TOYOSET™

TOYOTOMI

INSTALLATION AND OPERATING INSTRUCTIONS

Diesel Heater

MODEL **Laser 73**

IMPORTANT

1) READ AND UNDERSTAND INSTRUCTIONS BEFORE INSTALLING OR USING HEATER.
2) RETAIN INSTRUCTIONS IN A SAFE PLACE FOR FUTURE REFERENCE.
3) CHECK LOCAL AUTHORITY & NZ BUILDING CODES FOR INSTALLATION REQUIREMENTS.

CONTENTS

SECTION A: SPECIFICATIONS

Model:	Laser 73
Heater Efficiency:	92% (1)
Heat Input:	High - 10.3 kW (35,200 BTU/h) Med - 7.2 kW (24,600 BTU/h) Low - 3.6 kW (12,300 BTU/h)
Heat Output:	High - 9.5 kW (32,400 BTU/h) Med - 6.6 kW (22,500 BTU/h) Low - 3.3 kW (11,300 BTU/h)
Fuel Consumption:	High - 1.08 L/h Med - 0.75 L/h Low - 0.38 L/h
Fuel System:	External tank (2)
Fuel Type:	Automotive Diesel only
Packed Dimensions (W × D × H):	800 × 510 × 770 mm, 46.0 kg
Installed Dimensions (W × D × H):	720 × 427 × 700 mm, 40.0 kg (Note: Flue can add approx. 50 mm to depth)
Weight:	40.0 kg
Balanced Flue Wall Hole:	70 ~ 80 mm diameter
Maximum Length of flue extensions:	3 m, plus 3 bends (Section I "Accessories")
Electrical Rating:	230 Volts AC, 50 Hz Ignition — 285 W Burning — 80 W Stand by— 4 W
Typical Heating Space Capacity (3):	170 m² (@ -10˚C outdoors) 240 m² (@ 0˚C outdoors)
ERMA Approval No.	BUR0512
Environment Canterbury (Ecan) Approval No.	CRC 062469
Ecan "Clean Heat" Approved Complies with	AS1690:1975

(1) Heat and vaporized water are produced by fuel combustion. Heat rating does not account for heat loss due to condensation of water vapor.

(2) External tank to be purchased separately. (Consult your supplier for options)

(3) Guide only: Heating capacity depends on outside temperature, house insulation, window size, heat distribution, and other variable factors. Consult your supplier.

Most Insurance Companies require advice of any significant factors that could affect an insurance policy or risk. It is good practice to inform your insurer of the installation of any new heating equipment. By letter, inform your insurer, of your new heater and quote the Make, Model, plus ERMA and Ecan approval numbers, and ensure you receive from your Insurer, written acknowledgement of your formal advice.

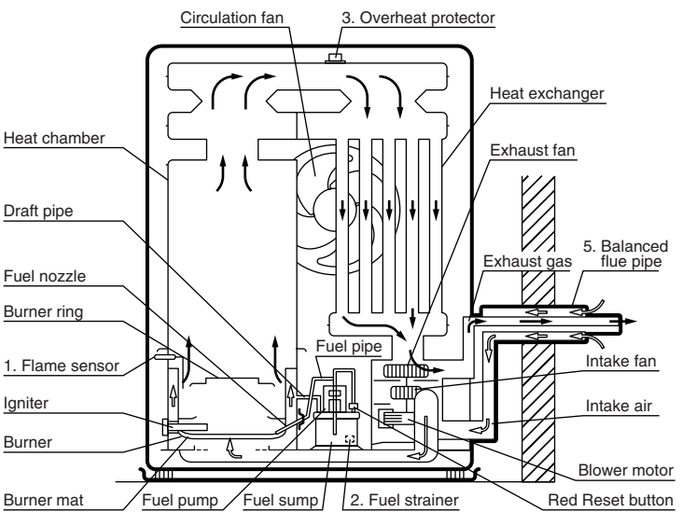
PERFORMANCE

In operation, the 9.5kW output capacity of the Laser can heat very large areas, but heating performance in a home is dependent on the warm air being effectively distributed. Leaving doors open is one way to distribute warm air. A **CLEANAIRE** Heat Recovery Ventilator (www.dryair.co.nz) will vastly improve the distribution of heat throughout your home, and for well insulated homes, creates a "Ducted Central Heating effect". Heat Transfer fans are also effective at transferring heat from the living to other parts of the home. For large homes, two or more Lasers supplied by one remote fuel tank is practical, and more cost effective than a hot water boiler.

NOTE: A label with abbreviated Operating Instructions is located on the left hand end of the Laser cabinet. ERMA (NZ Govt) Regulations require the label to be legible at all times. Do not remove or deface the Operating Instruction label.

SAFETY FEATURES

Your Laser is equipped with a number of integral safety features, and the NZ Govt (ERMA) regulations requires the installation of additional external safety devices, (eg: the spring lever fire valve). Please familiarize yourself with these features. If the Laser shuts down due to the operation of any safety device, ensure the problem is identified and corrected. Note that normal combustion flames inside the combustion chamber, can be seen through some "peep holes", located in the front bottom left hand corner of the hot air outlet louver's.



1. Flame Sensor
Heater will automatically stop all operations if ignition fails or if flame fails during combustion, in order to prevent fuel overflow. Error code will be displayed on the digital indicator.

2. Integral Fuel Strainer (Part No. 17187513)
Special strainer (filter) prevents dirt or impurities present in the fuel before it is sent to the burner. The fuel tank is fitted with another separate filter. (See diagram in Section J)

3. Overheat Protector
Automatically stops all operations if heater cabinet reaches abnormally high temperature due to motor malfunction or abnormal combustion.

4. Power Failure Recovery System
If power fails during heater operation, heater will turn off. When power resumes, heater will automatically reignite to maintain the selected room temperature.

5. Fully Vented System
Balanced Flue Pipe system provides outside air for combustion and vents all combustion products to outdoors.

6. Integral Fusible Link Valve (Separate from spring lever fire valve outside the house)
The integral fusible link valve (Part No. 17206097) valve is located inside the back right hand side of the cabinet, behind the fuel sump. The thread on the tap handle has a left hand thread. When the heater is received, the integral fusible link valve is OPEN, and does not need to be accessed at all. If any abnormal condition causes high temperatures within the heater or anywhere along the fusible string line, or near the integral fusible link valve, and/or the outdoor spring lever fire valve, the fuel supply to the heater will be shut down.

7. In addition to the "factory built" safety features, NZ Regulations require additional protection. Each Laser Heater is supplied with Spring Lever Fire Valve which is installed outside, and controlled and connected to a 15 metre length of "fusible string" which exits from the back of the Laser, via a 60mm length of copper pipe, near the power cord outlet. This fusible string is "run" through copper tube "sleeves", (or other acceptable means), from inside to outside the house, through the wall or floor (as appropriate to site), (by the installer) to a spring lever fire valve located outside. The outdoor Spring Lever Fire Valve is required to perform two functions....

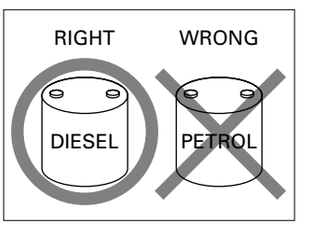
A) to shut down the fuel supply to the heater in the event of abnormally high temperatures within the heater cabinet.
B) to shut down the fuel supply in the event of abnormally high temperatures near the fuel tank.

There are other options to the Spring Lever Fire Valve, to achieve safety functions A) & B).
(ie. Bellows type capillary tube thermally operated valves), but one or two spring lever fire valves (must be installed outside the dwelling) are simple & cost effective. One spring lever fire valve is supplied with every Laser 73. Your installer will arrange whatever is best for the site.

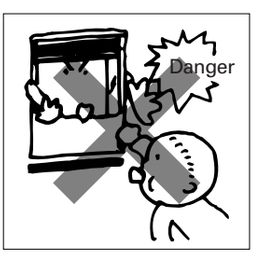
SECTION B:
SAFETY TIPS FOR OPERATION

CAUTION: The LASER and its Balanced Flue System must be properly installed before operation.
See "Instructions" under "Installation" in Section I

1. NEVER use any fuel other than clean, fresh, clear, Automotive Diesel. NEVER use Petrol or other unapproved fuels which might cause uncontrollable flames resulting in a destructive fire, and endanger life and property.



2. Keep children, pets, furniture and materials that may "scorch" well clear of hot air outlet grille when the heater is in operation (See Page 24, Fig. 2 and Fig. 3).



3. The Laser requires minimal maintenance but to prevent faults and prolong heater life, ensure you perform routine maintenance (Pages 12-13).

4. Never store or transport Diesel, other than in approved metal or plastic containers. Never use galvanized iron containers or pipe fittings for diesel fuel. Never store diesel fuel indoors. It is good practice to inform your insurer what storage arrangements you intend.

5. Operating Temperature Range: Do not operate the Laser if the outdoor Ambient is colder than -20˚C, UNLESS the indoor temperature is higher than 5˚C, when the heater is started. The thermostat range upper limit is 32˚C. The Laser will not operate in ambients above 32˚C. For applications outside this range consult your supplier.

SECTION C:
FUEL GUIDE — for all Laser 73 Diesel Heaters installed in New Zealand

1) The TOYOTOMI Model Laser 73 is designed to burn ordinary **Automotive Diesel Fuel ONLY.**
WARNING : **NEVER USE** Petrol, Kerosene, White Spirits, Camp Stove Fuel, Alcohol etc. Highly volatile fuels, ie ... petrol will cause instant and uncontrollable flames, extreme fire hazard, overheating and will endanger life and property.

2) a) The fuel must be "fresh" (see notes below), and clean, with a clear color, and water and contaminant free. Quality, fresh Diesel, should smell "fresh" and not smell sour or foul.

b) Poor quality Diesel causes ……..

- Excess tar deposits on burner and flue pipe.
- Incomplete combustion.
- Reduced life and reliability of the burner and associated components.

c) Most NZ fuel companies market winterized Diesel Fuel which contains additives to maintain viscosity in low temperatures. Winterized fuel is usually available from late February until September. It is preferable, (but not essential) to burn winterized fuel. Diesel fuel can "gel" if exposed to very low temperatures for sustained periods of time ie …. 0˚C. If the fuel tank is exposed to extreme cold weather for sustained periods of time, contact your fuel supplier for further information on solutions for fuel viscosity at low temperatures. Over time (approx. 6 to 12 months and more). Diesel fuels can "age", become stale, and develop an "algae growth". Contact supplier for approved fuel additives that inhibit algae growth and effects of aging.

Fuel quality problems are uncommon in NZ, but we suggest you endeavor to use as much fuel as practicable, by the end of the heating season, and begin next season with fresh fuel.

3) Heating Fuel, (50% Diesel/50% Kerosene), can be burnt by the Laser, **but first, the Laser requires certifiable adjustments** by a Toyotomi Serviceperson. Consult your Supplier for advice.

4) The Toyotomi Laser 73 is to be supplied with automotive diesel from a separate Fuel Tank, which must be constructed to comply with AS1692:1989, and installed to comply with AS1690:1985, and any special local Council Regulations that apply to the Tank and Burner installation. Consult your supplier and/or the local Council rules. Ensure the location of the tank in relation to the heater, complies with the Building Code, Siesmec Regulations, and advice in Section J Page 32.

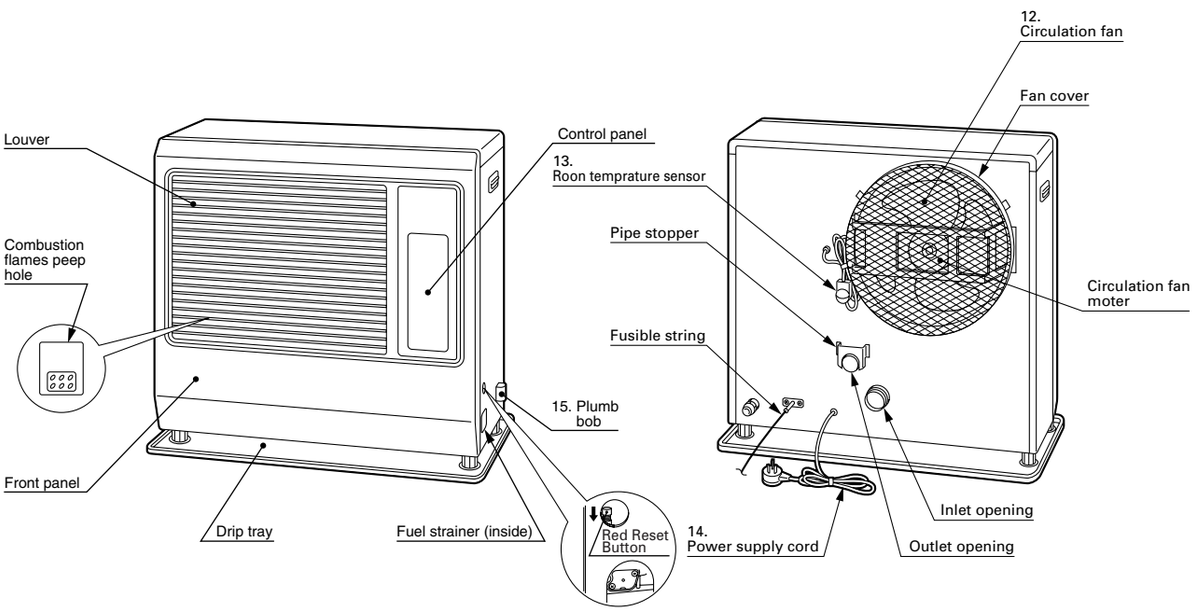
5) The Diesel Tank fuel outlet should be fitted with a high quality fuel filter. Avon recommends and supplies the GAR-BER (USA) R2000 water block filter. Ensure the filter is maintained. A blocked filter is identified by "EE2" on the Control Panel digital readout. To order replacement Gar-Ber filter cartridges quote Gar-Ber R2000 cartridge.

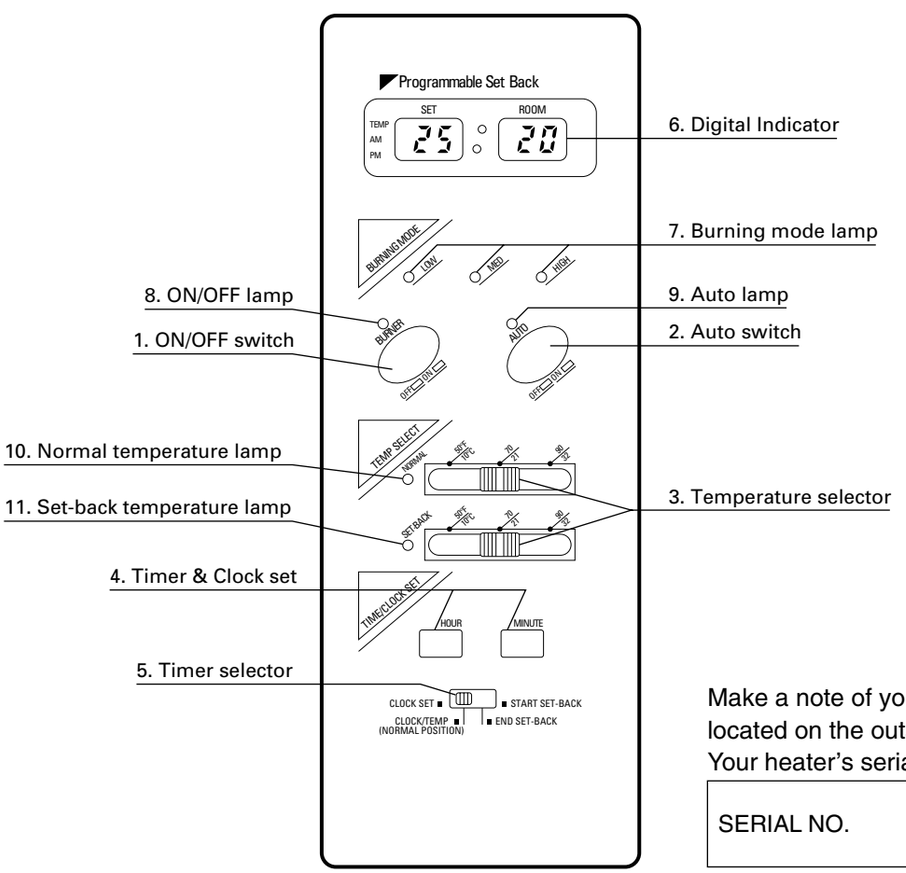
ANY queries, call **AVON** Technical Helpline, Ph 64-3-381-5595, (0800-379-247 -- 0800-DRY-AIR)

SECTION D:
OPERATING CONTROLS AND PART NAMES

OPERATING CONTROLS AND PART NAMES

Before using heater, familiarize yourself with the following operating controls and part names.





Make a note of your heater's serial number, located on the outside cabinet surface.
Your heater's serial number:

SERIAL NO.

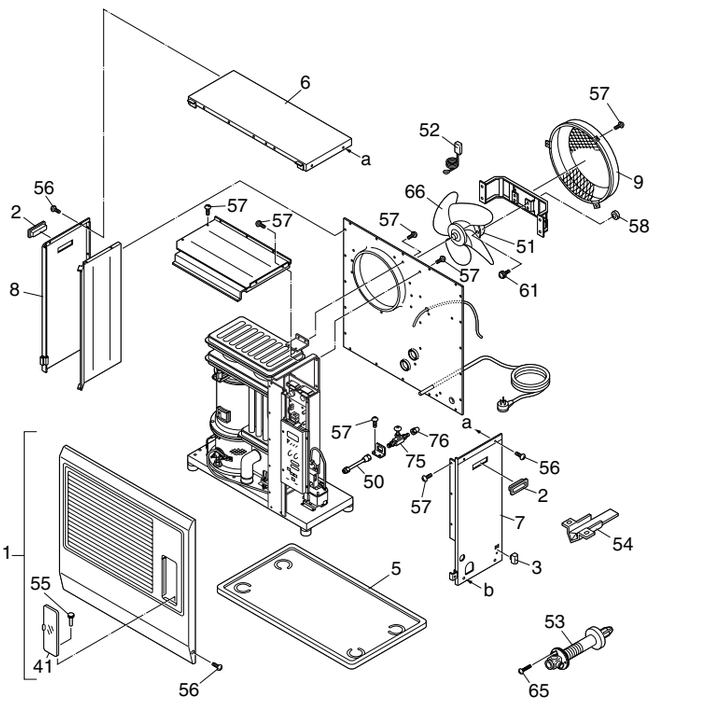
1.	Manual ON/OFF Switch:	Use for Manual Control to turn the Laser ON & OFF. When switched ON, the indicator flashes while pre-ignition is in progress and remains constantly ON when heater is in normal operation.
2.	Auto Switch:	Use Auto Switch instead of Manual switch for full automatic operation. (After automatic normal and setback times have been programmed as explained in Automatic Operation (See Page 11)).
3.	Temperature Selectors: (Thermostats)	"NORMAL" and "SET-BACK" temperature selectors allow user to select desired temperatures with Manual or Automatic operation.
4.	Timer & Clock set:	Adjust Timer & Clock set modes by pressing hour or minute buttons. Also for Manual Cleaning of Igniter (See Page 13, Para 6).
5.	Timer selector:	Clock, Clock set, "SET-BACK" mode, start time set and end time set can be selected by this switch.
6.	Digital indicator:	Displays clock, set temperature, (when heating functions are OFF, and room temperature and error codes, (when heating is ON).
7.	"Burning mode" lamps:	Indicates whether combustion is operating at High, Med or Low.
8.	ON/OFF lamp:	Light flashes when heater is in "Start Up" or "Cool Down" mode. Is continuously illuminated when heater is in normal operation.
9.	Auto lamp:	Continuously illuminated when operating in Automatic mode.
10.	Normal temperature lamp:	Lights when heater is set to "NORMAL" operation. (Normal means when the room is normally occupied).
11.	Set-back temperature lamp:	Lights when heater runs with "SET-BACK" mode of automatic operation. (Set-back means a lower temperature when the room is unoccupied, ie … overnight or away from the home etc).
12.	Circulation fan:	The 3 speed room circulation fan automatically switches from LOW, MED & HIGH, as heat demand requires, and circulates heat throughout the heated space.
13.	Room temperature sensor:	Monitors room temperature and supplies information to heater (See Page 30). Its location affects readout temperature. Floor level is the coldest part of a room. Behind the heater at floor level, (away from heat or sunlight) is a practical location for the sensor.
14.	Power supply cord:	Connect to 230V 50 Hz AC electrical outlets only.
15.	Plumb bob:	Check that heater is level. (to adjust leveling feet, See Page 29).

INDICATOR LAMPS

ON/OFF lamp	Flashing	-	Pre-heating, warm up and cool down mode.
	Lit	-	Heater in normal operation in Manual Mode.
AUTO lamp	Flashing	-	Power loss of more than 10 seconds.
	Lit	-	Heater in normal operation at auto mode.
LOW lamp	Lit	-	Heater operating at Low combustion.
MED lamp	Flashing	-	Heater in ignition mode (without flame).
	Lit	-	Heater in operation at medium combustion.
HIGH lamp	Lit	-	Heater in operation at high combustion.
NORMAL lamp	Lit	-	Heater in operation in normal mode.
SET-BACK lamp	Lit	-	Heater in operation in set-back mode.

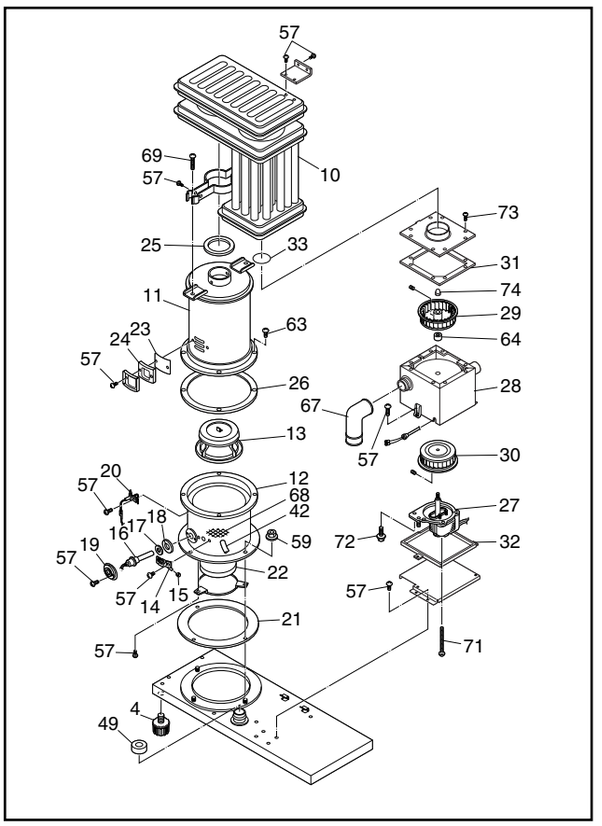
EXPLODED VIEW AND PARTS LIST

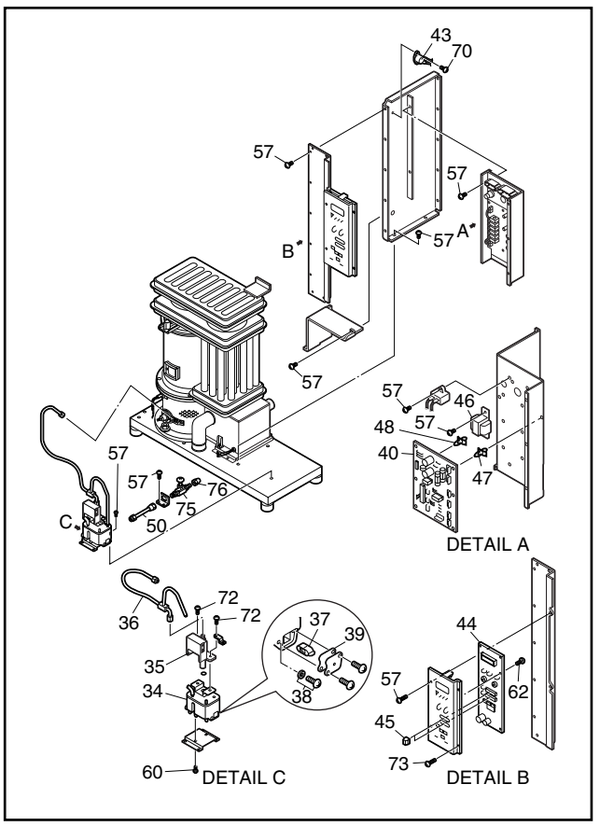
REF #	PART #	PART NAME
1	17206047	Front Panel
2	17185424	Carrying handle
3	17027961	Plumb bob
4	17185881	Adjustable leg
5	17185415	Drip tray
6	17185427	Top plate
7	17187563	Right side panel
8	17187564	Left side panel
9	17187572	Fan cover
10	17187510	Heat exchanger
11	17187506	Heat chamber assembly
12	17187579	Burner assembly
13	17187543	Burner ring
14	17187512	Fuel nozzle
15	17187580	Fuel nozzle gasket
16	17185474	Igniter
17	17187582	Igniter gasket
18	17187567	Igniter guide gasket
19	17187575	Igniter cover
20	17187520	Primary flame rod
21	17185401	Burner gasket
22	17187550	Burner insulating pad
23	17187502	Mica window
24	17187531	Peep window gasket
25	17187592	Joint packing
26	17187593	Heat chamber gasket
27	17187172	Blower motor
28	17187585	Blower motor assembly with case
29	17187542	Blower motor exhaust fan
30	17187541	Blower motor intake fan
31	17185489	Blower motor case gasket
32	17185449	Rubber mat
33	17187551	O-ring (P75)
34	17187703	Fuel sump
35	17187108	Fuel pump
36	17187559	Fuel pipe assembly
37	17187513	Fuel inlet strainer
38	17187533	Drain screw with O-ring
39	17187532	Strainer gasket
40	17187776	Main circuit board
41	17187518	Operation panel cover
42	17187588	Draft tube
43	17206007	High limit switch
44	17187007	Indicator lamp circuit
45	17187570	Knob for temperature selector
46	17187073	Transformer
47	17158344	PCB support
48	17187574	PCB support (S)
49	17187581	Air damper (P25)
50	17206060	Leveller fuel pipe
51	17187537	Circulation fan motor
52	17187573	Room thermistor
53	17206096	Standard flue pipe
54	17187525	Oil catch
55	17187503	Holder A
56	17185383	Screw 1S (white)
57	17185491	Screw C
58	17185471	Insulator A
59	17187561	Flange nut A
60	17245483	Screw E3



REF #	PART #	PART NAME
61	17187562	Screw O
62	17016667	Screw 2M
63	17187565	Screw 1T
64	17187558	Spacer B
65	17206066	Screw 4G
66	17187538	Circulation fan
67	17187522	Outlet adapter
68	17187514	Burner mat
69	17187569	Screw 1X

REF #	PART #	PART NAME
70	17187557	Screw 2R
71	17187556	Screw 1Z
72	17187555	Screw B4
73	17187554	Screw 3Z
74	17206090	Nut J
75	17206097	Fusible link valve
76	17160338	Flare nut
77	17206095	Instruction manual
78	17206026	Carton





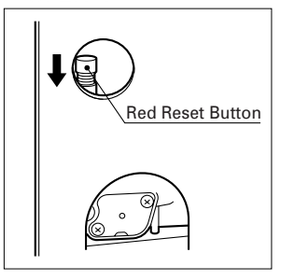
SECTION E: OPERATION

BEFORE IGNITION

NOTE: The Laser has been factory tested. After installation, to commission the Laser Heater there is no need for any adjustments, or any need to remove the front access panel, AT ALL.

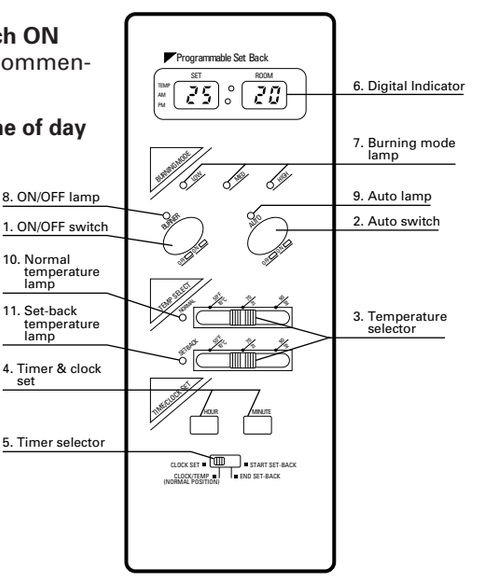
1. **Open the Valve(s)**
   Open the valve(s) on the external fuel tank. Check the outdoor Fire Valve Lever is "OPEN".

2. **Start the Fuel Flow**
   a) Press the Red Reset Button for approx. 1 second, to ensure the Sump Safety Valve is OPEN. (Also press the Red Reset Button at any time the heater runs out of fuel).
   b) Allow time for the fuel to flow from the tank and to fill the fuel sump. The longer the fuel supply pipe the longer the time to fill the internal fuel sump ··· suggest at least 5 minutes.
   c) Check there is no fuel leakage from any of the fuel line connections. Also check the fuel tank is within the height limits specified in Section J, "Fuel Storage and Supply System", Para's 4) & 6).



3. **Connect heater to a 230V AC 50 Hz electrical outlet, and switch ON**
   Note: A power outlet shared with other appliances is not recommended as it can be subject to nuisance disconnection's.

4. **Set the Clock ··· the Clock should always be set to the correct time of day**
   a) Position "Timer selector" slide switch to "CLOCK SET".
   b) Press "HOUR" and "MINUTE" buttons to correct time. (**See sketch, Ref. No. 4**) Check AM or PM indicators, to insure the correct time.
   c) After setting the colck return the timer selector switch to "CLOCK/TEMP (NORMAL POSITION)". Current time is displayed on digital indicator.
   d) Please note: If power fails at any time for more than ten (10) seconds, all clock and timer settings are cancelled. After power is restored, Digital indicator will flash "PM 12:00" when heater is in OFF mode. In Automatic heating mode, "AUTO" lamp will flash when heater is ON. In Manual heating mode there is no indication. After any power interruption reset all time clock and set-back thermostat functions.



OPERATION

EXPLANATION ··· A computer controls the heater, the time taken to "start up" and "cool down" depends on internal conditions inside the combustion chamber. It is normal for start up time or cool down time to vary between (approx.) 3 and 10 minutes. "Start Up" is explained in SECTION D (See Page 7).

Operation can be MANUAL, (by pressing the BURNER ON/OFF press-button), or AUTOMATIC, by programming desired operating times and temperatures, (for NORMAL mode and SET-BACK mode temperatures), using programming controls 4 and 5, (see above) and Pressing the AUTO Press Button.

In "MANUAL" operating mode, the "set-back" thermostat does not operate. The operation of the Laser is controlled by the user operating the ON/OFF switch, and the "Normal" thermostat. (The "AUTO" switch and indicator lamp is OFF in Manual mode). To operate, press the Burner ON/OFF Switch to ON. During ignition and warm up, the green "Burner" indicator lamp, flashes, and after warm up is completed the green "Burner" indicator and the red "normal" thermostat indicator on the "Temp Select" thermostat are continuously illuminated. The Laser will now maintain the "NORMAL" thermostat "SET" temperature, and will switch the burner settings between High, Med, and Low (or OFF), as required to maintain the "SET" temperature. The room temperature (as at the location of the Thermostat sensor), is digitally displayed in the "ROOM" window of the display panel.

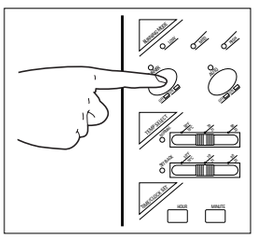
At any time the Laser is in use, if the room becomes warmer than the "SET" temperature displayed on the digital read out, (as might occur on a warm sunny day), the Laser will switch itself OFF, (the green "Burner" indicator, and the red 'Normal" thermostat indicator both remain ON), then, when the room cools down, (as after a warm sunny afternoon), the Laser will automatically restart and maintain the "SET" temperature.

STARTING UP THE LASER

1) Select Manual Operation

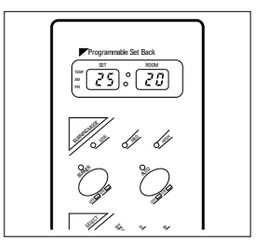
Press the "AUTO" switch to "OFF" position. (Auto indicator lamp is "OFF").

Note: Heater will not start when ROOM temperature is higher than the desire temperature setting. Adjust the "Normal" thermostat (Temperature Selector) as necessary so that the "SET" temperature displayed by the digital readout is higher than "Room" temperature.

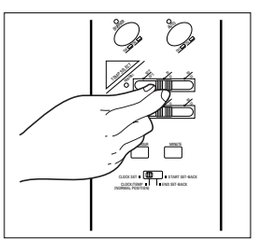


2) Turn Heater ON

a) Press Burner "ON/OFF" switch to "ON" position. The current room temperature and the set temperature is displayed on the digital indicator. The green ON/OFF lamp flashes ON and OFF, indicating that ignition and warm up, is in progress. Soon after, the combustion and exhaust fan motor starts.



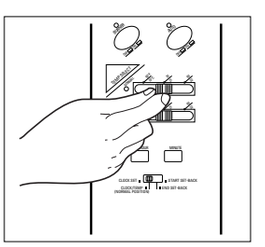
b) The burning mode **indicator** "MED" will start to flash after approx. 3 - 7 minutes, and continues until ignition is complete when it stops flashing. About 10 seconds after the MED Indicator lamp stops flashing, the LOW Burning Mode Lamp is illuminated, and continues on LOW while combustion chamber is heated to operating temperatures. Approx. three minutes later, when ignition and initial warm up is complete, the green "Burner" indicator light changes from flashing to "continuously illuminated", and the Circulation fan starts, the Burning Mode switches to High, and the Laser commences normal heating operation to achieve the desired "SET" temperature.



c) Functions a) and b) are automatic, The room temperature causes variations in the time of the various functions, which take between 4 and 9 minutes (approx.) regardless of the "SET" temperature "setting" on the digital readout. Heater will not switch to "HIGH" burning mode while the ignition or warm up cycle is in progress.

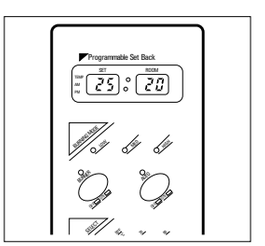
3. Adjusting Room Temperature

a) Slide "NORMAL" temperature selector to SET the desired room temperature. The "SET" temperature should be set to the temperature you find most comfortable.



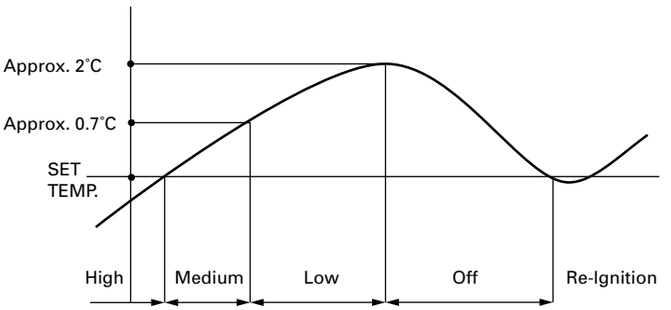
Note: Desired temperature setting "SET" is displayed on the digital indicator when you set the room temperature selector thermostat.

Note: The ˚C scale on the sliding thermostat temperature selector is a guide only. It is normal if the temperature scale and the digital readout do not coincide.



b) Burning mode (Low, Med and High) is automatically regulated to maintain whatever room temperature you have selected. The Laser will operate at "HIGH" burning mode until room temperature reaches the selected "SET" temperature, then automatically "switches back" to Med and to Low, and sometimes to OFF.

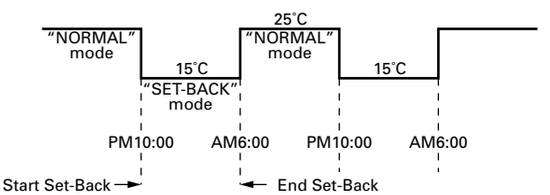
c) When the room temperature exceeds the selected "SET" temperature by approx. 2˚C, the Laser automatically shuts OFF. As the room temperature falls, the Laser will automatically re-start to maintain the "SET" temperature.



AUTOMATIC OPERATION PROGRAMMING

"AUTOMATIC" operation is established by programming the time/temperature settings **(see controls 4 and 5 Page 9)** for specific desired times. "SET-BACK" mode operation will be programmed in a 24-hour period. It is designed for energy efficiency by switching down to a lower temperature setting, generally at night.

Eg.



1. Set Start Time of "SET-BACK" Mode

A. Slide the timer selector to "START SET-BACK".

B. Press "HOUR" and "MINUTE" button of TIMER/CLOCK SET to set desired start time.

Note: When setting "SET-BACK" time, the "MINUTE" button will advance time by ten (10) units. (Eg. 10:00, 10:10, 10:20, etc.)

C. Start time of "SET-BACK" mode will be shown on digital indicator. (Eg. PM 10:00)

2. Set End Time of "SET-BACK" Mode

With the timer selector slide switch in the "END SET-BACK" position, program the end time as described above. (Eg. AM 6:00)

Important: Always return timer selector to "CLOCK/TEMP (NORMAL POSITION)" after settings.

3. Set Room Temperature

Slide "NORMAL" temperature selector and "SET-BACK" temperature selector to the desired temperature. (Eg. "NORMAL" 25˚C "SET-BACK" 15˚C)

Note: The temperature setting being used at that time is displayed on the digital indicator. To view and set the Set-Back temperature setting, press the "MINUTE" button for more than three (3) seconds. The display will go back to the Normal temperature setting after ten (10) seconds.

4. Push in AUTO switch to "ON" position

5. Turn Power ON

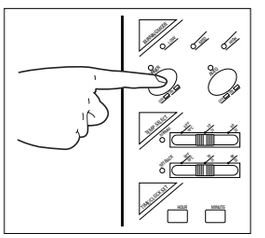
Press ON/OFF switch to "ON" position. Green burner indicator flashes and AUTO lamp will light.

The Combustion and Exhaust fan blower motor and ignition, will start.

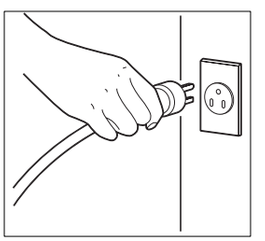
Note: SET-BACK OPERATION IRREGULARITIES: If the Laser is switched "OFF"; if the "AUTOMATIC" operation is switched off; or there is a power interruption while the Laser is operating in "SET-BACK" mode, the "SET-BACK" mode may be temporarily disabled until the next time the Set-Back is programmed to start.

TURNING HEATER OFF

Press ON/OFF switch to "OFF" position. (AUTO lamp and temperature lamp will go out. Burning mode lamp will flash until burner flame is extinguished.) Circulation fan and blower motors continue to operate for approx. three (3) minutes to cool down the heater. The ON/OFF lamp goes out when the fan stops.



Note: If ON/OFF switch is pressed to the "ON" position during the cool down period, the heater will automatically re-start ··· at the end of cool down period.



Note: If the heater is to be unused for a prolonged period, disconnect the heater plug from the electrical outlet (or switch OFF wall switch) after the power lamp has turned OFF.

Note: Heater may also be shut down by simply reducing the thermostat "SET" temperature ie … the heater goes into "OFF" cycle.

MANUAL COMBUSTION

WARNING: The following feature is for testing purpose only!

The heater can be kept burning at any desired combustion mode (High, Med or Low) manually, regardless of room temperature.

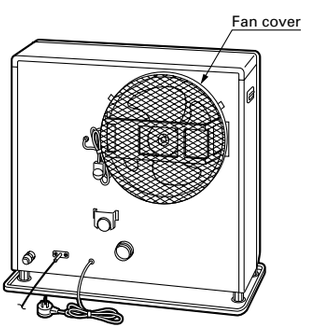
1. Press the "HOUR" button and "MINUTE" button at the same time for more than three (3) seconds when ON/OFF switch is "ON".
2. P1, P2 or P3 will be displayed on the Digital Indicator;
   P1 - Low mode
   P2 - Medium mode
   P3 - High mode
   Then select desired combustion mode by pressing "MINUTE" or "HOUR" button. "MINUTE" button changes combustion mode to higher, (from Low to Med to High) "HOUR" button changes combustion mode from High to Med to Low.
3. To clear the test function setting, press the "HOUR" button and "MINUTE" button at the same time for more than three (3) seconds until normal temperature display returns.

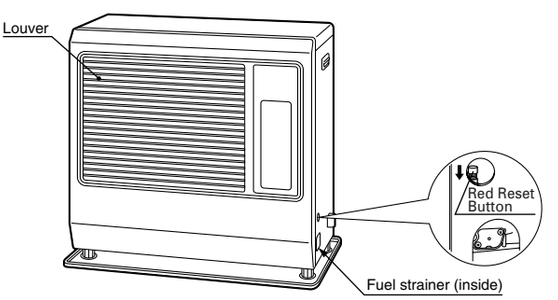
SECTION F: MAINTENANCE

CAUTION: Be sure to disconnect heater before performing any checks or cleaning.

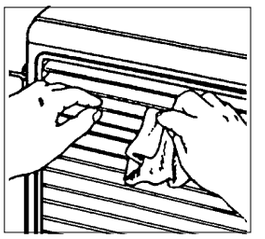
CAUTION: Allow heater to cool completely before cleaning or maintenance.

THE LASER REQUIRES MINIMAL MAINTENANCE , BUT FOR OPTIMUM PERFORMANCE, THE FOLLOWING MAINTENANCE SHOULD BE PERFORMED REGULARLY, OR AS MAY BE NECESSARY:

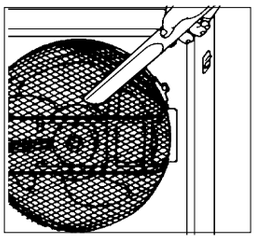




1) Clean Warm Air outlet Grille Louvers (as necessary)
Dust and stains should be wiped off louvers with a damp cloth.

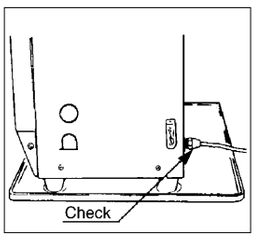


2. Clean the protective mesh cover over the Circulation Fan (approx. 1 to 2 monthly)
Remove carpet dust, pet hair etc, from the cover on the back of the heater.



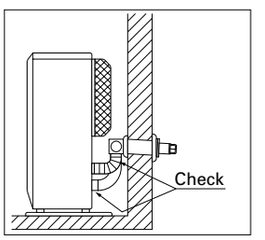
3. Check for Diesel Leaks (3 to 6 monthly)
Check for signs of any diesel leaks anywhere along the fuel line and at all fuel line joints ie ... tank drain and ON/OFF valves, fuel filter, the fire valve, and the fuel pipe connection at the back of the Laser. Diesel leaks can damage adjacent materials. If the Fuel Tank is installed with a "Bund Tank", ensure the Bund Tank is clean and dry.

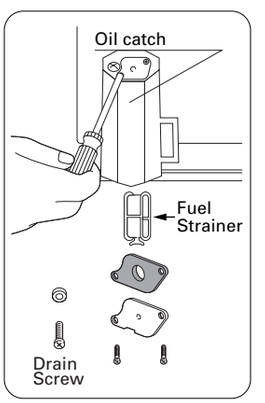
4. Check all Balanced Flue Pipe and fuel pipe connections (approx. 3 to 6 monthly)
Indoors: Check flue joints to ensure firm connections. Vacuum clean behind heater.
Outdoors: Check flue outlet clear of outdoor debris that might restrict exhaust or combustion air flows.



5. Clean Fuel "Strainer" (Part No. 17187513) (also known as ··· Integral Fuel Filter)
The integral fuel strainer (filter), must be clean at all times. If the fuel tank and fuel is clean, the integral filter requires minimal service. If the Fuel Tank is fitted with a Garber Fuel Filter, there should be no need to clean the integral fuel filter (strainer) at all. Each installation is different. Clean the integral filter as may be necessary for your installation as follows .....

(a) Close the outlet valve on the remote fuel tank.
(b) Push the thin end (with arrow) of the plastic "Oil Catch" (Part No. 17187525) under the fuel strainer cover, so that when the fuel strainer cover is removed, the diesel content of the fuel sump will flow to the "Oil Catch". Place a shallow container under the "Oil Catch" spout.
(c) Loosen the two screws that secure the strainer cover and remove.
(d) Remove the strainer and wash with Fuel, (not water or petrol). Shake dry.
(e) Return the strainer to its original position. Replace strainer cover and screws to secure.
(f) Wipe away any spilled diesel.
(g) Open the Fuel Tank valve. Check immediately and later, for any signs of diesel leakage.
(h) If the Laser is to be unused for more than 12 months, (ie ··· holiday house), shut OFF the remote fuel tank drain valve and drain the fuel sump, (using the "Oil Catch") by removing the 6mm drain screw located above the left hand oil strainer cover screw. Replace and tighten the drain screw. Remember to turn ON the fuel tank valve when the heater is returned to service.





6. IGNITER CLEANING SYSTEM
AUTOMATIC MODE: When used in Automatic mode, the igniter is automatically cleaned every day, at 2:00 a.m. for ten minutes. If the heater is operating in Auto heating mode, at that time, the digital display shows "CL:10".

MANUAL MODE: When used in Manual mode, the Igniter must be manually cleaned to prolong igniter life. It is recommended that the igniter is cleaned weekly. To clean the igniter .....

a) With the ON/OFF switch "OFF", Press the "HOUR" button and "MINUTE" button, (See Page 9, Ref. No. 4) at the same time, for more than three (3) seconds when ON/OFF.
b) Digital Display shows "CL:10". The igniter cleaning program commences and continues for approx. 10 minutes. No other input is necessary. After 10 minutes, the igniter is clean.

7. Check condition and tightness of the fusible string between the Laser and the Spring Lever Fire Valve

SECTION G: TROUBLESHOOTING

BEFORE REQUESTING A SERVICE CALL

The following symptoms are normal during operation of the heater.

	CONDITION	REASON
When heater is started or extinguished.	White smoke or smell inside home when the Laser is first used.	Machine oil used in factory assembly, or transit dust burns off the surfaces of the burner or heat exchanger.
	Flashing flames visible in viewing window for a few minutes after ignition.	The burner is cold and igniter is kept running for a while after.
	Irregular metallic "cracking" noises when when heater is ignited or extinguished.	Expansion / contraction of hot metal components within the Laser warming and cooling.
	Warm air is not discharged as soon as ignited.	Delay is to prevent nuisance cool air.
	Audible "chugging sound" from fuel pump.	Air is in the fuel pump (No fuel). At first "Start Up" the rapid "chugging noise", may continue for a minute or two, until air is purged from the pump*.
When heater is in operation.	Regular pulse "Ticking" noise from heater.	Sound of fuel pump in normal operation.
	Heat Chamber or Heat exchanger can be seen through the air outlet louver's glowing red hot.	Normal
	Occasional yellow flickering in blue flame.	Normal

*If rapid "chugging" sound from fuel pump does not cease and if heater shuts OFF…….

1. Push Fuel Sump Red Reset Button. (See Page 6). DO NOT hold down.
2. Insure that all valves (including fire valve) are open.
3. Insure external fuel tank has fuel and fuel filters are clean.

For any service or spare parts Call 0800-379-247 (0800-DRY-AIR), and be sure to quote the serial number and installation date of your Laser heater.

Should problems arise during operation or ignition, refer to the table below to determine the cause and the proper steps to take. Be sure to unplug heater, allow it to cool completely before taking corrective measures. In the event that heater should extinguish itself, without any action or your part, you should look to the digital indicator for any of the following error codes.

DISPLAY/LAMP	PROBLEM	CAUSE	SOLUTION
	POWER LAMP FAILS TO TURN ON	Disconnected power plug. Circuit board malfunction.	Plug into 230V 50Hz AC outlet. Consult your dealer.
EE2	NO IGNITION*	Out of fuel.	Check fuel tank and filters.
EE2		Fuel tank valve closed.	Open valve by turning counterclockwise.
EE2		Air pocket in fuel line.	Push reset button on the fuel sump (See Page 6), located right inside, once.
EE2		Clogged flue pipe.	Clean flue pipe.
EE2		Clogged fuel strainer.	Clean fuel strainers (See Page 13).
EE2		Igniter, circuit board, flame sensor or fuel pump malfunction.	Consult your dealer.
EE8		Blower motor malfunction.	Consult your dealer.
EE6	EXTINGUISHED AFTER IGNITION	Air pocket in fuel line.	Push Red reset button on the fuel sump (See Page 6), located right inside, once.
EE6		Out of fuel.	Check fuel gauge on fuel tank; refuel.
EE6		High limit switch activated.	Clean circulation fan cover, remove any obstructions.
EE6		Fuel flow obstruction.	Consult your dealer.
EE6		Tank too high.	Re-locate fuel tank.
EE6		Fuel sump valve malfunction.	Consult your dealer.
EE6		Flame sensor malfunction.	Consult your dealer
EE8		Blower motor malfunction.	Consult your dealer.
	POOR COMBUSTION/ NOISY COMBUSTION	Soot buildup in Balanced Flue pipe. Burner ring not properly seated. Altitude too high (See Page 24).	Clean out any soot. Consult your dealer. Consult your dealer.
EE10	DOES NOT EXTINGUISH	Possibly excess fuel in burner. Flame sensor malfunction.	Consult your dealer. Consult your dealer.
	DIESEL ODOR	Leaking Balanced Flue Pipe. Fuel leakage. Faulty packing or gasket in combustion area.	Tighten all Balanced Flue Pipe connections. Tighten all fuel line joints. Wipe away any diesel drippage. Consult your dealer.
Hi		Room temp is over 35˚C. Incorrect location of room temp sensor.	Correct the location of the room temp sensor.
Lo		Room temp is lower than -10˚C. Room temp sensor malfunction or disconnected.	Check room temp sensor.
Low/Med/ High lamps flashing at the same time	DOES NOT EXTINGUISH	Possibly excess fuel in the burner or flame sensor. malfunction (miss detection).	Consult your dealer.

WARNING: Error EE10: Do not use the heater until the cause of EE10 has been rectified.

Any flame failure will also indicate “Error EE2”. Press the Burner ON/OFF switch to OFF (to shut down the heater). Allow the heater to cool down (approx. 10 to 20 minutes). Note that the recirculating air fan may operate and assist cooling. Try and identify the cause of the problem, (as in problem solutions above ··· in particular EE2 Error Code Solutions). Restart the heater by pressing the Burner ON/OFF switch to ON.

Note: If the heater fails three times, after checking all causes listed, DO NOT CONTINUE attempts to restart the heater. Switch the heater OFF and contact your supplier / serviceperson.

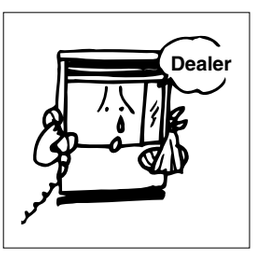
SECTION H:
LONG TERM STORAGE (more than 6 months)

When the heater is to be unused for an extended period, (ie ··· Holiday House over 12 months) the following is recommended.

1. Endeavor to run down the fuel in the tank. When diesel is stored long term, its quality may deteriorate. Aged Diesel fuel can grow an "algae", which can have an unfavorable effect on heater operation. If long term storage is unavoidable, (as in a holiday house) refer to heater supplier for details of approved anti algae diesel additives that is mixed into the fuel tank, to enhance the storage life qualities of Diesel Fuel.

2. If your heater needs any service or repair, now is the time to call your dealer and get it done before storage. Then your heater will be ready for use when next required.

3. Recommended.....
   (a) Disconnect power supply and store cordset to prevent unintentional reconnection.
   (b) Shut OFF the main fuel supply valve on the remote fuel tank.
   (c) Drain fuel sump and clean integral fuel strainer. (See Page 13, only for long term non use)
   (d) Clean the heater cabinet louver's and circulation fan cover.
   (e) Cover heater completely with a large plastic bag to protect from dust. NEVER COVER HEATER CABINET UNLESS FUEL TANK SUPPLY IS SHUT OFF AND CORDSET IS DISCONNECTED FROM POWER OUTLET and STORED TO PREVENT UNINTENTIONAL USE.



SECTION I: INSTALLATION

GENERAL DESCRIPTION: The Laser 73 is designed to be installed in an outside wall so the full advantage of installation simplicity can be made with the "Balanced Flue Pipe", which eliminates the need for tall chimney type flues. No hearth or fire surround is required. While some flue pipe extensions are available, they complicate installation. Two types of flue extensions are available. Read and understand the limitations of the two types of flue extension options (See Page 19).

Local Authorities may require the Laser installation to comply with AS1691:1985, however this old Standard is in fact "obsolescent", and no replacement Standard has been issued as at Jan 2007. AS1690:1985 does not provide for the advanced technology of the Laser Balanced Flue Pipe. The Laser 73 was approved by ERMA after passing tests conducted by an Independent NZ Laboratory in accordance with AS 1690:1975 "Temperature Hazards and Overheating", Para 3.2, Table 3.2, and Appendix A, paras A1, A2, A3 and A4, and which is a more demanding test that the "as installed" tests in AS1691:1985.

TOOLS NEEDED FOR INSTALLATION

Tool:	**Use:**
Phillips Head Screwdriver	Installation of Balanced Flue Pipe, etc.
Electric Drill	Drilling hole in wall for Balanced Flue Pipe, fuel pipe and fusible string sleeve pipe.
Hole Saw, 70mm to 80mm	Making hole in wall for Balanced Flue Pipe.
5mm and 8mm diameter, (very long) masonry drill bits	May be required for pilot holes if exterior cladding is masonry or brick or concrete.
Tube Cutter and Flare Tool	For fitting fuel copper pipe (8mm diameter).

For a house with masonry, concrete, plaster, or brick cladding, we recommend that before you create a 70mm to 80mm hole, first, pierce a 5mm hole right through the wall, (from inside, using the cardboard template), as a pilot hole, then engage a Hole Cutting Contractor to make a 70/75mm hole. A Hole saw can be used for weatherboard walls. An optional **"Weatherboard Packing Piece" (See Page 20)** is available to make the outdoor surface flat, so the flue flange can make a perfect weatherseal. Fix and seal the Weatherboard Packing Piece with an approved outdoor sealant such as Expandite SB or equivalent.

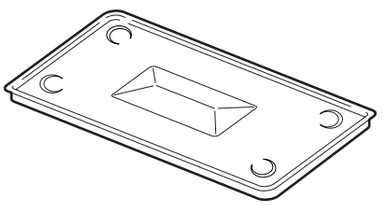
NZ BUILDING CODE & LOCAL COMPLIANCE AUTHORITY REQUIREMENTS

a) The NZ Building Code Section E2 (External Moisture) requires outdoor wall penetrations to be permanently weather sealed, (to prevent the ingress of moisture, air, or rain). Because wall claddings vary, this manual cannot detail specific instructions, except to state that the outdoor stainless steel flange of the Laser Balanced Flue Pipe is a "universal" type, supplied with a mastic impregnated polyurethane foam compressible gasket, which, when installed outdoors, is completely covered by the pressed stainless steel flange. The Gasket and Flange provides a permanent weather-tight seal against most outside claddings, but compliance with NZBC Section E2 is the installers responsibility. Our advice is: **when application is made to local Consent Authority for an Installation Consent,** provide the Local Authority with details of how the wall penetrations for the Balanced Flue Pipe, the fusible string sleeve, and the fuel pipe, are to be sealed in a manner that complies with NZBC E2. If this presents a problem. Contact Avon Technical Helpline Ph 0800-379-247, for advice.

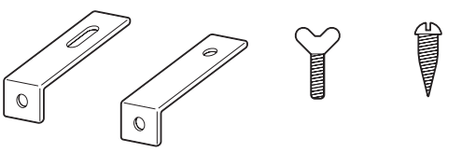
b) Consent to install any combustion heater requires the installation of a smoke alarm(s) in compliance with the NZBC F7/AS1 Warning Systems. Your local Council will have details of their requirements on their website. An excellent example of the requirements of the Christchurch City Council can be seen at www.ccc.govt . Search for "smoke alarms", to find a downloadable Information Sheet No IS29.

STANDARD INSTALLATION PARTS

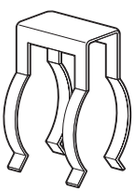
The following standard installation parts are enclosed with heater. For alternate installation methods, you may need to purchase additional accessories which are available from your dealer. See "Accessory Parts", Page 19.



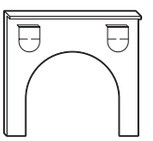
Drip Tray (1) (PART #17185415)



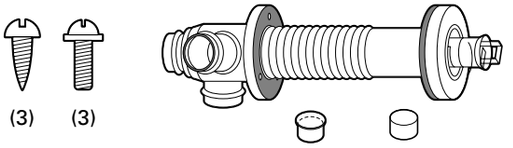
Wall Brackets (2 sets) (PART #17206081)



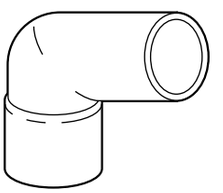
Pipe Holder (1) (PART #17206085)



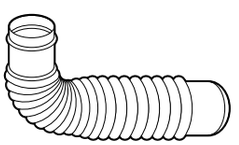
Pipe Stopper (1) (PART #17206086)



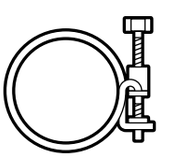
Balanced Flue Pipe (1) (PART #17206096)
Exhaust Air Cap (1) (PART #17206061)
Intake Air Cap (1) (PART #17206056)



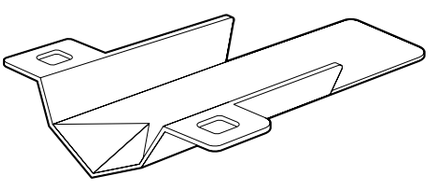
L-Shaped Hose (2) (PART #17206049)



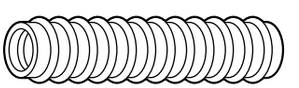
Bent Joint (1) (PART #17206066) (Elbow)



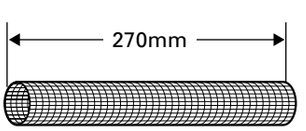
Hose Band (2) (PART #17206077) (Hose Clamp)



Oil Catch (1) (PART #17187525)



Intake Pipe (1) (PART #17206091)



Insulating Cloth Cover (1) (PART #17206025)

OPTIONAL ACCESSORY PARTS

Only use genuine Toyotomi parts and accessories, makeshift parts can affect safety and reduce performance, and invalidates Warranty. The Balanced Flue Pipe must be used in every installation, and cannot be installed other than through a wall, and with a slight "fall" to outside. The Balanced Flue Pipe is not designed for vertical installation.

There are two ways to extend the Combustion Air and Exhaust Pipe System *….

1) Extension Pipe Kits type (L), (M), and (S), (See Pages 21 and 22).
These stainless steel, telescopic pipe assemblies are designed to create distance between the heater and the Balanced Flue Pipe. They must only be installed by **surface (exposed) mounting, inside the heated space**, as illustrated in Para 4 Page 23, and terminate by connecting to the Balanced Flue Pipe which is the only approved means to transport hot exhaust flue gasses to outside. Extension pipe kits (L) (M) and (S) are provided with an Insulating Cloth Cover for the hot exhaust pipe, but depending on the site, more insulation may be necessary. Extension pipe kits type (L), (M), and (S) **must not be enclosed, or concealed within a building cavity**. See installation example in **"Installation Advice"**, Page 23, Para's 4 and 6.

Extension pipe kits (L), (M) and (S) are only suitable for maximum distances (horizontal or vertical) of up to 3 metres and with up to 3 x 90° bends, (Elbows). If the distance between the heater and the Balanced Flue Pipe is greater than 3 metres, then the proposed installation is unsuitable.

At the "exhaust end" of Extension pipe kits (L) (M) and (S), the **Balanced Flue Pipe** (through a wall) MUST ALWAYS BE INSTALLED as in Page 26, Para 5c, Fig. 9)

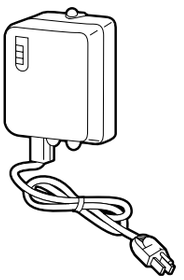
Accessory	Part No.	Application
Extension pipe kit (L)*	17206013	Extends pipe system by 1570mm to 2000mm
Extension pipe kit (M)*	17206012	Extends pipe system by 570mm to 1000mm
Extension pipe kit (S)*	17206011	Extends pipe system by 320mm to 500mm
L-Shaped exhaust joint*	17206016	(Elbow) for 90 degree bend in exhaust pipe
Exhaust extension pipe 1000	17206089	Short extension for difficult sites
Exhaust extension pipe 500	17206083	Short extension for difficult sites
Exhaust extension pipe 300	17206084	Short extension for difficult sites
Exhaust extension pipe 200	17206087	Short extension for difficult sites
Exhaust extension pipe 100	17206088	Short extension for difficult sites
Exhaust extension pipe 75	17206098	Short extension for difficult sites

2) The Balanced Flue Pipe (the "green", 60mm diameter pipe that passes through the wall) can be "extended" to pass through thick walls by adding "threaded extensions" ··· wind the screw thread IN or OUT to suit wall thickness. Page 27, Fig. 8 shows the optional extensions labeled "exhaust joint" and "intake joint". The Laser is supplied with one set of extensions so the Balanced Flue Pipe will fit external walls between 130mm and 320mm thick. Also available are three other extension lengths, (see below, and Balanced Flue Pipe Extensions illustration, in "Accessories", Page 20). Fitting through a window glass can also be arranged. Contact supplier for other options including longer extensions.

Balanced Flue Pipe Wall Extension	17206051	Extends balanced flue from 320mm to 420mm
Balanced Flue Pipe Wall Extension	17206052	Extends balanced flue from 420mm to 520mm
Balanced Flue Pipe Wall Extension	17206053	Extends balanced flue from 520mm to 620mm
L-Shaped Exhaust Joint	17206016	90 degree exhaust pipe bend or "Elbow"
Fuel Lifter Pump (Model OPT 91UL) Approx. 150mmW × 280mmH × 140mmD (Max lift is 8m)		For sites where the remote tank must be below the heater. (ie ··· hill sites and multi-story homes). Install near and above the heater (requires own 230V 50Hz power supply). The fuel lifter pump can "lift" diesel from a tank that is located up to 8m below the heater. Inquire to supplier for detail.
Flue Outlet Guard (FFP-380)	17206093	Extra protection for outdoor flue outlet pipe, (See sketch Page 20)
Weatherboard Wall Spacer	WB Wall	H4 Treated timber. Makes outside surface flat, so the compressible gasket on the flue flange provides a permanent weather tight seal.
Water Block Filter	WB-1	Complete Water Block Filter for diesel fuel
Replacement Filter Cartridge	RC-1	Replacement Cartridge for Water Block Filter

* Total length of extension pipe between heater and Balanced Flue Pipe must be no greater than 3m. No more than three bends may be used in extension pipe.

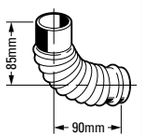
Fuel Lifter Pump Model OPT-91UL



Pipe Support Hardware

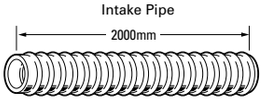
PART #17206004

L-Shaped exhaust joint



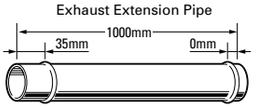
PART #17206016

Intake Pipe



PART #17206091

Exhaust Extension Pipe

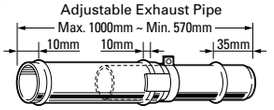


PART #17206089

Intake Pipe Joint

PART #17206092

Adjustable Exhaust Pipe



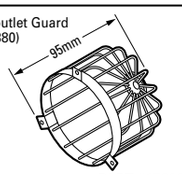
PART #17206027

BALANCED FLUE PIPE EXTENSION

Inner exhaust pipe — Green outer intake pipe

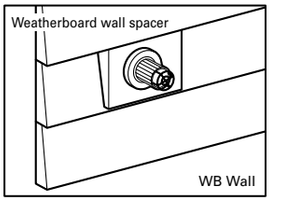
PART #17206051 Flue pipe ext. (for wall up to 330 mm - 410 mm)
PART #17206052 Flue pipe ext. (for wall up to 410 mm - 510 mm)
PART #17206053 Flue pipe ext. (for wall up to 510 mm - 610 mm)

Flue outlet Guard (FFP-380)

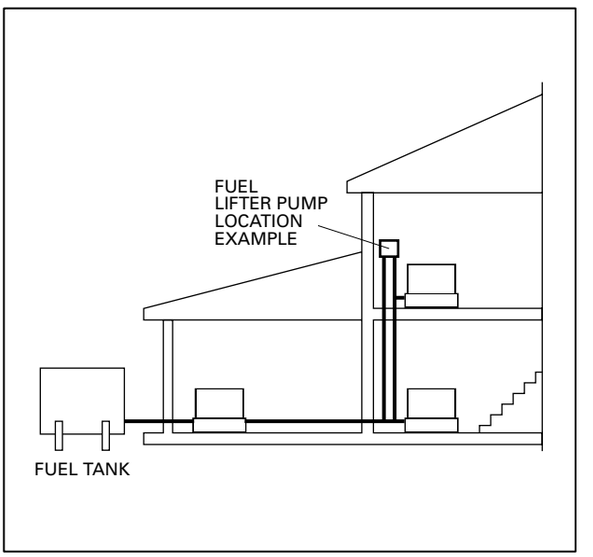


PART #17206093

Weatherboard wall spacer



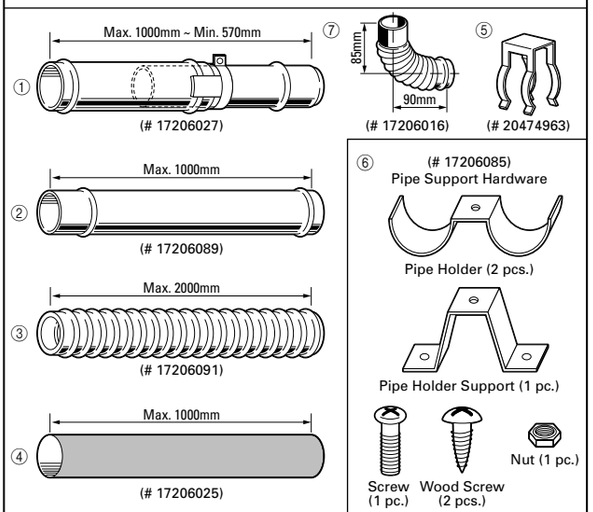
WB Wall



PIPE EXTENSION KIT

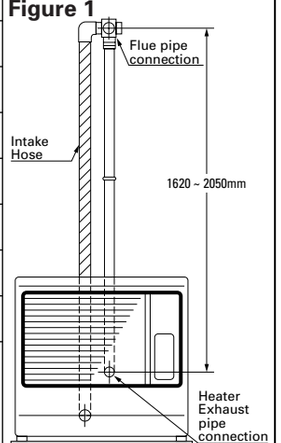
PIPE EXTENSION KITS: L, M, and S are designed to extend both Supply and Exhaust Pipes from the back of the Laser to the Balanced Flue Pipe which is the only approved method of transporting hot flue gasses through a wall. The extension pipes must be installed "exposed surface mounted" within the heated room. NZ Building Regulations make the installation of Pipe Kits L, M, and S, **within a combustible material wall** almost impossible.

Extension Pipe Kit (L) PART #17206013



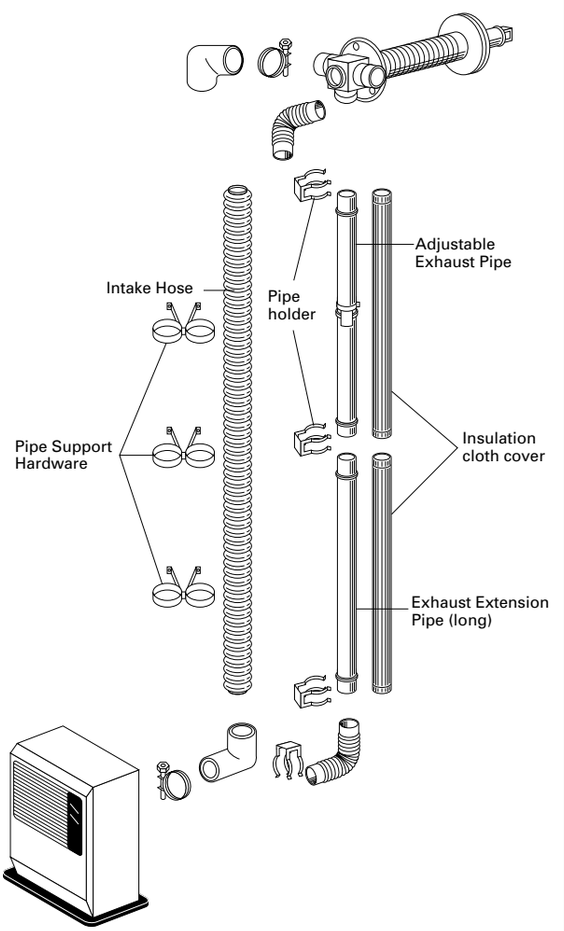
No.	Name of Part	Q'ty
①	Adjustable Exhaust Pipe Max. 1000mm ~ Min. 570mm	1
②	Exhaust Extension Pipe (long, 1000mm)	1
③	Intake Pipe (2000mm)	1
④	Insulating cloth cover (1000mm)	2
⑤	Pipe Holder	2
⑥	Pipe Support Hardware	3 sets
⑦	L-Shaped Exhaust Joint	1

Figure 1



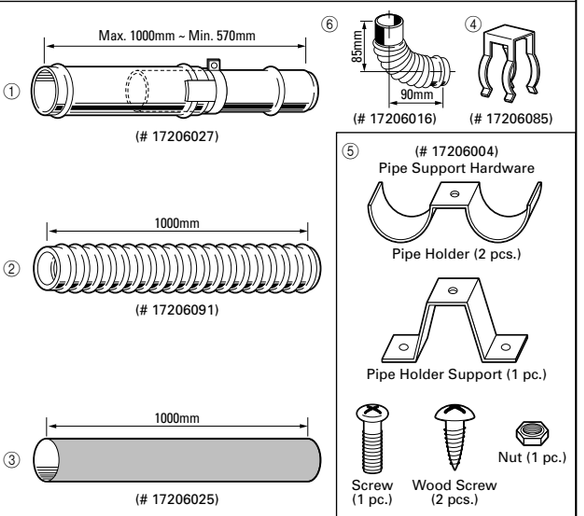
When using the "Extension pipe (L)" extension kit, the distance between the heater exhaust pipe connection and the flue pipe connection must be at least 1620mm but no more than 2050mm. (See Figure 1 above.)
"Note that Exhaust Extension Kits L, M, and S are designed for installation inside the heated room, and for exposed (surface) mounting only".
Concealed installation using Extension Kits L, M and S, cannot comply with NZ Building Code. Other options may suitable, please inquire to supplier.

INSTALLATION WITH EXTENSION PIPE KIT (L)



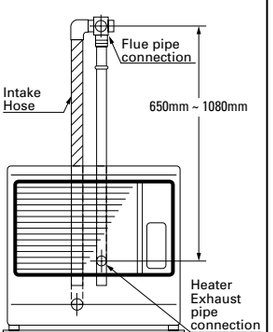
NOTE: Use "L"-shaped Exhaust Joint if necessary.

Extension Pipe Kit (M) PART #17206012



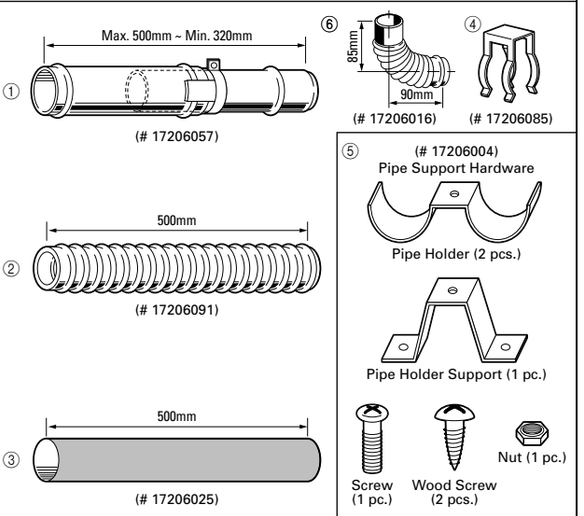
No.	Name of Part	Q'ty
①	Adjustable Exhaust Pipe Max. 1000mm ~ Min. 570mm	1
②	Intake Pipe (1000mm)	1
③	Insulating cloth cover (1000mm)	1
④	Pipe Holder	1
⑤	Pipe Support Hardware	2 sets
⑥	L-Shaped Exhaust Joint	1

Figure 2



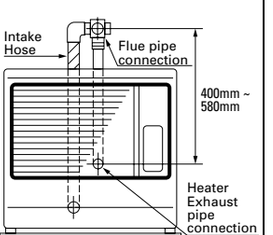
When using the "Extension pipe (M)" extension kit, the distance between the heater exhaust pipe connection and the flue pipe connection must be at least 650mm but no more than 1080mm. (See Figure 2 above.)
"Note that Exhaust Extension Kits L, M, and S are designed for installation inside the heated room, and for exposed (surface) mounting only".
Concealed installation using Extension Kits L, M and S, cannot comply with NZ Building Code. Other options may suitable, please inquire to supplier.

Extension Pipe Kit (S) PART #17206011



No.	Name of Part	Q'ty
①	Adjustable Exhaust Pipe Max. 500mm ~ Min. 320mm	1
②	Intake Pipe (500mm)	1
③	Insulating cloth cover (500mm)	1
④	Pipe Holder	1
⑤	Pipe Support Hardware	1 set
⑥	L-Shaped Exhaust Joint	1

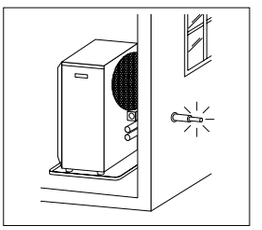
Figure 3



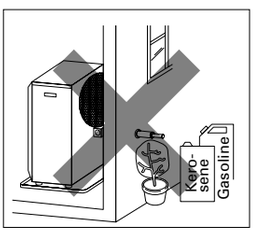
When using the "Extension pipe (S)" extension kit, the distance between the heater exhaust pipe connection and the flue pipe connection must be at least 400mm but no more than 580mm. (See Figure 3 above.)
"Note that Exhaust Extension Kits L, M, and S are designed for installation inside the heated room, and for exposed (surface) mounting only".
Concealed installation using Extension Kits L, M and S, cannot comply with NZ Building Code. Other options may suitable, please inquire to supplier.

INSTALLATION ADVICE

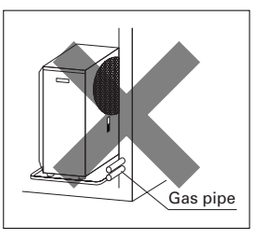
1. Intake air and exhaust flue pipe openings of the Balanced Flue Pipe must be fully exposed to outside. The Balanced Flue Pipe must not vent into a chimney, garage, basement, under-floor or ceiling cavity, or any enclosed area, or be installed vertically, because the Balanced Flue Pipe is a "Heat Exchanger" which causes condensate to form in the exhaust pipe, and which must drain to outside. (See Fig. 2 Page 24).



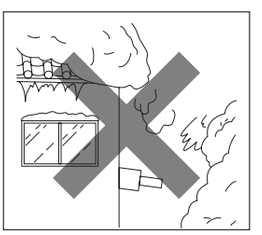
2. Install Balanced Flue Pipe, (See Fig's 2 and 3 Page 24). Note the volume and temperature of the hot exhaust gas that the exhaust pipe discharges to outside, is minimal, and does not normally present any problems. However, if the outdoor exhaust pipe can only be located where "accidental touching" might be a problem, inquire to supplier for an optional extra "guard" (FFP-380, Part No. 17206093 See Page 20), which extends protection of the outdoor flue outlet to prevent accidental touching of the exhaust outlet pipe.



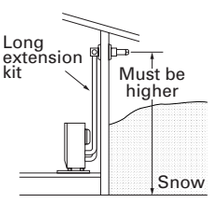
3. Before making a hole in the wall for the Balanced Flue Pipe ensure the wall cavity is free of electrical wires, gas pipes and other obstacles. Drilling a 5mm "pilot hole" from inside enables the final hole (and any associated "mess") to be completed from outside.



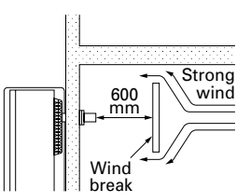
4. Do not install Balanced Flue Pipe where the air supply or exhaust gas outlet might become covered by snowdrifts, fouled by outdoor debris, or directly exposed to winds over 50kph.



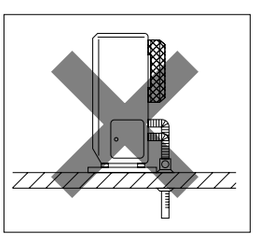
Important:
In areas of heavy snow falls, ground surface clearance must be increased according to average snow falls.

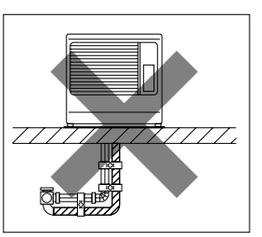


Important:
In open area with strong wind, a wind break may be necessary.

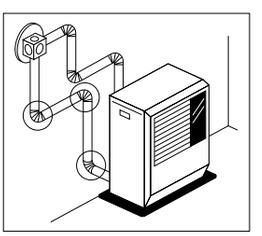


5. Never install the Balanced Flue Pipe below the heater.





6. Total length of any Extension Pipe Kits (accessories L, M or S) between heater and Balanced Flue Pipe must not exceed 3 metres , with not more than 3 × 90° bends.
   NOTE: When using Extension Pipe Kits type L, M, or S always insulate hot exhaust pipe with the insulating cloth cover supplied. (More insulation may be required by Local Authority).



7. For all Laser installations, the Balanced Flue Pipe must always be installed. It must be horizontal with slight fall to outside ··· **never vertically.**

INSTALLATION OF HEATER AND BALANCED FLUE PIPE

A) Before commencing any installation work, check that the proposed installation will comply with NZ Building Code requirements and Local Consent Authority rules that may apply to vented heaters in your area. (Check your Local Authority website, or consult your Installer / Supplier)

B) The Balanced Flue Pipe is designed to be installed through the wall of any conventional building cladding, including Brick, Hebel, Linear, Gibraltar and Plaster Board, Tiles, Weatherboard, Plastered Polystyrene, and metal profiles etc.

C) The Laser 73 heater is designed to be operated at altitudes up to 900 metres, above sea level. For installation at altitudes between 900 metres and 1800 metres, adjustments by authorized serviceperson is necessary. Consult your supplier for advice.

1. Select heater location. Ensure minimum clearance's as indicated below between heater and nearest combustible materials. (See Fig. 1). Provide service access to clean the rear circulating Fan Guard, integral fuel strainer and reset button.

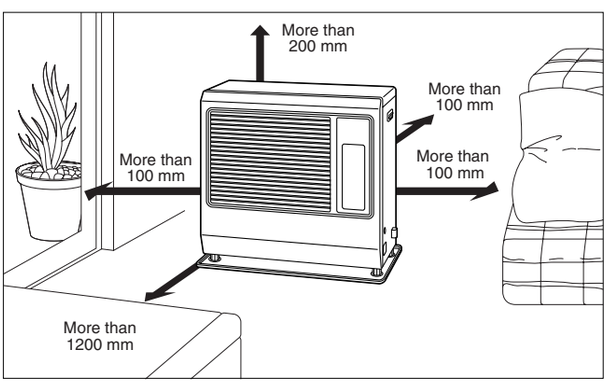


Fig. 1

2. Ensure the outdoor flue discharge area is clear of anything that might be affected by the hot flue exhaust gas. (See Fig. 2 and 3)

   The Balanced Flue Pipe (as in Fig. 2), is for wall thickness from 130 mm to 320 mm.

   For more than 320 mm, refer to page 19 for optional extra Balanced Flue Pipe Wall Extensions.

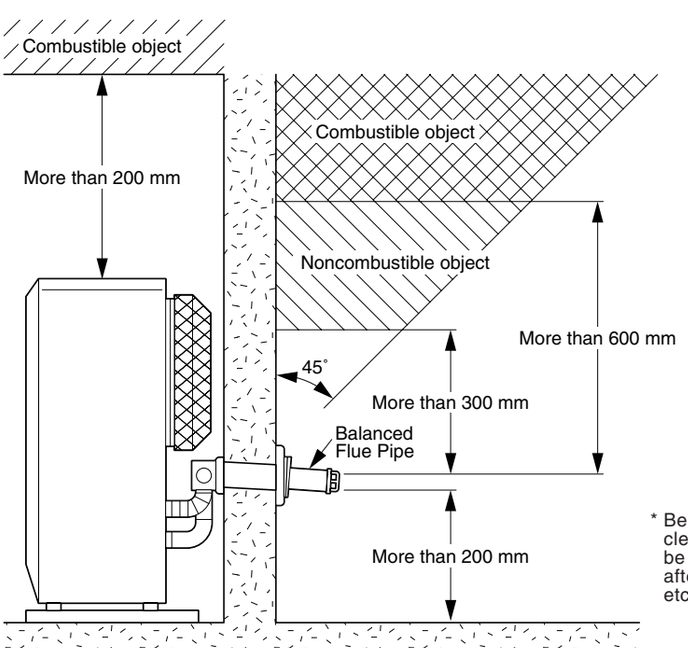


Fig. 2

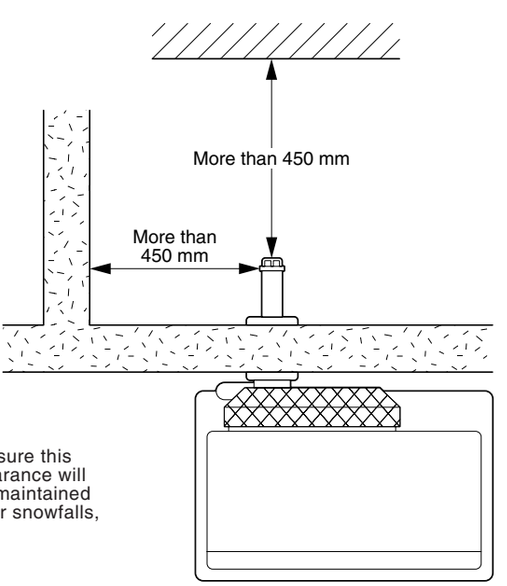


Fig. 3

Balanced Flue Pipe Installation

3. A cardboard template supplied with the heater is to identify location for the wall hole for the Balanced Flue Pipe. Tack or tape template to the wall at the desired position (See Fig. 4).

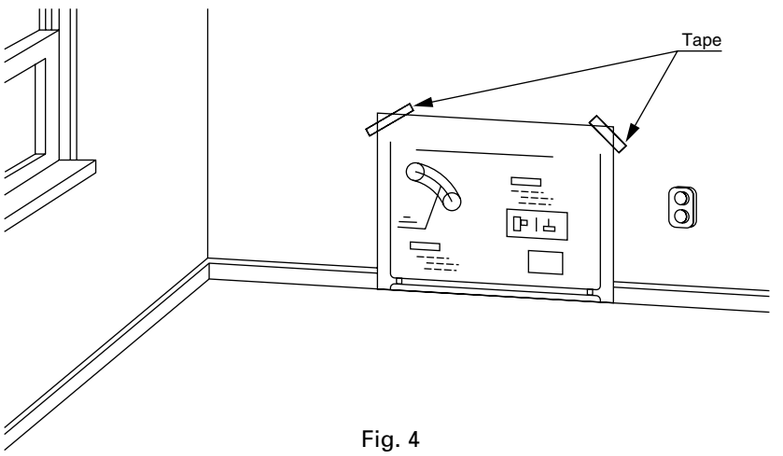


Fig. 4

NOTE: Heater should be installed on a sturdy floor that is level and flat.

NOTE: The cardboard template provides for accessories such as Extension Pipe Kits.

4. Install the Balanced Flue Pipe with a slight downward slope to outside, (2 degrees ··· See Fig. 6), to ensure that combustion condensate drains to outside, and also to prevent rain, watering systems or snow water entering from outside after installation. Before drilling the final size hole for the Balanced Flue Pipe, first, pierce the wall with a small "pilot hole", right through the wall (say 5mm diameter) from inside to outside. This method enables the angle of the final hole to be better controlled. Then enlarge the hole (to between 70mm and 80mm), starting from outside and maintaining the downward slope of approx. 2degrees. (See Fig. 5). (Warning: if the pilot hole is to big, it may make the final hole drilling difficult).

4a) Weather boards are a common NZ cladding. An optional H4 treated timber Weatherboard Wall Spacer (Sketch page 20, Part Reference "WB Wall"), designed to make the external wall "flat" is available from your supplier.

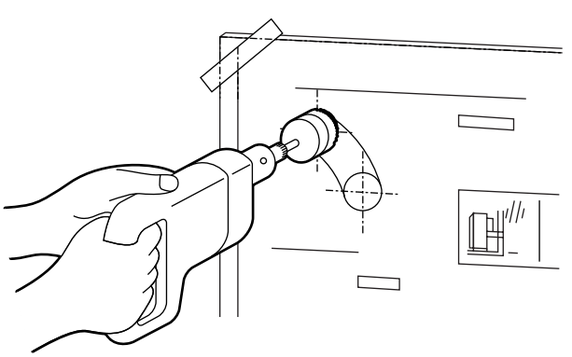


Fig. 5

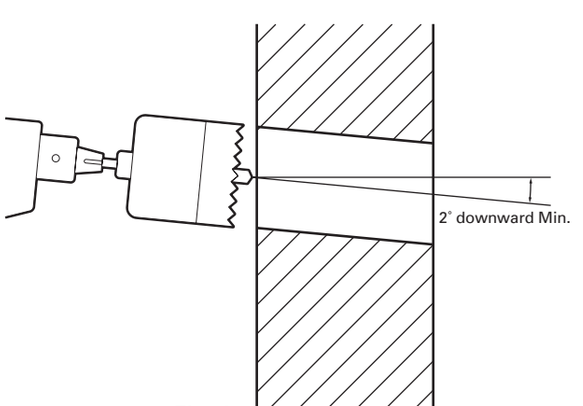


Fig. 6

NOTE: After creating the hole for the Balanced Flue Pipe assembly, discard the cardboard template.

5. Install the Balanced Flue Pipe. NZ Lasers are supplied with extensions to the outer and inner Balanced Flue Pipe (See Fig. 8) to enable the Balanced Flue Pipe to be installed in walls up to 320 mm thick. If the wall is less than 230 mm thick, discard the extensions as in Fig. 8.

   a. From inside, insert the Balanced Flue Pipe into the hole. Ensure the arrow on the inner flue flange is pointing UP, and prepare to secure the flange to the wall. (See Fig. 7)

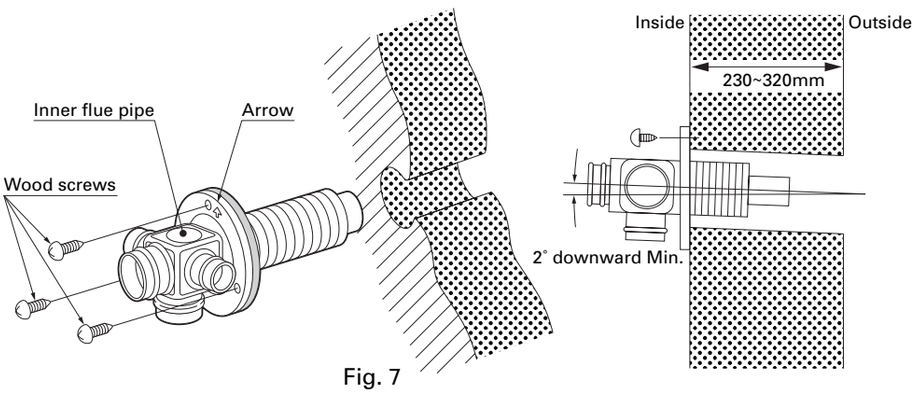


Fig. 7

   b. Where the wall thickness is between 130~230mm, discard the 150mm long Intake and Exhaust extensions that are supplied with the Laser. (See Fig. 8)

      Where the wall thickness is 230mm to 320mm thick, the 150mm long Intake and Exhaust flue pipe extensions (Supplied with every NZ Laser 73 as in Fig. 8, are required.

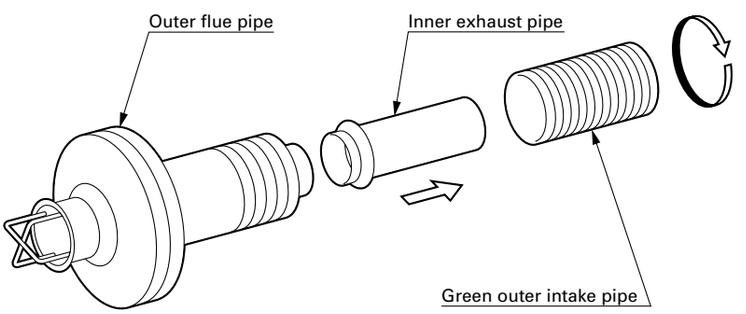


Fig. 8

   c. From outside, insert the outer part of the Balanced Flue Pipe into the wall hole, and twist so the outside section is “threaded” on to the inside section. Keep turning (screwing) the outside flue section clockwise, until the outside flange and its Polyurethane Foam Gasket, (See “A”, in Fig. 9) is tightly sealed against the outside cladding of the home. Ensure the arrow on the outer flange of the Balanced Flue Pipe is pointing UP. Secure the inside flange of the Balanced Flue Pipe to the inside wall with the screws supplied, (or other fastenings as appropriate for the wall material).

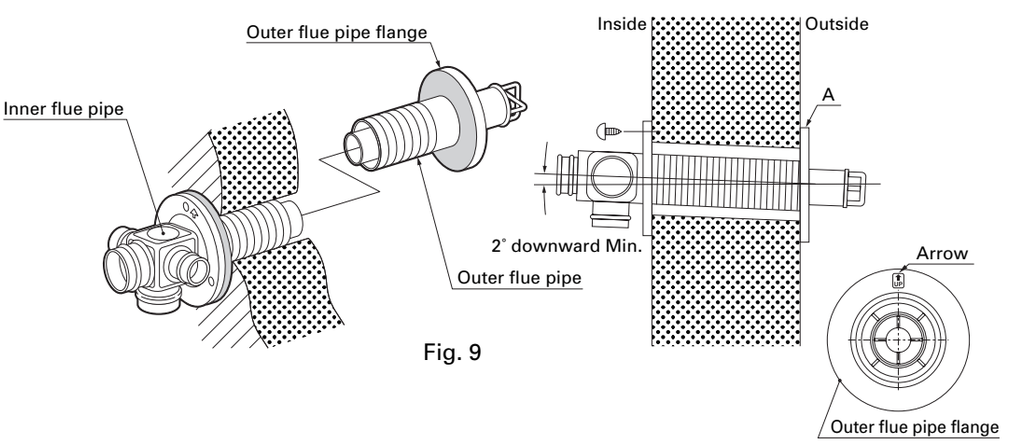


Fig. 9

6. Install the fusible link string from the back of the heater cabinet through a copper pipe "sleeve" which passes through a small hole in the wall or floor (as appropriate for the particular installation) to enable the fusible link string to be permanently held in tension, but able to release in the event of a fault. Loosely tie the string to the lever of the outside fire valve.

   A suitable "sleeve" through a wall or floor, for the fusible string, is a 6mm (1/4") or 8mm (5/16") OD copper pipe. In walls, drill the hole for the sleeve with a slight downwards slope to outside, to assist final weatherproofing. Before inserting the fusible string, "dress" the ends of the copper pipe, so that the "burr" created by a tube cutter, is removed, to avoid fraying or cutting the fusible string. If through an outside wall, permanently seal the sleeve against the ingress of moisture or weather, around the "sleeve hole" (for the 6mm pipe sleeve), in the wall cladding. Now loosely install the fusible string through the sleeve to outside, (through wall or floor as appropriate for installation).

7. Create another hole (8mm clearance), through the floor or wall (as appropriate for the particular site) for the 8mm (5/16" outside diameter) copper fuel pipe between the heater and the remote fuel tank. Locate the hole so there is sufficient pipe length inside the house, to enable access to the pipe connection at the back of the heater, and to enable the flare nut to be tightened, before finally positioning and fixing the heater. Now loosely install the 8mm diameter copper fuel pipe to outside, to the fire valve location (via wall or floor as appropriate for your installation).

   If the 8mm diameter copper fuel pipe passes through a wall to outside, drill the wall hole with a slight downwards slope to outside, to assist to achieve permanent weather tightness sealing as required to comply with NZBC Section E2 against the ingress of moisture or rain or weather.

8. a) The Balanced Flue Pipe has four connection "ports", which provide two options to connect the Exhaust "Elbow" and two options to connect the Combustion air intake pipe. A Stainless Steel and a Silicone Rubber Cap is provided to "Blank Off" the unused "ports". The exhaust "ports" of the Balanced Flue Pipe are fitted with internal silicone rubber "O" rings. For any of the joints explained in b), below, each exhaust connection must be fitted with a silicone rubber "O" ring. The silicone rubber "Elbows" have internal molded "threads" to fit the "ribs" on the air intake flexible pipe. Soapy water makes assembly of the Silicone Rubber components easier.

   b) Insert the "bent joint" (Stainless Steel "Elbow" See Fig. 10), to the exhaust opening of the Balanced Flue Pipe, and secure with stainless steel "pipe holder". (See Fig. 12 and P18)

   c) Fit the "Insulating Cloth Cover" over the "bent joint". Do not shorten the Insulating Cloth Cover. Fold the extra length of the Insulating Cloth Cover, inwards at each end to create a double thickness at each end. The Insulating Cloth Cover is now fitted on the "bent Joint" (Elbow), but not permanently positioned until later.

   d) If necessary, shorten the rubber Air Inlet hose to suit the distance between the rubber "Elbows", the Balanced Flue Pipe and the heater. Fit the rubber "Elbows" to the air inlet hose, the Balanced Flue Pipe and the heater "inlet opening" (See Fig. 11). Secure rubber elbows to heater and Balanced Flue Pipe with Hose Clamps. Use the rubber cap to seal the unused air intake "port" on the Balanced Flue Pipe.

   e) Install the stainless steel "Exhaust Air Cap", to seal the unused exhaust opening on the Balanced Flue Pipe (See Fig. 10). Use a light hammer to tap the cap into the Balanced Flue Pipe (with "O" ring), so that sealing is guaranteed (Leaking exhaust gasses are a hazard). Only use the Stainless Steel caps to blank off the unused Exhaust ports, and the Silicone Rubber caps to blank off the unused Air Inlet ports.

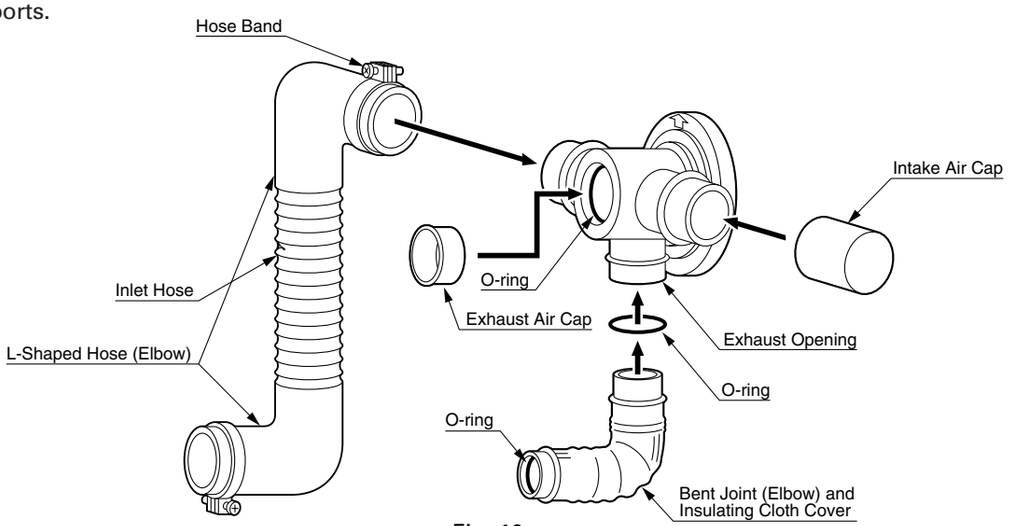


Fig. 10

9. Move the heater into position (with drip tray under). Connect the bent joint (Stainless Steel Elbow), to the exhaust "Outlet Opening" of the heater (the exhaust outlet is the higher of the two 42mm diameter pipes which exit at the back of the heater (See Fig. 11), and secure with the "U" shaped "pipe stopper". (See Fig. 12 and Page 18). Spread the Insulating Cloth Cover over the full length of the exhaust "Bent Joint" (Elbow), so that it entirely covers and insulates the Elbow and the pipe stopper at the Balanced Flue Pipe end of the "Bent Joint".

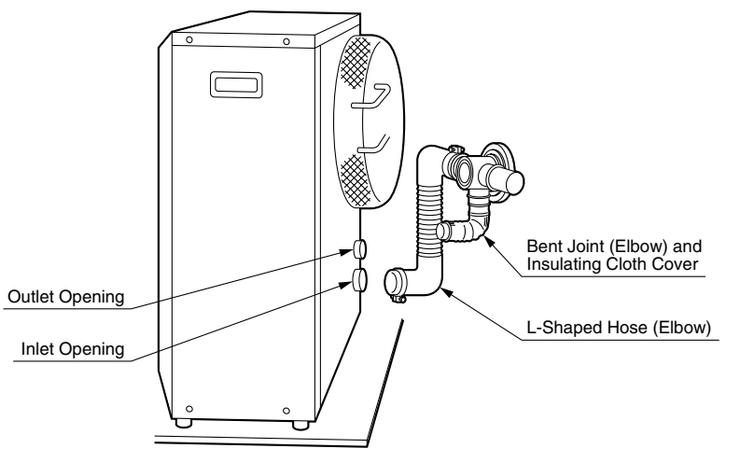


Fig. 11

10. If any of the Extension Pipe Kits (type L, M, or S) are used, use the pipe holders supplied with the Extension Pipe Kits to make permanent the connection between the bent joint (stainless steel Elbow) and the extension pipe. Secure the bent joint (or the extension pipe) to the exhaust outlet opening by sliding the pipe stopper in the exhaust opening bracket, located at the back of the heater cabinet (See Fig. 12).

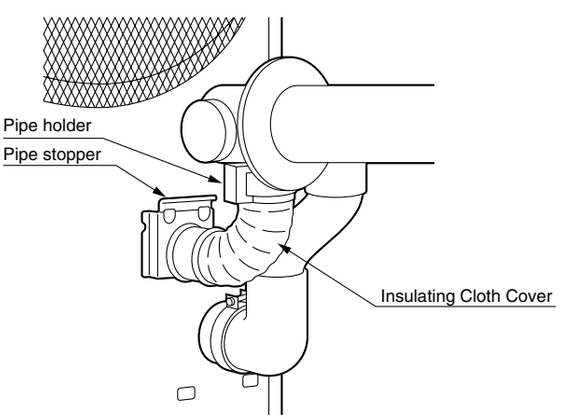
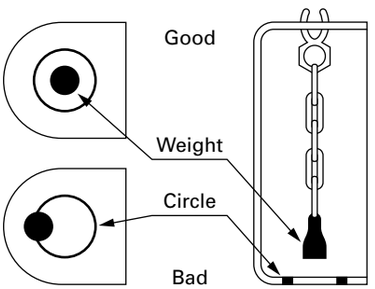


Fig. 12

11. Ensure the heater is level by using the "plumb bob" located at the right side of the heater. When viewed from above, the plumb bob "weight" should be within the circle. If not, adjust the heater "feet" until the plumb bob weight is within the circle (See Fig. 13 and Fig. 14).



Plumb bob as viewed from above

Fig. 13

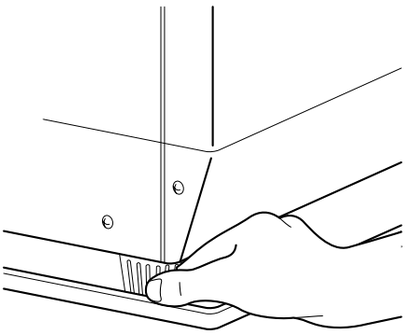


Fig. 14

12. **Seismic Restraint (REQUIRED by NZBC to NZS4219:1983) etc.**
The Laser Heater must be fixed to the main structure of the building to ensure compliance with (NZS 4219:1983 Seismic Restraint). Ensure the heater is parallel to the wall (See Fig. 15). Use wall fixings as appropriate for the wall materials to secure the wall brackets supplied with the Laser. The fixing/ location of the brackets to the back of the Laser heater may need to be re-located / moved to enable the wall brackets to fix to wall studs. New holes for the fixing brackets can be safely drilled into the back of the cabinet, along the "line" of the holes provided for the existing screws (across the top back of the cabinet) but take care that the drill bit does not penetrate within the cabinet more than 8mm. The two (slotted adjustable), wall fixing brackets (supplied) are each supplied with a wing nut to "fix" the final position of the heater. The wing nuts must be "spanner tightened". Hand tightened is not acceptable. Depending on site, the two wall brackets may not be sufficient to ensure NZS4220 compliance. While the "Bent Joint" elbow provides a rigid fixture to the wall, the strength of the flue is not allowed to be considered as part of Seismic Restraint Compliance. It is the installers responsibility to ensure that NZS 4220 is fully complied with.

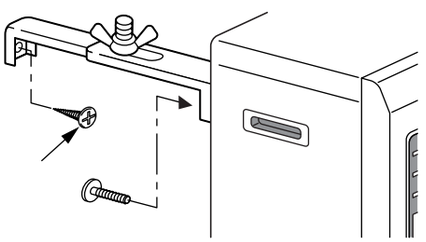


Fig. 15

13. To complete that part of the installation, associated with the indoor installation of the Laser, install the Spring Lever Fire Valve (s) (outside), and connect the fusible link string, so it, (they), perform the two functions A) and B) as described on Page 33 "SECTION J "Fuel Storage and Supply System" (Para 13), as in "Installation Diagram" Page 33. The fusible link string (withstands constant 50kG "pull'), must be stretched tight. If any part of the string line "gives" or becomes slack , (ie ··· the copper pipe sleeves bend or move, the fire valve lever will be released and will shut off the fuel supply to the heater.

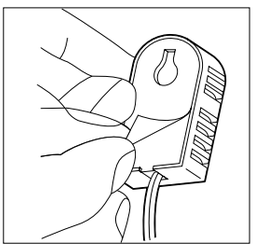
14. Install and tighten the 8mm diameter copper fuel pipe to the 5/16" (fuel inlet) flare fitting at the back of the heater. Note that the Laser fuel inlet is a flare fitting for 8mm (5/16" diameter) soft drawn copper pipe. The Flare Nut supplied with the heater (and Toyotomi remote tank), have metric threads, whereas conventional NZ "flare" fittings are SAE (Standard American Engineering), threads. If NZ / Toyotomi flare nuts are interchanged, threads will be damaged. Spare metric flare nuts are available from supplier. The Balanced Flue Pipe must be secured (with pipe saddles) as appropriate for the site, so the pipes cannot be easily damaged /dislodged.

Any queries, re installation contact Avon Technical Helpline 0800-379-247.

15. A remote room temperature sensor (which provides information to the Normal and Setback room thermostats and digital readout), is provided at the end of a 2.4m long extension wire, which exits from the rear of the Laser cabinet. Locate the sensor and wire to avoid being affected by heat or sunshine. Typically, as the floor is the coldest part of any room, locating the sensor at floor level behind the heater, in a location where it is unaffected by heat from the heater, is practical. If necessary, the sensor wire can be cut and extended up to 30 meters with ordinary twin core cable. Wherever the sensor is located, ensure it is not in direct sunlight, drafts or affected by radiant heat at the back of the heater.
To install the sensor .....

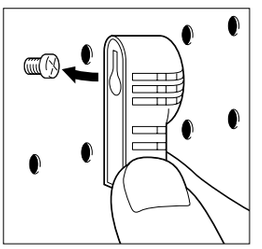
(a) Self Adhesive Tape

Peel off the protective tape on the back of the sensor and expose the adhesive. Press the sensor firmly on the wall so the adhesive secures.



(b) Wood Screw

Install the screw provided into the wall at the desired location and fit the Sensor enclosure to the screw head by the "keyhole" opening at the back of the sensor.



16. **Before ignition, and Commissioning / Operation (SECTION E), check the following:**
    a. All fuel connections are tight and firm.
    b. The heater is level, parallel to the wall and secured to the wall.
    c. Installation is as per these instructions, and complies with Local Authority Codes & NZBC requirements.

17. **Installers Certificate**
    ERMA compliance requires the installer to complete the Installers Certificate. Copies to the owner, installer and one to be returned to Avon.

PERMANENT WIRING AND EXTENDING THE POWER SUPPLY CABLE

PERMANENT WIRING: The heater is supplied with a 2.4 metre flexible cord with a side entry three pin plug, designed to be difficult to be accidentally removed from the wall socket.The Heater can be direct wired to a dedicated switched wall outlet (eg. PDL 651 or HPM XL770-2PC). A Registered Electrician is required to make the permanent connection.

Extending the wiring: If a longer power supply cord is required, it is best to replace the existing cord (rather than use an extension) or alternatively, install a dedicated power outlet adjacent to the heater, to avoid power interruptions to the heater, as this causes unnecessary cool down and re-ignition operations, and may cause the internal safety overheat devices to shut down the heater etc.

POWER OUTAGES

The Laser requires 230V 50Hz AC power to operate. Laser power consumption is minimal. Automatic ignition requires 285W for approx. 4 minutes. After ignition, for normal heating, (on high), the power consumption of the Laser heater is just 80W.

If power supply reliability at your home is a concern, options are .....

1) **A Generator**
   To select a generator that suits your needs, make a list of the electrical appliances you will need in a power outage. (ie ··· approx. power in watts) ··· Hot water cylinder 3000W, Refrigerator 400W, Microwave 700W, electric Jug 2000W, TV 110W, DVD 100W, Computer 140W, some lights 300W. Now add up the Power (W) of the appliances that you think you will need in a power outage, and use this total to select a generator. The maximum power consumption of the Laser is a minor factor when selecting a generator to protect your household against power outages.

2) **An Inverter** (with a car battery)
   Only a true "sine wave" inverter is suitable. (12V DC to 230V 50Hz). JAYCAR ELECTRONICS (www.jaycar.co.nz) offers a true sine wave inverter @ $NZ350. A 12V DC car battery will operate the Laser for 70 to 120 hours, depending on the capacity and condition. Contact supplier for advice.

SECTION J:
FUEL STORAGE AND SUPPLY SYSTEM

WARNING: Only use clean, fresh, Automotive Diesel. NEVER USE PETROL, White Spirits, or other flammable liquids, which can lead to explosive and destructive fire, and may cause serious injury or death.

LASER 73 FUEL TANK OPTIONS

The illustration below is a Toyotomi 84L Stainless Steel tank. Fuel suppliers usually will not deliver less than 250L. Larger capacity external tanks are available from your supplier. Common domestic tank capacities are 250L, 450L, 1000L, and all must comply with Standard, AS1692:1989. Note: Tanks less than 450L are not required to have a test certificate. Contact supplier for tank options to suit your site.

EXTERNAL TANK INSTALLATION

External tank installations must comply with Standard AS1691:1985 and subsequent amendments, or superceding Standards, plus any applicable local Authority Codes or Rules. Standard AS1691:1985 Compliance is the installers responsibility, but the following information will be of interest to the owner.

1) Some Consent Authorities require small domestic fuel tanks to be installed with a secondary containment system known as a "bund" tank. Check your local Council website, or your installer, for local rules that apply to your installation address.

2) Remote Fuel Tanks must be installed "outside".

3) The fuel tank vent must be a minimum of 1000mm from any opening into the building. The definition of "Opening" means fixed and opening windows and doors, and any foundation ventilation grates in raised floor homes.

4) Install the fuel tank so the bottom of the tank is not less than 400mm above the surface of the floor upon which the Laser Heater is installed. (For gravity to assist fuel flow to the heater).

5) Where the remote fuel tank can only be installed below the heater, (multi story homes and hillsides) an optional "fuel lifter pump" is available to "lift" diesel from up to 8m below the heater, to the heater. Contact your supplier for further information.

6) To avoid excess gravity fuel pressure to heater, the top of the fuel tank must not be more than 2.5m higher than the floor surface upon which heater rests.

7) Fuel tank should be located at least 1.5m away from all significant heat sources (Fuel Tank contents must not exceed 40˚C in normal operation ··· Paint it white).

8) Only use clean, new, soft drawn copper tubing for fuel line (8mm or 5/16" OD). If necessary to braze joint (extend) copper tube, ensure that internal "scale" caused by brazing, is blown away with dry compressed air, dry nitrogen, CO2, or by allowing at least three liter's of diesel to flow through the pipe to "wash away" internal copper pipe "scale", so the scale does not cause restriction the integral fuel filter /strainer (Part No 17187513). Galvanized pipe fittings or fuel tanks must not be used to store or transport diesel fuel. Diesel reacts adversely (it "gels"), in contact with Galvanising.

9) To prevent "air locks" in fuel pipe, the path of the fuel line should be generally parallel to horizontal with no U-shaped or "P" trap type "rise and fall" bends.

10) Use of a high quality fuel filter in fuel line adjacent to tank is recommended, also a shut-off valve at the fuel tank outlet and a drain valve on the tank, as shown below.

11) "Fuel tanks must be fitted with an effective fuel filter. Toyotomi recommend the GAR-BER R2000 Waterblock filter (www.GarBerfilters.com), inquire at your supplier".

12) Fuel pipe-work must be located or guarded so that it is protected against physical damage in normal service. Secure with pipe saddles as appropriate.

13) In addition to the integral Safety Controls within the Laser, NZ Regulations (NZ Gazette) requires a thermally triggered device to shut off the fuel supply in the event of two fault conditions, ie....

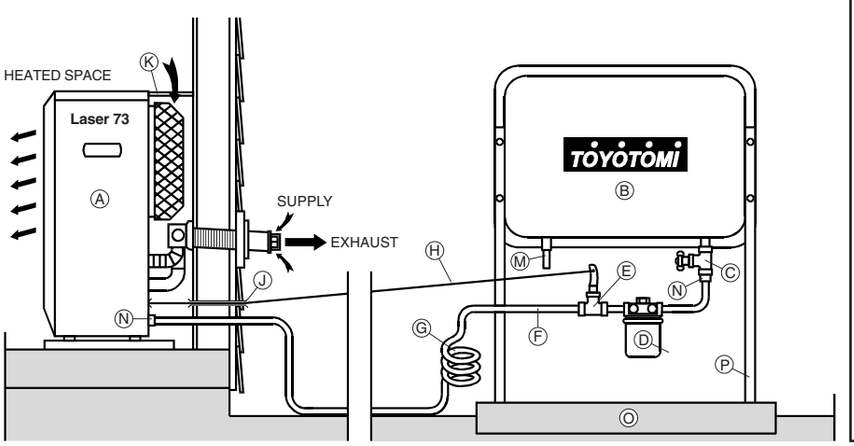
A) A fire within the heater.

B) A fire near the fuel tank.

The most practical way is to install a lever operated fire valve (which must be installed outside), to which a "fusible string" within the heater, is "in tension" between the heater and the fire valve lever. (See diagram below). The fire valve should be close enough to the tank to ensure that condition B) causes the fusible link string to fail and shut down the fuel supply. At sites where the fuel tank is a long way from the heater, it is not uncommon to have to install two fire valves to ensure both condition's A) and B) are complied with. See Diagram below. For other options to comply with A) & B), call Avon Technical Helpline 0800-379-247.

Typical Heater Installation with Toyotomi 84L Tank (other tank options available)

Notes
1. This sketch does not show 'Bund' Tank which may be required - check with Local Authority.
2. Locate tank in accordance with local codes.
3. Top of tank to be no more than 2.4m above floor of home.
4. Fuel outlet to be at least 400mm above floor of home.



Ⓐ - TOYOTOMI Laser 73
Ⓑ - TOYOTOMI 84 litres Tank (model TAK-90SJ)
Ⓒ - Fuel hand shut off valve
Ⓓ - Fuel Filter (model GAR-BER R2000)
Ⓔ - Spring loaded automatic Fire Shut Off Valve
Ⓕ - 8mm OD Copper Fuel Pipe
Ⓖ - Anti Vibration Loop (only if necessary)
Ⓗ - Special Fusible String in tension Holds Fire Valve Lever Open.
Ⓙ - 6mm OD Copper pipe (acts as a sleeve guide for the string)
Ⓚ - Seismic Restraint Brackets
Ⓜ - Water trap & Drain
Ⓝ - 8mm Flare Nut (non-standard thread)
Ⓞ - Base (to comply with sesimic restraint regulations)
Ⓟ - Mounting Brackets as supplied with tank (other mounting options available)

Thank you for purchasing a Laser Diesel Heater, we know you will be very satisfied with its remarkable engineering, reliability, & performance. Please tell your friends just how good the Laser is !, and, in the unlikely event of any problems, please call us for a solution. (Freephone 0800-379-247).

Can we ask you a favour ?

We would very much appreciate your thoughts and comments on the Laser 73 Heater, after a few months or years of actual service in your home.

Tell us about its performance, economy, convenience of use, noise, and its reliability, ------ compared to your old heating system.
All letters received, (P.O. BOX 19748, Christchurch), may be used as references, and will be rewarded. At Christmas, we will mail to you a large, high quality Wall Calendar with New Zealand scenic photos.

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