



TEST REPORT

TEST OF A PELLET STOVE FOR EMISSIONS AND EFFICIENCY

PER EPA METHODS 28R AND ASTM E2515 and ASTM E2779, MAY 2015

Client:
AICO Spa
Via Kupfer 31, 25036
Palazzolo , Italy

Model name: RV 120 TOUCH, ATENA V, VITORIA V

Attention: Rafaël Sanchez

TESTED BY:

Services Polytests inc.
695-B Gaudette
St-jean-sur-Richelieu, QC, J3B 7S7

TEST DATES:

REPORT DATE: May 19th 2017

Test date: May 12th 2017

Project number: PI-20145

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Tested:

written by:

A handwritten signature in black ink, appearing to read "Maxime Martin".

Maxime Martin

A handwritten signature in black ink, appearing to read "Danick Power".

Danick Power, P. Eng

Verified by third party certifier (CSA):

SUMMARY

1	Introduction	4
1.1	General.....	4
1.2	Test unit information	4
1.3	Results.....	4
1.4	Pretest information.....	4
2	Summary of test results.....	5
2.1	Emissions.....	5
2.2	Average calculation.....	5
2.3	Test facility conditions	6
2.4	Fuel qualities	6
2.5	Dilution tunnel flow rate measurements and sampling data (ASTM E2515).....	6
2.6	Dilution tunnel dual train precision	6
3	Process description.....	7
3.1	Discussion	7
3.2	Unit dimensions	7
3.3	Air supply system	8
3.4	operation during test	9
3.5	Start-up operation	9
3.6	Sampling locations	9
3.7	Drawings	9
3.8	Emissions efficiency testing equipment list	9
4	Sampling methods	10
4.1	Particulate sampling	10
5	Quality assurance	10
5.1	Instrument calibration	10
5.1.1	Gas meters.....	10
5.1.2	SCALES	10
5.1.3	Gas analyzers	10
5.2	Test method procedures.....	10
5.2.1	Leak check procedures	10
5.2.2	Tunnel velocity flow measurement	10
5.2.3	Pm sampling proportionality (ASTM E2515)	11

List of appendix

- APPENDIX 1: Raw data, forms and results
- APPENDIX 2: Proportionality results
- APPENDIX 3: Calibration data
- APPENDIX 4: Unit pre burn
- APPENDIX 5: Participants
- APPENDIX 6: Drawings and specifications
- APPENDIX 7: Operator's manual
- APPENDIX 8: Photographs of test set up
- APPENDIX 9: Test load photographs
- APPENDIX 10: Laboratory Operating Procedures
- APPENDIX 11: Sample calculations
- APPENDIX 12: Volume calculations (NA pellet stove)
- APPENDIX 13: Operating instruction
- APPENDIX 14: Drawing Air flow pattern
- APPENDIX 15: Application for wood stove program

1 INTRODUCTION

1.1 GENERAL

Laboratory

- Location: Services Polytests Inc., 695-B Gaudette St-jean-sur-Richelieu QC, Canada J3B 7S7
- Elevation: 100 feet above sea level

Test program

- Purpose: unit qualification NSPS 2020
- Test date: May 12th 2017
- Test methods used:
 - Particulate emissions: ASTM E2779-10 ; ASTM E2515-11, methods 28R as referred into 40 CFR Part 60 Subpart AAA
 - Efficiency: CSA B415.1-10

1.2 TEST UNIT INFORMATION

General

- Manufacturer: AICO Spa
- Product type: Pellet stove
- Combustion system: blower
- Unit tested: RV 120 TOUCH

Particularities

- Included also other models, only Esthetic differences. All three stoves have the same combustion components, setting, and dimensions.
- Models included: ATENA V, VITORIA V. ref. appendix 6 for detail on

1.3 RESULTS

Emission results obtained

- Weighted average emission rate: 0.6grams/hour
- Efficiency 79.25 %

Conformity: NSPS Phase 2020

1.4 PRETEST INFORMATION

Unit condition: The unit was received by carrier on April 2017. The 50hrs of aging is made in week of May 1st 2017.

Set up

- Venting system type: pellet venting conduit 3inch. diameter
- System height from floor: 15 feet
- Particularities: none

Break in period

- Duration: the unit was received from the manufacturer and ran for at least 50 hours at 50% of the maximum burn rate with adequate documentation of fuel additions and flue and unit temperatures during the week of May 1st 2017.
- Fuel: wood pellet

2 SUMMARY OF TEST RESULTS

2.1 EMISSIONS

Run Number	Date			Run Time (Min.)	Heat Output (Btu/hr)	1st Hour Emissions (g/hr)	Integrated Total (g/hr)	CO Emissions (g/hr)	Overall CO Emissions (g/hr)	Heating Efficiency (% HHV)	Overall Heating Efficiency (% HHV)
		Setting	BR								
1	May 12 th 2017	H	2.48	61	37 800	2.19	0.62	0.62	2.8	77.41	79.25
		M	1.22	120	18 500			3.56		78.81	
		L	0.83	180	12 900			4.52		81.54	
		OA	1.23	361	18 821			2.8		79.25	

2.2 AVERAGE CALCULATION

NA : Pellet Stove tested as ASTM E2779 section 9.4.1 integrate test run

2.3 TEST FACILITY CONDITIONS

Run Number	Room Temperature		Barometric pressure		Relative humidity		Air Velocity	
	Before (F)	After (F)	Before (in.Hg)	After (in.Hg)	Before (%)	After (%)	Before (ft/min)	After (ft/min)
1	73	77	30,121	30,062	35	36,3	7	5

2.4 FUEL QUALITIES

Run Number	Pre-test Load			Test Load			
	Loading Weight Wet Basis (lbs)	Moisture Content Dry Basis (%)	Coal bed Weight (lbs)	Weight Wet Basis (lbs)	Density Wet Basis (lbs/cuft)	Moisture Content Dry Basis (%)	Piece Length (in.)
1	9.0	6.11	na	17.36	na	6.11	na

2.5 DILUTION TUNNEL FLOW RATE MEASUREMENTS AND SAMPLING DATA (ASTM E2515)

Average dilution tunnel measurements				Sample Data			
Run Number	Burn Rate (Min)	Volumetric Flow Rate (dscf/min)	Total Temperatures (°R)	Volume sampled (DSCF)		Particulate catch (mg)	
				1	2	1	2
1	361	175,65	554,27	63,730	62,608	3,80	3,60

2.6 DILUTION TUNNEL DUAL TRAIN PRECISION

Run Number	Sample Ratio		Total Emission (g)		
	Train 1	Train 2	Train 1	Train 2	% Deviation
1	994,97	1012,81	3,80	3,67	1,78%

3 PROCESS DESCRIPTION

3.1 DISCUSSION

At the reception of the unit we do preliminary test run to ensure the unit can reach the limit of the standard.
We use those run for the aging of the unit

3.2 UNIT DIMENSIONS

Baffle

- Location: top of the combustion chamber
- Dimensions: refer to appendix 6 drawings
- Material: Stainless Steel

Bricks

- Location: back and side of the combustion chamber
- Dimensions: back: 5 ½ wide X 15 ½ height ; Sides: 7 wide X 15 ½ height
- Material: Vermiculite

Flue gas exhaust

- Location: back of the unit at 7 ½ from the bottom
- Dimensions: 2 ½ inch (inside diameter)
- Material: Cast Iron

Overall unit dimension

- Overall dimension : 21 ½ depth X 21 wide X 45 ¾ height
- Firebox dimensions : 6 ½ depth X 5 ½ wide at the back X 12 wide at the front X 16 Height
- Burner dimension : 4 depth X 4 wide X 5 height

Gasket

- Refer to appendix 6 for all details

Auger motor

- Manufacturer : MELLOR ELECTRICS
- Model: SC9-100

Convection fan

- Manufacturer : ECOFIT
- Model: 2GDSu15

Exhaust fan

- Manufacturer : EBM-PAPST
- Model: M2E 068-BF

Glass

- Dimension: 272 x 510 mm
- material : Ceramic glass
- Thickness : 5mm

3.3 AIR SUPPLY SYSTEM

Description

model	RV 120 TOUCH - VITTORIA V – ATENA V	
power	rpm blower	Auger motor (2 rpm)
1	1000	1.8 sec. ON / 5.4 sec. OFF
2	1270	2.7 sec. ON / 4.5 sec. OFF
3	1550	3.6 sec. ON / 3.6 sec. OFF
4	1820	4.6 sec. ON / 2.6 sec. OFF
5	2100	5.5 sec. ON / 1.7 sec. OFF

3.4 OPERATION DURING TEST

Run #1

This run was performed May 12th 2017. It lasted 361 minutes and as ASTM E 2779 section 9.4.1 integrate test run obtained at 1.23 kg/hr & emission at 0.62gr/hr. The pellet stove is preheated for 80 min. before the beginning of the test. For the first hour of the test the unit was set at power 5, then for the next 2 hours we set at power 2 to burn less than 50% of the maximum, and for the last portion of the test the pellet stove is set at power 1 for 3hours of minimum burn rate.

- Details: Refer to the front page of each test run data sheets found in appendix for the detailed test sequence showing air supply settings and adjustments, fuel bed adjustments and operational specifics of the test unit.

Test fuel

- Test fuel: wood pellet (model: Hotzpellets),
- Description: The pellet for each test and pre-burn period was sent to Twin ports testing inc for test fuel calorific analysis. This laboratory is ISO/IEC 17025 recognize. For the test fuel property refer to test fuel analysis in the appendix 3 Calibration data.
- Handling and storage: keep all bags in the same room (at 20C ambient and 50% humidity) all wrap together to ensure the stability of the moisture.

3.5 START-UP OPERATION

The complete manufacturer's firing procedure of each burn rate category is fully described in appendix 13.

3.6 SAMPLING LOCATIONS

Particulate samples are collected from the dilution tunnel at a point 15 feet from the tunnel entrance. The tunnel has two elbows and two mixing baffles in the system ahead of the sampling section. The sampling section is a continuous 10 foot section of 6 inch diameter pipe straight over its entire length. Tunnel velocity pressure is determined by a standard pitot tube located 48 inches from the beginning of the sampling section. Thermocouple is installed on the pitot tube to measure the dry bulb temperature. MC is assumed, as allowed, to be 4%. Tunnel samplers are located 56 inches downstream of the pitot tube and 16 inches upstream from the end of this section.

3.7 DRAWINGS

Various drawings of the stack gas sampling train and of dilution tunnel system are found in Appendix 1.

3.8 EMISSIONS EFFICIENCY TESTING EQUIPMENT LIST

The complete test equipment list together with all corresponding calibration data can be found in Appendix 3.

4 SAMPLING METHODS

4.1 PARTICULATE SAMPLING

Particulates were sampled in strict accordance with ASTM E2515. This method uses two identical sampling systems with Gelman A/E 61631 binder free (or equivalent), 47 mm diameter filters. The dryers used in the sample systems are filled with "Drierite" before each test run.

5 QUALITY ASSURANCE

5.1 INSTRUMENT CALIBRATION

5.1.1 GAS METERS

At the conclusion of each test program the gas meters are verified using the reference dry gas meter. This process involves sampling the train operation for 1 cubic foot of volume. With readings made to .01 fr', the resolution is 1 %, giving an accuracy higher than the 2% required by the standard.

5.1.2 SCALES

Before each test program, the different scales used are checked with traceable calibration weights to ensure their accuracy.

5.1.3 GAS ANALYZERS

The continuous analyzers are zeroed and spanned before each test with NBS traceable gases. A mid-scale multi-component calibration gas is then analyzed (values are recorded). At the conclusion of a test, the instruments are checked again with zero, span and calibration gases (values are recorded only). The drift in each meter is then calculated and must not exceed 5% of the scale used for the test.

5.2 TEST METHOD PROCEDURES

5.2.1 LEAK CHECK PROCEDURES

Before and after each test, each sample train is tested for leaks. Leakage rates are measured and must not exceed 0.02 CFM or 4% of the sampling rate. Leak checks are performed checking the entire sampling train. Pre-test and post-test leak checks are conducted with a vacuum of 5 inches of mercury. Vacuum is monitored during each test and the highest vacuum reached is then used for the post test vacuum value. If leakage limits are not met, the test run is rejected. During these tests, the vacuum is typically less than 2 inches of mercury. Thus, leakage rates reported are expected to be much higher than actual leakage during the tests.

5.2.2 TUNNEL VELOCITY FLOW MEASUREMENT

The tunnel velocity is calculated from a center point pitot tube signal multiplied by an adjustment factor. This factor is determined by a traverse of the tunnel as prescribed in EPA Method 1. Final tunnel velocities and flow rates are calculated from EPA Method 2, Equation 6.9 and 6.10. (Tunnel cross sectional area is the average from both lines of traverse.)

Pitot tubes are cleaned before each test and leak checks are conducted after each test.

5.2.3 PM SAMPLING PROPORTIONALITY (ASTM E2515)

Proportionalities were calculated in accordance with ASTM E2515. The data and results are found in appendix.

APPENDIX 1: Raw data, forms and results

Paramètres

Tous les facteurs de corrections et autres paramètres qui peuvent être modifiés par l'utilisateur du fichier sont regroupés ici.

Code verrouillage: RAV

Description du test

Test standard	EPA
Run #	1
Date	12-05-2017
Technicien	m.m
Project #	pi 20145

Description de l'unité

Manufacturier	ravelli	
Modèle	RV 120	
Combustion system	Pellet	
Appliance type	pellet stove	
Firebox volume	na	cu ft.
Appliance weight empty	na	lbs
Appliance weight full	na	lbs

Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	na	BTU/h Donnée fournie par le manfacturier
Targeted category		
Targeted output	na	BTU/h
Cp steel	na	BTU/lb-°F

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,987	Dimensionless
Equipment number (DGM #1):	EM-178	
Calibration Factor (DGM #2):	0,996	Dimensionless
Equipment number (DGM #2):	EM-179	
Calibration Factor (DGM #3):	0,986	
Equipment number (DGM #3):	EM-070	Dimensionless

Tunnel

Targeted tunnel flow rate	140	scfm
Tunnel diameter	6	in.
Molecular weight	28,78	May be assumed to be 28,78 (EPA) Si B-415 = 29
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu.	pi 20145
Date	12-05-2017
Technicien	m.m

Fuel data

Fuel type	Dimension
Fuel specie	Other
HHV	20294,0 kJ/kg
%C	50,47
%H	6,08
%O	42,31
%Ash	0,29
HHV	8725,0 Btu/lb
LHV	7631,0 Btu/lb

Default Fuel Values		
	D. Fir	Oak/Maple
HHV	19 810	19 887
%C	48,73	50
%H	6,87	6,6
%O	43,9	42,9
%Ash	0,5	0,5
HHV (Btu/lb)	8519	8552
LHV (Btu/lb)	7451	7480

	Start	End
Barometer (kPa):	102	101,8
Barometer (in.Hg):	30,120589	30,061529
Dry Bulb (F):	71,42	76,82
Humidity (%):	35	36,3
Air velocity (ft/min)	7	5

DGM #1	Final: ##### cuft
	Initial: ##### cuft
DGM #2	Final: ##### cuft
	Initial: ##### cuft

DGM room	
----------	--

Final: 507124,450	Liter
Initial: 505229,440	Liter
Final: 427926,060	Liter
Initial: 426083,560	Liter

Final: 1071,620	cuft
Initial: 990,910	cuft

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent

114

Autres données à rentrer: dans preload data, load data, traverse et filter set weight

Project nu.	pi 20145
Date	12-05-2017
Technicien	m.m

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
-------	-------	-------

####	#####	#####
------	-------	-------

* For boilers, a loading density factor of 10 lb/ft³ is applied

Load Volume: cu. ft

Loading Density: #VALEUR! lbs./ft3

Number of Spaces:

Spacer weight: lbs

Load Density (wet): #DIV/0! lbs./ft3
Dry Wood Density: #DIV/0! lbs./ft3

Piece Size (in):			Weight lbs	Meter Moisture Content					Ave. MC x	Volume	Ave. MC
Thick	Wide	:Length		Dry Uncorrected %					Weight	Cubic Inches	%
			17,36	6,11					106,0696	0,00	6,1
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
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										0,00	
										0,00	
										0,00	
								SUM MCx	106,0696		6,1 %

Test Load Weight: 17,36 lbs.

Dry Weight: kg.

Average Moisture Content: %

Dry:	6,11	Dry(EPA)	6,11
		Dry(B415)	6,11

6,11
Must be 19-25

Wet:
must be 15,2-22

Coal Bed Range: lbs. to

4,3 lbs.

TEST CHARGE:

Coal bed weight: 42,58

lbs.

Project nu.	pi 20145
Date	12-05-2017
Technicien	m.m

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,22 in. H2O
 Barometer: 29,900 in. Hg

Pour un tunnel de 12" et plus, prendre 6 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center			0,0000
B center			0,0000
A1			0,0000
A2			0,0000
A3			0,0000
A4			0,0000
A5			0,0000
A6			0,0000
B1			0,0000
B2			0,0000
B3			0,0000
B4			0,0000
B5			0,0000
B6			0,0000
AVERAGE	#DIV/0!	#DIV/0!	0,0000

PITOT CONSTANT=
0,943

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,061	70,50	0,2470
B center	0,062	70,66	0,2490
A1	0,050	70,48	0,2236
A2	0,054	70,54	0,2324
A3	0,053	70,42	0,2302
A4	0,051	70,64	0,2258
B1	0,052	70,690	0,2280
B2	0,055	70,610	0,2345
B3	0,056	70,660	0,2366
B4	0,053	70,620	0,2302
AVERAGE	0,0547	63,5320	0,2337

Project nu.	pi 20145
Date	12-05-2017
Technicien	m.m

Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	1	201	530	10	9	531	532	22	20	533	534	53	556		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,4491	0,1285	0,1299	10,9072	61,3835	0,1291	0,1281	10,7872	108,8330	0,1281	0,1280	10,2509	0,1278	11/05/2017	18:30
Before (6)	61,4492	0,1286	0,1300	10,9071	61,3835	0,1290	0,1280	10,7872	108,8429	0,1282	0,1279	10,2508	0,1279	12/05/2017	08:30
After (1)	61,4495	0,1297	0,1297	10,9096	61,3841	0,1297	0,1274	10,7895	108,8438	0,1302	0,1277	10,2539	0,1280	12/05/2017	16:00
After (2)	61,4494	0,1297	0,1297	10,9083	61,3841	0,1297	0,1274	10,7886	108,8438	0,1302	0,1277	10,2518	0,1280	16/05/2017	08:00
After (3)	61,4494	0,1297	0,1297	10,9083	61,3841	0,1297	0,1274	10,7882	108,8438	0,1302	0,1277	10,2518	0,1280	17/05/2017	08:00
After (4)	61,4494	0,1297	0,1297	10,9083	61,3841	0,1297	0,1274	10,7882	108,8438	0,1302	0,1277	10,2518	0,1280	19/05/2017	08:00
After (5)															
After (6)	61,4494	0,1297	0,1297	10,9083	61,3841	0,1297	0,1274	10,7882	108,8438	0,1302	0,1277	10,2518	0,1280	19/05/2017	08:00
Difference	0,0002	0,0011	-0,0003	0,0012	0,0006	0,0007	-0,0006	0,0010	0,0009	0,0020	-0,0002	0,0010	0,0001		
Total (mg)		2,2				3,9				3,7			0,1		
Total ajusté (mg)		2,10				3,80				3,60					

Project nu.	pi 20145
Date	12-05-2017
Technicien	M.M

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 0,62 g/hr

Burn Rate : 1,233 Dry kg/hr

Test Duration: 361 min

PRESSURE FACTOR: DGM 1 0,97873
DGM 2 0,98035
DGM 3 1,00572

BAROMETRIC PRESSURE
Average: 30,091059 in Hg
Start: 30,120589 in Hg
End: 30,061529 in Hg

TEMPERATURE FACTORS DGM 1 0,98583
DGM 2 0,98544
DGM 3 0,98772

DGM CONTROLLER VALUES

DGM 1 Final: 17908,931 Cuft
Initial: 17842,010 Cuft

VOLUMES SAMPLED DGM 1 63,730 SCft
DGM 2 62,608 SCft
DGM 3 79,052 SCft

DGM 2 Final: 15112,067 Cuft
Initial: 15046,999 Cuft

DGM #3 Final: 1071,620 Cuft
Initial: 990,910 Cuft

TOTAL TUNNEL VOLUME : 63410

TEMPERATURES

SAMPLE RATIOS
Sample Train 1: 994,971
Sample Train 2: 1012,808

DGM 1 535,592 °R
DGM 2 535,803 °R

Paticulate concentration
Sample Train 1 0,000061 g/dscf
Sample Train 2 0,000059 g/dscf
Room 0,000001 g/dscf

CALIBRATION FACTORS

DGM 1 0,9870
DGM 2 0,9960
DGM #3 0,9860

TUNNEL FLOW RATE: 175,651 Dscfm

TOTAL EMISSIONS
Sample Train 1 3,80 g
Sample Train 2 3,67 g

PARTICULATE CATCH
Total Sample Train 1: 3,90 mg
Total Sample Train 2: 3,70 mg
Total Sample Train 1 1st hour: 2,20 mg

EMISSION RATES
Sample Train 1 0,63 g/hr
Sample Train 2 0,61 g/hr

1st hour emission rate 2,19 g/hr

DEVIATION: 1,78%

Cs Train 1 Train 2
6,12E-05 5,90978E-05

Average Stove Temperature: #####				Min: 85,15				
Moisture content of wood (wet basis): 0,00				Max: 112,23				
		Average	0,01	5,75	#DIV/0!	266,54	74,57	92,09
*		*	*	*	*	*1	*2	*3
Elapsed		Weight				Flue	Room	Tunnel
Time	Raw data row	Remaining	CO	CO ₂	O ₂	Gas	Temp	Dry Bulb
min		lbs	%	%	%	°F	°F	°F
0,00	114,00	17,4	0,0	9,1	0,0	409,5	73,4	109,7
1,0	115,0	17,3	0,0	8,5	0,0	409,1	73,2	109,9
2,0	116,0	17,2	0,0	7,4	0,0	408,6	73,5	109,8
3,0	117,0	17,1	0,0	8,7	0,0	409,7	73,5	110,1
4,0	118,0	17,1	0,0	9,7	0,0	410,8	73,6	110,0
5,0	119,0	17,0	0,0	9,2	0,0	411,5	73,7	110,2
6,0	120,0	16,8	0,0	10,7	0,0	412,6	73,8	110,0
7,0	121,0	16,8	0,0	8,1	0,0	412,5	73,8	110,1
8,0	122,0	16,6	0,0	8,8	0,0	413,1	73,6	110,2
9,0	123,0	16,6	0,0	7,9	0,0	412,6	73,7	110,3
10,0	124,0	16,4	0,0	9,6	0,0	413,1	73,9	110,2
11,0	125,0	16,3	0,0	9,2	0,0	413,1	74,0	110,2
12,0	126,0	16,2	0,0	7,8	0,0	411,9	74,0	110,0
13,0	127,0	16,1	0,0	9,7	0,0	412,2	74,0	110,5
14,0	128,0	16,1	0,0	9,7	0,0	412,8	74,1	110,3
15,0	129,0	16,0	0,0	8,0	0,0	412,6	74,2	110,4
16,0	130,0	15,9	0,0	8,4	0,0	411,8	74,0	110,6
17,0	131,0	15,8	0,0	10,4	0,0	412,8	74,3	110,7
18,0	132,0	15,7	0,0	9,5	0,0	413,5	74,2	110,8
19,0	133,0	15,6	0,0	9,2	0,0	414,1	74,4	111,1
20,0	134,0	15,5	0,0	8,2	0,0	414,2	74,3	110,9
21,0	135,0	15,4	0,0	9,7	0,0	414,7	74,3	111,0
22,0	136,0	15,3	0,0	9,4	0,0	415,2	74,5	111,1
23,0	137,0	15,2	0,0	9,7	0,0	414,7	74,5	110,7
24,0	138,0	15,1	0,0	9,5	0,0	415,6	74,3	110,7
25,0	139,0	15,0	0,0	9,0	0,0	416,3	74,4	111,2
26,0	140,0	14,9	0,0	9,2	0,0	415,5	74,5	110,8
27,0	141,0	14,7	0,0	9,9	0,0	416,2	74,7	111,2
28,0	142,0	14,7	0,0	9,5	0,0	415,5	74,7	111,1
29,0	143,0	14,6	0,0	8,8	0,0	415,2	74,7	111,0
30,0	144,0	14,5	0,0	10,9	0,0	416,6	74,8	111,2
31,0	145,0	14,4	0,0	9,4	0,0	416,7	74,5	111,4
32,0	146,0	14,3	0,0	7,5	0,0	415,2	74,7	111,1
33,0	147,0	14,2	0,0	9,3	0,0	415,7	74,7	111,3
34,0	148,0	14,1	0,0	9,6	0,0	416,0	74,7	111,4
35,0	149,0	13,9	0,0	7,4	0,0	415,5	74,8	111,3
36,0	150,0	13,9	0,0	10,4	0,0	416,5	74,8	111,4
37,0	151,0	13,8	0,0	9,0	0,0	415,8	74,9	111,3
38,0	152,0	13,6	0,0	10,1	0,0	416,7	74,9	111,3
39,0	153,0	13,6	0,0	7,6	0,0	415,1	74,9	111,1
40,0	154,0	13,4	0,0	8,8	0,0	415,2	74,9	111,6
41,0	155,0	13,4	0,0	9,6	0,0	415,7	74,9	111,5
42,0	156,0	13,3	0,0	9,0	0,0	415,7	74,9	111,3
43,0	157,0	13,2	0,0	9,1	0,0	416,1	75,0	111,7
44,0	158,0	13,1	0,0	8,8	0,0	415,7	75,1	111,7
45,0	159,0	12,9	0,0	9,2	0,0	416,1	75,0	111,4
46,0	160,0	12,9	0,0	8,6	0,0	415,8	75,0	111,7
47,0	161,0	12,7	0,0	9,8	0,0	417,2	75,1	111,5
48,0	162,0	12,7	0,0	7,8	0,0	415,6	75,1	111,6
49,0	163,0	12,6	0,0	9,2	0,0	415,7	75,1	111,2
50,0	164,0	12,5	0,0	7,8	0,0	413,4	75,1	111,3
51,0	165,0	12,4	0,0	7,8	0,0	412,6	75,1	111,5
52,0	166,0	12,3	0,0	8,8	0,0	414,4	75,1	112,2
53,0	167,0	12,2	0,0	7,2	0,0	412,2	75,2	111,8
54,0	168,0	12,1	0,0	8,1	0,0	411,2	75,2	111,5
55,0	169,0	12,1	0,0	9,4	0,0	411,7	75,1	111,9
56,0	170,0	12,0	0,0	8,4	0,0	409,9	75,2	111,1
57,0	171,0	11,9	0,0	7,3	0,0	410,1	75,1	111,2
58,0	172,0	11,8	0,0	9,4	0,0	410,8	75,3	111,2
59,0	173,0	11,7	0,0	8,9	0,0	409,7	75,1	111,0
60,0	174,0	11,6	0,0	8,5	0,0	409,7	75,0	111,3
61,0	175,0	11,5	0,0	9,8	0,0	410,9	74,7	111,0
62,0	176,0	11,3	0,0	9,3	0,0	402,4	75,2	108,5
63,0	177,0	11,3	0,0	8,5	0,0	384,3	75,1	103,0
64,0	178,0	11,2	0,0	7,6	0,0	371,4	75,3	100,7
65,0	179,0	11,2	0,0	5,8	0,0	361,8	75,1	99,6

66,0	180,0	11,1	0,0	5,4	0,0	354,5	75,0	98,9
67,0	181,0	11,1	0,0	5,8	0,0	347,8	75,2	98,2
68,0	182,0	11,1	0,0	5,1	0,0	341,7	75,0	97,3
69,0	183,0	11,0	0,0	7,1	0,0	336,5	75,2	96,5
70,0	184,0	11,0	0,0	6,0	0,0	331,9	75,0	96,4
71,0	185,0	10,9	0,0	7,0	0,0	328,3	75,2	95,8
72,0	186,0	10,9	0,0	5,6	0,0	324,3	75,0	95,0
73,0	187,0	10,8	0,0	5,1	0,0	320,4	74,7	94,9
74,0	188,0	10,8	0,0	5,8	0,0	316,9	75,1	94,4
75,0	189,0	10,8	0,0	5,4	0,0	313,3	75,0	94,1
76,0	190,0	10,7	0,0	4,8	0,0	309,8	74,8	93,5
77,0	191,0	10,7	0,0	5,9	0,0	306,8	74,8	93,2
78,0	192,0	10,6	0,0	5,6	0,0	303,8	74,5	93,1
79,0	193,0	10,6	0,0	6,0	0,0	301,9	74,5	93,0
80,0	194,0	10,5	0,0	6,4	0,0	300,1	74,4	92,5
81,0	195,0	10,5	0,0	5,8	0,0	298,3	74,4	92,2
82,0	196,0	10,4	0,0	5,7	0,0	296,2	74,3	92,3
83,0	197,0	10,4	0,0	4,5	0,0	293,8	74,1	91,9
84,0	198,0	10,4	0,0	4,7	0,0	291,6	74,1	91,8
85,0	199,0	10,3	0,0	6,0	0,0	289,8	74,3	91,5
86,0	200,0	10,3	0,0	5,5	0,0	288,5	74,3	91,6
87,0	201,0	10,2	0,0	5,3	0,0	287,5	74,3	91,7
88,0	202,0	10,2	0,0	5,4	0,0	285,7	74,1	91,6
89,0	203,0	10,2	0,0	5,1	0,0	284,7	74,2	91,4
90,0	204,0	10,1	0,0	5,5	0,0	283,9	74,2	91,4
91,0	205,0	10,0	0,0	5,3	0,0	282,8	74,1	91,1
92,0	206,0	10,0	0,0	6,2	0,0	281,3	73,8	90,8
93,0	207,0	10,0	0,0	6,2	0,0	280,7	73,9	90,7
94,0	208,0	9,9	0,0	7,8	0,0	280,5	73,9	90,9
95,0	209,0	9,8	0,0	6,4	0,0	279,7	73,8	90,5
96,0	210,0	9,8	0,0	6,4	0,0	278,7	73,8	90,4
97,0	211,0	9,7	0,0	5,1	0,0	277,4	73,4	90,3
98,0	212,0	9,7	0,0	6,8	0,0	277,4	73,8	90,3
99,0	213,0	9,6	0,0	5,7	0,0	276,7	73,8	90,2
100,0	214,0	9,5	0,0	5,8	0,0	276,4	73,6	90,2
101,0	215,0	9,5	0,0	6,4	0,0	275,9	73,7	90,1
102,0	216,0	9,5	0,0	6,9	0,0	275,8	73,9	90,1
103,0	217,0	9,4	0,0	5,3	0,0	274,7	73,6	90,1
104,0	218,0	9,4	0,0	4,5	0,0	273,6	73,6	89,8
105,0	219,0	9,3	0,0	5,0	0,0	273,3	73,3	89,7
106,0	220,0	9,2	0,0	6,2	0,0	272,5	73,3	89,8
107,0	221,0	9,2	0,0	5,5	0,0	271,7	73,4	89,6
108,0	222,0	9,2	0,0	6,6	0,0	272,7	73,1	90,1
109,0	223,0	9,1	0,0	6,3	0,0	272,3	72,6	89,7
110,0	224,0	9,1	0,0	5,8	0,0	271,7	73,4	89,5
111,0	225,0	9,1	0,0	5,6	0,0	270,9	73,5	89,6
112,0	226,0	9,0	0,0	5,3	0,0	270,1	73,7	89,6
113,0	227,0	8,9	0,0	4,2	0,0	277,2	73,4	91,3
114,0	228,0	8,9	0,0	4,5	0,0	271,4	73,6	90,4
115,0	229,0	8,8	0,0	4,5	0,0	269,5	72,9	90,2
116,0	230,0	8,8	0,0	6,4	0,0	269,5	73,2	90,2
117,0	231,0	8,7	0,0	5,9	0,0	269,5	73,2	90,0
118,0	232,0	8,7	0,0	5,5	0,0	268,7	73,7	90,1
119,0	233,0	8,7	0,0	5,2	0,0	268,4	73,5	90,0
120,0	234,0	8,6	0,0	5,5	0,0	267,7	73,7	90,1
121,0	235,0	8,6	0,0	4,7	0,0	266,4	73,9	90,3
122,0	236,0	8,5	0,0	5,1	0,0	265,5	73,7	90,4
123,0	237,0	8,5	0,0	5,3	0,0	264,7	73,8	90,4
124,0	238,0	8,5	0,0	4,6	0,0	264,4	73,7	90,7
125,0	239,0	8,4	0,0	4,6	0,0	263,9	73,8	90,6
126,0	240,0	8,4	0,0	6,0	0,0	263,9	73,7	90,4
127,0	241,0	8,3	0,0	6,2	0,0	264,0	73,8	90,6
128,0	242,0	8,3	0,0	4,4	0,0	262,7	74,0	90,2
129,0	243,0	8,2	0,0	5,8	0,0	263,0	74,0	90,3
130,0	244,0	8,2	0,0	5,9	0,0	262,8	73,9	90,4
131,0	245,0	8,1	0,0	5,9	0,0	263,1	74,1	90,2
132,0	246,0	8,1	0,0	5,7	0,0	263,4	74,1	90,4
133,0	247,0	8,0	0,0	5,0	0,0	262,8	74,1	90,4
134,0	248,0	8,0	0,0	5,1	0,0	262,7	73,9	90,4
135,0	249,0	7,9	0,0	5,3	0,0	261,8	73,9	90,3
136,0	250,0	7,9	0,0	4,4	0,0	261,3	74,1	90,5
137,0	251,0	7,8	0,0	5,9	0,0	261,9	74,0	90,6
138,0	252,0	7,8	0,0	4,8	0,0	260,7	74,0	90,5

139,0	253,0	7,8	0,0	5,5	0,0	260,1	74,2	90,5
140,0	254,0	7,7	0,0	5,2	0,0	259,8	74,0	90,6
141,0	255,0	7,7	0,0	5,9	0,0	260,3	74,1	90,6
142,0	256,0	7,6	0,0	5,9	0,0	260,1	74,1	90,6
143,0	257,0	7,6	0,0	5,0	0,0	259,7	74,2	90,7
144,0	258,0	7,5	0,0	6,1	0,0	260,0	74,2	90,5
145,0	259,0	7,5	0,0	6,3	0,0	260,6	74,1	90,7
146,0	260,0	7,4	0,0	5,9	0,0	261,2	74,5	90,8
147,0	261,0	7,4	0,0	5,7	0,0	260,6	74,3	90,8
148,0	262,0	7,4	0,0	6,1	0,0	260,5	74,3	90,9
149,0	263,0	7,3	0,0	5,8	0,0	260,7	74,1	90,9
150,0	264,0	7,3	0,0	4,1	0,0	258,9	74,3	90,8
151,0	265,0	7,2	0,0	4,5	0,0	258,3	74,2	91,0
152,0	266,0	7,2	0,0	6,2	0,0	259,3	74,3	91,0
153,0	267,0	7,1	0,0	5,9	0,0	259,3	74,3	91,2
154,0	268,0	7,1	0,0	5,8	0,0	259,5	74,4	91,0
155,0	269,0	7,1	0,0	5,7	0,0	258,8	74,5	91,0
156,0	270,0	7,0	0,0	5,4	0,0	258,6	74,6	91,1
157,0	271,0	6,9	0,0	4,6	0,0	258,0	74,5	91,3
158,0	272,0	6,9	0,0	4,6	0,0	257,8	74,6	91,3
159,0	273,0	6,8	0,0	5,9	0,0	258,1	74,6	91,3
160,0	274,0	6,8	0,0	6,1	0,0	258,2	74,4	91,4
161,0	275,0	6,8	0,0	6,1	0,0	258,4	74,6	91,2
162,0	276,0	6,7	0,0	6,9	0,0	259,2	74,6	91,5
163,0	277,0	6,6	0,0	5,1	0,0	259,0	74,5	91,0
164,0	278,0	6,6	0,0	4,7	0,0	258,2	74,6	91,2
165,0	279,0	6,6	0,0	6,7	0,0	258,8	74,6	91,2
166,0	280,0	6,5	0,0	5,3	0,0	259,0	74,5	91,3
167,0	281,0	6,4	0,0	5,6	0,0	259,0	74,5	91,2
168,0	282,0	6,4	0,0	5,9	0,0	259,7	74,3	91,3
169,0	283,0	6,3	0,0	5,8	0,0	259,5	74,3	91,1
170,0	284,0	6,3	0,0	5,1	0,0	259,3	74,3	91,2
171,0	285,0	6,2	0,0	5,6	0,0	259,5	74,7	91,2
172,0	286,0	6,2	0,0	4,9	0,0	259,1	74,7	90,9
173,0	287,0	6,1	0,0	6,0	0,0	273,6	74,6	95,1
174,0	288,0	6,1	0,1	3,3	0,0	263,2	74,3	91,8
175,0	289,0	6,1	0,0	5,0	0,0	261,2	74,6	91,5
176,0	290,0	6,0	0,0	5,7	0,0	260,8	74,7	91,5
177,0	291,0	6,0	0,0	6,2	0,0	262,0	74,5	91,6
178,0	292,0	6,0	0,0	6,0	0,0	261,4	74,6	91,3
179,0	293,0	5,9	0,0	5,1	0,0	260,6	74,5	91,2
180,0	294,0	5,9	0,0	5,4	0,0	260,6	74,6	91,3
181,0	295,0	5,8	0,0	6,7	0,0	259,8	74,3	91,0
182,0	296,0	5,7	0,0	6,5	0,0	251,1	73,9	89,2
183,0	297,0	5,7	0,0	5,4	0,0	247,6	74,7	89,1
184,0	298,0	5,7	0,0	4,3	0,0	244,6	74,7	88,7
185,0	299,0	5,7	0,0	5,1	0,0	242,5	74,6	88,3
186,0	300,0	5,6	0,0	4,7	0,0	239,9	74,6	88,1
187,0	301,0	5,6	0,0	5,2	0,0	238,5	74,5	88,1
188,0	302,0	5,5	0,0	4,6	0,0	236,3	74,5	87,8
189,0	303,0	5,5	0,0	4,2	0,0	234,1	74,7	87,5
190,0	304,0	5,5	0,0	3,7	0,0	232,4	74,6	87,5
191,0	305,0	5,5	0,0	4,9	0,0	230,6	74,4	87,3
192,0	306,0	5,4	0,0	3,2	0,0	229,0	74,4	87,3
193,0	307,0	5,4	0,0	5,3	0,0	228,0	74,6	87,2
194,0	308,0	5,4	0,0	4,8	0,0	226,0	74,6	86,9
195,0	309,0	5,3	0,0	5,3	0,0	225,4	74,5	87,0
196,0	310,0	5,3	0,0	5,0	0,0	223,9	74,4	86,9
197,0	311,0	5,3	0,0	5,6	0,0	223,3	74,5	87,0
198,0	312,0	5,2	0,0	4,4	0,0	222,5	74,0	86,8
199,0	313,0	5,2	0,0	5,0	0,0	221,3	74,3	86,7
200,0	314,0	5,2	0,0	4,0	0,0	220,5	74,0	86,6
201,0	315,0	5,2	0,0	4,6	0,0	219,4	74,6	86,3
202,0	316,0	5,1	0,0	3,4	0,0	218,4	74,6	86,4
203,0	317,0	5,1	0,1	3,3	0,0	217,2	74,3	86,5
204,0	318,0	5,1	0,0	3,6	0,0	216,2	74,5	86,4
205,0	319,0	5,0	0,0	4,9	0,0	215,8	74,1	86,2
206,0	320,0	5,0	0,0	5,1	0,0	215,5	74,5	86,4
207,0	321,0	5,0	0,0	4,7	0,0	215,0	74,6	86,2
208,0	322,0	4,9	0,0	4,2	0,0	214,0	74,5	86,1
209,0	323,0	4,9	0,0	4,7	0,0	213,3	74,8	86,0
210,0	324,0	4,9	0,0	3,6	0,0	212,6	74,7	86,1
211,0	325,0	4,9	0,0	4,8	0,0	212,3	74,7	86,0

212,0	326,0	4,8	0,0	4,6	0,0	211,8	74,5	85,7
213,0	327,0	4,8	0,0	4,3	0,0	211,4	74,3	85,9
214,0	328,0	4,7	0,0	4,9	0,0	211,2	74,5	85,9
215,0	329,0	4,8	0,0	4,2	0,0	210,7	74,4	85,7
216,0	330,0	4,7	0,0	3,7	0,0	210,3	74,4	86,0
217,0	331,0	4,7	0,0	5,3	0,0	210,3	73,9	85,6
218,0	332,0	4,6	0,0	5,9	0,0	210,0	74,3	85,6
219,0	333,0	4,6	0,0	4,8	0,0	210,1	74,3	85,6
220,0	334,0	4,6	0,0	4,2	0,0	209,5	74,2	85,6
221,0	335,0	4,5	0,0	5,1	0,0	209,0	74,5	85,6
222,0	336,0	4,5	0,0	4,7	0,0	209,3	74,2	85,5
223,0	337,0	4,4	0,0	4,7	0,0	208,5	74,0	85,6
224,0	338,0	4,4	0,0	3,6	0,0	208,0	74,2	85,6
225,0	339,0	4,4	0,1	3,1	0,0	207,3	74,6	85,7
226,0	340,0	4,4	0,0	3,7	0,0	206,8	74,4	85,5
227,0	341,0	4,3	0,0	5,1	0,0	207,6	74,7	85,7
228,0	342,0	4,3	0,0	6,1	0,0	208,1	74,6	85,7
229,0	343,0	4,3	0,0	3,9	0,0	207,3	74,2	85,4
230,0	344,0	4,2	0,0	5,0	0,0	207,0	74,5	85,5
231,0	345,0	4,2	0,0	3,9	0,0	206,5	74,3	85,5
232,0	346,0	4,2	0,0	6,1	0,0	207,0	74,8	85,5
233,0	347,0	4,1	0,0	3,6	0,0	206,5	74,6	85,4
234,0	348,0	4,1	0,0	3,9	0,0	215,8	74,4	86,5
235,0	349,0	4,1	0,1	3,3	0,0	210,7	74,2	85,7
236,0	350,0	4,0	0,0	4,5	0,0	209,2	73,7	85,8
237,0	351,0	4,0	0,0	4,8	0,0	208,1	74,2	85,5
238,0	352,0	4,0	0,1	3,4	0,0	206,6	74,0	85,5
239,0	353,0	4,0	0,0	5,8	0,0	207,2	74,2	85,7
240,0	354,0	3,9	0,0	5,4	0,0	206,9	73,7	85,5
241,0	355,0	3,9	0,0	4,2	0,0	206,1	73,9	85,3
242,0	356,0	3,9	0,0	3,7	0,0	205,3	74,3	85,5
243,0	357,0	3,8	0,0	4,9	0,0	205,9	74,0	85,5
244,0	358,0	3,8	0,0	4,7	0,0	205,1	74,5	85,4
245,0	359,0	3,8	0,0	3,6	0,0	204,3	74,2	85,3
246,0	360,0	3,8	0,0	3,7	0,0	203,6	74,0	85,2
247,0	361,0	3,8	0,0	3,6	0,0	203,4	73,8	85,4
248,0	362,0	3,7	0,0	4,9	0,0	203,2	74,1	85,5
249,0	363,0	3,7	0,0	4,0	0,0	202,8	74,0	85,4
250,0	364,0	3,7	0,0	5,2	0,0	202,5	74,2	85,3
251,0	365,0	3,6	0,0	4,2	0,0	202,6	74,1	85,3
252,0	366,0	3,6	0,0	5,2	0,0	202,3	74,2	85,1
253,0	367,0	3,6	0,0	4,5	0,0	202,0	74,1	85,4
254,0	368,0	3,5	0,0	4,5	0,0	202,2	74,0	85,3
255,0	369,0	3,5	0,0	4,4	0,0	201,8	73,9	85,2
256,0	370,0	3,5	0,0	3,5	0,0	201,2	74,2	85,4
257,0	371,0	3,5	0,1	3,6	0,0	201,4	74,2	85,4
258,0	372,0	3,4	0,0	4,0	0,0	201,5	74,2	85,4
259,0	373,0	3,4	0,0	4,3	0,0	201,5	74,2	85,4
260,0	374,0	3,4	0,0	3,8	0,0	201,4	74,4	85,5
261,0	375,0	3,4	0,0	4,3	0,0	200,7	74,4	85,3
262,0	376,0	3,3	0,0	4,1	0,0	200,9	74,5	85,3
263,0	377,0	3,3	0,0	5,5	0,0	201,6	74,5	85,4
264,0	378,0	3,3	0,0	4,8	0,0	200,9	74,6	85,2
265,0	379,0	3,2	0,0	4,5	0,0	201,3	74,6	85,4
266,0	380,0	3,2	0,0	5,3	0,0	201,2	74,7	85,3
267,0	381,0	3,1	0,0	4,6	0,0	201,0	74,7	85,3
268,0	382,0	3,1	0,0	4,8	0,0	200,7	74,6	85,3
269,0	383,0	3,1	0,0	4,0	0,0	200,3	74,8	85,3
270,0	384,0	3,0	0,0	4,3	0,0	200,5	74,7	85,4
271,0	385,0	3,0	0,0	5,4	0,0	201,0	74,7	85,4
272,0	386,0	3,0	0,0	5,6	0,0	201,3	74,6	85,3
273,0	387,0	2,9	0,0	4,6	0,0	200,9	74,7	85,3
274,0	388,0	2,8	0,0	5,2	0,0	201,6	74,6	85,4
275,0	389,0	2,9	0,0	6,8	0,0	202,0	74,6	85,4
276,0	390,0	2,8	0,0	5,6	0,0	202,1	74,7	85,3
277,0	391,0	2,8	0,0	5,7	0,0	202,4	74,7	85,4
278,0	392,0	2,7	0,0	5,1	0,0	202,8	74,8	85,5
279,0	393,0	2,7	0,0	4,7	0,0	202,6	74,8	85,4
280,0	394,0	2,7	0,0	5,8	0,0	202,9	74,9	85,5
281,0	395,0	2,6	0,0	5,4	0,0	203,3	74,9	85,5
282,0	396,0	2,5	0,0	5,5	0,0	203,7	74,9	85,4
283,0	397,0	2,5	0,0	5,4	0,0	204,1	75,0	85,5
284,0	398,0	2,5	0,0	4,3	0,0	203,6	74,9	85,5

285,0	399,0	2,5	0,0	4,0	0,0	203,3	74,9	85,5
286,0	400,0	2,5	0,0	4,6	0,0	203,4	74,9	85,2
287,0	401,0	2,4	0,0	5,5	0,0	203,5	74,7	85,5
288,0	402,0	2,4	0,0	4,4	0,0	203,1	74,7	85,4
289,0	403,0	2,3	0,0	1,0	0,0	203,4	74,7	85,6
290,0	404,0	2,3	0,0	4,8	0,0	202,9	74,9	85,3
291,0	405,0	2,3	0,0	4,3	0,0	202,9	74,9	85,5
292,0	406,0	2,3	0,0	5,0	0,0	202,9	75,0	85,4
293,0	407,0	2,2	0,0	5,9	0,0	203,3	75,0	85,5
294,0	408,0	2,2	0,0	3,7	0,0	216,3	75,1	88,0
295,0	409,0	2,1	0,0	5,9	0,0	210,1	75,1	86,3
296,0	410,0	2,1	0,0	5,1	0,0	207,6	75,1	85,8
297,0	411,0	2,1	0,0	4,8	0,0	206,9	75,0	85,9
298,0	412,0	2,0	0,0	4,6	0,0	206,4	75,2	85,8
299,0	413,0	2,0	0,0	4,9	0,0	205,8	75,1	85,6
300,0	414,0	2,0	0,0	5,1	0,0	205,7	75,2	85,6
301,0	415,0	2,0	0,0	5,9	0,0	205,7	75,1	85,6
302,0	416,0	2,0	0,0	3,9	0,0	204,5	75,2	85,4
303,0	417,0	1,9	0,0	3,8	0,0	204,1	75,1	85,5
304,0	418,0	1,9	0,0	3,8	0,0	203,1	75,2	85,4
305,0	419,0	1,9	0,0	5,0	0,0	203,4	74,9	85,5
306,0	420,0	1,8	0,0	3,5	0,0	202,0	75,1	85,3
307,0	421,0	1,8	0,0	4,0	0,0	201,8	75,2	85,2
308,0	422,0	1,8	0,0	4,1	0,0	201,6	75,3	85,4
309,0	423,0	1,8	0,0	4,9	0,0	202,3	75,2	85,4
310,0	424,0	1,7	0,0	4,7	0,0	202,6	75,3	85,4
311,0	425,0	1,7	0,0	6,4	0,0	202,9	75,4	85,4
312,0	426,0	1,7	0,0	3,8	0,0	202,0	75,4	85,4
313,0	427,0	1,6	0,0	4,4	0,0	202,4	75,0	85,5
314,0	428,0	1,6	0,0	4,7	0,0	202,6	75,2	85,6
315,0	429,0	1,5	0,0	5,1	0,0	202,8	75,2	85,6
316,0	430,0	1,5	0,0	4,9	0,0	202,4	75,0	85,5
317,0	431,0	1,5	0,0	5,8	0,0	202,2	75,3	85,3
318,0	432,0	1,4	0,0	4,0	0,0	201,8	75,5	85,5
319,0	433,0	1,4	0,0	5,5	0,0	202,3	75,1	85,6
320,0	434,0	1,4	0,0	4,5	0,0	201,3	75,5	85,4
321,0	435,0	1,3	0,0	4,5	0,0	201,4	75,3	85,4
322,0	436,0	1,3	0,0	5,5	0,0	201,8	75,4	85,5
323,0	437,0	1,3	0,0	6,4	0,0	202,8	75,4	85,6
324,0	438,0	1,2	0,0	4,4	0,0	202,3	75,4	85,5
325,0	439,0	1,2	0,0	4,9	0,0	202,1	75,4	85,5
326,0	440,0	1,2	0,0	4,4	0,0	201,6	75,3	85,4
327,0	441,0	1,2	0,0	4,3	0,0	201,3	75,1	85,4
328,0	442,0	1,1	0,0	4,6	0,0	201,8	75,4	85,6
329,0	443,0	1,1	0,0	6,2	0,0	202,2	75,5	85,4
330,0	444,0	1,1	0,0	5,6	0,0	202,6	75,4	85,6
331,0	445,0	1,0	0,0	5,0	0,0	202,8	75,5	85,8
332,0	446,0	1,0	0,0	5,5	0,0	203,1	75,6	85,6
333,0	447,0	0,9	0,0	5,2	0,0	203,1	75,5	85,6
334,0	448,0	0,9	0,0	6,2	0,0	203,0	75,4	85,6
335,0	449,0	0,9	0,0	5,6	0,0	202,8	75,6	85,5
336,0	450,0	0,8	0,0	5,1	0,0	202,4	75,5	85,5
337,0	451,0	0,8	0,0	4,4	0,0	202,3	75,6	85,5
338,0	452,0	0,8	0,0	4,1	0,0	202,1	75,6	85,5
339,0	453,0	0,7	0,0	4,7	0,0	202,1	75,7	85,6
340,0	454,0	0,7	0,0	6,1	0,0	202,6	75,3	85,7
341,0	455,0	0,7	0,0	4,8	0,0	202,5	75,6	85,6
342,0	456,0	0,6	0,0	4,4	0,0	202,4	75,6	85,8
343,0	457,0	0,6	0,0	6,2	0,0	202,8	75,6	85,6
344,0	458,0	0,6	0,0	4,6	0,0	202,6	75,8	85,6
345,0	459,0	0,6	0,0	5,2	0,0	202,6	75,8	85,8
346,0	460,0	0,5	0,0	4,1	0,0	202,9	75,9	85,7
347,0	461,0	0,5	0,0	4,9	0,0	202,7	75,9	85,8
348,0	462,0	0,5	0,0	5,0	0,0	202,9	75,6	85,8
349,0	463,0	0,4	0,0	5,4	0,0	203,3	75,7	85,8
350,0	464,0	0,4	0,0	4,6	0,0	203,3	75,6	85,8
351,0	465,0	0,3	0,0	4,3	0,0	203,1	75,8	85,8
352,0	466,0	0,3	0,0	5,5	0,0	203,3	75,7	85,7
353,0	467,0	0,3	0,0	5,6	0,0	203,2	75,6	85,7
354,0	468,0	0,3	0,0	5,4	0,0	213,2	75,9	88,2
355,0	469,0	0,2	0,0	4,1	0,0	211,2	75,8	86,5
356,0	470,0	0,2	0,0	4,1	0,0	207,3	75,8	86,1
357,0	471,0	0,2	0,0	5,4	0,0	206,5	76,0	86,1

358,0	472,0	0,1	0,0	4,4	0,0	205,9	75,9	86,0
359,0	473,0	0,1	0,0	6,2	0,0	206,0	75,9	85,9
360,0	474,0	0,1	0,0	4,9	0,0	206,0	75,9	85,9
361,0	475,0	0,0	0,0	4,8	0,0	205,3	75,9	85,8

Manufacturer: ravelli
Model: RV 120

Run: 1
Project #: pi 20145
Test Duration: 361 min

	HHV	LHV
Eff	79,25%	84,72%
Comb Eff	99,50%	99,50%
HT Eff	79,65%	85,15%
Output	19 840	kJ/h
Burn Rate	1,23	kg/h
Grams CO	17	g
Input	25 036	kJ/h
MC wet	5,76	

Note: In the "Input data", "Calc. % O₂", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a], [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3

Ultimate CO₂
CO_{2-ult} 20,21
F₀
1,029

Overall Heating Efficiency:	79,25%	Air Fuel Ratio (A/F)	
Combustion Efficiency:	99,50%	Dry Molecular Weight (M _d)	29,52
Heat Transfer Efficiency:	79,65%	Dry Moles Exhaust Gas (N _p):	647,24
		Air Fuel Ratio (A/F)	18,60

Heat Output:	18 821 Btu/h	19 840 kJ/h
Heat Input:	23 749 Btu/h	25 036 kJ/h
Burn Duration:	6,02 h	
Burn Rate:	2,72 lb/h	1,234 kg/h
Stack Temp:	281,7 Deg. F	138,7 Deg. C

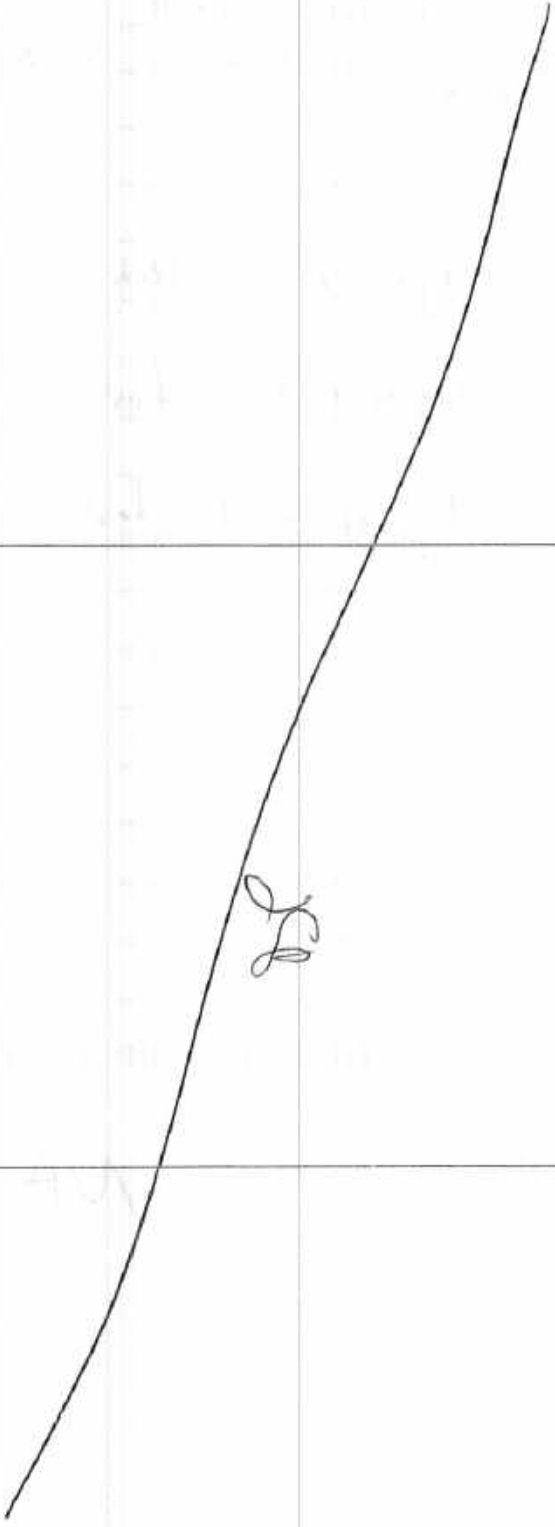
Date: 2012-05-12 Manufacturer: RAVELL Model: RV 120
Project #: PI 20143 Run: 1 Tech: MM Reviewer: DP
PI 20145 MM.

lines 114 5 ^{MM} test max maximum (5) 60 mm
line 124 test medium (2) 120 mm
lines 294 test low (1) 180 mm

TEST LOAD CONFIGURATION

NA

Date: _____ Manufacturer: _____ Model: _____
 Project #: _____ Run: _____ Tech: _____ Reviewer: _____

Side view	Front view	Top view
		

Date: _____ Manufacturer: _____ Model: _____
 Project #: _____ Run: _____ Tech: _____ Reviewer: _____

	ADDITION		SUBTRACTION	
	ft3	Volume	ft3	Volume
V measure				
V ashlip				
%				
V usable				
Usable Firebox: _____				
Test load weight: _____ Minimum: _____ Maximum: _____				
Déviation: _____				

BP

PRE / POST CHECKS

Date: 2017-05-12 Manufacturer: 1 Model: V120
 Project #: PI 20145 Run: 1 Tech: Max Marten Reviewer: DO
PI 20145
m.r.

Moisture Meter Calibration Check:

Facility Conditions:

Air Velocity from less than 2 feet

Smoke Capture Check.....

Picture.....

Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....

Date Dilution Tunnel Cleaned.....

Induced Draft Check (max 0.005 H₂O).....

Traverse before ignition.....

Flow Rate 140 cfm $\pm$ 10%.....

Temperature System:

Ambient (65°-90°F).....

Wood Heater Surface ($\pm$ 125°F).....

Proportional Checks:

Thermocouple check.....

Pitot Clean.....

Pitot verification.....

Sampling Train ID Numbers:

Probe.....

Filter Front.....

Filter Back.....

Filter Thermocouple.....

Filter (<90°F).....

Equipment #	Time	12%	22%
EM-191	7:00	ok	ok

Pre-Test

Post-Test

7 (max 50 Fpm)	5 (max 50 Fpm)
ok	ok
4 sides ok	ok

2017-05-12
2017-05-12
ok
ok

ok

ok	°F
ok	°F

ok
ok
ok

Train 1 st hour	Train 1	Train 2
ok	09	20
201	531	533
530	532	534
h	11	12
ok	ok	ok

SAMPLING EQUIPMENT CHECK OUT

Date: 2017-05-12 Manufacturer: AD Well Model: RV 120
 Project #: PI 20145 Run: 1 Tech: MM Reviewer: RP

Leakage Checks Tunnel Samplers

	System 1 st hour		System 1		System 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	- 15	- 15	- 15	- 15	- 15	- 15
Final 1minute DGM (Liter)	502228, 94	507125, 21	505229, 03	507125, 31	426082, 94	427926, 84
Initial 1minute DGM (Liter)	505228, 93	507125, 21	505229, 02	507125, 30	426082, 94	427926, 84
Change © (Liter)	0.01	φ	0.01	0.01	φ	φ
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	ok	ok	ok	ok	ok	ok

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre Test	Post Test
Vacuum (inches Hg.)	- 5	- 5
Rotometer Reading (mml/min.)	0	0
Flow Rate (lpm)	1.5	1.5
Allowable (.02 x Sample Rate)	30	30
Check OK	ok	ok

Leakage Checks Pitot

Plugged Probe	Pre Test 3 H ₂ O static	Pre Test 0.4-0.5 H ₂ O velocity	Post Test 3 H ₂ O Static	Post Test 0.4-0.5 H ₂ O velocity
Vacuum (inches Hg.)	3	0.4	3	.5
Check OK (no change after 15 sec.)	ok	ok	ok	ok

PRE-TEST SCALE AUDIT

Date: 2013-05-12 Manufacturer: NAVI Model: RV120
 Project #: p1 20145 Run: 1 Tech: mm Reviewer: DB

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	4.4 lbs, Class F	4.4 lbs
Wood	EM-090	4.4 lbs, Class F	4.4 lbs
Analytical	EM-128	100 mg, Class S	100 mg
Analytical	EM-129	200 g, Class S	200 g

LIMITS OF WEIGHT RANGES

ANALYTICAL SCALE: 50%-150% of dry filter weight, ± 0.1 mg
PLATFORM SCALE: 20%-80% of ideal test load weight, ± 0.1 lbs or 1%
WOOD SCALE: 20%-80% of ideal test load weight, ± 0.01 lbs or 1%

Date: 2017-05-12 Manufacturer: RAVELLI Model: RV 120
 Project #: PI 10145 Run: 1 Tech: mm Reviewer: DO

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 102 (KPa.) Static pressure (P_q) 0.20 (inches w.c.)
 Inside diameter: Port A _____ Port B _____
 Tunnel cross sectional area: .1963 ft²
 Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H ₂ O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0.061	70.50
B - Centroid	3.00	3.50	4	0.062	70.66
A-1	0.40	0.50	0.50	0.050	70.48
A-2	1.50	1.75	2	0.054	70.54
A-3	4.50	5.25	6	0.053	70.42
A-4	5.60	6.5	7.5	0.051	70.64
B-1	0.40	0.50	0.50	0.052	70.69
B-2	1.50	1.75	2	0.055	70.61
B-3	4.50	5.25	6	0.056	70.66
B-4	5.60	6.5	7.5	0.053	70.62
				AVERAGE	

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{(T_s)_{avg}}{P_s M_s}}$$

Where,

C_p = pitot tube coefficient, dimension less = 0.99 for standard pitot.

Δ_p = manometer reading (inches H₂O)

T_s = average absolute dilution tunnel temperature (°F + 460)

P_s = absolute dilution tunnel gas pressure or $P_{bar} + P_{qt}$

P_q = static pressure in. H₂O
 { 13.6 }

M_s = 28.56, wet molecular weight of stack gas (alternatively, it may be measured)

K_p = 85.49 pitot tube constant, (conversion factor for English units)

Δ_p avg. = average of the square roots of the velocity heads (Δ_p) measured at each traverse point.

CONTINUOUS ANALYZERS

Date: 2017-05-12 Manufacturer: NAUILLI Model: RV120
 Project #: PL 20145 Run: 1 Tech: MM Reviewer: DP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2.955	2.971	0.998	1.00
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO ₂	0	0	17.91	17.87	9.77	10.00
Tolerance CO ₂		+/- 0.02		+/- 0.5		+/- 0.5
O ₂ informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0.002	2.952	1.002	0.002	0.02	0.003	0.15	0.004	0.05	✓	
CO ₂	0	17.83	9.74	0	0.02	0.08	0.5	0.03	0.5	✓	
O ₂	na	na	na	✓	na	✓	na	✓	na	✓	

TEST DATA LOG

Date: 2017-05-12 Manufacturer: Navelli Model: NV 120
 Project #: PT 20145 Run: 1 Tech: MM Reviewer: DP

RAW DRY GAS METER READINGS

	System 1	System 2	Blank
Final (Liter)	507124,45	427926,06	071,62
Initial (Liter)	505229,44	426083,56	990,91

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	102,0	101,8
Dry Bulb (F):	71,42	76,82
Humidity (%):	35	36,3

Flow Meter

	Start	End
Flow meter reading	N.A	N.A

Flow Meter Verification

	Before	After
Flow meter Check (liters)	N.A	N.A
Scale Weight (Kg)	N.A	N.A



Project #: _____ Run: _____ Tech: _____ Reviewer: _____

Type of wood:

[illegible]

M TP-EPA – V10 – January 2016

Date: 2017-05-11 Manufacturer: PAVILLI Model: RV 120
Project #: PT 20145 Run: 1 Tech: MM Reviewer: SD

		SYSTEM 1 - 1 st hour						SYSTEM 1			
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Back Filter Number	gaskets	Blank
Date	Time	09	201	530	10	204	531	22	532	22	556
2017-05-11	18:30	61,4491	0,1285	0,1299	10,9072	61,3835	0,1291	10,7872	0,1281	10,7872	0,1278
2017-05-12	8:30	61,4492	0,1286	0,1300	10,9071	61,3835	0,1290	10,7872	0,1280	10,7872	0,1279

		SYSTEM 1 - 1 st hour						SYSTEM 1			
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Back Filter Number	gaskets	Blank
Date	Time	09	201	530	10	531	532	22	532	22	556
2017-05-12	16:00	61,4495	0,1297	0,1297	10,9096	61,3841	0,1297	10,7895	0,1274	10,7895	0,1280
2017-05-16	8:00	61,4494	0,1297	0,1297	10,9083	61,3841	0,1297	10,7886	0,1274	10,7886	0,1280
2017-05-17	8:00	61,4494	0,1297	0,1297	10,9083	61,3841	0,1297	10,7882	0,1274	10,7882	0,1280
2017-05-19	8:00	61,4494	0,1297	0,1297	10,9083	61,3841	0,1297	10,7882	0,1274	10,7882	0,1280

Date: 2017-05-11 Manufacturer: PAVE II Model: RV 120
 Project #: PI 20145 Run: 1 Tech: MR Reviewer: AP

SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time				
2017-05-11	18:30	108 8430	0, 1281	0, 1280	10, 2509
2017-05-12	8:30	108 8429	0, 1282	0, 1279	10, 2508

SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time				
2017-05-12	16:00	108 8438	0, 1302	0, 1277	10, 2539
2017-05-16	8:00	108 8438	0, 1302	0, 1277	10, 2518
2017-05-17	8:00	108 8438	0, 1302	0, 1277	10, 2518
2017-05-19	8:00	108 8438	0, 1302	0, 1277	10, 2518

APPENDIX 2: Proportionality results

Average	Average	Average						Average
15,87	Inlet +	Inlet +						0,249
	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	99,76	99,40	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
			PR1	PR2			Time	
Ft/Sec	Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
15,746	533,4	533,5			0,174	0,172	0	0,243301
15,722	533,6	533,6	104,37	104,07	0,174	0,172	1	0,2428847
15,881	533,7	533,7	103,24	103,00	0,174	0,172	2	0,245378
15,751	533,7	533,8	104,20	103,87	0,174	0,172	3	0,2433022
15,952	533,7	533,8	102,87	102,43	0,174	0,171	4	0,2464107
15,794	533,8	533,8	104,15	103,47	0,174	0,171	5	0,2439266
15,790	533,8	533,9	103,86	103,46	0,174	0,171	6	0,2439271
15,657	533,8	533,9	104,80	104,43	0,174	0,171	7	0,2418377
15,919	533,8	533,9	103,20	102,66	0,174	0,171	8	0,2458663
15,755	533,9	534,0	104,16	104,11	0,174	0,172	9	0,2433016
15,794	533,9	534,0	104,08	103,13	0,174	0,171	10	0,2439269
15,955	533,9	534,1	102,95	102,38	0,174	0,171	11	0,2464109
15,751	534,0	534,1	104,12	103,44	0,174	0,171	12	0,2433017
15,985	534,0	534,2	102,76	102,37	0,174	0,171	13	0,2468225
15,869	534,1	534,2	103,54	103,02	0,174	0,171	14	0,2450659
15,891	534,1	534,2	103,23	102,97	0,174	0,171	15	0,2453791
15,732	534,1	534,3	104,35	103,92	0,173	0,171	16	0,242885
15,759	534,2	534,3	104,09	103,72	0,173	0,171	17	0,2433019
15,571	534,2	534,3	105,48	105,40	0,173	0,172	18	0,2403655
15,926	534,2	534,4	103,12	102,80	0,173	0,172	19	0,2457921
15,871	534,2	534,4	103,49	102,98	0,173	0,171	20	0,2449648
15,804	534,2	534,4	103,71	103,42	0,173	0,171	21	0,2439275
15,900	534,3	534,4	103,07	103,00	0,173	0,171	22	0,2453795
15,868	534,3	534,5	103,42	103,16	0,173	0,171	23	0,244965
15,922	534,3	534,5	103,02	102,59	0,173	0,171	24	0,2457925
15,875	534,3	534,5	103,30	103,22	0,173	0,171	25	0,2449651
15,802	534,4	534,6	103,72	103,47	0,173	0,171	26	0,2439275
15,672	534,4	534,6	104,72	104,26	0,173	0,171	27	0,2418386
15,874	534,5	534,6	103,34	103,26	0,173	0,171	28	0,2449656
15,765	534,5	534,7	104,06	103,73	0,173	0,171	29	0,2433022
15,994	534,6	534,7	102,52	102,17	0,173	0,171	30	0,2468222
15,971	534,6	534,8	102,88	102,52	0,173	0,171	31	0,2464111
15,739	534,6	534,8	104,19	103,90	0,173	0,171	32	0,2428857
15,903	534,6	534,8	103,06	102,97	0,173	0,171	33	0,2453797
15,770	534,7	534,8	104,16	103,87	0,173	0,171	34	0,2433026
15,769	534,7	534,9	104,07	104,01	0,173	0,171	35	0,2433029
15,743	534,7	534,9	104,42	104,12	0,173	0,171	36	0,2428864
15,877	534,7	534,9	103,25	102,82	0,173	0,171	37	0,2449814
15,769	534,7	534,9	104,13	103,70	0,173	0,171	38	0,2433032
15,928	534,7	534,9	102,86	102,70	0,173	0,171	39	0,2457928
15,880	534,7	534,9	103,34	103,02	0,173	0,171	40	0,2449659
16,066	534,7	535,0	102,19	101,80	0,173	0,171	41	0,2478494
15,903	534,8	535,0	103,49	103,09	0,173	0,171	42	0,24538
15,728	534,8	535,0	104,32	103,97	0,173	0,171	43	0,2425914
15,882	534,8	535,0	103,49	102,91	0,173	0,171	44	0,2449646
15,998	534,8	535,0	102,72	102,09	0,173	0,171	45	0,246823
15,747	534,8	535,0	104,46	103,85	0,173	0,171	46	0,2428866
15,906	534,9	535,1	103,39	103,08	0,174	0,171	47	0,2453799
15,677	534,9	535,1	104,68	104,16	0,173	0,171	48	0,2418351
15,875	534,9	535,1	103,36	102,91	0,173	0,171	49	0,2449656
15,903	534,9	535,1	103,22	103,06	0,173	0,171	50	0,2453804
16,040	535,0	535,2	102,45	102,30	0,173	0,172	51	0,2474388
15,889	535,0	535,2	103,54	102,86	0,173	0,171	52	0,2449656
15,937	535,1	535,3	103,11	102,86	0,173	0,171	53	0,2457927

15,676	535,1	535,3	104,79	104,45	0,173	0,171	54	0,2418393
15,938	535,1	535,3	103,29	102,92	0,173	0,171	55	0,2457929
15,900	535,1	535,3	103,23	103,16	0,173	0,172	56	0,2453786
15,995	535,2	535,4	102,42	102,10	0,173	0,171	57	0,2468237
15,751	535,2	535,4	104,33	103,63	0,173	0,171	58	0,2430627
15,670	535,2	535,4	104,60	104,16	0,173	0,171	59	0,241839
15,970	535,2	535,5	102,88	102,20	0,173	0,171	60	0,2464127
15,899	535,3	535,5	103,20	102,93	0,173	0,171	61	0,2453837
15,864	535,3	535,5	102,82	102,70	0,173	0,171	62	0,2453808
15,880	535,3	535,6	101,75	101,17	0,173	0,171	63	0,2468237
16,029	535,4	535,6	100,52	100,01	0,173	0,171	64	0,2496387
15,805	535,4	535,6	101,63	101,27	0,173	0,171	65	0,2464129
15,954	535,4	535,6	100,69	100,16	0,173	0,171	66	0,2488717
15,852	535,4	535,6	101,11	100,82	0,173	0,171	67	0,2474399
15,800	535,4	535,7	101,28	100,88	0,173	0,171	68	0,246824
15,945	535,4	535,7	100,25	99,80	0,173	0,171	69	0,2492788
15,825	535,4	535,7	100,87	100,41	0,173	0,171	70	0,2474396
15,973	535,4	535,7	99,95	99,52	0,173	0,171	71	0,2498887
15,881	535,5	535,7	100,36	99,98	0,173	0,171	72	0,2486172
15,922	535,5	535,7	99,98	99,66	0,173	0,171	73	0,2492788
15,889	535,5	535,8	100,08	99,69	0,173	0,171	74	0,2488716
15,950	535,5	535,7	99,70	99,32	0,173	0,171	75	0,2498886
15,940	535,4	535,7	99,55	99,19	0,173	0,171	76	0,2498889
15,897	535,4	535,7	100,02	99,47	0,173	0,171	77	0,2492784
16,002	535,4	535,7	99,13	98,88	0,173	0,171	78	0,250935
15,895	535,4	535,7	99,83	99,24	0,173	0,171	79	0,2492786
16,043	535,4	535,7	98,82	98,33	0,173	0,171	80	0,2517099
16,013	535,4	535,7	99,10	98,66	0,173	0,171	81	0,2513066
15,794	535,3	535,7	100,45	99,85	0,173	0,171	82	0,2478516
15,853	535,4	535,7	99,86	99,53	0,173	0,171	83	0,2488718
16,032	535,4	535,7	98,82	98,43	0,173	0,171	84	0,25171
16,066	535,4	535,7	98,51	98,28	0,173	0,171	85	0,2523138
15,978	535,3	535,6	99,04	98,55	0,173	0,171	86	0,2509022
15,876	535,3	535,6	99,58	99,61	0,173	0,171	87	0,249279
15,874	535,3	535,6	99,69	99,29	0,173	0,171	88	0,2492784
15,872	535,3	535,6	99,52	99,44	0,173	0,171	89	0,2492783
15,872	535,3	535,6	99,75	99,26	0,173	0,171	90	0,2492782
15,842	535,3	535,6	99,97	99,63	0,173	0,171	91	0,2488712
16,082	535,3	535,5	98,34	98,05	0,173	0,171	92	0,2527155
16,017	535,3	535,5	98,70	98,18	0,173	0,171	93	0,2517096
16,121	535,2	535,5	98,11	97,59	0,173	0,171	94	0,2533183
15,963	535,2	535,5	98,85	98,56	0,173	0,171	95	0,250902
15,896	535,2	535,5	99,47	99,22	0,173	0,171	96	0,2498884
15,804	535,2	535,5	99,93	99,84	0,173	0,171	97	0,2484631
16,049	535,1	535,4	98,48	98,05	0,173	0,171	98	0,2523133
15,957	535,1	535,4	99,07	98,71	0,173	0,171	99	0,2509018
15,855	535,1	535,4	99,72	99,33	0,173	0,171	100	0,2492785
15,853	535,1	535,4	99,59	99,36	0,173	0,171	101	0,2492804
15,828	535,1	535,3	99,86	99,53	0,173	0,171	102	0,2488708
16,008	535,1	535,3	98,82	98,44	0,173	0,171	103	0,2517094
15,977	535,1	535,3	98,69	98,50	0,173	0,171	104	0,2513064
16,002	535,0	535,3	98,52	98,18	0,173	0,171	105	0,2517101
15,731	535,1	535,3	100,27	99,98	0,173	0,171	106	0,2474388
15,795	535,0	535,2	99,79	99,72	0,173	0,171	107	0,2484629
16,071	535,0	535,2	98,20	98,04	0,173	0,171	108	0,2527158
15,795	535,0	535,2	100,04	99,66	0,173	0,171	109	0,2484625
15,754	535,0	535,2	100,30	99,87	0,173	0,171	110	0,2478482
15,975	535,0	535,2	98,87	98,43	0,173	0,171	111	0,2513061
15,885	535,0	535,2	99,35	99,05	0,173	0,171	112	0,2498877
15,648	535,1	535,2	101,15	100,70	0,173	0,171	113	0,2457934
15,832	535,1	535,2	99,79	99,49	0,173	0,171	114	0,2488707

16,009	535,1	535,3	98,87	98,29	0,173	0,171	115	0,2517091
15,764	535,1	535,2	100,26	100,00	0,173	0,171	116	0,2478498
15,826	535,2	535,3	99,79	99,30	0,173	0,171	117	0,248871
16,007	535,2	535,3	98,76	98,43	0,173	0,171	118	0,2517092
15,890	535,2	535,3	99,41	99,19	0,173	0,171	119	0,249889
15,853	535,2	535,4	99,56	99,10	0,173	0,171	120	0,2492781
15,739	535,3	535,4	100,35	100,03	0,173	0,171	121	0,2474389
15,857	535,3	535,4	99,60	99,41	0,173	0,171	122	0,2492784
15,857	535,4	535,5	99,48	99,30	0,173	0,171	123	0,2492784
15,836	535,4	535,5	99,79	99,41	0,173	0,171	124	0,2488717
15,705	535,4	535,6	100,73	100,15	0,173	0,171	125	0,2468349
15,832	535,5	535,6	99,74	99,45	0,173	0,171	126	0,2488716
15,860	535,5	535,6	99,53	99,30	0,173	0,171	127	0,2492776
15,698	535,5	535,7	100,52	100,35	0,173	0,171	128	0,2468238
15,960	535,6	535,7	98,71	98,85	0,173	0,171	129	0,250902
15,986	535,6	535,7	98,86	98,12	0,173	0,171	130	0,2513065
16,009	535,6	535,8	98,43	98,30	0,173	0,171	131	0,2517091
16,011	535,6	535,8	98,56	98,06	0,173	0,171	132	0,2516971
15,896	535,6	535,8	99,34	98,86	0,173	0,171	133	0,2498895
15,895	535,7	535,8	99,34	98,92	0,173	0,171	134	0,2498887
15,894	535,7	535,8	99,38	98,88	0,173	0,171	135	0,2498895
15,898	535,7	535,8	99,32	98,89	0,173	0,171	136	0,2498889
15,769	535,7	535,9	99,98	99,53	0,173	0,171	137	0,2478506
15,859	535,7	535,9	99,62	99,39	0,173	0,171	138	0,2492793
15,987	535,7	535,9	98,76	98,35	0,173	0,171	139	0,2513078
15,834	535,7	535,9	99,87	99,32	0,173	0,171	140	0,2488719
15,809	535,8	535,9	99,89	99,46	0,173	0,171	141	0,248464
16,015	535,8	536,0	98,60	98,77	0,173	0,171	142	0,2517099
15,810	535,8	535,9	99,95	99,39	0,173	0,171	143	0,2484632
15,962	535,8	536,0	98,96	98,51	0,173	0,171	144	0,2509029
15,861	535,8	536,0	99,49	99,09	0,173	0,171	145	0,2492797
15,811	535,8	536,0	99,92	99,63	0,173	0,171	146	0,248464
15,837	535,8	536,0	99,91	99,28	0,173	0,171	147	0,2488725
15,967	535,9	536,0	98,95	98,60	0,173	0,171	148	0,2509026
15,968	535,9	536,0	99,01	98,51	0,173	0,171	149	0,2509033
15,838	535,9	536,1	99,66	99,43	0,173	0,171	150	0,2488777
15,911	535,9	536,1	99,36	99,08	0,173	0,171	151	0,2499893
15,749	535,9	536,1	100,19	100,01	0,173	0,171	152	0,2474412
15,908	535,9	536,1	99,40	98,95	0,173	0,171	153	0,2498903
15,709	535,9	536,1	100,49	100,34	0,173	0,171	154	0,2468244
15,969	536,0	536,2	98,92	98,53	0,173	0,171	155	0,250903
15,750	536,0	536,2	100,46	99,77	0,173	0,171	156	0,2474408
15,909	536,1	536,3	99,46	98,95	0,173	0,171	157	0,2498897
15,871	536,1	536,3	99,56	99,36	0,173	0,171	158	0,2492804
15,973	536,2	536,3	98,99	98,58	0,173	0,171	159	0,2509042
15,911	536,2	536,4	99,34	98,88	0,173	0,171	160	0,2498903
15,843	536,2	536,4	99,74	99,48	0,173	0,171	161	0,2488735
15,912	536,2	536,4	99,24	99,24	0,173	0,171	162	0,2498901
15,906	536,2	536,4	99,28	98,94	0,173	0,171	163	0,2498906
15,997	536,2	536,5	98,89	98,61	0,173	0,171	164	0,2512798
15,868	536,2	536,5	99,63	99,32	0,173	0,171	165	0,2492799
15,910	536,2	536,5	99,43	99,05	0,173	0,171	166	0,2498983
15,870	536,2	536,5	99,61	99,06	0,173	0,171	167	0,2492805
15,845	536,3	536,5	99,87	99,24	0,173	0,170	168	0,2488738
15,867	536,3	536,5	99,52	99,17	0,173	0,171	169	0,249281
15,868	536,3	536,5	99,51	99,43	0,173	0,171	170	0,2492805
15,869	536,3	536,5	99,53	99,30	0,173	0,171	171	0,2492809
16,019	536,3	536,5	98,66	97,95	0,173	0,171	172	0,251712
15,833	536,3	536,5	100,38	100,24	0,173	0,171	173	0,2478522
15,773	536,3	536,5	100,28	99,70	0,173	0,171	174	0,2476421
15,821	536,2	536,5	99,99	99,73	0,173	0,171	175	0,2484656

15,783	536,3	536,5	100,07	99,60	0,173	0,171	176	0,247853
16,029	536,3	536,5	98,67	98,26	0,173	0,171	177	0,2517132
15,845	536,3	536,6	99,76	99,49	0,173	0,171	178	0,2488744
15,908	536,3	536,6	99,28	99,00	0,173	0,171	179	0,2498914
15,844	536,3	536,5	99,65	99,39	0,173	0,171	180	0,2488742
15,905	536,3	536,5	99,24	98,81	0,173	0,171	181	0,2498912
15,995	536,3	536,5	98,40	97,99	0,173	0,171	182	0,2517125
15,943	536,3	536,6	98,60	98,34	0,173	0,171	183	0,2509049
15,833	536,3	536,6	99,41	98,92	0,173	0,171	184	0,2492818
15,866	536,3	536,6	98,99	98,78	0,173	0,171	185	0,2498908
15,773	536,3	536,6	99,58	99,15	0,173	0,171	186	0,2484653
15,953	536,3	536,6	98,49	98,01	0,173	0,170	187	0,2513093
16,039	536,3	536,6	97,99	97,37	0,173	0,170	188	0,2527191
15,816	536,4	536,6	99,19	98,89	0,173	0,171	189	0,2492813
15,790	536,3	536,6	99,25	99,24	0,173	0,171	190	0,2488742
15,916	536,3	536,6	98,46	98,33	0,173	0,171	191	0,2509049
16,006	536,3	536,6	97,99	97,76	0,173	0,171	192	0,2523166
15,914	536,4	536,6	98,52	98,17	0,173	0,171	193	0,2509044
15,690	536,3	536,6	100,03	99,66	0,173	0,171	194	0,247442
15,938	536,3	536,6	98,53	97,84	0,173	0,171	195	0,2513088
15,961	536,3	536,6	98,28	97,77	0,173	0,170	196	0,2517116
15,782	536,3	536,6	99,20	98,80	0,173	0,170	197	0,2488736
15,806	536,3	536,6	99,03	98,69	0,173	0,170	198	0,2492807
15,557	536,4	536,6	100,74	100,43	0,173	0,171	199	0,2453835
15,777	536,4	536,6	99,14	98,60	0,173	0,170	200	0,2488746
15,952	536,4	536,6	98,26	97,75	0,173	0,170	201	0,2517075
15,928	536,4	536,6	98,32	97,82	0,173	0,170	202	0,2513093
15,775	536,4	536,7	99,30	98,91	0,173	0,171	203	0,2488745
15,929	536,4	536,7	98,36	97,85	0,173	0,171	204	0,2513093
15,836	536,4	536,7	98,93	98,45	0,173	0,171	205	0,2498913
15,839	536,5	536,7	98,86	98,65	0,173	0,171	206	0,249908
15,951	536,5	536,7	98,22	97,59	0,173	0,171	207	0,2517123
15,796	536,5	536,7	99,04	98,59	0,173	0,170	208	0,2492813
15,794	536,5	536,7	98,99	98,65	0,173	0,170	209	0,2492815
15,702	536,5	536,7	99,81	99,38	0,173	0,171	210	0,2478079
15,794	536,5	536,7	98,92	98,60	0,173	0,171	211	0,2492816
15,944	536,5	536,7	98,04	97,69	0,173	0,171	212	0,2517126
15,793	536,4	536,7	99,14	98,86	0,173	0,171	213	0,2492813
15,831	536,4	536,7	98,84	98,49	0,173	0,171	214	0,2498909
15,893	536,4	536,6	98,44	97,94	0,173	0,171	215	0,2509043
15,768	536,4	536,6	99,40	98,93	0,173	0,171	216	0,2488743
15,795	536,4	536,6	99,11	98,67	0,173	0,171	217	0,2493891
15,980	536,3	536,6	97,75	97,58	0,173	0,171	218	0,2523166
15,788	536,3	536,6	99,08	98,61	0,173	0,171	219	0,249281
15,916	536,3	536,5	98,21	97,98	0,173	0,171	220	0,2513092
15,891	536,3	536,5	98,52	98,11	0,173	0,171	221	0,2509043
15,873	536,3	536,5	98,52	98,13	0,173	0,171	222	0,2506424
15,916	536,3	536,5	98,33	97,91	0,173	0,171	223	0,2513091
15,827	536,3	536,5	98,75	98,29	0,173	0,171	224	0,2498906
15,828	536,3	536,5	98,78	98,58	0,173	0,171	225	0,2498905
15,915	536,3	536,5	98,15	97,84	0,173	0,171	226	0,2513085
15,944	536,3	536,6	98,24	97,77	0,173	0,171	227	0,2517123
16,007	536,3	536,6	97,68	97,55	0,173	0,171	228	0,2527194
15,914	536,3	536,6	98,26	98,06	0,173	0,171	229	0,2513091
15,916	536,3	536,6	98,27	97,74	0,173	0,171	230	0,2513092
15,941	536,4	536,6	98,06	98,03	0,173	0,171	231	0,2517119
15,761	536,4	536,7	99,31	98,79	0,173	0,171	232	0,2488738
15,824	536,4	536,7	98,68	98,42	0,173	0,171	233	0,2498911
15,904	536,4	536,7	98,38	98,12	0,173	0,171	234	0,2509047
15,918	536,4	536,6	98,39	97,88	0,173	0,171	235	0,2513093
16,009	536,4	536,6	97,66	97,17	0,173	0,170	236	0,2527189

15,819	536,3	536,6	98,82	98,43	0,173	0,170	237	0,2497899
15,787	536,3	536,6	98,97	98,44	0,173	0,170	238	0,2492811
15,892	536,3	536,6	98,35	97,90	0,173	0,170	239	0,2509046
15,890	536,3	536,5	98,42	97,90	0,173	0,170	240	0,2509042
15,822	536,3	536,5	98,69	98,57	0,173	0,171	241	0,2498906
15,979	536,3	536,5	97,96	97,28	0,173	0,171	242	0,2523153
15,889	536,3	536,5	98,31	97,98	0,173	0,170	243	0,2509038
15,913	536,3	536,5	98,26	98,00	0,173	0,171	244	0,2513094
15,906	536,3	536,5	98,16	97,89	0,173	0,171	245	0,2512088
15,822	536,3	536,5	98,76	98,33	0,173	0,171	246	0,2498934
15,939	536,3	536,5	97,98	97,67	0,173	0,171	247	0,2517036
15,825	536,3	536,6	98,77	98,36	0,173	0,171	248	0,24989
15,733	536,4	536,6	99,33	98,85	0,173	0,170	249	0,2484654
15,823	536,4	536,6	98,82	98,38	0,173	0,171	250	0,2498906
15,913	536,4	536,6	98,37	97,90	0,173	0,171	251	0,2513088
15,884	536,4	536,6	98,32	98,03	0,173	0,171	252	0,2509036
15,939	536,4	536,6	97,98	97,67	0,173	0,171	253	0,2517118
15,823	536,4	536,6	98,86	98,20	0,173	0,170	254	0,2498914
16,000	536,4	536,6	97,70	97,23	0,173	0,170	255	0,2527184
15,887	536,4	536,6	98,41	97,81	0,173	0,170	256	0,2509046
15,824	536,4	536,6	98,69	98,38	0,173	0,170	257	0,2498915
15,888	536,4	536,6	98,22	98,13	0,173	0,171	258	0,2509045
15,940	536,4	536,6	98,08	97,78	0,173	0,171	259	0,2517122
15,786	536,4	536,6	99,08	98,52	0,173	0,171	260	0,249281
15,976	536,4	536,6	97,56	97,36	0,173	0,170	261	0,2523167
15,941	536,4	536,6	98,26	97,57	0,173	0,170	262	0,2517509
15,785	536,5	536,7	99,02	98,79	0,173	0,171	263	0,2492811
15,666	536,5	536,7	99,75	99,38	0,173	0,171	264	0,247442
16,002	536,5	536,7	97,58	97,26	0,173	0,171	265	0,2527192
15,912	536,5	536,7	98,22	97,98	0,173	0,171	266	0,2513099
15,912	536,5	536,7	98,28	97,75	0,173	0,171	267	0,2513092
15,886	536,5	536,7	98,35	98,05	0,173	0,171	268	0,2509047
15,760	536,5	536,8	99,11	98,70	0,173	0,171	269	0,2488879
15,694	536,5	536,8	99,61	99,45	0,173	0,171	270	0,2478526
16,066	536,6	536,8	97,15	96,83	0,173	0,171	271	0,2537217
15,603	536,6	536,8	100,13	99,61	0,173	0,170	272	0,2464156
15,786	536,6	536,8	98,97	98,38	0,173	0,170	273	0,249319
15,670	536,6	536,9	99,72	99,20	0,173	0,170	274	0,247443
15,903	536,6	536,9	98,18	98,11	0,173	0,171	275	0,2511464
15,887	536,6	536,9	98,26	97,89	0,173	0,171	276	0,2509058
15,824	536,6	536,9	98,84	98,32	0,173	0,170	277	0,2498916
15,825	536,6	536,9	98,88	98,50	0,173	0,171	278	0,2498913
15,786	536,6	536,9	98,93	98,70	0,173	0,171	279	0,2492822
15,915	536,6	536,9	98,27	97,76	0,173	0,171	280	0,2513099
15,941	536,7	536,9	98,07	97,85	0,173	0,171	281	0,2517127
15,760	536,7	536,9	99,40	98,85	0,173	0,171	282	0,2488747
15,941	536,7	536,9	97,97	97,66	0,173	0,171	283	0,2517132
15,915	536,7	536,9	98,20	97,75	0,173	0,171	284	0,2513093
15,940	536,7	537,0	97,94	97,59	0,173	0,170	285	0,2517133
15,886	536,7	537,0	98,43	98,00	0,173	0,171	286	0,250905
15,915	536,8	537,0	98,07	97,61	0,173	0,170	287	0,2513086
15,940	536,8	537,0	98,01	97,84	0,173	0,171	288	0,2517127
15,788	536,8	537,0	98,85	98,67	0,173	0,171	289	0,2492817
16,040	536,8	537,0	97,40	96,91	0,173	0,170	290	0,2533213
15,825	536,8	537,0	98,73	98,38	0,173	0,170	291	0,2498917
16,002	536,8	537,0	97,45	97,45	0,173	0,171	292	0,2527193
15,915	536,8	537,1	98,04	97,89	0,172	0,171	293	0,2513096
15,978	536,8	537,1	98,27	97,73	0,173	0,170	294	0,2517131
15,681	536,8	537,1	99,70	99,48	0,173	0,170	295	0,2474427
15,739	536,8	537,1	99,32	98,89	0,173	0,171	296	0,2484675
15,767	536,9	537,1	99,24	98,78	0,173	0,170	297	0,2488743

15,919	536,9	537,1	98,21	97,76	0,173	0,170	298	0,2513106
15,917	536,9	537,1	98,07	97,78	0,173	0,170	299	0,2513103
15,789	536,9	537,1	99,06	98,68	0,173	0,171	300	0,2492819
15,980	536,9	537,1	97,71	97,60	0,173	0,171	301	0,2523173
15,914	536,9	537,1	98,15	97,61	0,173	0,171	302	0,25131
15,890	536,9	537,1	98,15	97,89	0,173	0,170	303	0,2509052
15,977	536,9	537,1	97,55	97,39	0,172	0,170	304	0,2523172
15,979	536,9	537,1	97,70	97,22	0,172	0,170	305	0,2523175
16,001	536,9	537,1	97,57	97,17	0,173	0,170	306	0,25272
15,912	536,9	537,1	98,12	97,66	0,173	0,170	307	0,2513107
15,785	536,9	537,1	98,87	98,57	0,173	0,170	308	0,2492819
15,785	537,0	537,2	98,87	98,50	0,173	0,170	309	0,2492819
15,914	537,0	537,2	98,25	98,13	0,173	0,171	310	0,2513104
15,734	537,0	537,2	99,29	98,92	0,173	0,171	311	0,2484678
15,824	537,0	537,2	98,71	98,36	0,173	0,171	312	0,2498918
15,915	537,0	537,2	98,09	98,09	0,173	0,171	313	0,2513102
15,891	537,0	537,2	98,43	97,88	0,173	0,171	314	0,2509054
15,788	537,0	537,2	98,85	98,50	0,173	0,170	315	0,2492817
15,735	537,0	537,2	99,19	99,02	0,173	0,171	316	0,2484663
15,784	537,0	537,3	98,86	98,50	0,173	0,171	317	0,2492818
15,889	537,0	537,3	98,19	98,02	0,173	0,171	318	0,2509045
15,941	537,0	537,3	98,04	97,54	0,173	0,170	319	0,2516995
15,786	537,1	537,3	98,88	98,59	0,173	0,170	320	0,2492822
15,760	537,1	537,3	99,14	98,80	0,173	0,171	321	0,2488745
15,787	537,1	537,3	98,89	98,48	0,173	0,170	322	0,2492822
15,789	537,1	537,4	98,98	98,40	0,173	0,170	323	0,2492826
15,808	537,1	537,4	98,74	98,50	0,173	0,170	324	0,2496284
15,979	537,2	537,4	97,75	97,32	0,173	0,170	325	0,2523172
15,889	537,2	537,4	98,34	97,75	0,173	0,170	326	0,2509053
15,889	537,2	537,4	98,30	97,96	0,173	0,170	327	0,2509054
15,789	537,2	537,4	98,81	98,62	0,173	0,171	328	0,2492823
16,041	537,2	537,4	97,50	97,04	0,173	0,171	329	0,2533219
15,737	537,2	537,4	99,25	98,99	0,173	0,171	330	0,2484662
15,894	537,3	537,5	98,35	98,05	0,173	0,171	331	0,2509071
15,827	537,3	537,5	98,66	98,43	0,173	0,171	332	0,2498927
15,917	537,3	537,5	98,20	97,73	0,173	0,171	333	0,2513109
15,789	537,3	537,5	98,82	98,58	0,173	0,170	334	0,249283
15,826	537,3	537,5	98,49	98,45	0,172	0,171	335	0,2498927
15,890	537,3	537,5	98,37	97,90	0,173	0,171	336	0,2509067
15,941	537,3	537,5	97,92	97,39	0,173	0,170	337	0,2517141
15,762	537,3	537,5	99,06	98,70	0,173	0,170	338	0,2488755
15,827	537,3	537,5	98,55	98,30	0,173	0,170	339	0,2498927
15,943	537,3	537,5	97,89	97,60	0,172	0,170	340	0,2517137
15,827	537,3	537,6	98,58	98,32	0,172	0,170	341	0,2498935
15,983	537,3	537,6	97,65	97,15	0,172	0,170	342	0,2523178
15,890	537,3	537,6	98,17	97,80	0,172	0,170	343	0,2509061
15,754	537,3	537,6	98,94	98,96	0,172	0,171	344	0,24873
15,739	537,4	537,6	99,24	98,77	0,172	0,170	345	0,2484669
15,919	537,4	537,6	97,97	97,65	0,172	0,170	346	0,2513108
15,739	537,4	537,6	99,12	98,97	0,172	0,170	347	0,2484674
15,830	537,4	537,6	98,72	98,03	0,173	0,170	348	0,2498931
15,766	537,4	537,6	99,05	98,46	0,173	0,170	349	0,2488757
15,983	537,4	537,6	97,59	97,42	0,172	0,170	350	0,252318
15,901	537,4	537,7	98,26	97,98	0,173	0,171	351	0,2510192
15,893	537,5	537,7	98,26	97,76	0,173	0,170	352	0,2509064
15,982	537,5	537,7	97,70	97,12	0,173	0,170	353	0,2523178
15,800	537,5	537,7	99,46	98,86	0,173	0,170	354	0,2488744
15,776	537,5	537,7	98,94	98,73	0,173	0,170	355	0,2488762
15,950	537,5	537,7	97,99	97,68	0,172	0,170	356	0,2517139
15,988	537,5	537,7	97,77	97,53	0,173	0,171	357	0,252318
15,948	537,5	537,7	97,90	97,46	0,173	0,170	358	0,2517138

15,922	537,5	537,7	98,30	98,00	0,173	0,170	359	0,2513108
15,793	537,5	537,7	98,90	98,77	0,173	0,171	360	0,2492828
15,766	537,5	537,7	99,18	98,84	0,173	0,171	361	0,2488758

APPENDIX 4: Unit pre burn

Temps acquisition de données	Flue	scale	Tunnel Velocity
	temp		Pressure
	°F	lbs	in. Wc

0	238,60	21,98	0,0450
10	256,25	21,38	0,0450
20	269,23	20,78	0,0450
30	278,38	20,08	0,0450
40	286,07	19,58	0,0450
50	289,55	18,98	0,0450
60	288,37	18,38	0,0450
70	287,20	17,78	0,0450
80	288,35	17,28	0,0450
90	289,77	16,68	0,0450
100	290,91	15,98	0,0450
110	289,23	15,48	0,0450
120	263,16	14,98	0,0450
130	253,35	14,48	0,0450
140	247,80	14,08	0,0450
150	244,12	13,68	0,0450
160	241,11	13,18	0,0450
170	240,52	12,78	0,0450
180	240,65	12,28	0,0450
190	239,18	11,87	0,0450
200	239,06	11,37	0,0450
210	239,47	10,98	0,0450
220	238,24	10,47	0,0450
230	238,62	10,07	0,0450
240	238,44	9,68	0,0450
250	235,71	9,27	0,0450
260	235,01	8,78	0,0450
270	233,17	8,37	0,0450
280	233,94	7,97	0,0450
290	234,47	7,47	0,0450
300	235,00	7,07	0,0450
310	235,14	6,67	0,0450
320	236,13	6,17	0,0450
330	235,81	5,77	0,0450
340	235,71	5,27	0,0450
350	233,31	4,87	0,0450
360	Flue	weight	0,0450
370	170,24	52,96	0,0450
380	170,96	52,81	0,0450
390	169,38	52,61	0,0450
400	168,58	52,31	0,0450
410	Flue	weight	0,0450
420	164,42	51,40	0,0450
430	163,73	51,21	0,0450
440	166,56	50,90	0,0450
450	168,24	50,61	0,0450
460	165,77	50,41	0,0450
470	166,89	50,20	0,0450
480	167,71	50,01	0,0450
490	168,55	49,70	0,0450
500	168,42	49,40	0,0450
510	169,68	49,10	0,0450
520	169,87	48,80	0,0450
530	172,40	48,61	0,0450
540	170,35	48,40	0,0450
550	169,51	48,10	0,0450
560	169,03	47,80	0,0450
570	169,75	47,60	0,0450
580	169,24	47,30	0,0450
590	170,20	47,01	0,0450
600	167,85	46,84	0,0450
610	167,02	46,60	0,0450
620	168,55	46,30	0,0450
630	168,19	46,00	0,0450
640	169,45	45,80	0,0450
650	171,18	45,50	0,0450
660	169,85	45,30	0,0450
670	168,41	45,00	0,0450
680	168,20	44,70	0,0450
690	167,32	44,50	0,0450
700	169,11	44,20	0,0450
710	170,59	43,92	0,0450
720	169,05	43,70	0,0450
730	168,33	43,40	0,0450
740	167,40	43,14	0,0450
750	167,98	42,90	0,0450
760	169,02	42,60	0,0450
770	169,19	42,40	0,0450
780	166,95	42,10	0,0450
790	166,39	41,90	0,0450
800	165,55	41,60	0,0450
810	166,20	41,40	0,0450
820	167,62	41,09	0,0450
830	168,84	40,80	0,0450
840	167,34	40,60	0,0450
850	167,66	40,29	0,0450
860	166,13	39,99	0,0450
870	167,08	39,79	0,0450

880	166,30	39,50	0,0450
890	168,41	39,19	0,0450
900	166,48	38,99	0,0450
910	166,36	38,70	0,0450
920	165,29	38,49	0,0450
930	163,71	38,29	0,0450
940	164,44	37,99	0,0450
950	167,04	37,69	0,0450
960	165,59	37,49	0,0450
970	166,30	37,19	0,0450
980	178,14	37,09	0,0450
990	237,26	36,59	0,0450
1000	268,74	36,19	0,0450
1010	214,99	35,89	0,0450
1020	198,29	35,59	0,0450
1030	189,73	35,29	0,0450
1040	183,85	35,09	0,0450
1050	180,63	34,89	0,0450
1060	181,03	34,59	0,0450
1070	177,20	34,39	0,0450
1080	178,04	34,09	0,0450
1090	178,99	33,79	0,0450
1100	177,23	33,59	0,0450
1110	177,86	33,29	0,0450
1120	180,78	33,09	0,0450
1130	177,64	32,79	0,0450
1140	177,04	32,49	0,0450
1150	176,50	32,29	0,0450
1160	176,50	31,99	0,0450
1170	175,28	31,69	0,0450
1180	179,79	31,49	0,0450
1190	177,03	31,19	0,0450
1200	177,40	30,91	0,0450
1210	178,25	30,69	0,0450
1220	177,86	30,39	0,0450
1230	176,41	30,09	0,0450
1240	179,08	29,88	0,0450
1250	175,69	29,59	0,0450
1260	174,83	29,30	0,0450
1270	173,47	29,09	0,0450
1280	174,49	28,79	0,0450
1290	178,09	52,96	0,0450
1300	177,77	52,96	0,0450
1310	174,76	52,96	0,0450
1320	173,23	52,95	0,0450
1330	173,92	52,71	0,0450
1340	172,35	52,51	0,0450
1350	172,35	52,21	0,0450
1360	176,42	51,91	0,0450
1370	172,79	51,71	0,0450
1380	171,68	51,40	0,0450
1390	172,48	51,21	0,0450
1400	172,03	50,91	0,0450
1410	170,97	50,61	0,0450
1420	174,38	50,41	0,0450
1430	171,92	50,11	0,0450
1440	172,64	49,84	0,0450
1450	171,15	49,60	0,0450
1460	170,90	49,40	0,0450
1470	171,95	49,10	0,0450
1480	178,61	48,80	0,0450
1490	173,12	48,60	0,0450
1500	171,61	48,31	0,0450
1510	170,09	48,10	0,0450
1520	171,09	47,80	0,0450
1530	171,88	47,56	0,0450
1540	178,98	47,30	0,0450
1550	172,57	47,06	0,0450
1560	172,16	46,80	0,0450
1570	172,00	46,50	0,0450
1580	170,72	46,30	0,0450
1590	170,81	46,00	0,0450
1600	177,56	45,75	0,0450
1610	173,00	45,50	0,0450
1620	170,65	45,20	0,0450
1630	170,03	45,00	0,0450
1640	169,94	44,80	0,0450
1650	168,88	44,50	0,0450
1660	181,18	44,20	0,0450
1670	171,19	44,00	0,0450
1680	170,86	43,70	0,0450
1690	169,37	43,50	0,0450
1700	168,49	43,20	0,0450
1710	167,87	42,90	0,0450
1720	172,55	42,70	0,0450
1730	170,57	42,40	0,0450
1740	170,57	42,20	0,0450
1750	170,55	41,90	0,0450
1760	169,91	41,60	0,0450
1770	170,37	41,40	0,0450
1780	169,75	41,09	0,0450
1790	171,66	40,89	0,0450
1800	170,38	40,59	0,0450
1810	169,30	40,29	0,0450

1820	168,39	40,10	0,0450
1830	168,17	39,79	0,0450
1840	167,57	39,51	0,0450
1850	168,70	39,29	0,0450
1860	169,63	39,08	0,0450
1870	168,45	38,79	0,0450
1880	168,04	38,49	0,0450
1890	166,98	38,29	0,0450
1900	165,55	38,02	0,0450
1910	167,18	37,79	0,0450
1920	167,11	37,49	0,0450
1930	166,71	37,29	0,0450
1940	167,56	36,99	0,0450
1950	166,29	36,79	0,0450
1960	168,40	36,49	0,0450
1970	170,96	36,19	0,0450
1980	168,96	35,99	0,0450
1990	167,97	35,69	0,0450
2000	167,34	35,49	0,0450
2010	168,46	35,19	0,0450
2020	167,80	34,89	0,0450
2030	170,43	34,59	0,0450
2040	169,05	34,39	0,0450
2050	167,32	34,09	0,0450
2060	167,57	33,89	0,0450
2070	167,39	33,59	0,0450
2080	167,35	33,29	0,0450
2090	167,69	33,09	0,0450
2100	166,94	32,79	0,0450
2110	165,53	32,59	0,0450
2120	166,41	32,29	0,0450
2130	166,39	31,99	0,0450
2140	166,55	31,79	0,0450
2150	168,87	31,49	0,0450
2160	167,53	31,23	0,0450
2170	167,47	30,99	0,0450
2180	171,05	30,89	0,0450
2190	246,02	30,29	0,0450
2200	268,44	29,79	0,0450
2210	215,05	29,49	0,0450
2220	199,36	29,28	0,0450
2230	192,32	28,99	0,0450
2240	186,97	28,79	0,0450
2250	184,32	28,48	0,0450
2260	183,81	28,19	0,0450
2270	180,42	27,98	0,0450
2280	180,14	27,69	0,0450
2290	178,97	27,48	0,0450
2300	178,94	27,18	0,0450
2310	180,25	26,88	0,0450
2320	180,84	26,68	0,0450
2330	179,80	26,38	0,0450
2340	178,55	26,08	0,0450
2350	177,64	25,88	0,0450
2360	177,08	25,58	0,0450
2370	176,18	25,38	0,0450
2380	177,39	25,08	0,0450
2390	176,90	24,78	0,0450
2400	176,20	24,58	0,0450
2410	176,25	24,28	0,0450
2420	175,98	23,98	0,0450
2430	174,99	23,78	0,0450
2440	177,69	23,48	0,0450
2450	177,44	23,18	0,0450
2460	176,16	22,98	0,0450
2470	175,73	22,68	0,0450
2480	173,39	22,38	0,0450
2490	174,27	22,18	0,0450
2500	175,50	21,88	0,0450
2510	173,15	21,68	0,0450
2520	171,74	21,38	0,0450
2530	172,05	21,18	0,0450
2540	172,59	20,88	0,0450
2550	170,82	20,68	0,0450
2560	175,59	20,38	0,0450
2570	174,10	20,08	0,0450
2580	173,49	19,88	0,0450
2590	172,41	19,68	0,0450
2600	172,95	19,38	0,0450
2610	173,24	19,08	0,0450
2620	176,41	18,78	0,0450
2630	173,72	18,58	0,0450
2640	173,28	18,28	0,0450
2650	173,72	17,98	0,0450
2660	172,37	17,78	0,0450
2670	172,34	17,48	0,0450
2680	175,43	17,18	0,0450
2690	173,39	16,98	0,0450
2700	173,15	16,68	0,0450
2710	171,26	16,48	0,0450
2720	170,83	16,18	0,0450
2730	170,35	15,98	0,0450
2740	174,98	15,68	0,0450
2750	172,32	15,38	0,0450

2760	171,72	15,18	0,0450
2770	170,92	14,88	0,0450
2780	171,46	14,60	0,0450
2790	170,68	14,38	0,0450
2800	173,33	14,16	0,0450
2810	170,13	13,87	0,0450
2820	168,60	13,68	0,0450
2830	168,25	13,38	0,0450
2840	169,89	13,08	0,0450
2850	168,67	12,88	0,0450
2860	172,46	12,58	0,0450
2870	169,36	12,38	0,0450
2880	169,67	12,08	0,0450
2890	169,41	11,87	0,0450
2900	169,31	11,58	0,0450
2910	169,88	11,38	0,0450
2920	174,28	11,08	0,0450
2930	170,52	10,80	0,0450
2940	168,86	10,57	0,0450
2950	170,44	10,28	0,0450
2960	169,75	10,08	0,0450
2970	170,73	9,77	0,0450
2980	175,94	9,48	0,0450
2990	170,59	9,27	0,0450
3000	170,25	8,98	0,0450
3010	168,95	8,78	0,0450
3020	169,51	8,47	0,0450
3030	170,12	8,21	0,0450
3040	177,09	7,97	0,0450
3050	170,99	7,67	0,0450
3060	169,66	7,48	0,0450
3070	168,34	7,27	0,0450
3080	168,35	6,97	0,0450
3090	166,63	6,77	0,0450
3100	175,11	6,47	0,0450
3110	168,25	6,27	0,0450
3120	169,63	5,97	0,0450
3130	171,12	5,67	0,0450
3140	171,38	5,37	0,0450
3150	171,34	5,17	0,0450
3160	182,52	4,87	0,0450
3170	172,84	4,67	0,0450
3180	170,11	4,37	0,0450
3190	168,16	4,17	0,0450
3200	167,36	3,87	0,0450
3210	166,19	3,67	0,0450
3220	167,39	3,52	0,0450
3230	171,28	3,37	0,0450
3240	168,77	3,14	0,0450
3250	169,79	2,97	0,0450
3260	169,25	2,77	0,0450
3270	167,63	2,67	0,0450
3280	165,61	2,54	0,0450
3290	163,03	2,37	0,0450
3300	158,23	2,27	0,0450
3310	155,43	2,17	0,0450
3320	152,03	2,07	0,0450
3330	151,49	1,97	0,0450
3340	151,45	1,87	0,0450
3350	153,17	1,67	0,0450
3360	151,77	1,57	0,0450
3370	148,77	1,47	0,0450
3380	147,65	1,47	0,0450
3390	139,61	1,45	0,0450
3400	129,69	1,47	0,0450
3410	106,71	1,47	0,0450
3420	92,15	1,47	0,0450

APPENDIX 5: Participants

Danick Power ing.
v-p operation
Services Polytests inc.
450.741.3636
www.polytests.com

Maxime Martin
Technicien
Services Polytests inc.
450.741.3636
www.polytests.com

APPENDIX 7: Operator's manual

User and maintenance manual for stoves with touch remote



SAVE THESE INSTRUCTIONS

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. Contact local building or fire officials about restrictions and installation inspection requirements in your area. Contact local authorities to see if a permit must be obtained before installation.

ASTM E 1509-12 • UL 1482 - 11 • ULC S627-00 • Oregon Administration Rules 814-23-909 • Mobile Home Approved

Index

1. Introduction.....	pag 4
2. Safety information.....	pag 5
3. General.....	pag 6
4. Safety devices.....	pag 10
5. Technical features.....	pag 10
6. Positioning, assembly and installation	pag 10
6.1 Minimum distance from combustible material.....	pag 10
6.2 Environment of use	pag 11
6.3 Mobile Home Requirements.....	pag 11
6.4. Examples of installation.....	pag 12
7. Preliminary operations.....	pag 16
7.1 Description of the functioning and symbology of the display.....	pag 16
8. Description of the functions.....	pag 19
9. Description of alarms.....	pag 34
10. The electrical wiring diagram.....	pag 36
11. Maintenance.....	pag 37
12. Guarantee.....	pag 38

1. Introduction

Important:

Please read this manual carefully. It describes all the phases necessary for perfect functioning of the stove.

Warning:

The regulations on installation and operation in this manual may differ from the regulations in force locally. In this case, the indications of the competent local authorities must always be followed. The drawings shown in this manual are indicative and not to scale.

Information:

The packaging that we have used offers good protection against any damage due to transport. Always check the stove immediately after delivery: in the event of any damage, please inform your Ravelli dealer immediately.

Description of use and maintenance manual

With this use and maintenance manual, Ravelli wishes to provide the user with all the information on safety in using the stove, in order to avoid damage to persons or things or parts of the stove. Please read this manual carefully before use and any work on the product.

WARNINGS

Ravelli stoves are manufactured taking care even on the individual components in order to protect both the user and the installer from any accidents.

The authorized personnel, after any work on the product, should therefore always pay special attention to the electrical connections.

Installation must be performed by authorized personnel, who must give the purchaser a declaration of conformity of the appliance, and who will assume all responsibility for the final installation and consequent good functioning of the product installed. It is also necessary to take into consideration all the laws and national, regional, provincial and local regulations present in the country in which the appliance has been installed. In the event of failure to respect these precautions, Ravelli S.R.L. declines all responsibility.

This instruction manual is an integral part of the product: please make sure that it is always with the stove, including in the case of transfer to another owner or user, or transfer to another place. In the case of its damage or loss, please request another copy from the Technical service.

This stove must be used for the purpose for which it has been specifically manufactured. Do not use the appliance as an incinerator or in any way other than that for which it was designed. All contractual and tort responsibility of the manufacturer is excluded for damage caused to persons, animals or things, due to errors of installation, maintenance regulation or improper use. No other fuel except the pellets must be used. Do not use liquid fuels.

After having removed the packaging, please make sure that the contents are complete and intact.

All the electrical components that make up the stove must be replaced with original spare parts exclusively from an authorized technical assistance centre. **Maintenance of the stove must be performed at least once a year, planning it in time with the technical assistance centre.** Do not make any unauthorized modification to the appliance.

For safety reasons, please remember that:

- the stove must not be used by children or disabled people without assistance;
- do not touch the stove when barefoot or when any parts of the body are wet;
- the safety devices or adjustment devices must not be modified without the authorization or instructions of Ravelli.

The stove, especially the external surfaces, reaches very high temperatures when it is in operation; take care when touching it to avoid burns.

The stove has been designed to function in any climatic condition; in the event of particularly adverse conditions (wind, freezing), safety systems could switch off the stove.

If this occurs, contact the technical assistance and, in any case, do not disable the safety systems.

Thank you

Dear Customer,

We would like to thank you and congratulate you on the excellent choice you have made.

With the Ravelli stove, you will see that quality and economy can go hand in hand, offering excellent performances with limited consumption and being totally practical. Please find below some suggestions, which we would like to give you, to obtain the most from your stove and to fully enjoy all the advantages that it can give you.

Through this, we want to be close to our customers to offer the maximum technical support to all those who use our technology.

Ravelli thanks you for your confidence
and wishes you happy times in the company
of your pellet stove.

2. Safety information

The stove must be installed and tested by specialized personnel instructed by the Ravelli. Please read this use and maintenance manual before installing and putting the stove into operation!

If you require further information, please contact your Ravelli dealer.

IMPORTANT

- The place of installation of the stove must comply with local, national and Federal regulations.
- The stove must be fuelled only with quality pellets with a diameter of 6 mm as described in the specific chapter.

The stove cannot operate with traditional wood

The stove must not be used as an incinerator. FIRE HAZARD!!!

- **Installation, the electrical connections, checking the functioning and maintenance must be performed by qualified and authorized personnel.**

- Improper installation or poor maintenance (not compliant with what is shown in the following manual) may cause damage to persons and things. In this condition, Ravelli is relieved of all civil or criminal responsibility.

- Before connecting the stove electrically, the connection of the exhaust tubes must be completed (specifically for pellet stoves, not made from aluminium) with the flue.

- The protection grille inside the pellet hopper must never be removed.

- There must be sufficient circulation of air in the room where the stove is installed.

- Never open the door of the stove whilst it is functioning. **FIRE HAZARD!!!**

- **The stove must not be used with the door open or with the glass broken. FIRE HAZARD!!!**

- When the stove is operating, the surfaces, the glass, the handle and the pipes become overheated: during functioning, these parts must only be touched with the adequate protection.

- **Do not light the stove without having first performed the daily inspection as described in the MAINTENANCE chapter of this manual.**

- **Do not place any washing on the stove to dry. Keep clothes and similar at a suitable distance from the stove. FIRE HAZARD!!!**

-DO NOT INSTALL A FLUE DAMPER

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

- Attachment and securement of the exhaust venting system to the product and to each adjoining section. All joints for connector pipe shall be required to be fastened with at least three screws. If vented horizontally, joints shall be made gaslight in a manner that shall be specified.

- Perform regular inspection, maintenance, and cleaning of the chimney and chimney connector

- **Disposal of Ashes:** Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, and moved outdoors immediately. 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 thoroughly cooled. Other waste shall not be placed in this container.

- **Caution against the storage or use of flammable liquids, as follows:** Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use.

- Creosote - Formation and Need for Removal

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire

The exhaust venting system should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred.

If creosote has accumulated it should be removed to reduce the risk of a chimney fire.

- Scrupulously follow the maintenance programme.

- Do not switch off the stove by disconnecting the electricity mains supply.

- Do not clean the stove until the structure and the ashes have cooled down completely.

- Carry out all operations in maximum safety and tranquillity.

- Copy with exhaust venting system termination requirements including location restrictions to air inlets, distances from windows, doors, and air inlets and distance to combustible materials.

- do not connect to or use in conjunction with any air distribution ductwork

- hot while in operation. Keep children, clothing and furniture away. Contact may cause skin burns.

- The type of chimney shall be suitable for solid fuel and the chimney connector must be in good condition and kept clean.

- Establish a routine for the fuel, pellet burner and fring technique. Check daily for creosote build-up until experience shows how often you need to clean to be safe. Be aware that the hotter the fire the less creosote is deposited and weekly cleaning may be necessary in mild weather even though monthly cleaning may be enough in the coldest months. Contact your local or fire authority for information on how to handle a chimney fire. Have a clearly understood plan to handle a chimney fire.

- Keep firing and deashing doors closed and maintain all seals in good conditions.

- Do not strike or slam shut the door, the glass can brake. The glass shall be cleaned only when cold, do not clean a hot glass.

Use a dry cloth with normal glass detergent, do not use any abrasive cleaner.

- The type of chimney shall be suitable for solid fuel and the chimney connector must be in good condition and kept clean.

- When this room heater is not properly installed, a house fire may result. To reduce the risk of fire, follow the installation instructions. Contact local building or fire officials about restrictions and installation inspection requirements in your area.

- This room heater must be connected to a chimney complying with the requirements for type HT chimneys in the standard UL 103 or a code-approved masonry chimney with a flue liner.

- This wood heater needs periodic inspection and repair for proper operation. It is against federal regulations to operate this wood heater in a manner inconsistent with operating instructions in this manual.

- This wood heater has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulations to alter this setting or otherwise operate this wood heater in a manner inconsistent with operating instructions in this manual.
- This heater is designed to burn wood pellet only.DONOT BURN ANY OTHER FUEL. Burning other materials may result in release of toxic fumes or render the heater ineffective and cause smoke.
- Do not overfire. Attempts to achieve heat output rates that exceed heater design specifications can result in permanent damage to the heater.
- Flues gases contain carbon monoxide (CO), it is recommended to install smoke monitors and CO monitors for areas that are expected to generated CO. Inspect the the chimney to minimize visible emissions.
- Soot and Flyash: Formation and Need for Removal—The products of combustion will contain small particles of flyash. The flyash will collect in the exhaust venting system and restrict the flow of the flue gases. Incomplete combustion, such as occurs during startup, shutdown, or incorrect operation of the room heater will lead to some soot formation which will collect in the exhaust venting system. The exhaust venting system should be inspected at least once every year to determine if cleaning is necessary.

3. General

The Stove must only operate in rooms. As it is controlled by an electronic board, combustion is completely automatic and controlled and the control unit regulates the ignition phase, 5 levels of power and the switching off phase, guaranteeing safe functioning.

Most of the ashes produced by the combustion of the pellets fall into the collection drawer.

However, always check the fire pot every day, as not all pellets have high standards of quality and could leave residue that is difficult to remove.

The glass has a special air circulation for self-cleaning. However, a slight greyish film cannot be avoided after a few hours of functioning.

As already mentioned earlier, pellets with a diameter of 6 mm must be used with the stove.

3.1 Responsibility

Ravelli declines all responsibility, both civil and criminal, with the delivery of this manual, for any accidents deriving from partial or total failure to observe the instructions it contains,

Ravelli declines all responsibility deriving from the improper use of the stove, from its incorrect use by the user, by unauthorized modifications and/or repairs or from the use of spare parts which are not original.

The manufacturer declines all direct civil or criminal responsibility due to:

- poor maintenance
- failure to observe the instructions in the manual
- use not compliant with the safety instructions
- installation that is not compliant with the regulations in force in the country.
- installation by personnel who are not qualified or authorized
- modifications and repairs that are not authorized by the manufacturer
- use of spare parts that are not original
- exceptional events

3.2 Compliance status

This manual describes the installation and operation of the Ravelli, Vittoria V, Atena V and RV 120 Touch wood pellet heater. This heaters meet the 2020 U.S. Environmental Protection Agency's wood pellet emission limits for wood heaters sold after May 15th 2015. Under specific test conditions this heater has been shown to deliver heat at rates ranging from -- to --- Btu/hr.

This manual describes the installation and operation of the Ravelli, Vittoria C, Atena C and RC 120 Touch wood pellet heater. This heaters meet the 2020 U.S. Environmental Protection Agency's wood pellet emission limits for wood heaters sold after May 15th 2015. Under specific test conditions this heater has been shown to deliver heat at rates ranging from --- to --- Btu/hr.

	Emission Rate (g/hr)	Heating Efficiency (% Overall)	1st hour Emission Rate (g/hr)	CO emission (gr/hr)
Vittoria V				
Vittoria C				
Atena V				
Atena C				
RV 120 Touch				
RC 120 Touch				

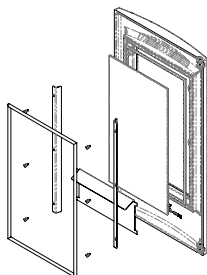
3.3 Spare parts

Use original spare parts only. Do not use any substitute material. Do not wait for the components to be worn before replacing them. Replace a worn component before it is completely broken to prevent any accidents caused by the sudden breakage of components, perform the periodic maintenance checks as described in the dedicated chapter. Removal of broken or damaged components shall be only done by authorized technical service.

3.3.1 Glass and gasket replacement

Use only ceramic type glass. To replace the glass the door needs to be disassembled according to the below drawing.

Vittoria V - Vittoria C - Atena V - Atena C - RV 120 Touch - RC 120 Touch



Ceramic glass dimensions:

272 x 510 mm (10.71" x 20.08")
thickness 5mm (0.20")

Glass ribbon trecotee gasket:

8 mm x 3 mm (0.31" x 0.12")
L1540 mm (60.63")

Door tricovet gasket:

diam. 10 mm (0.39")
L1680 mm (66.14")

3.4. Majolica finishes

Due to the special hand finish of the majolica surface imperfections such as shadowing may occur. Those are details that make every majolica one of its kind. As it is a delicate material, please handle with care whilst cleaning and avoid blows as sudden breakage may occur. Please also take care when loading the hopper (Ed.'s note; tank containing the pellets) with the bag of pellets: do not place it on the stove!

3.5. What are the wood pellets

The wood pellets are made from sawdust and wood shavings produced in joiners' shops. The material used cannot contain any foreign substance such as glue, varnish or synthetic substances.

Subjecting it to high pressure, the wood is pressed through a plate with holes and due to the high pressure the sawdust is heated activating the natural binders of the wood. Thus, the pellets keep their shape even without the addition of bonding substances. The density of the wood pellet varies according to the type of wood and can be 1.5 – twice greater than that of natural wood.

The diameter of the cylindrical rods is 6 mm and their length can vary between 10 and 40 mm.

Their real weight is greater than 650 kg/m³. Due to the low content of water (<10%) they have a high energy content.

The standards ISO 17225-2:2014 define the quality of the pellets:

Length:	< 40 mm
Diameter:	6 mm approx.
Real weight:	> 600 kg/m ³
Lower heating value:	≥ 16,5 MJ/kg (≥ 7100 BTU/lb)
Residual humidity:	< 10 %
Ashes:	< 1.2 %
Specific weight:	>1000 kg/m ³

Do not put the bag of pellets on the ceramic parts during the loading operations.



Pic.1



Pic.2

The pellets must be transported and stored in a dry place. They swell on contact with damp, and cannot be used. They must always be protected from the damp both during transport and in storage. Do not place such fuel within the space heater installation clearances or within the space required for charging and ash removal.

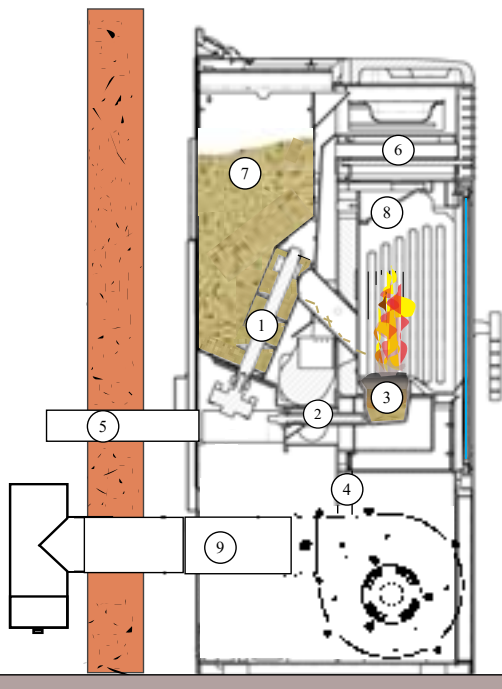
3.6. The components of the stove

1. pellet loading screw
2. electrical igniter
3. combustion fire pot
4. tube for passage of smoke
5. air intake tube
6. stainless steel heat exchanger
7. pellet hopper
8. baffle
9. smoke exhaust tube

This drawing shows the internal parts of a pellet stove.

By filling the hopper (7), the pellets are loaded into the fire pot (3) through the loading screw (1).

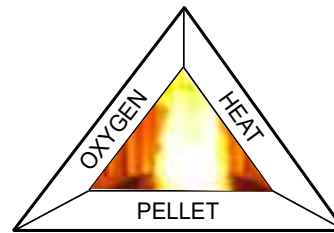
Ignition is by means of the electrical igniter (2), which overheats the air from the special entrance (5) which on contact with the pellets will allow the development of the flame. At this point the exhaust smoke is deviated towards the stainless steel exchanger (6) and through the smoke extraction tube (4) it is released into the flue, through the connection with the smoke exhaust pipe. (9).



3.7. The combustion

The combustion is a chemical reaction between fuel and oxidizer. The result of this reaction is the heat. The three elements that are required for the combustion are:

- Fuel (pellet)
- oxidizer (oxygen available in the air)
- Ignition (heat of embers or electrical ignitor)



To get the combustion, the combustible and the carburant must be available in a correct proportion.

The reaction between combustible and carburant is made by an external starter. The start can be made by the hot reaction or by a sparkle.

The combustion is NOT CORRECT, the flame is too tight with too much incandescent pellet in the firepot.

Adjust the Set pellet/air reducing the air percentage (from 0 up to -5); in the vent this is not enough to get a proper flame, increase the loading quantity of the pellet (from 0 up to +5) to reach the flame condition shown in picture 3.



Pic. 1

INCORRECT combustion, flame too drawn, in "blowtorch" style with a high quantity of incandescent pellets coming out of the grate. Correct the pellet/air set by reducing the percentage of air (from 0 to -5); if not sufficient, also increase the percentage of falling pellets (from 0 to +5) to arrive to the condition in Figure 3.

If the changes made to the settings do not bring the stove to the right combustion conditions in Figure 3, contact the Technical Support Centre.



Pic. 2

INCORRECT combustion, "spring" flame in "wood stove" style with high quantity of pellets not burning on the grate. Firstly, check the door is closed and the ash pan. Secondly, correct the pellet/air set by increasing the percentage of air (from 0 to +5); if not sufficient, also reduce the percentage of falling pellets (from 0 to -5) to arrive to the condition in Figure 3.

If the changes made to the settings do not bring the stove to the right combustion conditions in Figure 3, contact the Technical Support Centre.



Pic. 3

The combustion IS CORRECT, full flame yellow/white and minimum quantity of pellet in the firepot.

The combustion is fine and no ad.

The picture 3 shows a flame done with a stove working at power P5.

4. Safety devices

The stove is fitted with sophisticated safety systems so that, in the case of breakage of one of the individual parts or defects in the flue, no damage will be caused to the stove and the room in which it is installed. In any case, when a problem arises, the pellets stop falling immediately and the “ **switch off** ” phase is activated.

The corresponding alarm will be shown on the display. The details can be seen in chapter 9 “DESCRIPTION OF ALARMS”.

5. TECHNICAL FEATURES

	Unit of measurement	Vittoria V	Vittoria C	Atena V	Atena C	RV 120 Touch	RC 120 Touch
Height	Inch	45.7	45.7	45.8	45.8	45.8	45.8
Width	Inch	20.2	20.2	21.1	21.1	21.1	21.1
Depth	Inch	22.4	22.4	22.4	22.4	22.4	22.4
Weight	Lbs	420	430	420	430	400	410
Diameter of smoke exit tube	Inch	3.1	3.1	3.1	3.1	3.1	3.1
Min-max. hourly consumption of pellets	Lbs/h						
Supply	V - Hz	120 - 60	120 - 60	120 - 60	120 - 60	120 - 60	120 - 60
Hopper capacity	Lbs	50	50	50	50	50	50
Efficiency *	%						
Smoke temperature min - max	°F						

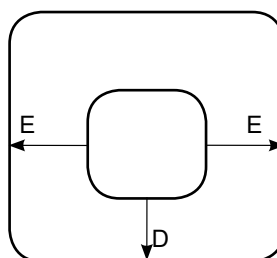
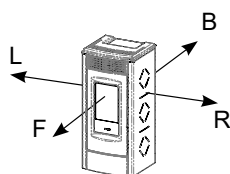
*overall heating efficiency is determined using higher heating value of the fuel.

The data shown above are indicative and not binding. Ravelli reserves the right to make any modifications for the purpose of improving the performances of the product.

6. Positioning, assembly and installation

6.1 Minimum distance from combustible material

NOTE: Install vent at clearances specified by the vent manufactures.



	Unit of measurement	Vittoria V	Vittoria C	Atena V	Atena C	RV 120 Touch	RC 120 Touch
R = right side	Inch/mm	7.9 / 200	7.9 / 200	7.9 / 200	7.9 / 200	7.9 / 200	7.9 / 200
L = left side	Inch/mm	7.9 / 200	7.9 / 200	7.9 / 200	7.9 / 200	7.9 / 200	7.9 / 200
B = rear side	Inch/mm	4.0 / 100	4.0 / 100	4.0 / 100	4.0 / 100	4.0 / 100	4.0 / 100
A = front side	Inch/mm	39.4 / 1000	39.4 / 1000	39.4 / 1000	39.4 / 1000	39.4 / 1000	39.4 / 1000
D = FRONT floor protection	Inch/mm	18 / 457	18 / 457	18 / 457	18 / 457	18 / 457	18 / 457
E = SIDE floor protection	Inch/mm	8 / 203	8 / 203	8 / 203	8 / 203	8 / 203	8 / 203
F = Ceiling	Inch/mm	52 / 1321	52 / 1321	52 / 1321	52 / 1321	52 / 1321	52 / 1321

N.B. The floor protection must extend under the chimney connector and 2 inches (50.8mm) beyond each side

6.2 Environment of use

The positioning of the stove is decisive for a successful and equal heating of the room. Before deciding where to place the stove, the following must be taken into account:

- The stove must be installed on a floor with a sufficient carrying capacity. If the existing building does not meet this requisite, appropriate measures must be taken (i.e. load distribution plate).
- The combustion air cannot be obtained from a garage or from an area without ventilation or exchange of air, but from a free or external space
- The stove must not be installed where there is already another heating appliance without an autonomous air flow (chimney, stove etc.)
- A non-combustible Hearth board 6" from front of unit and 6" from the sides must be installed before unit is placed on the floor.
- Installation is better in a large and central room in the house to ensure maximum circulation of the heat;
- Connection to the main supply is recommended using a grounded outlet (if the cable supplied is not long enough to reach the nearest outlet, use an extension cord with a surge protector);
- The stove must be placed in a position that receives the necessary level of air for appropriate combustion of the pellets (at least 131.23 f³/h must be available), in accordance with installation regulation and local legislations;
- All joints for connector pipe is required to be fastened with at least three screws.
- If vented horizontally joint should be siliconed with hi-temp. silicone and screwed so they are gas tight. (RTU 500 silicone)
- the chimney connector shall not pass through an attic or roof space, closet or similar concealed space, or a floor or ceiling. Where passage through a wall, or partition of combustible construction is desired, the installation shall conform to CAN/CSA-B365.

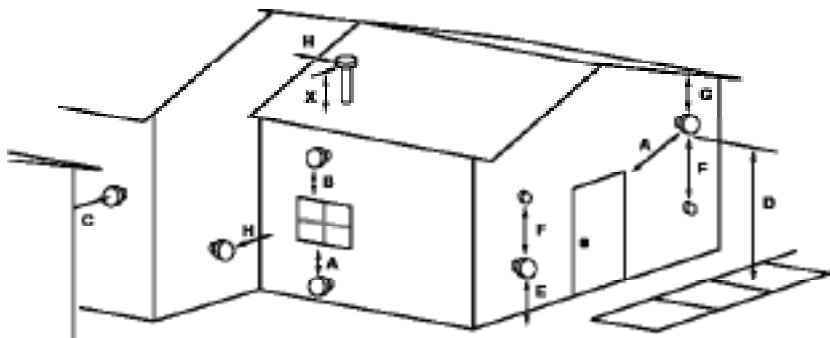
The stove must be installed and assembled by qualified personnel.

The room must be:

- Prepared for the environmental functioning conditions
- Prepared with an adequate system of evacuation of smoke
- Have a 120V 60 Hz electricity mains supply
- Do not connect this unit to a chimney flue serving another appliance
- Use only UL Listed Type L Vent or Pellet Vent 3" in. I.D. venting system to exhaust. Do not install flue damper in the exhaust system of this unit.
- The chimney connector and each other adjoining section must be firmly attached and secured to the stove.

6.3 Mobile Home Requirements

- Outside air is required
- The heater must be secured to the floor using lag bolts.
- The heater must be grounded to the chassis of the mobile home.
- Installation should be in accordance with the manufactured home.
- When outside air is required, system parts, such as vent sections, supports, spark arresters, rodent screens, etc. must be used.
- The space heater is to be connected to a factory built chimney conforming to CAN/ULC-S629.
- It is important to use all the specified components, do not use other components.
- Installation shall maintain an effective vapour barrier at the location where the chimney or other component penetrates to the exterior of the structure.
- Operating the space heater with open firing doors can cause serious injuries and health damages due to escaping flames or carbon monoxide generation inside the room.
- Adequate ventilation is required to avoid air starvation and icing which can determine an unhealthy indoor environment.
- Do not overfire.
- If the space heater is not correctly installed and operated it can interfere with smoke detectors.



WARNING: Do not install in bedroom

CAUTION: The structural integrity of the mobile home floor, ceiling, walls, roof must be maintained.

Refer to HUD Requirements, CFR 3280, Part 24

NOTE: Install vent at clearances specified by the vent manufactures.

NOTE: Measure clearances to the nearest edge of the exhaust hood.

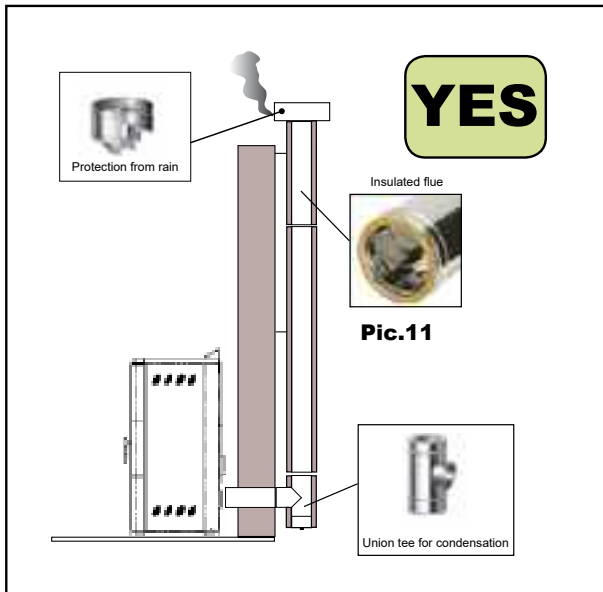
NOTE: Vent may not terminate in covered walkway or breezeway.

NOTE: If venting horizontally, check your venting specifications for distance pipe should extrude from building.

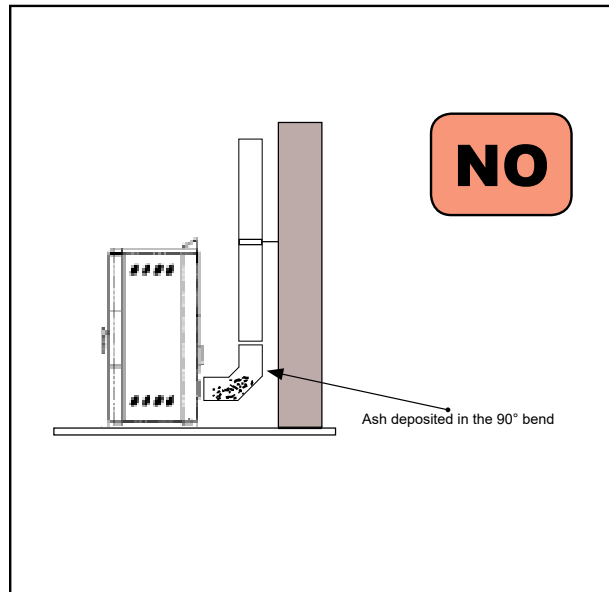
- | | |
|---|---|
| A | Minimum 4' clearance below or beside any door or window that opens (with outside air installed, 1' below or beside) |
| | Minimum 1' clearance below or beside any window that does not open. |
| B | Minimum 1' clearance above any door or window that opens |
| C | Minimum 2' clearance from any adjacent building |
| D | Minimum 7' clearance above any grade when adjacent to public walkways |
| E | Minimum 2' clearance above any grass, plants, or other combustible materials |
| F | Minimum 3' clearance from any forced air intake of any other appliance |
| G | Minimum 2' clearance below eaves or overhangs |
| H | Minimum 1' clearance horizontally from combustible wall |
| X | Must be a minimum of 2' above the roof |

6.4. Examples of installation

Pic.9



Pic.6

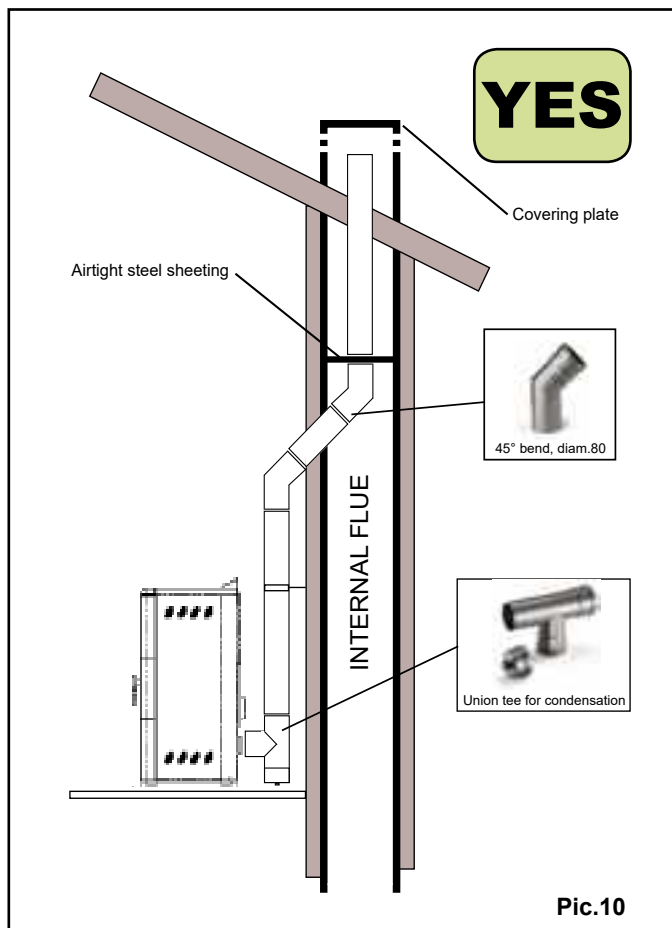
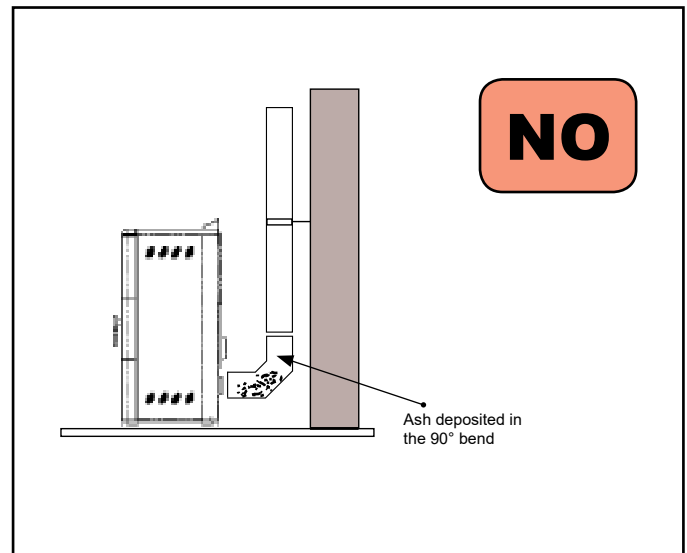


This type of installation (see Pic. 9) requires an insulated flue, as all the smoke pipe has been installed outside the house.

In the lower part of the flue, a union tee has been mounted with an inspection cap.

A 90° bend should not be installed as the first initial piece as the ashes would quickly obstruct the passage of smoke, causing problems for the draught of the flue. (See Pic. 6).

Pic.6



This type of installation (see Pic. 10) does not require an insulated flue as the smoke tube has been assembled partly inside the house and partly inside an existing flue.

In the lower part of the flue a union tee has been installed with a peephole cap.

A 90° bend should not be installed as the first piece, as the ash would quickly block the passage of smoke, causing problems for the draught of the flue (See Pic. 6).

Please note the use of 2 45° bends, to guarantee that the ash falls in the union tee with a peephole.

Determining Size of Pipe to install

To determine the diameter of pipe to use (3" or 4"), you can use the following guidelines.

Fillout the installation chart (table 1), and calculate your total equivalent pipe length.

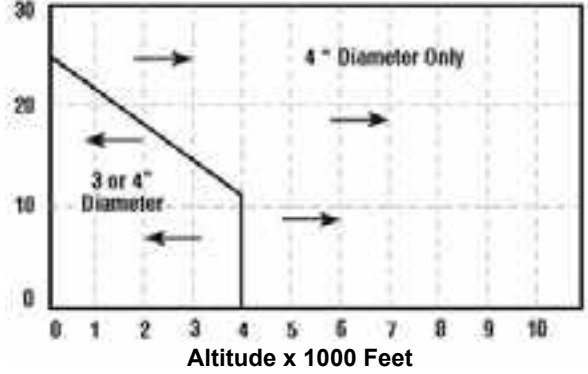
Then use the total equivalent pipe length and the altitude in the pipe selection chart. (pic.11) to determine if your installation requires 3" or 4" exhaust pipe.

Table 1: Installation chart

Type of Pipe	# of Elbows or Feet of Pipe		Equivalent
90° Elbows/ Tee (A & G)		x	5 feet (1.5 m)
45° Elbows (C)		x	3 feet (1.0 m)
Horizontal (B & F)		x	1 feet (0.3 m)
Vertical (E)		x	0.5 feet (0.15 m)

Equivalent Pipe Length (feet)

Pic. 11 .Pipe Selection Chart



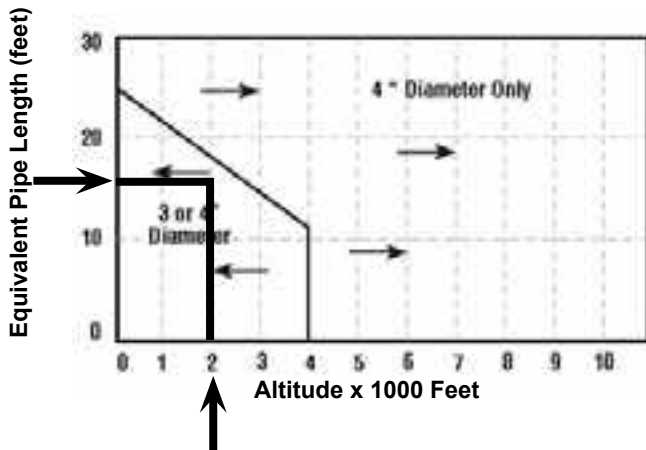
Sample installation chart

Type of Pipe	# of Elbows or Feet of Pipe		Equivalent	Total Equivalent
90° Elbows/ Tee (A & G)	2	x	5 feet (1.5 m)	10 feet (3.0 m)
45° Elbows (C)	1	x	3 feet (1.0 m)	3 feet (1.0 m)
Horizontal (B & F)	3	x	1 feet (0.3 m)	1 feet (1,0 m)
Vertical (E)	8	x	0.5 feet (0.15m)	1 feet (1,2 m)

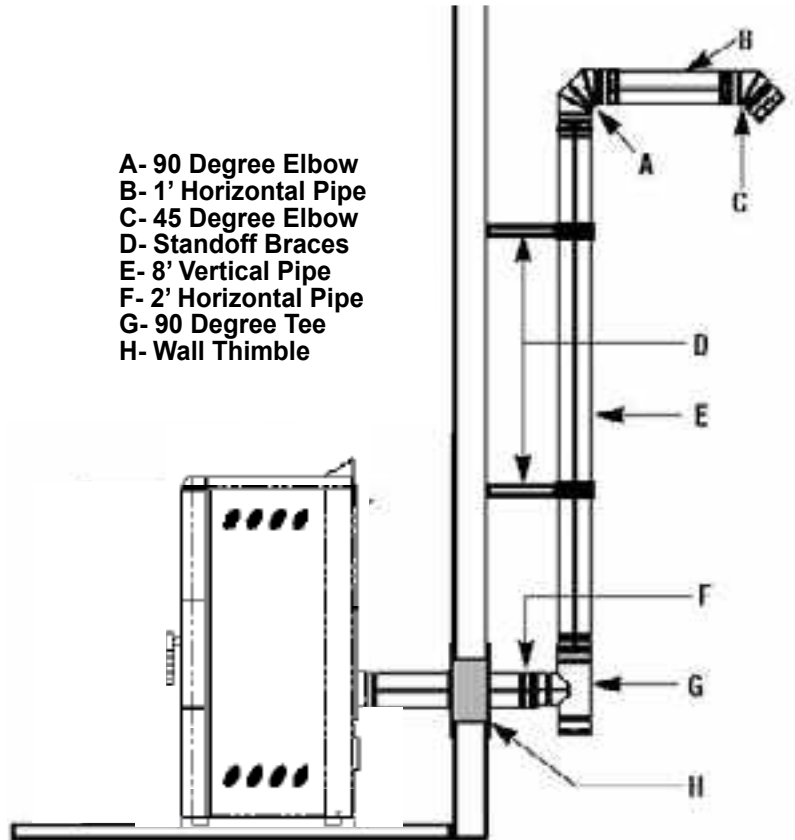
Table 2 - Sample chart for pic.12

Equivalent pipe lenght = (10 + 3 + 1 + 1) ft = 15 ft

If the stove is installed in a place with an altitude of 2000 ft, it is possible to use either a pipe of 3" or of 4", as you can see in the pipe selection chart below.



- A- 90 Degree Elbow
- B- 1' Horizontal Pipe
- C- 45 Degree Elbow
- D- Standoff Braces
- E- 8' Vertical Pipe
- F- 2' Horizontal Pipe
- G- 90 Degree Tee
- H- Wall Thimble



Pic. 12. See sample installation chart

Standard horizontal installation configurations

1. Locate the proper position for the listed type "PL" wall thimble. Avoid cutting wall studs when installing your pipe. Use a saber saw or keyhole saw to cut the proper diameter hole through the wall to accommodate the wall thimble. Use extreme caution to avoid cutting into power lines within the wall of the home. The hole size will depend on the brand of pellet vent that you are using. Install the wall thimble in the hole.

2. ALL INTERLOCKING PIPE CONNECTIONS WITH-IN THE ROOM MUST BE SEALED WITH HIGH TEMPERATURE RTV AND SECURED WITH A MINIMUM OF 3 FASTENERS PER CONNECTION. Position the stove approximately 12" (305 mm) from the wall on the floor pad. Push the "PL" pipe through the wall thimble. Squeeze a bead of high temperature silicone (RTV) sealer around the end of the machined portion of the 3" (76mm) pipe connector on the back of the stove. Firmly push on a section of "PL" pipe until inner pipe liner pushes into the bead of RTV sealer.

3. Push the stove with pipe attached towards the wall (the pipe will go through the wall thimble). Do not position the back of the stove closer than 2" (51mm) from the wall.

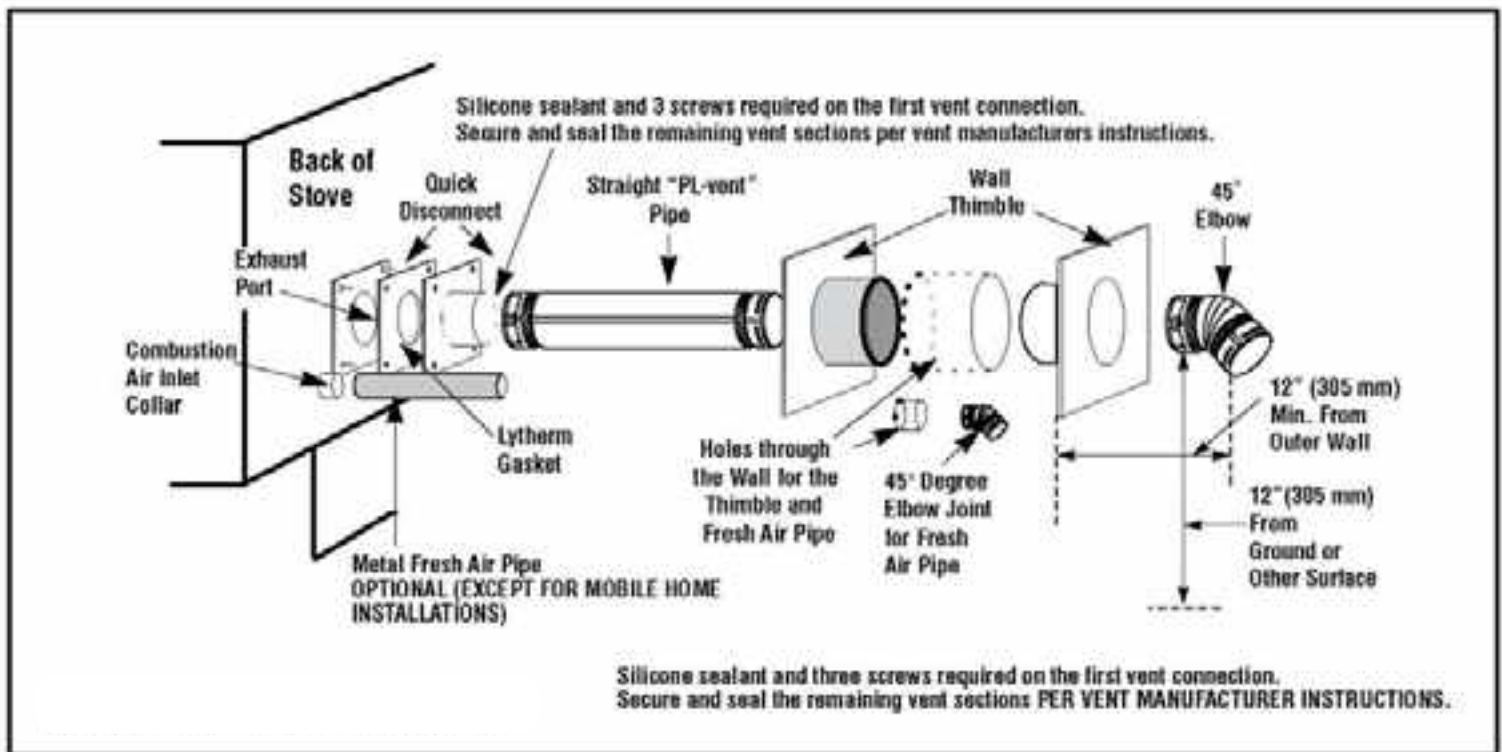
4. Install listed type "PL" 45 degree elbow with optional rodent screen or cap (recommended) on outside end of pipe. The rodent screen should be no less than 1/2" (13 mm) mesh and may clog with soot and ash if left unattended during the burn season.
NOTE: The end of the exhaust pipe must extend a minimum of 12" (305 mm) from the outside of the building.

5. If the installation includes a source of outside combustion air; cut a separate hole through the wall for the fresh air tube. Use a galvanized or stainless steel pipe for the duct. The minimum size for the duct shall be not less than 50% of the cross sectional flue area. Connect outside air pipe to air inlet on stove. This tube must be terminated with a 45 degree elbow or hood.

NOTES:

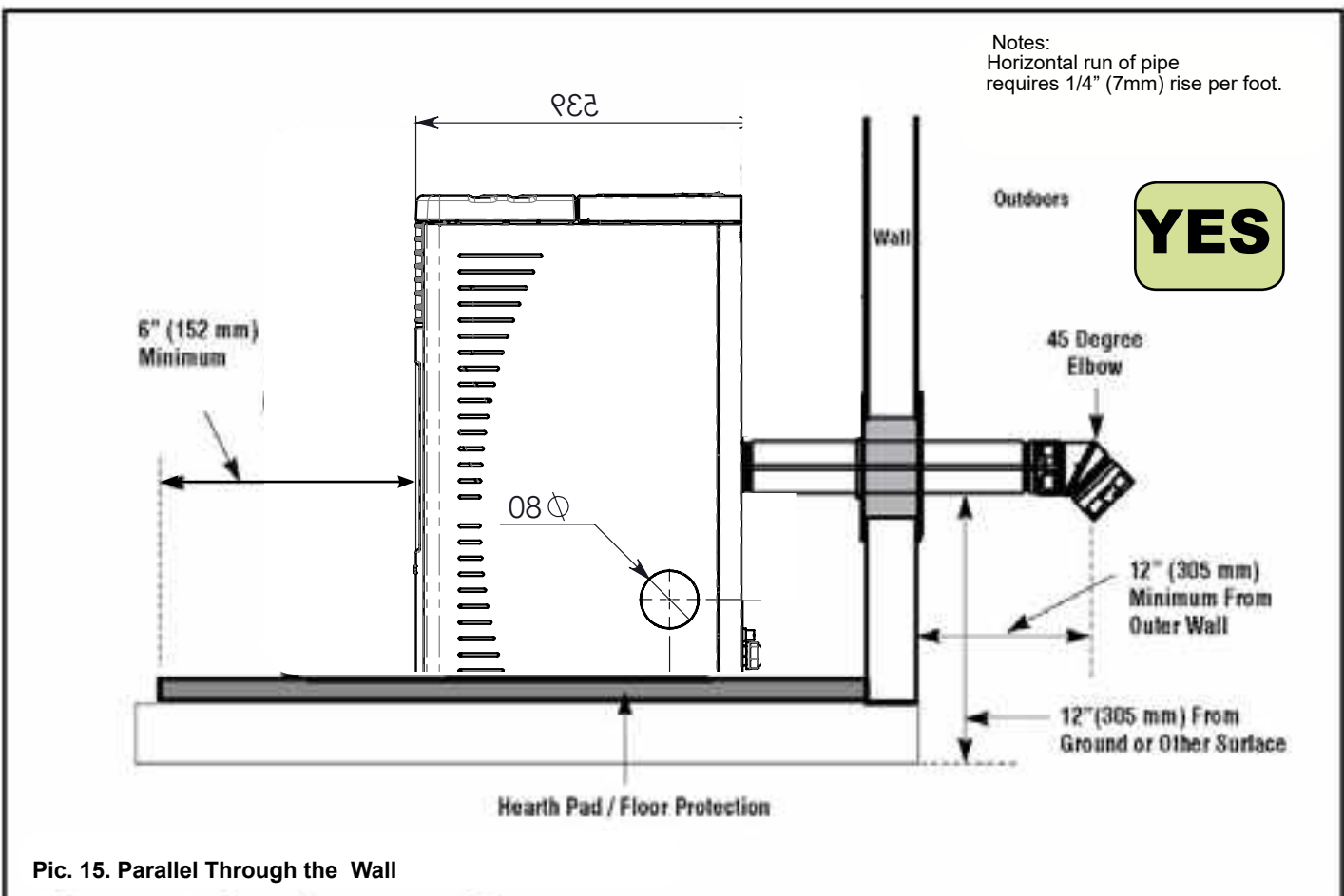
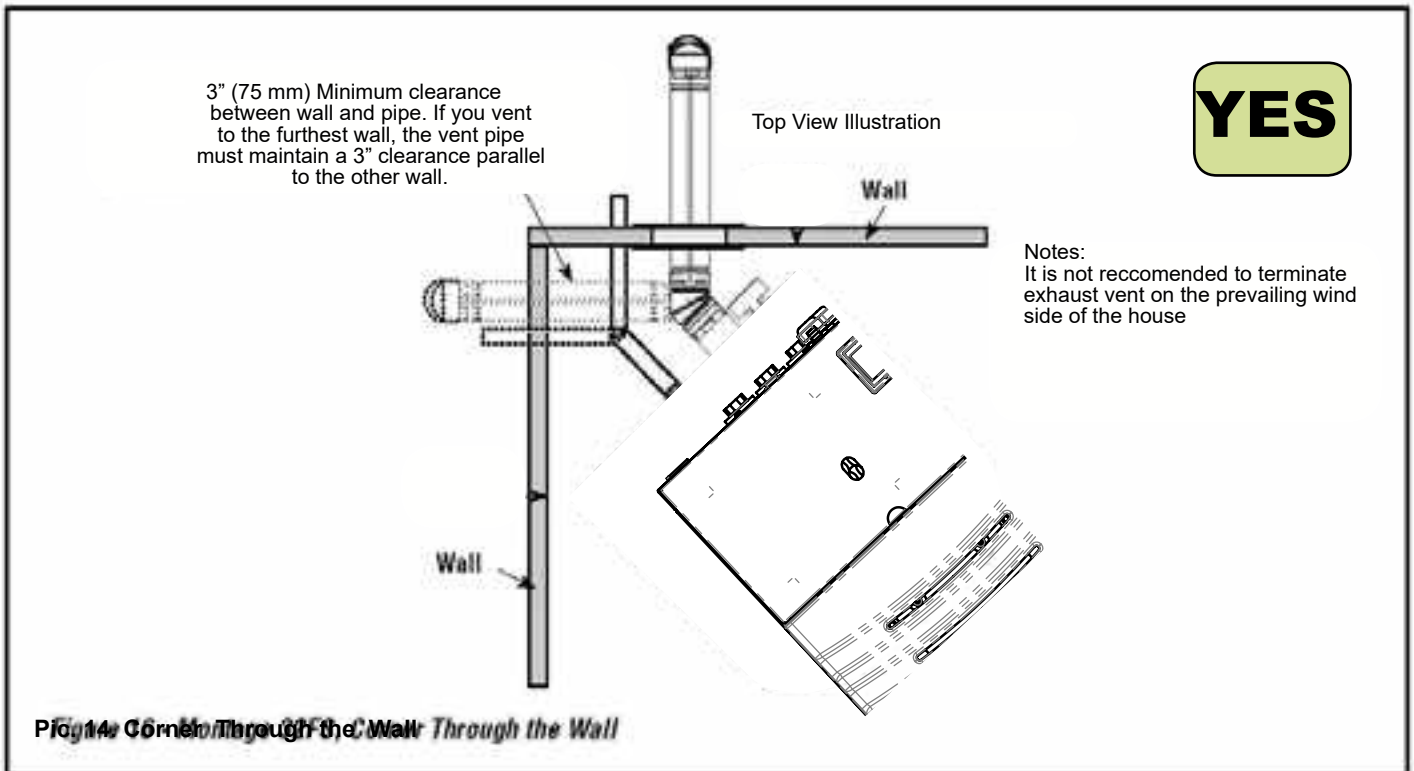
Combustion air may also be drawn from a vented crawl space under the home.

All joints for connector pipe are required to be fastened with at least three screws. If vented horizontally, joints shall be made gas-tight (air tight, sealed connection) in a manner as specified on this page (see instruction #2). Install vent at clearances specified by the vent manufacturer.



Pic. 13.Horizontal Vent installation

Standard horizontal installation configurations



Preliminary Operations

Wiring



Connect the power cord to the back of the stove and then to a wall socket. The I/O switch in the figure should be set to I to power the stove. If voltage is not supplied check the state of the fuse installed in the box below the switch (4A fuse). During the periods of inactivity, we recommend you disconnect the power cord of the stove.

What to check before turning on the stove

Make sure you have removed all parts that pose the risk of burns from the combustion chamber or glass (various instructions or stickers).

Before turning on the stove, make sure you have fitted the grate on the support base and check that the door and the ash drawer are properly close.

How to load the pellets

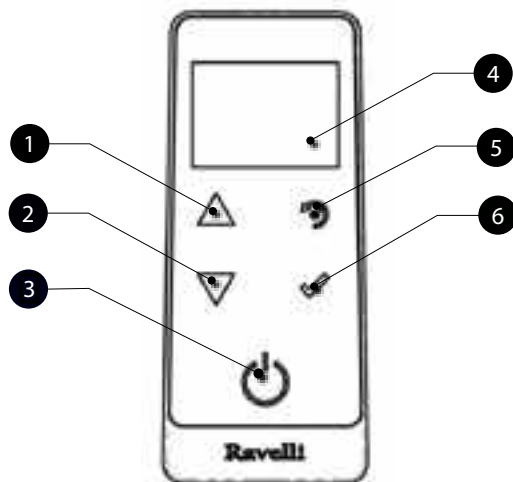
Fuel supply consists in the insertion of pellets from the top of the stove, by opening the door. During pellet loading prevent the pellet bag from coming into contact with hot surfaces.



NEVER INSERT INTO THE TANK OTHER KIND OF FUEL OTHER FROM THE PELLETS
COMPLYING WITH THE SPECIFICATIONS BELOW

Description of the touch remote:

The touch remote is shown in the picture below:



- | | |
|---|--|
| 1 | Increase button "UP" (selection key) |
| 2 | Decrease key "DOWN" (selection key) |
| 3 | ON/OFF or reset from "Sleep" mode key. |
| 4 | Display |
| 5 | Key for accessing the MENU and back |
| 6 | Confirmation key |



In "Sleep" mode, the touch remote screen is obscured, keeping however active the radio communication with the stove to reduce battery consumption.

The information below will allow you to become familiar with the product and achieve the best performance.

How to insert the batteries in the touch remote:

Remove the protective cover of the battery on the back of the remote control as shown in Figure A, and insert the 3 batteries (mini pen style battery AAA 1.5V) in the housing of the touch remote and observe the poles. Install the battery protective cover as shown in figure B



Figure A



Figure B

The touch remote, after a short screen showing the Ravelli logo, will list the languages available in the menu.



Select the desired language using the scroll keys and confirm your selection with the confirmation button.

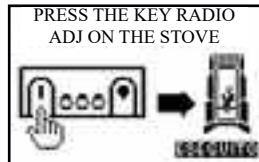
Touch remote radio initialization

In order to operate correctly, the touch remote should be interfaced with the electronic board installed inside the stove. For this reason, on display appears the following message:



If the touch remote is used for the first time, select **YES** using the selection keys and confirm with the dedicated key.

On the display of the touch remote appears the following:



Hold down for a few seconds the button of radio communication (RADIO ADJ) of the PCB, located on the back of the stove, to initialize the device.



The flashing yellow LED indicates that the circuit board is waiting to receive the signal from the touch remote.

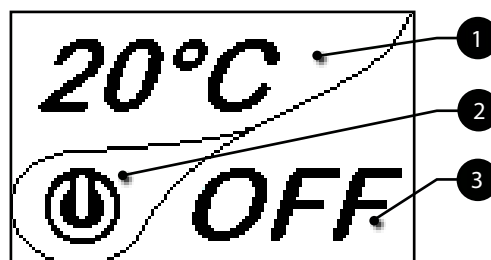
By pressing the enter key on the touch remote, the components start communicating with each other. A check sign on the display, accompanied by a sound signal, shows that the initialization of the touch remote has been completed successfully.



i When you replace the batteries, you do not have to run the initialization procedure of the touch remote. In this case, when on display appears the message "FIRST INSTALLATION ?", select **NO** and press the confirmation key.

Description of the display

The display of the touch remote is described below (in stand-by)



i After 5 minutes of inactivity, the display of the touch remote turns dark, switching to "SLEEP" mode, while maintaining the radio connection with the stove. By pressing the key ON/OFF, the display becomes active again.

i The first pressure of any key with the display active, lights up its backlight, but it is not, however, considered a command.

The display is subdivided into three parts:

- 1 It shows the current room temperature measured by the touch remote. Moreover, if you press the DOWN scroll key you will display the temperature settings that can be changed using the two UP/DOWN keys. Any change made is confirmed automatically within 3 seconds from the change or by pressing the confirmation key. A sound signal indicates that the change has been confirmed.



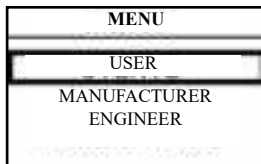
- 2 In the inactive phases (combined with the 3rd part of the display) indicates the state of the stove. In the active phases, it indicates the operating power of the stove. In addition, by pressing the DOWN scroll button, you can display the power settings, that can be edited using the two scroll keys
UP/DOWN: The confirmation of any change takes place automatically within 3 seconds from the change or by pressing the confirmation key. A sound signal indicates that the change has been confirmed.



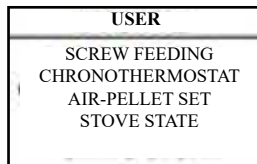
3

Time and date setting

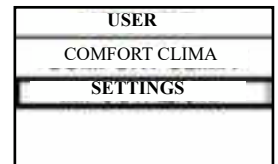
Below are given the steps for accessing the relative menu.



Press the key "access menu" to access the MENU page



Press the key "confirm" to access the USER page



Press the key "selection" for "selection" to switch to the second page of USER MENU and select SETTINGS.



Press the key "confirm" to access the SETTINGS page



Press the key "confirm" to access the DATE-TIME



Press the increase key to change every single value



Press the decrease key to change every single value



Press "confirm" to confirm the settings and switch to the next value.



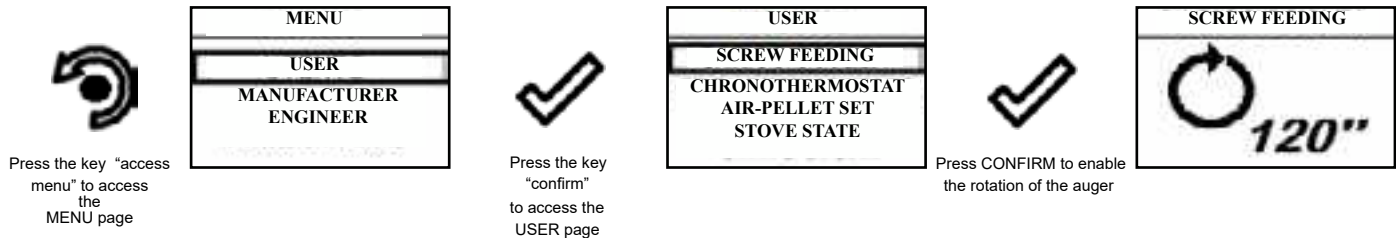
By pressing the key "back" for several times you will display the stand-by page.

8. Description of the functions

Loading the auger

 Carry out this operation to facilitate stove's first start operations; You should also check that you have introduced pellets into the hopper and wait until the stove is in "SHUTDOWN" or "FINAL CLEANING" mode. The number expressed in seconds indicates the rotation time of the infeed screw during the first loading cycle. Once this time has elapsed, the infeed screw stops immediately and then pellets are emptied from the grate before turning on the equipment.

Below are given the steps for accessing the relative menu.



At the end of the auger loading, the display shows 0 "and automatically switches to the USER menu page.



Press the key for several times until the Stand-by page is displayed.



ALWAYS EMPTY THE BRAZIER BEFORE TURNING THE STOVE ON AND ALWAYS CHECK THAT ALL NONE OF ITS HOLES IS CLOGGED NEVER EMPTY THE RBAZIER INSIDE THE HOPPER. FIRE HAZARD.

Setting operating temperature and power:

Set the two values following the indications given in the chapter "Description of thr display"

Turning the device on

Keep the key ON/OFF pressed for a few seconds to turn on the stove.



The appearance of the message "ADJUST THE RDS SYSTEM" indicates that the initial parameter testing procedure and calibration has been unsuccessfully. This indication does not cause stove blockage (see the SIGNALLING POP UP section).

On the display of the touch remote appears the following:



Press and hold the ON/OFF button to turn off the stove door, and reset any alarms triggered.



In case the infeed screw operations described above have not been executed, the stove may fail to turn on. In this case, carry out the operations described above and empty the brazier and reset the alarm.

If the stove still fails to turn on, check that the grate is properly installed and perfectly adherent to the base, and also check that there are no deposits that prevent the smooth passage of air to enable ignition. If the problem persists, contact the support service.

Sequence of ignition phases



SWITCH-ON- initial pellet loading phase;
WAIT FLAME - flame development wait phase;

FLAME PRESENT - flame stabilization phase and reduction of combustible inside the brazier;



WORK - operation phase described in the dedicated chapter;

What happens if the batteries are empty?



If the battery is discharged, within the "drop" is shown a symbol that indicates that the battery is empty, while maintaining active the features of your device.



As soon as the level of the battery prevents the radio communication the touch remote displays on full screen the picture of empty battery and all device functions are locked until the batteries are replaced

Operating phases of the appliance

Modulation

During the work phase, the appliance should reach the room temperature set; when this condition is met, the stove switches to MODULATION mode in which fuel consumption and ventilation are minimum.



If you wish to detect the ambient temperature by means of an external thermostat (optional), this must be connected to the appropriate connector on the rear side of the stove; and you will have to activate the reading in "SETTINGS - ENABLE THERMOSTAT." On display appears the writing TON / TOFF based on thermostat request.

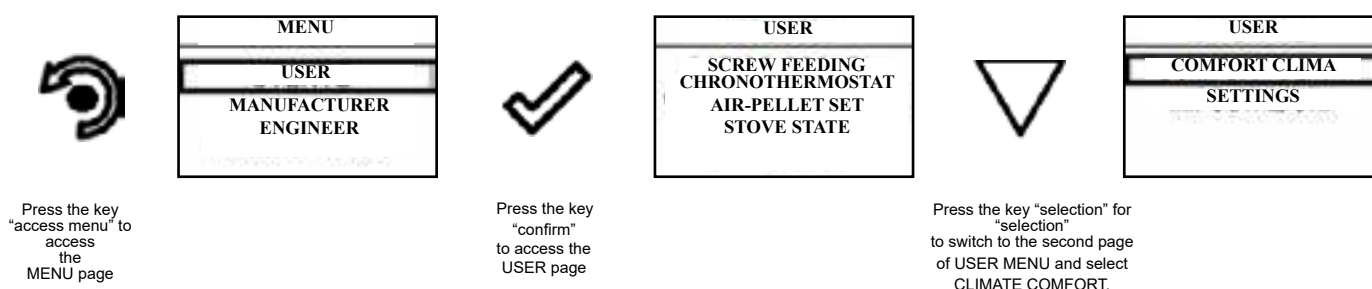


CONNECT AN EXTERNAL THERMOSTAT WITH A SIMPLE DRY CONTACT, THEREFORE, NOT POWERED. MOREOVER, WE RECOMMEND YOU USE A THERMOSTAT WITH A MINIMUM OFFSET OF 3°C IF YOU INTEND TO USE THE COMFORT CLIMA FUNCTION.

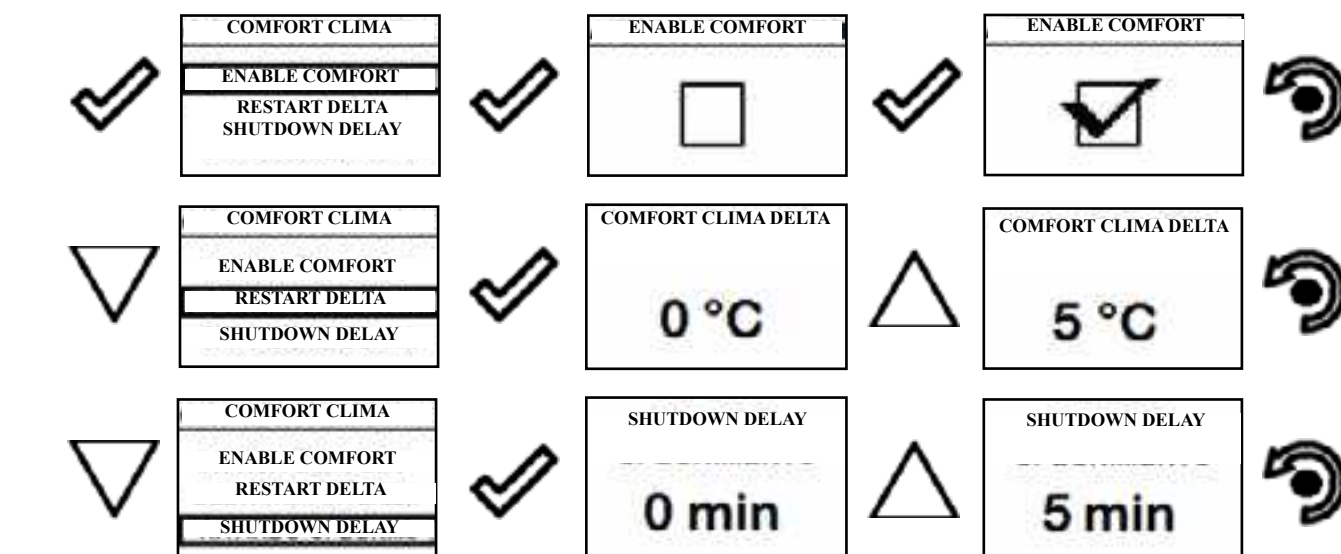
Comfort climate

The activation of this function enables the stove to reduce pellet consumption by activating the modulation phases, after the desired temperature has been reached. Subsequently, the stove checks that the temperature is maintained steady for a preset time. If this condition is met, it automatically switches off, and on display appears the writing ECO. The stove turns on again when the temperature drops below the set threshold.

Below are given the steps for accessing the relative menu.



Once you have accessed the Climate Comfort menu, it is possible to operate on the 3 types of settings dedicated to the function:



Press the key for several times until the Stand-by page is displayed.

The first setting allows the activation of the CLIMATE COMFORT function. This function is intended to ensure that the room temperature set is maintained steady upon setting the maximum period of "X" minutes (SWITCH-OFF DELAY: 5 MIN) before switching to ECO STOP phase. The STOVE maintains this state until the temperature drops below the set value (CLIMATE COMFORT DELTA: 5°C).

For example, with the room temperature at 21 °C, the stove switches off when this temperature is reached and restarts when the temperature reaches 15°C (21°C - 5°C - 0,5°C tolerance).

You can also activate the function using an external thermostat, keeping in mind that this does not include the value of the hysteresis.



We recommend you use an external thermostat with a hysteresis value that can be set to maximum 3°C. The operation of the stove could activate the switch ON/OFF phases for several times during the day; this may affect the service life of the ignition coil.



USING THIS METHOD, IT IS NECESSARY TO VERIFY THAT AFTER EACH AUTOMATIC SHUTDOWN THE GRATE IS ALWAYS VERY CLEAN TO GUARANTEE CORRECT AUTOMATIC SWITCH ON.

Description of menu functions



Press the key to access the MENU page

MENU
USER
MANUFACTURER
ENGINEER



The TECHNICIAN and MANUFACTURER menus are protected by password.

Chronothermostat

With the Chrono-thermostat function you can program the automatic switch ON/OFF of the stove for each day of the week for each day of the week in 4 independent time intervals (SET CHRONO 1-2-3-4)

Below are given the steps for accessing the relative menu starting from Stand-By mode.



MENU
USER
MANUFACTURER
ENGINEER



USER
SCREW FEEDING
CHRONOTHERMOSTAT
AIR-PELLET SET
STOVE STATE



USER
SCREW FEEDING
CHRONOTHERMOSTAT
AIR-PELLET SET
STOVE STATE

Press the key "access menu" to access the MENU page

Press the key "confirm" to access the USER page

Press the key "selection" to quickly switch to CRONO-THERMOSTAT.



CHRONO
ENABLE CHRONO
SET CHRONO 1
SET CHRONO 2
SET CHRONO 3
SET CHRONO 4



ENABLE CHRONO
☐



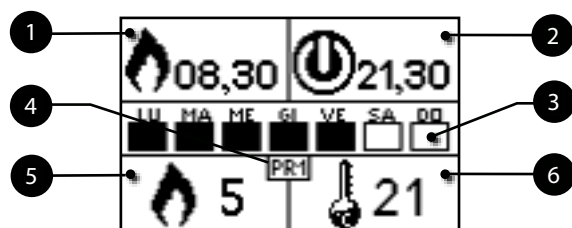
ENABLE CHRONO
☒



CHRONO
ENABLE CHRONO
SET CHRONO 1
SET CHRONO 2
SET CHRONO 3
SET CHRONO 4



00.00	00.00
LU HA HE GI VE SA DO	
5	21



- | | |
|---|--------------------------------------|
| 1 | Settable switch-on program |
| 2 | Settable switch-off program |
| 3 | Day of the week with active program |
| 4 | Number of "chrono" program (1-2-3-4) |
| 5 | Setting the power upon programming |
| 6 | Setting ambient temperature |



By pressing the Increment key you can change each value and, at step 3, enable the days of the week;



By pressing the Decrement key you can change each value and, at step 3, enable the days of the week;



Press "confirm" to confirm the settings and switch to the next value;



Press the "back" button to return to the CHRONO-THERMOSTAT page.

As per the above example, it has been set as CHRONO 1 an ignition from 08.30 to 21.30 from MONDAY to FRIDAY at the operating power 5 with a room temperature set at 21 ° C. Programmes 2-3-4 can be set in the same manner.

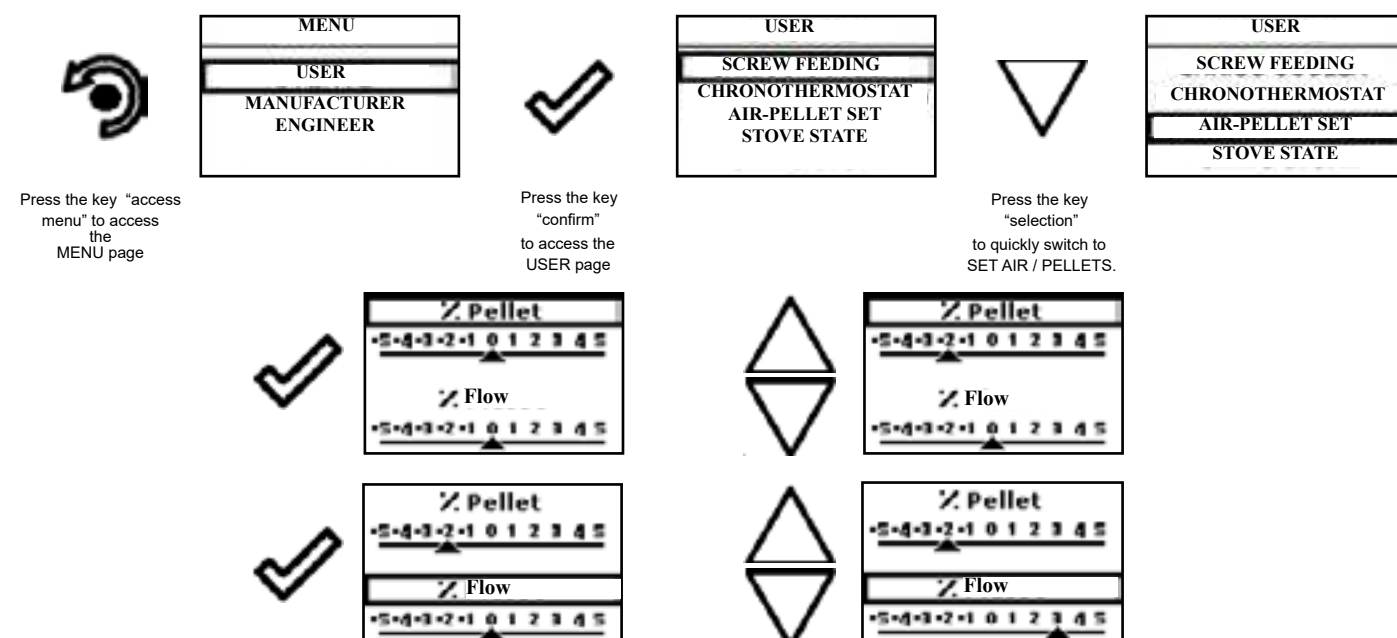


To exit the CHRONO-THERMOSTAT function and return to Stand-by page, press the button repeatedly.

AIR / PELLETS setting

Setting of the PELLET-FLOW mix enables you to immediately change the quantity of pellet loaded in the brazier and the air inflow. The stove is tested and inspected with DIN PLUS certified pellets. If using another type of pellets or uncertified pellets, fuel may need adjustment. Usually, the variation involves the FLOW percentage to adjust the input air and, therefore, the combustion; should the regulation of flow be insufficient, it may be necessary to also change the percentage of PELLET load.

Below are given the steps for accessing the relative menu starting from Stand-By mode.



As per the above example, you have set a percentage of -2 for PELLETS and +3 for the FLOW, an indication that a setting like this is a consequence of the fact that the oxygen needed for combustion is insufficient and pellet size is smaller than the average size of 2 cm.



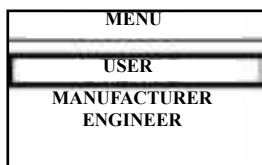
To exit the SET AIR - PELLET function and return to Stand-by page, press the button repeatedly.



NOTE: The number indicated during the change of parameters refers only to a percentage value that acts on the default parameters set on the electronic board (exclusively in the WORK phase). These values should be changed in the event of poor combustion, due in many cases to the purchase of pellets differing from those used during stove testing.

Stove State

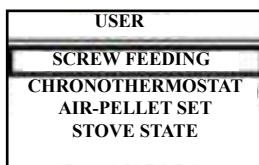
Below are given the steps for accessing the relative menu starting from Stand-By mode.



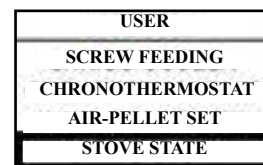
Press the key "access menu" to access the MENU page



Press the key "confirm" to access the USER page



Press the key "selection" to quickly switch to STOVE STATE.



RDS	00,00	m/s
RPM	0000	g/min
T	0030	°C
ALARM	ACTIVE	



SET	00,00	m/s
Dr	0030	°C
Dr	0030	°C
Dr	0030	°C

In this mode you can check the proper operation of the most important parameters of the appliance. Below is a list of real data of the stove useful for service during inspection.

- Actual flow
- Fume extractor revolutions;
- Fume temperature;
- Stove state:

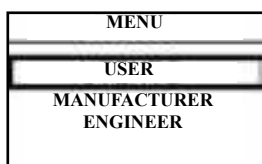
- Actual flow set;
- Inlet flow meter temperature;
- Heated flow meter temp.;
- Electronic board temperature;



To exit the STOVE STATE page and return to Stand-by page, press the button repeatedly.

Settings > Enable thermostat

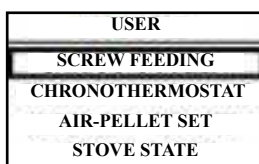
Below are given the steps for accessing the relative menu starting from Stand-By mode.



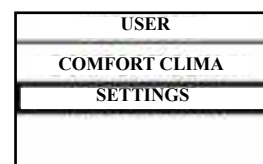
Press the key "access menu" to access the MENU page



Press the key "confirm" to access the USER page



Press the key "selection" to quickly switch to the second page of the menu SETTINGS.



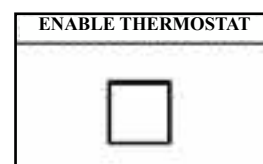
Press the key "confirm" to access the SETTINGS page



Press the key "selection" to switch to the function



Press the key "confirm" to access the function



Press the key "confirm" to enable the function.



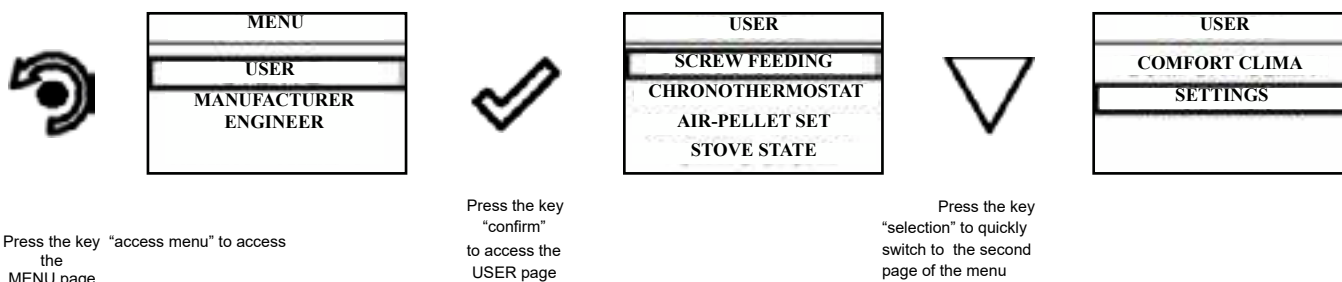
ENABLE THERMOSTAT. By repeatedly pressing the key you will go back to the "STAND BY"



In Stand-By mode, instead of the measured and settable ambient temperature appears the line T ON if the room where the thermostat is installed has not yet reached the requested value or the writing T OFF if the room temperature set has been reached.

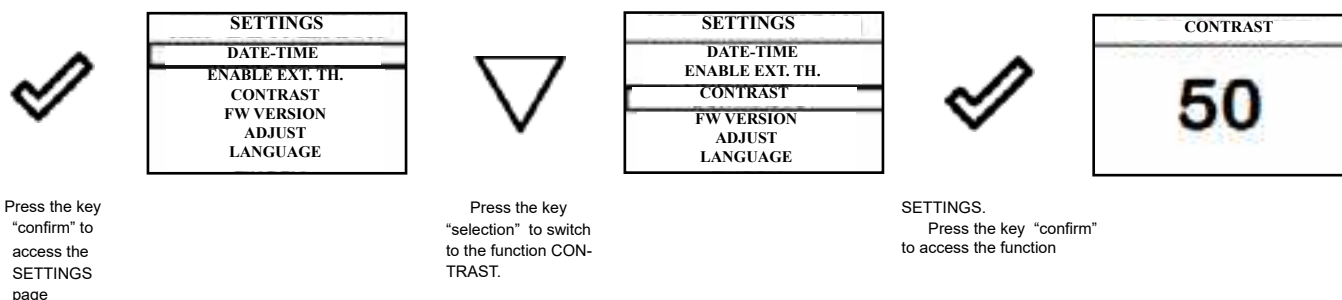
Settings

Below are given the steps for accessing the relative menu starting from Stand-By mode.



After following the procedure above step by step, you can set the following functions:

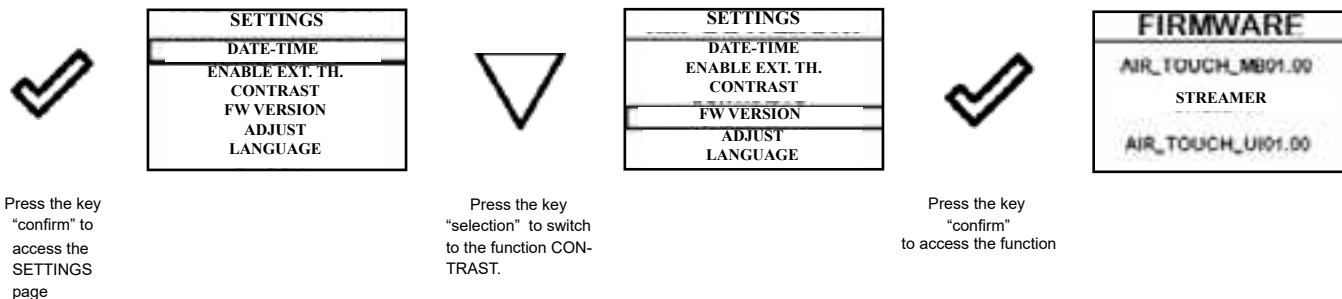
Settings > Contrast



Use the UP/DOWN keys to change contrast setting and obtain a better visualisation of the information shown on the touch remote. The value can vary from 0 to 100. 50 with respect to

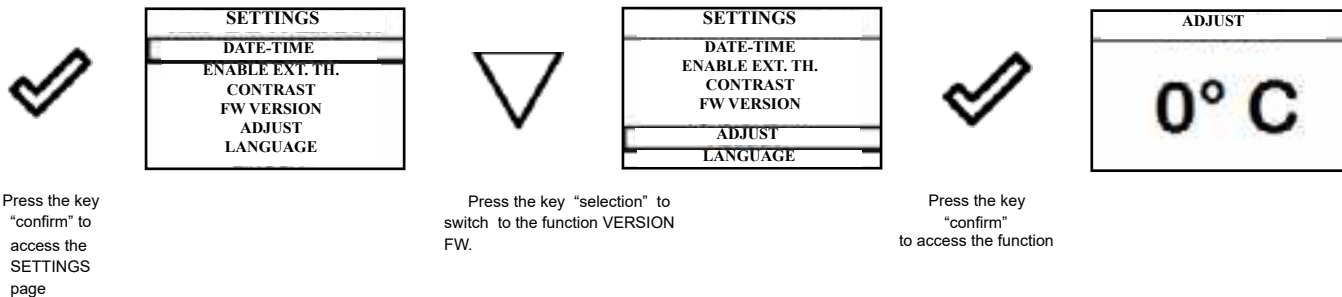
By pressing the following button you will confirm the data and switch to the page within the SETTINGS menu.

Settings > Firmware version



By pressing the following button you will confirm the data and switch to the page within the SETTINGS menu. SETTINGS.

Settings > Adjust



Use the UP/DOWN keys to change the value read by the room temperature probe installed inside the touch remote, with respect to a reference value. The value can vary from -10°C to

By pressing the following button you will confirm the data and switch to the page within the SETTINGS menu.

10°C. The standard value is 0°C.

Settings > Language

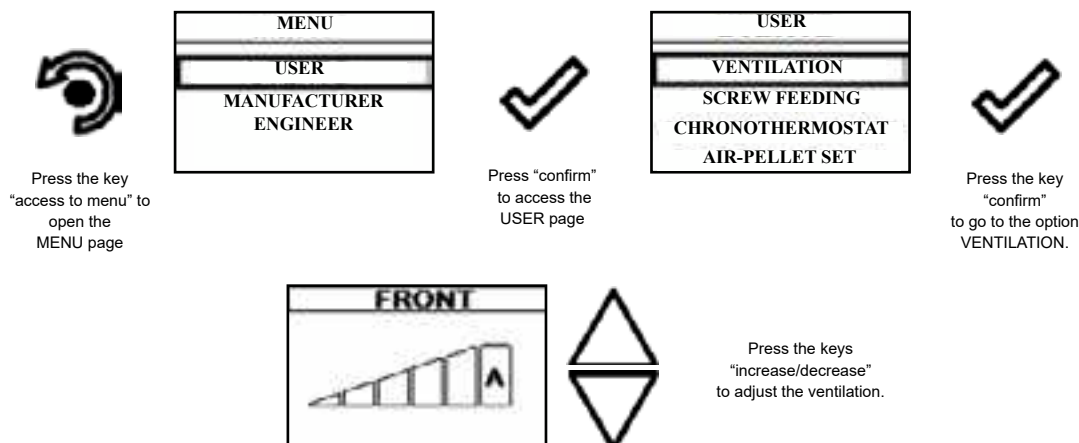
To access the next setting, follow the steps given above or simply remove and replace the batteries. The device resets and prompts you again to select the language you want to set.

Single ducting (function present only in models equipped with single ducting system)

The stoves with optional fan employ the natural convection system that ensures a considerable heat output in the environment with the total absence of noise generated by room ventilation. However, the user can activate the optional fan according to the heating power needed, using the menu below.

Below are given the steps to be followed to access the relative menu from the Standby page.

Control



The exit key opens the VENTILATION menu again to set the other operating parameters available in the menu.



To exit the page and go back to Standby page, press the key for several times.

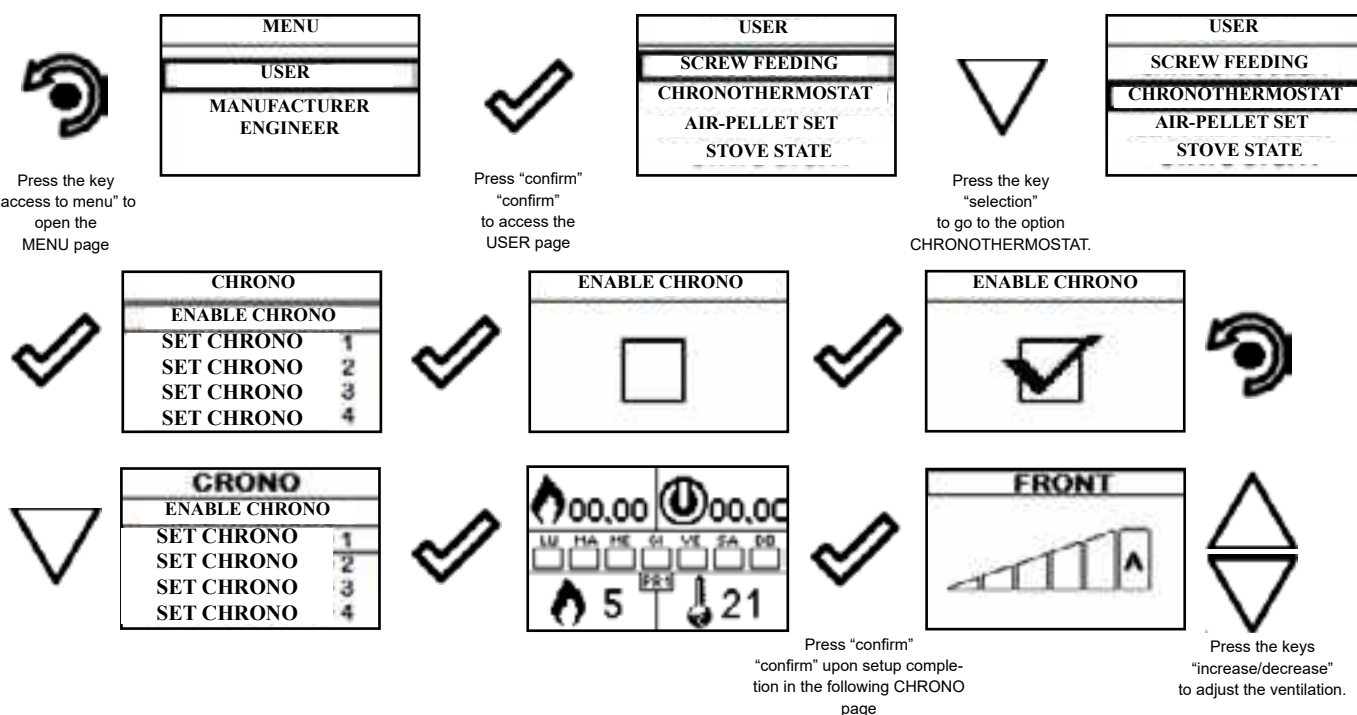
Control: the ventilation can be set from 0 to AUTO where 0 indicates that the same is disabled; settings from 1 to 5 enable the user to set the fan speed. If the value set is AUTO, the ventilation corresponds to the power set on the stove.



If the AUTO function is not enabled, the fan operation is not depending on stove's installed power, except for the cases in which the flame switches to modulation mode and the heat exchanger is forced to minimum.

Chrono function

By activating the chrono function, the user can control the fan speed for each program, as shown in the logic above.



The exit key opens the CHRONO menu again to set the other operating parameters available in the menu.



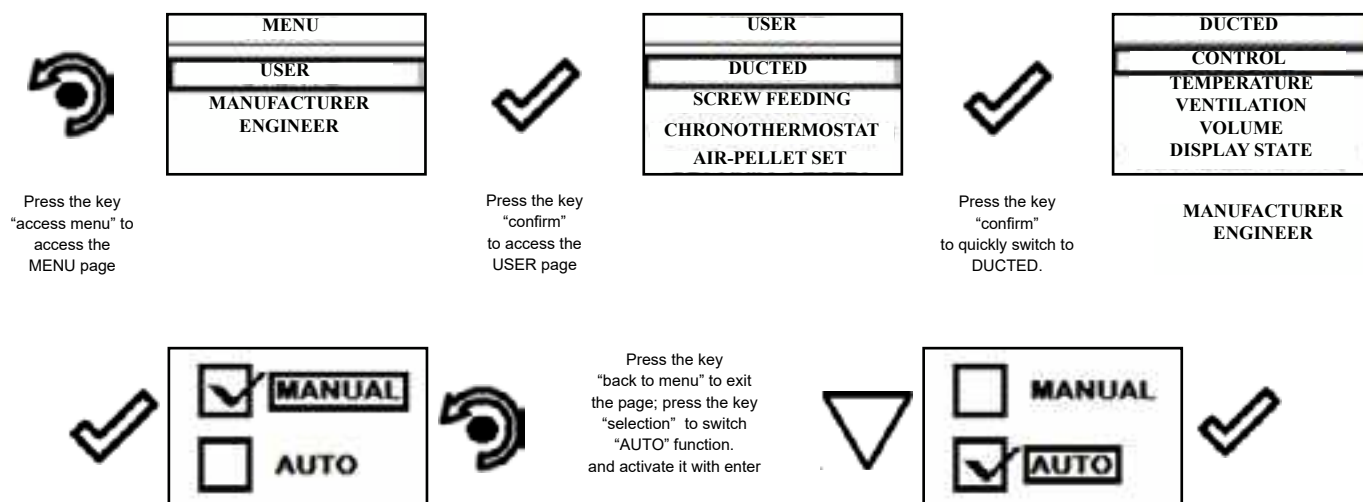
To exit the page and go back to Standby page, press the key for several times.

Single ducting (function present only in models equipped with single ducting system)

With this function you can set the level of ducting, therefore, the amount of hot air to be generated in the room where the stove is installed rather than in the room in which the ducting outlet is installed, with the option to disable it if there is no need for further heating. Ducting can be set manually or using the automatic function described in this chapter.

Below are given the steps for accessing the relative menu starting from Stand-By mode.

Recipe



The exit key shows the DUCTED menu to set other variables related to the menu functions.

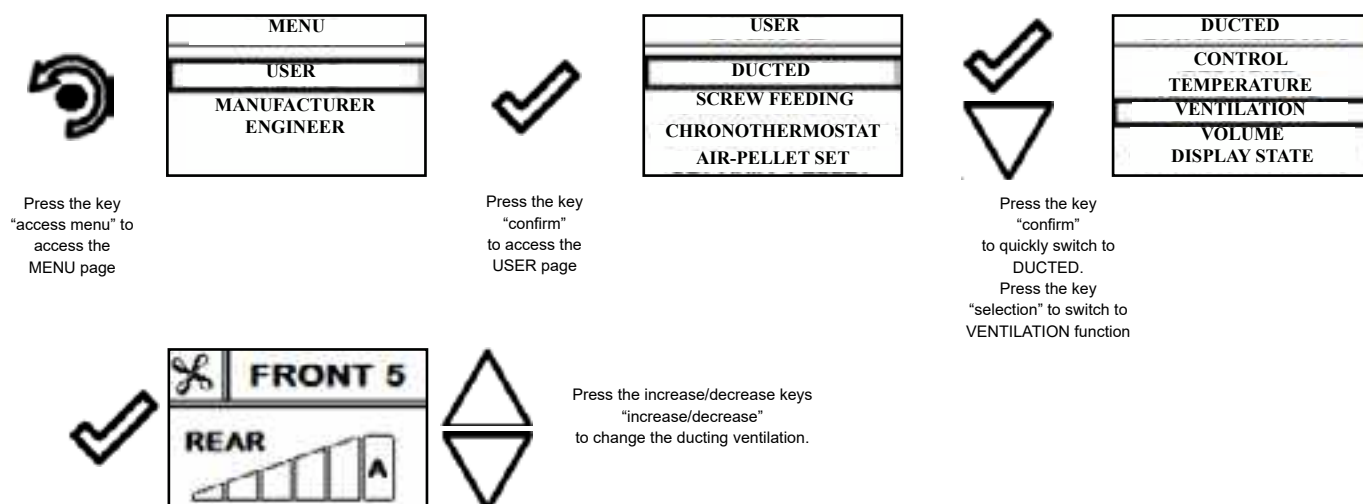


To exit the MANAGEMENT page and return to Stand-by page, press the button repeatedly.

Manual control: the front ventilation is working at the set power. The user can, through a simple operation on display, enable/disable the ventilation needed for heating the room in which the ducting outlet is installed.

The lines in the table indicate the two ventilations, while the columns indicate the five levels of positioning of the vents.

Ventilation (manual control)



Once you have accessed the function, the top line of the display shows the speed of the front ventilation linked to the power of the stove (e.g. Front 5), the ducting capacity (bottom line) can be set using the increase/decrease keys; the values can be set from 0 (ducting off) and Auto (ducting capacity adjusted according to front ventilation power); the intermediate settable values are 1 - 2 - 3 - 4 - 5.

The exit key shows the DUCTED menu to set other variables related to the menu functions.



To exit the VENTILATION page and return to Stand-by page, press the button repeatedly.



If you enable the MANUAL CONTROL function, you will not have access to TEMPERATURES or CUBIC CAPACITY. By enabling the AUTOMATIC CONTROL and setting the ducting temperatures you will enable the stove to automatically control the heat flow.

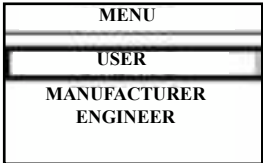
Automatic management: If this function is active, the stove controls the 5 ducting levels automatically. By activating the automatic function, the single condition required is to install a room temperature probe (optional) or an external thermostat in the room to be ducted.

	Front	3/4 Front	Middle	3/4 Rear	Rear
Aria Front	100%	100%	100%	60%	20%
Aria Rear	OFF	60%	100%	100%	100%

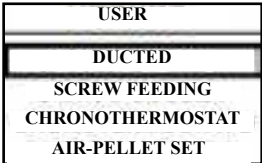
Temperatures (automatic control)



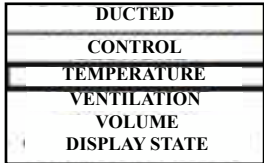
Press the key "access menu" to access the MENU page



Press the key "confirm" to access the USER page



Press the key "confirm" to quickly switch to DUCTED. Press the key "selection" to switch to TEMPERATURES function





Press the increase/decrease keys "increase/decrease" to change ducting temperature.



Press the key "confirm" to quickly switch to ENABLE EXT. THERM. Enable the ext. therm. by pressing the key "confirm"



Press the key to save the data and return to DUCTING MENU page.

In this mode, the two fans are working at the same power to reach the two set room temperatures. When one of the two set temperatures is reached, ventilation in the saturated room tends to decrease to a minimum or, even better, in the case of the rear room, it shuts off completely. The initial condition may reoccur if the temperatures in the two rooms will require more heat. Everything is done automatically.

The exit key shows the DUCTED menu to set other variables related to the menu functions.



To exit the TEMPERATURES page and return to Stand-by page, press the button repeatedly.

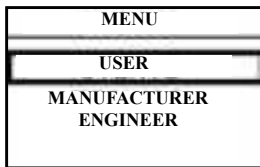


The room temperature probe relative to the ducting is connected by coupling the two poles in the back of the stove where is provided the quick coupling identified by the writing "EXT. T"

Cubic capacity

To optimize the automatic function, set the cubic capacity difference (m³) of the rooms during installation. Cubic capacity can be set at three levels as shown below: = EQUAL: if the cubic capacities of the two rooms are more or less similar; + REAR: if the cubic capacity of the room in which the ducting system is installed is higher than the room in which the stove is installed; + FRONT: if the cubic capacity of the room in which the ducting system is installed is smaller than the room in which the stove is installed;

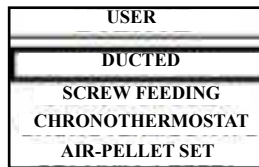
By setting, as in the example below, a room with cubic capacity greater than the other, equal to the power generated by the stove



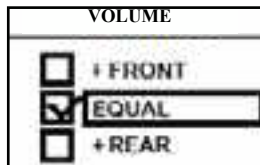
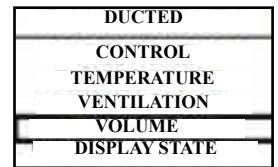
Press the key "access menu" to access the MENU page



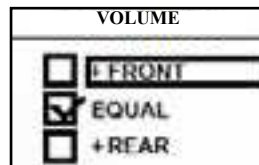
Press the key "confirm" to access the USER page



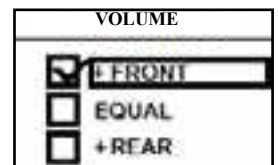
Press the key "confirm" to quickly switch to DUCTED.
Press the key "selection" to switch to CUBIC CAPACITY function



Press the increase/decrease keys
"increase/decrease"

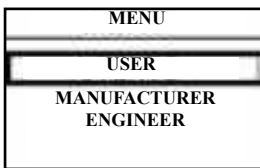


Press the key "confirm" to confirm the new setting
Press the key



Displaying the state of the single ducting system

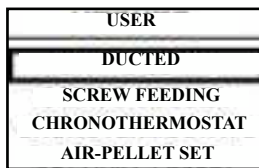
Below are given the steps for accessing the state display starting from Stand-By page.



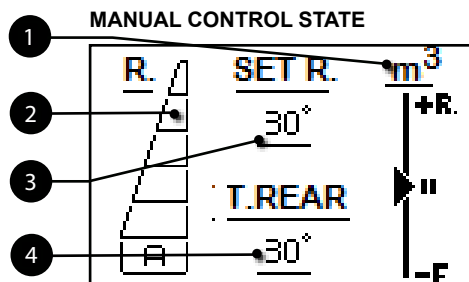
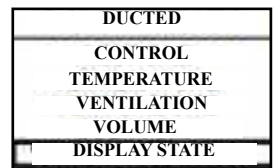
Press the key "access menu" to access the MENU page



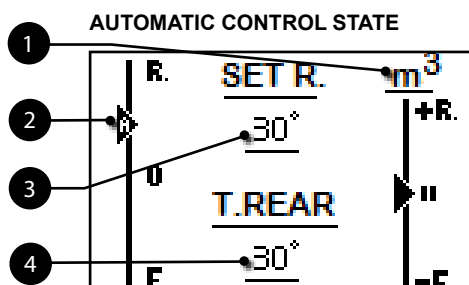
Press the key "confirm" to access the USER page



"confirm" to quickly switch to DUCTED. Press the key "selection" to switch to DISPLAY STATE function



- 1 Cubic capacity priority (active in automatic mode)
- 2 Set ducted ventilation
- 3 Set ducted temperature (controls in automatic mode)
- 4 Temperatura letta dalla sonda posta in canalizzazione



- 1 Cubic capacity priority
- 2 % of ventilation (see the automatic control table)
- 3 Set ducted temperature (controls in automatic mode)
- 4 Temperature read by the temperature probe installed on the ducting system

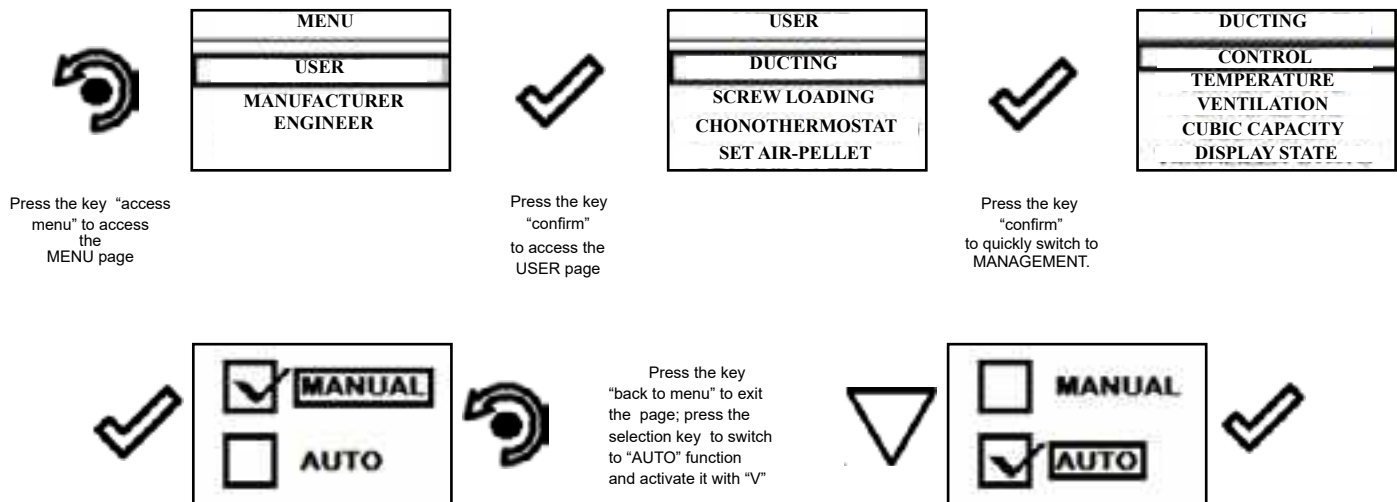
Double ducting (function present only in models equipped with double ducting system)

The range of stoves that use the following control system, dedicates much of its performance to ducting. This is shown by the fact that the front fan is small and can be set by the customer independently from the management of both manual and automatic ducting, as well as the operating power of the stove.

With regard to ducting control, this feature allows you to set the ducting level, therefore the amount of hot air to be developed in a room rather than another.

Below are given the steps for accessing the relative menu starting from Stand-By mode.

Recipe



The exit key shows the DUCTED menu to set other variables related to the menu functions.

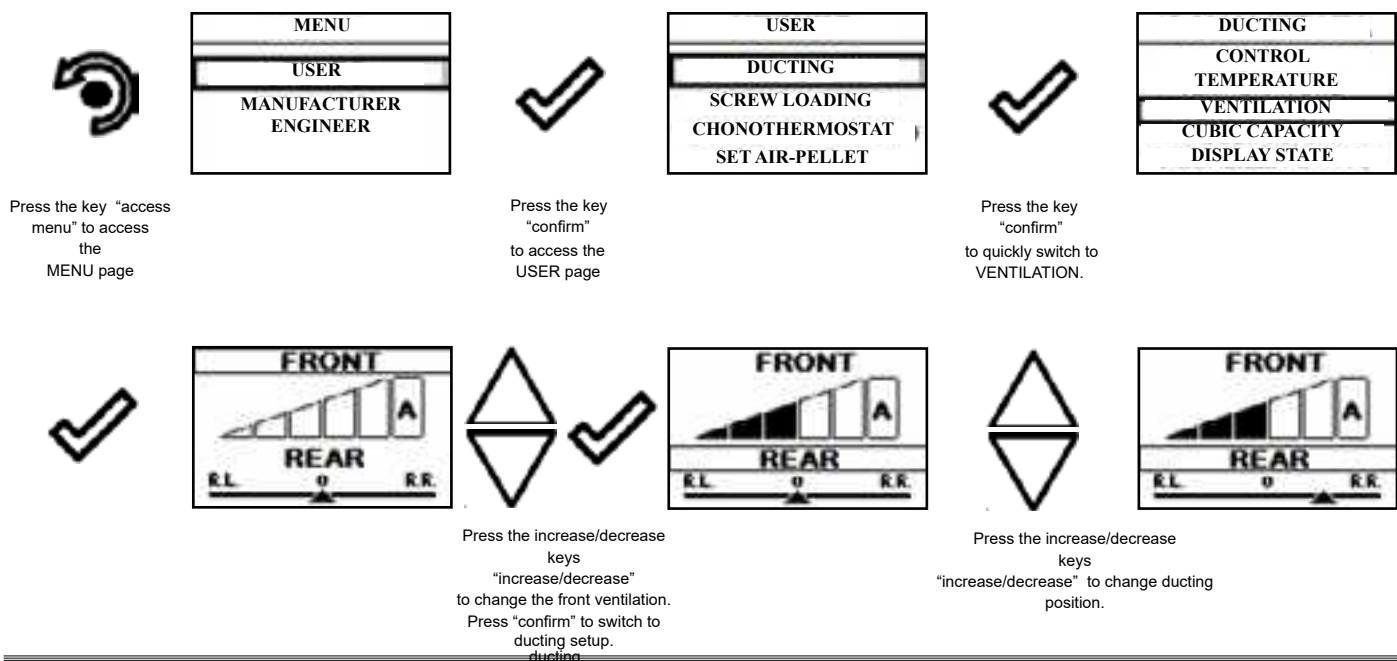


To exit the MANAGEMENT page and return to Stand-by page, press the button repeatedly.

Manual management: the user can set, through a simple operation on the display, the percentage of hot air to be dedicated to heating both rooms to be ducted. The front ventilation can be set separately from ducting management. Below is described the procedure for setting the ventilation according to user's requirements.

	Rear Left (posteriore sx)	Rear Left/Middle (posteriore sx/centro)	Middle	Middle/Rear right (centro/posteriore dx)	Rear Right (posteriore dx)
Aria frontale	da OFF ad A	da OFF ad A	da OFF ad A	da OFF ad A	da OFF ad A
Aria posteriore dx	15%	40%	65%	85%	100%
Aria posteriore sx	100%	85%	65%	40%	15%

Ventilazione (gestione manuale)



Once you accessed the function, the top line of the display shows the speed of the front ventilation which can be set by means of "increase / decrease" keys with values that can be set from 0 (ducting off) to Auto (ducting capacity that follows the power of the front ventilation); intermediate values can be set from 1-2 - 3 - 4 - 5. Regarding the ducting system, you can manually set the amount of heat that you want to be directed towards the vents.

The exit key shows the DUCTED menu to set other variables related to the menu functions.



To exit the VENTILATION page and return to Stand-by page, press the button repeatedly.

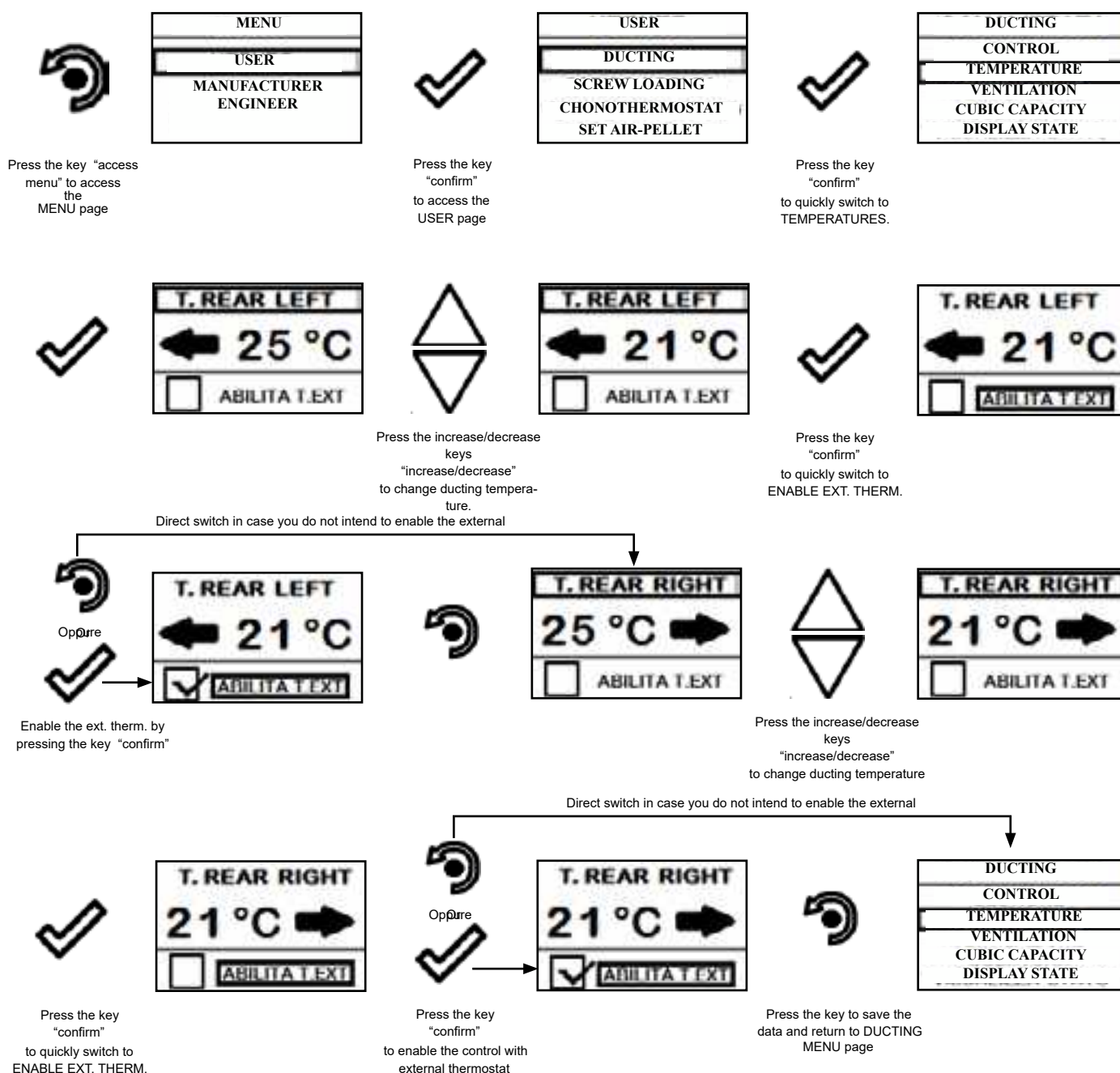


If you enable the MANUAL CONTROL function, you will not have access to TEMPERATURES or CUBIC CAPACITY. By enabling the AUTOMATIC CONTROL and setting the ducting temperatures you will enable the stove to automatically control the heat flow.

Automatic management: If this function is active, the stove controls the 5 ducting levels automatically

It should be noted that, by enabling the automatic function, it is required to install two room temperature probes (optional) or external thermostats

Temperatures (automatic control)



In this mode, the two fans are working at the same power to reach the two set room temperatures. When one of the set temperatures is reached, the ventilation in the saturated room tends to decrease to a minimum, increasing the ventilation of the room in which temperature still needs to be increased. The initial condition may reoccur if the temperatures in the two rooms will require more heat. Everything is done automatically.

The exit key shows the DUCTED menu to set other variables related to the menu functions.



To exit the TEMPERATURES page and return to Stand-by page, press the button repeatedly.



The room temperature probe relative to the ducting is connected by coupling the two poles in the back of the stove where is provided the quick coupling identified by the writing "EXT. T" and "T.TEXT R.R."

Cubic capacity

To optimize the automatic function, set the cubic capacity difference (m³) of the rooms during installation.

Cubic capacity can be set at three levels as shown below: = EQUAL: if the cubic capacities of the two rooms are more or less similar; + REAR RIGHT: if the cubic capacity of the room where the RH ducting system is installed is greater than the LH ducting system (referred to the stove in the front view);

+ REAR LEFT: if the cubic capacity of the room where the LH ducting system is installed is greater than the RH ducting system (referred to the stove in the front view);

By setting, as in the example below, a room with cubic capacity greater than the other, equal to the power generated by the stove and the ambient temperature lower than the set temperature on both outlets, the heat input will be mainly directed towards the larger room.



MENU
USER
MANUFACTURER
ENGINEER



Press the key "access menu" to access the MENU page

Press the key "confirm" to access the USER page

USER
DUCTING
SCREW LOADING
CHONOTHERMOSTAT
SET AIR-PELLET



Press the key "confirm" to quickly switch to CUBIC CAPACITY.

DUCTING
CONTROL
TEMPERATURE
VENTILATION
CUBIC CAPACITY
DISPLAY STATE



CUBIC CAPACITY
☐ + R.RIGHT
☒ EQUAL
☐ + R.LEFT



Press the increase/decrease keys "increase/decrease"

CUBIC CAPACITY
☐ + R.RIGHT
☒ EQUAL
☐ + R.LEFT



Press the key "confirm" to confirm the new setting
Press the key "confirm" to quickly switch to DUCTED.

CUBIC CAPACITY
☒ + R.RIGHT
☐ EQUAL
☐ + R.LEFT

Displaying the state of the double ducting system

Below are given the steps for accessing the state display starting from Stand-By page.



MENU
USER
MANUFACTURER
ENGINEER



Press the key "access menu" to access the MENU page

Press the key "confirm" to access the USER page

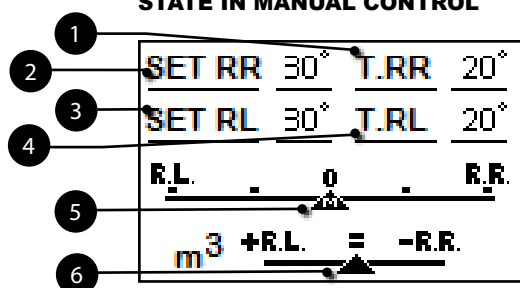
USER
DUCTING
SCREW LOADING
CHONOTHERMOSTAT
SET AIR-PELLET



Press the key "selection" to switch to DISPLAY STATE function

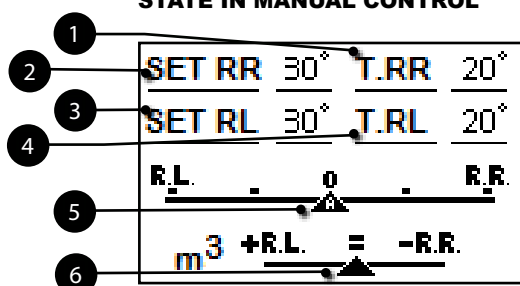
DUCTING
CONTROL
TEMPERATURE
VENTILATION
CUBIC CAPACITY
DISPLAY STATE

STATE IN MANUAL CONTROL



- 1 Temperature read by the temperature probe installed on the (RH) ducting system
- 2 Set RH ducted temperature (controls in automatic mode)
- 3 Set LH ducted temperature (controls in automatic mode)
- 4 Temperature read by the temperature probe installed on the (LH) ducting system
- 5 % of ventilation (see the MAN and AUT control table)
- 6 Cubic capacity priority among rooms (active in automatic mode)

STATE IN MANUAL CONTROL



- 1 Temperature read by the temperature probe installed on the (RH) ducting system
- 2 Set RH ducting temperature
- 3 Set LH ducting temperature
- 4 Temperature read by the temperature probe installed on the (LH) ducting system
- 5 % of ventilation (see the MAN and AUT control table)
- 6 Cubic capacity priority among rooms

Stove phase synthetical layout

	PHASE	DESCRIPTION
	FINAL CLEANING	The stove is in the switch off phase and the cooling phase has not been completed yet.
	SWITCH ON	The heater pre-heating phase has started and the pellets start to fall into the grate.
	WAITING FOR FLAME	The pellets ignite and take advantage of the heat in the intake air that passes through the incandescent heater tube.
	FLAME PRESENT	The flame is visible in the grate.
	AREAS	The stove has completed the switch on phase and runs at maximum set capacity.
	WORK MODULA	The room temperature set has been reached.
	THE GRATE	Brazier cleaning phase is active (periodic function).
	ECO STOP	With Climate Comfort active, the stove switches to automatic switch-off mode when the room temperature set is reached (see the dedicated section).

	PHASE	DESCRIPTION
	START/RESTART WAIT	Switch-on is requested but with the stove in cooling phase; once this condition is met, it restarts automatically.
	SWITCH ON RESTART	The HOT restart phase is activated. Functioning is similar to the SWITCH ON phase
	HOT SMOKE	The maximum fume temperature threshold has been reached. To facilitate cooling, the stove brings the capacity to a minimum with ventilation at power level 5, leading to a decrease in fume temperature.
	OFF	The stove is off
	WAIT FOR PELLETS OUT OF	When the switch-on request from ECO-STOP mode coincides with an automatic switch-off condition (from the TIMER), the stove turns on ensuring total cleaning of the brazier before switching to FINAL CLEANING.
	INFEEED SCREW OVERFLOW	CONDITION: when the pellet setting (set pellets +5) is near the continuous load condition. SOLUTION: Set the value back to 0.
	GENERIC ALARM	The stove is in alarm state; refer to the troubleshooting chapter.
	ANOMALY (general)	The stove has detected an anomaly; refer to the troubleshooting chapter.
	AUTOMATIC CLEANING SYSTEM ACTIVE	For models with semiautomatic cleaning it indicates the state of the same.

Warning Pop-Up

	FLAME	DESCRIPTION
	RDS SYSTEM ADJUSTMENT REQUEST <i>(only if the RDS system is provided)</i>	It shows that the testing procedure and initial parameter calibration have not been completed or have been performed incorrectly. This indication, however, does not block the stove.
	SERVICE REQUEST	The threshold value of set work hours has been reached. The symbol displayed remains active throughout the work phase. Non-routine maintenance is required on the stove.
	AIR FLOW METER FAILURE <i>(only if the RDS system is provided)</i>	It shows a failure of the air flow meter and the stove switches to minimum capacity disabling the RDS system.

SIGNALLING	REASON	SOLUTION
RUN BRAZIER CLEANING <i>(only if the RDS system is provided)</i>	• The door and the ash box are not closed correctly	• Make sure they are properly closed.
	• Poor combustion in grate.	• Switch off the stove, clean the brazier and check the cleanliness of the support bench, clean the tube bundle by activating the turbolators, and adjust the combustion through Pellet/Air settings.
	• Presence of foreign body in air intake tube.	• Check for any foreign body and remove it
	• The air flow meter may be dirty.	• Clean the flow meter with the stove in "Switched off" state
		• Contact the Support Service



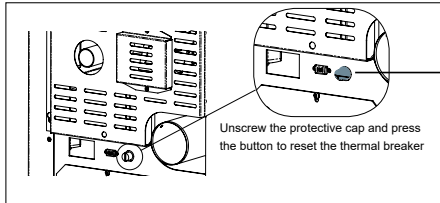
The appearance of the message "ADJUST THE RDS SYSTEM" indicates that the initial parameter testing procedure and calibration has been unsuccessfully. This indication does not block the stove.

9. Description of Alarms (table with reference codes)

TRIAL	TITLE	REASON	SOLUTION
AL 01	BLACK OUT	- No voltage during work phase	- Press the switch off key and switch on boiler switch-on.
			- If the problem persists, contact the Support Service
AL 02	FUME PROBE	- The fume probe is malfunctioning	- Contact the Support Service
		- The fume probe is disconnected from the electronic board	- Contact the Support Service
AL 03	FUME OVERTEMP.	- Combustion in the brazier is not optimal due to clogging or obstructions of internal stove ducts	- Switch off the stove, clean the brazier and the tube bundle and adjust the combustion setting the Pellet/Air values
		- The tangential fan (if provided) is malfunctioning or damaged	- Contact the Support Service
			- If the problem persists, contact the Support Service
AL 04	FUME EXHAUST DAMAGED	- Fume exhaust encoder is not working or is connected incorrectly	- Contact the Support Service
		- No power to fume exhaust system	- Contact the Support Service
		- The fume exhaust system is blocked	- Contact the Support Service
AL 05	NO SWITCH-ON	- The pellet tank is empty	- Check for the presence of pellets in the container. Top up, if necessary.
		- Pellet calibration and suction during switch on phase is incorrect.	- Contact the Support Service
		- The ignition coil is faulty or positioned	- Contact the Support Service
AL 06	PELLETS FINISHED	- The pellet tank is empty.	- Check for the presence of pellets in the container. Top up, if necessary.
		- The gear motor is not loading pellets	- Empty the tank to see if there are any objects inside that may prevent the proper operation of the auger.
		- Not enough pellets loaded	- Regulate pellets setting from "SET AIR/PELLETS"
			- If the problem persists, contact the Support Service Support
AL 07	RESET THERMAL BREAKER / PELLET DOOR OR GATE OPEN	- The manual reset thermostat has tripped connected to the hopper (RESET THERMAL BREAKER / Pellet door or gate is open)	- Reset the thermostat by pressing the button on the back of the stove or close the doors.
		- Combustion in the grate is not optimal due to the fact that the grate is clogged or the inner stove ducts are clogged. (RESET THERMAL BREAKER)	- Switch off the stove, clean the brazier and the tube bundle and adjust the combustion setting the Pellet/Air values
			- Contact the Support Service
AL 08	DEPRESSURIZATION	- The flue is blocked.	Check the flue is free and clean
		- The vacuum meter is faulty.	- Contact the Support Service
AL 12	FUME EXHAUST SYSTEM FAILURE	- The fume exhaust system has a loss of performance due to fan obstruction or voltage drop.	- Contact the Support Service
AL 14	SCREW PHASE	- No cable connection to power the gear motor of the auger	- Contact the Support Service
AL 15	AUGER TRIAC	- An internal part of the electronic board that controls the pellet infeed screw is faulty.	- Contact the Support Service
		- Possible voltage drops or incorrect input voltage stove inlet	- Check the mains voltage.
AL 17	NO FLOW (only if the RDS system is provided)	- The flow meter does not measure inlet air flow	- Check if the ash pan and door are closed correctly and check if the air inlet pipe is obstructed.
			- If the problem persists, contact the Support Service
AL 19	CLEANER FAILURE (for models equipped with cleaner)	- The cleaner did not complete the movement and is not in the correct position	- Reset the alarm and wait for the stove to switch to SHUTDOWN mode. Cut off and power again, the system reactivates the cleaner trying to search the correct position again.
			-- If the problem persists, contact the Support Service



In the case of alarm 07 THERMAL BREAKER below shows the location where to operate to reset the thermal switch with manual reset.



Manual reset thermal breaker



Unscrew the protective cap and press the button to reset the thermal breaker

i
Pellet door/gate open



Cleaning should be provided by the user

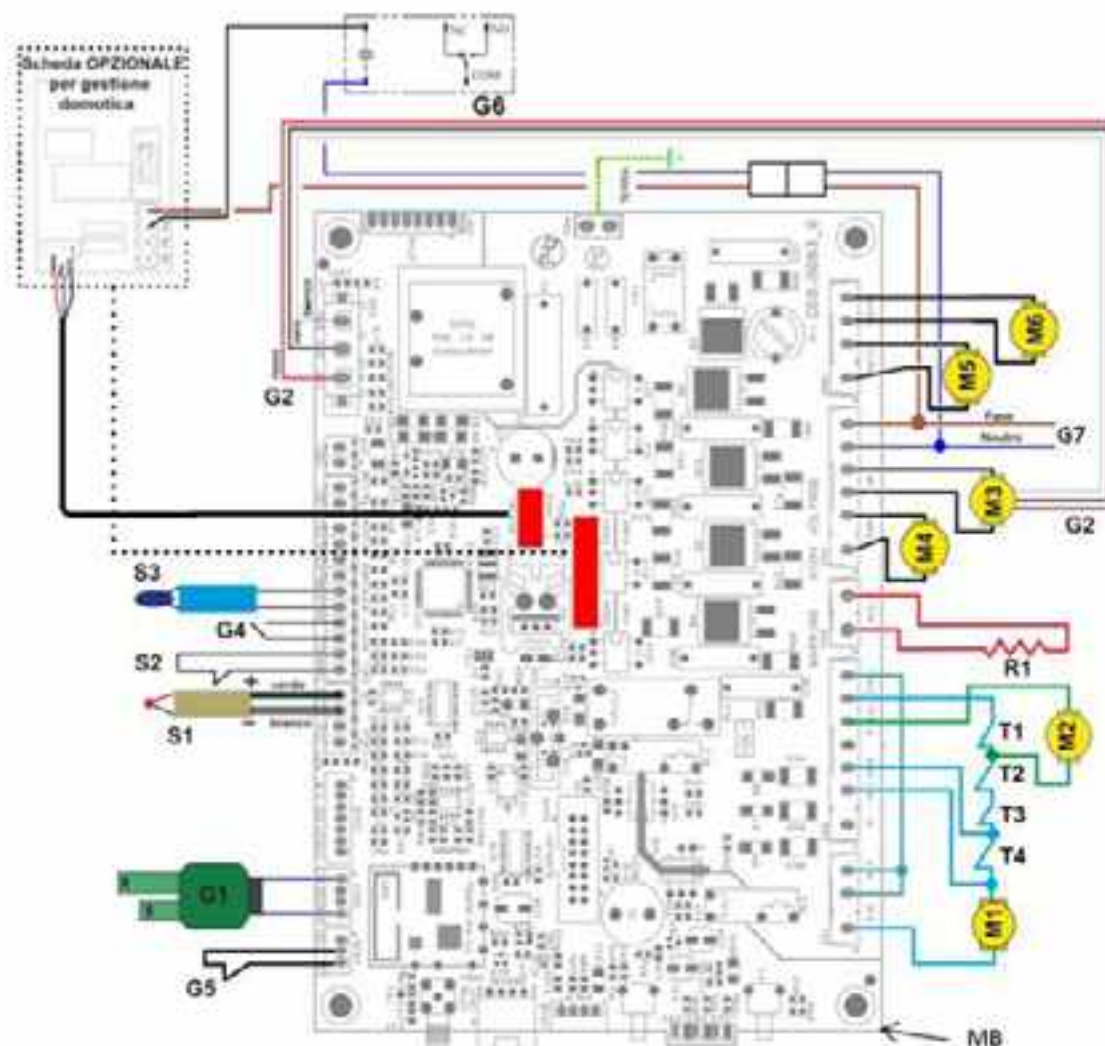
Before any cleaning operation on the stove, implement the following precautions:

- switch off the stove and disconnect the power cord with the stove in “Switched OFF” state;
- make sure all the parts of the stove are cold;
- make sure the ash is completely cooled.



PLEASE READ CAREFULLY THE FOLLOWING INSTRUCTIONS TO PERFORM PROPER CLEANING.
FAILURE TO COMPLY WITH THESE INSTRUCTIONS MAY LEAD TO MALFUNCTIONS OF THE STOVE.

10. The electrical wiring diagram



MB – Mother board

T1 – Door safety switch

T2 – Pellet lid safety switch

T3 – Safety temperature switch

T4 – Safety pressure switch

M1 – Auger motor

M2 – Burnpot cleaner motor

M3 – Flue fan

M4 – Front ambient fan

M5 – Rear right ambient fan *

M6 – Rear left ambient fan *

* Only for ducted stoves

R1 – Ignition resistance

G4 – Burnpot cleaner switch

G7 – Power cord plug; main switch

11. Maintenance



Cleaning should be provided by the user

Before any cleaning operation on the stove, implement the following precautions:

- switch off the stove and disconnect the power cord with the stove in "Switched OFF" state;
- make sure all the parts of the stove are cold;
- make sure the ash is completely cooled.



PLEASE READ CAREFULLY THE FOLLOWING INSTRUCTIONS TO PERFORM PROPER CLEANING. FAILURE TO COMPLY WITH THESE INSTRUCTIONS MAY LEAD TO MALFUNCTIONS OF THE STOVE.

Before carrying out any maintenance operation on the stove, please take the following precautions:

- Make sure that all the parts of the stove are cold
- Make sure that the ashes are completely extinguished
- Make sure that the general switch is in the zero position (off)
- Make sure that the plug is disconnected from the socket, thus avoiding accidental contacts.

IMPORTANT

Please follow the instructions for cleaning shown below carefully! Failure to observe them may lead to problems in the functioning of the stove AND FIRE HAZZARD.

11.1. Cleaning the surfaces

To clean the surfaces on the painted metal parts, use a wet cloth in water or at the most, water and soap.

Important: the use of aggressive detergents or diluents can damage the surfaces of the stove.

11.2. Cleaning the FIREX 600



All Ravelli products have a combustion chamber made with FIREX 600, a material based on vermiculite, the result of research and development by Ravelli. The main features of FIREX 600 are resistant to heat, its lightness and excellent insulating capacities, improving the combustion and performance of the stove.

During combustion, FIREX 600 turns white, due to an effect called PYROLYSIS, making the flame clear and shining. If the combustion is regulated in an optimal way, the FIREX 600 interior always remains clean and white.

The condition of FIREX 600 is therefore a thermometer to understand whether the combustion is good or not.

FIREX 600 LIGHT – GOOD COMBUSTION

FIREX 600 DARK – POOR COMBUSTION

Firex 600 does not require special maintenance, it only has to be dusted with a soft brush to remove the ash that is deposited during combustion.

Abrasive sponges to clean to most resistant waste should not be used as they could compromise the thickness of the FIREX600 panel, creating critical points of breakage.

The tube of the vacuum cleaner should not be used in direct contact with FIREX 600.

Wet cloths should not be used to clean FIREX 600.

FIREX 600 is resistant to heat but not to knocks; handle with care if moved.

FIREX 600 may show a slight abrasion after a few hours of functioning, this is perfectly normal as the flame creates microgrooves in the panel without compromising it.

The duration of FIREX 600 depends only on how maintenance is carried out.

The pellet stove is a generator of heat with a solid fuel and as such requires servicing by qualified personnel at least once a year at the start of the season. This maintenance has the purpose of ascertaining and ensuring the perfect efficiency of all the components.

We recommend you draw up an annual contract for maintenance of the product with your installer/dealer.

12. Guarantee

12.1. Certificate of Guarantee

Ravelli thanks you for the confidence you have placed in it with the purchase of one of our pellet stoves and invites the purchaser to:

- examine the instructions for the installation, use and maintenance of the stove.
- examine the conditions of guarantee shown below.

The enclosed coupon must be filled in and stamped by the installer. If this does not occur, the product will not be covered by the guarantee.

12.2. Conditions of guarantee

The limited guarantee covers defects of manufacturing materials, on condition that the product has not been broken due to an incorrect use, carelessness, wrong connections or errors of installation.

The following are not covered by guarantee:

- vermiculite (Firex 600);
- the glass of the door;
- the fibre gaskets;
- the painting;
- the fire pot;
- ignitor;
- the cast majolica;
- any damage caused by inappropriate installation and/or handling of the stove and/or shortcomings by the consumer.

The use of poor quality pellets or of any other material could damage components of the stove causing the termination of their guarantee and the annexed responsibility of the manufacturer.

The guarantee is void if the stove is not operated according to the owner's manual.

The pellets which meet the requisites listed in the chapter on them should be used.

All damage caused by transport are not acknowledged, therefore please carefully check the goods on receipt, immediately advising the dealer of any damage.

All the manufacturer's guarantees are shown here and no complaint may be made to the manufacturer according to any other guarantee, report or request.

For guarantee claims and instructions for return shipments please refer to your local dealer.

The guarantee coupon must be detached and sent to the following address within eight days of purchase:

**Ravelli c/o Aico Spa
Via Kupfer 31
25036
Palazzolo s/O Brescia ITALY**

12.3. Information and problems

For any information or problems, please contact your dealer or service centre, the only people who can meet any request you may have end, if necessary, who can intervene directly.

Ravelli®
il fuoco intelligente

AICO SPA

Via Kupfer, 31 - 25036 Palazzolo sull'Oglio / BS - ITALY

Tel. +39.030.7402939

Fax. +39.030.7301758

Internet : www.ravelligroup.it

E-mail : info@ravelligroup.it

Ravelli does not assume any responsibility for any errors in this booklet and considers itself free to make any variations to the features of its products without notice.

IMPORTANT

Before commencing installation refer to the label located on the back of the appliance and the manufacturer's installation instructions packaged together with this unit.

Do not remove this warning until the installation has been approved by the authority having jurisdiction.

U.S. ENVIROMENTAL PROTECTION AGENCY
Certified to comply with 2020 particulate emission standards using
pellet wood.

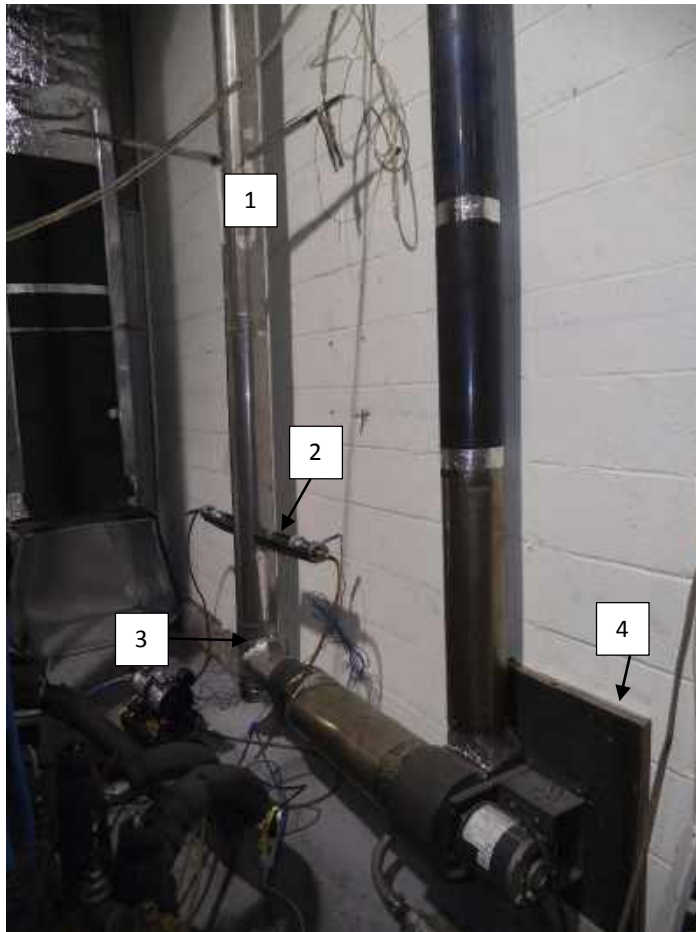
Emission Rate (g/hr)	Heating Efficiency (% Overall)	1st hour Emission Rate (g/hr)	CO emission gr/hr
0.62	79.25%	2.19	2.8

Made in Italy DO NOT REMOVE THIS LABEL

APPENDIX 8: Photographs of test set up

Dilution picture dia 6

Picture 1 : Sampling system



- 1 : 6 in dia Stainless steel pipe
- 2 : 16 in. Between sampling probe and lower elbow
- 3 : Air intake with damper to adjust flow rate
- 4 : Exhaust blower

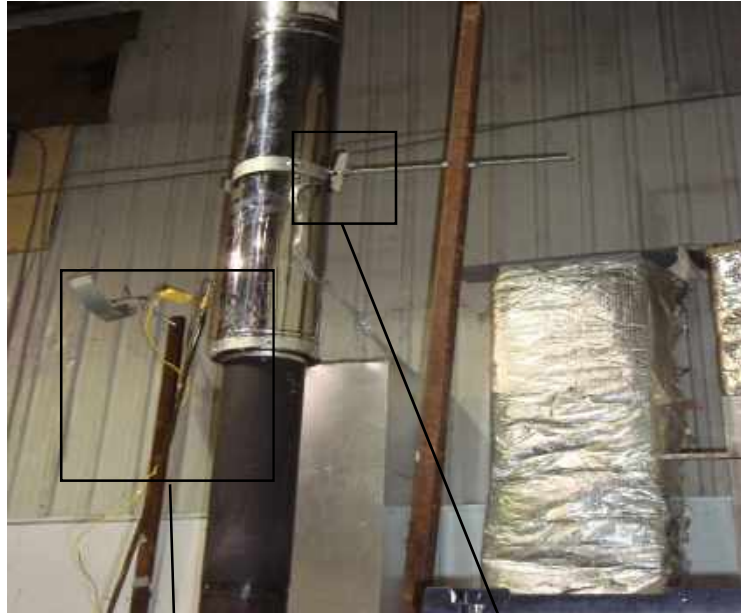
Picture 2 : Hood and mixing baffle



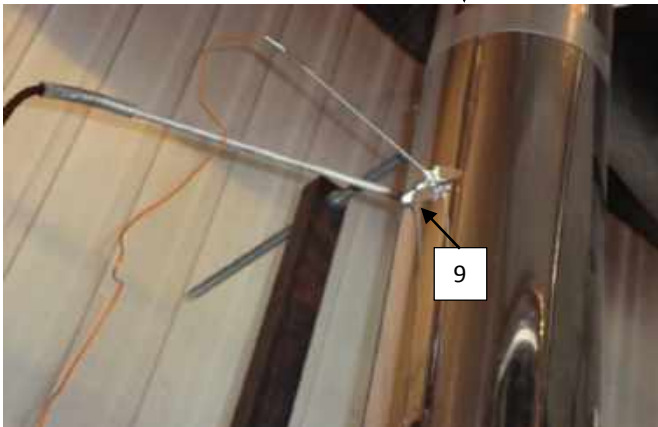
*The arrow point the deflectors inside of the pipe

- 5 : 8 in. dia. Stainless steel pipe
- 6 : Mixing baffle (2) location 1 foot between baffles
- 7 : 4 feet long between velocity port and upper elbow
- 8 : 24 in. dia. Galvanized steel smoke captures hood, located 3 feet away from dilution tunnel
- 9 : Velocity port

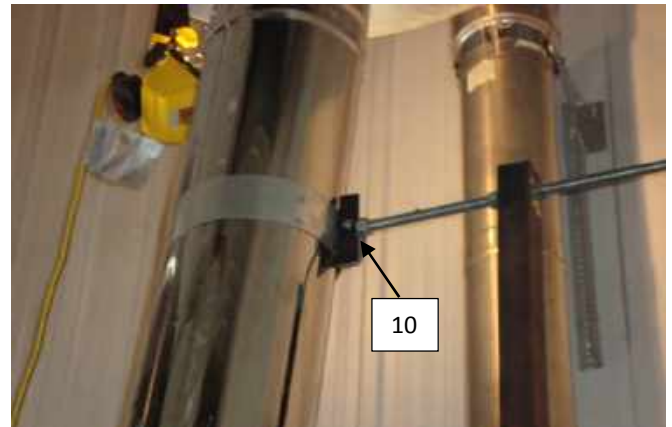
Picture 3: Stack sampling



Picture 3.1: Gas analysis and temperature probe



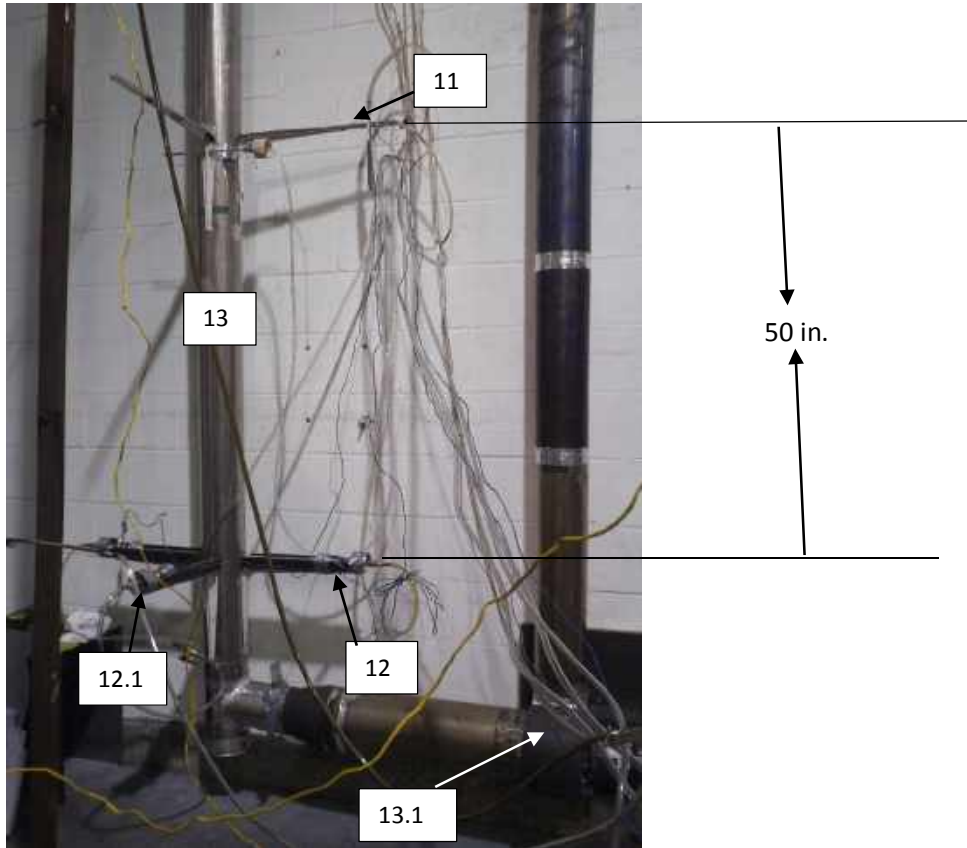
Picture 3.2: chimney support



9 : Temperature and gas analyser sampling ports located 9 feet above platform

10 : Exhaust system support bracket

Picture 4: Tunnel flow measurement and sampling probe



11 : Velocity port

12 : Sampling port, 2 sampling probes with 2x48 mm. dia.filter each. Filter used:
Millipore AP4004700

12.1 : Sampling port, sampling probes with 2x48 mm. dia.filter each. Filter used:
Millipore AP4004700, for first hour sampling

13 : 15 feet long dilution tunnel

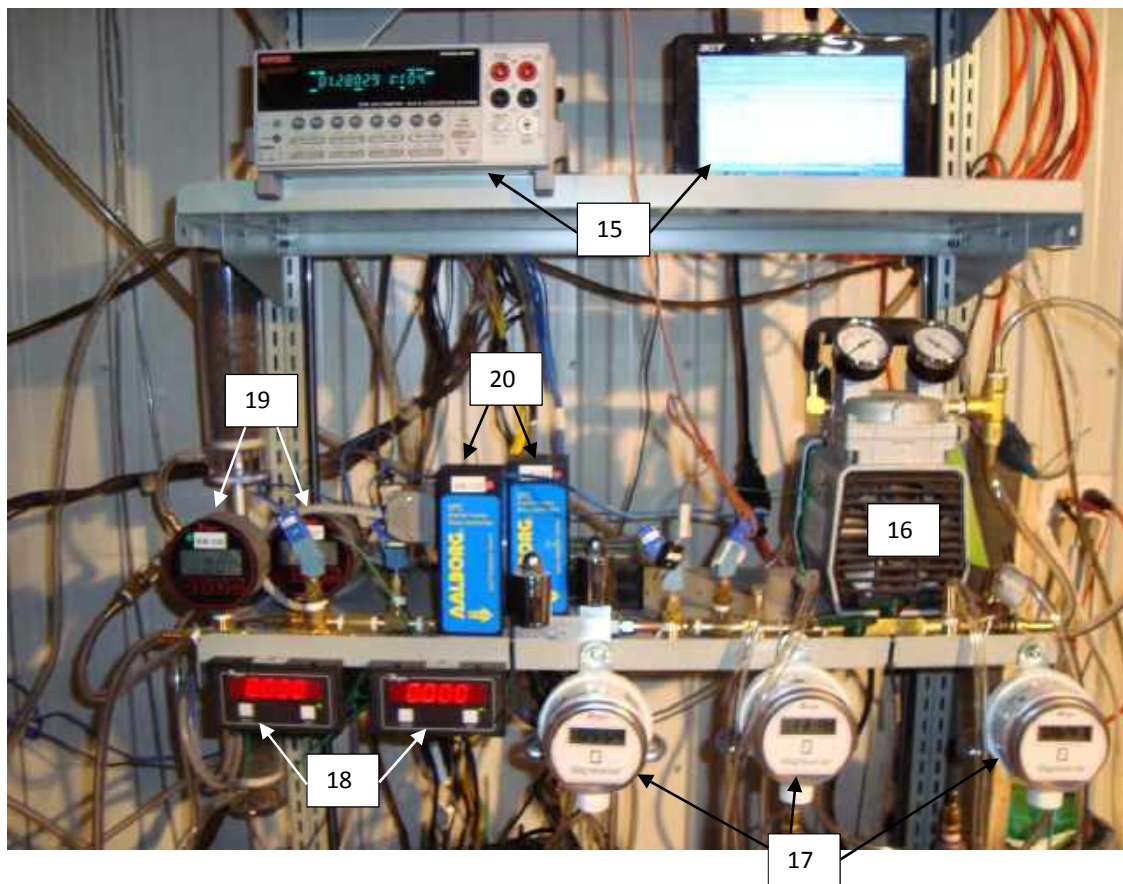
13.1 : Extraction blower

Picture 5: Draft sampling



14 : Draft sampling port located 6 in. from the flue outlet

Picture 6: Equipments



- 15 : Acquisition system
- 16 : Vacuum pump
- 17 : Digital manometer
- 18 : Digital read out for mass flow meter
- 19 : Digital vacuum gage
- 20 : Mass flow meter

Picture 7: Gaz analyser

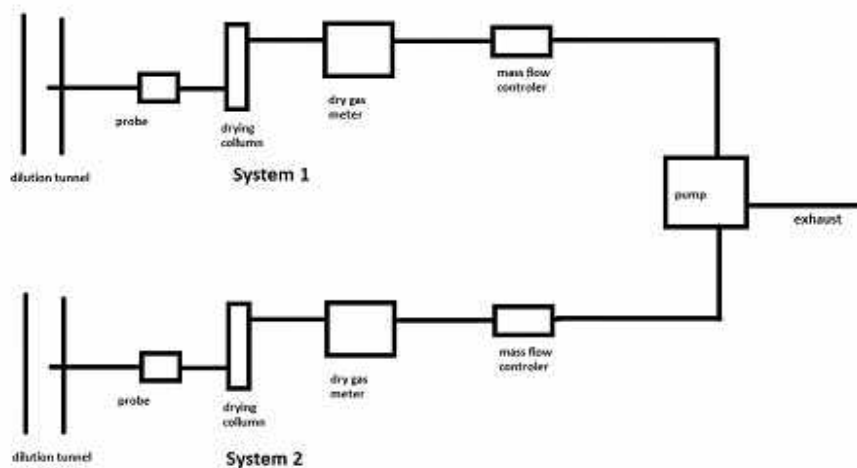


Picture 8: Reference dry gas meter

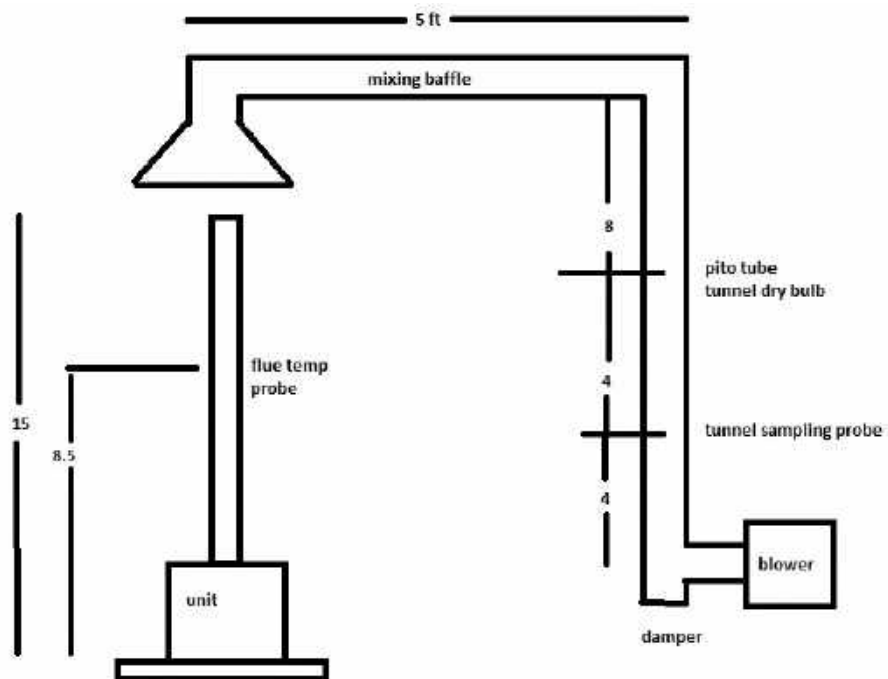




Picture 12 : Dilution tunnel sample system



Picture 13: Dilution tunnel



APPENDIX 9: Test load photographs

Run 1

