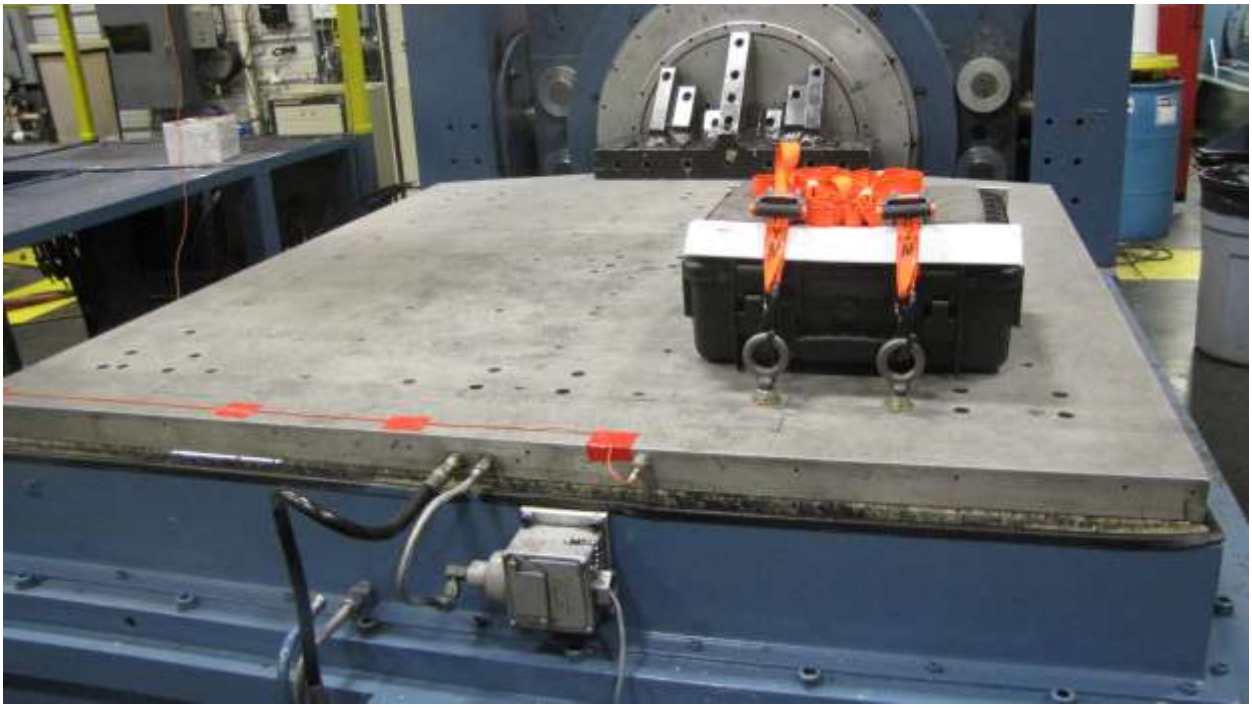
ATTACHMENT A

PHOTOGRAPHS

Photograph No. 1
Typical Low Temperature/Dry Heat Test Setup

Photograph No. 2
Typical Low Temperature/Dry Heat Test Setup
(Thermocouple Location)

Photograph No. 3
Typical Sinusoidal Vibration Test (K) Setup
(Top-to-Bottom Axis)



Photograph No. 4
Typical Sinusoidal Vibration Test (K) Setup
(Front-to-Back Axis)

Photograph No. 5
Typical Sinusoidal Vibration Test (K) Setup
(Side-to-Side Axis)

Photograph No. 6
Typical Impact Test (Vertical) Setup
(Bottom Impact)

Photograph No. 7
Typical Impact Test (Vertical) Setup
(Top Side)

Photograph No. 8
Typical Impact Test (Vertical) Setup
(Left Side)

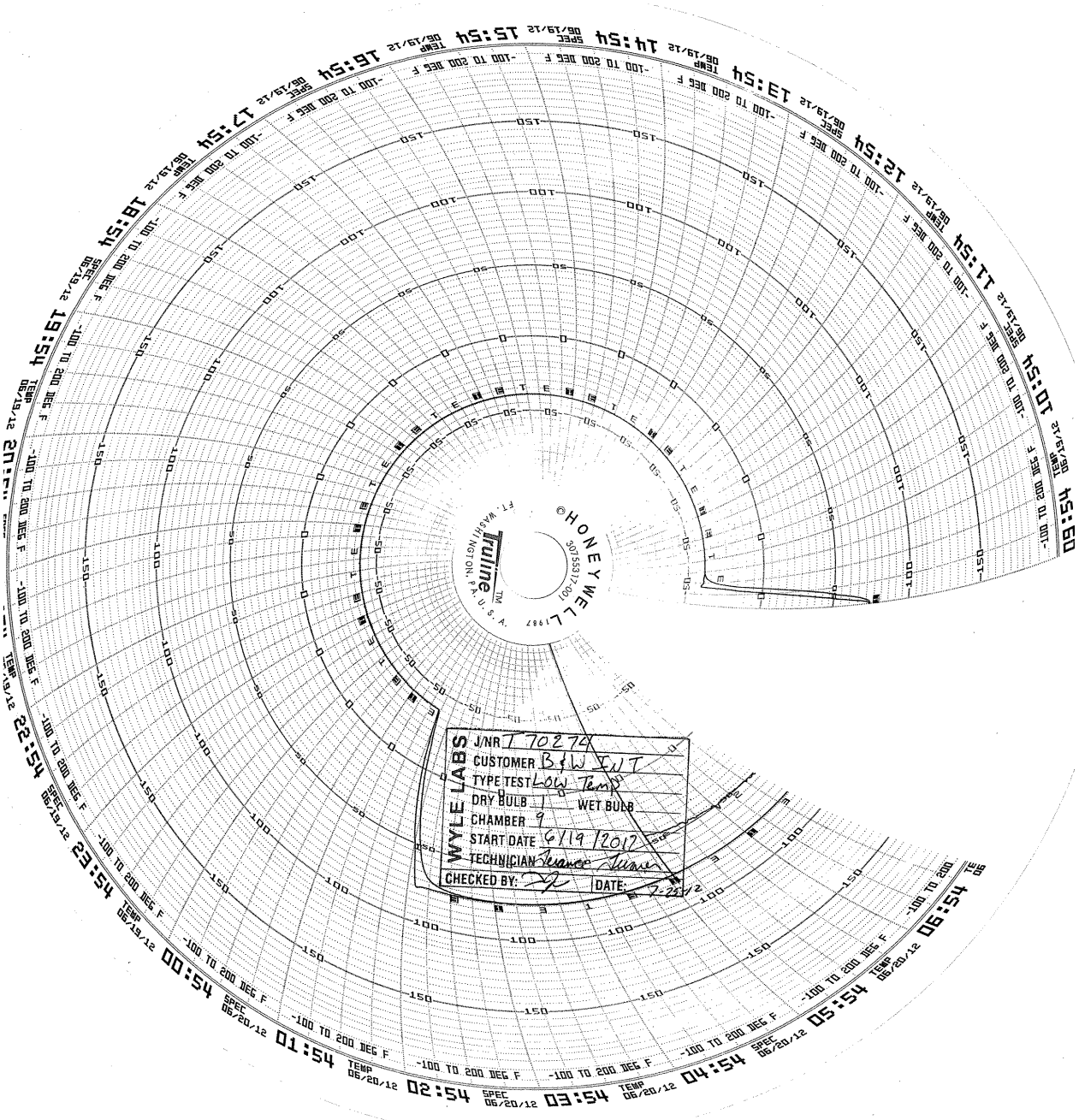
Photograph No. 9
Typical Impact Test (Vertical) Setup
(Right Side)

Photograph No. 10
Typical Impact Test (Vertical) Setup
(Near Side)

Photograph No. 11
Typical Impact Test (Vertical) Setup
(Far Side)

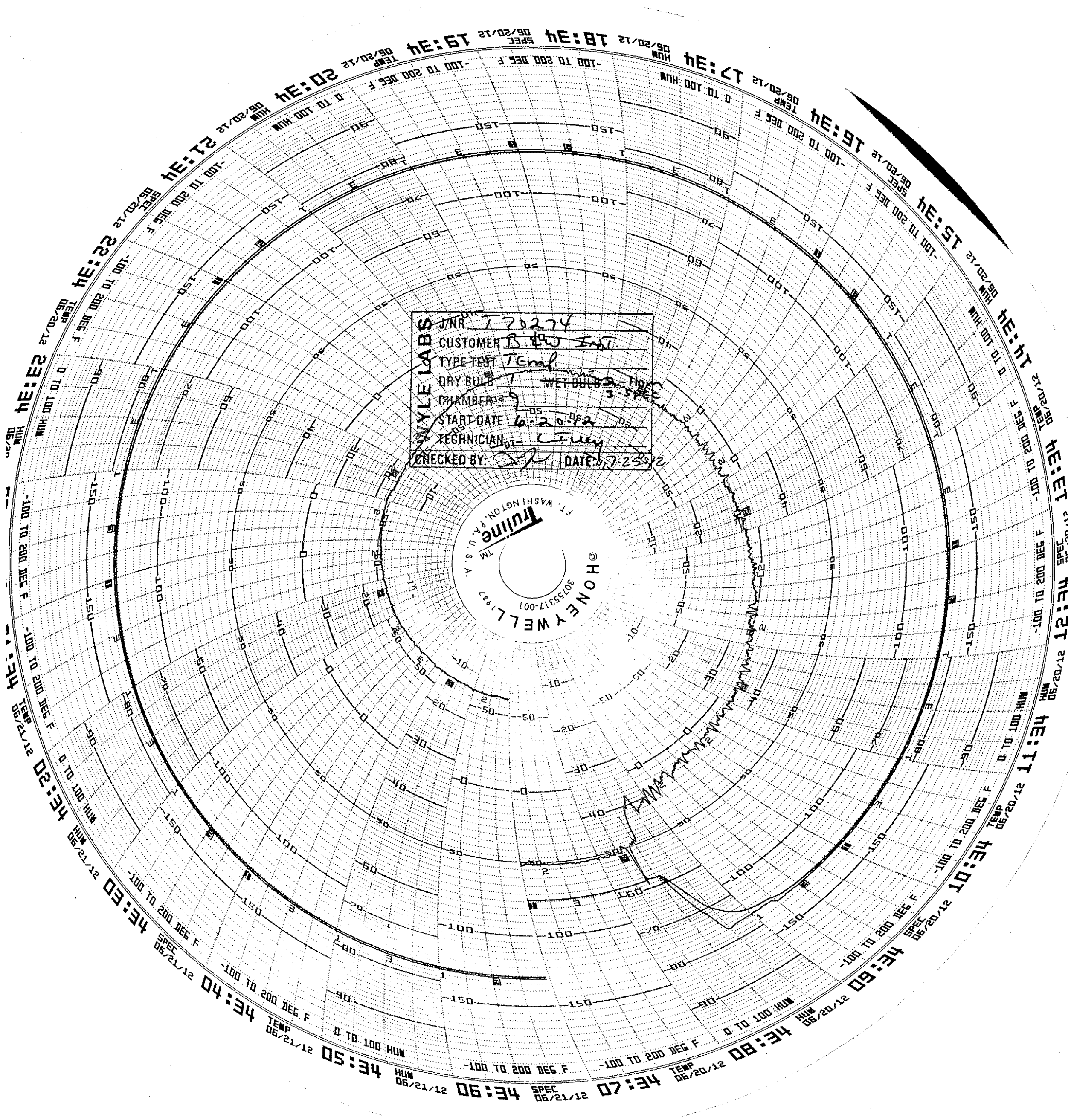
ATTACHMENT B

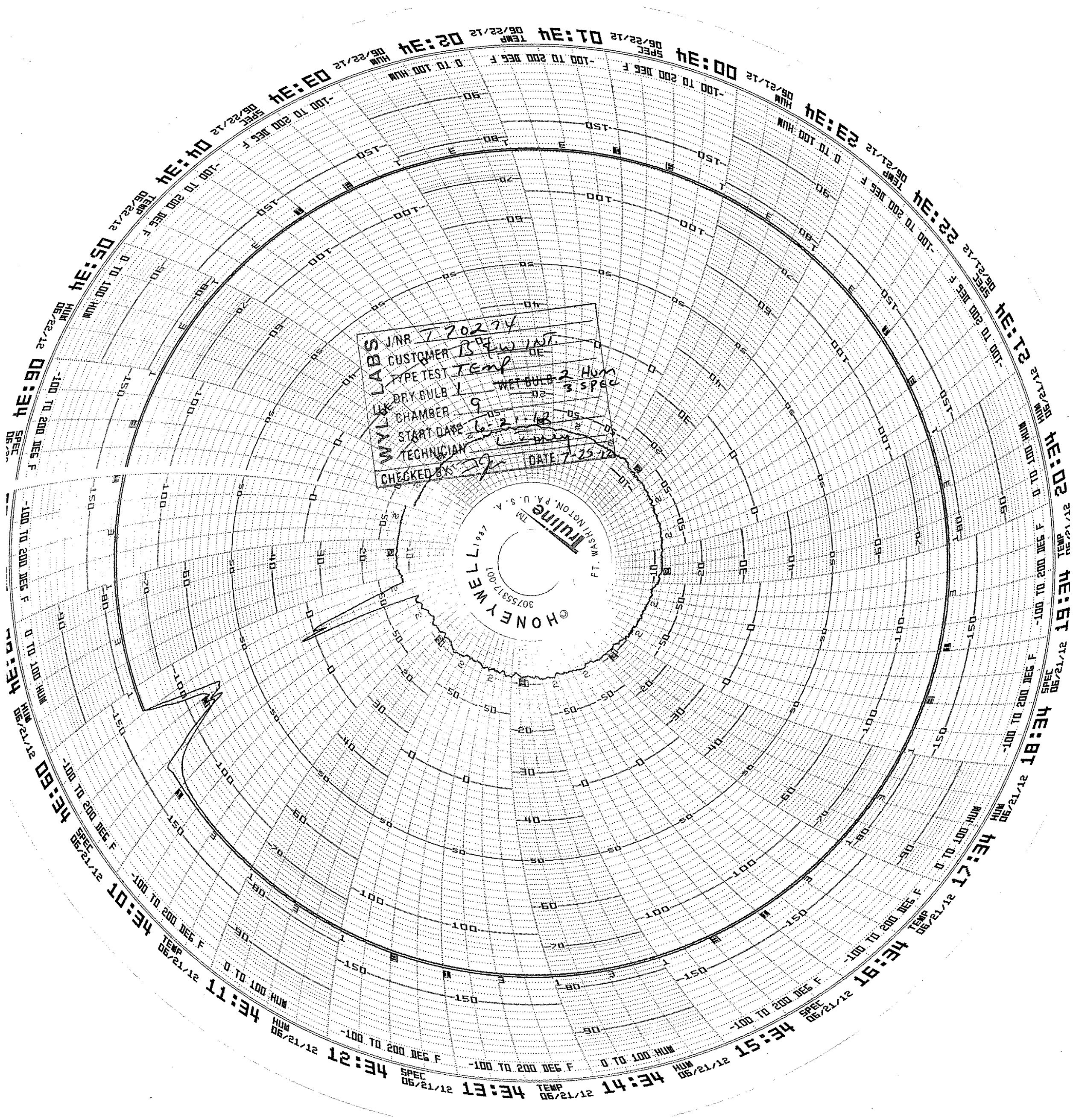
LOW TEMPERATURE TEST DATA

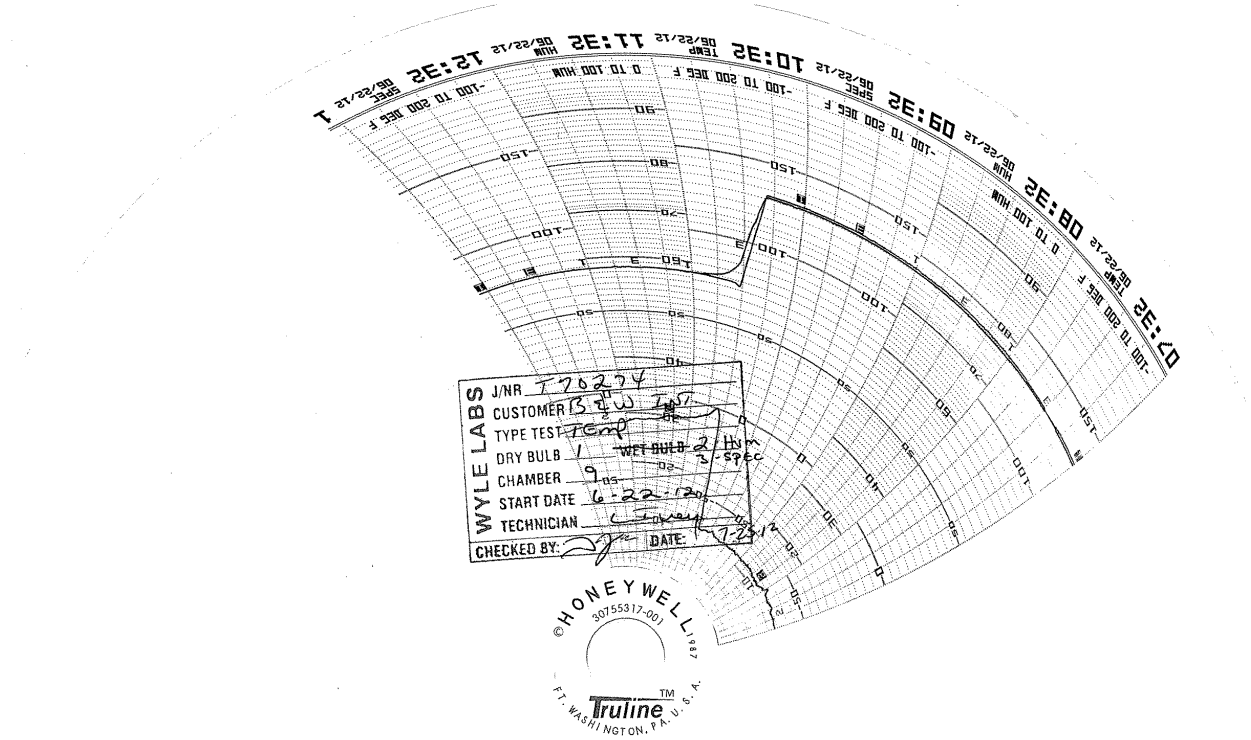

WYLE LABS
J/NR T 70274
CUSTOMER B&W IWT
TYPE TEST Low Temp
DRY BULB
WET BULB
CHAMBER 9
START DATE 6/19/2012
TECHNICIAN Jeanne Turner
CHECKED BY:
DATE: 7-25-12
Truline
©HONEYWELL 1987
FT. WASHINGTON, PA. U.S.A.

ATTACHMENT C

DRY HEAT TEST DATA

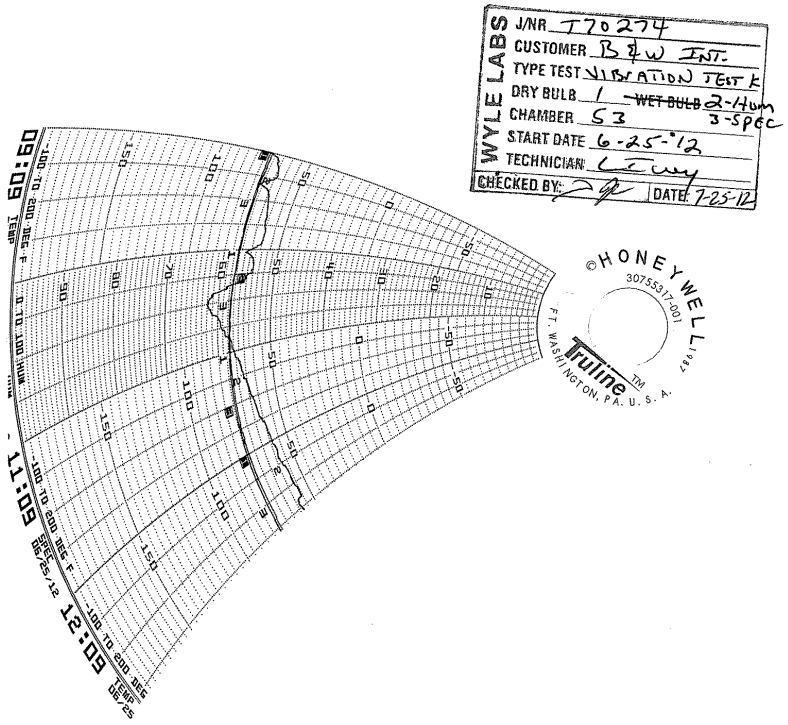

WYLE LABS
J/NR T70274
CUSTOMER
TYPE TEST
DRY BULB
WET BULB
CHAMBER
START DATE 6-20-12
TECHNICIAN
CHECKED BY:
DATE:
HONEYWELL
Truline
-100 TO 200 DEG F
0 TO 100 HUM


WYLE LABS
J/NR T70274
CUSTOMER
TYPE TEST Temp
DRY BULB 1
WET BULB 2 Hum
3 Spec
CHAMBER 9
START DATE 6-21-12
TECHNICIAN
CHECKED BY
DATE 7-25-12
HONEYWELL
Truline


WYLE LABS
J/NR T70274
CUSTOMER B & W
TYPE TEST TEMP
DRY BULB 1
WET BULB 2 HR
3-SEC
CHAMBER 9
START DATE 6-22-12
TECHNICIAN
CHECKED BY:
DATE: 7-23
HONEYWELL
307553I7-001
1987
Truline
FT. WASHINGTON, PA. U.S.A.

ATTACHMENT D

SINUSOIDAL VIBRATION (K) TEST DATA


WYLE LABS
J/NR T70274
CUSTOMER B & W INST.
TYPE TEST VIBRATION TEST K
DRY BULB 1 WET BULB 2-Hum 3-Spec
CHAMBER 53
START DATE 6-25-12
TECHNICIAN
CHECKED BY:
DATE 7-25-12
©HONEYWELL 1987
3075317-001
Truline
FT. WASHINGTON, PA. U.S.A.
08:08
11:09
12:09

VIBRATION TEST DATA SHEET

Customer **B&W INTERNATIONAL** Spec. **DEF-STAN 81-41** Specimen **RUGGEDIZED CASE**

Job No. **T70274** Method **N/A** Part No. **N/A** Specimen Temp. **AMBIENT**

GSI Yes [ ] No [X] Procedure **Wyle Quote No. 542/054667/MT dated 01-20-2012** S/N **T70274-002** Photo Yes [X] No [ ]

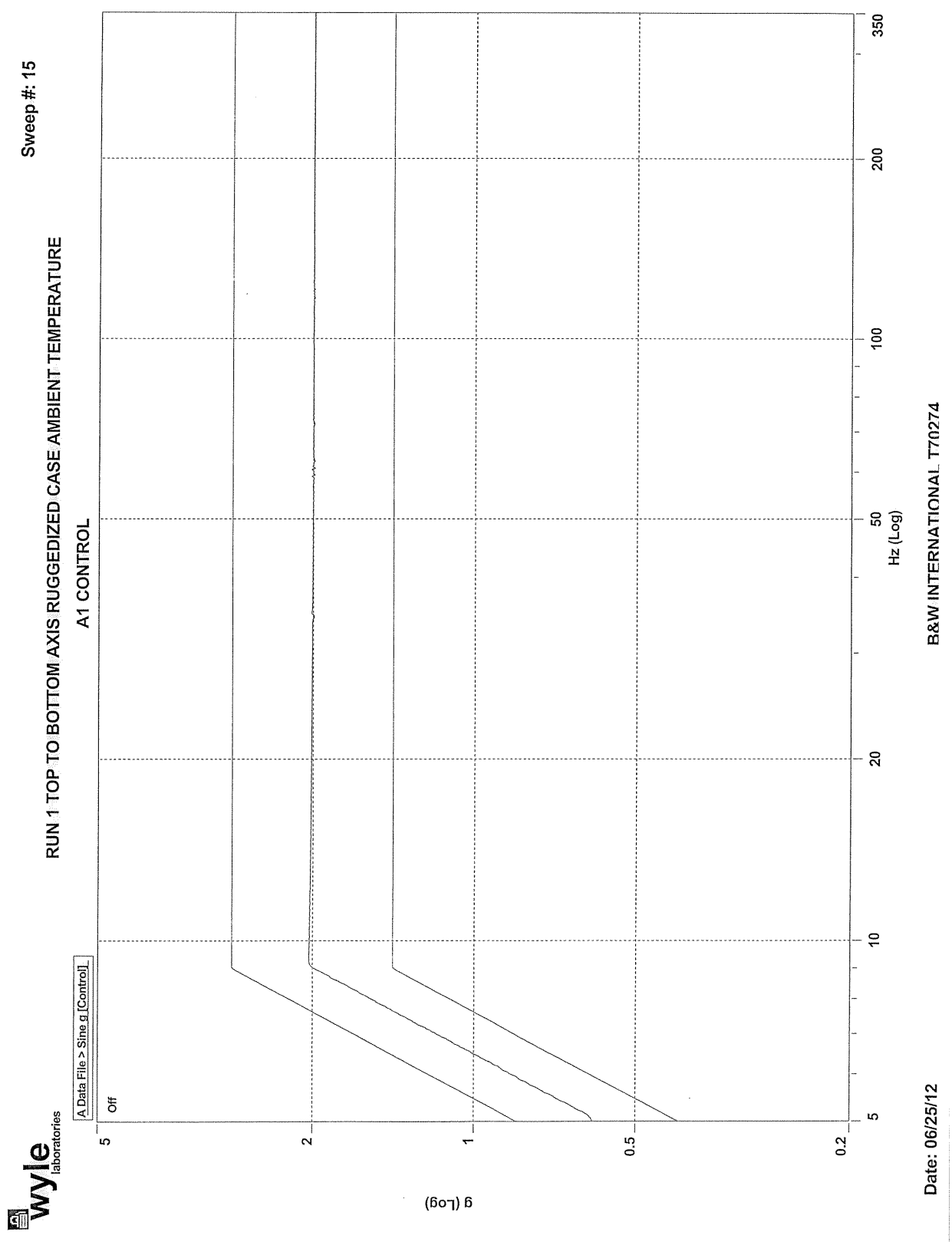
Test Title **SINUSOIDAL VIBRATION (K)**

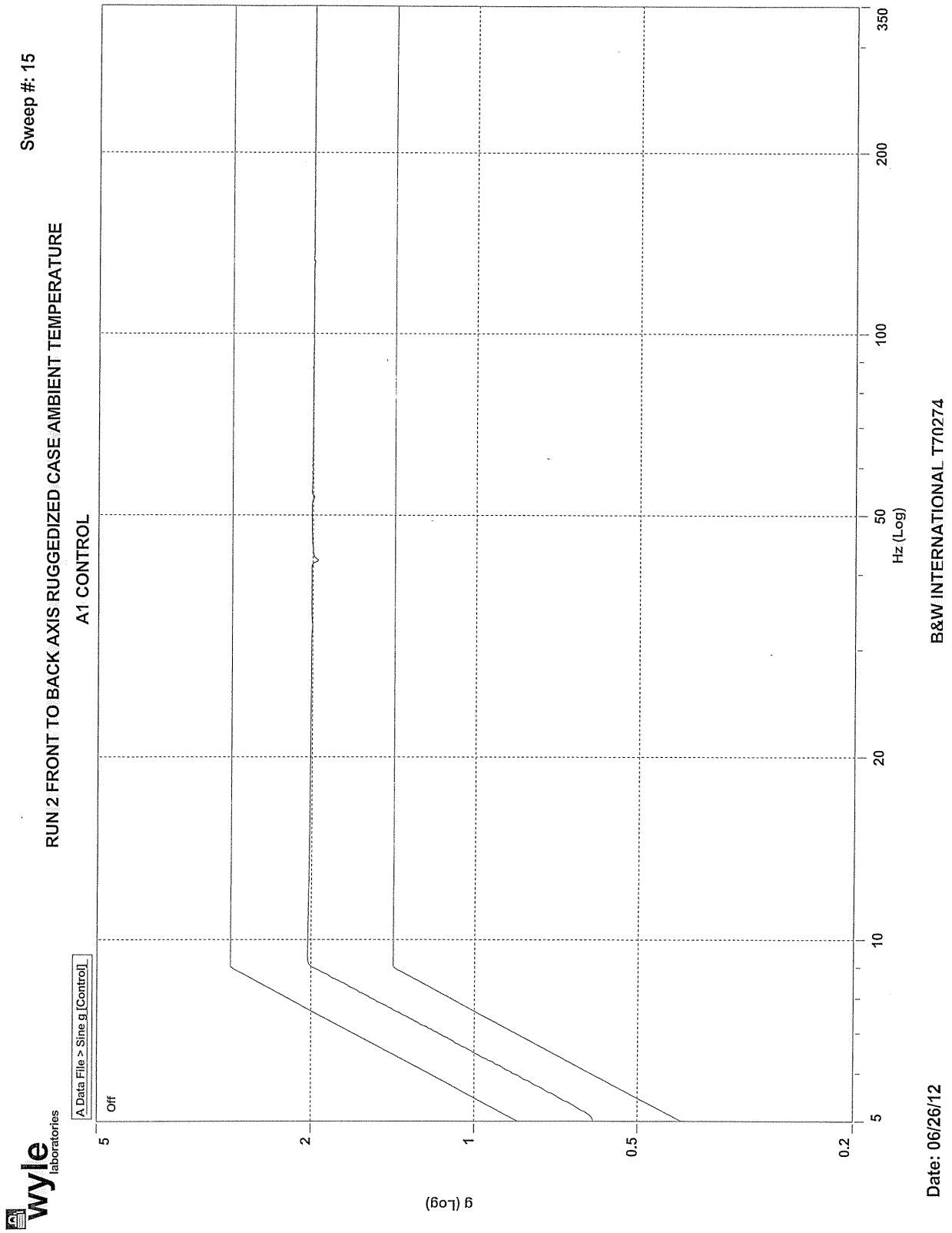
Date	Time	Axis	Temp (F)	SINUSOIDAL Freq. (cps)	SINUSOIDAL Disp. ("da)	SINUSOIDAL Accel. (±g)	RANDOM Freq. (cps)	RANDOM PSD (g2/Hz)	RANDOM Slope (dB/Oct)	TOTAL Accel. (grms)	Test Time (sec)	COMMENTS	NAME
												TEST REQUIREMENT	
6/25/12	10:09	T-B	AMB	5	0.46							RUN 1	CT
				9		2.0							
				350		2.0					7355		
6/26/12	07:41	F-B	AMB	5	0.46							RUN 2	CT
				9		2.0							
				350		2.0					7355		
6/26/12	10:04	S-S	AMB	5	0.46							RUN 3	CT
				9		2.0							
				350		2.0					7355		

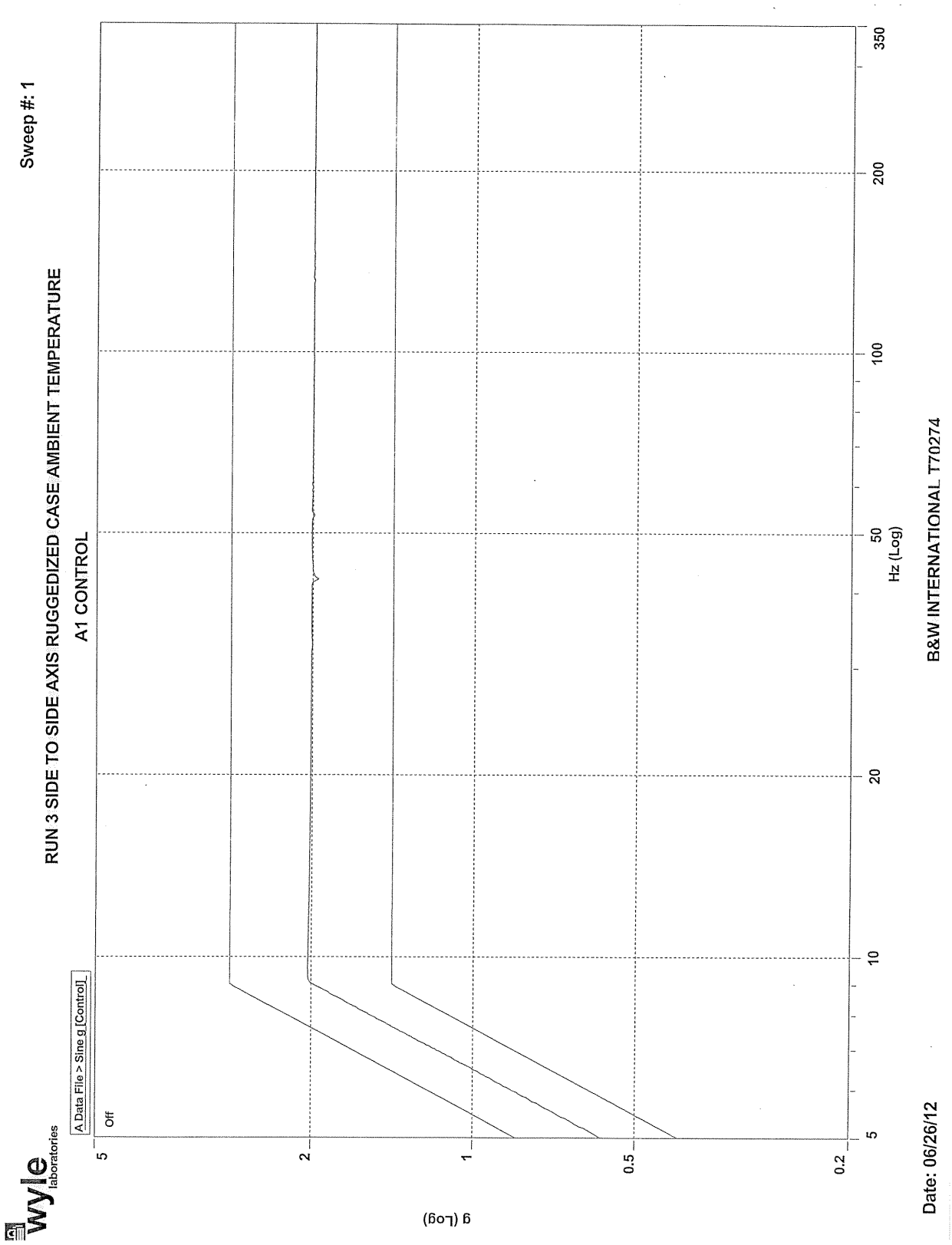
Job No. T70274
Report No. T70274-01
Date 6/28/2012
Page No. 1 of 1

WH-1028A

Signed C. Tennos 7-26-12 Approved [signature] 7-26-12


wyle laboratories
Sweep #: 15
RUN 1 TOP TO BOTTOM AXIS RUGGEDIZED CASE AMBIENT TEMPERATURE
A1 CONTROL
A Data File > Sine g [Control]
Off
g (Log)
5
2
1
0.5
0.2
5
10
20
50
100
200
350
Hz (Log)
B&W INTERNATIONAL T70274
Date: 06/25/12


Sweep #: 15
RUN 2 FRONT TO BACK AXIS RUGGEDIZED CASE AMBIENT TEMPERATURE
A1 CONTROL
A Data File > Sine g [Control]
Off
g (Log)
5
2
1
0.5
0.2
5
10
20
50
100
200
350
Hz (Log)
B&W INTERNATIONAL T70274
Date: 06/26/12


Sweep #: 1
RUN 3 SIDE TO SIDE AXIS RUGGEDIZED CASE AMBIENT TEMPERATURE
A1 CONTROL
A Data File > Sine g [Control]
Off
5
2
1
0.5
0.2
g (Log)
5
10
20
50
100
200
350
Hz (Log)
wyle laboratories
B&W INTERNATIONAL T70274
Date: 06/26/12

ATTACHMENT E

IMPACT TEST DATA

DATA SHEET

wyle laboratories

Customer B&W International
Specimen Ruggedized Case
Part No. N/A | Amb. Temp. Yes | Job No. T70274
Spec. DEF-STAN 81-41 | Photo Yes | Report No. T70274-01
Para. N/A | Test Med. N/A | Start Date 06/27/12
S/N T70274-002 | Specimen Temp. Ambient | GSI No

Test Title Impact

Date	Time	Temp	Drop Height	Location	Comments	Initials
6/27/12	10:00	AMB	39.4"	BOTTOM	DROP 1 (No damage)	CT
6/27/12	10:05	AMB	39.4"	TOP	DROP 2 (No damage)	CT
6/27/12	10:09	AMB	39.4"	LEFT	DROP 3 (No damage)	CT
6/27/12	10:14	AMB	39.4"	RIGHT	DROP 4 (No damage)	CT
6/27/12	10:16	AMB	39.4"	NEAR	DROP 5 (No damage)	CT
6/27/12	10:20	AMB	39.4"	FAR	DROP 6 (No damage)	CT

Tested By C. Simmons Date: 7-26-12
Witness — Date: —
Sheet No. — of —
Approved [signature] 7-26-12

Notice of Anomaly: N/A

Wyle Form WH 614A, Rev. APR '84

ATTACHMENT F

INSTRUMENTATION EQUIPMENT SHEETS

wyle laboratories

INSTRUMENTATION EQUIPMENT SHEET

DATE: 6/19/2012 JOB NUMBER: T70274 TYPE OF TEST LOW TEMP/HIGH TEMP

TECHNICIAN: T TURNER CUSTOMER: B&W INT TEST AREA: CHAMBER 9

No.	Description	Manufacturer	Model	Serial #	WYLE #	RANGE	ACCURACY	Cal Date	Cal Due
1	HUMIDITY\TEMP	VAISALA	HMT315	H1410001	01611	MULTI	MFG	4/30/2012	10/30/2012
2	TEMP ALARM	THERMOTRON	THERM-ALARM	923494	03144	TYPE T	±1°C	2/17/2012	2/17/2013
3	TEMP	THERMOTRON	4800	822825	03143	-125-375°F	.25%	2/17/2012	2/17/2013
4	TEMP RECORDER	HONEYWELL	DR450T	924488505000	109831	-200-600°F	.4°F	2/17/2012	2/17/2013

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION: Terrance Turner 6/19/12 CHECKED & RECEIVED BY: 6-19-12

Q.A.: Patti Bennett 6-19-12

WH-1029A,REV,APR'99

wyle laboratories

INSTRUMENTATION EQUIPMENT SHEET

DATE: 6/20/2012 JOB NUMBER: T70274 TYPE OF TEST DRY HEAT

TECHNICIAN: T TURNER CUSTOMER: B&W INT TEST AREA: CHAMBER 9

No.	Description	Manufacturer	Model	Serial #	WYLE #	RANGE	ACCURACY	Cal Date	Cal Due
1	HUMIDITY\TEMP	VAISALA	HMT315	H1410001	01611	MULTI	MFG	4/30/2012	10/30/2012
2	TEMP ALARM	THERMOTRON	THERM-ALARM	923494	03144	TYPE T	±1°C	2/17/2012	2/17/2013
3	TEMP	THERMOTRON	4800	822825	03143	-125-375°F	.25%	2/17/2012	2/17/2013
4	TEMP RECORDER	HONEYWELL	DR450T	924488505000	109831	-200-600°F	.4°F	2/17/2012	2/17/2013

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION: Terrance Turner 6/20/12 CHECKED & RECEIVED BY: 6-20-12

Q.A.: Patrick Arcuri 6-20-12

WH-1029A,REV,APR'99

wyle laboratories

INSTRUMENTATION EQUIPMENT SHEET

DATE: 6/25/2012 JOB NUMBER: T70274 TYPE OF TEST VIBRATION

TECHNICIAN: C TINNON CUSTOMER: B&W INTERNATIONAL TEST AREA: DYN LAB

No.	Description	Manufacturer	Model	Serial #	WYLE #	RANGE	ACCURACY	Cal Date	Cal Due
1	ACCELEROMETER	ENDEVCO	7704A-50	12634	04866	50pC/g	±5%	4/10/2012	10/7/2012
2	CHARGE	ENDEVCO	2775	AL43	102281	GAIN	1.55	1/30/2012	7/30/2012
3	DMM	KEITHLEY	179A	196804	101203	1200VDC	±.04%DC	3/5/2012	3/5/2013
4	HUMIDITY\TEMP	VAISALA	HMT315	H0430014	01502	MULTI	MFG	2/3/2012	8/3/2012
5	TEMP ALARM	THERMOTRON	012005	008287	101875	-125 to 375°F	.25%	12/7/2011	12/7/2012
6	TEMP	THERMOTRON	4800	N/A	108984	-125-375°F	.25%	12/7/2011	12/7/2012
7	TEMP RECORDER	HONEYWELL	DR45AT	0001Y044598	115968	-200 - 600°F	.4°F	12/7/2011	12/7/2012
8	VIB CONTROL	SPECTRAL DYN	2432-9700-1	2400-1656	116778	MFG	MFG	2/1/2012	2/1/2013

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION: C. Tinnon 6.25.12 CHECKED & RECEIVED BY: 6-25-12

Q.A.: Brenda Mayo 6/25/12

WH-1029A,REV,APR'99

wyle laboratories

INSTRUMENTATION EQUIPMENT SHEET

DATE: 6/27/2012 JOB NUMBER: T70274 TYPE OF TEST DROP

TECHNICIAN: C TINNON CUSTOMER: B&W INTERNATIONAL TEST AREA: DYN LAB

No.	Description	Manufacturer	Model	Serial #	WYLE #	RANGE	ACCURACY	Cal Date	Cal Due
1	RULER	PRODUCTS ENGIN	TEMPERED	NSN	04468	48"	±1/32NDS	6/21/2012	6/21/2014

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION: C. Tinnon 6-27-12 CHECKED & RECEIVED BY: 6-27-12

Q.A.: 6/27/2012

WH-1029A,REV,APR'99