
Pacific Energy

REVISED 3/11/2021

PFS TECO Project # 21-684

(Formerly Dirigo Project # 034-S-050-5)

Model: True North 40, TN40, TN40FS

Type: Free Standing Residential

Wood Fired Pellet Heater

EPA Certification Testing to
ASTM E2779.10 Determining
Particulate Matter Emissions From
Pellet Heaters

Contact:

Mr. Jeff Bain

2975 Allenby Rd

Duncan, BC Canada

V9L 6V8 (250) 715-

2398

Jeff.Bain@pefp.net

Revised by: Sebastian Button,

Laboratory Manager



11785 SW Highway 212 – Suite 305

Clackamas, OR 97015-9050

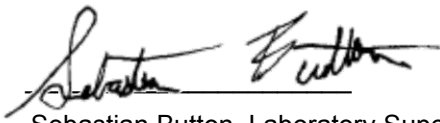
(503) 650-0088

Revision Summary

Date: December 22, 2015 – Original Issue from Dirigo Laboratories

Date: March 11, 2021 – The following revisions were made:

- 0.04 g/min of CO were added to the Certificate of Conformity (CoC)
- The test method used was added to the CoC
- The Certificate of Conformity was reissued under PFS TECO
- Train precision was verified to be within 7.5% if average emissions (in grams) or emission factors within 0.5 g/kg
- Raw Data added to Non-CBI report

A handwritten signature in black ink, appearing to read 'Sebastian Button', is written over a horizontal line.

Reviewed by: Sebastian Button, Laboratory Supervisor

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Raw Data

Affidavit:

Dirigo Laboratories, Inc. was contracted by Pacific Energy, Inc. to provide testing services to the True North 40 – Free Standing residential wood fired pellet heater per EPA Method 28R and ASTM E2779-10, *Standard Test Method for determining Particulate Matter Emissions from Pellet Heaters*. Particulate sampling was performed per ASTM E2515-11, *Standard Test Method for Determination of Particulate Matter Emissions Collected in a Dilution Tunnel*. All testing and associated procedures were conducted at Dirigo Laboratories, Inc. beginning 8/25/2015 and ending on 8/27/2015. Dirigo Laboratories is located at 11785 SE Highway 212 – Suite 305, Clackamas, Oregon 97015-9050.

Dirigo Laboratories is accredited by the U.S. Environmental Protection Agency for the certification and auditing of wood heaters pursuant to Subpart AAA of 40 CFR Part 60, *New Source Performance Standards for Residential Wood Heaters* and Subpart QQQQ of 40 CFR 60, *Standards of Performance for New Hydronic Heaters and Forced Air Furnaces*. Dirigo is certified for Methods 28R, 28 WHH, 28 WHH-PTS and all methods listed in Sections 60.534 and 60.5476. Dirigo holds EPA Accreditation Certificate Numbers 4 and 4M (mobile). Dirigo Laboratories, Inc. is accredited by A2LA to ISO 17020:2012 “Criteria for Bodies Performing Inspections”; ISO 17025:2005 “Requirements for Testing Laboratories”; and ISO 17065:2012 “Requirements for Bodies Operating Product Certification Systems”. Dirigo holds A2LA Certificate Numbers 3726.01, 3726.02, and 3726.03.

See Appendix E for Certifications.

The following people were associated with the testing, analysis and report writing associated with this project.

**John
Steinert**

Digitally signed by John Steinert
DN: cn=John Steinert, o=Dirigo
Laboratories, ou,
email=jsteinert@dirigolab.com,
c=US
Date: 2015.11.11 11:45:59 -08'00'

John Steinert, President

Gary Nelke

Digitally signed by Gary Nelke
DN: cn=Gary Nelke, o=Dirigo
Laboratories, Inc, ou=Operations,
email=gnelke@dirigolab.com,
c=US
Date: 2015.11.12 15:49:57 -08'00'

Gary Nelke, CMfgE

Ben Nelke

Digitally signed by Ben Nelke
DN: cn=Ben Nelke, o=Dirigo,
ou=Dirigo,
email=Bnelke@dirigolab.com, c=US
Date: 2015.11.12 15:54:44 -08'00'

Ben Nelke, Technician

NON-CBI

Introduction:

Pacific Energy Inc. of Duncan, BC CANADA, contracted with Dirigo Laboratories, Inc. to perform EPA certification testing on their True North non-catalytic Free Standing Pellet Fired Residential Wood Heater. All testing was performed at Dirigo Laboratories, Inc. Testing was performed by Mr. Ben Nelke, and Mr. Gary Nelke, CMfgE.

Notes:

- A 50 hour break-in was performed at a medium burn setting on the appliance by the manufacturer prior to testing. Data provided in separate electronic folder and in this document.
- Prior to testing, the dilution tunnel was cleaned with a steel brush.
- All runs were performed with the convection air blower in operation.
- Front filters of sample train A were changed at one hour.
- A total of 3 integrated runs were performed at the clients request and two thirds of the results (runs 2 & 3) were used in the calculation of the results- per section 9.4.8 of ASTM E2779-10.

Wood Heater Identification and Testing:

- Appliance Tested: ***Pacific Energy True North 40***
- Serial Number: **TN40 002**
- Manufacturer: ***Pacific Energy Inc.***
- Catalyst: **No**
- Heat exchange blower: ***Integral***
- Type: ***Pellet Stove***
- Style: ***Free Standing***
- Date Received: ***Monday, August 24, 2015***
- Wood Heater Aging: ***August 12-14, 2015***
- Testing Period – Start: ***Tuesday, August 25, 2015*** Finish: ***Thursday, August 27, 2015***
- Test Location: ***Dirigo Laboratories, Inc. -11785 SE HWY 212 – Suite 305, Clackamas, OR 97015***
- Elevation: ***30 Feet above sea level***
- Test Technician(s): ***Ben Nelke, Gary Nelke***

Test Procedures and Equipment:

All Sampling and analytical procedures were performed by Ben Nelke and Gary Nelke. All procedures used were directly from EPA Method 28R, ASTM E2779-10 and ASTM E2515-11. See Figures 1, 2, for equipment used. See Appendix D for calibration data.

Equipment List:

1. Analyzer - California Analytical ZRE CO₂/CO/O₂ IR ANALYZER
2. Delmhorst J-2000 Wood Moisture Meter
3. Dayton 4c121 Blower for dilution tunnel - Emissions Booth #2
4. ScienTech Balance Scale
5. 10 lb Calibration Weight
6. DigiWeigh Bench Shipping Scale
7. APEX XC-60 Digital Emissions Sampling Box A
8. APEX XC-60 Digital Emissions Sampling Box B
9. APEX Ambient sampling box
10. Gast MOA-P122-AA Vacuum Pump -Analyzer
11. Rice Lake 3'x3' floor scale w/digital weight indicator

Results:

The overall average emission rate is **1.36 g/hr** with an average efficiency of **72.15%** and average CO emissions of **0.05 g/min**. The Pacific Energy True North 40 freestanding pellet stove meets the 2020 PM emission standard of ≤ 2.0 g/hr per CFR 40 part 60, §60.532 (b).

Detailed individual run data can be found in separate digital folders supplied with this report. All runs were appropriate and valid.

Run	1st Hour Particulate Emissions- g/hr	Overall Avg. Emission Rate g/hr	Overall Efficiency HHV CSA B415.1-10	Output BTU/hr. HHV CSA B415.1-10	Burn Rate kg/hr. CSA B415.1-10	CO g/hr
1*	1.84.	0.6	65.3 %	12,472	1.02	7.45
2	4.51	1.17	71.1%	13,676	1.02	2.57
3	5.78	1.54	73.2%	13,674	0.99	2.87
Average of Two-Thirds Results	5.15 g/hr	1.36 g/hr	72.15%	13,675	1.005	2.72

Run 1:

*-This run was thrown out due to an incorrect air setting. The manufacturer updated the control board to achieve the correct setting and two additional runs were performed per the requirements of ASTM E2779-10.

Run 2:

No anomalies. All burn rate categories were achieved. All results were appropriate and valid.

Run 3:

No anomalies. All burn rate categories were achieved. All results were appropriate and valid.

Filter Catch:

Run 1:

Project #	034-S-050-5					MFG	Pacific Energy				
Run #	1					Model	True North 40				
Date	8/27/15										

Train A	Front	Rear	Filter #	Tare	Final	Net	Train B	Front	Rear	Filter #	Tare	Final	Net		
	☒	☐	2507	0.1151	0.1169	0.0018		☒	☐	2509	0.1137	0.1172	0.0035		
	☐	☒	2508	0.1196	0.1196	0		☐	☒	2510	0.1139	0.1139	0		
	☒	☐	2512	0.1203	0.122	0.0017		☐	☐				0		
	☐	☐				0		☐	☐				0		
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	☐	☐				0		☐	☐				0		
Nozzle						3.5	mg	Nozzle						3.5	mg

#	TARE	FINAL	Net
10A	116.8529	116.8528	0

#	TARE	FINAL	Net
10B	117.1909	117.1909	0

Ambient	Filter #	Tare	Final	Net	Vol (liliter)
	2511	0.1191	0.1191	0	1959.798

Notes: Train A Total: 3.5mg Train B Total: 3.5mg Ambient Total: 0.0mg 1 Hour Catch: 1.8mg

Run 2:

Project #	034-S-050-5					MFG	Pacific Energy				
Run #	2					Model	True North 40				
Date	8/28/15										

Train A	Front	Rear	Filter #	Tare	Final	Net	Train B	Front	Rear	Filter #	Tare	Final	Net		
	☒	☐	2513	0.1209	0.1252	0.0043		☒	☐	2515	0.1208	0.1249	0.0041		
	☐	☒	2514	0.1191	0.1192	0.0001		☐	☒	2516	0.1192	0.1194	0.0002		
	☒	☐	2518	0.1212	0.1236	0.0024		☒	☐	2519	0.1213	0.124	0.0027		
	☐	☐				0		☐	☐				0		
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Nozzle						6.8	mg	Nozzle						7	mg

#	TARE	FINAL	Net
2A	116.2514	116.2514	0

#	TARE	FINAL	Net
2B	116.3501	116.35	0

Ambient	Filter #	Tare	Final	Net	Vol (liliter)
	2517	0.1197	0.1199	0.0002	2012.363

Notes: Train A Total: 6.8mg Train B Total: 7mg Ambient Total: 0.2mg 1 Hour Catch: A: 4.3mg B: 4.1mg

Run 3:

Project #	034-S-050-5		MFG	Pacific Energy	
Run #	3		Model	True North 40	
Date					

Train A	Front	Rear	Filter #	Tare	Final	Net
	☒	☐	2520	0.1213	0.1268	0.0055
	☐	☒	2521	0.119	0.119	0
	☒	☐	2525	0.1217	0.1253	0.0036
	☐	☐				0
	☐	☐				0
	☐	☐				0
	☐	☐				0
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	☐	☐				0
	☐	☐				0
	☐	☐				0
Nozzle						9.1 mg

Train B	Front	Rear	Filter #	Tare	Final	Net
	☒	☐	2522	0.1207	0.1267	0.006
	☐	☒	2523	0.1216	0.1216	0
	☒	☐	2526	0.1215	0.1245	0.003
	☐	☐				0
	☐	☐				0
	☐	☐				0
	☐	☐				0
	☐	☐				0
	☐	☐				0
	☐	☐				0
	☐	☐				0
	☐	☐				0
	☐	☐				0
	☐	☐				0
Nozzle						9 mg

#	TARE	FINAL	Net
3A	116.0913	116.0913	0

Ambient	Filter #	Tare	Final	Net	Vol (liter)
	2524	0.1207	0.1209	0.0002	2028.912

Notes:	Train A Total: 9.1mg Train B Total: 9mg Ambient Total: 0.2mg 1 Hour Catch: A: 5.5mg B: 6mg				
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Test Condition Summary:

All testing conditions for all runs fell within allowable specifications of EPA Method 28R, ASTM E2779-10 and ASTM E2515-11. A summary of facility conditions, temperature averages, fuel burned and run times is listed below.

Runs	Ambient (Deg. F)		Barometric Pressure (In. Hg.)	Test Fuel Burned (Lbs.)	Test Fuel Moisture (Dry Basis)	Run Time (Min.)
	Pre	Post				
1	78	81	29.99	13.8	2.73	360
2	80	86	29.97	13.9	2.73	360
3	81	86	30.03	13.5	2.73	360

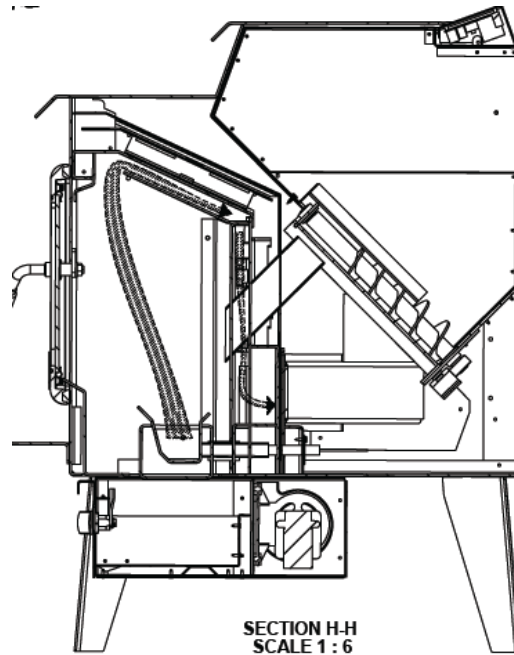
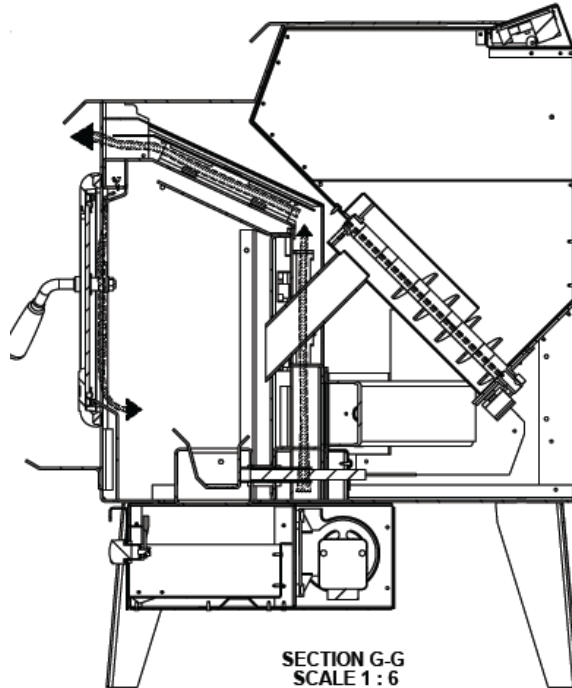
Heater Specifications:

Dimensions, firebox configuration, air supply locations, air introduction locations, and baffle locations of the wood heater are referenced below.

Heater Dimensions

Heater Dimensions				
Height	Width	Depth	Firebox Volume	Weight
32 7/8"	24"	25 3/8"	0.65 Cu.ft	256 lbs.

Air Flow Schematic



Front



Left



Right



Rear



Process Operations and Description:

The appliance was operated according to procedures as described in the Operations Manual. Preset automatic feed rates were utilized to obtain the necessary burn rates. Detailed Run information can be found in corresponding digital folders submitted with this report.

Settings & Run Notes

	Run Notes	
	Pre-Burn	Test Run
Run1	8/25/15 Start @ 12:46 pm- 1hr	Start 13:50 on high, Change front filter at 1hr & turned to Medium. Set to low at 3hr. End Test at 6hr. - Run thrown out
Run 2	8/26/15 Start @ 12:10pm -1hr	Start at 13:10 on high. Change front filter and set to medium at 1hr. Turned to low at 3 hr. Run time 6 hr.
Run 3	8/27/15 Start @ 12:02pm -1 hr	Start at 13:05 on high. Change front Filter @ 1hr & set to Medium. Turned to low at 3 hour mark. Run time 6 hr.

Test Fuel Properties:





Twin Ports Testing, Inc.
1301 North 3rd Street
Superior, WI 54980
p: 715-392-7114
p: 800-379-2562
f: 715-392-7183
www.twinportstesting.com

Analytical Test Report

Report No: USR:W215-0947-01
Issue No: 1

Client: DIRIGO LABORATORIES, INC
11785 SE Highway 212
Clackamas, OR 97015
Attention: John Steinert
PO No: Pac Energy

Signed: *Stephen Surdeen*
Stephen Surdeen
Chemistry Laboratory Manager
Date of Issue: 9/5/2015
THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

Sample Log No: W215-0947-01
Sample Designation: Wood Pellets
Sample Recognized As: Pellets

Sample Date: 8/25/2015
Sample Time:
Arrival Date: 8/31/2015

Test Results

	METHOD	UNITS	MOISTURE FREE	AS RECEIVED
Moisture Total	ASTM E871	wt. %		2.73
Ash	ASTM D1102	wt. %		
Volatile Matter	ASTM D3175	wt. %		
Fixed Carbon by Difference	ASTM D3172	wt. %		
Sulfur	ASTM D4239	wt. %	0.010	0.010
SO ₂	Calculated	lb/mmmbtu		0.022
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne		
Net Cal. Value at Const. Pressure	ISO 1928	J/g		
Gross Cal. Value at Const. Vol.	ASTM E711	J/g	20294	19739
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8725	8487
Carbon	ASTM D5373	wt. %		
Hydrogen*	ASTM D5373	wt. %		
Nitrogen	ASTM D5373	wt. %		
Oxygen*	ASTM D3176	wt. %		

*Note: As received values do not include hydrogen and oxygen in the total moisture

Chlorine	ASTM D6721	mg/kg
Fluorine	ASTM D3761	mg/kg
Mercury	ASTM D6722	mg/kg

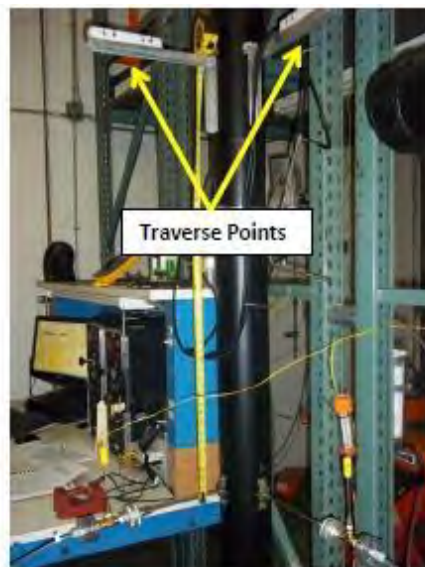
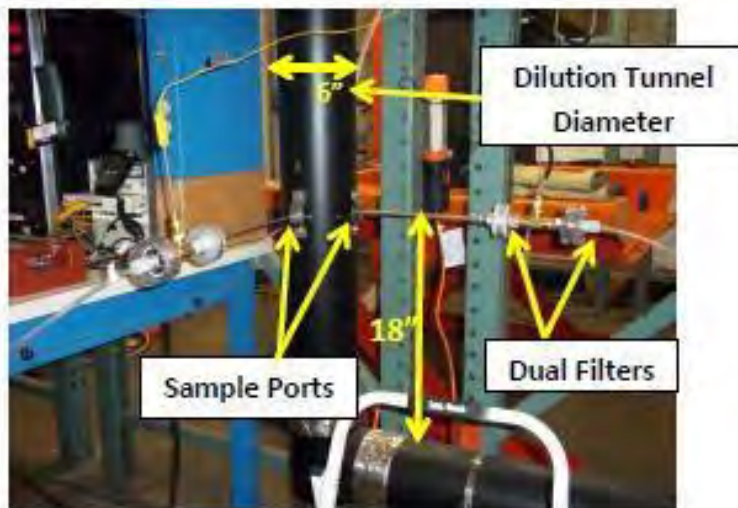
Bulk Density	ASTM E873	lbs/ft ³	
Fines (Less than 1/8")	TPT CH-P-06	wt. %	
Durability Index	Kansas State	PDI	
Sample Above 1.50"	TPT CH-P-06	wt. %	
Maximum Length (Single Pellet)	TPT CH-P-06	inch	
Diameter, Range	TPT CH-P-06	inch	to
Diameter, Average	TPT CH-P-06	inch	
Stated Bag Weight	TPT CH-P-01	lbs	
Actual Bag Weight	TPT CH-P-01	lbs	

Comments

Sampling Locations and Descriptions:

Sample ports are located 16.5 feet downstream from any disturbances and 1 foot upstream from any disturbances. Flow rate traverse data was collected 12 feet downstream from any disturbances and 5.5 feet upstream from any disturbances. (See below)

Sample Points



Sampling Methods:

ASTM E2515-11 was used in collecting particulate samples. The dilution tunnel is 6 inches in diameter. All fueling and operating protocols per ASTM E2779-10 were followed. No alternate procedures were used.

Analytical Methods Description:

All sample recovery and analysis procedures followed ASTM E2515-11 procedures. At the end of each test run, filters and probes were removed from their housings, dessicated for 24 hours, and then weighed to a constant weight per ASTM E2515-11 Section 10.

Calibration, Quality Control and Assurances:

Calibration procedures and results were conducted per ASTM E2515-11 Section 8 and ASTM E2779-10 Section 8. Test method quality control procedures (leak checks, volume meter checks, stratification checks, proportionality results) followed procedures outlined in ASTM E2515-11.

Appliance Sealing and Storage:

Following securing with metal strapping and the seal below, the appliance was placed into storage at client facilities located at: 2975 Allenby Rd – Duncan, BC V9L 6V8

Sealing Label

ATTENTION:	
THIS SEAL IS NOT TO BE BROKEN WITHOUT PRIOR AUTHORIZATION FROM THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY.	
THIS APPLIANCE HAS BEEN SEALED IN ACCORDANCE WITH REQUIREMENTS OF 40 CFR PART 60 SUBPART AAA §60.535(g)	
REPORT # _____	DATE SEALED _____
MANUFACTURER _____	MODEL # _____

Sealed Unit



Appendices:

Appendix A:

Sampling and Analytical Procedures

All Sampling and analytical procedures were performed by Ben Nelke and Gary Nelke. All procedures used were directly from EPA Method 28R, ASTM E2779-10 and ASTM E2515-11. No alternative procedures were used for this test series.

Appendix B:

Participants

The following personnel performed all testing.
Ben Nelke, Gary Nelke, CMfgE

Analysis and Report Writing

The following people were involved with analysis and report writing.

- Ben Nelke, Gary Nelke, CMfgE
- John Steinert, Doug Towne

Observers:

The following people were observers during testing:

- Jeff Bain

Appendix C:

Appliance Updates

No updates to the appliance were made.

Appendix D:

Test Equipment Calibration Audit:

- Calibrations for the platform scale and bench scale were performed with Certified Class F weights
- Gas Analyzer calibration performed with certified EPA Protocol gases
- 47mm filters weighed to a constant weight with calibrated analytical balance

All equipment calibration data has been submitted in a separate digital file along with this report.

Appendix E:

Accreditations:

CERTIFICATE OF ACCREDITATION

This certifies that:



Oirigo Laboratories, Inc.

Has satisfied the requirements for laboratory accreditation for the certification of wood heaters pursuant to subpart AAA of 40 CFR Part 60, New Source Performance Standards For Residential Wood Heaters and subpart QQQQ of 40 CFR Part 60, Standards of Performance for New Hydronic Heaters and Air Furnaces.

Clockwise: 21. 2015 - October 21, 2016

DATE

MEASUREMENT | BIOLOGY GROUP
GROUP LEADER

Methods 28R28 WHH.28 WHH-TJS.
All Methods will 60.534 and 60.576
METHODS

4

CERTIFICATE NUMBER

CERTIFICATE OF ACCREDITATION

This certifies that:



Dirigo Laboratories, Inc. (Mobile Laboratory)

Has satisfied the requirements for laboratory accreditation for the certification of wood heat as pursuant to subpart AAA of 40 CFR Part 60, New Source Performance Standards For Residential Wood Heaters

U.S. EPA
Director


MEASUREMENT TECHNOLOGY GROUP
GROUP LEADER

Portland, Maine
Method

CERTIFICATE NUMBER



American Association for Laboratory Accreditation

Accredited Inspection Body

A2LA has accredited

DIRIGO LABORATORIES, INC.

Clackamas, OR

for technical competence as an

Inspection Body

This inspection body is accredited in accordance with the recognized International Standard
ISO/IEC 17020:2012 *Conformity Assessment- Requirements for the operation of various types of bodies performing inspection*.
This accreditation demonstrates technical competence for a defined scope and the operation of a quality management system.

Presented this 17th day of October 2014.



President & CEO
For the Accreditation Council
Certificate Number 3726.03
Valid to December 31, 2016

For the inspection body which this accreditation applies, please refer to the organization's Inspection Body Scope of Accreditation.



American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

DIRIGO LABORATORIES, INC.

Clakamas, OR

for technical competence in the field of

Mechanical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated 8 Jan (Jty 2009).

Presented this 17th day of October 2014.



|||!a

for the Accreditation Council
Certificate Number 3726.01
Valid to December 31, 2016

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Mechanical Scope of Accreditation.



American Association for Laboratory Accreditation

Accredited Product Certification Body

A2LA has accredited

DIRIGO LABORATORIES, INC.

Clackamas, OR

for technical competence as a

Product Certification Body

This product certification body is Accredited in accordance with the recognized International Standard ISO/IEC 17065:2012 Conformity Assessment – Requirements for Bodies Certifying Products, Processes and Services.

This accreditation demonstrates technical competence for a defined scope and the operation of a quality management system.

Presented this 17th day of October 2014.



For the Accreditation Council

Certificate Number 3726.02

Valid 10 December 31, 2016

For the product certification systems to which this accreditation applies, please refer to the scope of accreditation.

IMPORTANT:
THESE INSTRUCTIONS ARE TO
REMAIN WITH THE HOMEOWNER.
SAVE THESE INSTRUCTIONS



SAFETY NOTICE

Please read this entire manual before installation and use of this pellet fuel-burning room heater. Failure to follow these instructions could result in property damage, bodily injury or even death.

INSTALLATION AND OPERATING INSTRUCTIONS



FREESTANDING WOOD PELLET STOVE

MODEL:TN40

SERIES: A

Contact your local building or fire officials regarding permits and any information on installation and inspection requirements in your area.

TESTED and LISTED to ASTM 1509-12,
CAN/ULC S627 AND UL 1482-11



Visit www.truenorthstoves.com for the most up-to-date version of this manual

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WARNING: this product can expose you to chemicals including ceramic fibers, which are known to the state of California to cause cancer, and to carbon monoxide, which is known to the state of California to cause birth defects or other reproductive harm.

For more information go to www.p65warnings.ca.gov.



**This warning is applicable to all
PACIFIC ENERGY FIREPLACE
PRODUCTS**

Introduction

SAVE THIS INSTRUCTION MANUAL FOR FUTURE REFERENCE

This manual describes the installation and operation of the True North TN 40 Pellet Stove. PLEASE READ THIS ENTIRE OWNER'S MANUAL BEFORE INSTALLING OR OPERATING YOUR PELLET STOVE.

Operation

For proper and safe operation, the Door, Ash Drawer and Hopper Lid must be kept closed to prevent air leaks when the unit is in operation. The Auger will not operate when they are open. Check all gaskets on the Door, Ash Pan and Hopper and replace when necessary.

Cleaning

The unit and its venting will require routine Maintenance and Cleaning. There will be some build up of fly ash with small amounts of creosote in the exhaust. This will vary due to the ash content of the fuel used and the operation of the stove. Inspect the venting periodically during the heating season to determine if a creosote buildup has occurred. If a significant layer of creosote has accumulated, (3mm or more) it should be removed to reduce the risk of a chimney fire. Venting should be cleaned annually or every two tons of pellets used.

Caution

The appliance, flue gas connector and the chimney flue require regular cleaning. Check them for blockage prior to re-lighting after a prolonged shut down period.

Smoke and CO Detectors

Since there are always several potential sources of fire in any home, we recommend installing smoke detectors. We also recommend a CO detector be installed within the same room as the stove, this may be a requirements of your local fire code. Check with your local building/fire department for requirements in your area.

Optional Thermostat

This stove can be operated manually or with an optional low voltage wall thermostat (not provided).

Electrical Generator Operation

Your True North TN40 stove may be able to operate with power from a portable generator. However, the generator's electrical regulator may not be compatible with the stove's electronics. The higher the quality of the generator, (smoother the output sine wave) the greater the chance that it is compatible with the stove.

If you have any questions with regards to your stove or the information contained in this manual, please contact your local dealer for further clarification and comments.

To prevent the possibility of a fire, have the appliance installed by a professional. Ensure that the appliance is properly installed by adhering to the installation instructions. Your dealer will be happy to assist you in obtaining information with regards to your local building codes and installation restrictions.

It is strongly recommended that the stove be serviced annually by a trained professional.

Specifications

Rating Label Location

On the inside of the Hopper Lid.

Listing information

Safety testing by Intertek Testing Services NA Ltd. to the following standards:
ASTM 1509-12, ULC 627S, UL 1482-11.

EPA Specifications

This heater meets the 2020 U.S. Environmental Protection agency's PM limits using Premium wood pellets.

EPA Certified Emissions:	1.36 g/hr
LHV Tested Efficiency (1):	78.9%
HHV Tested Efficiency (2):	72.2%
EPA Tested BTU output (3):	7,400 to 28,200 BTU/hr.
Input:	Aprox. 10,000 Btu to 39,500 (Depending on fuel type)
Fuel:	Premium Wood Pellets

(1) Weighted Average Lower Heating Value (LHV) efficiency as tested using CSA B415 Performance testing of solid-fuel-burning heating appliances. LHV assumes the moisture is already in a vapour state so there is no loss of energy

(2) Weighted Average Higher Heating Value (HHV) efficiency as tested using CSA B415 Performance testing of solid-fuel-burning heating appliances. HHV includes the energy required to vaporize the water in the fuel

(3) The range of BTU outputs is based on efficiency using CSA B415 Performance testing of solid-fuel-burning heating appliances and burn rates from the EPA tests

This wood pellet heater has a manufacturer-set minimum low burn that must not be altered. It is against federal regulations to alter this setting or otherwise operate this heater in a manner inconsistent with operating instructions in this manual.

Electrical

120 volts, 60 Hz.
5 Amps - Maximum.
2.5 Amps - Normal operating.

The use of a surge protected power bar is recommended to ensure the stove's electrical components are not damaged due to a surge in the electrical supply or lightning strike.



Warnings

Caution

Unit hot while in operation.

Parts of the appliance, especially the external surfaces, will be hot to touch when in operation. Keep children, clothing and furniture away. Contact may cause skin burns. Children and adults should be alerted to the hazards of high surface temperatures and should stay away to avoid burns or clothing ignition. Young children should be carefully supervised when they are in the same room as the Pellet stove.

Flammable Liquids:

Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or "freshen up" a fire in the heater. Keep all such liquids well away from the heater while it is in use.

Caution

Do not connect to any air distribution duct or system. Do not install a flue damper in the exhaust venting system of this unit. Do not connect this unit to a chimney flue serving another appliance.

Warning

Never place furniture, wood, paper, drapes or other combustible materials within 48" (122cm) of the front of the unit, 6" (15cm) from each side, and 3" (8cm) from the back of the unit. Do not let children or pets touch it when it is hot.

Chimney or Run Away Vent Fire

Call local fire department. Extinguish the fire in the burn pot liner with a cup of water and close the door. Examine the flue pipes, chimney, attic, and roof of the house, to see if any part has become hot enough to catch fire. If necessary, spray with fire extinguisher or water from the garden hose. IMPORTANT: Do not operate the stove again until you are certain the chimney and its lining have not been damaged.

Glass

Do not abuse the glass by striking or slamming the door. Do not operate appliance with the glass front removed, cracked, or broken. The stove uses ceramic glass. Replacement of the glass should be done by a qualified service technician. Replacement glass must be purchased through a Pacific Energy Fireplace Products dealer. Do not attempt to open the door and clean the glass while the unit is in operation or if glass is hot.

KEEP ASH PAN FREE OF RAW FUEL. DO NOT PLACE UNBURNED OR NEW PELLET FUEL IN ASH PAN. A FIRE IN THE ASH PAN MAY OCCUR.

Any grill, panel, or glass removed for service **MUST** be replaced prior to operating the stove. Failure to do so may allow contact with shock or fire hazards.

Caution:

When operating during extreme weather, if the unit exhibits dramatic changes in combustion stop using the unit immediately.

Warning

This appliance is equipped with a three-prong (grounding) plug for your protection against shock hazard and should be plugged directly into a properly grounded three-prong, 120 volt, 60 Hz receptacle. Do not cut or remove the grounding prong from this plug. Do not route power cord under or in front of appliance. The power supply cord must be routed to avoid contact with any of the hot or sharp exterior surface areas of the stove.

Negative Pressure Warning

This appliance has not been designed to be operated in a negatively pressurized room. Provide adequate air for combustion.

The stove's combustion system works with negative combustion chamber pressure and a slightly positive chimney pressure. It is very important to ensure that the exhaust system be sealed and airtight. The ash pan and viewing door must be locked securely for proper and safe operation of the pellet stove (See "Ash Pan Removal and Cleaning: (Leg or Pedestal models)" on page 13).

Do not burn with insufficient combustion air. A periodic check is recommended to ensure proper combustion air is admitted to the combustion chamber. Setting the proper combustion air (with the stove's damper) is required after installation. Minor adjustments can also be made on the controls.

The combustion air inlet for this stove is drawn through a pipe inside the rear of the stove. Air can be provided by the room the stove is installed in or by connection to outside of the house.

Room air: The room must be well ventilated - In well insulated/air tight homes, a lack of air for combustion can easily be caused by many common household appliances which exhaust air from the home (such as a furnace, heat pump, air conditioner, clothes dryer, exhaust fans, fireplaces, and other fuel burning appliances).

Outside air: A 2"(51mm) id. non-combustible flexible or rigid pipe can be attached between the stove's air intake and an outside duct to draw air from outside the house. This will greatly reduce the risk, but may not eliminate the problem.

Pacific Energy Fireplace Products Ltd. accepts no liability for damages resulting from negative pressures described here.

Outside Fresh Air is required for mobile home installations.

Paint Curing

This stove has been painted with a high-temperature metallic paint. It is dry to the touch, but completes the curing process during the first few times the stove is burned on high. Also, some parts of the appliance may be lightly coated with machining oil. During the first firings, the paint and oil may give off unpleasant odors. Open the windows to ventilate the room.

Pellet Fuel Specifications

This stove is designed and EPA certified to burn premium wood pellet fuel. Burning any other fuel that is not approved for use with this appliance will void the appliance warranty.

Caution

It is important to select and use only fuel that is free of dirt or other impurities such as chemical binders or high salt content. "Dirty" fuel will adversely affect the operation and performance of the unit and will void the warranty. We recommend the use of pellets that meet or exceed the PFI standards. Ask your dealer for a recommended pellet type.

Store fuels at least 48" (1.2 m) away from the pellet stove.

In The U.S.

- Burn only pellets that have been graded by an EPA approved organization. Pellet Fuels Institute, ENplus or CANplus are approved organizations.

Minimum Fuel Specifications;

DENSITY: > 38lbs/cuft.

DIMENSIONS: < 1.5 in. with a diameter of .230 to .285

INORGANIC FINES (Ash Content): <1%

CHLORIDES: <300ppm by weight.

ASH CONTENT: < 2%

TRACE METALS: < 100mg/kg

Contains no construction or demolition waste.

In Canada

- Use premium grade pellets.

Max. feed rate is approx. 4.5 lbs/hour. ** Feed Rates can vary greatly depending on fuel type and quality **
Due to this, the stove may require adjustment to the damper and or the feed rate trim to achieve a satisfactory burn on low.

Ash

The ash content of the fuel and operation of your stove will directly determine the frequency of cleaning. The use of high ash fuels may result in the stove needing to be cleaned daily. Pellets made from hardwoods generally produce more ash than those made from softwoods.

Clinkering

[Clinkers are minerals, silica (sand) or other impurities in the fuel that will form a hard mass during the burning process]. If the Burn Pot Liner holes do become blocked, remove the liner (when the unit is cold) and clean/scrape the clinkers out. (See "Burn-Pot and Liner Cleaning" on page 12).

BTU Content

BTU (heat value) content may range from just under 7,000 to almost 9,000 Btu/lb., depending upon species and region of the country and other variables.

The use of Cord wood is Prohibited. Do not burn garbage, rubber, plastics or flammable fluids such as gasoline, naphtha or engine oil.

Controls

Control Panel

The following is a list of the control panel's features:

1. **POWER** light - Is red during start-up, switching to green when the stove is at operating temperature. The light will change to orange during shutdown. .
2. **ON/OFF** Button - Is pushed to start the stove, and to turn the auger off and start the shut down sequence.
3. **HEAT LEVEL** Buttons - The down arrow is pushed to reduce the heat output. It is also used to reduce the values of the "trim" settings. The up arrow is pushed to increase the heat output setting. It is also used to increase the values of the "trim" settings.
4. **AUGER** - The Auger will operate continuously while this button is pressed. It is also used with the Heat level buttons to trim the auger ON time pulses when the pellet quality/size requires more or less fuel to burn properly.
5. **MAN-HI/LO-AUTO** - Thermostat mode selector switch. The slide switch is used to select the desired thermostat mode. (See "Thermostat Operation" on page 10)
6. **HEAT LEVEL INDICATORS** - Show what heat output setting the unit is on. Low or #1 (far left) and High or #5 (far right). Also used to show fault codes and trim settings.

Fault Codes

If the stove shuts down unexpectedly, the following Heat Level indicator may be flashing.

- Fault code, #3 light flashing: - Stove did not light / Fire went out / Stove went cold while in operation.
- Fault code, #4 light flashing: - Hi limit switch is open / Stove over heated.

See trouble shooting section for causes and solutions

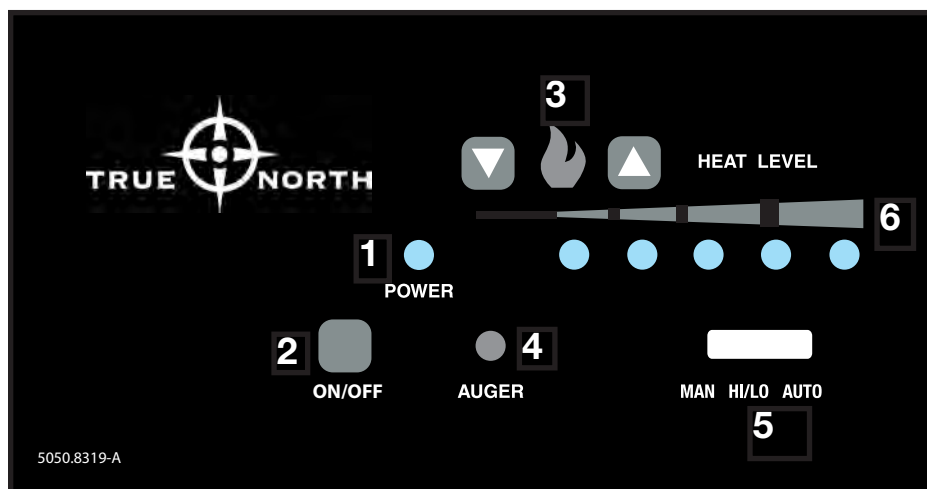


Figure 1: Control panel.

Operation

Note: when the stove is plugged into power for the first time the combustion blower will come on and run for 10 minutes, this is the same function as after a power failure.

Filling the Hopper

The hopper can be accessed by lifting the top of the stove. The hopper will hold up to 80 pounds (36 Kg) of pellets. Check for any foreign objects in the hopper before filling with pellets.

Opening the Door

Rotate the door handle clockwise to the horizontal position and slowly pull open. This will help prevent large amounts of ash from being sucked out as you open the door. To close the Door, reverse the steps.

Before Lighting your stove

Check the holes in the Burn Pot Liner to make sure they are clear. Remove any ash/clinkers if needed. (See "Burn-Pot and Liner Cleaning" on page 12). Check to see that the Burn Pot Liner is seated correctly and pressed back against the Ignitor Tube for proper ignition and operation.

Lighting your Stove

Note: If this is the first time the stove has been started or the stove has run out of pellets, the auger will be empty and the Burn-Pot liner will need to be primed. To prime, place a handful of pellets into the middle of the liner. Or hold down the Auger button, this will cause the auger to run continuously while the button is held. Release the button once pellets begin to drop.

Push the ON/OFF button, on the control board, This will turn the POWER indicator light red and will begin a 15 minute lighting sequence. During the lighting sequence, the auger will pre-load the Burn-Pot liner with pellets, the igniter will light the pellets and once lit, the auger will resume feeding pellets. Some smoke inside the firebox can be expected during light up. Once the ignition cycle is finished and the stove is lit, the POWER light will turn green. The stove will continue to burn at the desired level indicated by the HEAT LEVEL display.

Caution: Do not attempt to re-start the lighting sequence before it has run its course as the Burn-Pot will overload with pellets. If after 15 minutes the stove is not lit, the middle light of the HEAT LEVEL display will flash red. When cooled, safely empty the burn pot liner of any unburned pellets and re-start the stove.

WARNING: Never empty unburned pellets from the Burn-Pot into the pellet hopper. Pellets that appear to be cool may retain enough heat to ignite other pellets resulting in smoke or fire damage.

General Operation

Use the HEAT LEVEL LOW and HIGH buttons to adjust the heat level to the desired setting.

Avoid over firing the stove - do not hand feed pellets to the appliance during operation.

Due to different sizes and quality of the fuel, the stove may require adjustment to the damper and or the feed rate trim to achieve an optimal burn on High or Low

Turning the Unit OFF

Normal - To turn the stove off, press the ON/OFF button. The Power light will turn orange and the control panel lights will go out. The Auger will stop running but the fans will continue to operate until the exhaust temperature drops to a safe temperature and the control board completes the shut down cycle.

Convection Blower Operation

Your TN40 stove comes equipped with a room air convection blower that extracts heat from the stove. After the stove warms up, the fan will turn on automatically. The speed of the fan will automatically vary with the burn rate of the stove. The fan will continue to operate after the Auger shuts off, until the stove has cooled down.

Auger Feed Trim

The controls allow you to adjust the Fuel Feed Trim slightly. **[Factory setting is number 3]**

- For low quality pellets where the unit goes out during long periods on the Low Heat setting, you can increase the amount of pellet feed across the whole heat range. Hold down the Auger button and the display will change to four lights on and one off, press the UP arrow for the Heat Output to increase the auger on time.

WARNING THIS WILL INCREASE THE FEED RATE FOR THE COMPLETE RANGE - BE CAUTIOUS - DO NOT OVER FIRE THE UNIT

- To decrease the Auger feed on High energy pellets, (if the low heat is still to warm) decrease the fuel feed by holding down the Auger button and the display will change to four lights on and one off, then press the Down arrow for the Heat Output to reduce the auger on time across the complete heat range

Combustion Blower Trim.

WARNING: THIS SHOULD ONLY BE USED AFTER THE DAMPER HAS BEEN ADJUSTED AS PER THIS MANUAL AND AS A LAST RESORT. This feature should only be used if the unit is getting too much or too little combustion air when on lowest heat settings due to a sudden change in pellet quality. By adjusting the Combustion Blower Voltage you will effect the lowest four heat output combustion blower settings. To adjust hold down the hidden button under the TH in "TRUE NORTH" on the controls and use the Heat Level buttons to adjust up or down the same way as the Auger Feed Trim. The factory setting is position number 3.

Normal Operating Sounds

As the True North TN40 stove is burning, a number of normal operational sounds may be heard. When the blowers come on, the sound of rushing air can be heard as well as some small creaks. The lower the burn rate the slower the fan operates. Pellets can be heard dropping into the Burn-Pot. Also, the motor turning the auger may be heard as it pulses on and off. Occasionally a cracking noise might be heard as the auger cuts a pellet in half.

Power Outage

If the stove loses electrical power and it is still hot when power returns, the stove will go into a start-up sequence and will continue to operate. If the power loss is long enough for the stove to cool, the exhaust blower will run for 10 minutes to purge any smoke. If the stove is connected to a thermostat in the "Auto mode", the stove will not start the ignition sequence until the thermostat calls for heat again.

Thermostat Operation (Optional)

Once installed, the thermostat can control the operation of the stove. Use a low voltage/millivolt thermostat. (See "Optional Thermostat Installation" on page 28) for installation instructions.

Important: When connected to a thermostat, it is necessary to push the ON/OFF button for the initial burn, when the electrical power to the stove is interrupted, or if the stove runs out of pellets and therefore shuts off with a fault code.

- **Manual Mode**

After the stove is burning (See "Before Lighting your stove" on page 9), the heat level setting controls the pellet feed rate and the stove's heat output. Once set, the stove will continue to burn at this rate until the heat level is changed or the stove is shut off.

- **HI/LO Mode**

After the initial ignition sequence, when the thermostat calls for heat (the room temperature is less than the temperature set on the thermostat), the stove will burn at the heat level setting. The higher the setting, the quicker the room will heat up. Once the thermostat no longer calls for heat (the room is up to the desired temperature), the stove will drop down to burn at the lowest HEAT LEVEL setting. This cycle will continue until the stove is turned off or runs out of fuel.

- **AUTO Mode**

When the thermostat calls for heat (the room temperature is less than the temperature set on the thermostat), the stove will burn at the heat level setting. The higher the setting, the quicker the room will heat up. Once the thermostat no longer calls for heat (the room is up to the desired temperature), the stove will drop down to burn at the lowest HEAT LEVEL setting. The stove will continue to burn for 45 minutes at the lowest setting. If the thermostat does not call for heat again during that time, the stove will shut off. It will relight when the thermostat calls for heat. If, during that 45 min., the thermostat calls for heat again, the stove will again burn at the HEAT LEVEL setting until the thermostat no longer calls for heat.

Damper Adjustment

The Damper is used along with the Combustion Blower control to regulate air flow through the stove.

THE DAMPER MUST BE SET AFTER INSTALLATION, DURING THE FIRST FIRING. This procedure should be done by a Qualified Installer or Service Technician. (See "Initial Set-up" on page 27)

Because of the differences in pellet quality, the Damper may need to be adjusted from time to time. If the stove goes out continually on low, the unit may need to have the damper closed slightly for reduced airflow at the lower heat settings adjust the Combustion Blower Trim setting(See "Initial Set-up" on page 27) . If the stove continually builds up with ash/clinkers in the liner the damper may need to be opened slightly for more airflow through the liner.

Routine Checks and Maintenance

Inspection /cleaning	weekly	monthly	yearly	
Ash Pan - Pedestal	X			or Every 30 bags of fuel burned
Ash Pan - Leg Model	X			or Every 15 bags of fuel burned
Burn-Pot	X			or Every 5 bags of fuel burned
Burn-Pot Liner	X			Daily - depending on fuel quality
Blower - Convection			X	or more frequently if pets present
Blower - Exhaust			X	or more frequently depending on fuel quality
Firebox		X		or more frequently depending on fuel quality
Venting system			X	more frequently depending on fuel quality
Glass	X			or if viewing area becomes completely obstructed
Door Seals/Gaskets		X		Replace if damaged

CAUTION: INSTALLATION AND REPAIR SHOULD ONLY BE PERFORMED BY A QUALIFIED SERVICE TECHNICIAN. DO NOT ATTEMPT TO SERVICE THE APPLIANCE YOURSELF.

IMPORTANT CAUTIONS:

SHUT DOWN THE STOVE, UNPLUG THE POWER CORD AND ENSURE THE APPLIANCE IS COLD BEFORE PERFORMING ANY MAINTENANCE WORK.

- Some brands of pellets produce more ash and clinkers than others. Therefore the frequency of performing the following cleaning procedures depends to a great degree on the type of pellets burned.
- Not cleaning this unit will cause it to burn poorly and may void your warranty.
- A cleaning brush can be used to loosen any ash build-up before vacuuming.

CAUTION: *DO NOT USE A STANDARD HOUSEHOLD VACUUM, USE AN ASH OR SHOP VACUUM. A FINE DUST FILTER MUST BE INSTALLED IN THE SHOP VACUUM, AS THE STANDARD FILTERS WILL LEAK THE FINE PARTICLES OF ASH INTO THE HOME. DEPENDING ON THE SYSTEM, USE CAUTION AS SOME DUST MAY STILL PASS THROUGH THE VACUUM.*****

*****DO NOT VACUUM HOT ASH!*****

- Using a drop cloth is recommended as some ash may spill onto the floor during the cleaning process.

Soot

Operation of the stove with insufficient combustion air will result in the formation of soot and/or creosote which will collect on the glass, the heat exchanger, the exhaust vent system, and may stain the outside of the house. Frequently check your stove and adjust as needed to ensure proper combustion (See "Initial Set-up" on page 27).

Burn-Pot and Liner Cleaning

The Burn-Pot Liner has a number of holes in the bottom and sides that provide combustion air to the pellets. The extreme temperatures in the Burn-Pot can cause the impurities in the pellets to form clinkers. The liner should be inspected daily to ensure the holes are clear of any build up.

The Burn-Pot should be checked/cleaned out after burning about 5 - 10 bags of pellets.

When the stove is cool, open the door then lift up on the Burn Pot Liner to remove. Using a suitable vacuum

clean out the Burn Pot. Or remove the Burn Pot by loosening the nuts on the bottom corners of the Burn Pot and sliding the Pot towards the back. Lift up at the front of the pot pull it towards the front of the firebox to remove it from the tubes. Empty the ash from the Burn-Pot and Liner. Scrape the bottom of the pot with a scraper to remove all ash and clinkers from these surfaces if needed.

Make sure all the holes in the Burn Pot Liner are open. Clean/scrape any hard clinkers out. Clean the holes with a small pointed object if required

Reinstall the Burn-Pot into the stove by reversing the removal procedure. Then place the Burn-Pot Liner back into the Burn-Pot, ensuring that the Ignitor hole is towards the back of the stove. Push the Burn Pot Liner back in the Burn Pot against the ignitor tube to create a seal for the ignitor. Tighten Burn Pot mounting screws if required.

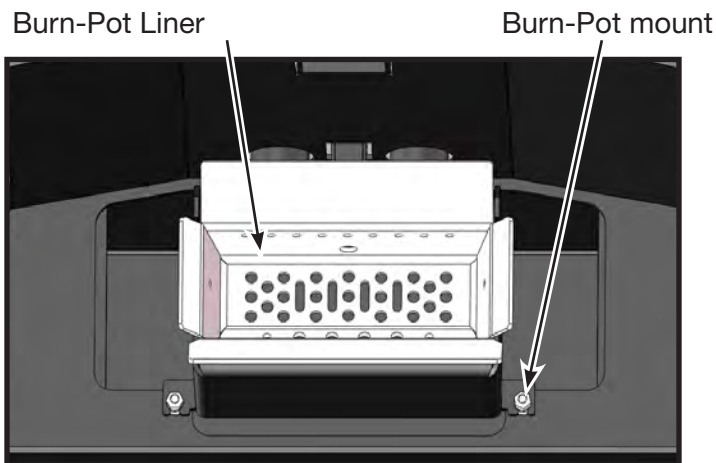


Figure 2: TN40 Burn Pot Mount.



Figure 3: Leg Ash drawer open.

Cleaning Glass

CAUTION: Do not clean glass when hot. Do not open the front door when the stove is hot.

Open the Door and clean the glass using a soft cloth or paper towel and household non-abrasive glass cleaner or wood stove window cleaner. **DO NOT use abrasive cleaners.**

Ash Pan Removal and Cleaning: (Leg or Pedestal models)

CAUTION: Do not remove the ash pan when the stove is operating or hot.

To remove the Ash Pan, Rotate the latch counter-clockwise to release the ash pan. Pull the Ash Pan up then out from the stove. Safely dispose of ashes or Vacuum out the Ash Pan enclosure before inserting the Ash Pan.

CAUTION: Disposal of Ashes - Ashes should be placed in a metal container with a tight fitting lid. The closed container should be placed on a non-combustible surface – well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have been thoroughly cooled.

To close, push the Ash Pan in until the bottom catches and drops down. Make sure the Ash Pan is tight to the face of the Ash Pan enclosure, then tighten the Latch.

WARNING: if the ash pan does not seal tightly to the stove, the stove can produce excess smoke and emissions. Creosote may also form that will cover the inside of the unit and be expelled out of the venting. If the Ash pan is left open enough the Firebox Vacuum Switch will open stopping the auger and the stove will shut down.

Inspect Gaskets

Inspect the condition of the gaskets around the door, window and ash pan, periodically. If the gasket becomes loose or falls off, is excessively frayed or has a gap in it, replace as necessary. Inspect the die-cut gaskets on the blowers when cleaning and replace if they become torn or damaged.

Cabinet Side Removal

Loosen or Remove the two screws holding the back of the Cabinet Side to the chassis. Push the panel forward to disengage the screws at the front. Installation is the reverse.

Cleaning the Flue Gas Passages

Cleaning the flue gas passage should be done at least once a year or every one to two tons of pellets used.(50-100 bags) Burning high ash pellets may require this cleaning to be done more often. Clean this passage only when the stove and ash are cold.

Cleaning the Firebox Passage

Remove the Burn-Pot and Liner as described in (See "Burn-Pot and Liner Cleaning" on page 12), and use an Ash Vacuum to remove the loose ash from the firebox.

- Remove the Upper Firebox Liner by pulling it forward. It will then drop down and can be pulled out through the door opening
- Using penetrating oil and a ratchet with a 5/16" socket, remove a total of five screws securing both sides of the Firebox Liner to the firebox (Figure 5).

Using a 3/8" socket, remove the two screws securing the center firebox liner section and remove from firebox (Figure 6).

Using an ash vacuum, clean out all the ash in the exhaust passages (Figure 7).

Don't forget to clean up around the heat exchanger by using the vacuum on the openings above the door opening. Once the passage is clear of ash build-up, reinstall the Firebox Liners.

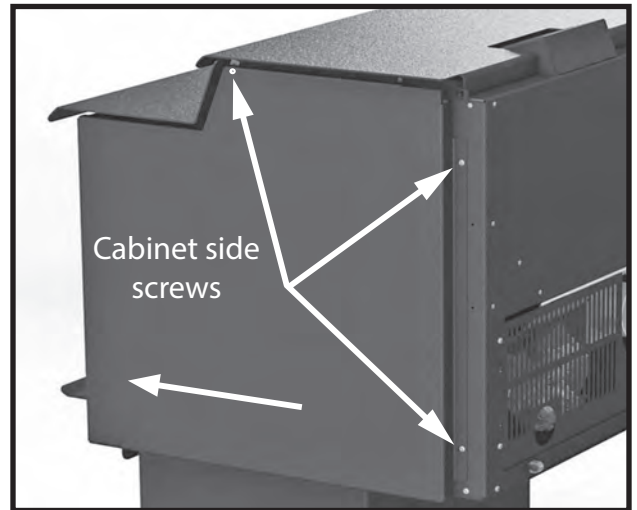


Figure 4: Side shield removal.

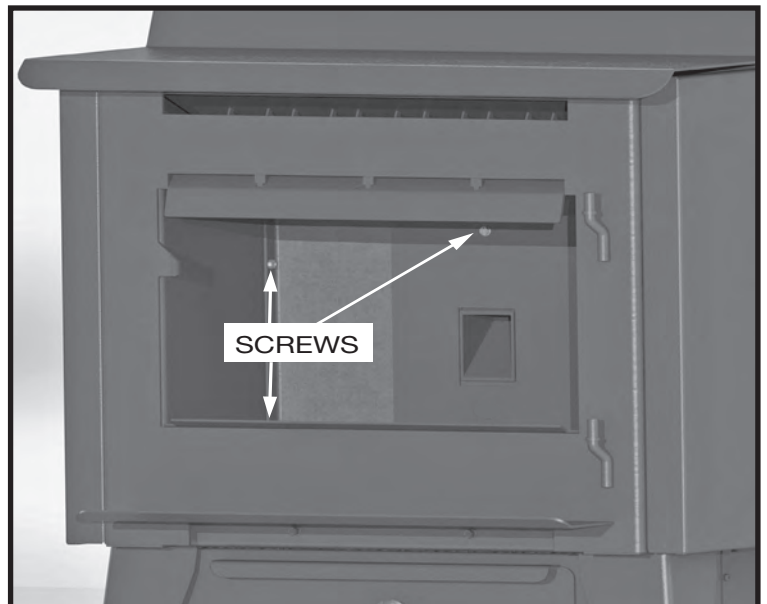


Figure 5: Firebox Liner removal.

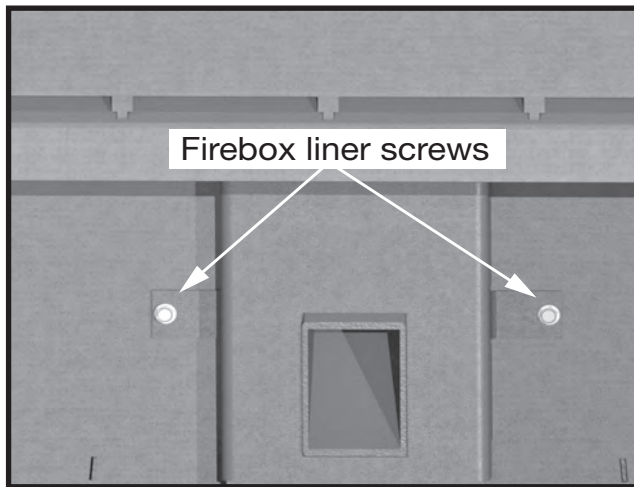


Figure 6: Internal rear liner removal.



Figure 7: firebox passage cleaning.

Pacific Energy Fireplace Products recommends having your stove inspected and cleaned by a trained professional.

Cleaning the Vent Pipe

Soot and Fly-ash – Formation and Need for Removal: The products of combustion will contain small particles of fly-ash and/or soot. The Fly-ash and/or soot will collect in the exhaust venting system and restrict the flow of the flue gases. The exhaust venting system should be inspected at least once every year to determine if cleaning is necessary. Sweep the pipe as needed. A tee and clean-out in the vent system at the transition from horizontal to vertical will make this cleaning easier.

Cleaning the Exhaust/Combustion Blower

To clean the combustion blower, unplug the stove, remove the left cabinet side. Remove the four screws (Figure 8) with a Phillips screwdriver. The motor can now be pulled from the fan housing. The blower cooling fan and main blade can be vacuumed once the motor is removed. Before reinstalling, vacuum out the blower housing and the flue gas passages leading to and from the combustion blower. Clean the inner surface of the Proof of Fire Switch located on the combustion fan housing. When reinstalling the motor, check the gasket between the motor and the fan housing, a new gasket may need to be installed if damaged. Place the motor back on the fan housing (motor down) and rotate clockwise to lock the flange, tighten the four screws with a Phillips screwdriver.

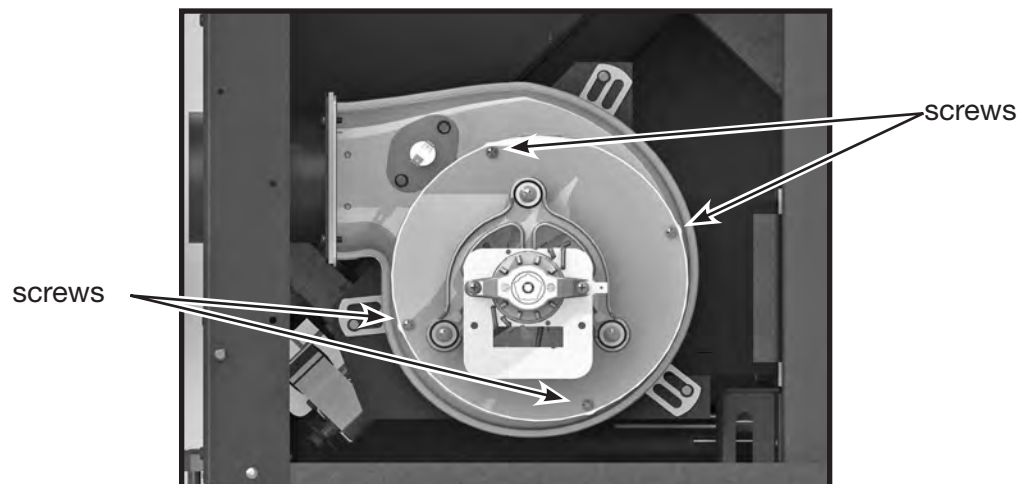


Figure 8: Combustion blower cleaning.

Cleaning the Convection Blower

To clean the convection blower, remove the four screws securing the cover on the back of the pedestal base or the Ash box (leg model) and set the cover aside (Figure 9). Disconnect the stove power cord from the electrical outlet.

Using a 5/16" socket, remove the four screws (Figure 10) securing the blower to the pedestal. A vacuum can be used to remove any dust accumulation on the blower's blades or inside the blower ducts. Caution should be used not to damage the blower's blades during cleaning. Reverse this process to reinstall the blower.

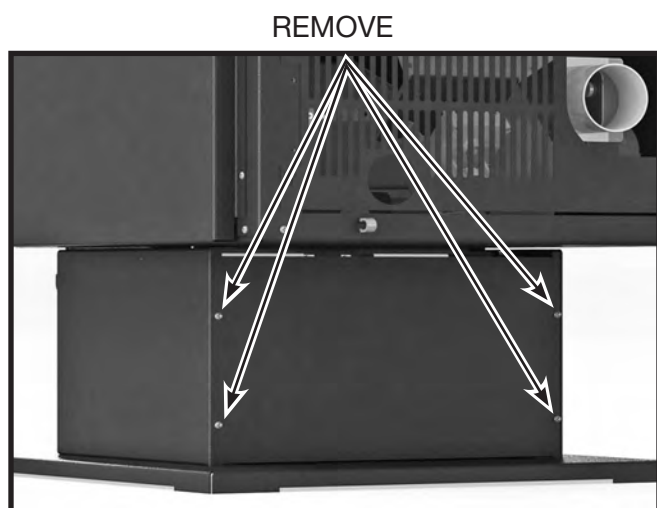


Figure 9: Pedestal cover removal.

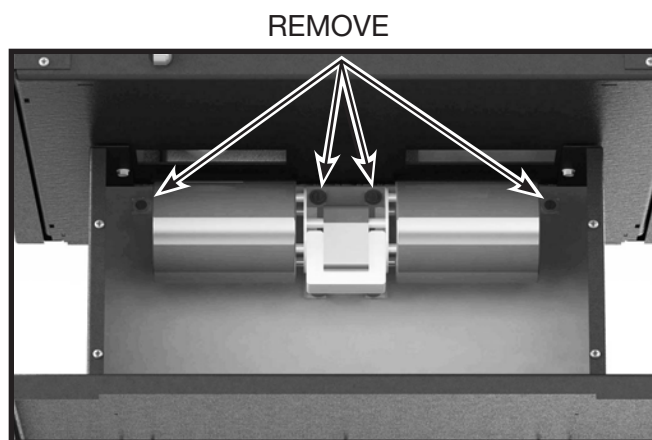


Figure 10: Convection blower removal.

Door Removal

CAUTION: Do not open the Firebox door when the stove is hot or operating.

To remove the door, rotate the door handle clockwise to release, and swing the door open. Lift the door up and off the hinges. To reinstall the door, repeat the steps in reverse order.

Back Grill Removal

To remove the back grill, loosen the three screws securing the grill to the chassis. The back can now be pulled up and off of the stove. Installation is the reverse.

Basic Troubleshooting

PROBLEM	CAUSE	SOLUTION
Stove won't turn ON (No lights or fan noise after 30sec.)	No Power to stove	Check power cord is plugged in. Check household Circuit Breaker
	High Limit switch faulty or tripped	Contact dealer/Service
Pellets won't drop in to Burn Pot Liner	Hopper Empty	Check Hopper fuel level
	Hopper lid open	Close lid
	Sawdust/pellets plugging auger	Remove sawdust/pellets from Auger system.
	Hopper lid switch damaged	Contact Dealer/Service
	Vacuum switch/lines plugged or damaged	Check switch and vacuum hose for damage or kinks.
	Combustion Blower blocked or damaged	Check/Clean venting system.
	Auger Motor fuse blown	Check motor for visible signs of a short , if OK, replace fuse (See wiring diagram)
Pellets won't light after 8-10 min.	Burn Pot/Burn Pot Liner not installed correctly	Ensure Burn Pot and Liner is installed properly. See, "Burn Pot and Liner Cleaning" section
	Igniter hole in Burn Pot Liner restricted or plugged	Clean Liner holes and igniter tube.
	Igniter fuse blown	Check Igniter Fuse –if blown, check igniter for visible damage (See wiring diagram. page 26)
	Igniter faulty	Contact Dealer/Service
Stove turns off while operating (Fault Code 3 - see page 8)	Fire went out or fire too cold	See "Stove won't turn ON, Pellets won't drop" Low grade fuel - Trim auger feed to get more heat. (See "Operation" on page 3)
		Check firebox vacuum levels. Adjust if needed. (See "Initial Set-up" on page 27)
		See "Pellets won't drop in to Burn Pot Liner" Check venting for ash build-up. Clean venting as required.
Stove won't turn off after Shutdown period (unit may take up to 20 min to cool, depending on operating temp. at time of shutdown.)	Exhaust Temp. Switch dirty or damaged	Contact Dealer/Service

Stove Dimensions

Weight - 325 pounds (147 Kg.)

Hopper Capacity - up to 80 pounds (36 Kg.) Results will vary based on fuel density.

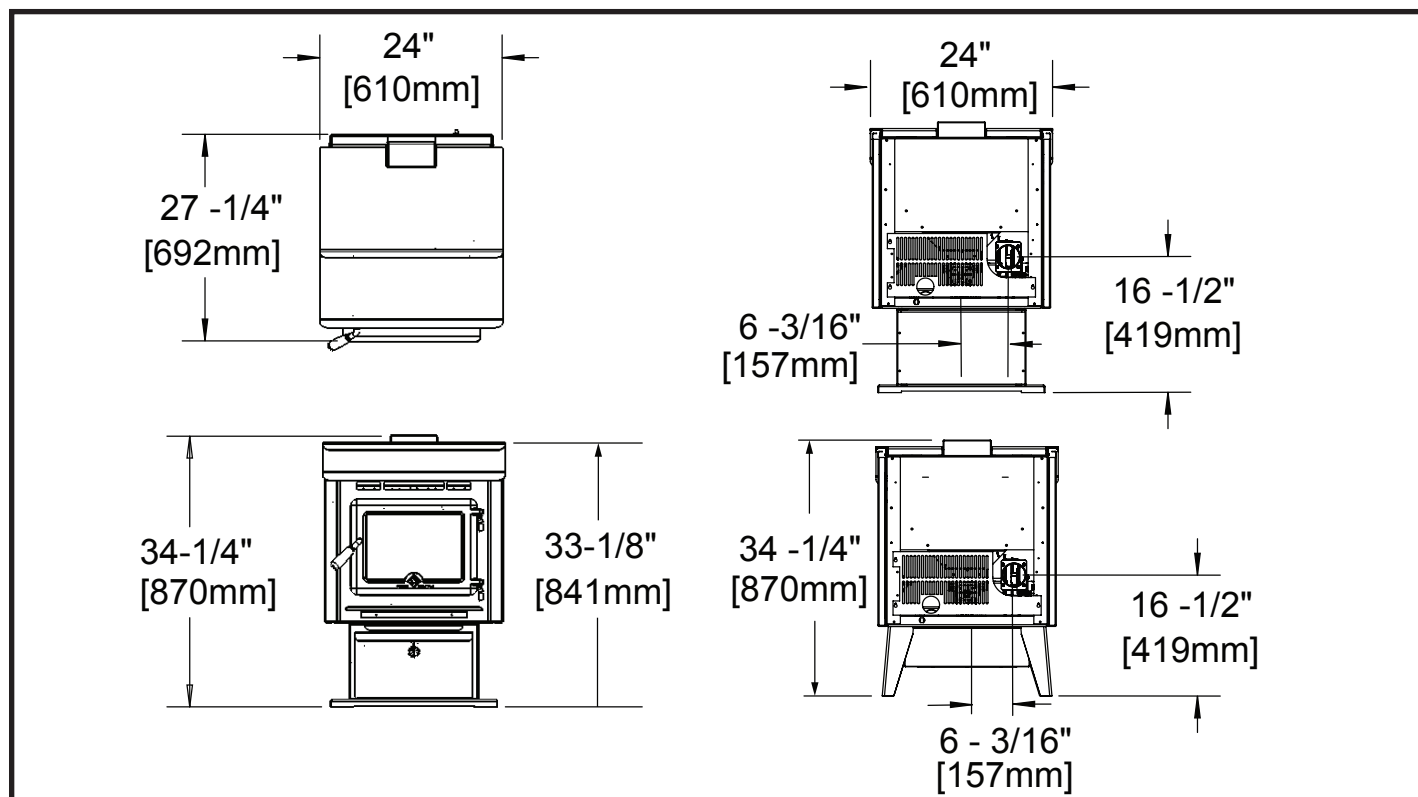


Figure 11: TN40 Dimensions.

Installation

Before you begin

Please read and carefully follow all of the installation and operating instructions found in this manual. Please pay special attention to the safety instructions provided in this manual.

It is recommended that you have this appliance installed by a W.E.T.T or N.F.I. qualified installer.

Contact your local building or fire official to obtain a permit and any information on installation restrictions and inspection requirements for your area. Check all local building and safety codes before installation. The installation instructions and appropriate code requirements must be followed exactly and without compromise. Familiarity with these requirements before installation is essential.

Failure to follow these instructions will void the manufacturers warranty. Alterations to the stove are not allowed.

Installation Options

- Residential or Manufactured/Mobile Home
- Maximum 36" deep Alcove
- Vertical and Horizontal Vent (See "Venting" on page 24).
- Thermostat or manual operation
- Outside Air Compatible

Selecting a Location

Be sure to maintain the structural integrity of your home when passing a vent through walls, ceilings, or roofs, and all construction meets local building codes. It is recommended that the unit be secured into its position in order to avoid any displacement. This appliance must be installed on a floor with an adequate load bearing capacity, if existing construction doesn't meet load capacity, suitable measures (e.g. load distributing plate) must be taken to achieve it.

Due to high temperatures, the stove should be located out of traffic areas and away from furniture and draperies.

The layout of your house and the location of the Pellet Stove will determine how efficient it is at heating the intended area. Pellet Stoves use mainly air circulation to disperse their heat, therefore a central location with good airflow works best. Try to locate the heater in the area you want heated.

Consider the following things when selecting a location:

- Use of an existing approved Chimney
- Location of Vent Termination
- Aesthetic Considerations
- Interference with House Framing, Plumbing and Wiring
- Floor Protection
- Room Traffic Patterns
- Proximity to Combustibles
- Location of Air for Combustion
- Electrical Outlet
- Pellet Fuel Storage

Caution:

DO NOT CONNECT TO OR USE IN CONJUNCTION WITH ANY AIR DISTRIBUTION DUCT WORK. THIS UNIT IS NOT APPROVED FOR SUCH INSTALLATIONS.

Ember Protection

The appliance must be installed on a non-combustible ember protector extending the full width and depth under the heater (including the vent pipe), and must extend an additional 6" (152mm) beyond the front and beyond each side of the Firebox Viewing Door and Ash Pan openings.

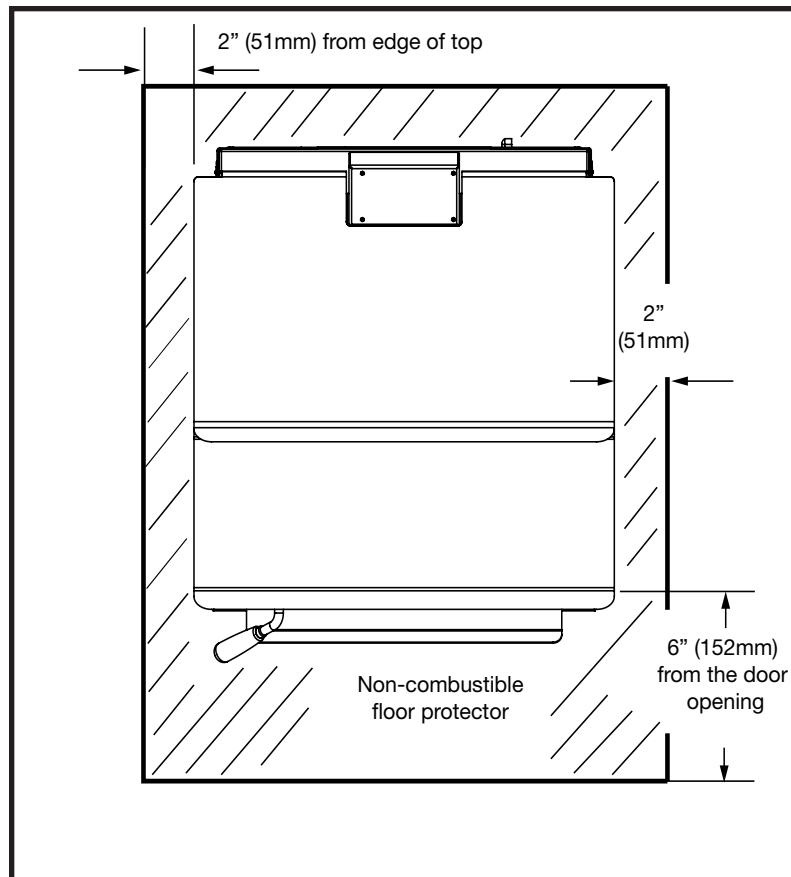


Figure 12: TN40 Hearth Protection.

Outside Air

Connecting the True North TN40 stove to outside combustion air is optional, except in mobile home installations and when required by local building codes. The stove's internal air intake will accept 2"(51mm) ID non combustible pipe to accommodate outside air installations. The air intake on the exterior of the home should always be located substantially below the flue termination and terminate with a screen cover to keep out weather and pests.

Outside air can be taken from a well ventilated crawl space. However, outside air must not be drawn from an enclosed space (garage, unventilated crawl space).

Maximum recommended length is 10ft. (3m). If a longer run is needed increase the intake supply tube to 3" (75mm)

Clearances to Combustibles

Clearances

Front 48" (1.2m)
 Side 6" (152mm) from edge of top
 Back 3" (76mm) from back of hopper

The center of the flue is 16-1/2" (419mm) above the surface upon which the stove rests.

IMPORTANT: INSTALL VENT AT CLEARANCES SPECIFIED BY THE VENT MANUFACTURER.

- Minimum clearances specified may not allow for ease of operation and maintenance (please take this in to account when planning the installation). If installed to the minimum clearances, removal of the appliance may be necessary for servicing.
- Recommended clearance zone from the front of the appliance to combustibles is 4 feet (1.2m) minimum.

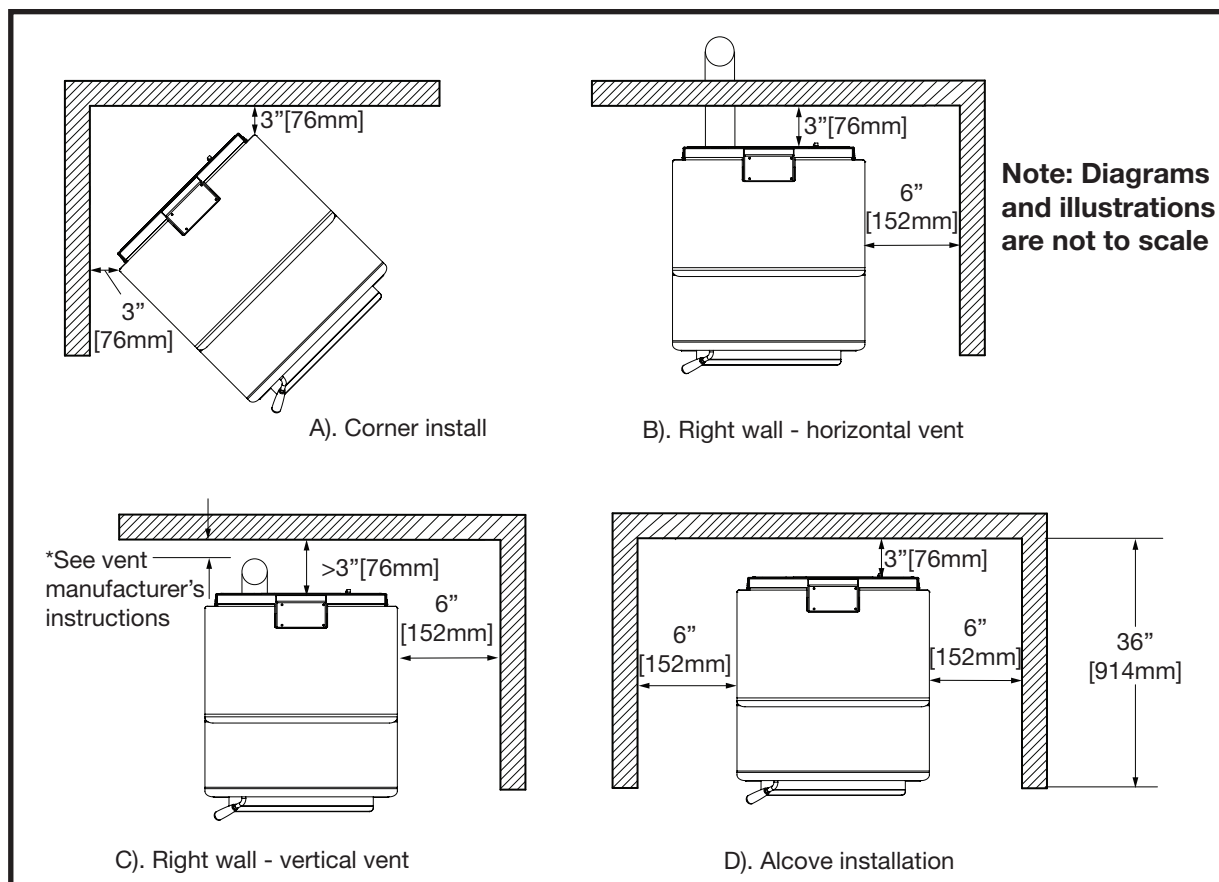


Figure 13: TN40 Wall Clearances.

Corner Installations

Refer to (Figure 13) for minimum clearances.

Alcove Installations

Minimum alcove height is 7 ft. (2.13 m), minimum width is 36 in. (92 cm) and maximum depth is 36 in. (92 cm), (Figure 13).

Note: it will be difficult to service the unit when installed in a 36 in (92cm) wide alcove and may require the unit to be removed for servicing. Please allow as much area on either side of the unit as possible for ease of service.

Vent Terminal Minimum Clearances

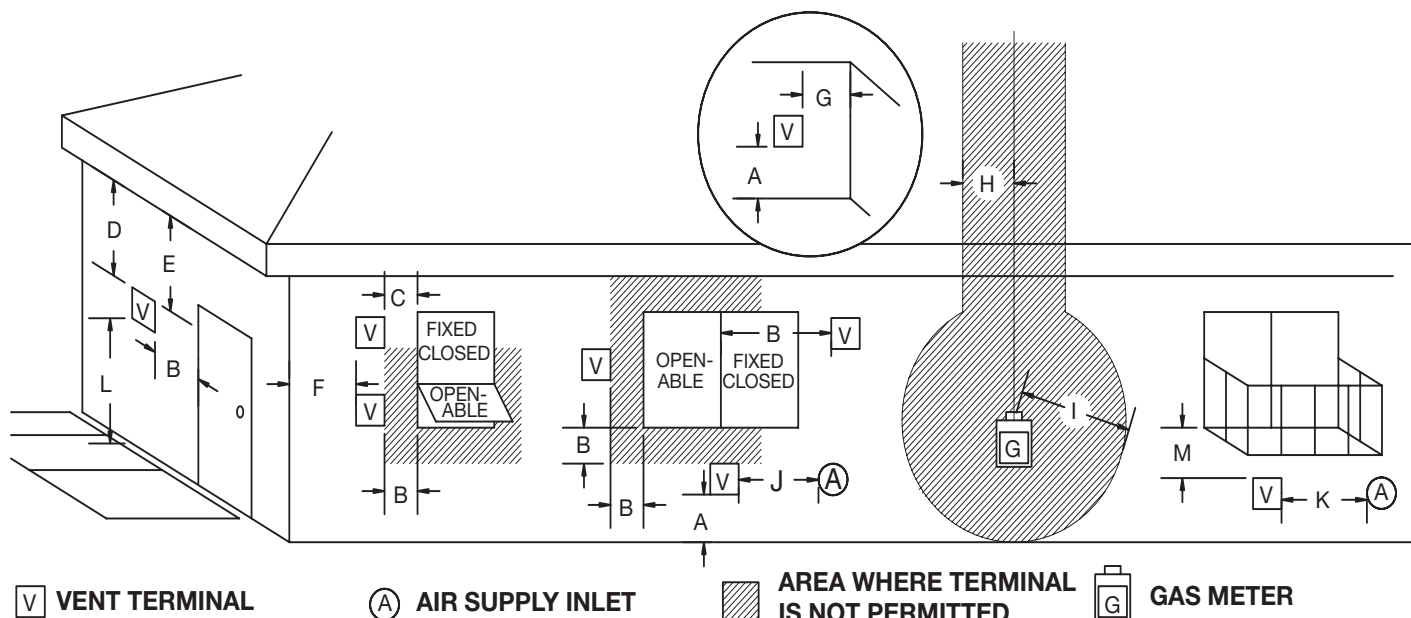


Figure 14: Vent terminal minimum clearances.

A=	*12 inches (30 cm)	Clearances above non combustible grade
	*24 inches (60 cm)	Clearances above grass, top of plants, wood, combustible veranda, porch, deck, or balcony
B=	*48 inches (120 cm)	Clearance beside or below a window or door that may be opened
	*18 inches (45 cm)	If Fresh Air is Installed to the Unit - Clearance beside or below a window or door that may be opened
	*12 inches (30 cm)	Above a window or door that opens
C=	12 inches (30 cm)	Clearance to permanently closed window recommended to prevent condensation on window
D=	36 inches (76 cm)	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (60 cm) from the edge of the terminal
	18 inches (45 cm)	If Fresh Air Installed to Unit - Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (60 cm) from the edge of the terminal
E=	12 inches (30 cm)	Clearance to unventilated soffit
F=	12 inches (30 cm)	Clearance to outside corner
G=	12 inches (30 cm)	Clearance to inside corner
H=	3 feet (90 cm)	*Not to be installed above a meter/regulator assembly within 3 feet (90 cm) horizontally from the center-line of the regulator
I=	*6 feet (1.8 m)	Clearance to service regulator vent outlet
J=	*4 feet (1.2 m)	Clearance to non mechanical air supply inlet to building or the combustion air inlet to any other appliance
	12 inches (30 cm)	If Fresh Air installed to Unit - Clearance to non mechanical air supply inlet to building or the combustion air inlet to any other appliance
K=	*10 feet (3.1 m)	Clearance to a mechanical air supply inlet
L=	7 feet (2.1 m)	^ Clearance above paved side-walk or a paved driveway located on public property
M=	**12 inches (30 cm)	Clearance under veranda, porch, deck, or balcony

^ a vent shall not terminate directly above a side-walk or paved driveway which is located between two single family dwellings and serves both dwellings*

** only permitted if veranda, porch, deck, or balcony is fully open on a minimum of 2 sides beneath the floor*

* Note: local Codes or Regulation may require different clearances

Vent Termination Requirement

1. Do not terminate the vent in any enclosed or semi-enclosed areas such as a carport, garage, attic, crawl space, narrow walkway, closely fenced area, under an enclosed sun deck or porch, or any location that can build up a concentration of fumes such as stairwells, covered breezeway, etc.
2. Termination must exhaust above the inlet elevation. It is recommended that a minimum of 5 feet of vertical pipe be installed in the vent system. This will create a natural draft to prevent the possibility of smoke or odor during appliance shut down or power failure and avoid exposing people or landscaping shrubs to high temperatures.
3. Vent surfaces can become hot enough to cause burns if touched. Non-combustible shielding or guards may be required if exposed vent is located in high traffic areas.
4. The Vent must terminate a minimum of 12 inches (30 cm) from the wall. Vertical termination must protrude a minimum of 24" (60 cm) from the roof surface.
5. Locate the vent termination at least two feet away from combustible materials such as shrubs, plants, grass, fences, roof overhangs and adjacent buildings.

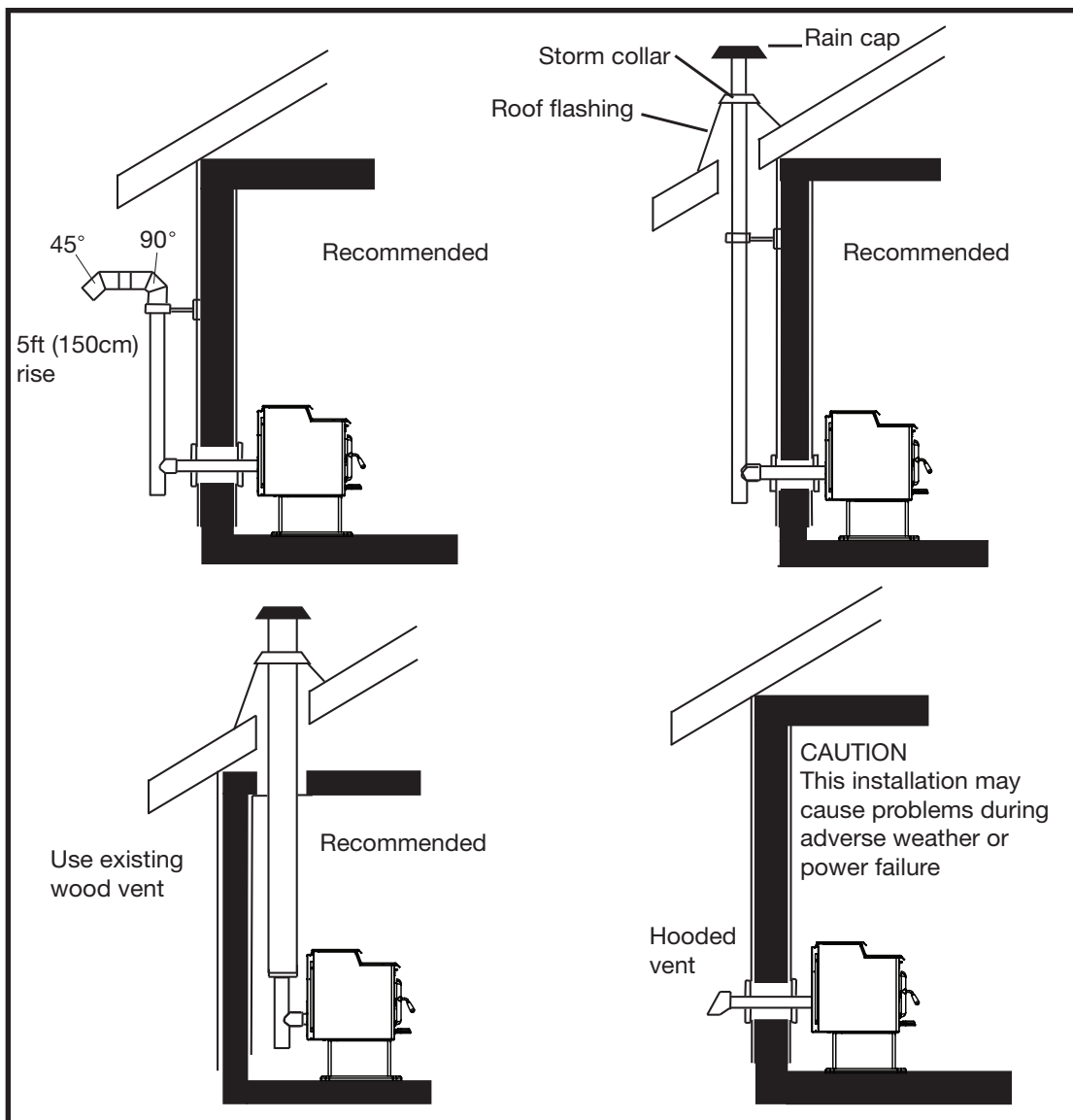


Figure 15: TN40 Vent installed into wood stove pipe.

Venting

FOLLOW THE VENT MANUFACTURERS INSTALLATION GUIDELINES. INSTALL VENT AT CLEARANCES SPECIFIED BY THE VENT MANUFACTURER.

This heater is approved for venting with any 3"(76mm) or 4"(102mm) Type PL and Type L pellet vent pipe listed to UL 641 and ULC S609. Stainless Steel Single wall pipe can ONLY be used as a liner inside a masonry or approved wood burning chimney system on this pellet stove. The stove's starter flue collar is 3" in outside diameter.

The vent pipe can be installed vertically or horizontally (see Venting section for recommended installations). Note: When installing this stove at altitudes over 4000 feet, we suggest the use of 4"(102mm) pellet vent.

The stove's combustion blower pressurizes and pushes flue gases out the vent pipe. The vent pipe should be siliconed and fastened with three screws to the stove's starter pipe. If the pipe does not have a locking system then all pipe joints should be screwed together with three screws. If required, seal all joints externally with high temperature silicone or aluminium tape.

An approved wall thimble or approved ceiling firestop must be used when the pellet pipe passes through a combustible wall or ceiling. Where the vent pipe may pass through a wall, or partition of combustible materials, the installation shall conform to CAN/CSA-B365, as well as any local/regional codes. When installing the wall thimble and other venting components, follow the vent manufacturers instructions. Maintain an effective vapor barrier at the location where the chimney or other component penetrates to the exterior of the structure.

The longer the run of pipe and the more elbows used, the greater the resistance to the flow of flue gases. 4 inch diameter pellet pipe is recommended for horizontal runs greater than 10 feet (3 m) or when more than 3 elbows are used.

To aid in cleaning, whenever possible, the venting system should include a tee with clean out at the transition from horizontal to vertical.

DO NOT INSTALL A FLUE DAMPER IN THE EXHAUST VENTING SYSTEM OF THIS UNIT.

DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.

Horizontal installations that terminate without any vertical sections of pipe are approved; however, it is recommended that a minimum of 5 ft.(1.5m) of vertical be included in the vent system. Having a vertical section in the venting will help prevent smoke from exiting the appliance during power failures.

Wind may direct flue gases back towards the vent and the house, causing operation and/or discoloring problems. For this reason, - vertical through the eaves - installations are ideal.

The chimney may incorporate an offset. Follow the pellet venting manufacturer's instructions. The chimney must be suitably supported by the chimney manufacturer's listed offset support.

Venting into a Wood Stove Pipe

Your pellet stove can be vented into existing 6"(152mm) inside diameter approved wood stove pipe using approved adapter.

Installing into a Masonry Chimney

When venting into a masonry chimney, use an approved 3"(76mm) or 4"(102mm) Stainless Steel Liner Kit all the way up the chimney. Use a top plate at the top of the chimney and a rain cap on the flue pipe as per liner kit manufacturer's instructions.

A "Chimney connector" shall not pass through an attic or roof space, closet or similar concealed space, a floor, or ceiling. Where passage through a wall or partition of combustible construction is desired, the installation shall conform to CAN/CSA-B365, Installation code for Solid-Fuel Burning Appliances and Equipment

Mobile Home Installations

The following additional items are required to install your stove in mobile homes:

1. Connecting the stove to outside combustion air is required (See "Outside Air" on page 20).
2. The stove must be fastened to the floor of the mobile home, using lag screws. The screws can be inserted through the holes provided in the pedestal or using the Anchor Tabs with the legs (Figure 16).
3. The stove must be electrically grounded to the steel chassis of the Mobile Home. This is in addition to the power cord ground.

It is important that you use all specified components.

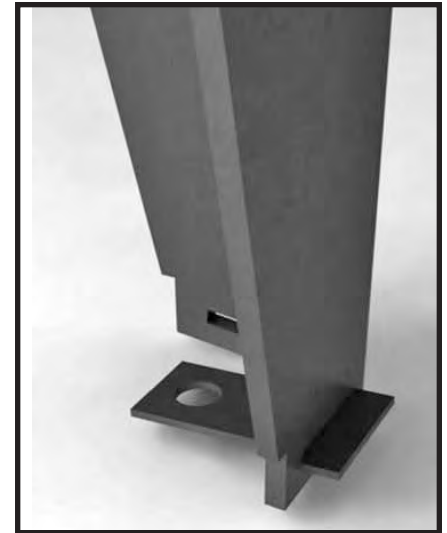


Figure 16: Anchor tabs for mobile homes.

WARNING: DO NOT INSTALL THIS STOVE IN A SLEEPING ROOM IN A MANUFACTURED HOME.

CAUTION: THE STRUCTURAL INTEGRITY OF THE MANUFACTURED HOME FLOOR, WALL AND CEILING/ROOF MUST BE MAINTAINED.

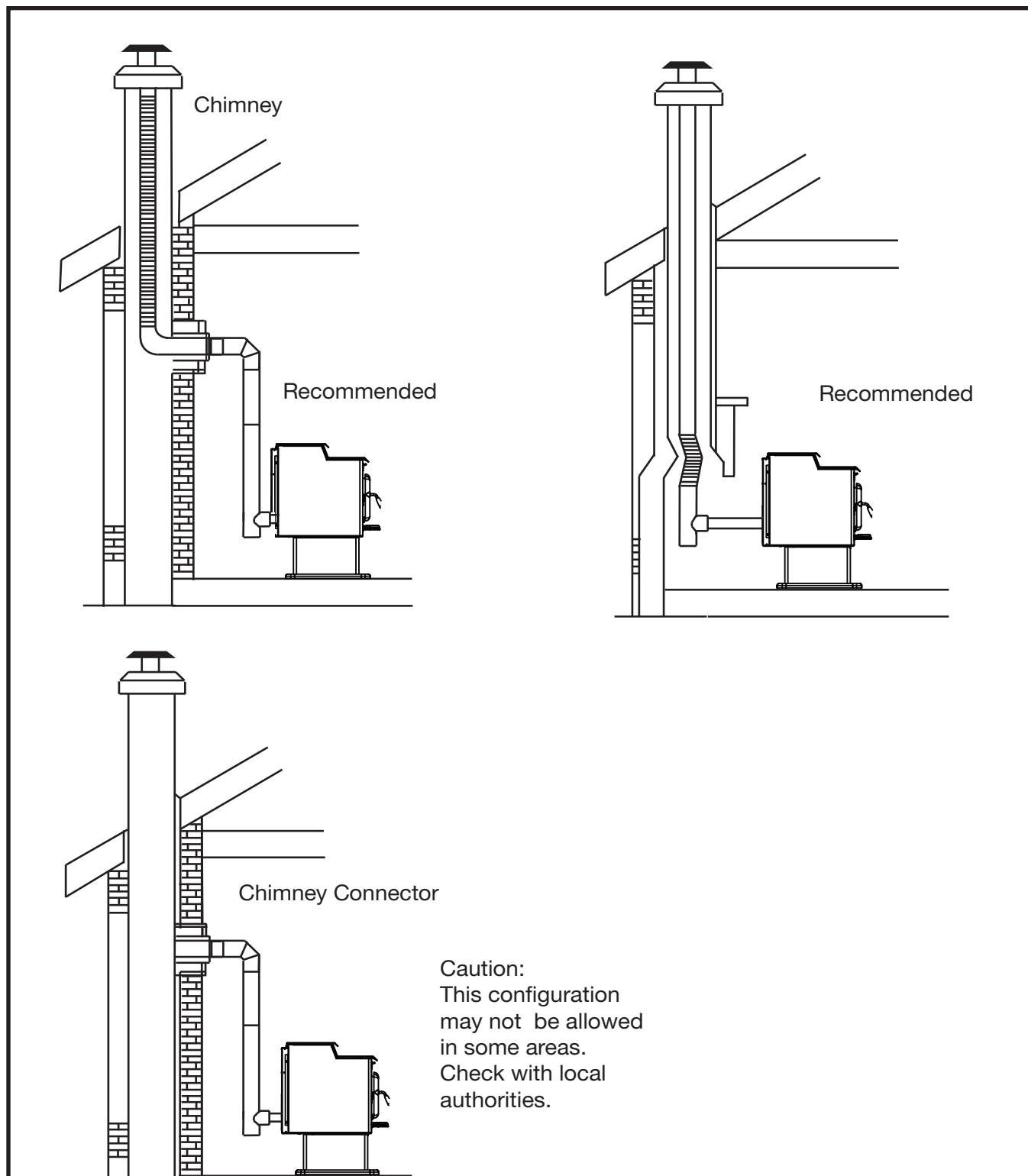


Figure 17: TN40 Vent installed into existing chimney.

Initial Set-up

The stove's damper needs to be set after installation, during the initial burn in. This will optimize the stoves performance based on the installation and reduce emissions. This should be done with a low pressure digital vacuum gauge or magnehelic.

Install the gauge using a sealed 1/8" metal probe into the port located above or to the side of the ash pan door.

Remove the left side panel (See "Inspect Gaskets" on page 14). Find the damper, located against the back of the Air Jacket. loosen the locking screw.

Start the unit per the instructions. Check factory trim levels for both combustion blower and auger speed. They should be set to 3, middle position.(See "Controls" on page 8)

After the unit has been running on high for 15-20 min. adjust the damper to achieve a reading of 0.10-0.12n.w.c.

- To increase the vacuum in the firebox, pull the damper out towards the outside of the stove See "Figure 18: TN40 Damper." and push it in to reduce the vacuum.

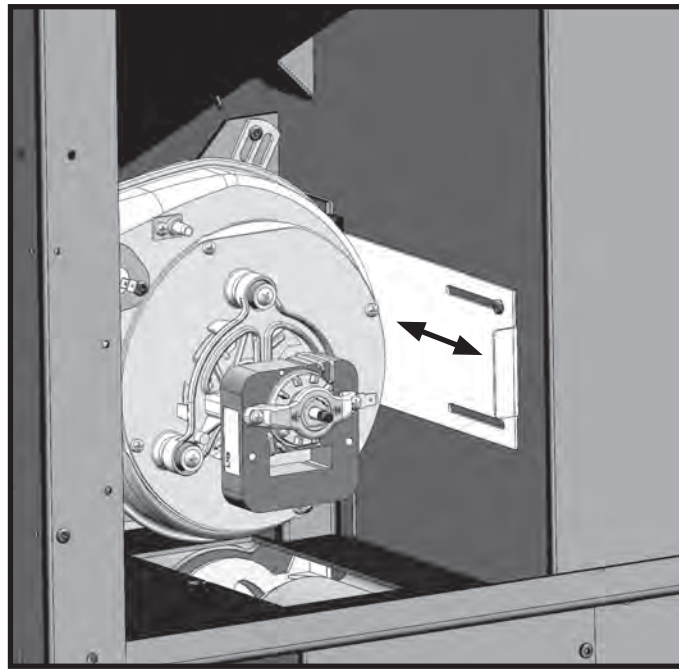


Figure 18: TN40 Damper.

Next, turn the stove down to Heat Level 1 (LOW), wait 5 -10 minutes and take Vacuum readings. They should be 0.09" to 0.11" If not, adjust the Combustion Blower Trim up or down as needed.(See "Controls" on page 8)below

- To adjust, the Combustion Blower Trim, hold down the hidden button under the "TH" in "TRUE NORTH" and use the Heat Level buttons (up, down arrows) to adjust up or down the same way as the Auger Feed Trim. The factory setting is position number 3. The light that is out indicates the setting.

Tighten the Damper locking screw. Re-install the left side shield.

Optional Thermostat Installation

Your Pellet Stove can be operated manually or by a thermostat. The stove comes from the factory in the manual mode. To operate in the two "Thermostat" modes a low voltage thermostat must be installed.

To install the thermostat:

1. Unplug the stove from the electrical outlet. Open the right cabinet side (See "Inspect Gaskets" on page 14) and remove the 2 screws holding the main board to the side of the hopper (Figure 19).
2. Locate the double screw terminal wiring block at the top of the board (Figure 20), loosen the two screws on the block. Insert one of the wires from the thermostat into one of the slots and tighten the screw. Repeat this process for the other thermostat wire.

(See "Thermostat Operation (Optional)" on page 11) for thermostat operation modes.

IMPORTANT NOTE: Follow the Thermostat manufacturers installation and set-up instructions. Failure to follow manufacturers instructions could result in a malfunction. Pay special attention to the thermostat location requirements. If the location requirements are not followed, the appliance may operate erratically or failure may occur.

Do not mount the thermostat where it may be affected by:

- Radiant heat from the stove, sun or other heat sources.
- Drafts or dead spots behind doors or in corners.
- Hot or cold air from ducts.



Figure 19: Main board location.

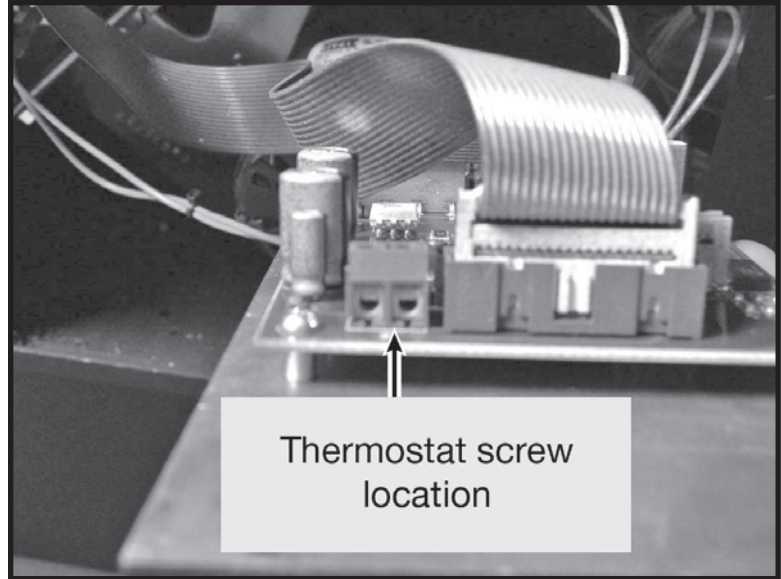
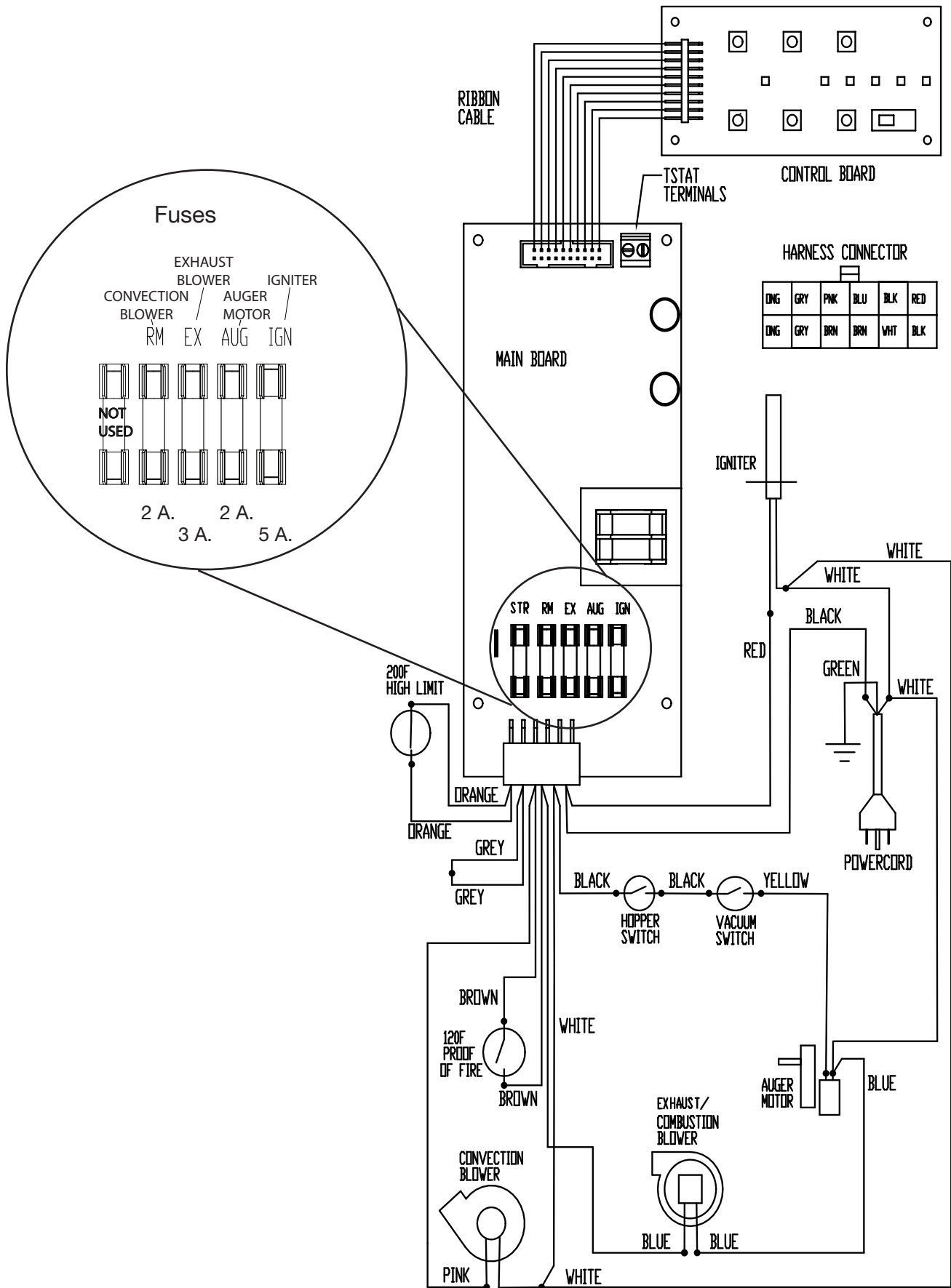


Figure 20: Thermostat screw location.

Wiring Diagram

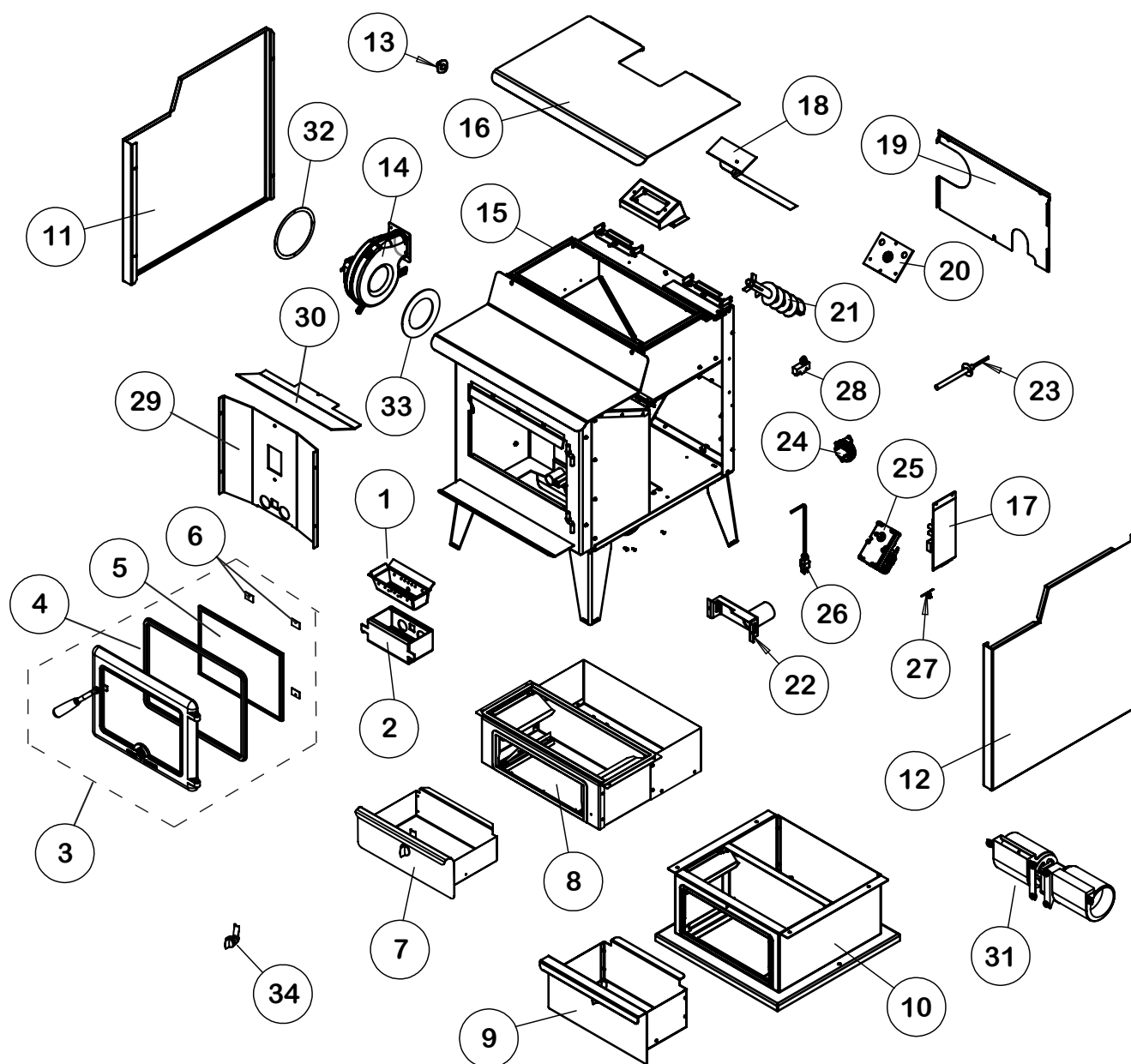


Components List

Item	PART NUMBER	DESCRIPTION
1	80001342.....	Burn-Pot Liner, TN40
2	80001350.....	Burn-Pot, TN40
3	80001329.....	Door Assembly, TN40
4	80000600.....	Door and Glass Gasket, TN
5	80000616.....	Glass (c/w clamps/gasket), TN
6	80000617.....	Glass Clamp Set, 4 piece, TN
7	80001352.....	Ash Box, Leg, TN40
8	80001353.....	Leg Enclosure Assembly, TN40
9	80001344.....	Ash Box, Pedestal, TN40
10	80001343.....	Pedestal Assembly, TN40
11	80001345.....	Side Panel, LHS, TN40
12	80001346.....	Side Panel, RHS, TN40
13	80001336.....	Switch, Bi-Metalic, 120f, Ceramic
14	80001334.....	Combustion Blower, Sit, TN40
15	80001330.....	Gasket, Hopper Lid, TN40
16	80001851.....	Hopper Lid, TN40
17	80001354.....	Circuit Board, Main, C/W Mount, TN40
18	80002027.....	Keypad Mount, C/W Decal, Fs, TN40
19	80001355.....	Panel, Rear Grill, TN40
20	80001341.....	Auger Plate, C/W Bushing, Tn40
21	80000951.....	Auger Assembly, Pellet
22	80001349.....	Air Inlet Assembly, TN40
23	80001817.....	Ignitor, 400w, Pellet
24	80001338.....	Vacuum Switch, .05"Wc
25	80000892.....	Auger Motor, 1 Rpm, Pellet
26	80000911.....	Power Cord, Wired C/W Strain Relief
27	80001337.....	200 F - N/C Manual Reset, Hi Limit
28	80001339.....	Hopper Switch
29	80001351.....	Firebox Liner, Rear, TN40
30	80001348.....	Firebox Liner ,Upper, TN40 32
31	80001858.....	Circulation Blower, WODC
32	80002259.....	Gasket, Service, Combustion Blower, TN40
33	80002134.....	Gasket, Combustion Blower Mount, TN40
34	80001666.....	Latch, Ash Pan, Pellet

WHEN ORDERING, INCLUDE PART NUMBER WITH DESCRIPTION)

All parts may be ordered from your nearest TRUE NORTH dealer.
truenorthstoves.com for the location of the dealer nearest you.





Rating Label



DO NOT REMOVE THIS LABEL/ NE RETIREZ PAS CETTE ÉTIQUETTE.

101-

CERTIFIED FOR CANADA AND U.S.A./ CERTIFIÉ AU CANADA ET AUX ÉTATS-UNIS.
LISTED ROOM HEATER./ APPAREIL DE CHAUFFAGE AMBIANT
PELLET FUEL-BURNING TYPE./ HOMOLOGUÉ, DE TYPE À GRANULES.
ALSO FOR USE IN MOBILE HOMES/ CONÇU AUSSI POUR MAISONS MOBILES

Intertek
ETL#4001507

MODEL **TN40 Series A**

PEDESTAL

LEG

CONFORMS TO: ASTM E 1509-12 CERTIFIED TO / CERTIFIÉ POUR ULC S627-00
INPUT / PUISSANCE : 9,000 - 40,000 Btu/Hr ELECTRICAL/ELECTRIQUE: 120V A/C, 4.3AMP, 60Hz

- Install and use only in accordance with pacific energy installation and operating instructions.
- Contact local building or fire officials about restrictions, permits and inspection in your area.
- Use only, 3" or 4" "PL" or "L" listed exhaust venting systems. Inspect and clean exhaust venting system frequently.
- DO NOT connect this unit to a chimney flue serving another appliance
- See local building code and pacific energy instructions, as well as vent manufacturer's instructions for precautions required when passing exhaust venting through a combustible wall or ceiling.
- For use with only premium wood pellet fuel. DO NOT USE OTHER TYPES OF FUEL.
- WARNING: FOR MOBILE/MANUFACTURED HOMES: Do not install appliance in a sleeping room. Unit must be connected to outside air. Structural integrity of the home floor walls and ceiling must be maintained.
- Keep viewing door and ash drawer closed tightly during operation.
- DO NOT obstruct air openings. Replace glass only with 5mm ceramic glass from your dealer.
- Keep furnishings and other combustible materials well away from heater.
- Use only components specified in the TN40 installation instructions.
- This wood pellet heater needs periodic inspection and repair for proper operation. - Consult the owners manual for further information. It is against federal regulations to operate this wood pellet heater in a manner inconsistent with the operating instructions in the owner's manual

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIALS (measured from top/back of unit)

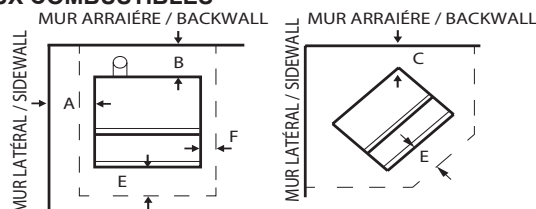
DÉGAGEMENTS MINIMUMS AUX MATÉRIAUX COMBUSTIBLES

- A. SIDEWALL TO UNIT 6 in.(po.) / 152 mm
MUR LATÉRAL AU POËLE
- B. BACKWALL TO UNIT 3 in.(po.) / 76 mm
MUR ARRIÈRE AU POËLE
- C. CORNER TO UNIT 3 in.(po.) / 76 mm
COIN DU POËLE AU MUR ADJACENT

MINIMUM HEIGHT FROM BASE OF UNIT 7ft.(pieds) 2.13m
HAUTEUR MINIMALE DU PLAFOND À LA BASE DU POËLE

COMBUSTIBLE FLOOR MUST BE PROTECTED BY A CONTINUOUS NON-COMBUSTIBLE MATERIAL (UL 1618 type 1)
EXTENDED PAST THE FRONT (E) 6 in/155 mm, SIDES (F) 2 in/51 mm and BACK under vent tee if installed.

ALCOVE SIZE : Maximum DEPTH - 36 in. / 0.91m. - Minimum HEIGHT 7 FT. / 2.13m



TOUT PLANCHER EN MATÉRIAUX COMBUSTIBLES DOIT ÊTRE PROTÉGÉ PAR UN PLATE-FORME CONTINUE EN MATÉRIAUX NON COMBUSTIBLES DÉPASSANT À L'AVANT (E) 6 in./ 155 mm, AUX CÔTÉS (F) 3 in./ 75 mm ET À L'ARRIÈRE DU POËLE TEL QU'INDIQUÉ.

DIMENSIONS POUR INSTALLATION DANS UNE ALCÔVE : Maximum PROFONDEUR : 36 po. / 0,91m. - Minimale HAUTEUR : 7 PIEDS / 2,13m.

- Installez et utilisez selon les instructions d'installation et d'utilisation de pacific energy.
- Contactez les agents locaux du bâtiment ou du service-incendie concernant les restrictions, le permis d'installation et les exigences d'inspection applicables à votre région.
- Utilisez seulement 3" ou 4" conduits d'évacuation homologués de type "PL" "L"
- Inspectez et nettoyez fréquemment le conduit d'évacuation.
- Ne raccordez pas cet appareil à un conduit de cheminée desservant un autre appareil.
- Si le conduit d'évacuation traverse un mur ou plafond en matériau combustible voir les exigences du code du bâtiment local et celles de pacific energy et du fabricant de conduit d'évacuation
- Pour utilisation seulement avec des granules de bois. N'obstruez pas les ouvertures d'air
- La porte vitrée et le tiroir à cendres doivent être tenus bien fermés durant le fonctionnement.
- Appareil de chauffage ambiant à combustible granulé, conçu aussi pour les maisons mobiles.
- Tenez les meubles et autres matériaux combustibles à une bonne distance du poêle.
- Utilisez seulement les composants spécifiés dans les instructions d'installation de TN40.
- La vitre doit être remplacée seulement par une vitre en 5mm céramique.

U.S. ENVIRONMENTAL PROTECTION AGENCY
CERTIFIED TO COMPLY WITH 2020 PARTICULATE
EMISSION STANDARDS/
CERTIFIÉ CONFORME AUX NORMES SUR LES
ÉMISSIONS DE PARTICULES (2020).

This heater meets the 2020 U.S. EPA emissions limits
for Pellet Stoves. Tested to method 28R and ASTM
E2779-10 using premium wood pellets.

1.36g/hr.

MANUFACTURED BY/FABRIQUÉ PAR :
PACIFIC ENERGY FIREPLACE PRODUCTS LTD.
2975 ALLENBY RD., DUNCAN, BC V9L 6V8

DATE OF MANUFACTURE/ DATE DE FABRICATION

J	F	M	A	M	J	J	A	S	O	N	D
2015	2016	2017	2018	2019	2020						

MADE IN CANADA

171115

5050.820-A

TN40-1





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2975 Allenby Rd., Duncan, B.C. V9L 6V8
For technical support, please contact your retailer.
Web site: www.truenorthstoves.com

Printed in Canada



True North Limited Warranty Pellet Products

Engineered with the value conscious buyer in mind

True North warrants to the original consumer of the product the following:

3 years parts (1 year labour)

Firebox, Castings, Glass (glass for thermal breakage only, not impact)

1 year parts and labour

Electrical components and switches

1 year (parts only)

Gaskets, Paint (peeling), Bricks, Firebox liner, Burn pot and liner

CONDITIONS

The warranty of the manufacturer extends only to the original consumer purchaser and is not transferable. Proof of purchase (dated, bill of sale), model name and serial number must be supplied when making any warranty claim to your TRUE NORTH Dealer. This warranty covers brand new products only, which have not been altered, modified nor repaired since shipment from factory. This warranty applies to normal residential use only.

EXCLUSIONS

- Damages caused by misuse, abuse, improper installation, lack of maintenance, over firing, negligence, accident during transportation, power failures, downdrafts, or venting problems are not covered by this warranty.
- The warranty is void if the unit is used to burn materials for which the unit is not certified by the EPA and void if not operated according to the owner's manual.
- This warranty does not cover any scratch, corrosion, warping, or discoloration caused by over firing, abrasives or chemical cleaners.
- Any defect or damage caused by the use of unauthorized parts void this warranty.
- An authorized qualified technician must perform the installation in accordance with the instructions supplied with this product and all local and national building codes.
- Any service call related to an improper installation is not covered by this warranty.

The manufacturer may require that defective products be returned or that digital pictures be provided to support the claim. Returned products are to be shipped prepaid to the manufacturer or agent for investigation.

If a product is found to be defective, the manufacturer will repair or replace (at the manufacturer's discretion) such defect. The manufacturer may, at its discretion, fully discharge all obligations with respect to this warranty by refunding the wholesale price of any warranted but defective part(s).

The manufacturer shall in no event be responsible for any special, indirect, consequential damages of any nature, which are in excess of the original purchase price of the product. A one-time replacement limit applies to all parts benefiting from warranty coverage.

Date:	August 12 2015	Technician	Jeff Bain			
Manufacturer	Pacific Energy	Total Hours Seasoning	19 hours			
Model	True North TN40					
Time minutes	Time hours	Stack Temp °F	Scale Weight lbs			
0	0.00	501.98	388.90	Add Fuel	59.30	lbs
1	0.02	505.40	388.80			
2	0.03	509.36	388.70			
3	0.05	514.22	388.60			
4	0.07	512.78	388.50			
5	0.08	515.30	388.40			
6	0.10	514.40	388.30			
7	0.12	516.56	388.30			
8	0.13	516.20	388.20			
9	0.15	516.38	388.10			
10	0.17	519.62	388.00			
11	0.18	521.60	387.90			
12	0.20	521.78	387.80			
13	0.22	523.22	387.70			
14	0.23	521.42	387.60			
15	0.25	521.78	387.60			
16	0.27	520.52	387.50			
17	0.28	523.58	387.40			
18	0.30	525.38	387.30			
19	0.32	526.82	387.20			
20	0.33	527.36	387.10			
21	0.35	527.72	387.00			
22	0.37	528.44	386.90			
23	0.38	528.80	386.80			
24	0.40	530.06	386.70			
25	0.42	529.70	386.70			
26	0.43	529.88	386.60			
27	0.45	528.80	386.50			
28	0.47	527.00	386.40			

29	0.48	529.34	386.30
30	0.50	530.24	386.20
31	0.52	530.42	386.20
32	0.53	528.08	386.10
33	0.55	527.00	386.00
34	0.57	526.28	385.90
35	0.58	523.22	385.80
36	0.60	525.20	385.80
37	0.62	527.90	385.70
38	0.63	530.06	385.60
39	0.65	530.60	385.50
40	0.67	531.32	385.40
41	0.68	533.48	385.30
42	0.70	532.58	385.20
43	0.72	532.40	385.10
44	0.73	533.30	385.10
45	0.75	532.58	385.00
46	0.77	533.66	384.90
47	0.78	535.10	384.80
48	0.80	537.26	384.70
49	0.82	537.98	384.60
50	0.83	537.62	384.60
51	0.85	538.70	384.50
52	0.87	535.28	384.40
53	0.88	534.74	384.30
54	0.90	532.58	384.20
55	0.92	531.50	384.20
56	0.93	531.86	384.10
57	0.95	533.66	384.00
58	0.97	535.28	383.90
59	0.98	535.64	383.80
60	1.00	534.92	383.70
61	1.02	532.40	383.60

62	1.03	532.22	383.60
63	1.05	532.40	383.50
64	1.07	529.52	383.40
65	1.08	529.16	383.30
66	1.10	524.84	383.30
67	1.12	525.20	383.20
68	1.13	523.40	383.10
69	1.15	522.68	383.00
70	1.17	518.54	383.00
71	1.18	518.72	382.90
72	1.20	513.68	382.80
73	1.22	506.84	382.80
74	1.23	503.24	382.70
75	1.25	501.62	382.70
76	1.27	497.66	382.60
77	1.28	494.96	382.50
78	1.30	495.86	382.50
79	1.32	489.92	382.40
80	1.33	489.56	382.40
81	1.35	487.94	382.30
82	1.37	488.84	382.20
83	1.38	486.86	382.20
84	1.40	488.30	382.10
85	1.42	485.96	382.00
86	1.43	489.92	382.00
87	1.45	486.68	381.90
88	1.47	485.78	381.80
89	1.48	488.84	381.80
90	1.50	488.66	381.70
91	1.52	490.28	381.60
92	1.53	490.46	381.60
93	1.55	490.82	381.50
94	1.57	490.46	381.40

95	1.58	490.28	381.40
96	1.60	485.60	381.30
97	1.62	486.32	381.30
98	1.63	482.54	381.20
99	1.65	485.96	381.10
100	1.67	484.16	381.10
101	1.68	482.90	381.00
102	1.70	483.62	380.90
103	1.72	486.86	380.90
104	1.73	490.28	380.80
105	1.75	487.22	380.70
106	1.77	478.04	380.70
107	1.78	476.60	380.60
108	1.80	484.70	380.50
109	1.82	487.22	380.50
110	1.83	487.94	380.40
111	1.85	490.10	380.30
112	1.87	492.44	380.30
113	1.88	486.86	380.20
114	1.90	491.18	380.10
115	1.92	486.32	380.10
116	1.93	488.48	380.00
117	1.95	491.00	379.90
118	1.97	493.88	379.90
119	1.98	492.62	379.80
120	2.00	494.06	379.70
121	2.02	493.16	379.70
122	2.03	493.70	379.60
123	2.05	494.96	379.50
124	2.07	491.36	379.50
125	2.08	491.54	379.40
126	2.10	492.08	379.30
127	2.12	494.60	379.20

128	2.13	491.36	379.20
129	2.15	492.08	379.10
130	2.17	493.52	379.00
131	2.18	494.42	379.00
132	2.20	492.44	378.90
133	2.22	491.18	378.80
134	2.23	490.82	378.80
135	2.25	492.98	378.70
136	2.27	491.00	378.60
137	2.28	492.08	378.60
138	2.30	493.70	378.50
139	2.32	494.24	378.40
140	2.33	495.14	378.40
141	2.35	494.06	378.30
142	2.37	493.88	378.20
143	2.38	485.78	378.20
144	2.40	482.72	378.10
145	2.42	479.12	378.10
146	2.43	481.46	378.00
147	2.45	481.28	377.90
148	2.47	480.38	377.90
149	2.48	478.58	377.80
150	2.50	483.26	377.70
151	2.52	484.70	377.70
152	2.53	480.02	377.60
153	2.55	476.96	377.60
154	2.57	482.00	377.50
155	2.58	483.62	377.40
156	2.60	480.02	377.30
157	2.62	482.72	377.30
158	2.63	484.34	377.20
159	2.65	488.84	377.10
160	2.67	485.96	377.10

161	2.68	489.02	377.00
162	2.70	486.86	376.90
163	2.72	475.34	376.90
164	2.73	472.28	376.90
165	2.75	468.68	376.80
166	2.77	466.88	376.70
167	2.78	462.02	376.70
168	2.80	444.38	376.70
169	2.82	446.36	376.60
170	2.83	451.22	376.60
171	2.85	449.06	376.50
172	2.87	451.76	376.50
173	2.88	450.68	384.30
174	2.90	452.12	376.40
175	2.92	453.92	376.30
176	2.93	442.04	376.30
177	2.95	440.24	376.20
178	2.97	441.86	376.20
179	2.98	436.10	376.10
180	3.00	439.88	376.10
181	3.02	444.02	376.00
182	3.03	443.84	376.00
183	3.05	433.76	375.90
184	3.07	438.08	375.90
185	3.08	431.78	375.80
186	3.10	428.18	375.80
187	3.12	430.52	375.70
188	3.13	426.38	375.70
189	3.15	428.00	375.70
190	3.17	427.10	375.60
191	3.18	419.00	375.60
192	3.20	425.48	375.50
193	3.22	424.94	375.50

194	3.23	428.72	375.40
195	3.25	429.98	375.40
196	3.27	431.78	375.30
197	3.28	427.28	375.30
198	3.30	428.36	375.20
199	3.32	424.04	375.20
200	3.33	419.18	375.10
201	3.35	421.52	375.10
202	3.37	418.64	375.10
203	3.38	420.62	375.00
204	3.40	426.92	374.90
205	3.42	425.30	374.90
206	3.43	424.94	374.90
207	3.45	423.86	374.80
208	3.47	417.56	380.00
209	3.48	425.84	374.70
210	3.50	424.58	374.70
211	3.52	428.18	374.60
212	3.53	431.96	374.50
213	3.55	429.62	374.50
214	3.57	428.54	374.50
215	3.58	431.96	374.40
216	3.60	422.06	374.40
217	3.62	428.54	374.30
218	3.63	438.62	374.20
219	3.65	434.66	374.20
220	3.67	432.50	374.10
221	3.68	437.36	374.10
222	3.70	430.34	374.10
223	3.72	428.00	374.00
224	3.73	427.28	374.00
225	3.75	420.08	373.90
226	3.77	422.78	373.90

227	3.78	426.02	373.80
228	3.80	429.26	373.80
229	3.82	431.24	373.70
230	3.83	431.42	373.70
231	3.85	415.94	373.70
232	3.87	418.10	373.60
233	3.88	423.14	373.50
234	3.90	423.50	373.50
235	3.92	424.22	373.40
236	3.93	423.50	373.40
237	3.95	419.18	373.40
238	3.97	422.42	373.30
239	3.98	416.84	373.30
240	4.00	414.14	373.20
241	4.02	415.58	373.20
242	4.03	417.56	373.10
243	4.05	418.64	373.10
244	4.07	420.08	373.00
245	4.08	412.34	373.00
246	4.10	411.98	373.00
247	4.12	418.46	372.90
248	4.13	422.42	372.80
249	4.15	423.86	372.80
250	4.17	422.42	372.80
251	4.18	419.54	372.70
252	4.20	423.32	372.70
253	4.22	422.96	372.60
254	4.23	424.58	372.60
255	4.25	417.74	372.50
256	4.27	416.48	372.50
257	4.28	416.66	372.40
258	4.30	416.30	372.40
259	4.32	409.28	372.30

260	4.33	454.10	372.30
261	4.35	453.92	372.20
262	4.37	448.88	372.20
263	4.38	456.98	372.10
264	4.40	411.44	372.10
265	4.42	415.04	372.10
266	4.43	390.92	372.00
267	4.45	434.84	371.90
268	4.47	431.06	371.90
269	4.48	410.90	371.80
270	4.50	455.18	371.80
271	4.52	438.26	371.70
272	4.53	411.98	371.70
273	4.55	413.60	371.60
274	4.57	419.54	371.60
275	4.58	449.78	371.60
276	4.60	413.96	371.50
277	4.62	431.96	371.50
278	4.63	402.08	371.40
279	4.65	408.92	371.40
280	4.67	417.74	371.30
281	4.68	447.98	371.30
282	4.70	450.86	371.20
283	4.72	394.34	371.20
284	4.73	393.44	371.10
285	4.75	415.40	371.10
286	4.77	448.88	371.00
287	4.78	455.36	371.00
288	4.80	443.48	370.90
289	4.82	447.08	370.90
290	4.83	453.74	370.80
291	4.85	415.94	370.80
292	4.87	417.02	370.70

293	4.88	419.72	370.70
294	4.90	442.22	370.60
295	4.92	410.72	370.60
296	4.93	416.12	370.50
297	4.95	453.74	370.50
298	4.97	402.08	370.40
299	4.98	464.36	370.40
300	5.00	430.34	370.30
301	5.02	462.02	370.30
302	5.03	417.56	370.20
303	5.05	460.04	370.20
304	5.07	417.74	370.10
305	5.08	400.46	370.10
306	5.10	446.00	370.00
307	5.12	395.60	370.00
308	5.13	412.52	370.00
309	5.15	405.50	369.90
310	5.17	399.56	369.80
311	5.18	422.42	369.80
312	5.20	450.14	369.80
313	5.22	430.70	369.70
314	5.23	390.38	369.70
315	5.25	394.88	369.60
316	5.27	440.06	369.60
317	5.28	379.40	369.60
318	5.30	427.10	369.50
319	5.32	374.72	369.50
320	5.33	371.30	369.50
321	5.35	374.54	369.40
322	5.37	411.80	369.30
323	5.38	446.36	369.30
324	5.40	455.54	369.20
325	5.42	403.88	369.20

326	5.43	438.80	369.10
327	5.45	396.50	369.10
328	5.47	401.72	369.00
329	5.48	394.70	369.00
330	5.50	429.98	368.90
331	5.52	451.04	368.90
332	5.53	444.74	368.80
333	5.55	401.90	368.80
334	5.57	455.18	368.70
335	5.58	395.78	368.70
336	5.60	439.88	368.60
337	5.62	459.32	368.60
338	5.63	456.98	368.50
339	5.65	455.18	368.50
340	5.67	447.44	368.40
341	5.68	449.24	368.40
342	5.70	439.52	368.30
343	5.72	463.10	368.30
344	5.73	462.38	368.20
345	5.75	410.54	368.20
346	5.77	394.88	368.20
347	5.78	430.52	368.10
348	5.80	450.50	368.10
349	5.82	397.58	368.00
350	5.83	435.56	367.90
351	5.85	437.72	367.90
352	5.87	442.04	367.80
353	5.88	441.14	367.80
354	5.90	421.52	367.70
355	5.92	436.10	367.70
356	5.93	462.20	367.60
357	5.95	468.50	367.60
358	5.97	470.66	367.50

359	5.98	464.36	367.50
360	6.00	429.80	367.40
361	6.02	401.00	367.40
362	6.03	394.34	367.40
363	6.05	385.52	367.30
364	6.07	437.36	367.20
365	6.08	459.14	367.20
366	6.10	389.48	367.20
367	6.12	458.42	367.10
368	6.13	398.12	367.10
369	6.15	417.02	367.00
370	6.17	449.96	367.00
371	6.18	417.74	366.90
372	6.20	404.24	366.90
373	6.22	445.10	366.80
374	6.23	459.86	366.80
375	6.25	446.18	366.70
376	6.27	421.70	366.70
377	6.28	462.02	366.60
378	6.30	414.14	366.60
379	6.32	406.04	366.50
380	6.33	405.68	366.50
381	6.35	455.72	366.40
382	6.37	426.74	366.30
383	6.38	465.80	366.30
384	6.40	446.36	366.20
385	6.42	442.40	366.20
386	6.43	462.92	366.20
387	6.45	400.64	366.10
388	6.47	428.18	366.10
389	6.48	391.82	366.00
390	6.50	406.04	366.00
391	6.52	397.58	365.90

392	6.53	383.36	365.90
393	6.55	406.58	365.90
394	6.57	433.40	365.80
395	6.58	391.82	365.70
396	6.60	428.54	365.70
397	6.62	421.52	365.60
398	6.63	405.50	365.60
399	6.65	459.14	365.50
400	6.67	419.72	365.50
401	6.68	451.04	365.40
402	6.70	410.00	365.40
403	6.72	446.18	365.40
404	6.73	417.02	365.30
405	6.75	436.46	365.30
406	6.77	464.36	365.20
407	6.78	467.60	365.10
408	6.80	427.82	365.10
409	6.82	428.36	365.10
410	6.83	438.98	365.00
411	6.85	460.22	365.00
412	6.87	446.54	364.90
413	6.88	444.56	364.90
414	6.90	391.46	364.80
415	6.92	411.44	364.80
416	6.93	433.76	364.70
417	6.95	413.42	364.70
418	6.97	422.24	364.60
419	6.98	403.88	364.50
420	7.00	415.04	364.50
421	7.02	428.72	364.40
422	7.03	405.50	364.40
423	7.05	455.72	364.40
424	7.07	407.48	364.30

425	7.08	446.90	364.30
426	7.10	389.48	364.20
427	7.12	441.86	364.20
428	7.13	394.88	364.10
429	7.15	445.28	364.10
430	7.17	412.34	364.00
431	7.18	423.86	364.00
432	7.20	460.58	363.90
433	7.22	444.92	363.90
434	7.23	380.48	363.90
435	7.25	453.74	363.80
436	7.27	408.20	363.70
437	7.28	452.66	363.70
438	7.30	459.14	363.60
439	7.32	463.10	363.60
440	7.33	460.40	363.50
441	7.35	414.68	363.50
442	7.37	441.68	363.40
443	7.38	393.26	363.40
444	7.40	438.80	363.30
445	7.42	412.34	363.30
446	7.43	404.42	363.20
447	7.45	431.96	363.20
448	7.47	454.64	363.10
449	7.48	450.32	363.10
450	7.50	431.42	363.00
451	7.52	459.86	363.00
452	7.53	461.66	362.90
453	7.55	452.12	362.90
454	7.57	427.82	362.80
455	7.58	439.34	362.80
456	7.60	451.40	362.70
457	7.62	397.04	362.70

458	7.63	453.02	362.60
459	7.65	464.00	362.60
460	7.67	401.00	362.60
461	7.68	404.78	362.50
462	7.70	393.08	362.50
463	7.72	391.64	362.50
464	7.73	409.10	362.40
465	7.75	418.82	362.40
466	7.77	401.36	362.30
467	7.78	409.10	362.30
468	7.80	436.82	362.20
469	7.82	455.72	362.10
470	7.83	451.22	362.10
471	7.85	381.20	362.10
472	7.87	408.02	362.10
473	7.88	388.58	362.00
474	7.90	397.40	361.90
475	7.92	440.06	361.90
476	7.93	433.22	361.80
477	7.95	447.62	361.80
478	7.97	448.34	361.70
479	7.98	447.44	361.70
480	8.00	391.46	361.60
481	8.02	436.10	361.60
482	8.03	455.54	361.50
483	8.05	406.04	361.50
484	8.07	410.36	361.40
485	8.08	418.10	361.40
486	8.10	424.40	361.30
487	8.12	430.52	361.30
488	8.13	406.58	361.20
489	8.15	401.36	361.20
490	8.17	458.60	361.10

491	8.18	462.20	361.00
492	8.20	450.14	361.00
493	8.22	422.42	360.90
494	8.23	450.86	360.90
495	8.25	431.06	360.90
496	8.27	460.22	360.80
497	8.28	464.90	360.70
498	8.30	424.40	360.70
499	8.32	409.64	360.60
500	8.33	439.88	360.60
501	8.35	447.62	360.50
502	8.37	442.58	360.50
503	8.38	471.38	360.40
504	8.40	454.64	360.40
505	8.42	430.52	360.30
506	8.43	439.34	360.30
507	8.45	463.82	360.20
508	8.47	413.24	360.20
509	8.48	463.82	360.10
510	8.50	419.54	360.10
511	8.52	431.60	360.00
512	8.53	433.04	360.00
513	8.55	420.80	359.90
514	8.57	401.18	359.90
515	8.58	404.06	359.80
516	8.60	465.44	359.80
517	8.62	447.80	359.70
518	8.63	420.44	359.70
519	8.65	405.14	359.60
520	8.67	402.08	359.60
521	8.68	417.20	359.50
522	8.70	411.62	359.50
523	8.72	398.48	359.40

524	8.73	418.46	359.40
525	8.75	444.38	359.40
526	8.77	384.26	359.30
527	8.78	458.06	359.20
528	8.80	427.28	359.20
529	8.82	423.50	359.10
530	8.83	438.80	359.10
531	8.85	412.34	359.10
532	8.87	399.38	359.00
533	8.88	400.46	359.00
534	8.90	414.14	358.90
535	8.92	416.84	358.90
536	8.93	451.76	358.80
537	8.95	456.26	358.80
538	8.97	451.94	358.70
539	8.98	438.80	358.60
540	9.00	453.92	358.60
541	9.02	426.20	358.50
542	9.03	450.68	358.50
543	9.05	434.66	358.40
544	9.07	465.44	358.40
545	9.08	449.96	358.30
546	9.10	412.52	358.30
547	9.12	472.10	358.20
548	9.13	447.62	358.20
549	9.15	401.90	358.20
550	9.17	411.44	358.10
551	9.18	414.86	358.10
552	9.20	430.70	358.00
553	9.22	425.66	358.00
554	9.23	411.80	357.90
555	9.25	453.74	357.90
556	9.27	409.82	357.80

557	9.28	444.38	357.80
558	9.30	466.70	357.70
559	9.32	415.04	357.70
560	9.33	406.58	357.60
561	9.35	456.80	357.50
562	9.37	466.88	357.50
563	9.38	434.30	357.50
564	9.40	412.88	357.40
565	9.42	409.46	357.40
566	9.43	400.46	357.30
567	9.45	447.26	357.30
568	9.47	439.52	357.20
569	9.48	397.94	357.20
570	9.50	443.48	357.10
571	9.52	447.26	357.10
572	9.53	411.44	357.00
573	9.55	420.44	357.00
574	9.57	428.72	356.90
575	9.58	412.52	356.90
576	9.60	429.62	356.90
577	9.62	385.70	356.80
578	9.63	392.72	356.80
579	9.65	390.56	356.70
580	9.67	384.44	356.70
581	9.68	424.76	356.60
582	9.70	428.18	356.60
583	9.72	395.42	356.50
584	9.73	449.42	356.50
585	9.75	395.42	356.40
586	9.77	420.80	356.40
587	9.78	465.08	356.30
588	9.80	431.96	356.30
589	9.82	410.54	356.20

590	9.83	422.96	356.20
591	9.85	442.40	356.10
592	9.87	426.74	356.10
593	9.88	459.68	356.00
594	9.90	460.76	356.00
595	9.92	454.82	355.90
596	9.93	404.24	355.90
597	9.95	401.36	355.80
598	9.97	457.52	355.80
599	9.98	413.24	355.70
600	10.00	459.32	355.70
601	10.02	441.32	355.60
602	10.03	430.52	355.60
603	10.05	438.44	355.50
604	10.07	447.62	355.50
605	10.08	409.10	355.40
606	10.10	419.90	355.40
607	10.12	407.30	355.30
608	10.13	444.02	355.30
609	10.15	444.38	355.20
610	10.17	439.16	355.20
611	10.18	429.62	355.10
612	10.20	449.60	355.10
613	10.22	415.76	355.00
614	10.23	400.64	355.00
615	10.25	405.14	354.90
616	10.27	422.78	354.90
617	10.28	410.54	354.90
618	10.30	450.68	354.80
619	10.32	447.98	354.80
620	10.33	398.48	354.70
621	10.35	419.18	354.70
622	10.37	405.32	354.60

623	10.38	440.96	354.60
624	10.40	439.70	354.50
625	10.42	386.42	354.50
626	10.43	446.36	354.40
627	10.45	425.66	354.40
628	10.47	416.48	354.40
629	10.48	420.26	354.30
630	10.50	384.26	354.30
631	10.52	395.96	354.20
632	10.53	393.26	354.20
633	10.55	426.02	354.10
634	10.57	437.36	354.10
635	10.58	402.26	354.00
636	10.60	417.20	353.90
637	10.62	424.22	353.90
638	10.63	456.98	353.90
639	10.65	461.66	353.80
640	10.67	458.96	353.70
641	10.68	449.78	353.70
642	10.70	449.78	353.60
643	10.72	420.44	353.60
644	10.73	426.74	353.50
645	10.75	438.62	353.50
646	10.77	431.42	353.40
647	10.78	425.30	353.40
648	10.80	442.04	353.30
649	10.82	392.72	353.30
650	10.83	458.42	353.20
651	10.85	453.38	353.20
652	10.87	413.24	353.10
653	10.88	436.82	353.10
654	10.90	420.26	353.10
655	10.92	411.98	353.00

656	10.93	395.42	353.00
657	10.95	441.86	352.90
658	10.97	427.82	352.90
659	10.98	456.44	352.80
660	11.00	403.34	352.70
661	11.02	464.00	352.70
662	11.03	439.52	352.70
663	11.05	395.60	352.60
664	11.07	401.90	352.60
665	11.08	396.68	352.50
666	11.10	443.84	352.50
667	11.12	448.88	352.40
668	11.13	398.12	352.40
669	11.15	432.14	352.40
670	11.17	444.56	352.30
671	11.18	424.58	352.30
672	11.20	428.00	352.20
673	11.22	448.16	352.20
674	11.23	400.64	352.10
675	11.25	402.44	352.10
676	11.27	419.00	352.00
677	11.28	449.24	352.00
678	11.30	455.90	351.90
679	11.32	396.86	351.90
680	11.33	423.68	351.80
681	11.35	415.04	351.80
682	11.37	395.78	351.70
683	11.38	443.48	351.70
684	11.40	408.38	351.60
685	11.42	397.76	351.60
686	11.43	426.38	351.60
687	11.45	397.58	351.50
688	11.47	443.66	351.50

689	11.48	433.76	351.40
690	11.50	421.88	351.40
691	11.52	449.42	351.30
692	11.53	447.44	351.30
693	11.55	418.82	351.20
694	11.57	454.82	351.20
695	11.58	403.70	351.10
696	11.60	408.38	351.10
697	11.62	447.80	351.00
698	11.63	382.28	351.00
699	11.65	410.18	350.90
700	11.67	412.34	350.90
701	11.68	444.74	350.90
702	11.70	453.02	350.80
703	11.72	411.80	350.70
704	11.73	441.86	350.70
705	11.75	399.38	350.70
706	11.77	403.16	350.60
707	11.78	464.90	350.50
708	11.80	430.16	350.50
709	11.82	444.02	350.50
710	11.83	421.34	350.40
711	11.85	440.96	350.30
712	11.87	441.32	350.30
713	11.88	391.82	350.20
714	11.90	420.26	350.20
715	11.92	434.12	350.20
716	11.93	433.76	350.10
717	11.95	401.90	350.10
718	11.97	408.56	350.00
719	11.98	395.24	350.00
720	12.00	404.96	349.90
721	12.02	423.50	349.90

722	12.03	445.10	349.80
723	12.05	437.54	349.80
724	12.07	402.26	349.70
725	12.08	408.20	349.70
726	12.10	397.40	349.60
727	12.12	401.72	349.60
728	12.13	440.60	349.50
729	12.15	434.30	349.50
730	12.17	396.68	349.40
731	12.18	452.30	349.40
732	12.20	451.94	349.30
733	12.22	448.52	349.30
734	12.23	404.06	349.20
735	12.25	400.64	349.20
736	12.27	399.74	349.10
737	12.28	408.02	349.00
738	12.30	413.78	349.00
739	12.32	416.66	349.00
740	12.33	442.40	348.90
741	12.35	455.18	348.90
742	12.37	406.40	348.80
743	12.38	406.76	348.80
744	12.40	395.96	348.70
745	12.42	461.48	348.70
746	12.43	431.24	348.60
747	12.45	402.44	348.60
748	12.47	437.36	348.50
749	12.48	446.54	348.50
750	12.50	429.44	348.40
751	12.52	412.70	348.40
752	12.53	427.82	348.30
753	12.55	453.74	348.30
754	12.57	395.96	348.20

755	12.58	425.66	348.20
756	12.60	448.52	348.20
757	12.62	443.66	348.10
758	12.63	411.08	348.00
759	12.65	443.66	348.00
760	12.67	464.72	347.90
761	12.68	447.80	347.90
762	12.70	406.94	347.80
763	12.72	419.90	347.80
764	12.73	404.06	347.70
765	12.75	407.12	347.70
766	12.77	450.50	347.60
767	12.78	453.56	347.60
768	12.80	454.10	347.50
769	12.82	418.28	347.50
770	12.83	431.60	347.40
771	12.85	404.42	347.40
772	12.87	463.10	347.30
773	12.88	401.00	347.30
774	12.90	404.42	347.30
775	12.92	444.38	347.20
776	12.93	393.44	347.20
777	12.95	448.52	347.10
778	12.97	399.02	347.10
779	12.98	392.90	347.00
780	13.00	418.28	347.00
781	13.02	402.08	346.90
782	13.03	382.46	346.90
783	13.05	414.68	346.80
784	13.07	392.00	346.80
785	13.08	437.54	346.80
786	13.10	442.04	346.70
787	13.12	384.62	346.70

788	13.13	446.18	346.60
789	13.15	432.68	346.60
790	13.17	420.62	346.50
791	13.18	399.20	346.50
792	13.20	434.66	346.50
793	13.22	398.48	346.40
794	13.23	383.00	346.40
795	13.25	379.40	346.30
796	13.27	406.40	346.30
797	13.28	424.58	346.20
798	13.30	427.28	346.20
799	13.32	434.66	346.10
800	13.33	387.68	346.10
801	13.35	453.02	346.00
802	13.37	447.26	346.00
803	13.38	430.34	345.90
804	13.40	435.92	345.90
805	13.42	425.66	345.80
806	13.43	457.52	345.80
807	13.45	407.66	345.70
808	13.47	395.78	345.70
809	13.48	437.00	345.60
810	13.50	422.96	345.60
811	13.52	450.32	345.50
812	13.53	419.36	345.50
813	13.55	398.30	345.40
814	13.57	443.84	345.40
815	13.58	406.40	345.30
816	13.60	442.40	345.30
817	13.62	458.24	345.20
818	13.63	463.28	345.20
819	13.65	402.44	345.10
820	13.67	409.82	345.10

821	13.68	440.78	345.00
822	13.70	451.58	345.00
823	13.72	401.00	344.90
824	13.73	425.66	344.90
825	13.75	424.40	344.80
826	13.77	462.02	344.80
827	13.78	451.04	344.70
828	13.80	417.38	344.70
829	13.82	412.16	344.60
830	13.83	449.24	344.60
831	13.85	447.80	344.60
832	13.87	443.12	344.50
833	13.88	434.48	344.50
834	13.90	381.92	344.40
835	13.92	391.46	344.40
836	13.93	379.40	344.30
837	13.95	380.30	344.30
838	13.97	389.84	344.20
839	13.98	445.64	344.20
840	14.00	391.28	344.10
841	14.02	414.50	344.10
842	14.03	407.66	344.00
843	14.05	458.24	344.00
844	14.07	395.78	343.90
845	14.08	404.60	343.90
846	14.10	392.72	343.80
847	14.12	464.18	343.80
848	14.13	465.62	343.70
849	14.15	435.92	343.60
850	14.17	453.38	343.60
851	14.18	462.74	343.60
852	14.20	396.14	343.50
853	14.22	434.84	343.50

854	14.23	400.10	343.40
855	14.25	408.20	343.40
856	14.27	443.48	343.30
857	14.28	415.40	343.30
858	14.30	408.92	343.20
859	14.32	390.02	343.20
860	14.33	400.46	343.10
861	14.35	462.02	343.10
862	14.37	454.82	343.00
863	14.38	463.64	343.00
864	14.40	410.00	342.90
865	14.42	438.80	342.90
866	14.43	403.16	342.80
867	14.45	397.04	342.80
868	14.47	419.36	342.70
869	14.48	402.80	342.70
870	14.50	448.52	342.60
871	14.52	406.04	342.60
872	14.53	462.92	342.50
873	14.55	461.30	342.50
874	14.57	447.08	342.40
875	14.58	460.76	342.40
876	14.60	426.74	342.30
877	14.62	402.26	342.30
878	14.63	406.58	342.20
879	14.65	436.46	342.20
880	14.67	448.52	342.10
881	14.68	395.24	342.10
882	14.70	460.94	342.00
883	14.72	418.64	342.00
884	14.73	466.16	341.90
885	14.75	437.54	341.90
886	14.77	416.66	341.80

887	14.78	419.72	341.80
888	14.80	404.78	341.70
889	14.82	402.08	341.70
890	14.83	417.38	341.60
891	14.85	398.48	341.60
892	14.87	455.90	341.50
893	14.88	452.30	341.50
894	14.90	446.72	341.50
895	14.92	451.40	341.40
896	14.93	406.40	341.40
897	14.95	433.04	341.30
898	14.97	459.50	341.20
899	14.98	450.50	341.20
900	15.00	398.84	341.20
901	15.02	452.30	341.10
902	15.03	429.26	341.10
903	15.05	457.52	341.00
904	15.07	415.04	340.90
905	15.08	397.40	340.90
906	15.10	397.22	340.80
907	15.12	460.94	340.80
908	15.13	412.34	340.80
909	15.15	414.68	340.70
910	15.17	462.02	340.60
911	15.18	410.90	340.60
912	15.20	400.46	340.50
913	15.22	438.08	340.50
914	15.23	467.96	340.40
915	15.25	460.58	340.40
916	15.27	449.60	340.30
917	15.28	455.54	340.30
918	15.30	453.92	340.20
919	15.32	438.08	340.20

920	15.33	417.92	340.20
921	15.35	460.40	340.10
922	15.37	400.10	340.10
923	15.38	449.60	340.00
924	15.40	446.90	340.00
925	15.42	405.32	339.90
926	15.43	434.84	339.90
927	15.45	414.32	339.80
928	15.47	409.10	339.80
929	15.48	435.56	339.70
930	15.50	452.84	339.70
931	15.52	418.82	339.60
932	15.53	426.20	339.60
933	15.55	419.90	339.60
934	15.57	381.56	339.50
935	15.58	421.34	339.50
936	15.60	423.32	339.40
937	15.62	432.14	339.40
938	15.63	437.90	339.40
939	15.65	403.52	339.30
940	15.67	443.66	339.20
941	15.68	401.90	339.20
942	15.70	445.10	339.10
943	15.72	418.64	339.10
944	15.73	418.46	339.00
945	15.75	408.38	339.00
946	15.77	428.90	338.90
947	15.78	404.78	338.90
948	15.80	446.90	338.80
949	15.82	418.82	338.80
950	15.83	426.56	338.70
951	15.85	410.18	338.70
952	15.87	440.60	338.60

953	15.88	399.20	338.60
954	15.90	413.60	338.60
955	15.92	388.94	338.50
956	15.93	394.88	338.40
957	15.95	417.56	338.40
958	15.97	425.66	338.40
959	15.98	399.38	338.30
960	16.00	400.10	338.30
961	16.02	426.92	338.20
962	16.03	440.42	338.10
963	16.05	429.08	338.10
964	16.07	457.88	338.00
965	16.08	414.50	338.00
966	16.10	410.90	338.00
967	16.12	456.44	337.90
968	16.13	460.40	337.90
969	16.15	461.48	337.80
970	16.17	440.42	337.70
971	16.18	405.86	337.70
972	16.20	454.82	337.70
973	16.22	421.16	337.60
974	16.23	401.00	337.60
975	16.25	414.50	337.50
976	16.27	429.44	337.50
977	16.28	394.16	337.40
978	16.30	406.58	337.40
979	16.32	442.04	337.40
980	16.33	447.80	337.30
981	16.35	434.12	337.30
982	16.37	397.58	337.20
983	16.38	391.28	337.20
984	16.40	388.04	337.10
985	16.42	379.58	337.10

986	16.43	432.68	337.00
987	16.45	401.00	337.00
988	16.47	445.64	336.90
989	16.48	402.62	336.90
990	16.50	400.64	336.80
991	16.52	401.36	336.80
992	16.53	412.16	336.70
993	16.55	436.28	336.70
994	16.57	391.46	336.60
995	16.58	415.04	336.60
996	16.60	455.36	336.50
997	16.62	455.54	336.50
998	16.63	393.80	336.40
999	16.65	411.08	336.40
1000	16.67	390.74	336.30
1001	16.68	401.72	336.30
1002	16.70	434.84	336.30
1003	16.72	420.62	336.20
1004	16.73	390.38	336.20
1005	16.75	442.94	336.10
1006	16.77	385.16	336.10
1007	16.78	389.66	336.00
1008	16.80	421.88	336.00
1009	16.82	381.92	336.00
1010	16.83	428.90	335.90
1011	16.85	437.72	335.80
1012	16.87	389.48	335.80
1013	16.88	427.28	335.80
1014	16.90	386.78	335.70
1015	16.92	438.26	335.60
1016	16.93	388.76	335.60
1017	16.95	454.10	335.50
1018	16.97	417.20	335.50

1019	16.98	410.90	335.40
1020	17.00	431.06	335.40
1021	17.02	402.62	335.40
1022	17.03	410.54	335.30
1023	17.05	401.00	335.20
1024	17.07	429.80	335.20
1025	17.08	405.50	335.10
1026	17.10	448.16	335.10
1027	17.12	437.00	335.10
1028	17.13	393.26	335.00
1029	17.15	406.58	334.90
1030	17.17	414.68	334.90
1031	17.18	418.10	334.80
1032	17.20	458.60	334.80
1033	17.22	417.38	334.70
1034	17.23	464.36	334.70
1035	17.25	410.18	334.60
1036	17.27	450.50	334.60
1037	17.28	402.98	334.50
1038	17.30	403.34	334.50
1039	17.32	399.74	334.40
1040	17.33	429.44	334.40
1041	17.35	416.30	334.30
1042	17.37	443.84	334.30
1043	17.38	448.52	334.30
1044	17.40	442.94	334.20
1045	17.42	435.02	334.20
1046	17.43	433.76	334.10
1047	17.45	395.60	334.00
1048	17.47	413.42	334.00
1049	17.48	396.14	334.00
1050	17.50	422.60	333.90
1051	17.52	409.46	333.90

1052	17.53	442.76	333.80
1053	17.55	410.90	333.70
1054	17.57	405.32	333.70
1055	17.58	423.32	333.70
1056	17.60	438.62	333.60
1057	17.62	411.44	333.60
1058	17.63	448.52	333.50
1059	17.65	445.28	333.50
1060	17.67	446.18	333.40
1061	17.68	463.82	333.40
1062	17.70	401.36	333.30
1063	17.72	429.98	333.20
1064	17.73	460.94	333.20
1065	17.75	402.44	333.20
1066	17.77	418.28	333.10
1067	17.78	452.66	333.10
1068	17.80	446.54	333.00
1069	17.82	395.24	333.00
1070	17.83	424.94	333.00
1071	17.85	419.18	332.90
1072	17.87	432.14	332.90
1073	17.88	408.02	332.80
1074	17.90	417.20	332.80
1075	17.92	391.28	332.70
1076	17.93	442.04	332.70
1077	17.95	401.00	332.60
1078	17.97	403.52	332.60
1079	17.98	419.54	332.50
1080	18.00	442.58	332.50
1081	18.02	451.76	332.40
1082	18.03	448.34	332.40
1083	18.05	443.48	332.30
1084	18.07	392.36	332.30

1085	18.08	394.52	332.20
1086	18.10	448.34	332.20
1087	18.12	398.30	332.10
1088	18.13	463.82	332.10
1089	18.15	462.20	332.00
1090	18.17	465.62	331.90
1091	18.18	406.40	331.90
1092	18.20	458.42	331.90
1093	18.22	396.68	331.80
1094	18.23	402.26	331.70
1095	18.25	406.22	331.70
1096	18.27	406.40	331.70
1097	18.28	405.68	331.60
1098	18.30	446.90	331.60
1099	18.32	441.86	331.50
1100	18.33	448.70	331.50
1101	18.35	406.58	331.40
1102	18.37	413.42	331.40
1103	18.38	413.96	331.30
1104	18.40	400.28	331.30
1105	18.42	437.00	331.20
1106	18.43	401.72	331.20
1107	18.45	440.06	331.10
1108	18.47	440.60	331.10
1109	18.48	427.82	331.00
1110	18.50	382.28	331.00
1111	18.52	388.04	331.00
1112	18.53	372.02	330.90
1113	18.55	383.36	330.90
1114	18.57	386.96	330.80
1115	18.58	448.88	330.80
1116	18.60	439.88	330.70
1117	18.62	394.88	330.70

1118	18.63	394.52	330.70
1119	18.65	383.72	330.60
1120	18.67	442.22	330.50
1121	18.68	408.56	330.50
1122	18.70	438.98	330.50
1123	18.72	395.24	330.40
1124	18.73	447.44	330.30
1125	18.75	393.26	330.30
1126	18.77	435.56	330.20
1127	18.78	404.24	330.20
1128	18.80	448.70	330.20
1129	18.82	437.36	330.10
1130	18.83	454.82	330.10
1131	18.85	441.86	330.00
1132	18.87	447.26	330.00
1133	18.88	450.32	329.90
1134	18.90	433.22	329.90
1135	18.92	436.46	329.80
1136	18.93	427.82	329.80
1137	18.95	449.42	329.70
1138	18.97	442.94	329.70
1139	18.98	418.64	329.60
1140	19.00	416.12	329.60
1141	19.02	400.64	329.50
1142	19.03	441.86	329.50
1143	19.05	435.02	329.50
1144	19.07	400.10	329.40
1145	19.08	449.78	329.40
1146	19.10	419.36	329.30
1147	19.12	391.82	329.30
1148	19.13	398.30	329.20
1149	19.15	425.12	329.20
1150	19.17	431.42	329.10

1151	19.18	429.08	329.10
1152	19.20	449.24	329.00
1153	19.22	442.94	329.00
1154	19.23	386.06	328.90
1155	19.25	392.90	328.90
1156	19.27	410.00	328.80
1157	19.28	394.52	328.80
1158	19.30	397.76	328.70
1159	19.32	400.10	328.70
1160	19.33	441.86	328.60
1161	19.35	421.34	328.60
1162	19.37	413.60	328.50
1163	19.38	423.86	328.50
1164	19.40	404.24	328.40
1165	19.42	408.02	328.40
1166	19.43	405.32	328.30
1167	19.45	401.36	328.30
1168	19.47	404.78	328.20
1169	19.48	422.24	328.20
1170	19.50	400.10	328.10
1171	19.52	404.06	328.10
1172	19.53	428.00	328.00
1173	19.55	457.52	328.00
1174	19.57	415.58	328.00
1175	19.58	395.24	327.90
1176	19.60	431.96	327.90
1177	19.62	427.64	327.80
1178	19.63	399.74	327.80
1179	19.65	425.84	327.70
1180	19.67	388.58	327.70
1181	19.68	376.70	327.70
1182	19.70	427.10	327.60
1183	19.72	431.24	327.60

1184	19.73	426.56	327.50
1185	19.75	411.26	327.50
1186	19.77	386.06	327.40

Date:	August 13 2015	Technician	Jeff Bain			
Manufacturer	Pacific Energy	Total Hours Seasoning	15 hours			
Model	True North TN40					
Time minutes	Time hours	Stack Temp °F	Scale Weight lbs			
0	0.00	442	349.60	Add Fuel	33.50	lbs
1	0.02	474	349.50			
2	0.03	484	349.50			
3	0.05	421	349.50			
4	0.07	393	349.40			
5	0.08	416	349.40			
6	0.10	439	349.30			
7	0.12	428	349.30			
8	0.13	428	349.20			
9	0.15	400	349.20			
10	0.17	408	349.10			
11	0.18	409	349.10			
12	0.20	348	349.10			
13	0.22	401	349.00			
14	0.23	376	349.00			
15	0.25	373	349.00			
16	0.27	369	348.90			
17	0.28	332	348.90			
18	0.30	361	348.80			
19	0.32	354	348.80			
20	0.33	323	348.70			
21	0.35	352	348.70			
22	0.37	369	348.70			
23	0.38	338	348.60			
24	0.40	371	348.60			
25	0.42	355	348.50			
26	0.43	334	348.50			

27	0.45	385	348.40
28	0.47	344	348.40
29	0.48	372	348.40
30	0.50	321	348.30
31	0.52	369	348.30
32	0.53	367	348.30
33	0.55	367	348.20
34	0.57	313	348.20
35	0.58	361	348.10
36	0.60	355	348.10
37	0.62	367	348.10
38	0.63	357	348.00
39	0.65	345	348.00
40	0.67	327	348.00
41	0.68	371	347.90
42	0.70	308	347.90
43	0.72	369	347.80
44	0.73	348	347.80
45	0.75	405	347.70
46	0.77	366	347.70
47	0.78	376	347.60
48	0.80	390	347.60
49	0.82	435	347.50
50	0.83	396	347.50
51	0.85	395	347.40
52	0.87	419	347.40
53	0.88	381	347.40
54	0.90	413	347.30
55	0.92	435	347.30
56	0.93	390	347.20
57	0.95	441	347.20

58	0.97	397	347.10
59	0.98	382	347.10
60	1.00	372	347.10
61	1.02	389	347.00
62	1.03	429	347.00
63	1.05	430	346.90
64	1.07	384	346.90
65	1.08	421	346.80
66	1.10	366	346.90
67	1.12	363	346.80
68	1.13	418	346.80
69	1.15	410	346.80
70	1.17	410	346.70
71	1.18	405	346.70
72	1.20	412	346.60
73	1.22	384	346.60
74	1.23	419	346.50
75	1.25	376	346.50
76	1.27	376	346.50
77	1.28	397	346.40
78	1.30	412	346.40
79	1.32	359	346.30
80	1.33	364	346.30
81	1.35	383	346.20
82	1.37	396	346.20
83	1.38	421	346.20
84	1.40	419	346.10
85	1.42	363	346.10
86	1.43	362	346.10
87	1.45	407	346.00
88	1.47	357	346.00

89	1.48	380	345.90
90	1.50	358	345.90
91	1.52	353	345.90
92	1.53	409	345.80
93	1.55	361	345.80
94	1.57	371	345.70
95	1.58	412	345.70
96	1.60	392	345.60
97	1.62	381	345.60
98	1.63	412	345.60
99	1.65	348	345.60
100	1.67	343	345.50
101	1.68	341	345.50
102	1.70	380	345.40
103	1.72	353	345.40
104	1.73	356	345.40
105	1.75	408	345.30
106	1.77	348	345.30
107	1.78	381	345.20
108	1.80	407	345.20
109	1.82	408	345.20
110	1.83	387	345.10
111	1.85	375	345.10
112	1.87	374	345.00
113	1.88	418	345.00
114	1.90	416	344.90
115	1.92	366	344.90
116	1.93	401	344.90
117	1.95	375	344.80
118	1.97	366	344.80
119	1.98	422	344.70

120	2.00	374	344.70
121	2.02	414	344.60
122	2.03	363	344.60
123	2.05	408	344.60
124	2.07	347	344.50
125	2.08	381	344.50
126	2.10	391	344.40
127	2.12	355	344.40
128	2.13	405	344.30
129	2.15	384	344.30
130	2.17	368	344.30
131	2.18	417	344.20
132	2.20	390	344.20
133	2.22	346	344.20
134	2.23	388	344.10
135	2.25	383	344.10
136	2.27	383	344.00
137	2.28	349	344.00
138	2.30	354	343.90
139	2.32	410	343.90
140	2.33	340	343.90
141	2.35	353	343.90
142	2.37	351	343.80
143	2.38	355	343.80
144	2.40	385	343.80
145	2.42	328	343.70
146	2.43	375	343.70
147	2.45	340	343.70
148	2.47	389	343.60
149	2.48	382	343.60
150	2.50	352	343.50

151	2.52	386	343.50
152	2.53	369	343.40
153	2.55	348	343.40
154	2.57	384	343.40
155	2.58	389	343.30
156	2.60	405	343.30
157	2.62	396	343.20
158	2.63	350	343.20
159	2.65	380	343.20
160	2.67	404	343.10
161	2.68	395	343.10
162	2.70	377	343.00
163	2.72	350	343.00
164	2.73	403	342.90
165	2.75	384	342.90
166	2.77	405	342.90
167	2.78	352	342.80
168	2.80	376	342.80
169	2.82	360	342.80
170	2.83	356	342.70
171	2.85	381	342.70
172	2.87	361	342.60
173	2.88	360	342.60
174	2.90	369	342.50
175	2.92	362	342.50
176	2.93	397	342.50
177	2.95	406	342.40
178	2.97	392	342.40
179	2.98	372	342.40
180	3.00	346	342.30
181	3.02	361	342.30

182	3.03	367	342.20
183	3.05	408	342.20
184	3.07	364	342.10
185	3.08	418	342.10
186	3.10	360	342.00
187	3.12	412	342.00
188	3.13	388	342.00
189	3.15	400	341.90
190	3.17	383	341.90
191	3.18	420	341.80
192	3.20	358	341.80
193	3.22	410	341.70
194	3.23	411	341.70
195	3.25	359	341.70
196	3.27	404	341.60
197	3.28	353	341.60
198	3.30	391	341.60
199	3.32	337	341.50
200	3.33	409	341.50
201	3.35	376	341.40
202	3.37	376	341.40
203	3.38	401	341.40
204	3.40	366	341.30
205	3.42	357	341.30
206	3.43	351	341.20
207	3.45	408	341.20
208	3.47	407	341.10
209	3.48	400	341.10
210	3.50	380	341.10
211	3.52	364	341.00
212	3.53	379	341.00

213	3.55	373	341.00
214	3.57	338	340.90
215	3.58	341	340.90
216	3.60	356	340.90
217	3.62	370	340.80
218	3.63	406	340.80
219	3.65	341	340.70
220	3.67	383	340.70
221	3.68	404	340.60
222	3.70	360	340.60
223	3.72	369	340.60
224	3.73	357	340.50
225	3.75	341	340.50
226	3.77	384	340.40
227	3.78	395	340.40
228	3.80	372	340.30
229	3.82	412	340.30
230	3.83	366	340.30
231	3.85	410	340.20
232	3.87	357	340.20
233	3.88	359	340.10
234	3.90	375	340.10
235	3.92	369	340.10
236	3.93	351	340.00
237	3.95	391	340.00
238	3.97	380	340.00
239	3.98	403	339.90
240	4.00	348	339.90
241	4.02	368	339.80
242	4.03	403	339.80
243	4.05	358	339.80

244	4.07	357	339.70
245	4.08	379	339.70
246	4.10	384	339.70
247	4.12	372	339.70
248	4.13	372	339.60
249	4.15	355	339.60
250	4.17	336	339.60
251	4.18	336	339.50
252	4.20	360	339.50
253	4.22	340	339.40
254	4.23	367	339.40
255	4.25	336	339.40
256	4.27	398	339.30
257	4.28	405	339.30
258	4.30	404	339.20
259	4.32	348	339.20
260	4.33	363	339.10
261	4.35	377	339.10
262	4.37	389	339.10
263	4.38	405	339.00
264	4.40	360	339.00
265	4.42	345	338.90
266	4.43	358	338.90
267	4.45	403	338.90
268	4.47	397	338.80
269	4.48	340	338.80
270	4.50	339	338.80
271	4.52	404	338.70
272	4.53	384	338.70
273	4.55	412	338.60
274	4.57	415	338.60

275	4.58	397	338.50
276	4.60	369	338.50
277	4.62	345	338.50
278	4.63	359	338.40
279	4.65	344	338.40
280	4.67	397	338.40
281	4.68	399	338.30
282	4.70	381	338.30
283	4.72	396	338.20
284	4.73	411	338.20
285	4.75	352	338.10
286	4.77	371	338.10
287	4.78	373	338.10
288	4.80	351	338.00
289	4.82	362	338.00
290	4.83	408	337.90
291	4.85	379	337.90
292	4.87	423	337.80
293	4.88	406	337.80
294	4.90	373	337.70
295	4.92	385	337.70
296	4.93	402	337.70
297	4.95	367	337.60
298	4.97	409	337.60
299	4.98	358	337.60
300	5.00	369	337.50
301	5.02	411	337.50
302	5.03	377	337.40
303	5.05	372	337.40
304	5.07	404	337.30
305	5.08	422	337.30

306	5.10	388	337.30
307	5.12	371	337.20
308	5.13	378	337.20
309	5.15	352	337.10
310	5.17	402	337.10
311	5.18	373	337.10
312	5.20	391	337.00
313	5.22	348	337.00
314	5.23	407	336.90
315	5.25	416	336.90
316	5.27	361	336.90
317	5.28	412	336.80
318	5.30	416	336.70
319	5.32	359	336.70
320	5.33	413	336.70
321	5.35	395	336.70
322	5.37	372	336.60
323	5.38	400	336.60
324	5.40	345	336.60
325	5.42	406	336.50
326	5.43	338	336.50
327	5.45	397	336.40
328	5.47	360	336.40
329	5.48	379	336.30
330	5.50	350	336.30
331	5.52	334	336.30
332	5.53	361	336.20
333	5.55	394	336.20
334	5.57	356	336.20
335	5.58	395	336.10
336	5.60	362	336.10

337	5.62	388	336.00
338	5.63	371	336.00
339	5.65	381	336.00
340	5.67	366	335.90
341	5.68	408	335.90
342	5.70	402	335.80
343	5.72	377	335.80
344	5.73	356	335.80
345	5.75	332	335.70
346	5.77	369	335.70
347	5.78	398	335.70
348	5.80	335	335.60
349	5.82	390	335.60
350	5.83	359	335.50
351	5.85	342	335.50
352	5.87	346	335.40
353	5.88	356	335.40
354	5.90	380	335.40
355	5.92	368	335.30
356	5.93	383	335.30
357	5.95	386	335.20
358	5.97	345	335.20
359	5.98	397	335.20
360	6.00	407	335.10
361	6.02	377	335.10
362	6.03	379	335.10
363	6.05	395	335.00
364	6.07	351	335.00
365	6.08	353	334.90
366	6.10	404	334.90
367	6.12	380	334.80

368	6.13	346	334.80
369	6.15	352	334.80
370	6.17	357	334.70
371	6.18	349	334.70
372	6.20	339	334.70
373	6.22	328	334.60
374	6.23	400	334.60
375	6.25	341	334.60
376	6.27	339	334.50
377	6.28	397	334.50
378	6.30	345	334.40
379	6.32	371	334.40
380	6.33	385	334.40
381	6.35	344	334.30
382	6.37	398	334.30
383	6.38	389	334.30
384	6.40	341	334.20
385	6.42	349	334.20
386	6.43	367	334.10
387	6.45	338	334.10
388	6.47	388	334.00
389	6.48	362	334.00
390	6.50	394	334.00
391	6.52	340	333.90
392	6.53	384	333.90
393	6.55	395	333.80
394	6.57	390	333.80
395	6.58	358	333.80
396	6.60	373	333.80
397	6.62	354	333.70
398	6.63	370	333.60

399	6.65	376	333.60
400	6.67	354	333.60
401	6.68	396	333.50
402	6.70	335	333.50
403	6.72	386	333.50
404	6.73	336	333.40
405	6.75	339	333.40
406	6.77	399	333.30
407	6.78	358	333.30
408	6.80	398	333.30
409	6.82	386	333.20
410	6.83	340	333.20
411	6.85	373	333.20
412	6.87	340	333.10
413	6.88	345	333.10
414	6.90	344	333.00
415	6.92	362	333.00
416	6.93	409	332.90
417	6.95	333	332.90
418	6.97	350	332.90
419	6.98	346	332.80
420	7.00	357	332.80
421	7.02	392	332.70
422	7.03	410	332.70
423	7.05	402	332.70
424	7.07	380	332.60
425	7.08	344	332.60
426	7.10	378	332.50
427	7.12	405	332.50
428	7.13	344	332.50
429	7.15	403	332.40

430	7.17	380	332.40
431	7.18	347	332.30
432	7.20	400	332.30
433	7.22	391	332.30
434	7.23	381	332.20
435	7.25	398	332.20
436	7.27	351	332.10
437	7.28	343	332.10
438	7.30	382	332.10
439	7.32	340	332.00
440	7.33	366	332.00
441	7.35	341	332.00
442	7.37	348	331.90
443	7.38	334	331.90
444	7.40	357	331.80
445	7.42	401	331.80
446	7.43	391	331.80
447	7.45	348	331.70
448	7.47	414	331.70
449	7.48	407	331.60
450	7.50	384	331.60
451	7.52	353	331.60
452	7.53	384	331.50
453	7.55	367	331.50
454	7.57	334	331.50
455	7.58	390	331.40
456	7.60	384	331.40
457	7.62	388	331.30
458	7.63	395	331.30
459	7.65	364	331.30
460	7.67	378	331.20

461	7.68	386	331.20
462	7.70	373	331.10
463	7.72	402	331.10
464	7.73	374	331.10
465	7.75	338	331.00
466	7.77	389	331.00
467	7.78	325	331.00
468	7.80	362	330.90
469	7.82	372	330.90
470	7.83	347	330.80
471	7.85	371	330.80
472	7.87	397	330.70
473	7.88	355	330.70
474	7.90	349	330.70
475	7.92	343	330.60
476	7.93	375	330.60
477	7.95	388	330.60
478	7.97	338	330.50
479	7.98	397	330.50
480	8.00	405	330.40
481	8.02	403	330.40
482	8.03	423	330.30
483	8.05	366	330.30
484	8.07	408	330.30
485	8.08	385	330.20
486	8.10	414	330.20
487	8.12	368	330.10
488	8.13	373	330.10
489	8.15	370	330.10
490	8.17	350	330.00
491	8.18	339	330.00

492	8.20	384	329.90
493	8.22	403	329.90
494	8.23	344	329.90
495	8.25	344	329.80
496	8.27	385	329.80
497	8.28	337	329.70
498	8.30	339	329.70
499	8.32	378	329.60
500	8.33	404	329.60
501	8.35	407	329.60
502	8.37	404	329.50
503	8.38	354	329.50
504	8.40	355	329.50
505	8.42	355	329.40
506	8.43	409	329.40
507	8.45	368	329.30
508	8.47	381	329.30
509	8.48	389	329.30
510	8.50	347	329.20
511	8.52	356	329.20
512	8.53	400	329.10
513	8.55	398	329.10
514	8.57	350	329.10
515	8.58	346	329.00
516	8.60	403	329.00
517	8.62	361	328.90
518	8.63	407	328.90
519	8.65	365	328.90
520	8.67	370	328.80
521	8.68	368	328.80
522	8.70	354	328.70

523	8.72	370	328.70
524	8.73	354	328.70
525	8.75	404	328.60
526	8.77	404	328.60
527	8.78	351	328.50
528	8.80	397	328.50
529	8.82	371	328.50
530	8.83	400	328.40
531	8.85	355	328.40
532	8.87	338	328.40
533	8.88	328	328.30
534	8.90	377	328.20
535	8.92	407	328.20
536	8.93	388	328.10
537	8.95	415	328.10
538	8.97	342	328.10
539	8.98	384	328.10
540	9.00	390	328.00
541	9.02	381	328.00
542	9.03	399	328.00
543	9.05	388	327.90
544	9.07	399	327.90
545	9.08	379	327.80
546	9.10	339	327.80
547	9.12	345	327.70
548	9.13	354	327.70
549	9.15	384	327.70
550	9.17	349	327.60
551	9.18	339	327.60
552	9.20	389	327.60
553	9.22	329	327.50

554	9.23	362	327.50
555	9.25	339	327.40
556	9.27	338	327.40
557	9.28	403	327.40
558	9.30	345	327.30
559	9.32	338	327.30
560	9.33	379	327.20
561	9.35	370	327.20
562	9.37	388	327.20
563	9.38	370	327.10
564	9.40	409	327.10
565	9.42	395	327.00
566	9.43	341	327.00
567	9.45	373	327.00
568	9.47	395	326.90
569	9.48	386	326.90
570	9.50	334	326.90
571	9.52	335	326.90
572	9.53	377	326.80
573	9.55	337	326.80
574	9.57	378	326.70
575	9.58	388	326.70
576	9.60	340	326.60
577	9.62	365	326.60
578	9.63	392	326.60
579	9.65	394	326.50
580	9.67	371	326.50
581	9.68	379	326.40
582	9.70	399	326.40
583	9.72	361	326.40
584	9.73	386	326.40

585	9.75	330	326.30
586	9.77	366	326.30
587	9.78	364	326.20
588	9.80	402	326.20
589	9.82	360	326.10
590	9.83	402	326.10
591	9.85	376	326.00
592	9.87	343	326.00
593	9.88	355	326.00
594	9.90	361	326.00
595	9.92	321	325.90
596	9.93	385	325.90
597	9.95	401	325.80
598	9.97	326	325.80
599	9.98	319	325.80
600	10.00	386	325.70
601	10.02	351	325.70
602	10.03	323	325.70
603	10.05	356	325.60
604	10.07	321	325.60
605	10.08	335	325.60
606	10.10	366	325.50
607	10.12	375	325.50
608	10.13	378	325.50
609	10.15	348	325.40
610	10.17	330	325.40
611	10.18	334	325.30
612	10.20	334	325.30
613	10.22	331	325.30
614	10.23	325	325.30
615	10.25	311	325.20

616	10.27	339	325.20
617	10.28	339	325.10
618	10.30	348	325.10
619	10.32	366	325.10
620	10.33	373	325.00
621	10.35	337	325.00
622	10.37	334	325.00
623	10.38	343	324.90
624	10.40	325	324.90
625	10.42	387	324.80
626	10.43	371	324.80
627	10.45	341	324.80
628	10.47	399	324.70
629	10.48	380	324.70
630	10.50	365	324.60
631	10.52	395	324.60
632	10.53	402	324.50
633	10.55	383	324.50
634	10.57	364	324.50
635	10.58	395	324.40
636	10.60	335	324.40
637	10.62	324	324.40
638	10.63	316	324.40
639	10.65	377	324.30
640	10.67	312	324.30
641	10.68	358	324.30
642	10.70	359	324.20
643	10.72	341	324.20
644	10.73	320	324.20
645	10.75	382	324.10
646	10.77	328	324.10

647	10.78	367	324.00
648	10.80	359	324.00
649	10.82	382	324.00
650	10.83	373	323.90
651	10.85	388	323.90
652	10.87	380	323.90
653	10.88	351	323.80
654	10.90	372	323.80
655	10.92	381	323.70
656	10.93	362	323.70
657	10.95	349	323.70
658	10.97	396	323.60
659	10.98	368	323.60
660	11.00	362	323.50
661	11.02	390	323.50
662	11.03	383	323.50
663	11.05	382	323.40
664	11.07	387	323.40
665	11.08	324	323.40
666	11.10	377	323.30
667	11.12	380	323.30
668	11.13	354	323.30
669	11.15	358	323.20
670	11.17	372	323.20
671	11.18	311	323.20
672	11.20	374	323.10
673	11.22	357	323.10
674	11.23	382	323.00
675	11.25	323	323.00
676	11.27	389	323.00
677	11.28	352	322.90

678	11.30	337	322.90
679	11.32	321	322.90
680	11.33	369	322.80
681	11.35	327	322.80
682	11.37	314	322.80
683	11.38	359	322.70
684	11.40	380	322.70
685	11.42	334	322.70
686	11.43	322	322.60
687	11.45	358	322.60
688	11.47	368	322.60
689	11.48	309	322.50
690	11.50	312	322.50
691	11.52	326	322.40
692	11.53	362	322.40
693	11.55	348	322.40
694	11.57	372	322.30
695	11.58	325	322.30
696	11.60	359	322.30
697	11.62	326	322.30
698	11.63	373	322.20
699	11.65	364	322.20
700	11.67	352	322.10
701	11.68	359	322.10
702	11.70	328	322.10
703	11.72	347	322.10
704	11.73	339	322.00
705	11.75	353	322.00
706	11.77	382	321.90
707	11.78	348	321.90
708	11.80	349	321.90

709	11.82	322	321.80
710	11.83	311	321.80
711	11.85	354	321.80
712	11.87	379	321.70
713	11.88	352	321.70
714	11.90	310	321.70
715	11.92	338	321.60
716	11.93	319	321.60
717	11.95	312	321.60
718	11.97	357	321.60
719	11.98	364	321.50
720	12.00	325	321.50
721	12.02	341	321.40
722	12.03	365	321.40
723	12.05	314	321.40
724	12.07	303	321.30
725	12.08	362	321.30
726	12.10	377	321.20
727	12.12	358	321.20
728	12.13	366	321.20
729	12.15	381	321.10
730	12.17	360	321.10
731	12.18	380	321.10
732	12.20	316	321.00
733	12.22	313	321.00
734	12.23	302	321.00
735	12.25	355	321.00
736	12.27	325	320.90
737	12.28	319	320.90
738	12.30	320	320.90
739	12.32	339	320.80

740	12.33	347	320.80
741	12.35	309	320.80
742	12.37	364	320.70
743	12.38	321	320.70
744	12.40	357	320.70
745	12.42	346	320.70
746	12.43	352	320.60
747	12.45	355	320.60
748	12.47	328	320.60
749	12.48	318	320.50
750	12.50	304	320.50
751	12.52	307	320.50
752	12.53	308	320.40
753	12.55	326	320.40
754	12.57	305	320.40
755	12.58	322	320.30
756	12.60	321	320.30
757	12.62	358	320.30
758	12.63	362	320.20
759	12.65	369	320.20
760	12.67	345	320.10
761	12.68	343	320.10
762	12.70	375	320.10
763	12.72	318	320.00
764	12.73	375	320.00
765	12.75	340	320.00
766	12.77	305	320.00
767	12.78	356	319.90
768	12.80	333	319.90
769	12.82	315	319.80
770	12.83	322	319.80

771	12.85	349	319.80
772	12.87	336	319.70
773	12.88	340	319.70
774	12.90	331	319.70
775	12.92	319	319.60
776	12.93	360	319.60
777	12.95	297	319.60
778	12.97	311	319.60
779	12.98	297	319.50
780	13.00	358	319.50
781	13.02	346	319.50
782	13.03	314	319.40
783	13.05	343	319.40
784	13.07	290	319.40
785	13.08	298	319.40
786	13.10	300	319.30
787	13.12	288	319.30
788	13.13	293	319.30
789	13.15	299	319.20
790	13.17	285	319.20
791	13.18	352	319.20
792	13.20	318	319.10
793	13.22	331	319.10
794	13.23	303	319.10
795	13.25	352	319.00
796	13.27	341	319.00
797	13.28	361	318.90
798	13.30	342	318.90
799	13.32	362	318.90
800	13.33	305	318.90
801	13.35	340	318.80

802	13.37	341	318.80
803	13.38	308	318.80
804	13.40	304	318.70
805	13.42	294	318.70
806	13.43	343	318.70
807	13.45	319	318.60
808	13.47	339	318.60
809	13.48	311	318.60
810	13.50	341	318.60
811	13.52	341	318.50
812	13.53	298	318.50
813	13.55	366	318.40
814	13.57	338	318.40
815	13.58	356	318.40
816	13.60	299	318.40
817	13.62	316	318.30
818	13.63	321	318.30
819	13.65	316	318.30
820	13.67	308	318.20
821	13.68	359	318.20
822	13.70	311	318.20
823	13.72	362	318.10
824	13.73	354	318.10
825	13.75	328	318.10
826	13.77	312	318.00
827	13.78	352	318.00
828	13.80	348	318.00
829	13.82	356	317.90
830	13.83	354	317.90
831	13.85	297	317.90
832	13.87	348	317.90

833	13.88	316	317.80
834	13.90	330	317.80
835	13.92	352	317.80
836	13.93	295	317.70
837	13.95	332	317.70
838	13.97	339	317.70
839	13.98	289	317.70
840	14.00	284	317.60
841	14.02	292	317.60
842	14.03	289	317.60
843	14.05	336	317.50
844	14.07	284	317.50
845	14.08	300	317.50
846	14.10	284	317.50
847	14.12	297	317.50
848	14.13	272	317.40
849	14.15	307	317.40
850	14.17	276	317.40
851	14.18	264	317.40
852	14.20	258	317.40
853	14.22	245	317.30
854	14.23	275	317.30
855	14.25	252	317.30
856	14.27	275	317.20
857	14.28	266	317.20
858	14.30	272	317.20
859	14.32	279	317.20
860	14.33	266	317.10
861	14.35	300	317.10
862	14.37	273	317.10
863	14.38	319	317.10

864	14.40	322	317.00
865	14.42	324	317.00
866	14.43	326	317.00
867	14.45	322	316.90
868	14.47	277	316.90
869	14.48	326	316.90
870	14.50	312	316.90
871	14.52	324	316.80
872	14.53	280	316.80
873	14.55	325	316.80
874	14.57	269	316.80
875	14.58	321	316.70
876	14.60	324	316.70
877	14.62	283	316.70
878	14.63	315	316.60
879	14.65	278	316.60
880	14.67	270	316.60
881	14.68	320	316.50
882	14.70	319	316.50
883	14.72	328	316.50
884	14.73	330	316.50
885	14.75	286	316.40
886	14.77	332	316.40
887	14.78	290	316.40
888	14.80	330	316.30
889	14.82	327	316.30
890	14.83	302	316.30
891	14.85	274	316.30
892	14.87	303	316.30
893	14.88	288	316.20
894	14.90	306	316.20

895	14.92	311	316.20
896	14.93	307	316.20
897	14.95	287	316.20
898	14.97	269	316.10
899	14.98	272	316.10
900	15.00	301	316.10
901	15.02	301	316.10
902	15.03	253	316.10
903	15.05	262	316.00
904	15.07	295	316.00
905	15.08	242	316.00
906	15.10	266	316.00
907	15.12	297	315.90
908	15.13	295	315.90
909	15.15	255	315.90
910	15.17	301	315.90
911	15.18	270	315.80
912	15.20	251	315.80
913	15.22	260	315.80
914	15.23	284	315.80
915	15.25	277	315.70
916	15.27	309	315.70
917	15.28	287	315.70
918	15.30	307	315.70
919	15.32	303	315.60
920	15.33	244	315.60
921	15.35	271	315.60
922	15.37	279	315.60
923	15.38	280	315.60
924	15.40	259	315.50
925	15.42	295	315.50

926	15.43	251	315.50
927	15.45	228	315.50
928	15.47	253	315.50
929	15.48	242	315.40
930	15.50	275	315.40
931	15.52	251	315.40
932	15.53	270	315.40
933	15.55	250	315.40
934	15.57	188	315.40
935	15.58	226	315.40
936	15.60	215	315.40
937	15.62	162	315.40
938	15.63	194	315.40
939	15.65	136	315.40
940	15.67	173	315.40
941	15.68	177	315.40
942	15.70	121	315.40
943	15.72	123	315.40
944	15.73	152	315.40
945	15.75	125	315.40
946	15.77	121	314.00









Date:	August 14 2015	Technician	Jeff Bain			
Manufacturer	Pacific Energy	Total Hours Seasoning	19 hours			
Model	True North TN40					
Time minutes	Time hours	Stack Temp °F	Scale Weight lbs			
0	0.00	286	391.70	Add Fuel	45.40	lbs
1	0.02	264	391.70			
2	0.03	278	391.70			
3	0.05	319	391.60			
4	0.07	269	391.60			
5	0.08	339	391.50			
6	0.10	333	391.50			
7	0.12	293	391.40			
8	0.13	307	391.40			
9	0.15	293	391.40			
10	0.17	326	391.40			
11	0.18	325	391.30			
12	0.20	353	391.30			
13	0.22	318	391.20			
14	0.23	321	391.20			
15	0.25	345	391.10			
16	0.27	351	391.10			
17	0.28	361	391.10			
18	0.30	362	391.00			
19	0.32	350	391.00			
20	0.33	329	391.00			
21	0.35	351	390.90			
22	0.37	336	390.90			
23	0.38	342	390.80			
24	0.40	367	390.80			
25	0.42	351	390.80			
26	0.43	323	390.70			

27	0.45	324	390.70
28	0.47	328	390.60
29	0.48	347	390.60
30	0.50	359	390.60
31	0.52	376	390.50
32	0.53	385	390.40
33	0.55	376	390.40
34	0.57	372	390.40
35	0.58	349	390.30
36	0.60	373	390.30
37	0.62	358	390.30
38	0.63	364	390.20
39	0.65	328	390.20
40	0.67	388	390.10
41	0.68	397	390.10
42	0.70	376	390.10
43	0.72	391	390.00
44	0.73	350	390.00
45	0.75	389	389.90
46	0.77	368	389.90
47	0.78	370	389.80
48	0.80	345	389.80
49	0.82	376	389.80
50	0.83	396	389.70
51	0.85	399	389.70
52	0.87	357	389.70
53	0.88	370	389.60
54	0.90	371	389.60
55	0.92	386	389.60
56	0.93	324	389.50
57	0.95	380	389.50

58	0.97	394	389.40
59	0.98	395	389.40
60	1.00	355	389.30
61	1.02	344	389.30
62	1.03	379	389.30
63	1.05	374	389.30
64	1.07	366	389.20
65	1.08	345	389.20
66	1.10	344	389.10
67	1.12	385	389.10
68	1.13	342	389.00
69	1.15	373	389.00
70	1.17	358	389.00
71	1.18	389	388.90
72	1.20	340	388.90
73	1.22	388	388.80
74	1.23	392	388.80
75	1.25	387	388.80
76	1.27	345	388.70
77	1.28	357	388.70
78	1.30	391	388.60
79	1.32	393	388.60
80	1.33	352	388.60
81	1.35	338	388.60
82	1.37	355	388.50
83	1.38	354	388.50
84	1.40	343	388.40
85	1.42	370	388.40
86	1.43	398	388.30
87	1.45	383	388.30
88	1.47	384	388.30

89	1.48	348	388.20
90	1.50	373	388.20
91	1.52	349	388.10
92	1.53	357	388.10
93	1.55	352	388.00
94	1.57	345	388.00
95	1.58	383	388.00
96	1.60	394	387.90
97	1.62	350	387.90
98	1.63	385	387.80
99	1.65	404	387.80
100	1.67	391	387.80
101	1.68	391	387.70
102	1.70	339	387.70
103	1.72	336	387.70
104	1.73	384	387.60
105	1.75	351	387.60
106	1.77	383	387.60
107	1.78	339	387.50
108	1.80	338	387.50
109	1.82	367	387.50
110	1.83	336	387.40
111	1.85	350	387.40
112	1.87	326	387.40
113	1.88	325	387.30
114	1.90	335	387.30
115	1.92	381	387.20
116	1.93	356	387.20
117	1.95	389	387.10
118	1.97	348	387.10
119	1.98	339	387.10

120	2.00	387	387.00
121	2.02	386	387.00
122	2.03	343	386.90
123	2.05	389	386.90
124	2.07	353	386.80
125	2.08	400	386.80
126	2.10	363	386.70
127	2.12	385	386.70
128	2.13	367	386.70
129	2.15	371	386.60
130	2.17	397	386.60
131	2.18	369	386.50
132	2.20	347	386.50
133	2.22	375	386.50
134	2.23	404	386.40
135	2.25	361	386.40
136	2.27	346	386.40
137	2.28	346	386.30
138	2.30	370	386.30
139	2.32	350	386.20
140	2.33	363	386.20
141	2.35	352	386.10
142	2.37	386	386.10
143	2.38	397	386.10
144	2.40	383	386.00
145	2.42	398	386.00
146	2.43	360	385.90
147	2.45	353	385.90
148	2.47	379	385.90
149	2.48	357	385.80
150	2.50	398	385.80

151	2.52	386	385.70
152	2.53	391	385.70
153	2.55	402	385.60
154	2.57	372	385.60
155	2.58	393	385.60
156	2.60	395	385.50
157	2.62	364	385.50
158	2.63	405	385.40
159	2.65	383	385.40
160	2.67	366	385.30
161	2.68	413	385.30
162	2.70	385	385.30
163	2.72	385	385.20
164	2.73	360	385.20
165	2.75	391	385.10
166	2.77	354	385.10
167	2.78	384	385.10
168	2.80	389	385.00
169	2.82	393	385.00
170	2.83	379	384.90
171	2.85	386	384.90
172	2.87	389	384.90
173	2.88	339	384.90
174	2.90	392	384.80
175	2.92	387	384.70
176	2.93	396	384.70
177	2.95	354	384.70
178	2.97	358	384.60
179	2.98	372	384.60
180	3.00	348	384.60
181	3.02	394	384.50

182	3.03	373	384.50
183	3.05	384	384.50
184	3.07	389	384.40
185	3.08	369	384.30
186	3.10	398	384.30
187	3.12	345	384.30
188	3.13	361	384.20
189	3.15	386	384.20
190	3.17	399	384.10
191	3.18	394	384.10
192	3.20	397	384.00
193	3.22	373	384.00
194	3.23	357	384.00
195	3.25	351	383.90
196	3.27	392	383.90
197	3.28	399	383.80
198	3.30	375	383.80
199	3.32	404	383.70
200	3.33	359	383.70
201	3.35	345	383.70
202	3.37	352	383.60
203	3.38	398	383.60
204	3.40	384	383.50
205	3.42	370	383.50
206	3.43	400	383.50
207	3.45	391	383.40
208	3.47	391	383.40
209	3.48	362	383.30
210	3.50	359	383.30
211	3.52	400	383.30
212	3.53	398	383.20

213	3.55	389	383.20
214	3.57	388	383.10
215	3.58	347	383.10
216	3.60	392	383.00
217	3.62	404	383.00
218	3.63	389	383.00
219	3.65	394	382.90
220	3.67	357	382.90
221	3.68	395	382.80
222	3.70	401	382.80
223	3.72	370	382.80
224	3.73	377	382.70
225	3.75	396	382.70
226	3.77	395	382.70
227	3.78	391	382.60
228	3.80	346	382.60
229	3.82	378	382.50
230	3.83	382	382.50
231	3.85	358	382.40
232	3.87	403	382.40
233	3.88	357	382.30
234	3.90	386	382.30
235	3.92	377	382.30
236	3.93	350	382.20
237	3.95	370	382.20
238	3.97	385	382.10
239	3.98	366	382.10
240	4.00	378	382.10
241	4.02	354	382.00
242	4.03	368	382.00
243	4.05	391	381.90

244	4.07	384	381.90
245	4.08	410	381.80
246	4.10	379	381.80
247	4.12	362	381.70
248	4.13	402	381.70
249	4.15	386	381.70
250	4.17	371	381.60
251	4.18	376	381.60
252	4.20	398	381.50
253	4.22	388	381.50
254	4.23	356	381.50
255	4.25	350	381.40
256	4.27	382	381.40
257	4.28	389	381.40
258	4.30	369	381.30
259	4.32	389	381.30
260	4.33	377	381.30
261	4.35	377	381.30
262	4.37	321	381.20
263	4.38	325	381.20
264	4.40	395	381.10
265	4.42	347	381.10
266	4.43	333	381.00
267	4.45	342	381.00
268	4.47	401	380.90
269	4.48	388	380.90
270	4.50	343	380.90
271	4.52	397	380.80
272	4.53	391	380.80
273	4.55	338	380.80
274	4.57	360	380.70

275	4.58	386	380.70
276	4.60	343	380.60
277	4.62	342	380.60
278	4.63	352	380.50
279	4.65	355	380.50
280	4.67	394	380.50
281	4.68	370	380.40
282	4.70	367	380.40
283	4.72	383	380.40
284	4.73	368	380.30
285	4.75	372	380.30
286	4.77	397	380.20
287	4.78	357	380.20
288	4.80	374	380.10
289	4.82	398	380.10
290	4.83	365	380.10
291	4.85	360	380.00
292	4.87	398	380.00
293	4.88	362	379.90
294	4.90	381	379.90
295	4.92	351	379.80
296	4.93	366	379.80
297	4.95	403	379.80
298	4.97	356	379.70
299	4.98	364	379.70
300	5.00	364	379.60
301	5.02	368	379.60
302	5.03	396	379.60
303	5.05	400	379.50
304	5.07	349	379.50
305	5.08	362	379.40

306	5.10	386	379.40
307	5.12	400	379.30
308	5.13	351	379.30
309	5.15	361	379.30
310	5.17	340	379.20
311	5.18	348	379.20
312	5.20	355	379.20
313	5.22	324	379.10
314	5.23	362	379.10
315	5.25	375	379.10
316	5.27	380	379.00
317	5.28	351	379.00
318	5.30	391	378.90
319	5.32	382	378.90
320	5.33	355	378.90
321	5.35	357	378.80
322	5.37	350	378.80
323	5.38	369	378.80
324	5.40	342	378.70
325	5.42	344	378.70
326	5.43	370	378.70
327	5.45	349	378.60
328	5.47	385	378.60
329	5.48	373	378.50
330	5.50	344	378.50
331	5.52	367	378.40
332	5.53	357	378.40
333	5.55	386	378.40
334	5.57	374	378.30
335	5.58	355	378.30
336	5.60	366	378.20

337	5.62	359	378.20
338	5.63	362	378.20
339	5.65	351	378.10
340	5.67	351	378.10
341	5.68	377	378.10
342	5.70	386	378.00
343	5.72	382	378.00
344	5.73	370	377.90
345	5.75	351	377.90
346	5.77	348	377.80
347	5.78	338	377.80
348	5.80	335	377.80
349	5.82	348	377.70
350	5.83	387	377.70
351	5.85	359	377.60
352	5.87	394	377.60
353	5.88	389	377.60
354	5.90	391	377.50
355	5.92	353	377.50
356	5.93	380	377.50
357	5.95	359	377.40
358	5.97	378	377.40
359	5.98	354	377.30
360	6.00	373	377.30
361	6.02	391	377.20
362	6.03	355	377.20
363	6.05	354	377.10
364	6.07	387	377.10
365	6.08	384	377.10
366	6.10	382	377.00
367	6.12	362	377.00

368	6.13	394	377.00
369	6.15	368	376.90
370	6.17	367	376.90
371	6.18	366	376.90
372	6.20	341	376.80
373	6.22	372	376.80
374	6.23	373	376.80
375	6.25	376	376.70
376	6.27	361	376.70
377	6.28	345	376.70
378	6.30	326	376.60
379	6.32	379	376.60
380	6.33	329	376.50
381	6.35	359	376.50
382	6.37	386	376.50
383	6.38	386	376.40
384	6.40	333	376.40
385	6.42	371	376.40
386	6.43	366	376.30
387	6.45	333	376.20
388	6.47	360	376.20
389	6.48	373	376.20
390	6.50	388	376.20
391	6.52	348	376.10
392	6.53	364	376.10
393	6.55	346	376.00
394	6.57	334	376.00
395	6.58	355	376.00
396	6.60	367	375.90
397	6.62	364	375.90
398	6.63	333	375.80

399	6.65	367	375.80
400	6.67	320	375.80
401	6.68	373	375.70
402	6.70	374	375.70
403	6.72	386	375.70
404	6.73	372	375.60
405	6.75	337	375.60
406	6.77	344	375.50
407	6.78	391	375.50
408	6.80	344	375.40
409	6.82	374	375.40
410	6.83	359	375.40
411	6.85	362	375.30
412	6.87	377	375.30
413	6.88	345	375.20
414	6.90	340	375.20
415	6.92	373	375.20
416	6.93	357	375.10
417	6.95	390	375.10
418	6.97	348	375.00
419	6.98	378	375.00
420	7.00	373	375.00
421	7.02	390	374.90
422	7.03	361	374.90
423	7.05	358	374.80
424	7.07	347	374.80
425	7.08	374	374.80
426	7.10	374	374.70
427	7.12	362	374.70
428	7.13	377	374.60
429	7.15	384	374.60

430	7.17	357	374.50
431	7.18	401	374.50
432	7.20	364	374.50
433	7.22	345	374.40
434	7.23	398	374.40
435	7.25	367	374.40
436	7.27	375	374.40
437	7.28	369	374.30
438	7.30	379	374.20
439	7.32	355	374.20
440	7.33	343	374.20
441	7.35	400	374.10
442	7.37	338	374.10
443	7.38	327	374.10
444	7.40	379	374.00
445	7.42	355	374.00
446	7.43	334	373.90
447	7.45	379	373.90
448	7.47	327	373.90
449	7.48	317	373.90
450	7.50	365	373.80
451	7.52	378	373.70
452	7.53	393	373.70
453	7.55	378	373.70
454	7.57	340	373.60
455	7.58	373	373.60
456	7.60	350	373.50
457	7.62	367	373.50
458	7.63	390	373.50
459	7.65	383	373.40
460	7.67	344	373.40

461	7.68	361	373.30
462	7.70	350	373.30
463	7.72	382	373.30
464	7.73	373	373.20
465	7.75	391	373.20
466	7.77	399	373.10
467	7.78	362	373.10
468	7.80	342	373.10
469	7.82	393	373.00
470	7.83	375	373.00
471	7.85	362	372.90
472	7.87	378	372.90
473	7.88	391	372.90
474	7.90	390	372.80
475	7.92	386	372.80
476	7.93	383	372.70
477	7.95	373	372.70
478	7.97	345	372.70
479	7.98	372	372.60
480	8.00	386	372.60
481	8.02	363	372.60
482	8.03	343	372.50
483	8.05	340	372.50
484	8.07	339	372.50
485	8.08	335	372.40
486	8.10	377	372.40
487	8.12	376	372.30
488	8.13	339	372.30
489	8.15	345	372.20
490	8.17	390	372.20
491	8.18	363	372.20

492	8.20	355	372.10
493	8.22	381	372.10
494	8.23	380	372.10
495	8.25	376	372.00
496	8.27	383	371.90
497	8.28	403	371.90
498	8.30	392	371.80
499	8.32	366	371.80
500	8.33	357	371.80
501	8.35	368	371.70
502	8.37	384	371.70
503	8.38	382	371.70
504	8.40	386	371.60
505	8.42	378	371.60
506	8.43	391	371.60
507	8.45	367	371.50
508	8.47	350	371.50
509	8.48	397	371.40
510	8.50	368	371.40
511	8.52	352	371.30
512	8.53	380	371.30
513	8.55	378	371.20
514	8.57	362	371.20
515	8.58	348	371.20
516	8.60	362	371.10
517	8.62	382	371.10
518	8.63	360	371.00
519	8.65	371	371.00
520	8.67	400	370.90
521	8.68	365	370.90
522	8.70	360	370.90

523	8.72	394	370.80
524	8.73	365	370.80
525	8.75	383	370.70
526	8.77	363	370.70
527	8.78	405	370.60
528	8.80	396	370.60
529	8.82	355	370.60
530	8.83	391	370.50
531	8.85	355	370.50
532	8.87	353	370.50
533	8.88	400	370.40
534	8.90	396	370.40
535	8.92	392	370.30
536	8.93	388	370.30
537	8.95	345	370.30
538	8.97	339	370.20
539	8.98	356	370.20
540	9.00	362	370.20
541	9.02	385	370.10
542	9.03	387	370.10
543	9.05	375	370.10
544	9.07	339	370.00
545	9.08	352	370.00
546	9.10	344	369.90
547	9.12	395	369.90
548	9.13	380	369.80
549	9.15	362	369.80
550	9.17	361	369.70
551	9.18	362	369.70
552	9.20	362	369.70
553	9.22	357	369.60

554	9.23	366	369.60
555	9.25	378	369.60
556	9.27	338	369.50
557	9.28	349	369.50
558	9.30	391	369.40
559	9.32	385	369.40
560	9.33	374	369.40
561	9.35	342	369.30
562	9.37	361	369.30
563	9.38	361	369.20
564	9.40	366	369.20
565	9.42	340	369.20
566	9.43	341	369.10
567	9.45	358	369.10
568	9.47	367	369.10
569	9.48	336	369.00
570	9.50	348	369.00
571	9.52	331	369.00
572	9.53	330	368.90
573	9.55	369	368.90
574	9.57	370	368.80
575	9.58	351	368.80
576	9.60	353	368.70
577	9.62	393	368.70
578	9.63	357	368.70
579	9.65	385	368.60
580	9.67	340	368.60
581	9.68	359	368.60
582	9.70	388	368.50
583	9.72	361	368.50
584	9.73	355	368.40

585	9.75	385	368.40
586	9.77	381	368.30
587	9.78	378	368.30
588	9.80	368	368.30
589	9.82	382	368.20
590	9.83	377	368.20
591	9.85	340	368.20
592	9.87	369	368.10
593	9.88	392	368.10
594	9.90	368	368.00
595	9.92	379	368.00
596	9.93	402	367.90
597	9.95	379	367.90
598	9.97	395	367.80
599	9.98	358	367.80
600	10.00	399	367.70
601	10.02	395	367.70
602	10.03	356	367.70
603	10.05	401	367.60
604	10.07	391	367.60
605	10.08	355	367.50
606	10.10	378	367.50
607	10.12	389	367.40
608	10.13	372	367.40
609	10.15	394	367.40
610	10.17	368	367.30
611	10.18	384	367.30
612	10.20	342	367.30
613	10.22	373	367.20
614	10.23	349	367.20
615	10.25	349	367.10

616	10.27	384	367.10
617	10.28	346	367.00
618	10.30	352	367.00
619	10.32	395	367.00
620	10.33	396	366.90
621	10.35	397	366.90
622	10.37	361	366.90
623	10.38	345	366.80
624	10.40	357	366.70
625	10.42	365	366.70
626	10.43	371	366.70
627	10.45	359	366.60
628	10.47	398	366.60
629	10.48	345	366.60
630	10.50	387	366.50
631	10.52	391	366.50
632	10.53	344	366.50
633	10.55	348	366.50
634	10.57	357	366.40
635	10.58	333	366.40
636	10.60	380	366.30
637	10.62	353	366.30
638	10.63	343	366.20
639	10.65	379	366.20
640	10.67	372	366.10
641	10.68	390	366.10
642	10.70	395	366.00
643	10.72	392	366.00
644	10.73	393	366.00
645	10.75	405	365.90
646	10.77	366	365.90

647	10.78	382	365.80
648	10.80	373	365.80
649	10.82	386	365.70
650	10.83	375	365.70
651	10.85	352	365.70
652	10.87	391	365.60
653	10.88	387	365.60
654	10.90	369	365.50
655	10.92	397	365.50
656	10.93	378	365.50
657	10.95	386	365.40
658	10.97	357	365.40
659	10.98	397	365.30
660	11.00	350	365.30
661	11.02	349	365.30
662	11.03	333	365.30
663	11.05	381	365.20
664	11.07	384	365.20
665	11.08	389	365.10
666	11.10	348	365.10
667	11.12	353	365.00
668	11.13	389	365.00
669	11.15	363	364.90
670	11.17	400	364.90
671	11.18	381	364.90
672	11.20	368	364.80
673	11.22	347	364.80
674	11.23	388	364.80
675	11.25	376	364.70
676	11.27	350	364.70
677	11.28	354	364.60

678	11.30	342	364.60
679	11.32	362	364.50
680	11.33	355	364.50
681	11.35	391	364.50
682	11.37	357	364.40
683	11.38	391	364.40
684	11.40	392	364.40
685	11.42	356	364.30
686	11.43	376	364.30
687	11.45	335	364.30
688	11.47	378	364.20
689	11.48	347	364.20
690	11.50	368	364.10
691	11.52	383	364.10
692	11.53	333	364.10
693	11.55	358	364.00
694	11.57	385	364.00
695	11.58	379	364.00
696	11.60	337	363.90
697	11.62	337	363.90
698	11.63	336	363.80
699	11.65	348	363.80
700	11.67	373	363.80
701	11.68	386	363.70
702	11.70	364	363.70
703	11.72	338	363.70
704	11.73	366	363.60
705	11.75	345	363.50
706	11.77	358	363.50
707	11.78	346	363.50
708	11.80	390	363.40

709	11.82	346	363.40
710	11.83	375	363.40
711	11.85	335	363.40
712	11.87	373	363.30
713	11.88	348	363.30
714	11.90	344	363.20
715	11.92	384	363.20
716	11.93	345	363.10
717	11.95	375	363.10
718	11.97	389	363.00
719	11.98	389	363.00
720	12.00	392	363.00
721	12.02	362	362.90
722	12.03	346	362.90
723	12.05	351	362.80
724	12.07	331	362.90
725	12.08	315	362.80
726	12.10	375	362.70
727	12.12	387	362.70
728	12.13	349	362.70
729	12.15	363	362.60
730	12.17	367	362.60
731	12.18	382	362.50
732	12.20	384	362.50
733	12.22	383	362.40
734	12.23	384	362.40
735	12.25	380	362.40
736	12.27	389	362.30
737	12.28	385	362.30
738	12.30	345	362.30
739	12.32	365	362.20

740	12.33	368	362.20
741	12.35	365	362.20
742	12.37	333	362.10
743	12.38	366	362.10
744	12.40	338	362.10
745	12.42	372	362.00
746	12.43	346	361.90
747	12.45	385	361.90
748	12.47	357	361.90
749	12.48	374	361.80
750	12.50	353	361.80
751	12.52	355	361.80
752	12.53	371	361.70
753	12.55	383	361.70
754	12.57	346	361.60
755	12.58	335	361.60
756	12.60	342	361.60
757	12.62	376	361.50
758	12.63	381	361.50
759	12.65	338	361.50
760	12.67	340	361.40
761	12.68	340	361.40
762	12.70	357	361.30
763	12.72	345	361.30
764	12.73	347	361.20
765	12.75	384	361.20
766	12.77	384	361.10
767	12.78	374	361.10
768	12.80	364	361.10
769	12.82	338	361.00
770	12.83	344	361.00

771	12.85	389	360.90
772	12.87	384	360.90
773	12.88	385	360.90
774	12.90	367	360.80
775	12.92	397	360.80
776	12.93	380	360.70
777	12.95	348	360.70
778	12.97	353	360.70
779	12.98	358	360.60
780	13.00	357	360.60
781	13.02	395	360.50
782	13.03	352	360.50
783	13.05	356	360.50
784	13.07	355	360.40
785	13.08	346	360.40
786	13.10	342	360.40
787	13.12	339	360.30
788	13.13	347	360.30
789	13.15	352	360.20
790	13.17	370	360.20
791	13.18	381	360.10
792	13.20	377	360.10
793	13.22	376	360.10
794	13.23	355	360.00
795	13.25	369	360.00
796	13.27	389	359.90
797	13.28	343	359.90
798	13.30	389	359.90
799	13.32	349	359.80
800	13.33	387	359.80
801	13.35	341	359.80

802	13.37	381	359.70
803	13.38	341	359.70
804	13.40	368	359.70
805	13.42	350	359.60
806	13.43	382	359.60
807	13.45	364	359.50
808	13.47	336	359.50
809	13.48	334	359.50
810	13.50	362	359.40
811	13.52	338	359.40
812	13.53	338	359.40
813	13.55	334	359.30
814	13.57	350	359.30
815	13.58	376	359.20
816	13.60	384	359.20
817	13.62	377	359.20
818	13.63	374	359.10
819	13.65	335	359.10
820	13.67	336	359.10
821	13.68	342	359.00
822	13.70	380	359.00
823	13.72	376	358.90
824	13.73	370	358.90
825	13.75	381	358.80
826	13.77	397	358.80
827	13.78	389	358.70
828	13.80	353	358.70
829	13.82	352	358.60
830	13.83	346	358.60
831	13.85	345	358.60
832	13.87	372	358.60

833	13.88	382	358.50
834	13.90	380	358.50
835	13.92	332	358.50
836	13.93	334	358.40
837	13.95	334	358.40
838	13.97	328	358.40
839	13.98	358	358.30
840	14.00	370	358.30
841	14.02	384	358.20
842	14.03	355	358.20
843	14.05	359	358.10
844	14.07	348	358.10
845	14.08	339	358.10
846	14.10	346	358.00
847	14.12	359	358.00
848	14.13	379	358.00
849	14.15	384	357.90
850	14.17	376	357.80
851	14.18	385	357.80
852	14.20	382	357.80
853	14.22	386	357.70
854	14.23	371	357.70
855	14.25	352	357.70
856	14.27	375	357.70
857	14.28	367	357.60
858	14.30	333	357.60
859	14.32	337	357.50
860	14.33	382	357.50
861	14.35	368	357.40
862	14.37	358	357.40
863	14.38	369	357.30

864	14.40	339	357.30
865	14.42	351	357.30
866	14.43	361	357.30
867	14.45	358	357.20
868	14.47	373	357.20
869	14.48	342	357.10
870	14.50	365	357.10
871	14.52	384	357.00
872	14.53	368	357.00
873	14.55	364	357.00
874	14.57	326	357.00
875	14.58	367	356.90
876	14.60	361	356.90
877	14.62	357	356.80
878	14.63	377	356.80
879	14.65	352	356.70
880	14.67	335	356.70
881	14.68	375	356.70
882	14.70	350	356.60
883	14.72	347	356.60
884	14.73	388	356.50
885	14.75	382	356.50
886	14.77	340	356.50
887	14.78	341	356.40
888	14.80	369	356.40
889	14.82	360	356.30
890	14.83	388	356.30
891	14.85	370	356.20
892	14.87	399	356.20
893	14.88	382	356.20
894	14.90	373	356.10

895	14.92	341	356.10
896	14.93	386	356.10
897	14.95	355	356.00
898	14.97	366	356.00
899	14.98	357	355.90
900	15.00	347	355.90
901	15.02	368	355.90
902	15.03	338	355.90
903	15.05	329	355.80
904	15.07	364	355.80
905	15.08	315	355.80
906	15.10	328	355.70
907	15.12	339	355.60
908	15.13	345	355.60
909	15.15	350	355.60
910	15.17	390	355.50
911	15.18	355	355.50
912	15.20	346	355.40
913	15.22	384	355.40
914	15.23	351	355.30
915	15.25	398	355.30
916	15.27	354	355.30
917	15.28	383	355.20
918	15.30	401	355.20
919	15.32	362	355.10
920	15.33	363	355.10
921	15.35	402	355.00
922	15.37	385	355.00
923	15.38	364	355.00
924	15.40	347	354.90
925	15.42	375	354.90

926	15.43	357	354.90
927	15.45	388	354.80
928	15.47	363	354.80
929	15.48	380	354.70
930	15.50	393	354.70
931	15.52	354	354.70
932	15.53	362	354.60
933	15.55	357	354.60
934	15.57	338	354.60
935	15.58	358	354.50
936	15.60	368	354.50
937	15.62	384	354.40
938	15.63	350	354.40
939	15.65	329	354.40
940	15.67	350	354.40
941	15.68	327	354.30
942	15.70	337	354.30
943	15.72	332	354.20
944	15.73	351	354.20
945	15.75	364	354.10
946	15.77	371	354.10
947	15.78	333	354.10
948	15.80	331	354.00
949	15.82	335	354.00
950	15.83	376	354.00
951	15.85	386	353.90
952	15.87	343	353.90
953	15.88	347	353.80
954	15.90	347	353.80
955	15.92	391	353.70
956	15.93	376	353.70

957	15.95	346	353.70
958	15.97	387	353.60
959	15.98	384	353.60
960	16.00	360	353.60
961	16.02	349	353.50
962	16.03	338	353.50
963	16.05	361	353.40
964	16.07	373	353.40
965	16.08	347	353.30
966	16.10	346	353.30
967	16.12	348	353.30
968	16.13	344	353.20
969	16.15	359	353.20
970	16.17	376	353.10
971	16.18	349	353.10
972	16.20	369	353.00
973	16.22	399	353.00
974	16.23	354	353.00
975	16.25	354	353.00
976	16.27	342	352.90
977	16.28	394	352.80
978	16.30	354	352.80
979	16.32	349	352.80
980	16.33	374	352.70
981	16.35	344	352.70
982	16.37	377	352.70
983	16.38	348	352.60
984	16.40	392	352.60
985	16.42	390	352.50
986	16.43	366	352.50
987	16.45	396	352.40

988	16.47	351	352.40
989	16.48	357	352.40
990	16.50	346	352.30
991	16.52	347	352.30
992	16.53	333	352.30
993	16.55	366	352.20
994	16.57	382	352.20
995	16.58	352	352.10
996	16.60	350	352.10
997	16.62	354	352.10
998	16.63	347	352.00
999	16.65	344	352.00
1000	16.67	344	351.90
1001	16.68	354	351.90
1002	16.70	357	351.90
1003	16.72	356	351.80
1004	16.73	345	351.80
1005	16.75	396	351.70
1006	16.77	404	351.60
1007	16.78	395	351.60
1008	16.80	401	351.60
1009	16.82	389	351.60
1010	16.83	345	351.50
1011	16.85	372	351.40
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1013	16.88	405	351.40
1014	16.90	390	351.30
1015	16.92	370	351.30
1016	16.93	355	351.20
1017	16.95	396	351.20
1018	16.97	348	351.20

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1021	17.02	390	351.10	
1022	17.03	395	351.00	
1023	17.05	386	351.00	
1024	17.07	382	350.90	
1025	17.08	360	350.90	
1026	17.10	375	350.90	
1027	17.12	365	350.80	
1028	17.13	369	350.80	
1029	17.15	350	350.70	
1030	17.17	356	350.70	
1031	17.18	345	350.70	
1032	17.20	385	350.60	
1033	17.22	360	350.60	
1034	17.23	357	350.50	
1035	17.25	352	350.50	
1036	17.27	390	350.40	
1037	17.28	396	350.40	
1038	17.30	375	350.40	
1039	17.32	349	350.30	
1040	17.33	354	350.30	
1041	17.35	386	350.20	
1042	17.37	396	350.20	
1043	17.38	400	350.10	
1044	17.40	386	350.10	
1045	17.42	390	350.10	
1046	17.43	395	350.00	
1047	17.45	357	350.00	
1048	17.47	387	350.00	
1049	17.48	380	349.90	

1050	17.50	358	349.90
1051	17.52	352	349.80
1052	17.53	385	349.80
1053	17.55	388	349.80
1054	17.57	360	349.70
1055	17.58	348	349.70
1056	17.60	345	349.60
1057	17.62	393	349.60
1058	17.63	350	349.60
1059	17.65	369	349.50
1060	17.67	401	349.40
1061	17.68	361	349.40
1062	17.70	384	349.40
1063	17.72	352	349.30
1064	17.73	359	349.30
1065	17.75	381	349.30
1066	17.77	391	349.20
1067	17.78	395	349.20
1068	17.80	364	349.20
1069	17.82	355	349.10
1070	17.83	370	349.10
1071	17.85	391	349.00
1072	17.87	351	349.00
1073	17.88	357	348.90
1074	17.90	391	348.90
1075	17.92	369	348.90
1076	17.93	329	348.80
1077	17.95	378	348.80
1078	17.97	347	348.70
1079	17.98	395	348.70
1080	18.00	354	348.70

1081	18.02	349	348.60
1082	18.03	392	348.60
1083	18.05	383	348.60
1084	18.07	391	348.50
1085	18.08	391	348.50
1086	18.10	345	348.40
1087	18.12	391	348.40
1088	18.13	345	348.40
1089	18.15	347	348.30
1090	18.17	381	348.30
1091	18.18	352	348.20
1092	18.20	353	348.20
1093	18.22	395	348.10
1094	18.23	353	348.10
1095	18.25	376	348.10
1096	18.27	374	348.00
1097	18.28	402	348.00
1098	18.30	350	347.90
1099	18.32	372	347.90
1100	18.33	400	347.80
1101	18.35	367	347.80
1102	18.37	350	347.80
1103	18.38	337	347.80
1104	18.40	352	347.70
1105	18.42	347	347.70
1106	18.43	342	347.60
1107	18.45	358	347.60
1108	18.47	355	347.50
1109	18.48	363	347.50
1110	18.50	370	347.40
1111	18.52	363	347.40

1112	18.53	355	347.40
1113	18.55	404	347.30
1114	18.57	400	347.30
1115	18.58	386	347.30
1116	18.60	379	347.20
1117	18.62	394	347.20
1118	18.63	352	347.10
1119	18.65	349	347.10
1120	18.67	380	347.10
1121	18.68	372	347.00
1122	18.70	380	347.00
1123	18.72	369	346.90
1124	18.73	358	346.90
1125	18.75	387	346.80
1126	18.77	350	346.80
1127	18.78	345	346.80
1128	18.80	377	346.70
1129	18.82	351	346.70
1130	18.83	363	346.70
1131	18.85	372	346.60
1132	18.87	353	346.50
1133	18.88	359	346.50
1134	18.90	363	346.50
1135	18.92	361	346.50
1136	18.93	362	346.40
1137	18.95	359	346.40
1138	18.97	353	346.30
1139	18.98	352	346.30
1140	19.00	375	346.30
1141	19.02	381	346.20
1142	19.03	354	346.20

1143	19.05	378	346.10
1144	19.07	370	346.10
1145	19.08	386	346.10
1146	19.10	343	346.00
1147	19.12	376	346.00
1148	19.13	348	345.90
1149	19.15	388	345.90
1150	19.17	389	345.80
1151	19.18	346	345.80
1152	19.20	376	345.80
1153	19.22	384	345.70
1154	19.23	353	345.70
1155	19.25	373	345.70
1156	19.27	377	345.60
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1160	19.33	358	345.40
1161	19.35	380	345.40
1162	19.37	353	345.40
1163	19.38	358	345.30
1164	19.40	354	345.30
1165	19.42	391	345.20
1166	19.43	364	345.20
1167	19.45	375	345.20
1168	19.47	393	345.10
1169	19.48	331	345.10
1170	19.50	341	345.10
1171	19.52	374	345.00
1172	19.53	374	345.00
1173	19.55	345	345.00

1174	19.57	346	344.90
1175	19.58	389	344.90
1176	19.60	371	344.80
1177	19.62	351	344.80
1178	19.63	350	344.70
1179	19.65	346	344.70
1180	19.67	345	344.70
1181	19.68	354	344.60
1182	19.70	373	344.60
1183	19.72	386	344.60
1184	19.73	378	344.50
1185	19.75	388	344.50
1186	19.77	376	344.40



CERTIFIED FOR CANADA AND U.S.A./ CERTIFIÉ AU CANADA ET AUX ÉTATS-UNIS.
LISTED ROOM HEATER./ APPAREIL DE CHAUFFAGE AMBIANT
PELLET FUEL-BURNING TYPE./ HOMOLOGUÉ, DE TYPE À GRANULES.
ALSO FOR USE IN MOBILE HOMES/ CONÇU AUSSI POUR MAISONS MOBILES

Intertek
ETL#4001507

MODEL **TN40 Series A**

PEDESTAL
LEG

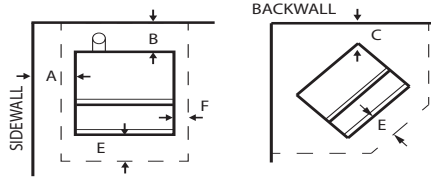
TESTED TO/ TESTÉ SELON LA NORME: ASTM E 1509-12 /UL 1482-11/ ULC S627-00
INPUT / PUISSANCE : 9,000 - 40,000 Btu/Hr ELECTRICAL/ELECTRIQUE: 120V A/C, 4.3AMP, 60Hz

- Install and use only in accordance with pacific energy installation and operating instructions.
- Contact local building or fire officials about restrictions, permits and inspection in your area.
- Use only, 3" or 4" "PL" or "L" listed exhaust venting systems. Inspect and clean exhaust venting system frequently.
- DO NOT connect this unit to a chimney flue serving another appliance
- See local building code and pacific energy instructions, as well as vent manufacturer's instructions for precautions required when passing exhaust venting through a combustible wall or ceiling.
- For use with only premium wood pellet fuel. DO NOT USE OTHER TYPES OF FUEL.
- **WARNING: FOR MOBILE/MANUFACTURED HOMES:** Do not install appliance in a sleeping room. Unit must be connected to outside air. Structural integrity of the home floor walls and ceiling must be maintained.
- Keep viewing door and ash drawer closed tightly during operation.
- DO NOT obstruct air openings. Replace glass only with 5mm ceramic glass from your dealer.
- Keep furnishings and other combustible materials well away from heater.
- Use only components specified in the TN40 installation instructions.
- **REQUIRED PARTS:** TN40 DOOR PART# TN40.DRBK.
- This wood pellet heater needs periodic inspection and repair for proper operation. - Consult the owners manual for further information. It is against federal regulations to operate this wood pellet heater in a manner inconsistent with the operating instructions in the owner's manual
- **MINIMUM CLEARANCES TO COMBUSTIBLE MATERIALS (measured from top/back of unit)**

COMBUSTIBLE FLOOR MUST BE PROTECTED BY A CONTINUOUS NON-COMBUSTIBLE MATERIAL EXTENDED PAST THE FRONT (E) 6 in./155 mm, SIDES (F) 2 in./51 mm and BACK under vent tee if installed.

ALCOVE SIZE : Maximum DEPTH - 36 in. / 0.91m. - Minimum HEIGHT 7 FT. / 2.13m

- A. SIDEWALL TO UNIT 6 in.(po.) / 152 mm
MUR LATÉRAL AU POÊLE
- B. BACKWALL TO UNIT 3 in.(po.) / 76 mm
MUR ARRIÈRE AU POÊLE
- C. CORNER TO UNIT 3 in.(po.) / 76 mm
DU COIN AU POÊLE
- MINIMUM HEIGHT FROM BASE OF UNIT 7ft.(pieds)
MINIMALE HAUTEUR



DÉGAGEMENTS MINIMUMS AUX MATÉRIAUX COMBUSTIBLES

TOUT PLANCHER EN MATÉRIAUX COMBUSTIBLES DOIT ÊTRE PROTÉGÉ PAR UN PLATE-FORME CONTINUE EN MATÉRIAUX NON COMBUSTIBLES DÉPASSANT À L'AVANT (E) 6 in./ 155 mm, AUX CÔTÉS (F) 3 in./ 75 mm ET À L'ARRIÈRE DU POÊLE TEL QU'INDIQUÉ.

DIMENSIONS POUR INSTALLATION DANS UNE ALCÔVE : Maximum PROFONDEUR : 36 po. / 0,91m. - Minimale HAUTEUR : 7 PIEDS / 2,13m.

- Installez et utilisez selon les instructions d'installation et d'utilisation de pacific energy.
- Contactez les agents locaux du bâtiment ou du service-incendie concernant les restrictions, le permis d'installation et les exigences d'inspection applicables à votre région.
- Utilisez seulement 3" ou 4" conduits d'évacuation homologués de type "PL" ou "L"
- Inspectez et nettoyez fréquemment le conduit d'évacuation.
- Ne raccordez pas cet appareil à un conduit de cheminée desservant un autre appareil.
- Si le conduit d'évacuation traverse un mur ou plafond en matériau combustible voir les exigences du code du bâtiment local et celles de pacific energy et du fabricant de conduit d'évacuation
- Pour utilisation seulement avec des granules de bois. N'obstruez pas les ouvertures d'air
- La porte vitrée et le tiroir à cendres doivent être tenus bien fermés durant le fonctionnement.
- Appareil de chauffage ambiant à combustible granulé, conçu aussi pour les maisons mobiles.
- Tenez les meubles et autres matériaux combustibles à une bonne distance du poêle.
- Utilisez seulement les composants spécifiés dans les instructions d'installation de TN40.
- La vitre doit être remplacée seulement par une vitre en 5mm céramique.
- PIÈCES EXIGÉES : PORTE TN40, NUMERO TN40.DRBK

U.S. ENVIRONMENTAL PROTECTION AGENCY
CERTIFIED TO COMPLY WITH 2020 PARTICULATE
EMISSION STANDARDS/
CERTIFIÉ CONFORME AUX NORMES LES
ÉMISSIONS DE PARTICULES (2020).

This heater meets the 2020 U.S. EPA emissions limits for Pellet Stoves. Tested to method 28R and ASTM E2779-10 using premium wood pellets

1.36g/hr.

MANUFACTURED BY/FABRIQUÉ PAR :
PACIFIC ENERGY FIREPLACE PRODUCTS LTD.
2975 ALLENBY RD., DUNCAN, BC V9L 6V8

DATE OF MANUFACTURE/ DATE DE FABRICATION

J	F	M	A	M	J	J	A	S	O	N	D
2015	2016	2017	2018	2019	2020						



Twin Ports Testing, Inc.
 1301 North 3rd Street
 Superior, WI 54880
 p: 715-392-7114
 p: 800-373-2562
 f: 715-392-7163
 www.twinportstesting.com

Report No: USR:W215-0947-01
Issue No: 1

Analytical Test Report

Client:	DIRIGO LABORATORIES, INC 11785 SE Highway 212 Clackamas, OR 97015	Signed:	
Attention:	John Steinert		Stephen Sundeen Chemistry Laboratory Manager
PO No:	Pac Energy	Date of Issue:	9/8/2015
THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL			

Sample Details			
Sample Log No:	W215-0947-01	Sample Date:	8/25/2015
Sample Designation:	Wood Pellets	Sample Time:	
Sample Recognized As:	Pellets	Arrival Date:	8/31/2015

Test Results				
	METHOD	UNITS	MOISTURE FREE	AS RECEIVED
Moisture Total	ASTM E871	wt. %		2.73
Ash	ASTM D1102	wt. %		
Volatile Matter	ASTM D3175	wt. %		
Fixed Carbon by Difference	ASTM D3172	wt. %		
Sulfur	ASTM D4239	wt. %	0.010	0.010
SO ₂	Calculated	lb/mmbtu		0.022
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne		
Net Cal. Value at Const. Pressure	ISO 1928	J/g		
Gross Cal. Value at Const. Vol.	ASTM E711	J/g	20294	19739
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8725	8487
Carbon	ASTM D5373	wt. %		
Hydrogen*	ASTM D5373	wt. %		
Nitrogen	ASTM D5373	wt. %		
Oxygen*	ASTM D3176	wt. %		
*Note: As received values do not include hydrogen and oxygen in the total moisture.				
Chlorine	ASTM D6721	mg/kg		
Fluorine	ASTM D3761	mg/kg		
Mercury	ASTM D6722	mg/kg		
Bulk Density	ASTM E873	lbs/ft ³		
Fines (Less than 1/8")	TPT CH-P-06	wt. %		
Durability Index	Kansas State	PDI		
Sample Above 1.50"	TPT CH-P-06	wt. %		
Maximum Length (Single Pellet)	TPT CH-P-06	inch		
Diameter, Range	TPT CH-P-05	inch		to
Diameter, Average	TPT CH-P-05	inch		
Stated Bag Weight	TPT CH-P-01	lbs		
Actual Bag Weight	TPT CH-P-01	lbs		

Comments	

Project #

034-S-050-5

Pacific Energy True North 40 Pellet Heater

- Received 8/24/15 by J. Steinert
- 50 hr conditioning performed @ Client facilities.
Conditioning data provided + on file.

8/25/15 - Run #1

Unit set-up in booth. Testing Method ASTM E2779-10

Pre-burn start @ 12:46 unit on high

Test start @ 13:50 - unit on high 00000 ✓

Amb start: 79.6°F

Amb END: 105.7°F

Train A front filter change @ 1 hour + unit turned down to medium. 00000

Unit turned to low setting @ 3 hrs into run. 00000

Run Time: 6 hrs

Ambient volume: 1959.798 liters

8/26/15 - Run #2

Eff. not as good as client wants. Doing two more runs.
Air settings changed.

Pre-burn start @ 12:10 unit on High.

Test start @ 13:10 unit on high, 00000 ✓ Amb: 94.3°F

Unit turned down to medium setting @ 1 hr 00000

Front filter change on A & B @ 1 hr

Turned Down to low @ 3 hours 00000



8/26/15 - Run #2 Continued

Run Time: 6 hours

Ambient volume: 2012.363 ^{cites}

End Temp: 110.6 °F

8/27/15 - Run #3

Pre-Burn start @ 12:02 unit on high

Test Start @ 13:05 - unit on high 00000 ✓
Ambient: 96.1 °F

Train A & B Front Filter change @ 1 hour

Unit turned down to medium setting @ ~~2~~ hours 00000

Unit turned down to low setting @ 3 hours 00000

Run Time: 6 hours

Ambient volume: 2028.912 ^{Lik}
110.6 °F

Weather History for KTTD - August, 2015



August

25

2015

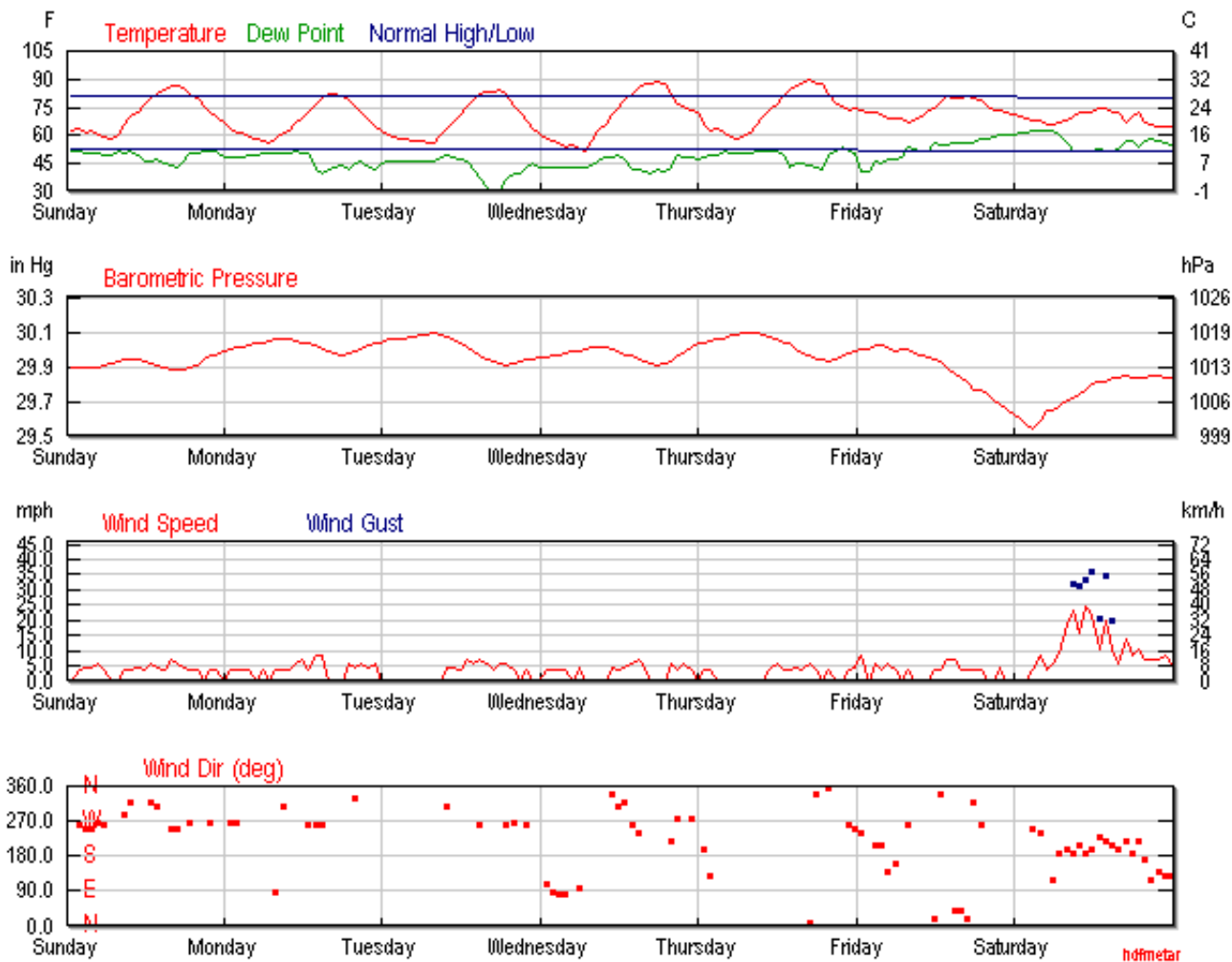
View

just 23, 2015 through August 29, 2015

Daily	Weekly	Monthly	Custom				
				Max	Avg	Min	Sum
Temperature							
Max Temperature				90 °F	85 °F	77 °F	
Mean Temperature				75 °F	72 °F	68 °F	
Min Temperature				67 °F	57 °F	50 °F	
Degree Days							
Heating Degree Days [base 65]				0	0	0	0
Cooling Degree Days [base 65]				10	7	3	46
Growing Degree Days [base 50]				24	21	18	148
Dew Point							
Dew Point				63 °F	49 °F	30 °F	
Precipitation							
Precipitation				0.20 in	0.03 in	0.00 in	0.20 in
Snowdepth				-	-	-	-
Wind							
Wind				31 mph	4 mph	0 mph	

Gust Wind	43 mph	29 mph	20 mph
Sea Level Pressure			
Sea Level Pressure	30.10 in	29.94 in	29.54 in

Weekly Weather History Graph



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Search for Another Location

Airport or City:

KTTD

Submit

Trip Planner

Search our weather history database for the weather conditions in past years. The results will help you decide how hot, cold, wet, or windy it might be!

Date:

August

25

Submit

[report this ad](#) | [why ads?](#)

Astronomy

Aug. 25, 2015	Rise	Set
Actual Time	6:22 AM PDT	8:00 PM PDT
Civil Twilight	5:50 AM PDT	8:31 PM PDT
Nautical Twilight	5:12 AM PDT	9:09 PM PDT
Astronomical Twilight	4:31 AM PDT	9:50 PM PDT
Moon	4:58 PM PDT [8/25]	1:47 AM PDT [8/25]
Length of Visible Light	14h 40m	
Length of Day	13h 38m	

Waxing Gibbous, 79% of the Moon is Illuminated

Aug 25	Aug 29	Sep 5	Sep 12	Sep 21
Waxing Gibbous	Full	Last Quarter	New	First Quarter



Daily Weather History & Observations

2015	Temp. [°F]			Dew Point [°F]			Humidity [%]			Sea Level Press. [in]			Visibility [mi]		
Aug	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low
	88	73	58	52	49	43	72	47	21	29.99	29.92	29.88	10	6	3
	83	69	55	51	47	40	83	53	23	30.06	30.02	29.97	10	10	10
	85	68	50	49	42	30	72	43	14	30.09	29.99	29.91	10	10	10

90	71	51	49	44	40	71	45	18	30.03	29.97	29.91	10	10	10
90	74	57	54	49	42	77	49	21	30.10	30.02	29.93	10	10	10
82	75	67	60	53	41	68	50	31	30.02	29.88	29.62	10	10	10
77	71	64	63	56	51	81	62	43	29.85	29.75	29.54	10	10	4

report this ad

60

[illegible][illegible]

Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.56	lb/lb-mole
Dilution Tunnel H2O:	4.00	%
Dilution Tunnel Static:	-0.400	In H2O
Tunnel Area:	0.196	ft ²
Pitot Tube Cp:	0.99	

Tunnel Velocity:	13.0326 ft/sec.
Initial Tunnel Flow:	138.3966 scfm
Average Tunnel Flow:	138.0274 scfm

Notes:

Run # 1
 Date: 8/25/15

Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H2O: 4.00 %
 Dilution Tunnel Static: -0.400 In H2O
 Tunnel Area: 0.196 ft²
 Pitot Tube Cp: 0.99

Dilution Tunnel Traverse Data								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8
dP	0.038	0.035	0.040	0.033	0.035	0.038	0.033	0.036
Temperature	100	100	100	100	100	100	100	100

0.036
100.000

Tunnel Velocity: 13.033 ft/sec.
 Intial Tunnel Flow: 138.4 scfm
 Average Tunnel Flow 138.03 scfm

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DATE:

8_25_15

RUN #:

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SAMPLE BOX :

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PROBE MATERIAL:

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FINAL LEAK RATE (CFM):

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IN-HG

FINAL LEAK RATE (CFM):

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Run Time:

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							TEMPERATURES							
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	STOVE AVG T	
0	0	0	NA	0	0	-1	334	382	79	181	360	77	294	
10	1.353	0.135	103	-0.05	1.99	-1.14	334	382	84	177	356	77	293	
20	2.717	0.136	103	-0.04	1.99	-1.32	340	386	86	178	358	80	296	
30	4.091	0.137	103	-0.06	2.03	-1.91	345	395	86	180	366	85	301	
40	5.470	0.138	102	-0.05	2.02	-1.88	358	406	85	185	372	89	309	
50	6.855	0.139	102	-0.05	2	-1.32	353	399	84	184	372	93	306	
60	8.243	0.139	102	-0.05	2.02	-2.14	353	398	83	184	371	95	306	
70	9.641	0.140	102	-0.05	2	-2.17	334	366	83	198	340	98	295	
80	11.040	0.140	102	-0.04	2.02	-1.57	297	324	83	187	301	100	265	
90	12.439	0.140	101	-0.04	2.01	-2.37	282	313	82	178	279	101	252	
100	13.843	0.140	101	-0.04	2.02	-1.42	271	301	82	174	267	103	243	
110	15.246	0.140	101	-0.04	2.02	-1.75	266	295	82	172	258	104	239	
120	16.648	0.140	101	-0.04	2.01	-2.22	260	291	83	169	253	104	235	
130	18.054	0.141	101	-0.04	2.01	-2.32	258	290	83	167	251	105	233	
140	19.459	0.141	101	-0.04	2.01	-1.89	258	289	83	167	247	106	232	
150	20.868	0.141	101	-0.04	2.01	-1.73	265	296	83	168	251	106	236	
160	22.276	0.141	101	-0.04	2.01	-1.94	263	295	83	169	256	107	237	
170	23.680	0.140	101	-0.04	2.01	-1.93	271	299	83	170	259	107	241	
180	25.094	0.141	101	-0.04	2.03	-1.45	263	297	83	170	254	108	238	
190	26.509	0.142	100	-0.04	2.03	-2.11	238	265	83	176	237	108	223	
200	27.927	0.142	100	-0.04	2.03	-2.62	217	239	82	168	215	108	205	
210	29.340	0.141	100	-0.03	2.01	-1.83	200	220	82	160	198	108	191	
220	30.758	0.142	100	-0.03	2.02	-2.64	189	210	82	153	187	109	181	
230	32.171	0.141	100	-0.03	2.01	-2.57	185	205	81	148	179	109	177	
240	33.588	0.142	100	-0.03	2	-1.91	185	207	81	147	179	109	177	
250	35.002	0.141	100	-0.03	2.03	-1.49	180	203	82	145	175	109	173	
260	36.420	0.142	100	-0.03	2.01	-2.19	173	195	81	143	168	110	167	
270	37.833	0.141	99	-0.03	1.99	-2.6	177	200	82	142	169	110	170	
280	39.249	0.142	100	-0.03	2.01	-2.02	173	194	82	142	166	110	166	
290	40.661	0.141	99	-0.03	2.02	-1.47	173	194	82	140	164	110	166	
300	42.077	0.142	100	-0.03	2.01	-2.16	174	199	83	142	167	110	169	
310	43.487	0.141	99	-0.02	2.01	-1.46	170	195	83	141	164	110	166	
320	44.902	0.142	100	-0.03	2.01	-2.09	172	199	84	139	164	110	167	
330	46.313	0.141	99	-0.03	2	-1.84	170	196	84	141	163	110	166	
340	47.727	0.141	99	-0.03	2.01	-2.33	176	200	83	140	167	110	169	
350	49.138	0.141	100	-0.03	2	-2.21	179	206	84	144	170	109	173	
360	50.550	0.141	99	-0.03	2	-1.55	175	202	84	143	168	110	170	

Run Notes:

170

Ambient Sample Results:

JOB NUMBER: 034_S_050_5
TECHNICIAN: GENBTN
DATE: 8_25_15
RUN NUMBER: 1

METER Y FACTOR: **1.016**

	<u>Sample Volume (L)</u>	<u>Meter Temp °F</u>	<u>ΔH</u>	<u>ΔP</u>
Start	0	79.6	0	0
End	1959.798	105.7	0	0

Total Sample Volume - Vm

Total Sample Volume - Vm

Average Sample Rate

Sample Time

Average Meter Temperature

Total Sample Volume (Standard Conditions) - Vmstd

Total Particulates

Particulate Concentration (dry-standard)

Particulate Emission Rate

SAMPLE INFORMATION	
1959.798	Liters
69.210	ft ³
0.19	ft ³ /min
360.00	Minutes
92.65	°F
67.338	dscf

0.0	mg
-----	----

0.000000000	grams/dscf
0.000000000	grams/hour

JOB NUMBER

034_S_050_5

RUN #

1

DATE:

8_25_15

BURN RATE

1.02

KG/HR DRY

FILTER A
PARTICULATE

3.5

mg

FILTER B
PARTICULATE

3.5

mg

Total Sample Volume - Vm

Average Gas Velocity in Dilution Tunnel - vs

Average Gas Flow Rate in Dilution Tunnel - Qsd

Total Sample Volume (Standard Conditions) - Vmstd

SAMPLE A
INFORMATION

51.46

feet/second

13.03

dscf/hour

8281.64

dscf

48.26

SAMPLE B
INFORMATION

50.55

feet/second

13.03

dscf/hour

8281.64

dscf

47.89

Average Tunnel Temperature

103.6

F

Average Delta p

0.036

103.6

F

0.036

Average Gas Meter Temperature

106

F

Average Delta H

1.97

in-h20

Total Time of Test

360

min

103

F

2.01

in-h20

360

min

Total Particulates

3.5

mg

3.5

mg

Particulate Concentration (dry-standard)

0.00007

grams/dscf

Ambient Train (dry-standard)

0.000000000

grams/dscf

Net (dry-standard)

0.000072530

grams/dscf

Particulate Emission Rate

0.60

grams/hour

Total PM Emissions

3.60

grams

0.00007

grams/dscf

0.000000000

grams/dscf

0.000073086

grams/dscf

0.61

grams/hour

3.63

grams

Average Total PM Emissions

3.62

grams

AVERAGE PARTICULATE

0.60

grams/hour

EMISSIONS RATE

% OF AVERAGE

99.6

100.4

Emissions Factor

0.591

g/Kg -Dry

0.596

g/Kg -Dry

PREBURN

Model Designation PACIFIC_TN40

DATE: 8_26_15

READING INTERVAL:

READING INTERVAL: 10

Run Time: 60

[illegible][illegible]

Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.56	lb/lb-mole
Dilution Tunnel H2O:	4.00	%
Dilution Tunnel Static:	-0.400	In H2O
Tunnel Area:	0.196	ft ²
Pitot Tube Cp:	0.99	

Tunnel Velocity:	13.0332 ft/sec.
Initial Tunnel Flow:	139.0942 scfm
Average Tunnel Flow:	138.021 scfm

Notes:

--

Run # 2
 Date: 8/26/15

Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H2O: 4.00 %
 Dilution Tunnel Static: -0.400 In H2O
 Tunnel Area: 0.196 ft²
 Pitot Tube Cp: 0.99

Dilution Tunnel Traverse Data								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8
dP	0.038	0.038	0.040	0.035	0.035	0.035	0.034	0.036
Temperature	100	100	100	100	100	100	100	100

0.036
100.000

Tunnel Velocity: 13.033 ft/sec.
 Intial Tunnel Flow: 139.09 scfm
 Average Tunnel Flow 138.02 scfm

Page 4 of 10

Page 5 of 10

JOB #	034_S_050_5	
TECHNICIAN	GENBTN	
DATE:	8_26_15	
RUN #:	2	
READING INTERVAL:	10	
SAMPLE BOX :	B	
METER Y FACTOR:	1.003	
PROBE MATERIAL:	SS	
FRONT FILTER #:	2515&2519	
REAR FILTER #:	2516	
FINAL LEAK RATE (CFM):	< 0.01	@ 5 IN-HG
FINAL LEAK RATE (CFM):	< 0.01	@ 5 IN-HG

Run Time: 360 Firebox Delta T 128

ET	GAS METER VOLUME	SAMPLE RATE(Ft3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	1	2	3	4	5	6	STOVE AVG T
							LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	
0	0	0	NA	0	0	-1	363	405	80	186	380	79	312
10	1.361	0.136	103	-0.05	2.01	-1.85	373	419	83	189	386	80	319
20	2.734	0.137	103	-0.05	2.03	-1.61	364	409	83	189	381	83	313
30	4.109	0.138	102	-0.05	1.99	-2.63	370	411	84	189	380	88	315
40	5.497	0.139	103	-0.06	1.98	-2.31	378	416	84	191	385	92	319
50	6.888	0.139	102	-0.06	2	-2.87	375	415	84	191	384	95	318
60	8.277	0.139	102	-0.06	1.99	-3.24	374	412	85	192	382	98	318
70	9.642	0.137	99	-0.05	2.01	-1.93	349	375	86	208	352	100	305
80	11.053	0.141	102	-0.04	2.01	-2.1	310	335	85	194	313	103	275
90	12.462	0.141	102	-0.05	2.01	-1.63	305	329	85	187	297	104	267
100	13.872	0.141	101	-0.05	2.02	-1.27	293	319	85	183	283	106	259
110	15.285	0.141	101	-0.04	2.03	-2.03	290	317	86	182	279	107	256
120	16.697	0.141	101	-0.04	2.02	-1.75	286	313	85	181	277	108	254
130	18.111	0.141	101	-0.04	2.02	-2.08	285	313	85	177	272	108	252
140	19.522	0.141	101	-0.04	2	-2.14	278	301	85	177	267	109	246
150	20.935	0.141	101	-0.04	2	-1.76	290	313	85	179	273	109	254
160	22.350	0.142	101	-0.04	2.03	-1.76	288	313	86	180	275	110	254
170	23.774	0.142	102	-0.05	2.04	-1.5	292	324	86	182	277	110	259
180	25.193	0.142	101	-0.05	2.03	-1.6	289	319	86	182	278	111	257
190	26.613	0.142	100	-0.04	2.01	-1.3	263	288	85	191	263	111	243
200	28.029	0.142	99	-0.03	1.99	-2.28	238	260	85	180	239	112	222
210	29.458	0.143	100	-0.04	2.04	-1.97	227	249	85	172	226	112	212
220	30.883	0.143	100	-0.03	2.02	-1.17	218	239	84	166	216	112	204
230	32.305	0.142	100	-0.03	2.02	-1.43	211	232	84	162	210	112	198
240	33.731	0.143	100	-0.03	2.02	-2.34	205	224	84	158	202	113	192
250	35.149	0.142	99	-0.03	2.01	-1.99	203	221	84	155	199	113	190
260	36.571	0.142	100	-0.03	2.02	-1.51	199	218	84	153	194	113	187
270	37.989	0.142	99	-0.03	2	-2	204	222	84	154	195	113	189
280	39.408	0.142	99	-0.03	2	-1.6	200	220	84	156	194	113	188
290	40.835	0.143	100	-0.03	2.03	-2.11	199	218	84	154	191	114	186
300	42.260	0.143	100	-0.03	2.02	-2.03	199	218	85	153	191	114	186
310	43.688	0.143	100	-0.03	2.02	-1.5	200	220	85	154	191	114	187
320	45.108	0.142	99	-0.03	2	-2.43	199	219	85	154	189	114	186
330	46.533	0.143	100	-0.03	2	-1.45	195	214	85	152	187	114	183
340	47.955	0.142	99	-0.03	2	-2.06	199	218	85	153	187	114	185
350	49.379	0.142	100	-0.03	2.03	-2.15	197	214	84	152	185	114	183
360	50.803	0.142	100	-0.03	2.01	-1.37	198	215	84	152	185	114	184

Run Notes:

183.6

Ambient Sample Results:

JOB NUMBER: 034_S_050_5
TECHNICIAN: GENBTN
DATE: 8_26_15
RUN NUMBER: 2

METER Y FACTOR: **1.016**

	<u>Sample Volume (L)</u>	<u>Meter Temp °F</u>	<u>ΔH</u>	<u>ΔP</u>
Start	0	94.3	0	0
End	2012.363	110.6	0	0

Total Sample Volume - Vm

Total Sample Volume - Vm

Average Sample Rate

Sample Time

Average Meter Temperature

Total Sample Volume (Standard Conditions) - Vmstd

Total Particulates

Particulate Concentration (dry-standard)

Particulate Emission Rate

SAMPLE INFORMATION	
2012.363	Liters
71.066	ft ³
0.20	ft ³ /min
360.00	Minutes
102.45	°F
67.894	dscf

0.2	mg
-----	----

0.000002946	grams/dscf
0.000033333	grams/hour

JOB NUMBER

034_S_050_5

RUN #

2

DATE:

8_26_15

BURN RATE

1.02

KG/HR DRY

FILTER A
PARTICULATE

6.8

mg

FILTER B
PARTICULATE

7

mg

Total Sample Volume - Vm

Average Gas Velocity in Dilution Tunnel - vs

Average Gas Flow Rate in Dilution Tunnel - Qsd

Total Sample Volume (Standard Conditions) - Vmstd

SAMPLE A
INFORMATION

51.59

feet/second

13.03

dscf/hour

8281.26

dscf

48.09

SAMPLE B
INFORMATION

50.80

feet/second

13.03

dscf/hour

8281.26

dscf

47.82

Average Tunnel Temperature

103.3

F

Average Delta p

0.036

103.3

F

0.036

Average Gas Meter Temperature

110

F

Average Delta H

1.97

in-h20

Total Time of Test

360

min

106

F

2.01

in-h20

360

min

Total Particulates

6.8

mg

7

mg

Particulate Concentration (dry-standard)

0.00014

grams/dscf

Ambient Train (dry-standard)

0.000002946

grams/dscf

Net (dry-standard)

0.000138452

grams/dscf

Particulate Emission Rate

1.15

grams/hour

Total PM Emissions

6.88

grams

0.00015

grams/dscf

0.000002946

grams/dscf

0.000143446

grams/dscf

1.19

grams/hour

7.13

grams

Average Total PM Emissions

7.00

AVERAGE PARTICULATE

1.17

EMISSIONS RATE

% OF AVERAGE

98.2

Emissions Factor

1.121

g/Kg -Dry

grams

grams/hour

101.8

1.161

g/Kg -Dry

PREBURN

Model Designation Pacific_TN40

DATE: 8_27_15

READING INTERVAL:

READING INTERVAL:

Run Time:

Run Time:

[illegible][illegible]

Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.56	lb/lb-mole
Dilution Tunnel H2O:	4.00	%
Dilution Tunnel Static:	-0.400	In H2O
Tunnel Area:	0.196	ft ²
Pitot Tube Cp:	0.99	

Tunnel Velocity:	13.02484 ft/sec.
Intial Tunnel Flow:	137.9044 scfm
Average Tunnel Flow:	138.1096 scfm

Notes:

Run # 3
 Date: 8/27/15

Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H2O: 4.00 %
 Dilution Tunnel Static: -0.400 In H2O
 Tunnel Area: 0.196 ft²
 Pitot Tube Cp: 0.99

Dilution Tunnel Traverse Data								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8
dP	0.035	0.033	0.038	0.036	0.035	0.037	0.039	0.035
Temperature	105	105	105	105	105	105	105	105

0.036
105.000

Tunnel Velocity: 13.025 ft/sec.
 Intial Tunnel Flow: 137.9 scfm
 Average Tunnel Flow 138.11 scfm

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Page 5 of 10

JOB #	034_S_050_5	
TECHNICIAN	GENBTN	
DATE:	8_27_15	
RUN #:	3	
READING INTERVAL:	10	
SAMPLE BOX :	B	
METER Y FACTOR:	1.003	
PROBE MATERIAL:	SS	
FRONT FILTER #:	2522&2526	
REAR FILTER #:	2523	
FINAL LEAK RATE (CFM):	< 0.01	@ 5 IN-HG
FINAL LEAK RATE (CFM):	< 0.01	@ 5 IN-HG

Run Time: 360 Firebox Delta T 129.4

ET	GAS METER VOLUME	SAMPLE RATE(Ft3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	TEMPERATURES						METER	STOVE AVG T
							1	2	3	4	5	6		
0	0	0	NA	0	0	-1	376	402	81	188	373	79	312	
10	1.362	0.136	103	-0.05	1.99	-1.96	379	402	83	190	376	80	314	
20	2.735	0.137	103	-0.05	1.99	-2.13	381	393	82	189	373	84	311	
30	4.119	0.138	103	-0.06	2.02	-2.19	379	395	81	189	372	89	311	
40	5.507	0.139	102	-0.06	2.02	-3.1	379	399	81	190	375	93	313	
50	6.898	0.139	102	-0.06	2.01	-2.08	385	402	81	191	374	96	315	
60	8.291	0.139	102	-0.05	2	-2.05	390	400	81	192	375	99	316	
70	9.671	0.138	100	-0.05	2.02	-1.54	371	378	82	212	355	101	312	
80	11.078	0.141	102	-0.05	2.01	-2.09	328	340	82	198	315	103	281	
90	12.484	0.141	101	-0.05	2	-1.51	313	327	82	190	296	105	269	
100	13.897	0.141	102	-0.04	2.04	-1.24	308	319	82	186	285	106	263	
110	15.314	0.142	102	-0.05	2.03	-1.58	298	310	82	181	275	107	255	
120	16.730	0.142	101	-0.05	2.02	-1.77	295	309	82	179	271	108	253	
130	18.145	0.142	101	-0.04	2.01	-1.79	297	312	82	180	270	109	254	
140	19.560	0.142	101	-0.04	2	-1.39	294	305	82	180	270	110	252	
150	20.975	0.142	101	-0.05	2.02	-1.8	293	305	82	179	268	110	251	
160	22.394	0.142	101	-0.05	2.04	-1.32	291	304	82	179	266	110	250	
170	23.818	0.142	101	-0.05	2.03	-2.29	293	308	82	179	267	111	251	
180	25.247	0.143	102	-0.04	2.04	-2.26	297	310	82	179	269	111	253	
190	26.669	0.142	100	-0.04	2.03	-2.1	261	279	81	187	255	112	237	
200	28.092	0.142	100	-0.03	2.02	-1.48	238	255	80	179	236	112	220	
210	29.515	0.142	100	-0.03	2.02	-2.05	221	234	80	168	218	113	204	
220	30.938	0.142	100	-0.04	2.02	-1.76	218	232	80	163	211	113	200	
230	32.363	0.143	100	-0.03	2.03	-2.32	213	229	80	160	205	113	196	
240	33.784	0.142	100	-0.04	2.02	-1.68	212	229	80	160	203	113	196	
250	35.208	0.142	100	-0.03	2.02	-1.87	209	224	80	158	199	113	193	
260	36.626	0.142	99	-0.03	2.01	-2.09	205	222	80	156	195	114	190	
270	38.047	0.142	99	-0.03	2.02	-1.5	200	217	80	154	190	114	186	
280	39.467	0.142	99	-0.02	2.01	-2.01	174	188	80	146	173	114	166	
290	40.890	0.142	100	-0.03	2	-1.44	154	160	80	138	151	114	149	
300	42.312	0.142	100	-0.03	2.03	-2.54	171	184	81	135	158	114	162	
310	43.736	0.142	100	-0.03	2.02	-1.5	181	196	80	142	168	114	170	
320	45.163	0.143	100	-0.03	2.01	-1.47	193	207	80	147	178	114	178	
330	46.584	0.142	99	-0.03	2.01	-1.42	199	214	80	150	183	115	183	
340	48.007	0.142	99	-0.03	2.01	-1.89	197	214	81	152	185	115	183	
350	49.425	0.142	99	-0.03	1.98	-2.07	199	216	81	152	186	115	184	
360	50.852	0.143	100	-0.02	2.01	-1.57	196	213	82	151	184	115	182	

Run Notes:

182.4

Ambient Sample Results:

JOB NUMBER: 034_S_050_5
TECHNICIAN: GENBTN
DATE: 8_27_15
RUN NUMBER: 3

METER Y FACTOR: 1.016

	<u>Sample Volume (L)</u>	<u>Meter Temp °F</u>	<u>ΔH</u>	<u>ΔP</u>
Start	0	96.1	0	0
End	2028.912	110.6	0	0

Total Sample Volume - Vm

Total Sample Volume - Vm

Average Sample Rate

Sample Time

Average Meter Temperature

Total Sample Volume (Standard Conditions) - Vmstd

Total Particulates

Particulate Concentration (dry-standard)

Particulate Emission Rate

SAMPLE INFORMATION	
2028.912	Liters
71.650	ft ³
0.20	ft ³ /min
360.00	Minutes
103.35	°F
68.480	dscf

0.2	mg
-----	----

0.000002921	grams/dscf
0.000033333	grams/hour

JOB NUMBER

034_S_050_5

RUN #

3

DATE:

8_27_15

BURN RATE

0.99

KG/HR DRY

FILTER A
PARTICULATE

9.1

mg

FILTER B
PARTICULATE

9

mg

Total Sample Volume - Vm

Average Gas Velocity in Dilution Tunnel - vs

Average Gas Flow Rate in Dilution Tunnel - Qsd

Total Sample Volume (Standard Conditions) - Vmstd

SAMPLE A
INFORMATION

51.65

feet/second

13.02

dscf/hour

8286.57

dscf

48.19

SAMPLE B
INFORMATION

50.85

feet/second

13.02

dscf/hour

8286.57

dscf

47.91

Average Tunnel Temperature

103.7

F

Average Delta p

0.036

103.7

F

0.036

Average Gas Meter Temperature

110

F

Average Delta H

1.97

in-h20

Total Time of Test

360

min

107

F

2.02

in-h20

360

min

Total Particulates

9.1

mg

9

mg

Particulate Concentration (dry-standard)

0.00019

grams/dscf

Ambient Train (dry-standard)

0.000002921

grams/dscf

Net (dry-standard)

0.000185915

grams/dscf

Particulate Emission Rate

1.54

grams/hour

Total PM Emissions

9.24

grams

0.00019

grams/dscf

0.000002921

grams/dscf

0.000184938

grams/dscf

1.53

grams/hour

9.19

grams

Average Total PM Emissions

9.22

grams

AVERAGE PARTICULATE

1.54

grams/hour

EMISSIONS RATE

% OF AVERAGE

100.3

99.7

Emissions Factor

1.551

g/Kg -Dry

1.543

g/Kg -Dry

60

[illegible][illegible]

Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.56	lb/lb-mole
Dilution Tunnel H2O:	4.00	%
Dilution Tunnel Static:	-0.400	In H2O
Tunnel Area:	0.196	ft ²
Pitot Tube Cp:	0.99	

Tunnel Velocity:	13.14253 ft/sec.
Intial Tunnel Flow:	138.3966 scfm
Average Tunnel Flow:	136.8728 scfm

Notes:

Run # 1
 Date: 8/25/15

Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H2O: 4.00 %
 Dilution Tunnel Static: -0.400 In H2O
 Tunnel Area: 0.196 ft²
 Pitot Tube Cp: 0.99

Dilution Tunnel Traverse Data								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8
dP	0.038	0.035	0.040	0.033	0.035	0.038	0.033	0.036
Temperature	100	100	100	100	100	100	100	100

0.036
100.000

Tunnel Velocity: 13.143 ft/sec.
 Intial Tunnel Flow: 138.4 scfm
 Average Tunnel Flow 136.87 scfm

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JOB #	034_S_050_5	
TECHNICIAN	GENBTN	
DATE:	8_25_15	
RUN #:	1	
READING INTERVAL:	10	
SAMPLE BOX :	B	
METER Y FACTOR:	1.003	
PROBE MATERIAL:	SS	
FRONT FILTER #:	2509	
REAR FILTER #:	2510	
FINAL LEAK RATE (CFM):	< 0.01	@ 5 IN-HG

Run Time: 360 Firebox Delta T 124.4

ET	GAS METER VOLUME	SAMPLE RATE(Ft3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	TEMPERATURES						METER	STOVE AVG T
							1	2	3	4	5	6		
0	0	0	NA	0	0	-1	334	382	79	181	360	77	294	
10	1.353	0.135	102	-0.05	1.99	-1.14	334	382	84	177	356	77	293	
20	2.717	0.136	102	-0.04	1.99	-1.32	340	386	86	178	358	80	296	
30	4.091	0.137	102	-0.06	2.03	-1.91	345	395	86	180	366	85	301	
40	5.470	0.138	102	-0.05	2.02	-1.88	358	406	85	185	372	89	309	
50	6.855	0.139	101	-0.05	2	-1.32	353	399	84	184	372	93	306	
60	8.243	0.139	101	-0.05	2.02	-2.14	353	398	83	184	371	95	306	
70	9.641	0.140	101	-0.05	2	-2.17	334	366	83	198	340	98	295	
80	11.040	0.140	101	-0.04	2.02	-1.57	297	324	83	187	301	100	265	
90	12.439	0.140	100	-0.04	2.01	-2.37	282	313	82	178	279	101	252	
100	13.843	0.140	100	-0.04	2.02	-1.42	271	301	82	174	267	103	243	
110	15.246	0.140	100	-0.04	2.02	-1.75	266	295	82	172	258	104	239	
120	16.648	0.140	100	-0.04	2.01	-2.22	260	291	83	169	253	104	235	
130	18.054	0.141	100	-0.04	2.01	-2.32	258	290	83	167	251	105	233	
140	19.459	0.141	100	-0.04	2.01	-1.89	258	289	83	167	247	106	232	
150	20.868	0.141	100	-0.04	2.01	-1.73	265	296	83	168	251	106	236	
160	22.276	0.141	100	-0.04	2.01	-1.94	263	295	83	169	256	107	237	
170	23.680	0.140	100	-0.04	2.01	-1.93	271	299	83	170	259	107	241	
180	25.094	0.141	100	-0.04	2.03	-1.45	263	297	83	170	254	108	238	
190	26.509	0.142	99	-0.04	2.03	-2.11	238	265	83	176	237	108	223	
200	27.927	0.142	100	-0.04	2.03	-2.62	217	239	82	168	215	108	205	
210	29.340	0.141	99	-0.03	2.01	-1.83	200	220	82	160	198	108	191	
220	30.758	0.142	99	-0.03	2.02	-2.64	189	210	82	153	187	109	181	
230	32.171	0.141	99	-0.03	2.01	-2.57	185	205	81	148	179	109	177	
240	33.588	0.142	99	-0.03	2	-1.91	185	207	81	147	179	109	177	
250	35.002	0.141	99	-0.03	2.03	-1.49	180	203	82	145	175	109	173	
260	36.420	0.142	99	-0.03	2.01	-2.19	173	195	81	143	168	110	167	
270	37.833	0.141	99	-0.03	1.99	-2.6	177	200	82	142	169	110	170	
280	39.249	0.142	99	-0.03	2.01	-2.02	173	194	82	142	166	110	166	
290	40.661	0.141	99	-0.03	2.02	-1.47	173	194	82	140	164	110	166	
300	42.077	0.142	99	-0.03	2.01	-2.16	174	199	83	142	167	110	169	
310	43.487	0.141	98	-0.02	2.01	-1.46	170	195	83	141	164	110	166	
320	44.902	0.142	99	-0.03	2.01	-2.09	172	199	84	139	164	110	167	
330	46.313	0.141	98	-0.03	2	-1.84	170	196	84	141	163	110	166	
340	47.727	0.141	99	-0.03	2.01	-2.33	176	200	83	140	167	110	169	
350	49.138	0.141	99	-0.03	2	-2.21	179	206	84	144	170	109	173	
360	50.550	0.141	99	-0.03	2	-1.55	175	202	84	143	168	110	170	

Run Notes:

170

Ambient Sample Results:

JOB NUMBER: 034_S_050_5
TECHNICIAN: GENBTN
DATE: 8_25_15
RUN NUMBER: 1

METER Y FACTOR: 1.016

	<u>Sample Volume (L)</u>	<u>Meter Temp °F</u>	<u>ΔH</u>	<u>ΔP</u>
Start	0	79.6	0	0
End	1959.798	105.7	0	0

Total Sample Volume - Vm

Total Sample Volume - Vm

Average Sample Rate

Sample Time

Average Meter Temperature

Total Sample Volume (Standard Conditions) - Vmstd

Total Particulates

Particulate Concentration (dry-standard)

Particulate Emission Rate

SAMPLE INFORMATION	
1959.798	Liters
69.210	ft ³
0.19	ft ³ /min
360.00	Minutes
92.65	°F
67.338	dscf

0.0	mg
-----	----

0.000000000	grams/dscf
0.000000000	grams/hour

JOB NUMBER

034_S_050_5

RUN #

1

DATE:

8_25_15

BURN RATE

0.33

KG/HR DRY

FILTER A ONE HOUR
PARTICULATE

1.8

mg

mg

Total Sample Volume - Vm
Average Gas Velocity in Dilution Tunnel - vs
Average Gas Flow Rate in Dilution Tunnel - Qsd
Total Sample Volume (Standard Conditions) - Vmstd

Average Tunnel Temperature
Average Delta p

Average Gas Meter Temperature
Average Delta H
Total Time of Test

Total Particulates

Particulate Concentration (dry-standard)

Ambient Train (dry-standard)

Net (dry-standard)

Particulate Emission Rate

Total PM Emissions

Average Total PM Emissions

AVERAGE PARTICULATE

EMISSIONS RATE

% OF AVERAGE

Emissions Factor

SAMPLE A
INFORMATION

8.38

13.14

feet/second

8212.37

dscf/hour

8.13

dscf

113.1

F

0.036

87

F

1.97

in-h20

60

min

1.8

mg

0.00022

grams/dscf

0.000000000

grams/dscf

0.000221283

grams/dscf

1.82

grams/hour

1.82

grams

SAMPLE B
INFORMATION

50.55

13.14

feet/second

8212.37

dscf/hour

47.89

dscf

113.1

F

0.036

103

F

2.01

in-h20

360

min

0

mg

0.00000

grams/dscf

0.000000000

grams/dscf

0.000000000

grams/dscf

0.00

grams/hour

0.00

grams

grams

grams/hour

#DIV/0!

#DIV/0!

g/Kg -Dry

0.000

g/Kg -Dry

Technician _____

[illegible]

Run # 2
 Date: 8/26/15

Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H2O: 4.00 %
 Dilution Tunnel Static: -0.400 In H2O
 Tunnel Area: 0.196 ft²
 Pitot Tube Cp: 0.99

Dilution Tunnel Traverse Data								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8
dP	0.038	0.038	0.040	0.035	0.035	0.035	0.034	0.036
Temperature	100	100	100	100	100	100	100	100

0.036
100.000

Tunnel Velocity:	13.137	ft/sec.
Intial Tunnel Flow:	139.09	scfm
Average Tunnel Flow	136.93	scfm

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JOB #	034_S_050_5	
TECHNICIAN	GENBTN	
DATE:	8_26_15	
RUN #:	2	
READING INTERVAL:	10	
SAMPLE BOX :	B	
METER Y FACTOR:	1.003	
PROBE MATERIAL:	SS	
FRONT FILTER #:	2515&2519	
REAR FILTER #:	2516	
FINAL LEAK RATE (CFM):	< 0.01	@ 5 IN-HG
FINAL LEAK RATE (CFM):	< 0.01	@ 5 IN-HG

Run Time: 360 Firebox Delta T 128

ET	GAS METER VOLUME	SAMPLE RATE(Ft3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	TEMPERATURES						METER	STOVE AVG T
							1	2	3	4	5	6		
0	0	0	NA	0	0	-1	363	405	80	186	380	79	312	
10	1.361	0.136	102	-0.05	2.01	-1.85	373	419	83	189	386	80	319	
20	2.734	0.137	102	-0.05	2.03	-1.61	364	409	83	189	381	83	313	
30	4.109	0.138	101	-0.05	1.99	-2.63	370	411	84	189	380	88	315	
40	5.497	0.139	102	-0.06	1.98	-2.31	378	416	84	191	385	92	319	
50	6.888	0.139	101	-0.06	2	-2.87	375	415	84	191	384	95	318	
60	8.277	0.139	101	-0.06	1.99	-3.24	374	412	85	192	382	98	318	
70	9.642	0.137	98	-0.05	2.01	-1.93	349	375	86	208	352	100	305	
80	11.053	0.141	101	-0.04	2.01	-2.1	310	335	85	194	313	103	275	
90	12.462	0.141	101	-0.05	2.01	-1.63	305	329	85	187	297	104	267	
100	13.872	0.141	100	-0.05	2.02	-1.27	293	319	85	183	283	106	259	
110	15.285	0.141	100	-0.04	2.03	-2.03	290	317	86	182	279	107	256	
120	16.697	0.141	100	-0.04	2.02	-1.75	286	313	85	181	277	108	254	
130	18.111	0.141	100	-0.04	2.02	-2.08	285	313	85	177	272	108	252	
140	19.522	0.141	100	-0.04	2	-2.14	278	301	85	177	267	109	246	
150	20.935	0.141	100	-0.04	2	-1.76	290	313	85	179	273	109	254	
160	22.350	0.142	100	-0.04	2.03	-1.76	288	313	86	180	275	110	254	
170	23.774	0.142	101	-0.05	2.04	-1.5	292	324	86	182	277	110	259	
180	25.193	0.142	100	-0.05	2.03	-1.6	289	319	86	182	278	111	257	
190	26.613	0.142	99	-0.04	2.01	-1.3	263	288	85	191	263	111	243	
200	28.029	0.142	99	-0.03	1.99	-2.28	238	260	85	180	239	112	222	
210	29.458	0.143	100	-0.04	2.04	-1.97	227	249	85	172	226	112	212	
220	30.883	0.143	99	-0.03	2.02	-1.17	218	239	84	166	216	112	204	
230	32.305	0.142	99	-0.03	2.02	-1.43	211	232	84	162	210	112	198	
240	33.731	0.143	99	-0.03	2.02	-2.34	205	224	84	158	202	113	192	
250	35.149	0.142	99	-0.03	2.01	-1.99	203	221	84	155	199	113	190	
260	36.571	0.142	99	-0.03	2.02	-1.51	199	218	84	153	194	113	187	
270	37.989	0.142	99	-0.03	2	-2	204	222	84	154	195	113	189	
280	39.408	0.142	99	-0.03	2	-1.6	200	220	84	156	194	113	188	
290	40.835	0.143	99	-0.03	2.03	-2.11	199	218	84	154	191	114	186	
300	42.260	0.143	99	-0.03	2.02	-2.03	199	218	85	153	191	114	186	
310	43.688	0.143	99	-0.03	2.02	-1.5	200	220	85	154	191	114	187	
320	45.108	0.142	99	-0.03	2	-2.43	199	219	85	154	189	114	186	
330	46.533	0.143	99	-0.03	2	-1.45	195	214	85	152	187	114	183	
340	47.955	0.142	99	-0.03	2	-2.06	199	218	85	153	187	114	185	
350	49.379	0.142	99	-0.03	2.03	-2.15	197	214	84	152	185	114	183	
360	50.803	0.142	99	-0.03	2.01	-1.37	198	215	84	152	185	114	184	

Run Notes:

183.6

Ambient Sample Results:

JOB NUMBER: 034_S_050_5
TECHNICIAN: GENBTN
DATE: 8_26_15
RUN NUMBER: 2

METER Y FACTOR: 1.016

	<u>Sample Volume (L)</u>	<u>Meter Temp °F</u>	<u>ΔH</u>	<u>ΔP</u>
Start	0	94.3	0	0
End	2012.363	110.6	0	0

Total Sample Volume - Vm

Total Sample Volume - Vm

Average Sample Rate

Sample Time

Average Meter Temperature

Total Sample Volume (Standard Conditions) - Vmstd

Total Particulates

Particulate Concentration (dry-standard)

Particulate Emission Rate

SAMPLE INFORMATION	
2012.363	Liters
71.066	ft ³
0.20	ft ³ /min
360.00	Minutes
102.45	°F
67.894	dscf

0.2	mg
-----	----

0.000002946	grams/dscf
0.000033333	grams/hour

JOB NUMBER

034_S_050_5

RUN #

2

DATE:

8_26_15

BURN RATE

0.34

KG/HR DRY

FILTER A ONE HOUR
PARTICULATE

4.3

mg

FILTER B
PARTICULATE

mg

Total Sample Volume - Vm
Average Gas Velocity in Dilution Tunnel - vs
Average Gas Flow Rate in Dilution Tunnel - Qsd
Total Sample Volume (Standard Conditions) - Vmstd

SAMPLE A
INFORMATION

8.40

feet/second

13.14

dscf/hour

8215.77

dscf

7.83

SAMPLE B
INFORMATION

50.80

feet/second

13.14

dscf/hour

8215.77

dscf

47.82

Average Tunnel Temperature
Average Delta p

112.3

F

0.036

112.3

F

0.036

Average Gas Meter Temperature
Average Delta H
Total Time of Test

110

F

1.96

in-h20

60

min

106

F

2.01

in-h20

360

min

Total Particulates

4.3

mg

0

mg

Particulate Concentration (dry-standard)

0.00055

grams/dscf

Ambient Train (dry-standard)

0.000000000

grams/dscf

Net (dry-standard)

0.000549038

grams/dscf

Particulate Emission Rate

4.51

grams/hour

Total PM Emissions

4.51

grams

0.00000

grams/dscf

0.000002946

grams/dscf

-2.94578E-06

grams/dscf

-0.02

grams/hour

-0.15

grams

Average Total PM Emissions
AVERAGE PARTICULATE
EMISSIONS RATE

% OF AVERAGE

Emissions Factor

#DIV/0!

13.325

g/Kg -Dry

grams
grams/hour

#DIV/0!

-0.071

g/Kg -Dry

60

[illegible][illegible]

Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.56	lb/lb-mole
Dilution Tunnel H2O:	4.00	%
Dilution Tunnel Static:	-0.400	In H2O
Tunnel Area:	0.196	ft ²
Pitot Tube Cp:	0.99	

Tunnel Velocity:	13.1223 ft/sec.
Initial Tunnel Flow:	137.9044 scfm
Average Tunnel Flow:	137.0838 scfm

Notes:

Run # 3
 Date: 8/27/15

Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H2O: 4.00 %
 Dilution Tunnel Static: -0.400 In H2O
 Tunnel Area: 0.196 ft²
 Pitot Tube Cp: 0.99

Dilution Tunnel Traverse Data								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8
dP	0.035	0.033	0.038	0.036	0.035	0.037	0.039	0.035
Temperature	105	105	105	105	105	105	105	105

0.036
105.000

Tunnel Velocity: 13.122 ft/sec.
 Intial Tunnel Flow: 137.9 scfm
 Average Tunnel Flow 137.08 scfm

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[illegible]

JOB #	034_S_050_5	
TECHNICIAN	GENBTN	
DATE:	8_27_15	
RUN #:	3	
READING INTERVAL:	10	
SAMPLE BOX :	B	
METER Y FACTOR:	1.003	
PROBE MATERIAL:	SS	
FRONT FILTER #:	2522&2526	
REAR FILTER #:	2523	
FINAL LEAK RATE (CFM):	< 0.01	@ 5 IN-HG
FINAL LEAK RATE (CFM):	< 0.01	@ 5 IN-HG

Run Time: 360 Firebox Delta T 129.4

ET	GAS METER VOLUME	SAMPLE RATE(Ft3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	TEMPERATURES						METER	STOVE AVG T
							1	2	3	4	5	6		
0	0	0	NA	0	0	-1	376	402	81	188	373	79	312	
10	1.362	0.136	102	-0.05	1.99	-1.96	379	402	83	190	376	80	314	
20	2.735	0.137	102	-0.05	1.99	-2.13	381	393	82	189	373	84	311	
30	4.119	0.138	102	-0.06	2.02	-2.19	379	395	81	189	372	89	311	
40	5.507	0.139	102	-0.06	2.02	-3.1	379	399	81	190	375	93	313	
50	6.898	0.139	101	-0.06	2.01	-2.08	385	402	81	191	374	96	315	
60	8.291	0.139	101	-0.05	2	-2.05	390	400	81	192	375	99	316	
70	9.671	0.138	99	-0.05	2.02	-1.54	371	378	82	212	355	101	312	
80	11.078	0.141	101	-0.05	2.01	-2.09	328	340	82	198	315	103	281	
90	12.484	0.141	100	-0.05	2	-1.51	313	327	82	190	296	105	269	
100	13.897	0.141	101	-0.04	2.04	-1.24	308	319	82	186	285	106	263	
110	15.314	0.142	101	-0.05	2.03	-1.58	298	310	82	181	275	107	255	
120	16.730	0.142	101	-0.05	2.02	-1.77	295	309	82	179	271	108	253	
130	18.145	0.142	100	-0.04	2.01	-1.79	297	312	82	180	270	109	254	
140	19.560	0.142	100	-0.04	2	-1.39	294	305	82	180	270	110	252	
150	20.975	0.142	100	-0.05	2.02	-1.8	293	305	82	179	268	110	251	
160	22.394	0.142	101	-0.05	2.04	-1.32	291	304	82	179	266	110	250	
170	23.818	0.142	101	-0.05	2.03	-2.29	293	308	82	179	267	111	251	
180	25.247	0.143	101	-0.04	2.04	-2.26	297	310	82	179	269	111	253	
190	26.669	0.142	99	-0.04	2.03	-2.1	261	279	81	187	255	112	237	
200	28.092	0.142	99	-0.03	2.02	-1.48	238	255	80	179	236	112	220	
210	29.515	0.142	99	-0.03	2.02	-2.05	221	234	80	168	218	113	204	
220	30.938	0.142	99	-0.04	2.02	-1.76	218	232	80	163	211	113	200	
230	32.363	0.143	99	-0.03	2.03	-2.32	213	229	80	160	205	113	196	
240	33.784	0.142	99	-0.04	2.02	-1.68	212	229	80	160	203	113	196	
250	35.208	0.142	99	-0.03	2.02	-1.87	209	224	80	158	199	113	193	
260	36.626	0.142	98	-0.03	2.01	-2.09	205	222	80	156	195	114	190	
270	38.047	0.142	99	-0.03	2.02	-1.5	200	217	80	154	190	114	186	
280	39.467	0.142	98	-0.02	2.01	-2.01	174	188	80	146	173	114	166	
290	40.890	0.142	99	-0.03	2	-1.44	154	160	80	138	151	114	149	
300	42.312	0.142	99	-0.03	2.03	-2.54	171	184	81	135	158	114	162	
310	43.736	0.142	99	-0.03	2.02	-1.5	181	196	80	142	168	114	170	
320	45.163	0.143	99	-0.03	2.01	-1.47	193	207	80	147	178	114	178	
330	46.584	0.142	98	-0.03	2.01	-1.42	199	214	80	150	183	115	183	
340	48.007	0.142	99	-0.03	2.01	-1.89	197	214	81	152	185	115	183	
350	49.425	0.142	98	-0.03	1.98	-2.07	199	216	81	152	186	115	184	
360	50.852	0.143	99	-0.02	2.01	-1.57	196	213	82	151	184	115	182	

Run Notes:

182.4

Ambient Sample Results:

JOB NUMBER: 034_S_050_5
TECHNICIAN: GENBTN
DATE: 8_27_15
RUN NUMBER: 3

METER Y FACTOR: 1.016

	<u>Sample Volume (L)</u>	<u>Meter Temp °F</u>	<u>ΔH</u>	<u>ΔP</u>
Start	0	96.1	0	0
End	2028.912	110.6	0	0

Total Sample Volume - Vm

Total Sample Volume - Vm

Average Sample Rate

Sample Time

Average Meter Temperature

Total Sample Volume (Standard Conditions) - Vmstd

Total Particulates

Particulate Concentration (dry-standard)

Particulate Emission Rate

SAMPLE INFORMATION	
2028.912	Liters
71.650	ft ³
0.20	ft ³ /min
360.00	Minutes
103.35	°F
68.480	dscf

0.2	mg
-----	----

0.000002921	grams/dscf
0.000033333	grams/hour

JOB NUMBER

034_S_050_5

RUN #

3

DATE:

8_27_15

BURN RATE

0.34

KG/HR DRY

FILTER A ONE HOUR
PARTICULATE

5.5

mg

FILTER B
PARTICULATE

0

mg

Total Sample Volume - Vm
Average Gas Velocity in Dilution Tunnel - vs
Average Gas Flow Rate in Dilution Tunnel - Qsd
Total Sample Volume (Standard Conditions) - Vmstd

SAMPLE A
INFORMATION

8.39

feet/second

13.12

dscf/hour

8225.03

dscf

7.83

SAMPLE B
INFORMATION

50.85

feet/second

13.12

dscf/hour

8225.03

dscf

47.91

Average Tunnel Temperature
Average Delta p

112.1

F

0.036

112.1

F

0.036

Average Gas Meter Temperature
Average Delta H
Total Time of Test

110

F

1.97

in-h20

60

min

107

F

2.02

in-h20

360

min

Total Particulates

5.5

mg

0

mg

Particulate Concentration (dry-standard)

0.00070

grams/dscf

Ambient Train (dry-standard)

0.000000000

grams/dscf

Net (dry-standard)

0.000702239

grams/dscf

Particulate Emission Rate

5.78

grams/hour

Total PM Emissions

5.78

grams

0.00000

grams/dscf

0.000002921

grams/dscf

-2.92058E-06

grams/dscf

-0.02

grams/hour

-0.14

grams

Average Total PM Emissions
AVERAGE PARTICULATE
EMISSIONS RATE

% OF AVERAGE

Emissions Factor

#DIV/0!

17.063

g/Kg -Dry

grams
grams/hour

#DIV/0!

-0.071

g/Kg -Dry

Dirigo Laboratories, Inc.

Manufacturer: Pacific Energy
Model: True North 40
Date: 9/4/2015
Run: 1
Control #: 034-S-050-5
Test Duration: 360
Output Category: Overall

	HHV Basis	LHV Basis
Overall Efficiency	65.3%	70.6%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	65.7%	71.0%

HHV Output Rate (kJ/h)	13,148	12,472	(Btu/h)
Burn Rate (kg/h)	1.02	2.24	(lb/h)
Input (kJ/h)	20,123	19,089	(Btu/h)

Test Load Weight (dry kg)	6.1	13.4	dry lb
MC wet (%)	2.66		
MC dry (%)	2.73		
Particulate (g)	3.62		
CO (g)	45		
Test Duration (h)	6		

Emissions	Particulate	CO
g/MJ Output	0.05	0.57
g/kg Dry Fuel	0.59	7.33
g/h	0.60	7.45
lb/MM Btu Output	0.11	1.32

Air/Fuel Ratio (A/F)	23.32
----------------------	-------

Test Results in Accordance with CSA B415.1-10

Technician: _____

VERSION: 2.4

4/15/2010

Manufacturer: Pacific Energy

Appliance Type: Pellet (Cat, Non-Cat, Pellet)

Model: True North 40

Date: 9/4/2015

Run: 1

Control #: 034-S-050-5

Test Duration: 360

Burn Category 2

Wood Moisture (% DRY):

2.73

Wood Moisture (% wet):

2.66

Load Weight (lb wet):

13.80

Burn Rate (dry kg/h):

1.02

Total Particulate Emissions:

3.62

g

Fuel Data

D. Fir

HHV

19,810

kJ/kg

%C

48.73

%H

6.87

%O

43.90

%Ash

0.50

☒ Douglas☐ Oak

Averages

366.4

80.8

15.98

4.42

0.02

Temp. (F)

Elapsed
Time (min)Fuel Weight
Remaining (lb)Flue
GasRoom
Temp

Flue Gas Composition (%)

O2

CO2

CO

0	13.8	488.0	78.0	12.97	7.93	0.02
10	13.1	497.0	78.0	11.43	9.37	0.02
20	12.4	498.0	78.0	12.64	7.86	0.03
30	11.6	505.0	79.0	11.52	9.15	0.02
40	10.8	507.0	79.0	14.15	6.49	0.02
50	10.1	506.0	79.0	12.36	8.35	0.01
60	9.3	505.0	80.0	12.64	8.22	0.01
70	8.8	463.0	80.0	14.27	6.18	0.01
80	8.3	434.0	80.0	16.03	4.38	0.01
90	7.9	427.0	80.0	15.05	5.51	0.00
100	7.4	420.0	80.0	13.65	7.01	0.00
110	6.9	410.0	80.0	17.49	2.90	0.01
120	6.5	416.0	80.0	14.58	5.98	0.00
130	6.0	413.0	81.0	15.97	4.42	0.00
140	5.6	414.0	81.0	14.87	5.49	0.00
150	5.1	419.0	81.0	16.29	4.09	0.00
160	4.6	408.0	81.0	17.80	2.53	0.01
170	4.2	414.0	81.0	15.68	4.55	0.00
180	3.7	419.0	81.0	15.67	4.76	0.00
190	3.5	319.0	81.0	19.03	1.24	0.18
200	3.2	316.0	82.0	15.81	4.38	0.00
210	3.0	296.0	82.0	16.22	3.98	0.00
220	2.9	275.0	82.0	18.23	2.08	0.00
230	2.6	273.0	82.0	17.53	2.71	0.00
240	2.4	278.0	82.0	18.60	1.67	0.07
250	2.2	277.0	82.0	15.30	5.06	0.00
260	2.1	254.0	82.0	16.46	3.83	0.00
270	1.9	272.0	82.0	19.22	1.05	0.09
280	1.7	254.0	82.0	18.95	1.35	0.03
290	1.4	265.0	82.0	17.15	2.97	0.00
300	1.3	272.0	82.0	17.25	2.88	0.00
310	1.1	256.0	82.0	19.23	1.01	0.05

320	0.9	282.0	82.0	17.36	2.89	0.00
330	0.7	266.0	81.0	17.11	3.12	0.00
340	0.5	281.0	81.0	18.45	1.92	0.01
350	0.2	283.0	81.0	17.75	2.64	0.00
360	0.0	275.0	81.0	16.68	3.58	0.00

Manufacturer: Pacific Energy
Model: True North 40
Date: 9/4/2015
Run: 1
Control #: 034-S-050-5
Test Duration: 360 min

Overall Heating Efficiency: 65.3%
Combustion Efficiency: 99.5%
Heat Transfer Efficiency: 65.7%

Air Fuel Ratio (A/F)	
Dry Molecular Weight (Md)	29.36
Dry Moles Exhaust Gas (Nr)	811.70
Air Fuel Ratio (A/F)	23.32

%HC
0.80

	HHV	LHV
Eff	65.3%	70.6%
Comb Eff	99.5%	99.5%
HT Eff	65.7%	71.0%
Output	13,148	kJ/h
Burn Rate	1.02	kg/h
Grams CO	45	g
Input	20,123	kJ/h
MC wet	2.66	
Averages	0.02	4.42

Ultimate CO2
CO2-ult 19.64
Fo 1.057

Heat Output: 12,472 Btu/h 13,148 kJ/h
Heat Input: 19,089 Btu/h 20,123 kJ/h
Burn Duration: 6 h
Burn Rate: 2.2 lb/h 1.0 kg/h
Stack Temp: 363.0 Deg. F 183.9 Deg. C

INPUT DATA				Oxygen Calculation			Input Data		Combust	Heat	Net	Air	Wet Wt	% Wet	Dry Wt.	% Dry	Fuel Properties	
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO2 [d]	Excess Air EA	Total O2	Calc. % O2 [g]	Flue Gas (°C)	Room Temp (°C)	Eff %	Transfer %	Eff %	Fuel Ratio	Now Wt	Consumed x	Now Wtdn	Consumed y	Total Input	Carbon /12= [a]
0	6.26	0.02	7.93	147.1%	20.42	12.48	253.3	25.6	100.2%	72.6%	72.8%	14.9	6.26	0.00	6.09	0.00	0	4.06
10	5.94	0.02	9.37	109.2%	20.32	10.94	258.3	25.6	100.2%	74.9%	75.0%	12.7	5.94	5.07	5.79	5.07	9187	4.06
20	5.63	0.03	7.86	149.0%	20.42	12.54	258.9	25.6	100.1%	72.0%	72.1%	15.0	5.63	10.14	5.48	10.14	6562	4.06
30	5.26	0.02	9.15	114.2%	20.33	11.17	262.8	26.1	100.2%	74.3%	74.4%	13.0	5.26	15.94	5.12	15.94	6999	4.06
40	4.90	0.02	6.49	201.7%	20.51	14.01	263.9	26.1	100.4%	67.7%	68.0%	18.2	4.90	21.74	4.77	21.74	6562	4.06
50	4.58	0.01	8.35	135.0%	20.39	12.03	263.3	26.1	100.3%	72.7%	72.9%	14.2	4.58	26.81	4.46	26.81	6562	4.06
60	4.22	0.01	8.22	138.7%	20.40	12.17	262.8	26.7	100.3%	72.5%	72.8%	14.4	4.22	32.61	4.11	32.61	5687	4.06
70	3.99	0.01	6.18	217.3%	20.53	14.35	239.4	26.7	100.5%	69.4%	69.7%	19.2	3.99	36.23	3.89	36.23	4375	4.06
80	3.77	0.01	4.38	347.4%	20.65	16.27	223.3	26.7	100.9%	63.3%	63.9%	27.1	3.77	39.86	3.67	39.86	3937	4.06
90	3.58	0.00	5.51	256.5%	20.58	15.07	219.4	26.7	100.8%	69.3%	69.8%	21.6	3.58	42.75	3.49	42.75	3937	4.06
100	3.36	0.00	7.01	180.2%	20.48	13.47	215.6	26.7	100.6%	74.1%	74.6%	16.9	3.36	46.38	3.27	46.38	4375	4.06
110	3.13	0.01	2.90	575.0%	20.75	17.84	210.0	26.7	101.5%	52.6%	53.4%	40.9	3.13	50.00	3.05	50.00	3937	4.06
120	2.95	0.00	5.98	228.5%	20.55	14.57	213.3	26.7	100.7%	71.6%	72.1%	19.9	2.95	52.90	2.87	52.90	3937	4.06
130	2.72	0.00	4.42	344.4%	20.65	16.23	211.7	27.2	101.1%	65.3%	66.0%	26.9	2.72	56.52	2.65	56.52	3937	4.06
140	2.54	0.00	5.49	257.8%	20.58	15.09	212.2	27.2	100.8%	70.1%	70.7%	21.6	2.54	59.42	2.47	59.42	3937	4.06
150	2.31	0.00	4.09	380.3%	20.67	16.58	215.0	27.2	101.2%	62.8%	63.5%	29.1	2.31	63.04	2.25	63.04	4375	4.06
160	2.09	0.01	2.53	673.3%	20.77	18.24	208.9	27.2	101.8%	47.5%	48.4%	47.0	2.09	66.67	2.03	66.67	3937	4.06
170	1.91	0.00	4.55	331.7%	20.64	16.09	212.2	27.2	101.0%	66.0%	66.7%	26.1	1.91	69.57	1.85	69.57	3937	4.06
180	1.68	0.00	4.76	312.7%	20.63	15.87	215.0	27.2	101.0%	66.6%	67.3%	25.0	1.68	73.19	1.63	73.19	3062	4.06
190	1.59	0.18	1.24	1283.3%	20.85	19.52	159.4	27.2	93.3%	30.0%	28.0%	83.2	1.59	74.64	1.55	74.64	2187	4.06
200	1.45	0.00	4.38	348.5%	20.65	16.27	157.8	27.8	101.1%	73.2%	74.0%	27.1	1.45	76.81	1.41	76.81	2187	4.06
210	1.36	0.00	3.98	393.5%	20.68	16.70	146.7	27.8	101.2%	73.2%	74.1%	29.9	1.36	78.26	1.32	78.26	1312	4.06
220	1.32	0.00	2.08	844.4%	20.80	18.72	135.0	27.8	102.7%	60.6%	62.2%	57.5	1.32	78.99	1.28	78.99	1750	4.06
230	1.18	0.00	2.71	624.8%	20.76	18.05	133.9	27.8	102.0%	67.9%	69.2%	44.0	1.18	81.16	1.15	81.16	2187	4.06
240	1.09	0.07	1.67	1028.9%	20.83	19.12	136.7	27.8	99.8%	52.9%	52.8%	68.5	1.09	82.61	1.06	82.61	1750	4.06
250	1.00	0.00	5.06	288.2%	20.61	15.55	136.1	27.8	100.9%	78.3%	79.0%	23.5	1.00	84.06	0.97	84.06	1312	4.06
260	0.95	0.00	3.83	412.9%	20.69	16.86	123.3	27.8	101.3%	76.4%	77.4%	31.1	0.95	84.78	0.93	84.78	1312	4.06
270	0.86	0.09	1.05	1623.1%	20.86	19.77	133.3	27.8	98.4%	33.4%	32.8%	105.0	0.86	86.23	0.84	86.23	1750	4.06
280	0.77	0.03	1.35	1323.4%	20.85	19.48	123.3	27.8	102.4%	49.8%	51.0%	87.1	0.77	87.68	0.75	87.68	2187	4.06
290	0.64	0.00	2.97	561.4%	20.74	17.77	129.4	27.8	101.8%	70.8%	72.1%	40.1	0.64	89.86	0.62	89.86	1750	4.06
300	0.59	0.00	2.88	582.0%	20.75	17.87	133.3	27.8	101.8%	69.3%	70.6%	41.4	0.59	90.58	0.57	90.58	1312	4.06
310	0.50	0.05	1.01	1753.1%	20.87	19.84	124.4	27.8	101.5%	35.9%	36.5%	113.8	0.50	92.03	0.49	92.03	1750	4.06
320	0.41	0.00	2.89	579.7%	20.75	17.86	138.9	27.8	101.8%	68.2%	69.5%	41.2	0.41	93.48	0.40	93.48	1750	4.06
330	0.32	0.00	3.12	529.6%	20.73	17.61	130.0	27.2	101.7%	71.6%	72.8%	38.2	0.32	94.93	0.31	94.93	1750	4.06
340	0.23	0.01	1.92	917.8%	20.81	18.89	138.3	27.2	102.5%	56.8%	58.3%	62.0	0.23	96.38	0.22	96.38	2187	4.06
350	0.09	0.00	2.64	644.1%	20.77	18.13	139.4	27.2	102.0%	65.8%	67.1%	45.2	0.09	98.55	0.09	98.55	3062	4.06
360	0.00	0.00	3.58	448.7%	20.70	17.12	135.0	27.2	101.4%	73.2%	74.2%	33.2	0.00	100.00	0.00	100.00	875	4.06
0															0.00			

Moisture Content MCwb: 2.66

Combustion Efficiency:	99.5%				Moisture of Wood (wet basis):	2.66		Dry kg :	6.09
Total Input (kJ):	120,741	114,517	(Btu)		Initial Dry Weight Wtdo (kg):	6.09		CA:	48.73
Total Output (kJ):	78,888	74,821	(Btu)		Moisture Content Dry	2.73		HY:	6.87
Efficiency:	65.3%							OX:	43.90
Total CO (g):	44.70								

Load Weight (kg):	6.26								
Fuel Heating:	HHV	LHV			HHV	LHV			
Value in kJ/kg - CV:	19810.00	18328.69			Btu/lb	8522.48	7885.21		

6.87	2.74	19810.00	2.66	79.34	21.05	1.09	3.78	-0.02	0.11	40.74	229.54	0.39	-0.31	1033.94	35.15	1.52	458.93	6472.63	4804.04
es	Oxygen /16= [c]	Calorific Value	Mw Moisture Fuel Burnt	Mass Balance (moles/100 mole dry flue gas)					kg Wood per 100 mole dfp Nk	Moles per kg of Dry Wood						Moisture Present	Stack Temp K	Heat Content Cha F	
Hydrogen /1= [b]				[h]	[u]	[w]	[j]	[k]		CO2	O2	CO	HC	N2	H2O			CO2	O2
6.87	2.74	19810.00	2.66	79.57	21.11	1.95	6.74	-0.02	0.19	40.80	64.18	0.10	-0.09	409.39	34.70	1.52	526.48	9453.97	6946.16
6.87	2.74	19810.00	2.66	79.67	21.13	2.31	7.96	-0.01	0.23	40.79	47.62	0.09	-0.06	346.82	34.65	1.52	531.48	9678.37	7103.88
6.87	2.74	19810.00	2.66	79.57	21.11	1.94	6.69	-0.02	0.19	40.74	65.02	0.16	-0.08	412.40	34.69	1.52	532.04	9703.35	7121.42
6.87	2.74	19810.00	2.66	79.66	21.13	2.25	7.77	-0.02	0.22	40.79	49.82	0.09	-0.07	355.10	34.66	1.52	535.93	9857.22	7227.88
6.87	2.74	19810.00	2.66	79.48	21.08	1.60	5.53	-0.02	0.16	40.81	88.10	0.13	-0.12	499.78	34.77	1.52	537.04	9907.33	7263.01
6.87	2.74	19810.00	2.66	79.61	21.12	2.05	7.09	-0.02	0.20	40.85	58.87	0.05	-0.09	389.46	34.70	1.52	536.48	9882.27	7245.44
6.87	2.74	19810.00	2.66	79.60	21.11	2.02	6.98	-0.02	0.20	40.85	60.49	0.05	-0.09	395.60	34.70	1.52	535.93	9835.99	7211.51
6.87	2.74	19810.00	2.66	79.46	21.08	1.52	5.26	-0.02	0.15	40.89	94.92	0.07	-0.14	525.76	34.81	1.52	512.59	8791.97	6476.50
6.87	2.74	19810.00	2.66	79.34	21.05	1.07	3.74	-0.02	0.11	40.95	152.07	0.09	-0.23	741.82	34.98	1.52	496.48	8080.32	5971.85
6.87	2.74	19810.00	2.66	79.42	21.07	1.35	4.69	-0.02	0.13	40.99	112.09	0.00	-0.18	590.89	34.88	1.52	492.59	7909.66	5850.39
6.87	2.74	19810.00	2.66	79.52	21.09	1.72	5.95	-0.02	0.17	40.94	78.65	0.00	-0.13	464.42	34.78	1.52	488.71	7739.45	5729.07
6.87	2.74	19810.00	2.66	79.25	21.02	0.71	2.49	-0.03	0.07	41.06	252.61	0.14	-0.39	1121.94	35.29	1.52	483.15	7497.05	5555.98
6.87	2.74	19810.00	2.66	79.45	21.08	1.47	5.09	-0.02	0.15	40.97	99.80	0.00	-0.16	544.40	34.84	1.52	486.48	7642.39	5659.80
6.87	2.74	19810.00	2.66	79.35	21.05	1.08	3.77	-0.03	0.11	41.05	150.73	0.00	-0.24	737.05	35.01	1.52	484.82	7548.43	5591.50
6.87	2.74	19810.00	2.66	79.42	21.07	1.35	4.67	-0.02	0.13	40.99	112.66	0.00	-0.18	593.05	34.89	1.52	485.37	7572.66	5608.80
6.87	2.74	19810.00	2.66	79.33	21.04	1.00	3.49	-0.03	0.10	41.08	166.53	0.00	-0.27	796.80	35.06	1.52	488.15	7693.93	5695.37
6.87	2.74	19810.00	2.66	79.22	21.01	0.62	2.18	-0.03	0.06	41.10	296.29	0.16	-0.45	1287.07	35.43	1.52	482.04	7427.43	5505.02
6.87	2.74	19810.00	2.66	79.36	21.05	1.11	3.88	-0.03	0.11	41.05	145.15	0.00	-0.23	715.92	34.99	1.52	485.37	7572.66	5608.80
6.87	2.74	19810.00	2.66	79.37	21.05	1.17	4.06	-0.03	0.12	41.03	136.77	0.00	-0.22	684.23	34.96	1.52	488.15	7693.93	5695.37
6.87	2.74	19810.00	2.66	79.06	20.97	0.35	1.21	-0.01	0.03	35.77	562.96	5.19	-0.15	2280.67	34.82	1.52	432.59	5311.10	3977.29
6.87	2.74	19810.00	2.66	79.35	21.05	1.07	3.74	-0.03	0.11	41.06	152.52	0.00	-0.25	743.81	35.01	1.52	430.93	5219.75	3909.80
6.87	2.74	19810.00	2.66	79.32	21.04	0.97	3.40	-0.03	0.10	41.09	172.38	0.00	-0.28	818.93	35.08	1.52	419.82	4754.46	3569.68
6.87	2.74	19810.00	2.66	79.20	21.01	0.50	1.79	-0.03	0.05	41.41	372.76	0.00	-0.60	1576.79	35.72	1.52	408.15	4269.76	3213.76
6.87	2.74	19810.00	2.66	79.24	21.02	0.66	2.33	-0.03	0.07	41.25	274.79	0.00	-0.44	1206.26	35.41	1.52	407.04	4223.81	3179.92
6.87	2.74	19810.00	2.66	79.14	20.99	0.42	1.50	-0.02	0.04	39.64	453.83	1.66	-0.49	1878.45	35.50	1.52	409.82	4338.76	3264.53
6.87	2.74	19810.00	2.66	79.39	21.06	1.24	4.31	-0.03	0.12	41.02	126.01	0.00	-0.20	643.55	34.93	1.52	409.26	4315.76	3247.60
6.87	2.74	19810.00	2.66	79.31	21.04	0.94	3.27	-0.03	0.09	41.10	180.91	0.00	-0.29	851.18	35.10	1.52	396.48	3789.01	2859.06
6.87	2.74	19810.00	2.66	79.09	20.98	0.28	0.99	-0.02	0.03	38.22	719.56	3.28	-0.68	2878.65	35.88	1.52	406.48	4200.84	3163.01
6.87	2.74	19810.00	2.66	79.14	20.99	0.33	1.20	-0.03	0.03	40.72	587.71	0.90	-0.81	2387.05	36.15	1.52	396.48	3789.01	2859.06
6.87	2.74	19810.00	2.66	79.26	21.02	0.72	2.55	-0.03	0.07	41.21	246.62	0.00	-0.40	1099.69	35.32	1.52	402.59	4040.34	3044.70
6.87	2.74	19810.00	2.66	79.25	21.02	0.70	2.47	-0.03	0.07	41.22	255.79	0.00	-0.41	1134.38	35.35	1.52	406.48	4200.84	3163.01
6.87	2.74	19810.00	2.66	79.10	20.98	0.25	0.93	-0.02	0.03	39.81	781.85	1.97	-0.97	3118.15	36.46	1.52	397.59	3834.63	2892.78
6.87	2.74	19810.00	2.66	79.25	21.02	0.70	2.48	-0.03	0.07	41.22	254.74	0.00	-0.41	1130.41	35.34	1.52	412.04	4430.89	3332.26
6.87	2.74	19810.00	2.66	79.27	21.03	0.76	2.67	-0.03	0.08	41.19	232.52	0.00	-0.37	1046.37	35.27	1.52	403.15	4084.50	3077.97
6.87	2.74	19810.00	2.66	79.18	21.00	0.47	1.67	-0.03	0.05	41.22	405.48	0.21	-0.62	1699.90	35.76	1.52	411.48	4429.10	3331.71
6.87	2.74	19810.00	2.66	79.23	21.02	0.64	2.27	-0.03	0.06	41.27	283.34	0.00	-0.46	1238.58	35.43	1.52	412.59	4475.20	3365.58
6.87	2.74	19810.00	2.66	79.30	21.03	0.87	3.06	-0.03	0.09	41.13	196.73	0.00	-0.32	911.00	35.16	1.52	408.15	4291.02	3230.14

					SUMS							AVERAGE	SUMS						
4655.09	4606.96	6377.77	5565.32	300.24	9765.56	33567.61	4110.18	150212.80	-10362.43	64397.22	2779.72	6877.59	40366	-883	41249.41	81250	-883	44.70	-24.00
Inge - Ambient to Stack Temperature				Room Temp K	Energy Losses (kJ/kg of Dry Fuel)							Total Loss Rate							
Flue Gas Constituent					Flue Gas Constituent							Total Loss Rate	Total Loss	Chemical Loss 1	Sensible and Latent Loss	Total Output	Chem Loss 2	Grams Produced	
CO	N2	CH4	H2O		CO2	O2	CO	N2	CH4	H2O Comb	H2O Fuel MC							CO	HC
6713.19	6647.49	9470.15	8020.24	298.71	385.70	445.81	29.80	2721.43	-79.40	1803.98	78.85	5386.17	0	0	0.00	0	0	0.00	0.00
6863.81	6797.01	9710.63	8199.61	298.71	394.77	338.31	25.24	2357.32	-57.53	1807.67	79.12	4944.91	2293	-15	2308.15	6894	-15	1.13	-0.47
6880.55	6813.64	9737.43	8219.55	298.71	395.30	463.01	45.07	2809.91	-73.73	1810.24	79.15	5528.95	1831	-10	1841.03	4731	-10	1.44	-0.43
6981.79	6914.24	9905.99	8339.96	299.26	402.08	360.06	25.85	2455.26	-60.44	1812.87	79.34	5075.01	1793	-12	1805.36	5206	-12	0.88	-0.38
7015.31	6947.52	9959.89	8379.87	299.26	404.32	639.86	36.47	3472.23	-111.08	1820.14	79.40	6341.34	2101	-25	2125.15	4461	-25	1.17	-0.65
6998.55	6930.88	9932.93	8359.92	299.26	403.70	426.54	14.19	2699.33	-78.83	1815.70	79.37	5359.99	1775	-21	1796.72	4787	-21	0.45	-0.46
6965.77	6898.41	9886.41	8320.76	299.82	401.83	436.24	14.41	2729.00	-81.07	1814.60	79.31	5394.31	1549	-19	1567.58	4138	-19	0.40	-0.41
6263.49	6201.30	8770.38	7484.32	299.82	359.50	614.75	19.14	3260.41	-128.61	1791.03	78.04	5994.26	1324	-24	1347.71	3051	-24	0.41	-0.51
5780.36	5721.92	8017.59	6908.60	299.82	330.89	908.13	27.00	4244.63	-207.50	1779.94	77.16	7160.24	1423	-36	1458.70	2514	-36	0.52	-0.73
5663.96	5606.45	7838.06	6769.85	299.82	324.24	655.76	0.00	3312.79	-161.94	1769.94	76.95	5977.74	1188	-32	1219.97	2749	-32	0.00	-0.57
5547.64	5491.08	7659.37	6631.19	299.82	316.84	450.59	0.00	2550.16	-113.61	1759.66	76.74	5040.39	1113	-25	1137.95	3262	-25	0.00	-0.45
5381.62	5326.42	7405.58	6433.25	299.82	307.80	1403.49	40.83	5975.91	-346.26	1778.91	76.44	9237.12	1836	-60	1896.15	2101	-60	0.79	-1.23
5481.21	5425.19	7557.65	6551.99	299.82	313.13	564.82	0.00	2953.46	-144.13	1760.34	76.62	5524.25	1098	-28	1126.34	2839	-28	0.00	-0.51
5415.39	5359.97	7461.94	6473.41	300.37	309.90	842.83	0.00	3950.59	-217.68	1765.87	76.50	6728.02	1337	-43	1380.09	2600	-43	0.00	-0.77
5431.99	5376.43	7487.29	6493.20	300.37	310.43	631.88	0.00	3188.47	-162.70	1760.38	76.53	5804.99	1154	-32	1185.80	2783	-32	0.00	-0.58
5515.01	5458.78	7614.32	6592.18	300.37	316.07	948.45	0.00	4349.54	-240.54	1772.60	76.69	7222.81	1595	-53	1647.69	2780	-53	0.00	-0.95
5332.42	5277.68	7335.43	6374.48	300.37	305.29	1631.07	46.84	6792.75	-406.57	1783.60	76.35	10229.33	2033	-71	2104.07	1904	-71	0.90	-1.44
5431.99	5376.43	7487.29	6493.20	300.37	310.83	814.09	0.00	3849.08	-209.62	1765.65	76.53	6606.57	1313	-41	1354.36	2624	-41	0.00	-0.74
5515.01	5458.78	7614.32	6592.18	300.37	315.70	778.94	0.00	3735.04	-197.54	1767.75	76.69	6476.57	1001	-30	1031.44	2061	-30	0.00	-0.54
3862.78	3820.98	5155.88	4620.90	300.37	189.97	2239.07	1489.43	8714.40	-133.28	1691.92	73.70	14265.21	1575	148	1427.49	612	148	16.05	-0.26
3797.46	3756.32	5065.18	4542.82	300.93	214.31	596.33	0.00	2794.00	-219.67	1698.56	73.58	5157.10	569	-24	593.54	1618	-24	0.00	-0.43
3469.19	3431.17	4595.27	4150.78	300.93	195.36	615.35	0.00	2809.90	-248.15	1687.91	72.98	5133.35	340	-16	356.44	972	-16	0.00	-0.29
3125.25	3090.59	4109.31	3739.90	300.93	176.82	1197.97	0.00	4873.22	-536.31	1704.26	72.36	7488.31	661	-47	708.62	1088	-47	0.00	-0.85
3092.53	3058.20	4063.43	3700.81	300.93	174.25	873.82	0.00	3688.98	-395.34	1687.84	72.30	6101.84	674	-43	717.19	1514	-43	0.00	-0.78
3174.34	3139.19	4178.27	3798.55	300.93	171.98	1481.55	475.47	5896.82	-436.40	1695.68	72.45	9357.54	827	3	823.41	923	3	4.11	-0.69
3157.97	3122.99	4155.26	3779.00	300.93	177.01	409.23	0.00	2009.80	-181.31	1667.75	72.42	4154.90	275	-12	287.22	1037	-12	0.00	-0.21
2782.08	2750.85	3630.97	3329.79	300.93	155.74	517.23	0.00	2341.48	-260.15	1660.41	71.74	4486.46	297	-17	314.39	1015	-17	0.00	-0.31
3076.18	3042.00	4040.51	3681.26	300.93	160.54	2275.97	937.09	8756.86	-608.21	1709.83	72.27	13304.35	1175	28	1146.80	575	28	8.10	-0.96
2782.08	2750.85	3630.97	3329.79	300.93	154.29	1680.29	258.60	6566.41	-727.22	1709.85	71.74	9713.96	1073	-52	1124.27	1115	-52	2.80	-1.44
2961.74	2928.70	3880.58	3544.51	300.93	166.50	750.87	0.00	3220.66	-354.73	1677.99	72.06	5533.36	489	-31	519.97	1261	-31	0.00	-0.56
3076.18	3042.00	4040.51	3681.26	300.93	173.18	809.05	0.00	3450.77	-367.99	1684.23	72.27	5821.52	386	-24	409.94	927	-24	0.00	-0.44
2814.73	2783.17	3676.20	3368.81	300.93	152.66	2261.74	563.30	8678.36	-867.56	1726.12	71.80	12586.41	1112	-27	1138.84	638	-27	4.87	-1.37
3239.81	3204.02	4270.45	3876.77	300.93	182.65	848.86	0.00	3621.87	-366.57	1690.98	72.57	6050.35	534	-32	566.67	1215	-32	0.00	-0.58
2994.11	2960.71	3922.99	3583.25	300.37	168.23	715.69	0.00	3098.01	-334.47	1677.21	72.12	5396.78	477	-29	506.13	1273	-29	0.00	-0.53
3239.47	3203.64	4267.00	3876.42	300.37	182.56	1350.94	61.45	5445.86	-555.50	1711.18	72.57	8269.06	913	-54	967.37	1274	-54	0.66	-1.10
3272.21	3236.06	4313.16	3915.54	300.37	184.68	953.60	0.00	4008.13	-407.75	1696.76	72.63	6508.05	1006	-63	1068.75	2056	-63	0.00	-1.13
3141.28	3106.42	4128.93	3759.10	300.37	176.48	635.45	0.00	2829.94	-283.05	1677.91	72.39	5109.13	226	-12	238.09	649	-12	0.00	-0.22

Dirigo Laboratories, Inc.

Manufacturer: Pacific Energy
Model: True North 40
Date: 9/4/2015
Run: 1
Control #: 034-S-050-5
Test Duration: 360
Output Category: 2

	HHV Basis	LHV Basis
Overall Efficiency	65.3%	70.6%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	65.7%	71.0%

HHV Output Rate (kJ/h)	13,148	12,472	(Btu/h)
Burn Rate (kg/h)	1.02	2.24	(lb/h)
Input (kJ/h)	20,123	19,089	(Btu/h)

Test Load Weight (dry kg)	6.1	13.4	dry lb
MC wet (%)	2.66		
MC dry (%)	2.73		
Particulate (g)	3.62		
CO (g)	45		
Test Duration (h)	6		

Emissions	Particulate	CO
g/MJ Output	0.05	0.57
g/kg Dry Fuel	0.59	7.33
g/h	0.60	7.45
lb/MM Btu Output	0.11	1.32

Air/Fuel Ratio (A/F)	23.32
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Test Results in Accordance with CSA B415.1-10

Technician: _____

Default Fuel Values

	D. Fir	Oak
HHV (kJ/kg)	19,810	19,887
%C	48.73	50
%H	6.87	6.6
%O	43.9	42.9
%Ash	0.5	0.5

VERSION: 2.4

4/15/2010

Manufacturer: Pacific Energy

Model: True North 40

Date: 9/4/2015

Run: 2

Control #: 034-S-050-5

Test Duration: 360

Burn Category: 2

Appliance Type: Pellet (Cat, Non-Cat, Pellet)

Temp. Units: F (F or C)

Weight Units: lb (kg or lb)

Wood Moisture (% DRY): 2.73

Wood Moisture (% wet): 2.66

Load Weight (lb wet): 13.90

Burn Rate (dry kg/h): 1.02

Total Particulate Emissions: 7 g

Fuel Data

D. Fir

HHV: 19,810 kJ/kg

%C: 48.73

%H: 6.87

%O: 43.90

%Ash: 0.50

☒ Douglas Fir

☐ Oak

Elapsed Time (min)	Fuel Weight Remaining (lb)	Averages		Temp. (F)			Flue Gas Composition (%)		
		347.5	84.7	15.03	5.38	0.01	O2	CO2	CO
0	13.9	481.0	80.0	10.47	10.35	0.06			
10	13.1	485.0	81.0	13.41	7.36	0.01			
20	12.3	482.0	81.0	11.43	9.43	0.03			
30	11.6	486.0	82.0	11.01	9.92	0.05			
40	10.8	489.0	82.0	10.48	10.30	0.04			
50	10.0	487.0	83.0	10.69	10.02	0.04			
60	9.3	486.0	83.0	11.56	9.07	0.02			
70	8.8	433.0	83.0	16.18	4.18	0.01			
80	8.3	418.0	83.0	14.43	6.08	0.01			
90	7.8	419.0	84.0	14.39	6.06	0.01			
100	7.3	410.0	84.0	16.02	4.34	0.01			
110	6.9	405.0	84.0	15.22	5.20	0.00			
120	6.5	391.0	85.0	18.37	2.09	0.03			
130	6.0	405.0	85.0	16.09	4.28	0.01			
140	5.5	400.0	85.0	15.55	4.87	0.00			
150	5.0	407.0	85.0	15.26	5.19	0.00			
160	4.6	404.0	85.0	13.29	7.13	0.00			
170	4.1	408.0	85.0	14.80	5.45	0.01			
180	3.6	409.0	86.0	13.90	6.38	0.00			
190	3.4	288.0	86.0	17.53	2.74	0.00			
200	3.2	270.0	86.0	14.18	6.14	0.00			
210	3.0	273.0	86.0	16.97	3.16	0.00			
220	2.8	256.0	86.0	16.16	4.07	0.00			
230	2.6	248.0	86.0	18.36	1.90	0.01			
240	2.4	245.0	86.0	16.17	4.04	0.01			
250	2.2	246.0	86.0	17.68	2.59	0.00			
260	2.0	246.0	86.0	15.76	4.57	0.00			
270	1.8	265.0	86.0	13.79	6.53	0.00			
280	1.6	248.0	86.0	15.40	4.87	0.00			
290	1.4	244.0	86.0	16.11	4.17	0.00			
300	1.2	250.0	87.0	13.82	6.60	0.00			
310	1.0	246.0	86.0	16.74	3.44	0.00			
320	0.8	242.0	86.0	17.80	2.45	0.00			
330	0.6	253.0	86.0	15.32	5.00	0.00			
340	0.4	243.0	86.0	18.24	2.02	0.01			
350	0.2	245.0	86.0	15.53	4.74	0.00			
360	0.0	245.0	86.0	17.86	2.31	0.01			

Manufacturer: Pacific Energy
Model: True North 40
Date: 9/4/2015
Run: 2
Control #: 034-S-050-5
Test Duration: 360

Overall Heating Efficiency: 71.1%
Combustion Efficiency: 99.5%
Heat Transfer Efficiency: 71.5%

Air Fuel Ratio (A/F)	
Dry Molecular Weight (Md)	29.47
Dry Moles Exhaust Gas (Nr):	686.62
Air Fuel Ratio (A/F)	19.72

%HC
0.80

Combustion Efficiency: 99.5%
Total Input (kJ): 121,616
Total Output (kJ): 86,503
Efficiency: 71.1%
Total CO (g): 15.45

Heat Output: 13,676 Btu/h 14,417 kJ/h
Heat Input: 19,228 Btu/h 20,269 kJ/h
Burn Duration: 6 h
Burn Rate: 2.3 lb/h 1.0 kg/h
Stack Temp: 343.8 Deg. F 173.2 Deg. C

Ultimate CO2
CO2-ult 19.64
Fo
1.059

	min	LHV
Eff	71.1%	76.9%
Comb Eff	99.5%	99.5%
HT Eff	71.5%	77.3%
Output	14,417	kJ/h
Burn Rate	1.02	kg/h
Grams CO	15	g
Input	20,269	kJ/h
MC wet	2.66	

INPUT DATA				Oxygen Calculation				Input Data		Combust	Heat	Net	Air	Wet Wt	% Wet	Dry Wt.	% Dry	Fuel Properties					Mw
Elapsed	Weight	%	%	Excess	Total	Calc. %	Flue	Room		Eff	Transfer	Eff	Fuel	Now	Consumed	Now	Consumed	Total	Carbon	Hydrogen	Oxygen	Calorific	Moisture
Time	Remaining (kg)	CO [e]	CO2 [d]	Air EA	O2	O2 [g]	Gas (°C)	Temp (°C)	%	%	%	%	Ratio	Wt	x	Wtdn	y	Input	/12= [a]	/1= [b]	/16= [c]	Value	Fuel Burnt
0	6.31	0.06	10.35	88.7%	20.25	9.87	249.4	26.7	99.8%	77.0%	77.0%	76.9%	11.4	6.31	0.00	6.14	0.00	0	4.06	6.87	2.74	19810.00	2.66
10	5.94	0.01	7.36	166.5%	20.45	13.09	251.7	27.2	100.4%	71.6%	71.9%	76.9%	16.1	5.94	5.76	5.79	5.76	10499	4.06	6.87	2.74	19810.00	2.66
20	5.58	0.03	9.43	107.6%	20.32	10.87	250.0	27.2	100.1%	75.8%	75.8%	76.9%	12.6	5.58	11.51	5.43	11.51	6562	4.06	6.87	2.74	19810.00	2.66
30	5.26	0.05	9.92	97.0%	20.28	10.34	252.2	27.8	99.9%	76.3%	76.2%	76.9%	11.9	5.26	16.55	5.12	16.55	6562	4.06	6.87	2.74	19810.00	2.66
40	4.90	0.04	10.30	90.0%	20.26	9.94	253.9	27.8	100.0%	76.7%	76.7%	76.9%	11.5	4.90	22.30	4.77	22.30	6999	4.06	6.87	2.74	19810.00	2.66
50	4.54	0.04	10.02	95.3%	20.28	10.24	252.8	28.3	100.0%	76.5%	76.4%	76.9%	11.8	4.54	28.06	4.42	28.06	6562	4.06	6.87	2.74	19810.00	2.66
60	4.22	0.02	9.07	116.1%	20.34	11.26	252.2	28.3	100.2%	75.1%	75.2%	76.9%	13.1	4.22	33.09	4.11	33.09	5250	4.06	6.87	2.74	19810.00	2.66
70	3.99	0.01	4.18	368.8%	20.66	16.48	222.8	28.3	101.0%	62.3%	62.9%	76.9%	28.4	3.99	36.69	3.89	36.69	4375	4.06	6.87	2.74	19810.00	2.66
80	3.77	0.01	6.08	222.5%	20.54	14.45	214.4	28.3	100.6%	72.0%	72.4%	76.9%	19.5	3.77	40.29	3.67	40.29	4375	4.06	6.87	2.74	19810.00	2.66
90	3.54	0.01	6.06	223.6%	20.54	14.47	215.0	28.9	100.6%	71.9%	72.3%	76.9%	19.6	3.54	43.88	3.44	43.88	4375	4.06	6.87	2.74	19810.00	2.66
100	3.31	0.01	4.34	351.6%	20.65	16.31	210.0	28.9	100.9%	65.4%	66.0%	76.9%	27.3	3.31	47.48	3.22	47.48	3937	4.06	6.87	2.74	19810.00	2.66
110	3.13	0.00	5.20	277.8%	20.60	15.40	207.2	28.9	100.9%	69.8%	70.5%	76.9%	22.8	3.13	50.36	3.05	50.36	3500	4.06	6.87	2.74	19810.00	2.66
120	2.95	0.03	2.09	826.6%	20.80	18.70	199.4	29.4	101.4%	42.2%	42.8%	76.9%	56.3	2.95	53.24	2.87	53.24	3937	4.06	6.87	2.74	19810.00	2.66
130	2.72	0.01	4.28	357.9%	20.66	16.37	207.2	29.4	100.9%	65.5%	66.1%	76.9%	27.7	2.72	56.83	2.65	56.83	4375	4.06	6.87	2.74	19810.00	2.66
140	2.50	0.00	4.87	303.3%	20.62	15.75	204.4	29.4	101.0%	68.9%	69.6%	76.9%	24.4	2.50	60.43	2.43	60.43	4375	4.06	6.87	2.74	19810.00	2.66
150	2.27	0.00	5.19	278.5%	20.60	15.41	208.3	29.4	100.9%	69.7%	70.3%	76.9%	22.9	2.27	64.03	2.21	64.03	3937	4.06	6.87	2.74	19810.00	2.66
160	2.09	0.00	7.13	175.5%	20.47	13.34	206.7	29.4	100.6%	75.5%	75.9%	76.9%	16.7	2.09	66.91	2.03	66.91	3937	4.06	6.87	2.74	19810.00	2.66
170	1.86	0.01	5.45	259.8%	20.58	15.12	208.9	29.4	100.7%	70.6%	71.1%	76.9%	21.8	1.86	70.50	1.81	70.50	4375	4.06	6.87	2.74	19810.00	2.66
180	1.63	0.00	6.38	207.9%	20.52	14.14	209.4	30.0	100.7%	73.5%	74.0%	76.9%	18.6	1.63	74.10	1.59	74.10	3062	4.06	6.87	2.74	19810.00	2.66
190	1.54	0.00	2.74	616.9%	20.76	18.02	142.2	30.0	102.0%	66.7%	68.0%	76.9%	43.5	1.54	75.54	1.50	75.54	1750	4.06	6.87	2.74	19810.00	2.66
200	1.45	0.00	6.14	219.9%	20.53	14.39	132.2	30.0	100.7%	81.2%	81.8%	76.9%	19.3	1.45	76.98	1.41	76.98	1750	4.06	6.87	2.74	19810.00	2.66
210	1.36	0.00	3.16	521.6%	20.73	17.57	133.9	30.0	101.7%	71.6%	72.8%	76.9%	37.7	1.36	78.42	1.32	78.42	1750	4.06	6.87	2.74	19810.00	2.66
220	1.27	0.00	4.07	382.6%	20.67	16.60	124.4	30.0	101.2%	77.4%	78.3%	76.9%	29.2	1.27	79.86	1.24	79.86	1750	4.06	6.87	2.74	19810.00	2.66
230	1.18	0.01	1.90	928.4%	20.81	18.91	120.0	30.0	102.5%	63.3%	64.9%	76.9%	62.7	1.18	81.29	1.15	81.29	1750	4.06	6.87	2.74	19810.00	2.66
240	1.09	0.01	4.04	385.0%	20.67	16.63	118.3	30.0	101.0%	78.2%	79.0%	76.9%	29.3	1.09	82.73	1.06	82.73	1750	4.06	6.87	2.74	19810.00	2.66
250	1.00	0.00	2.59	658.4%	20.77	18.18	118.9	30.0	102.1%	70.9%	72.4%	76.9%	46.1	1.00	84.17	0.97	84.17	1750	4.06	6.87	2.74	19810.00	2.66
260	0.91	0.00	4.57	329.8%	20.64	16.07	118.9	30.0	101.0%	79.7%	80.5%	76.9%	26.0	0.91	85.61	0.88	85.61	1750	4.06	6.87	2.74	19810.00	2.66
270	0.82	0.00	6.53	200.8%	20.51	13.98	129.4	30.0	100.6%	82.1%	82.6%	76.9%	18.2	0.82	87.05	0.79	87.05	1750	4.06	6.87	2.74	19810.00	2.66
280	0.73	0.00	4.87	303.3%	20.62	15.75	120.0	30.0	101.0%	80.2%	81.0%	76.9%	24.4	0.73	88.49	0.71	88.49	1750	4.06	6.87	2.74	19810.00	2.66
290	0.64	0.00	4.17	371.1%	20.66	16.49	117.8	30.0	101.2%	78.7%	79.7%	76.9%	28.5	0.64	89.93	0.62	89.93	1750	4.06	6.87	2.74	19810.00	2.66
300	0.54	0.00	6.60	197.6%	20.50	13.90	121.1	30.6	100.6%	83.1%	83.6%	76.9%	18.0	0.54	91.37	0.53	91.37	1750	4.06	6.87	2.74	19810.00	2.66
310	0.45	0.00	3.44	471.0%	20.71	17.27	118.9	30.0	101.5%	75.9%	77.0%	76.9%	34.6	0.45	92.81	0.44	92.81	1750	4.06	6.87	2.74	19810.00	2.66
320	0.36	0.00	2.45	701.8%	20.78	18.33	116.7	30.0	102.2%	70.3%	71.9%	76.9%	48.7	0.36	94.24	0.35	94.24	1750	4.06	6.87	2.74	19810.00	2.66
330	0.27	0.00	5.00	292.9%	20.61	15.61	122.8	30.0	100.9%	80.2%	80.9%	76.9%	23.8	0.27	95.68	0.26	95.68	1750	4.06	6.87	2.74	19810.00	2.66
340	0.18	0.01	2.02	867.6%	20.81	18.78	117.2	30.0	102.3%	65.8%	67.3%	76.9%	58.9	0.18	97.12	0.18	97.12	1750	4.06	6.87	2.74	19810.00	2.66
350	0.09	0.00	4.74	314.4%	20.63	15.89	118.3	30.0	101.0%	80.2%	81.0%	76.9%	25.1	0.09	98.56	0.09	98.56	2625	4.06	6.87	2.74	19810.00	2.66
360	0.00	0.01	2.31	746.7%	20.79	18.47	118.3	30.0	102.0%	68.6%	70.0%	76.9%	51.5	0.00	100.00	0.00	100.00	875	4.06	6.87	2.74	19810.00	2.66

Moisture Content MCwb: 2.66

115,347 (Btu) Moisture of Wood (wet basis): 2.66 Dry kg : 6.14
82,044 (Btu) Initial Dry Weight Wtdo (kg): 6.14 CA: 48.73
Moisture Content Dry 2.73 HY: 6.87
OX: 43.90

Load Weight (kg): 6.31
Fuel Heating: HHV LHV
Value in kJ/kg - CV: 19810.00 18328.69 Btu/lb 8522.48 7885.21

																					SUM			
79.41	21.06	1.32	4.59	-0.02	0.13	40.98	155.65	0.08	-0.24	755.43	35.00	1.52	448.44	5943.57	4416.10	4280.36	4235.85	5846.12	5117.69	302.44	8999.21	21744.75	811.90	105084.95
Mass Balance (moles/100 mole dry flue gas)					kg Wood per 100 mole dfp	Moles per kg of Dry Wood						Moisture Present	Stack Temp K	Heat Content Change - Ambient to Stack Temperature Flue Gas Constituent					Room Temp K	Energy Losses (kJ Flue Gas Co				
[h]	[u]	[w]	[j]	[k]		CO2	O2	CO	HC	N2	H2O			CO2	O2	CO	N2	CH4		H2O	CO2	O2	CO	N2
79.72	21.15	2.56	8.81	-0.01	0.25	40.61	38.73	0.24	-0.03	312.75	34.58	1.52	522.59	9237.47	6790.90	6564.09	6499.65	9244.95	7842.42	299.82	375.09	263.03	68.14	2032.74
79.54	21.10	1.81	6.26	-0.02	0.18	40.87	72.67	0.06	-0.11	441.65	34.74	1.52	524.82	9315.62	6844.51	6614.95	6550.21	9331.57	7902.87	300.37	380.69	497.40	16.08	2892.88
79.67	21.13	2.33	8.02	-0.01	0.23	40.74	46.96	0.13	-0.06	344.19	34.64	1.52	523.15	9241.06	6792.02	6564.78	6500.41	9251.88	7843.12	300.37	376.48	318.97	37.53	2237.37
79.69	21.14	2.45	8.44	-0.01	0.24	40.65	42.35	0.20	-0.04	326.53	34.60	1.52	525.37	9319.24	6845.63	6615.64	6550.98	9338.55	7903.58	300.93	378.79	289.93	59.33	2139.10
79.72	21.15	2.54	8.76	-0.01	0.25	40.69	39.26	0.16	-0.04	314.98	34.60	1.52	527.04	9393.90	6898.16	6665.82	6600.79	9418.45	7963.34	300.93	382.28	270.83	45.78	2079.11
79.70	21.14	2.47	8.52	-0.01	0.25	40.69	41.57	0.16	-0.04	323.69	34.61	1.52	525.93	9322.85	6846.76	6616.34	6551.75	9345.53	7904.29	301.48	379.38	284.62	47.05	2120.76
79.65	21.13	2.23	7.71	-0.02	0.22	40.79	50.64	0.09	-0.07	358.21	34.66	1.52	525.37	9297.97	6829.25	6599.62	6535.15	9318.92	7884.37	301.48	379.27	345.83	26.05	2340.98
79.33	21.04	1.03	3.57	-0.03	0.10	40.96	161.47	0.10	-0.25	777.37	35.01	1.52	495.93	7992.15	5905.35	5715.65	5657.94	7933.04	6831.15	301.48	327.36	953.55	28.29	4398.33
79.46	21.08	1.49	5.18	-0.02	0.15	40.89	97.20	0.07	-0.15	534.40	34.82	1.52	487.59	7627.14	5645.28	5466.35	5410.65	7549.63	6533.97	301.48	311.89	548.75	19.40	2891.44
79.46	21.08	1.49	5.16	-0.02	0.15	40.89	97.67	0.07	-0.15	536.16	34.82	1.52	488.15	7630.13	5646.21	5466.93	5411.29	7555.42	6534.55	302.04	312.01	551.47	19.46	2901.31
79.34	21.05	1.07	3.71	-0.02	0.11	40.95	153.88	0.09	-0.23	748.67	34.99	1.52	483.15	7412.02	5490.45	5317.52	5263.10	7327.08	6356.42	302.04	303.54	844.86	27.20	3940.31
79.40	21.06	1.27	4.43	-0.02	0.13	41.01	121.42	0.00	-0.20	626.18	34.91	1.52	480.37	7291.15	5404.01	5234.57	5180.85	7200.83	6257.52	302.04	298.99	656.15	0.00	3244.16
79.18	21.00	0.52	1.82	-0.03	0.05	40.73	364.32	0.58	-0.50	1543.11	35.52	1.52	472.59	6932.64	5145.96	4986.53	4934.94	6829.97	5961.61	302.59	282.36	1874.76	168.36	7615.16
79.34	21.04	1.05	3.66	-0.02	0.10	40.95	156.66	0.10	-0.24	759.18	35.00	1.52	480.37	7269.87	5387.62	5218.54	5165.01	7181.17	6238.30	302.59	297.74	844.02	27.58	3921.17
79.38	21.06	1.19	4.15	-0.03	0.12	41.03	132.67	0.00	-0.21	668.73	34.95	1.52	477.59	7149.23	5301.25	5135.64	5082.80	7055.35	6139.44	302.59	293.30	703.31	0.00	3399.00
79.40	21.06	1.27	4.42	-0.02	0.13	41.01	121.74	0.00	-0.20	627.39	34.91	1.52	481.48	7318.19	5422.18	5251.72	5197.91	7231.62	6277.86	302.59	300.11	660.09	0.00	3261.13
79.53	21.10	1.75	6.06	-0.02	0.17	40.94	76.58	0.00	-0.12	456.61	34.77	1.52	479.82	7245.72	5370.34	5201.96	5148.57	7155.97	6218.53	302.59	296.61	411.29	0.00	2350.90
79.42	21.07	1.34	4.64	-0.02	0.13	40.91	113.53	0.08	-0.17	596.11	34.87	1.52	482.04	7342.36	5439.47	5268.30	5214.36	7256.86	6297.64	302.59	300.37	617.53	21.64	3108.35
79.48	21.08	1.57	5.42	-0.02	0.16	40.96	90.77	0.00	-0.15	510.26	34.81	1.52	482.59	7345.25	5440.37	5268.86	5214.98	7262.45	6298.21	303.15	300.85	493.81	0.00	2660.97
79.24	21.02	0.67	2.35	-0.03	0.07	41.25	271.26	0.00	-0.44	1192.92	35.40	1.52	415.37	4484.24	3368.39	3273.96	3237.99	4330.61	3917.32	303.15	184.97	913.73	0.00	3862.66
79.47	21.08	1.51	5.22	-0.02	0.15	40.97	96.04	0.00	-0.15	530.20	34.83	1.52	405.37	4069.83	3063.64	2979.35	2946.29	3916.09	3565.34	303.15	166.73	294.24	0.00	1562.14
79.27	21.03	0.77	2.71	-0.03	0.08	41.18	228.99	0.00	-0.37	1033.02	35.26	1.52	407.04	4138.70	3114.37	3028.42	2994.87	3984.79	3623.96	303.15	170.43	713.15	0.00	3093.76
79.33	21.04	1.00	3.47	-0.03	0.10	41.08	167.57	0.00	-0.27	800.73	35.06	1.52	397.59	3749.52	2827.23	2750.61	2719.84	3597.56	3291.97	303.15	154.04	473.76	0.00	2177.87
79.18	21.00	0.46	1.65	-0.03	0.05	41.22	410.26	0.22	-0.63	1717.97	35.78	1.52	393.15	3567.27	2692.38	2620.05	2590.61	3417.07	3135.91	303.15	147.06	1104.58	61.97	4450.60
79.32	21.04	0.99	3.46	-0.03	0.10	40.97	168.61	0.10	-0.26	804.37	35.04	1.52	391.48	3499.08	2641.86	2571.12	2542.18	3349.66	3077.42	303.15	143.35	445.45	28.96	2044.84
79.23	21.02	0.63	2.22	-0.03	0.06	41.28	289.73	0.00	-0.47	1262.76	35.45	1.52	392.04	3521.80	2658.70	2587.42	2558.32	3372.11	3096.91	303.15	145.37	770.31	0.00	3230.53
79.36	21.05	1.12	3.90	-0.03	0.11	41.04	144.31	0.00	-0.23	712.77	34.99	1.52	392.04	3521.80	2658.70	2587.42	2558.32	3372.11	3096.91	303.15	144.55	383.69	0.00	1823.50
79.49	21.09	1.60	5.55	-0.02	0.16	40.95	87.67	0.00	-0.14	498.54	34.80	1.52	402.59	3955.23	2979.14	2897.62	2865.37	3801.94	3467.66	303.15	161.98	261.18	0.00	1428.49
79.38	21.06	1.19	4.15	-0.03	0.12	41.03	132.67	0.00	-0.21	668.73	34.95	1.52	393.15	3567.27	2692.38	2620.05	2590.61	3417.07	3135.91	303.15	146.35	357.19	0.00	1732.41
79.34	21.04	1.02	3.56	-0.03	0.10	41.07	162.47	0.00	-0.26	781.44	35.05	1.52	390.93	3476.36	2625.03	2554.81	2526.04	3327.23	3057.93	303.15	142.79	426.49	0.00	1973.95
79.50	21.09	1.62	5.61	-0.02	0.16	40.95	86.27	0.00	-0.14	493.25	34.80	1.52	394.26	3591.48	2709.68	2636.64	2607.07	3442.38	3155.70	303.71	147.08	233.77	0.00	1285.93
79.29	21.03	0.84	2.94	-0.03	0.08	41.14	206.60	0.00	-0.33	948.33	35.19	1.52	392.04	3521.80	2658.70	2587.42	2558.32	3372.11	3096.91	303.15	144.90	549.27	0.00	2426.13
79.22	21.01	0.60	2.11	-0.03	0.06	41.31	309.03	0.00	-0.50	1335.76	35.52	1.52	389.82	3430.96	2591.36	2522.20	2493.76	3282.42	3018.94	303.15	141.73	800.82	0.00	3331.08
79.39	21.06	1.23	4.26	-0.03	0.12	41.02	128.06	0.00	-0.21	651.29	34.93	1.52	395.93	3681.11	2776.64	2701.63	2671.36	3529.75	3233.43	303.15	150.99	355.57	0.00	1739.84
79.19	21.01	0.49	1.75	-0.03	0.05	41.19	383.01	0.20	-0.59	1614.94	35.70	1.52	390.37	3453.66	2608.19	2538.50	2509.90	3304.82	3038.43	303.15	142.27	998.96	58.23	4053.35
79.37	21.05	1.16	4.04	-0.03	0.12	41.03	137.53	0.00	-0.22	687.12	34.97	1.52	391.48	3499.08	2641.86	2571.12	2542.18	3349.66	3077.42	303.15	143.58	363.34	0.00	1746.79
79.21	21.01	0.56	2.00	-0.03	0.06	41.14	328.95	0.18	-0.50	1410.58	35.53	1.52	391.48	3499.08	2641.86	2571.12	2542.18	3349.66	3077.42	303.15	143.94	869.05	50.85	3585.94

AS			AVERAGE	SUMS						
-7925.03	63555.15	2754.60	5270.96	33620	-884	34504.54	88871	-884	15.45	-18.70
/kg of Dry Fuel)			Total							
Instituent			Loss	Total	Chemical	Sensible and	Total	Chem	Grams Produced	
CH4	H2O Comb	H2O Fuel MC	Rate	Loss	Loss 1	Latent Loss	Output	Loss 2	CO	HC
-25.19	1791.57	78.58	4583.96	0	0	0.00	0	0	0.00	0.00
-97.89	1802.04	78.67	5569.88	2952	-43	2995.03	7547	-43	0.82	-0.92
-50.96	1794.56	78.58	4792.52	1588	-5	1592.07	4975	-5	1.20	-0.30
-34.43	1794.75	78.67	4706.15	1559	8	1550.98	5003	8	1.90	-0.20
-36.10	1797.01	78.76	4617.67	1632	3	1628.38	5368	3	1.56	-0.23
-38.86	1795.28	78.68	4666.90	1546	2	1543.41	5016	2	1.51	-0.23
-61.49	1797.20	78.64	4906.48	1300	-9	1309.59	3949	-9	0.67	-0.29
-220.48	1778.70	77.05	7342.78	1622	-42	1663.65	2753	-42	0.61	-0.87
-131.59	1758.30	76.60	5474.78	1209	-25	1233.62	3166	-25	0.42	-0.52
-132.23	1758.39	76.60	5487.01	1212	-25	1236.44	3163	-25	0.42	-0.52
-209.85	1760.90	76.33	6743.29	1340	-36	1376.28	2597	-36	0.53	-0.74
-175.30	1753.57	76.18	5853.76	1034	-31	1064.88	2466	-31	0.00	-0.55
-449.32	1773.76	75.73	11340.81	2254	-56	2309.71	1683	-56	3.25	-1.59
-213.65	1757.20	76.15	6710.19	1482	-41	1522.65	2893	-41	0.59	-0.84
-191.51	1751.27	76.00	6031.37	1332	-42	1373.87	3043	-42	0.00	-0.75
-175.76	1754.34	76.21	5876.11	1168	-35	1202.52	2769	-35	0.00	-0.62
-110.56	1744.97	76.12	4769.32	948	-22	969.69	2989	-22	0.00	-0.39
-154.09	1752.60	76.24	5722.63	1264	-29	1292.80	3111	-29	0.46	-0.61
-131.05	1750.04	76.24	5150.85	796	-20	816.32	2266	-20	0.00	-0.36
-390.38	1694.96	72.63	6338.56	560	-34	594.22	1190	-34	0.00	-0.62
-138.15	1655.70	72.09	3612.75	319	-12	331.27	1431	-12	0.00	-0.22
-329.41	1678.10	72.18	5398.22	477	-29	505.81	1273	-29	0.00	-0.52
-240.96	1657.06	71.68	4293.44	379	-21	400.45	1371	-21	0.00	-0.38
-561.55	1685.39	71.44	6959.49	615	-44	658.74	1135	-44	0.54	-0.89
-229.18	1648.30	71.35	4153.07	367	-18	384.48	1383	-18	0.25	-0.36
-416.51	1668.72	71.38	5469.81	483	-37	519.81	1267	-37	0.00	-0.66
-207.46	1646.69	71.38	3862.35	341	-18	359.43	1409	-18	0.00	-0.33
-126.09	1651.02	71.95	3448.52	305	-11	315.71	1445	-11	0.00	-0.20
-190.73	1646.29	71.44	3762.96	332	-17	349.17	1417	-17	0.00	-0.30
-233.55	1648.08	71.32	4029.07	356	-21	376.45	1394	-21	0.00	-0.37
-124.03	1639.95	71.47	3254.17	287	-11	298.36	1462	-11	0.00	-0.20
-296.99	1656.13	71.38	4550.82	402	-26	428.12	1348	-26	0.00	-0.47
-444.21	1668.87	71.27	5569.55	492	-39	531.07	1258	-39	0.00	-0.70
-184.13	1649.00	71.59	3782.87	334	-16	350.35	1416	-16	0.00	-0.29
-524.00	1677.96	71.30	6478.07	572	-41	613.24	1178	-41	0.50	-0.83
-197.71	1644.99	71.35	3772.34	500	-26	525.93	2125	-26	0.00	-0.47
-449.69	1671.52	71.35	5942.98	262	-18	280.04	612	-18	0.22	-0.36

Dirigo Laboratories, Inc.

Manufacturer: Pacific Energy
Model: True North 40
Date: 9/4/2015
Run: 2
Control #: 034-S-050-5
Test Duration: 360
Output Category: 2

	HHV Basis	LHV Basis
Overall Efficiency	71.1%	76.9%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	71.5%	77.3%

HHV Output Rate (kJ/h)	14,417	13,676	(Btu/h)
Burn Rate (kg/h)	1.02	2.26	(lb/h)
Input (kJ/h)	20,269	19,228	(Btu/h)

Test Load Weight (dry kg)	6.1	13.5	dry lb
MC wet (%)	2.66		
MC dry (%)	2.73		
Particulate (g)	7.00		
CO (g)	15		
Test Duration (h)	6		

Emissions	Particulate	CO
g/MJ Output	0.08	0.18
g/kg Dry Fuel	1.14	2.52
g/h	1.17	2.57
lb/MM Btu Output	0.19	0.42

Air/Fuel Ratio (A/F)	19.72
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Test Results in Accordance with CSA B415.1-10

Technician: _____

Default Fuel Values

	D. Fir	Oak
HHV (kJ/kg)	19,810	19,887
%C	48.73	50
%H	6.87	6.6
%O	43.9	42.9
%Ash	0.5	0.5

VERSION: 2.4

4/15/2010

Manufacturer: Pacific Energy

Model: True North 40

Date: 9/4/2015

Run: 3

Control #: 034-S-050-5

Test Duration: 360

Burn Category 2

Wood Moisture (% DRY): 2.73

Wood Moisture (% wet): 2.66

Load Weight (lb wet): 13.50

Burn Rate (dry kg/h): 0.99

Total Particulate Emissions: 9.22 g

Appliance Type: Pellet (Cat, Non-Cat, Pellet)

Temp. Units: F (F or C)

Weight Units: lb (kg or lb)

Fuel Data

D. Fir

HHV 19,810 kJ/kg

%C 48.73

%H 6.87

%O 43.90

%Ash 0.50

☒ Douglas Fir

☐ Oak

Averages

334.6

85.0

15.01

5.37

0.01

Temp. (F)

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas	Room Temp	Flue Gas Composition (%)		
				O2	CO2	CO
0	13.5	464.0	81.0	11.90	8.60	0.01
10	12.7	464.0	82.0	13.16	7.50	0.01
20	12.0	462.0	82.0	11.67	9.14	0.02
30	11.2	463.0	83.0	11.51	9.30	0.02
40	10.5	465.0	83.0	10.06	10.71	0.06
50	9.7	467.0	83.0	10.12	10.53	0.12
60	8.9	468.0	83.0	10.68	9.92	0.09
70	8.4	436.0	84.0	12.58	7.95	0.01
80	8.0	402.0	84.0	17.02	3.34	0.01
90	7.5	403.0	84.0	13.49	6.99	0.01
100	7.0	397.0	84.0	15.64	4.82	0.00
110	6.6	394.0	84.0	16.14	4.22	0.00
120	6.1	392.0	85.0	12.73	7.75	0.01
130	5.6	394.0	84.0	15.77	4.61	0.00
140	5.2	388.0	85.0	14.14	6.31	0.00
150	4.7	390.0	85.0	14.59	5.80	0.00
160	4.3	389.0	85.0	14.13	6.26	0.00
170	3.8	393.0	85.0	14.24	6.16	0.00
180	3.3	393.0	86.0	16.03	4.31	0.00
190	3.1	282.0	86.0	12.88	7.60	0.00
200	2.9	258.0	86.0	16.46	3.83	0.00
210	2.7	247.0	86.0	15.34	5.03	0.00
220	2.5	250.0	86.0	15.67	4.60	0.00
230	2.3	246.0	86.0	17.40	2.80	0.00
240	2.1	252.0	86.0	16.05	4.16	0.00
250	1.9	245.0	87.0	17.43	2.76	0.00
260	1.7	241.0	86.0	17.58	2.64	0.01
270	1.5	238.0	87.0	18.52	1.67	0.02
280	1.5	193.0	86.0	19.72	0.56	0.06
290	1.4	238.0	86.0	14.79	5.48	0.00
300	1.1	246.0	87.0	17.35	2.80	0.00
310	0.9	229.0	87.0	17.51	2.70	0.00
320	0.7	238.0	86.0	15.70	4.47	0.00
330	0.5	237.0	86.0	17.44	2.72	0.00
340	0.3	237.0	86.0	15.09	5.18	0.00
350	0.1	238.0	86.0	17.26	2.86	0.00
360	0.0	240.0	86.0	17.65	2.58	0.00

Manufacturer: Pacific Energy
Model: True North 40
Date: 9/4/2015
Run: 3
Control #: 034-S-050-5
Test Duration: 360

Overall Heating Efficiency: 73.2%
Combustion Efficiency: 99.5%
Heat Transfer Efficiency: 73.6%

Air Fuel Ratio (A/F)	
Dry Molecular Weight (Md)	29.47
Dry Moles Exhaust Gas (Nr):	687.52
Air Fuel Ratio (A/F)	19.75

%HC
0.80

Combustion Efficiency: 99.5%
Total Input (kJ): 118,116
Total Output (kJ): 86,488
Efficiency: 73.2%
Total CO (g): 17.21

	min	
	HHV	LHV
Eff	73.2%	79.1%
Comb Eff	99.5%	99.5%
HT Eff	73.6%	79.5%
Output	14,415	kJ/h
Burn Rate	0.99	kg/h
Grams CO	17	g
Input	19,686	kJ/h
MC wet	2.66	

Ultimate CO2
CO2-ult 19.64
Fo
1.059

Heat Output: 13,674 Btu/h 14,415 kJ/h
Heat Input: 18,674 Btu/h 19,686 kJ/h
Burn Duration: 6 h
Burn Rate: 2.2 lb/h 1.0 kg/h
Stack Temp: 331.0 Deg. F 166.1 Deg. C

	Averages		0.01	5.37	419.1%	20.58	15.21	168.1	29.4	101.0%	73.0%	73.7%	31.6	2.16	64.72	0.08	64.72	118554	4.06	6.87	2.74	19810.00	2.66
INPUT DATA				Oxygen Calculation			Input Data		Combust Eff %	Heat Transfer %	Net Eff %	Air Fuel Ratio	Wet Wt Now Wt	% Wet Consumed x	Dry Wt. Now Wtdn	% Dry Consumed y	Fuel Properties			Oxygen /16= [c]	Calorific Value	Mw Moisture Fuel Burnt	
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO2 [d]	Excess Air EA	Total O2	Calc. % O2 [g]	Flue Gas (°C)	Room Temp (°C)									Total Input	Carbon /12= [a]	Hydrogen /1= [b]				
0	6.13	0.01	8.60	128.1%	20.37	11.77	240.0	27.2	100.3%	75.2%	75.4%	13.8	6.13	0.00	5.96	0.00	0	4.06	6.87	2.74	19810.00	2.66	
10	5.76	0.01	7.50	161.6%	20.44	12.94	240.0	27.8	100.4%	73.1%	73.3%	15.8	5.76	5.93	5.61	5.93	10062	4.06	6.87	2.74	19810.00	2.66	
20	5.44	0.02	9.14	114.4%	20.34	11.19	238.9	27.8	100.2%	76.2%	76.3%	13.0	5.44	11.11	5.30	11.11	6562	4.06	6.87	2.74	19810.00	2.66	
30	5.08	0.02	9.30	110.8%	20.32	11.01	239.4	28.3	100.2%	76.4%	76.6%	12.7	5.08	17.04	4.95	17.04	6562	4.06	6.87	2.74	19810.00	2.66	
40	4.76	0.06	10.71	82.4%	20.23	9.49	240.6	28.3	99.8%	78.2%	78.0%	11.0	4.76	22.22	4.64	22.22	6562	4.06	6.87	2.74	19810.00	2.66	
50	4.40	0.12	10.53	84.4%	20.24	9.65	241.7	28.3	99.3%	77.9%	77.3%	11.1	4.40	28.15	4.28	28.15	6999	4.06	6.87	2.74	19810.00	2.66	
60	4.04	0.09	9.92	96.2%	20.28	10.31	242.2	28.3	99.5%	77.1%	76.7%	11.9	4.04	34.07	3.93	34.07	5687	4.06	6.87	2.74	19810.00	2.66	
70	3.81	0.01	7.95	146.8%	20.41	12.46	224.4	28.9	100.4%	75.5%	75.7%	14.9	3.81	37.78	3.71	37.78	3937	4.06	6.87	2.74	19810.00	2.66	
80	3.63	0.01	3.34	486.4%	20.72	17.37	205.6	28.9	101.3%	58.8%	59.5%	35.5	3.63	40.74	3.53	40.74	3937	4.06	6.87	2.74	19810.00	2.66	
90	3.40	0.01	6.99	180.6%	20.48	13.48	206.1	28.9	100.4%	75.2%	75.5%	17.0	3.40	44.44	3.31	44.44	4375	4.06	6.87	2.74	19810.00	2.66	
100	3.18	0.00	4.82	307.5%	20.62	15.80	202.8	28.9	101.0%	68.8%	69.5%	24.7	3.18	48.15	3.09	48.15	3937	4.06	6.87	2.74	19810.00	2.66	
110	2.99	0.00	4.22	365.5%	20.66	16.44	201.1	28.9	101.2%	66.0%	66.8%	28.2	2.99	51.11	2.91	51.11	3937	4.06	6.87	2.74	19810.00	2.66	
120	2.77	0.01	7.75	153.1%	20.43	12.67	200.0	29.4	100.4%	77.3%	77.6%	15.3	2.77	54.81	2.69	54.81	4375	4.06	6.87	2.74	19810.00	2.66	
130	2.54	0.00	4.61	326.1%	20.64	16.03	201.1	28.9	101.0%	68.1%	68.8%	25.8	2.54	58.52	2.47	58.52	3937	4.06	6.87	2.74	19810.00	2.66	
140	2.36	0.00	6.31	211.3%	20.52	14.21	197.8	29.4	100.7%	74.5%	75.0%	18.8	2.36	61.48	2.30	61.48	3937	4.06	6.87	2.74	19810.00	2.66	
150	2.13	0.00	5.80	238.7%	20.56	14.76	198.9	29.4	100.8%	73.0%	73.5%	20.5	2.13	65.19	2.08	65.19	3937	4.06	6.87	2.74	19810.00	2.66	
160	1.95	0.00	6.26	213.8%	20.53	14.27	198.3	29.4	100.7%	74.3%	74.8%	19.0	1.95	68.15	1.90	68.15	3937	4.06	6.87	2.74	19810.00	2.66	
170	1.72	0.00	6.16	218.9%	20.53	14.37	200.6	29.4	100.7%	73.8%	74.3%	19.3	1.72	71.85	1.68	71.85	4375	4.06	6.87	2.74	19810.00	2.66	
180	1.50	0.00	4.31	355.8%	20.66	16.35	200.6	30.0	101.1%	66.8%	67.5%	27.6	1.50	75.56	1.46	75.56	3062	4.06	6.87	2.74	19810.00	2.66	
190	1.41	0.00	7.60	158.5%	20.44	12.84	138.9	30.0	100.5%	82.5%	82.9%	15.6	1.41	77.04	1.37	77.04	1750	4.06	6.87	2.74	19810.00	2.66	
200	1.32	0.00	3.83	412.9%	20.69	16.86	125.6	30.0	101.3%	76.3%	77.3%	31.1	1.32	78.52	1.28	78.52	1750	4.06	6.87	2.74	19810.00	2.66	
210	1.23	0.00	5.03	290.5%	20.61	15.58	119.4	30.0	100.9%	80.7%	81.4%	23.6	1.23	80.00	1.19	80.00	1750	4.06	6.87	2.74	19810.00	2.66	
220	1.13	0.00	4.60	327.0%	20.64	16.04	121.1	30.0	101.0%	79.4%	80.3%	25.8	1.13	81.48	1.10	81.48	1750	4.06	6.87	2.74	19810.00	2.66	
230	1.04	0.00	2.80	601.5%	20.76	17.96	118.9	30.0	101.9%	72.4%	73.8%	42.6	1.04	82.96	1.02	82.96	1750	4.06	6.87	2.74	19810.00	2.66	
240	0.95	0.00	4.16	372.2%	20.67	16.51	122.2	30.0	101.2%	78.0%	78.9%	28.6	0.95	84.44	0.93	84.44	1750	4.06	6.87	2.74	19810.00	2.66	
250	0.86	0.00	2.76	611.7%	20.76	18.00	118.3	30.6	101.9%	72.4%	73.8%	43.2	0.86	85.93	0.84	85.93	1750	4.06	6.87	2.74	19810.00	2.66	
260	0.77	0.01	2.64	641.2%	20.77	18.12	116.1	30.0	101.7%	71.9%	73.2%	45.0	0.77	87.41	0.75	87.41	1750	4.06	6.87	2.74	19810.00	2.66	
270	0.68	0.02	1.67	1062.3%	20.83	19.15	114.4	30.6	102.4%	61.7%	63.2%	70.9	0.68	88.89	0.66	88.89	875	4.06	6.87	2.74	19810.00	2.66	
280	0.68	0.06	0.56	3068.2%	20.90	20.31	89.4	30.0	101.5%	32.4%	32.9%	197.5	0.68	88.89	0.66	88.89	437	4.06	6.87	2.74	19810.00	2.66	
290	0.64	0.00	5.48	258.4%	20.58	15.10	114.4	30.0	100.8%	82.1%	82.8%	21.7	0.64	89.63	0.62	89.63	1750	4.06	6.87	2.74	19810.00	2.66	
300	0.50	0.00	2.80	601.5%	20.76	17.96	118.9	30.6	101.9%	72.5%	73.9%	42.6	0.50	91.85	0.49	91.85	2187	4.06	6.87	2.74	19810.00	2.66	
310	0.41	0.00	2.70	627.5%	20.76	18.06	109.4	30.6	102.0%	74.0%	75.5%	44.2	0.41	93.33	0.40	93.33	1750	4.06	6.87	2.74	19810.00	2.66	
320	0.32	0.00	4.47	339.4%	20.64	16.17	114.4	30.0	101.1%	80.0%	80.9%	26.6	0.32	94.81	0.31	94.81	1750	4.06	6.87	2.74	19810.00	2.66	
330	0.23	0.00	2.72	622.2%	20.76	18.04	113.9	30.0	102.0%	73.0%	74.5%	43.9	0.23	96.30	0.22	96.30	1750	4.06	6.87	2.74	19810.00	2.66	
340	0.14	0.00	5.18	279.2%	20.60	15.42	113.9	30.0	100.9%	81.7%	82.4%	22.9	0.14	97.78	0.13	97.78	1750	4.06	6.87	2.74	19810.00	2.66	
350	0.05	0.00	2.86	586.8%	20.75	17.89	114.4	30.0	101.9%	73.8%	75.2%	41.7	0.05	99.26	0.04	99.26	1750	4.06	6.87	2.74	19810.00	2.66	
360	0.00	0.00	2.58	661.4%	20.77	18.19	115.6	30.0	102.1%	71.6%	73.1%	46.3	0.00	100.00	0.00	100.00	437	4.06	6.87	2.74	19810.00	2.66	
0																0.00							
0																0.00							

Moisture Content MCwb: 2.66

112,027 (Btu) Moisture of Wood (wet basis): 2.66 Dry kg : 5.96
82,030 (Btu) Initial Dry Weight Wtdo (kg): 5.96 CA: 48.73
Moisture Content Dry 2.73 HY: 6.87
OX: 43.90

Load Weight (kg): 6.13
Fuel Heating: HHV LHV HHV LHV
Value in kJ/kg - CV: 19810.00 18328.69 Btu/lb 8522.48 7885.21

																					SUM			
79.41	21.06	1.32	4.58	-0.02	0.13	40.91	185.05	0.17	-0.27	866.32	35.07	1.52	441.24	5631.25	4190.11	4062.82	4020.26	5525.63	4858.08	302.58	8520.71	21649.25	1822.21	103448.86
Mass Balance (moles/100 mole dry flue gas)					kg Wood per 100 mole dfp	Moles per kg of Dry Wood						Moisture Present	Stack Temp K	Heat Content Change - Ambient to Stack Temperature Flue Gas Constituent					Room Temp K	Energy Losses (kJ Flue Gas Co				
[h]	[u]	[w]	[j]	[k]		CO2	O2	CO	HC	N2	H2O			CO2	O2	CO	N2	CH4		H2O	CO2	O2	CO	N2
79.62	21.12	2.12	7.30	-0.02	0.21	40.85	55.89	0.05	-0.08	378.19	34.69	1.52	513.15	8795.40	6477.56	6264.15	6202.03	8777.00	7485.00	300.37	359.27	362.02	13.74	2345.56
79.55	21.10	1.84	6.37	-0.02	0.18	40.86	70.50	0.05	-0.11	433.43	34.73	1.52	513.15	8774.14	6461.18	6248.12	6186.20	8757.39	7465.79	300.93	358.54	455.50	15.76	2681.28
79.65	21.13	2.25	7.77	-0.02	0.22	40.79	49.92	0.09	-0.07	355.49	34.66	1.52	512.04	8724.80	6426.30	6214.75	6153.09	8704.97	7426.03	300.93	355.89	320.79	25.81	2187.34
79.67	21.13	2.29	7.90	-0.01	0.23	40.79	48.31	0.09	-0.06	349.41	34.65	1.52	512.59	8728.20	6427.35	6215.41	6153.81	8711.54	7426.70	301.48	356.02	310.50	25.37	2150.21
79.74	21.15	2.65	9.12	-0.01	0.26	40.61	35.98	0.23	-0.02	302.36	34.57	1.52	513.71	8777.56	6462.24	6248.78	6186.93	8763.99	7466.46	301.48	356.45	232.51	65.80	1870.67
79.70	21.14	2.62	9.01	0.00	0.26	40.35	36.96	0.46	0.01	305.38	34.51	1.52	514.82	8826.95	6497.14	6282.16	6220.06	8816.51	7506.23	301.48	356.12	240.14	133.00	1899.47
79.68	21.13	2.46	8.47	0.00	0.25	40.46	42.07	0.37	-0.01	324.96	34.55	1.52	515.37	8851.66	6514.60	6298.86	6236.63	8842.80	7526.12	301.48	358.13	274.05	106.19	2026.68
79.58	21.11	1.96	6.75	-0.02	0.19	40.86	64.03	0.05	-0.10	408.98	34.71	1.52	497.59	8044.12	5941.05	5749.52	5691.62	7990.54	6871.42	302.04	328.65	380.41	14.84	2327.75
79.28	21.03	0.82	2.86	-0.03	0.08	41.01	213.35	0.12	-0.33	973.51	35.17	1.52	478.71	7218.74	5352.18	5184.83	5131.51	7125.29	6198.19	302.04	296.08	1141.88	35.39	4995.56
79.52	21.09	1.72	5.94	-0.02	0.17	40.87	78.84	0.06	-0.12	464.96	34.76	1.52	479.26	7242.87	5369.45	5201.41	5147.96	7150.46	6217.97	302.04	296.03	423.31	16.85	2393.58
79.38	21.06	1.18	4.11	-0.03	0.12	41.03	134.51	0.00	-0.22	675.68	34.96	1.52	475.93	7098.23	5265.85	5101.95	5049.33	6999.73	6099.36	302.04	291.23	708.30	0.00	3411.75
79.34	21.04	1.03	3.60	-0.03	0.10	41.07	160.01	0.00	-0.26	772.14	35.04	1.52	474.26	7026.04	5214.09	5052.25	5000.05	6924.61	6040.08	302.04	288.56	834.31	0.00	3860.73
79.57	21.11	1.91	6.59	-0.02	0.19	40.86	66.81	0.05	-0.10	419.49	34.72	1.52	473.15	6956.67	5163.20	5003.09	4951.37	6854.94	5981.36	302.59	284.25	344.97	15.18	2077.07
79.36	21.05	1.13	3.93	-0.03	0.11	41.04	142.67	0.00	-0.23	706.57	34.98	1.52	474.26	7026.04	5214.09	5052.25	5000.05	6924.61	6040.08	302.04	288.36	743.91	0.00	3532.86
79.48	21.08	1.55	5.36	-0.02	0.15	40.96	92.26	0.00	-0.15	515.92	34.82	1.52	470.93	6860.61	5094.25	4936.86	4885.69	6755.15	5902.36	302.59	281.02	470.02	0.00	2520.61
79.44	21.07	1.42	4.93	-0.02	0.14	40.98	104.27	0.00	-0.17	561.31	34.86	1.52	472.04	6908.62	5128.72	4969.97	4918.53	6805.01	5941.86	302.59	283.12	534.75	0.00	2760.81
79.47	21.08	1.54	5.32	-0.02	0.15	40.96	93.35	0.00	-0.15	520.04	34.82	1.52	471.48	6884.61	5111.48	4953.41	4902.11	6780.07	5922.11	302.59	282.01	477.18	0.00	2549.28
79.47	21.08	1.51	5.24	-0.02	0.15	40.97	95.59	0.00	-0.15	528.48	34.83	1.52	473.71	6980.71	5180.45	5019.65	4967.79	6879.93	6001.12	302.59	285.97	495.19	0.00	2625.39
79.34	21.05	1.05	3.68	-0.03	0.10	41.06	155.73	0.00	-0.25	755.94	35.02	1.52	473.71	6959.42	5164.06	5003.62	4951.95	6860.25	5981.90	303.15	285.77	804.19	0.00	3743.40
79.56	21.10	1.87	6.45	-0.02	0.19	40.92	69.13	0.00	-0.11	428.42	34.75	1.52	412.04	4345.78	3266.70	3175.69	3140.69	4191.82	3799.93	303.15	177.85	225.83	0.00	1345.52
79.31	21.04	0.94	3.27	-0.03	0.09	41.10	180.91	0.00	-0.29	851.18	35.10	1.52	398.71	7795.17	2860.97	2783.27	2752.17	3642.86	3331.00	303.15	155.99	517.58	0.00	2342.60
79.39	21.06	1.23	4.28	-0.03	0.12	41.02	127.03	0.00	-0.20	647.40	34.93	1.52	392.59	3544.53	2675.54	2603.74	2574.46	3394.58	3116.41	303.15	145.39	339.87	0.00	1666.70
79.36	21.05	1.13	3.92	-0.03	0.11	41.04	143.08	0.00	-0.23	708.11	34.98	1.52	394.26	3612.78	2726.08	2652.68	2622.90	3462.09	3174.91	303.15	148.28	390.05	0.00	1857.30
79.24	21.02	0.68	2.40	-0.03	0.07	41.24	264.44	0.00	-0.43	1167.10	35.37	1.52	392.04	3521.80	2658.70	2587.42	2558.32	3372.11	3096.91	303.15	145.23	703.06	0.00	2985.82
79.33	21.04	1.02	3.55	-0.03	0.10	41.07	162.97	0.00	-0.26	783.33	35.05	1.52	395.37	3658.32	2759.78	2685.31	2655.21	3507.18	3213.92	303.15	150.26	449.76	0.00	2079.90
79.24	21.02	0.67	2.37	-0.03	0.07	41.25	268.96	0.00	-0.43	1184.19	35.39	1.52	391.48	3477.78	2625.46	2555.08	2526.34	3329.96	3058.20	303.71	143.44	706.14	0.00	2991.66
79.23	21.02	0.65	2.27	-0.03	0.06	41.09	282.01	0.16	-0.43	1233.10	35.38	1.52	389.26	3408.27	2574.54	2505.90	2477.63	3260.04	2999.45	303.15	140.04	726.05	44.43	3055.17
79.16	21.00	0.41	1.46	-0.03	0.04	41.01	470.18	0.49	-0.68	1943.78	35.89	1.52	387.59	3318.97	2507.68	2440.97	2413.40	3173.30	2921.78	303.71	136.10	1179.06	140.17	4691.12
79.07	20.97	0.15	0.55	-0.02	0.01	38.34	1390.54	4.11	-1.64	5413.90	37.80	1.52	362.59	2329.82	1770.13	1725.44	1705.45	2206.09	2066.07	303.15	89.33	2461.43	1169.66	9233.14
79.42	21.07	1.34	4.66	-0.02	0.13	40.99	112.94	0.00	-0.18	594.13	34.89	1.52	387.59	3340.27	2524.07	2457.00	2429.24	3193.00	2941.00	303.15	136.93	285.08	0.00	1443.28
79.24	21.02	0.68	2.40	-0.03	0.07	41.24	264.44	0.00	-0.43	1167.10	35.37	1.52	392.04	3500.50	2642.30	2571.39	2542.48	3352.41	3077.70	303.71	144.35	698.73	0.00	2967.34
79.24	21.02	0.66	2.32	-0.03	0.07	41.26	275.99	0.00	-0.44	1210.77	35.41	1.52	382.59	3115.43	2356.44	2294.38	2268.33	2973.12	2746.51	303.71	128.53	650.34	0.00	2746.44
79.36	21.05	1.09	3.81	-0.03	0.11	41.05	148.55	0.00	-0.24	728.78	35.00	1.52	387.59	3340.27	2524.07	2457.00	2429.24	3193.00	2941.00	303.15	137.12	374.94	0.00	1770.38
79.24	21.02	0.66	2.33	-0.03	0.07	41.25	273.61	0.00	-0.44	1201.78	35.40	1.52	387.04	3317.62	2507.26	2440.71	2413.11	3170.69	2921.52	303.15	136.86	686.01	0.00	2900.03
79.40	21.06	1.27	4.41	-0.02	0.13	41.01	122.06	0.00	-0.20	628.61	34.92	1.52	387.04	3317.62	2507.26	2440.71	2413.11	3170.69	2921.52	303.15	136.05	306.04	0.00	1516.90
79.25	21.02	0.70	2.45	-0.03	0.07	41.23	257.90	0.00	-0.41	1142.38	35.35	1.52	387.59	3340.27	2524.07	2457.00	2429.24	3193.00	2941.00	303.15	137.71	650.97	0.00	2775.12
79.23	21.02	0.63	2.22	-0.03	0.06	41.28	291.04	0.00	-0.47	1267.71	35.46	1.52	388.71	3385.60	2557.71	2489.60	2461.50	3237.68	2979.97	303.15	139.76	744.39	0.00	3120.45

AS			AVERAGE	SUMS						
-9020.08	63330.09	2740.03	5202.46	30278	-759	31037.17	88275	-759	17.21	-16.77
/kg of Dry Fuel)			Total							
Instituent			Loss	Total	Chemical	Sensible and	Total	Chem	Grams Produced	
CH4	H2O Comb	H2O Fuel MC	Rate	Loss	Loss 1	Latent Loss	Output	Loss 2	CO	HC
-74.60	1784.87	78.04	4868.89	0	0	0.00	0	0	0.00	0.00
-94.82	1786.51	78.01	5280.79	2682	-40	2722.04	7380	-40	0.77	-0.86
-60.49	1781.21	77.95	4688.50	1553	-11	1564.53	5009	-11	0.83	-0.36
-58.37	1780.99	77.95	4642.67	1538	-11	1548.80	5024	-11	0.81	-0.34
-22.22	1778.23	78.01	4359.45	1444	14	1430.02	5118	14	2.11	-0.13
6.79	1776.28	78.07	4489.88	1586	48	1538.06	5413	48	4.55	0.04
-12.74	1779.21	78.10	4609.62	1323	26	1297.13	4364	26	2.95	-0.07
-85.80	1764.86	77.11	4807.83	956	-14	969.56	2982	-14	0.29	-0.30
-291.93	1764.55	76.09	8017.61	1593	-51	1644.14	2344	-51	0.68	-1.03
-106.16	1744.46	76.12	4844.19	1070	-20	1089.35	3305	-20	0.36	-0.42
-194.15	1750.16	75.94	6043.23	1201	-38	1239.37	2736	-38	0.00	-0.69
-230.94	1752.19	75.85	6580.70	1308	-46	1353.45	2629	-46	0.00	-0.82
-89.53	1734.39	75.76	4442.08	981	-16	997.28	3394	-16	0.33	-0.35
-205.92	1749.40	75.85	6184.47	1229	-41	1269.76	2708	-41	0.00	-0.73
-133.14	1736.50	75.64	4950.64	984	-26	1010.19	2953	-26	0.00	-0.47
-150.47	1739.80	75.70	5243.71	1042	-30	1071.86	2895	-30	0.00	-0.53
-134.72	1737.36	75.67	4986.78	991	-27	1017.69	2946	-27	0.00	-0.48
-137.95	1740.47	75.79	5084.85	1123	-30	1153.13	3252	-30	0.00	-0.54
-224.74	1749.47	75.76	6433.85	995	-34	1029.03	2068	-34	0.00	-0.62
-99.47	1659.73	72.45	3381.91	299	-9	307.48	1451	-9	0.00	-0.16
-260.15	1660.45	71.74	4488.22	396	-23	419.34	1353	-23	0.00	-0.41
-182.62	1644.76	71.41	3685.51	326	-16	341.62	1424	-16	0.00	-0.29
-205.71	1649.24	71.50	3910.65	345	-18	363.54	1404	-18	0.00	-0.33
-380.15	1664.89	71.38	5190.24	458	-33	491.92	1291	-33	0.00	-0.60
-234.31	1653.62	71.56	4170.79	368	-21	389.03	1381	-21	0.00	-0.37
-386.62	1664.20	71.33	5190.14	458	-34	492.48	1291	-34	0.00	-0.61
-385.09	1661.96	71.24	5313.80	469	-30	499.38	1280	-30	0.38	-0.61
-611.82	1683.02	71.12	7288.78	322	-21	342.71	553	-21	0.61	-0.48
-1462.01	1740.09	69.82	13301.48	294	-7	300.27	144	-7	2.54	-0.58
-162.33	1636.50	71.15	3410.61	301	-14	315.56	1449	-14	0.00	-0.26
-380.14	1664.21	71.35	5165.84	570	-42	612.21	1617	-42	0.00	-0.75
-396.57	1654.23	70.85	4853.82	429	-35	463.66	1321	-35	0.00	-0.63
-213.50	1641.88	71.15	3781.96	334	-19	352.86	1416	-19	0.00	-0.34
-393.24	1660.07	71.12	5060.84	447	-35	481.65	1303	-35	0.00	-0.62
-175.43	1637.20	71.12	3491.87	308	-15	323.89	1441	-15	0.00	-0.28
-370.68	1658.38	71.15	4922.65	435	-33	467.46	1315	-33	0.00	-0.59
-418.33	1664.77	71.21	5322.26	118	-9	126.74	320	-9	0.00	-0.17

Dirigo Laboratories, Inc.

Manufacturer: Pacific Energy
Model: True North 40
Date: 9/4/2015
Run: 3
Control #: 034-S-050-5
Test Duration: 360
Output Category: 2

	HHV Basis	LHV Basis
Overall Efficiency	73.2%	79.1%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	73.6%	79.5%

HHV Output Rate (kJ/h)	14,415	13,674	(Btu/h)
Burn Rate (kg/h)	0.99	2.19	(lb/h)
Input (kJ/h)	19,686	18,674	(Btu/h)

Test Load Weight (dry kg)	6.0	13.1	dry lb
MC wet (%)	2.66		
MC dry (%)	2.73		
Particulate (g)	9.22		
CO (g)	17		
Test Duration (h)	6		

Emissions	Particulate	CO
g/MJ Output	0.11	0.20
g/kg Dry Fuel	1.55	2.89
g/h	1.54	2.87
lb/MM Btu Output	0.25	0.46

Air/Fuel Ratio (A/F)	19.75
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Test Results in Accordance with CSA B415.1-10

Technician: _____

Default Fuel Values

	D. Fir	Oak
HHV (kJ/kg)	19,810	19,887
%C	48.73	50
%H	6.87	6.6
%O	43.9	42.9
%Ash	0.5	0.5



July 20, 2015

Dirigo Laboratories, Inc.
11785 SE Highway 212
Suite 305
Clackamas, OR 97015

Dr. Rafael Sanchez
USEPA Headquarters
Ariel Rios Building
1200 Pennsylvania Ave. NW
Mail Code: 2227A

Dear Dr. Sanchez,

This is to formally request authorization for Dirigo Laboratories, Inc. to perform certification testing on the True North – TN40 and TN40 Insert model pellet heaters per EPA Method 28 – “Certification and Auditing of Wood Heaters”. The TN-40 and TN-40 Insert are manufactured by Pacific Energy Fireplace Products located at 2975 Allenby Road- Duncan, BC- Canada V9L 6V8 . This request serves as our 30 day notice to begin testing the week of August 24th, 2015.

Kind Regards,

John Steinert, President
Dirigo Laboratories, Inc.
jsteinert@dirigolaboratories.com



Certificate of Calibration



10392070

Certificate Page 1 of 1

CALIBRATION CERT #2357.18

Instrument Identification

PO Number: CC-JOHN STEINERT

Company ID: 691956
DIRIGO LABORATORIES
JOHN STEINERT
11785 SE HIGHWAY 212
SUITE 305
CLACKAMAS, OR 97015

Instrument ID: **NX0202013**
Manufacturer: DWYER
Description: DIGITAL MANOMETER
ACCURACY: Manufacturer Specifications

Model Number: 475-000-FM
Serial Number: NX0202013

Certificate Information

Reason For Service: CALIBRATION
Type of Cal: ACCREDITED 17025 WITH UNCERTAINTIES
As Found Condition: IN TOLERANCE
As Left Condition: IN TOLERANCE
Procedure: 375A1171CSP, JUN 2013
Remarks:

Technician: MARK JOUBERT
Cal Date: 04Sep2015
Cal Due Date: 04Sep2016
Interval: 12 MONTHS
Temperature: 20.3 C
Humidity: 57.0 %

Tektronix certifies the performance of the above instrument has been verified using test equipment of known accuracy, which is traceable to a National Standards Laboratory (NIST, NPL, PTB). The policies and procedures used comply with ISO/IEC 17025:2005. This certificate shall not be reproduced, except in full, without the written approval of the calibration facility. Reported uncertainties are expanded uncertainties expressed at approximately the 95% confidence level using a coverage of $k=2$.

When a test result has a status of Pass or Fail and the difference between the test result and the test limit is greater than the uncertainty, the coverage probability of the decision is greater than 95%. When the difference between the test result and the test limit is less than the uncertainty, the decision has reduced probability.

This certificate and associated attachments relate only to the metrological quantities presented in this report. No representation is made about the long-term stability of this unit. Any number of factors can influence the calibration that may cause the unit to drift out of specification before the calibration interval has expired.

This certificate shall not be reproduced, except in full, without the written permission of Tektronix. Data Report Attached.

Questions / Comments about our Calibration Certificate? Please visit <http://www.lek.com/cert-survey>

Approved By: MARK JOUBERT
Service Representative

Issue Date: 9/4/2015

Calibration Standards

NIST Traceable#	Inst. ID#	Description	Manufacturer	Model	Cal Date	Date Due
8462658	04-0084	MICROTECTOR	DWYER	1430	31Mar2014	31Mar2017



Manufacturer: DWYER
Model Number: 475-000-FM

Calibration Date: 4-Sep-2015

Serial number: NX0202013
Asset Number: NX0202013

Nominal Value	As Found	Result	As Left	Result	Min	Max	Units	Uncertainty
Pressure Accuracy (InH2O)								
0.200	0.198	P	SAME	P	0.195	0.205	InH2O	0.00065InH2O
0.400	0.400	P	SAME	P	0.395	0.405	InH2O	0.00065InH2O
0.600	0.601	P	SAME	P	0.595	0.605	InH2O	0.00065InH2O
0.800	0.804	P	SAME	P	0.795	0.805	InH2O	0.00065InH2O
1.000	1.004	P	SAME	P	0.995	1.005	InH2O	0.00065InH2O



EPA Method 5 Dry Gas Meter Calibration for γ and $\Delta H@$

Manufacturer / Model: Apex-AK-600
ID: Ambient Box
Serial Number: 810016
Equipment No.: Dirigo 055
Calibration Date: 7/30/2015
Next Calibration Due: 1/30/2016
Barometric Pressure: 29.94 inHg
Signature/Date: *[Signature]* 7/30/15

Average DGM γ factor =

1.016

Average Meter Orifice $\Delta H@$ =

32.841

	Run 1	Run 2	Run 3
Standard DGM Initial Volume (L)	0.000	0.000	0.000
Standard DGM Final Volume (L)	150.924	161.127	162.531
Standard Ave. Meter Temperature ($^{\circ}$ F), (Tstd)	85.0	89.5	90.0
DGM Initial Volume (cuft)	0.000	0.000	0.000
DGM Final Volume (cuft)	5.178	5.657	5.763
DGM Average Temperature ($^{\circ}$ F), (T _{DGM})	90.0	96.5	96.5
Time (min)	40.0	35.0	30.0
Orifice ΔH ("H ₂ O)	1.00	1.49	2.05
Vacuum ("H ₂ O)	0.00	0.00	0.00
Total Volume for Standard DGM (Vstd) (cuft)	5.330	5.690	5.740
Total Volume for DGM (V _{DGM}) (cuft)	5.178	5.657	5.763

Standard Meter Data

Date	4/17/2014
γ Factor	0.998
Model	SK25DA
Serial Number	1101001

Pre-Calibration Data

Date	4/25/2014
γ Factor	1.003
$\Delta H@$	22.091
Tolerance (5%)	0.050
Deviation	0.013

Pass

Dry Gas Meter γ Factor	1.034	1.013	1.001
γ Factor Deviation From Average	0.018	0.003	0.015
Meter Orifice $\Delta H@$	32.689	32.951	32.884
Orifice $\Delta H@$ Deviation From Average	0.152	0.110	0.043

DGM Calibration Data

γ Deviation Tolerance	0.020
Maximum γ Deviation	0.018
$\Delta H@$ Deviation Tolerance	0.200
Maximum $\Delta H@$ Deviation	0.152

Pass

Calculations:

1. Deviation = |Average value for all runs - current run value|
2. $\gamma = (V_{std} \times (Std \gamma \text{ factor}) \times (P_{bar}) \times (T_{DGM} + 460)) / (V_{DGM} \times (T_{std} + 460)) \times (P_{bar} + (dH / 13.6))$
3. $\Delta H@ = 0.0319 \times \Delta H (((T_{DGM} + 460) \times (Time^2)) / (P_{bar} \times (\gamma \text{ factor}^2) \times (V_{DGM}^2)))$

Measurement of uncertainty = +/- 0.14 cfm

Certificate of Calibration

Certificate Number: **469735**



JJ Calibrations, Inc.

7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

Dirigo Laboratories, Inc.
11785 SE Hwy. 212
Suite 305
Clackamas, OR 97015

PO: 7

Order Date: **02/04/2011**

Authorized By: **N/A**



0723.01
Calibration

Property #: **051**
User: **N/A**
Department: **N/A**
Make: **Unknown**
Model: **10 Lbs. (Class F)**
Serial #: **051**
Description: **Mass**
Procedure: **DCN 500901**
Accuracy: **Class F ($\pm 450\text{mg}$)**

Calibrated on: **02/08/2011**
*Recommended Due: **02/08/2016**
Environment: **18 °C 36 % RH**
* As Received: **Within Tolerance**
* As Returned: **Within Tolerance**
Action Taken: **Calibrated**
Technician: **92**

Remarks: * Many factors may cause the unit to drift out of calibration before the recommended due date. Any reported error is the absolute value between the reference and the unit.
Uncertainties include the effects of the unit.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
432A	Sartorius	C-44	Microbalance 5.1g	11/08/2011	461791
503A	Rice Lake	1mg-200g (Class O)	Mass Set	11/08/2011	460936
550A	And (A&D) Co.	HP-30K	Balance 30 Kg	02/02/2012	467177

Measurement Data

Parameter	Measurement Description	Range Unit	Reference	Min	Max	*Error	UUT	Uncertainty
Before/After								Accredited = ✓
Mass								
Class F - 10 lb		mg	4535924.0	4535474	4536374	157	4536081 mg	3.5E+02 ✓

JJ Calibrations, Inc. certifies that this instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual with the stated procedure using standards that are traceable to the National Institute of Standards and Technology (NIST), or other National Measurement Institutes (NMI's), or by using natural physical constants, intrinsic standards or ratio calibration techniques. The quality system and this certificate are in compliance with ANSI/NCCL Z540-1-1994, ISO/IEC 17025-2005, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless otherwise stated, a test accuracy ratio (TAR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without prior written consent of JJ Calibrations, Inc.
JJ Calibrations, Inc. quality system has been assessed and accredited to ISO/IEC 17025:2005.

Reviewer

3 Issued 02/08/2011

Rev # 15

Inspector

Report and Certificate of Calibration



by
Cal-Cert

6709 S.E. Lake Road Milwaukie, OR 97222 (800)356-4662 Fax (503)654-9670



ACCREDITED
Laboratory Code CL-108

Report #: 52692-D-01 Customer PO#:
Customer Name: Dirigo Laboratories
Customer Address: 11785 SE Highway 212, Suite 305
City: Clackamas State: OR Zip: 97015
Contact: John Steinert
Service Address: 11785 SE Highway 212, Suite 305, Clackamas, OR 97015

Calibration Standards

15-11KG/00547 Troemner Weight Set S/N: 00547, 30257, 30258 Cal Date: 5/21/14 Due Date: 5/21/16 Vendor: QCS REPORT#: 20141167/20142000
15-RH/00987 Comark Thermohygrometer S/N: 06259400322 Cal Date: 5/14/15 Due Date: 5/14/16 Vendor: CC REPORT#: 52289-C-20

Instrument Data

Calibration Date:	July 9, 2015	Reference:	ASTM E-898
Calibration Due Date:	July 9, 2016	Number of Ranges:	One
Calibration Frequency:	12 Months	Indicating System:	Digital
Manufacturer:	Scientech	Temperature:	73 °F
Model Number:	ZSA 210	Humidity:	38% RH
Type:	Digital Balance	Asset #:	#048
Serial #:	28095	Service Location:	Service Address
Scale Capacity:	200 grams	As Found:	PASS
		As Left:	PASS

Scale Linear Test

Instrument Range:		200.0000 grams		Resolution:		0.0001 grams	
Calibration Standard	As Found UUT	As Found Error	As Left UUT	As Left Error	As Left % of Error	Tolerance (As Left) Allowable Error	
grams	grams	grams	grams	grams		Error	Condition
0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.0000	PASS
20.0000	20.0062	0.0062	20.0062	0.0062	0.031	0.0200	PASS
40.0000	40.0123	0.0123	40.0123	0.0123	0.031	0.0400	PASS
60.0000	60.0174	0.0174	60.0174	0.0174	0.029	0.0600	PASS
80.0000	80.0244	0.0244	80.0244	0.0244	0.031	0.0800	PASS
100.0000	100.0264	0.0264	100.0264	0.0264	0.026	0.1000	PASS
120.0000	120.0327	0.0327	120.0327	0.0327	0.027	0.1200	PASS
140.0000	140.0384	0.0384	140.0384	0.0384	0.027	0.1400	PASS
160.0000	160.0436	0.0436	160.0436	0.0436	0.027	0.1600	PASS
180.0000	180.0499	0.0499	180.0499	0.0499	0.028	0.1800	PASS
200.0000	200.0557	0.0557	200.0557	0.0557	0.028	0.2000	PASS
100.0000	100.0263	0.0263	100.0263	0.0263	0.026	0.1000	PASS
0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.0000	PASS

Expanded Uncertainty± 0.001254 grams

FUNCTIONAL CHECKS					
OFF CENTER LOAD:		HYSTERESIS: Load Increments		REPEATABILITY:	
Loading position	100.0000	Test Weight Applied. % of load	Readings	Test Weight Applied	100.0000
Right	100.0222	0%	0.0000	1st	100.0247
Left	100.0273	(R1) 50%	100.0264	2nd	100.0239
Front	100.0254	100%	200.0557	3rd	100.0239
Back	100.0238	(R2) 50%	100.0263	4th	100.0239
As Left	PASS	0%	0.0000	5th	100.0252
Tolerance Deviation of lowest and highest reading within 0.1%		As Left	PASS	As Left	PASS
		Tolerance The Difference of R1 and R2 must be within 0.1%		Tolerance Deviation of lowest and highest reading within 0.1%	

Remarks:

We sincerely thank you for your business.

Please call us at 1-800-356-4662 for all your calibration needs.

Cleaning and preventive maintenance were performed before calibration of this equipment.

Accredited by the International Accreditation Service, Inc. (IAS) under Calibration Laboratory Code CL-108.
This Laboratory meets the requirements of ISO/IEC 17025 AND ANSI/NCSL Z540.3

The above system, accessories and associated software has been calibrated or verified in accordance with an appropriate Cal-Cert procedure that is based on internationally recognized standards or manufacture tolerances. Cleaning and preventive maintenance were performed before calibration of this equipment. The calibration standards used for this calibration are calibrated in accordance with an international recognized standard and or manufacture tolerance and are traceable to the National Institute of Standards and technology (NIST). This calibration complies with the data gathering and reporting requirements of ISO/IEC Guide 17025, ANSI/NCSL Z540 3, and Cal-Cert Procedure CP-002.

This Certificate is issued as a statement of the fact that on this date the above instrument(s) has accuracy as indicated. It should not be construed or regarded as a Guarantee or Warranty of any kind (in favor of the client, the client's customers, or the public at large) that the instrument(s) will continue to retain the same percentage (%) of accuracy or efficiency as determined on the date when the calibration was performed and reported by "Cal-Cert". Since the calibrator has absolutely no control over the future operation, damage, maintenance, repairs, and overall condition of the instrument(s) and hereby expressly disclaims any and all liability for damage or loss sustained by all parties arising or resulting from deterioration, obsolescence, malfunction, or substandard performance of said instrument(s), which shall be deemed to be and which shall remain the sole responsibility of the machines regular custodian, owner, and/or manufacture.

This report shall not be reproduced except in full, without written approval from Cal-Cert.

Service Engineer: KEVIN CORRIGAN

Date: July 9, 2015

Technical Manager: MARSHALL DOYLE

Signature: *M Doyle*

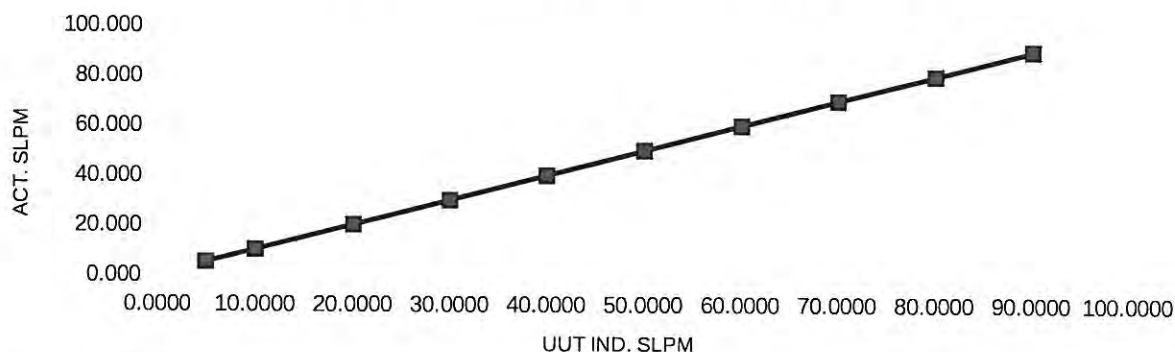
REPORT#: 52692-D-01

CERTIFICATE OF CALIBRATION

CUSTOMER: DIRIGO LABORATORIES INC. CLACKAMAS OR
PO NUMBER: 74
INST. MANUFACTURER: APEX
INST. DESCRIPTION: DIGITAL DGM STANDARD
MODEL NUMBER: SK25DA
SERIAL NUMBER: 1101001
RATED UNCERTAINTY: +/- .5 % RD.
UNCERTAINTY GIVEN: FLOW measurement uncertainty: +/- .099 % RD.; K=2
NOTES: AS RECEIVED/AS LEFT WITHIN SPECS. REFERENCE CONDITIONS ARE: 760 mm HGA 70 F

CALIBRATION DATE: 02/19/15
CALIBRATION DUE: 02/19/16
PROCEDURE: NAVAIR 17-20MG-02
CALIBRATION FLUID: AIR @ 14.7 PSIA 70 F
STANDARD(S) USED: A4, A24, A321 DUE 06-2016
1329407628, 1361269184, 1390386562
NIST TRACE #'S:
AMBIENT CONDITIONS: 761 mm HGA 51 % RH 72 F
CERTIFICATE FILE #: 449362.15

TEST POINT NUMBER	UUT INDICATED SLPM	DM.STD. ACTUAL SLPM	CORRECTION SLPM	K FACTOR
1	5.0122	4.996	0.99677	60.195
2	10.0234	9.991	0.99677	60.195
3	20.0441	20.018	0.99870	60.078
4	30.0631	29.985	0.99740	60.156
5	40.0808	39.994	0.99783	60.130
6	50.0960	50.013	0.99834	60.100
7	60.1082	60.021	0.99855	60.087
8	70.1204	69.991	0.99815	60.111
9	80.1295	79.928	0.99748	60.151
10	90.1367	90.022	0.99873	60.076
AVERAGE (Y)=			0.99787295	



All instruments used in the performance of the shown calibration have traceability to the National Institute of Standards and Technology (NIST). The uncertainty ratio between the calibration standards (DM.STD.) used and the unit under test (UUT) is a minimum of 4:1, unless otherwise noted. Calibration has been performed per the shown procedure number, in accordance with ISO 10012:2003, ISO 17025:2005, ANSI/NC'SL-Z-540.3, and/or MIL-STD-45662A. Test methods: API2530-92 & ASME MFC-3M-1989.

Dick Munns Company • 10572 Calle Lee #130 • Los Alamitos, CA 90720
Phone (714) 827-1215 • Fax (714) 827-0823

This Calibration Certificate shall not be reproduced, in full, without approval of DICK MUNN'S COMPANY. The data shown applies only to the instrument being calibrated and under the stated conditions of calibration.

Date:

Approved by:

Calibration Technician:

2/19/2015

[Signature]

[Signature]

Date **Order #:** 1387420 **Ship To** 11785 SE HIGHWAY 212 #305
Completed: 08/07/2015 **Cert #:** 13874203 **Address:** CLACKAMAS, OR 97015

WID No: 88456 **Location** **Capacity:** 10000
MFG: RICE LAKE **Asset No:** **Division:** 1
Model: IQ+350 **Other:** **Units:** LBS
Serial No: 5026 **Next Due Date:** 02/03/16

Readings

Reading	Applied Weight	As Found	Final	+/- Tolerance	As Found Error
1	0	0	0	1	0
2	500	500	500	1	0

Corner Test**Applied Weight:** 500

Corner/Shift	As Found	Final	+/- Tolerance	As Found Error
1 ☐ ☐	500	500	1	0
2 ☐ ☐	500	500	1	0
3 ☐ ☐	500	500	1	0
4 ☐ ☐	500	500	1	0

All standards used to calibrate this device are traceable to the National Institute of Standards

Scale Details

Temperature: NA **% Relative Humidity:** NA **Condition of Scale:** Good

Initial Tolerance: In **Final Tolerance:** In **Cert Type:**

Certificate: OR-15-185-F **Standards Used:** 20-50LB, 2-25LB KIT
Test Date: 06/20/15 **Retest Date:** 06/20/17

Notes

TEST AND INSPECT SCALE WITHIN TOLERANCE, NO ADJUSTMENTS MADE

Technician

PATRICK BURBIDGE

License Number

707



Certificate of Calibration

Certificate Number: 601316

Dirigo Laboratories, Inc.
11785 SE Hwy. 212
Suite 305
Clackamas, OR 97015



JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994



PO: 77
Order Date: 09/04/2015
Authorized By: N/A

Calibrated on: 09/11/2015
*Recommended Due: 09/11/2016
Environment: 21 °C 55 % RH
* As Received: Within Tolerance
* As Returned: Within Tolerance
Action Taken: Calibrated w/Parts
Technician: 127

Property #: #039
User: N/A
Department: N/A
Make: Omega
Model: CL3512A
Serial #: 10000891
Description: Thermometer/Calibrator
Procedure: DCN 403519
Accuracy: Refer to Mfg. Specs.

Remarks: * Many factors may cause the unit to drift out of calibration before the recommended due date. Any reported error is the absolute value between the reference and the unit.
Uncertainties include the effects of the unit.

Replaced battery. Received & Returned with cover.

Standards Used

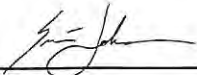
Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
427A	Fluke	5500A-SC300	Calibrator W/300MHz	02/04/2016	582108

Parameter		Measurement Data					UUT	Uncertainty
Measurement Description		Range	Unit	Reference	Min	Max	*Error	Accredited = ✓
Before/After								
Thermocouple/ Type K								
reading T1	°C	-100.0		-102	-98	0	-100 °C	2.4E+00 ✓
reading T1	°C	0.00		-1.0	1.0	0.4	0.4 °C	1.3E+00 ✓
reading T1	°C	300.0		299	301	0	300 °C	1.3E+00 ✓
reading T1	°C	600.0		598	602	0	600 °C	2.4E+00 ✓
reading T1	°C	900.0		898	902	1	899 °C	2.4E+00 ✓
reading T1	°C	1300.0		1298	1302	0	1300 °C	2.4E+00 ✓
reading T2	°C	-100.0		-102	-98	0	-100 °C	2.4E+00 ✓
reading T2	°C	0.00		-1.0	1.0	0.3	0.3 °C	1.3E+00 ✓
reading T2	°C	300.0		299	301	0	300 °C	1.3E+00 ✓
reading T2	°C	600.0		598	602	0	600 °C	2.4E+00 ✓
reading T2	°C	900.0		898	902	1	899 °C	2.4E+00 ✓
reading T2	°C	1300.0		1298	1302	1	1299 °C	2.4E+00 ✓
Thermocouple/ Type J								
reading T1	°C	-100.0		-102	-98	0	-100 °C	2.4E+00 ✓
reading T1	°C	0.00		-1.0	1.0	0.4	0.4 °C	1.3E+00 ✓
reading T1	°C	300.0		299	301	0	300 °C	1.3E+00 ✓
reading T1	°C	600.0		598	602	0	600 °C	2.4E+00 ✓
reading T1	°C	900.0		898	902	0	900 °C	2.4E+00 ✓
reading T1	°C	1100.0		1098	1102	0	1100 °C	2.4E+00 ✓
reading T2	°C	-100.0		-102	-98	1	-99 °C	2.4E+00 ✓
reading T2	°C	0.00		-1.0	1.0	0.4	0.4 °C	1.3E+00 ✓
reading T2	°C	300.0		299	301	0	300 °C	1.3E+00 ✓
reading T2	°C	600.0		598	602	0	600 °C	2.4E+00 ✓
reading T2	°C	900.0		898	902	0	900 °C	2.4E+00 ✓
reading T2	°C	1100.0		1098	1102	0	1100 °C	2.4E+00 ✓
Thermocouple/ Type T								
reading T1	°C	-100.0		-102	-98	1	-99 °C	2.4E+00 ✓
reading T1	°C	0.00		-1.0	1.0	0.5	0.5 °C	1.3E+00 ✓
reading T1	°C	300.0		299	301	0	300 °C	1.3E+00 ✓
reading T2	°C	-100.0		-102	-98	1	-99 °C	2.4E+00 ✓
reading T2	°C	0.00		-1.0	1.0	0.4	0.4 °C	1.3E+00 ✓
reading T2	°C	300.0		299	301	0	300 °C	1.3E+00 ✓

Parameter	Measurement Data					UUT	Uncertainty
Measurement Description	Range Unit						
Before/After		Reference	Min	Max	*Error		Accredited = ✓
Thermocouple/ Type K							
output T1	°C	-100.00	-103.0	-97.0	0.3	-100.3 °C	3.5E+00 ✓
output T1	°C	150.00	148.0	152.0	0.4	149.6 °C	2.4E+00 ✓
output T1	°C	500.00	497.0	503.0	0.5	500.5 °C	3.5E+00 ✓
output T1	°C	875.00	872.0	878.0	0.2	875.2 °C	3.5E+00 ✓
output T1	°C	1200.00	1197.0	1203.0	0.4	1200.4 °C	3.5E+00 ✓
Thermocouple/ Type J							
output T1	°C	-100.00	-103.0	-97.0	0.1	-100.1 °C	3.5E+00 ✓
output T1	°C	150.00	148.0	152.0	0.3	149.7 °C	2.4E+00 ✓
output T1	°C	500.00	497.0	503.0	0.6	500.6 °C	3.5E+00 ✓
output T1	°C	875.00	872.0	878.0	0.2	874.8 °C	3.5E+00 ✓
output T1	°C	1100.00	1097.0	1103.0	0.4	1099.6 °C	3.5E+00 ✓
Thermocouple/ Type T							
output T1	°C	-100.00	-103.0	-97.0	0.5	-100.5 °C	3.5E+00 ✓
output T1	°C	150.00	148.0	152.0	0.8	149.2 °C	2.4E+00 ✓
output T1	°C	350.00	348.0	352.0	0.6	350.6 °C	2.4E+00 ✓

JJ Calibrations, Inc. certifies that this instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual with the stated procedure using standards that are traceable to the National Institute of Standards and Technology (NIST), or other National Measurement Institutes (NMI's), or by using natural physical constants, intrinsic standards or ratio calibration techniques. The quality system and this certificate are in compliance with ANSI/NC SL Z540-1-1994, ISO/IEC 17025-2005, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless otherwise stated, a test accuracy ratio (TAR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without prior written consent of JJ Calibrations, Inc.

JJ Calibrations, Inc. quality system has been assessed and accredited to ISO/IEC 17025:2005.

Reviewer 

3 Issued 09/15/2015 Rev # 15

Inspector 

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Airgas Specialty Gases

11711 S. Alameda Street
Los Angeles, CA 90059
323-568-2208 Fax: 323-567-3686
www.airgas.com

Part Number: E04NI77E15A0575
Cylinder Number: CC17630
Laboratory: ASG - Los Angeles - CA
PGVP Number: B32014
Gas Code: CO,CO2,O2,BALN

Reference Number: 48-124469787-1
Cylinder Volume: 151.0 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 590
Certification Date: Dec 24, 2014

Expiration Date: Dec 24, 2022

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	2.500 %	2.509 %	G1	+/- 0.6% NIST Traceable	12/24/2014
CARBON DIOXIDE	10.00 %	10.03 %	G1	+/- 0.6% NIST Traceable	12/22/2014
OXYGEN	10.50 %	10.47 %	G1	+/- 0.4% NIST Traceable	12/22/2014
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	08061402	CC267714	1.959 % CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 26, 2018
NTRM	12061353	CC360995	11.002 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Jan 11, 2018
NTRM	09060206	CC262089	9.961 % OXYGEN/NITROGEN	+/- 0.3%	Nov 08, 2018

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS 6E CO2	NDIR	Dec 18, 2014
HORIBA % CO	NDIR	Dec 24, 2014
SIEMENS OXYMAT 6	PARAMAGNETIC	Dec 15, 2014

Triad Data Available Upon Request



[Signature]
Approved for Release

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Airgas Specialty Gases

11711 S. Alameda Street
Los Angeles, CA 90059
323-568-2208 Fax: 323-567-3686
www.airgas.com

Part Number: E04NI61E15A0574
Cylinder Number: CC281967
Laboratory: ASG - Los Angeles - CA
PGVP Number: B32014
Gas Code: CO,CO2,O2,BALN

Reference Number: 48-124469757-1
Cylinder Volume: 101.2 CF
Cylinder Pressure: 1310 PSIG
Valve Outlet: 590
Certification Date: Dec 24, 2014

Expiration Date: Dec 24, 2022

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	4.250 %	4.217 %	G1	+/- 0.6% NIST Traceable	12/24/2014
CARBON DIOXIDE	17.00 %	16.97 %	G1	+/- 0.6% NIST Traceable	12/24/2014
OXYGEN	17.00 %	17.00 %	G1	+/- 0.5% NIST Traceable	12/24/2014
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	08061208	CC269447	7.976 % CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 22, 2018
NTRM	08061315	CC255254	20.09 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Jun 28, 2018
NTRM	09061417	CC273563	22.53 % OXYGEN/NITROGEN	+/- 0.4%	Mar 08, 2019

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS 6E CO2	NDIR	Dec 18, 2014
HORIBA % CO	NDIR	Dec 24, 2014
SIEMENS OXYMAT 6	PARAMAGNETIC	Dec 15, 2014

Triad Data Available Upon Request



Approved for Release

CERTIFICATE OF BATCH ANALYSIS

NITROGEN - ULTRA HIGH PURITY-PURE

Airgas Nor Pac
11900 NE 95th St., Ste. 400
Vancouver, Washington 98682
(360) 944-4000 Fax: (360) 944-4100
www.airgas.com

Part Number:	NI UHP200BA	Reference Number:	16-101518687-3
Cylinder Analyzed:	6564&	Cylinder Volume:	230 Cubic Feet
Laboratory:	NOR - Portland - OR	Cylinder Pressure:	2200 PSIG
Analysis Date:	May 10, 2011	Valve Outlet:	580
Lot #:	16-101518687-3		

ANALYTICAL RESULTS

Component	Requested Purity	Certified Concentration
NitrogenUltraHighPurity	99.999%	99.999%
CO + CO2	< 1 PPM	< 1 PPM
Moisture	< 1 PPM	< 1 PPM
Oxygen	< 1 PPM	< 1 PPM
THC	< 0.5 PPM	< 0.5 PPM

Cylinders in Batch:

CAI2175778Y, CG969822, N-459011

Notes:

Impurities verified against analytical standards traceable to NIST by weight and/or analysis.



Approved for Release

Page 1 of 16-101521404-1



Praxair
5700 South Alameda Street
Los Angeles, CA 90058
Tel: (323) 585-2154 Fax: (714) 542-6689
PGVPID: F22015

DocNumber: 000081344

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

PRAXAIR WHSE VANCOUVER WA
603 SE VICTORY AVE
VANCOUVER WA 986610

Praxair Order Number: 31502729
Customer P. O. Number: 05574704
Customer Reference Number:

Fill Date: 6/15/2015
Part Number: NI CD17COBE-AS
Lot Number: 109516602
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:	6/26/2023	NIST Traceable
Cylinder Number:	CC350241	Analytical Uncertainty:
16.89 %	CARBON DIOXIDE	± 0.3 %
4.29 %	CARBON MONOXIDE	± 0.4 %
16.94 %	OXYGEN	± 0.3 %
Balance	NITROGEN	

Certification Information: Certification Date: 6/26/2015 Term: 96 Months Expiration Date: 6/26/2023

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Do Not Use this Standard if Pressure is less than 100 PSIG.

O2 responses have been corrected for CO2 interference.

Analytical Data:

(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

1. Component: CARBON DIOXIDE

Requested Concentration: --- 17 % ---
Certified Concentration: 16.89 %
Instrument Used: Horiba VIA-510 S/N 2807014
Analytical Method: NDIR
Last Multipoint Calibration: 6/15/2015

Reference Standard Type: GMIS
Ref. Std. Cylinder #: SA14543
Ref. Std. Conc: 17.89%
Ref. Std. Traceable to SRM #: 1675b
SRM Sample #: 6-F-51
SRM Cylinder #: CAL014538

First Analysis Data:		Date: 6/26/2015	
Z: 0	R: 17.89	C: 16.89	Conc: 16.89
R: 17.89	Z: 0	C: 16.88	Conc: 16.88
Z: 0	C: 16.89	R: 17.89	Conc: 16.89
UOM: %	Mean Test Assay: 16.887 %		

Second Analysis Data:		Date:	
Z: 0	R: 0	C: 0	Conc: 0
R: 0	Z: 0	C: 0	Conc: 0
Z: 0	C: 0	R: 0	Conc: 0
UOM: %	Mean Test Assay: 0 %		

2. Component: CARBON MONOXIDE

Requested Concentration: 4.25 %
Certified Concentration: 4.29 %
Instrument Used: Horiba VIA-510 S/N UB9UCSYX
Analytical Method: NDIR
Last Multipoint Calibration: 6/5/2015

Reference Standard Type: GMIS
Ref. Std. Cylinder #: CC257812
Ref. Std. Conc: 3.96%
Ref. Std. Traceable to SRM #: 2641a
SRM Sample #: 59-C-02
SRM Cylinder #: FF13690

First Analysis Data:		Date: 6/26/2015	
Z: 0	R: 3.96	C: 4.3	Conc: 4.293
R: 3.97	Z: 0	C: 4.3	Conc: 4.293
Z: 0	C: 4.3	R: 3.97	Conc: 4.293
UOM: %	Mean Test Assay: 4.293 %		

Second Analysis Data:		Date:	
Z: 0	R: 0	C: 0	Conc: 0
R: 0	Z: 0	C: 0	Conc: 0
Z: 0	C: 0	R: 0	Conc: 0
UOM: %	Mean Test Assay: 0 %		

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information contained herein exceed the fee established for providing such information.

PREMIUM



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100% Natural
No Additives or Plastics
Low Ash
Made in the USA
By American Workers

Prevents air pollution & global warming

**NET WT. 40 LBS.
18.14 KG**

