



FJH-3、 5B1/(2)
Fuel Fired Air Heater
Manual of Installation
Operation and Maintenance

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I、 Scope

FJH-5B and FJH-3B are heaters with fuel atomized by volatilization and are installed apart from engine system. These heaters with power supply of 12V or 24V DC are automatically controlled in operation. And Taking light diesel adapted to ambient temperature as fuel these heaters start up and work normally in ambient with temperature of above -40°C. They absorb fresh air under ambient temperature and heat it using heat generated from fired fuel and then blow it to where warmth in need.

These heaters are compact in structure, light in weight, high in heat efficiency, economic in fuel and electricity consumption, and convenient in installation. They are used in heavy truck, minibus, engineering vehicle and vehicle for special purpose working, for warmth of the cabin, heating the engine and defrosting of the front glass.

II. Technical Parameters

Type flow	Rated Heat (kw)	Working voltage motor (DC.V)	Rated power of Ption (w)	Fuel consum (L/h)	Flow of Hot air (m ³ /h)	Mass of heater (kg)	Dimension (L × W × H) (mm)
FJH-5B/1(2)	5	12/24	50	0.58	340	6	451 × 169 × 199
FJH-3B/1(2)	3	12/24	50	0.36	200	6	451 × 169 × 199

FJH-5B and FJH-3B are completely the same in structure and the only difference of them lies in control program and parameters.

Therefore following information related to structural drawing including wiring diagram is presented only based on sample of FJH-5B.

III. Structure and working philosophy (see attached drawing)

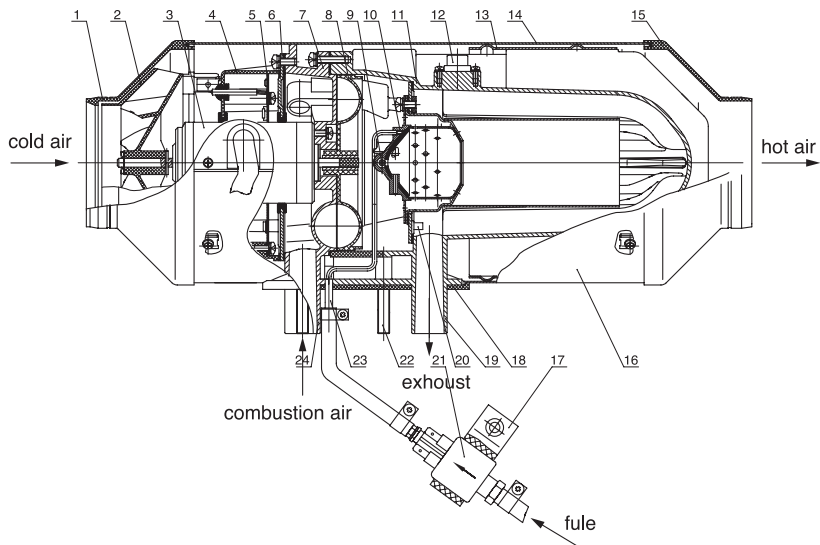
(1). Structure

1. Rotating part: At the centre of the heater is a fixed DC motor with one end a combustion air fan fitted on and the other end a fresh air fan fitted on.

2. Fuel supply system: Fuel is drawn from the fuel tank by solenoid pump and sent to flame chamber through fuel hose.

3. Heat exchange system: A heat exchange solution composed of heat exchanger, top case and bottom case, and air inlet and outlet.

4. Electrical control system : Composed of glow plug, overheat cutoff, igniting sensor, control unit, switch panel, etc.



Structure of FJH-5B/1(2) air heater

- | | | |
|---------------------------|-----------------------------|-------------------------|
| 1. Front Cover | 2. Heating fan | 3. Fan motor |
| 4. Control Unit Box | 5. Control Unit | 6. Air-in cover |
| 7. Middle part | 8. Combustion Fan | 9. Glow plug |
| 10. Flame Chamber | 11. Heat Exchanger | 12. Overheat Cutoff |
| 13. Heat insulation piece | 14. Top case | 15. Back cover |
| 16. Bottom Case | 17. Clamp of solenoid valve | 18. Damping pad |
| 19. Exhaust hose | 20. Igniting sensor | 21. Solenoid pump |
| 22. Bolt | 23. Fuel intake | 24. Combustion air pass |

(2) Working philllosophy

After the heater turn on, solenoid pump works to supply fuel which later is vaporized in flame chamber. Then the vaporized fuel mixed with combustion air is fired by the working glow plug. The combustion air taken from outside of the bus is supplied through combustion air pass under working of combustion fan(For FJH-5B/1(2) with combustion air regulator ,volume of air-in can be adjusted as per quality of fuel, burning efficiency and exhaust standard to realize optimum combustion results).And the fired gas passes through heat exchanger and is discharged through exhaust hose to outside of the bus while the cold air taken in under suction of heating fan is heated passing around the heat exchanger and sent to through air-outlet where warmth in need.

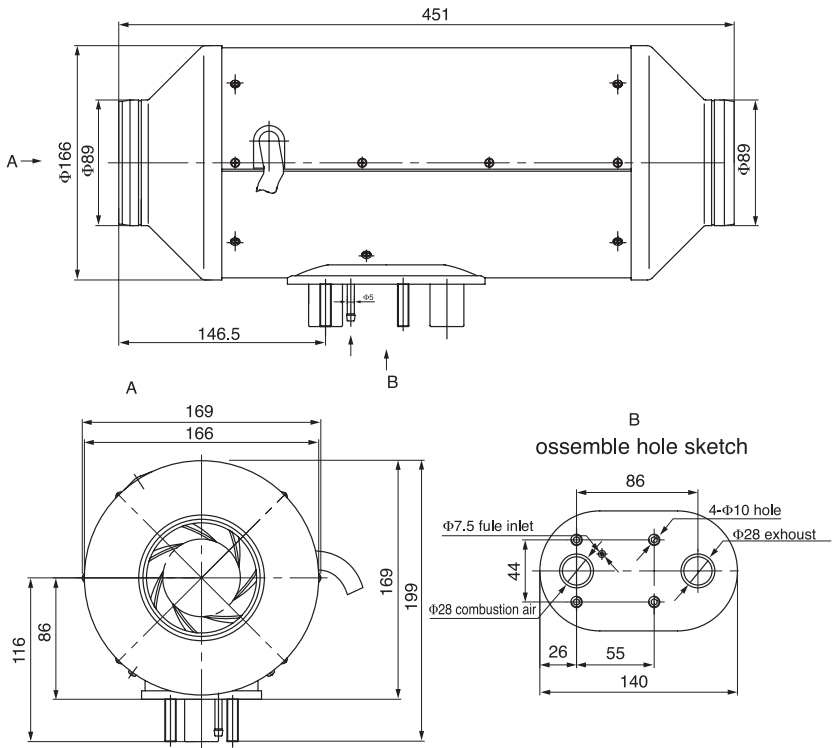
IV . Instructions on Installation and Operation

一 . This heater can be used in following working conditions:

- (1).Ambient temperature-40°C — +40°C .
- (2).Altitude \leq 3000m .
- (3). Fuel for this heater must be light diesel of suitable quality.
(To be advised ; Gasoline is not allowed for this heater)

二 . Installation of heater ;

Outline and dimension of this heater:



Dimension and Installation of Air heater FJH-5B/1(2)

Installation Requirement:

This heater shall be installed and fixed well by bolt on to floor of vehicles horizontally and be protected by seal. This heater is not allowed to install in closed space. Hoses for air-intake/outlet, combustion air intake and exhaust discharge shall be fit in accordance with instruction of this manual and any special requirement should be submitted to advice of our company.

This heater is not allowed to be used in places where stocks are flammable or dirt and soot are rampant (e.g. places with stock of fuel, coal, wood, grain and the like.).This heater can not be used in closed area such as garage because toxic gas released from working heater can poison people.

Before fuel refilling heater must be turned off.

Key points of installation:

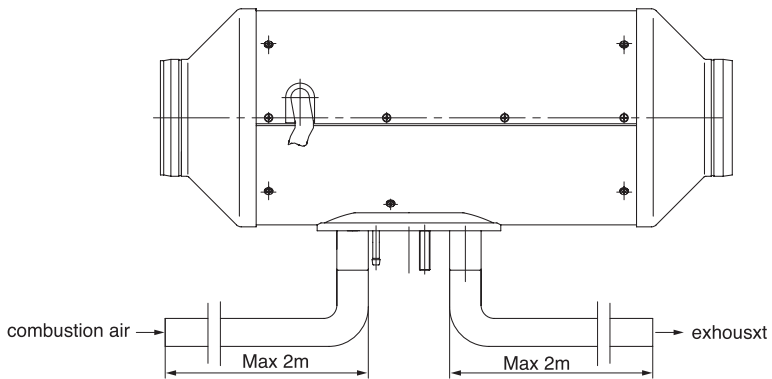
- Installation must be carried out in accordance with instruction of installation manual because strong heat and toxic gas shall be generated and released during working of each heater
 - Fuel hose and exhaust hose shall be well fixed to prevent damage caused by vibration (Fix the hose in every 50cm length). Hot air outlet must not face parts sensitive to temperature, people and soft objects.
 - If there is no air intake pipe a protection grid shall be fitted on the air intake to protect motor.
 - Heater shall not be turned on until it is completely installed and heater case must not be opened during operation.
 - Heater is designed for vehicle and is not suitable for constant heat supply of areas such as bedroom. Space for installation of heater should be big enough and no other articles stored in.
 - Heater should be apart far from fuel tank, sprayer, gas tank, extinguisher and mop.
 - Protection grid on air intake should be checked regularly ,and before use in working season it is necessary to have a clean.
 - Damaged fuse can only be replaced by specified one.

- Before use in working season heater should have a test running, and it should be turned off as soon as constant black smoke, abnormal burning sound or sore fuel smell found during running. Then a trouble shooting shall be carried out after the fuse removed. The heater can not be turned on until it is checked and repaired by specialists who get through training of the manufacturer.

- Heater installation should be arranged in such a way that exhaust from engine or heater will not be drawn into the air-intake of heater, to prevent heating air from contamination.

- It should be guaranteed that during working of heater hot air from outlet will not be directly drawn into air intake, to prevent short circulation.

Circulation of combustion air and discharge of exhaust gas: (Take heater FJH-5B/1(2) as sample , see sketch below)



- Installation shall guarantee that combustion air pass and exhaust outlet will not be jammed by snow or dirt and water conserved can drain.

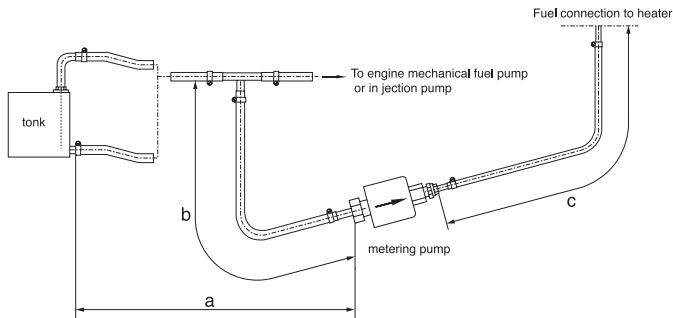
- Exhaust can only be discharged outside of vehicle(cabin) and exhaust traveling passage should be well sealed to prevent exhaust from getting into air intake and combustion air pass. Exhaust outlet should point at side direction or back direction against the vehicle.

- No flammable articles are allowed around exhaust outlet and hot air outlet. And surface of heater should be clean and free from dirt and grease.

- Intake of combustion air should not be fit in the direction of vehicle traveling.
- Combustion air must be taken from outside of the vehicle to guarantee safety of passengers.

Fuel supply: arrange of fuel supply line shall be carried out as per following requirement:

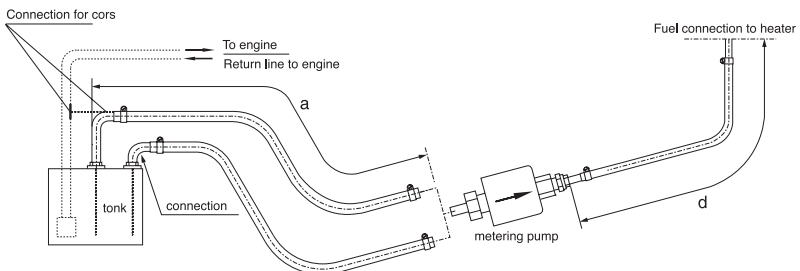
1. As for engine with mechanical pump fuel to the heater shall be taken from line of fuel supply to the engine (See attached sketch).



Dimension: a = (Max) 2m b = (Max) 300mm c = (Max) 4m

Precondition: Line of fuel supply from fuel tank to the engine must be well sealed.

2.As for truck with diesel engine following method can be adopted:(See sketch below)



Dimension: a = (Max) 5m d = (Max) 6m

3. If an independent fuel tank is equipped for heater use fuel should be taken directly from the fuel tank.

4. Fitting of solenoid pump: (See sketch on right)

Fuel pressure from fuel tank to solenoid valve:

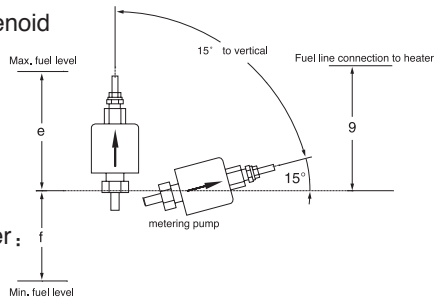
e (max) 400mm .

Suction force of the pump:

f (max) 400mm .

Lift force of solenoid pump to heater:

g (max) 2000mm .



Fuel line from solenoid pump to heater should go horizontally straight or slant upward but must not go with heave. And the solenoid pump should be fixed well.

5. Connections in fuel line should be strong and well sealed and fasteners shall be used to fix up fuel line against tremor to prevent short supply of fuel and abnormal burning.

≡ Electrical parts:

Electric wire and switch of heater should be guaranteed that heater installation on the vehicle does not influence their normal work.

Wire harness should be arranged far from heat resource of the vehicle and silicon sealant or other solutions should be applied to keep plugs and sockets good in connection and free from splash of muddy water.

Temperature sensor is fit inside of the vehicle connected to switch. And Settings between “open” and “close” could be controlled in accordance to temperature at the area where the sensor is placed, and the extent of switching.

Operation Instruction:

Description of start up:

Turn on: After put through of switch, heater turns on. And control unit works to check state of power supply voltage, glow plug, solenoid pump, motor, igniting sensor, etc. and warns through indicator light for any abnormal situation.

After 3seconds: Motor and solenoid pump start work.

After 10seconds; Motor works with low running, solenoid pump stops, and glow plug is put through. Then after 50 second preheating, motor and solenoid pump resume regular working, and heater starts ignition.

After a constant flame probed by the igniting sensor, glow plug breaks off, green indicator light works and heater starts regular heating.

After start up, heater should run with maximum heating capacity to realize regular working temperature of heat exchanger. And heating capacity of heater is depend on ambient temperature and setting temperature.

Automatic control in heating course:

Heater turn off automatically with motor still running when ambient temperature reaches level of setting temperature (10°C-40°C) , while heater will resume automatically with motor fast running when ambient temperature becomes lower than setting temperature.

Motor remains running before restart of heater and runs in a high speed after the heater resumes work.

After heater turns off, motor remains running until the heater cools down which lasts about 4- 5minuites and then green indicator light works.

Igniting sensor checks the flame and overheat cut off controls the temperature within limit, if any trouble found heater will turn off automatically.

1. When heater igniting fails after 90 seconds of fuel supply from solenoid pump, solenoid pump and motor stop working and resume to work after 20 seconds. When heater fails again after 90 seconds of fuel supply from solenoid pump, the heater restarts again. And when, once again, heater ignition fails after another 90 seconds of fuel supply from solenoid pump, green indicator light warns for trouble.

2. When flame extinguishes in the course of heating, heater reignites.

3. When heater runs under overheat, the overheat cut off works to stop fuel supply and heater turned off, green light indicator of switch flashes constantly. Heater shall restart after trouble shooting.

4. Heater shall stops for protection when voltage is lower than 10V / 19V, or higher than 15V /32V.

Notice: During welding operation in the vehicle, positive pole of power supply shall be broken off and ground wired to protect control unit. And before test of heater performance, the switch shall be opened to the greatest extend.

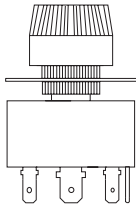
During moving of heater the air intake and air outlet shall be free from force.

Function of Switch board :

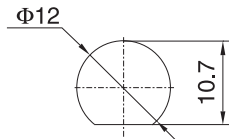
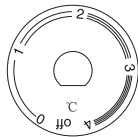
Switch board works to turn off/on the heater, set temperature in the area where temperature sensor is placed, and show working state of the heater.

Regular work of heater- green indicator light works constantly ;

Overheat or trouble warning-repetition of flashes (see table below).

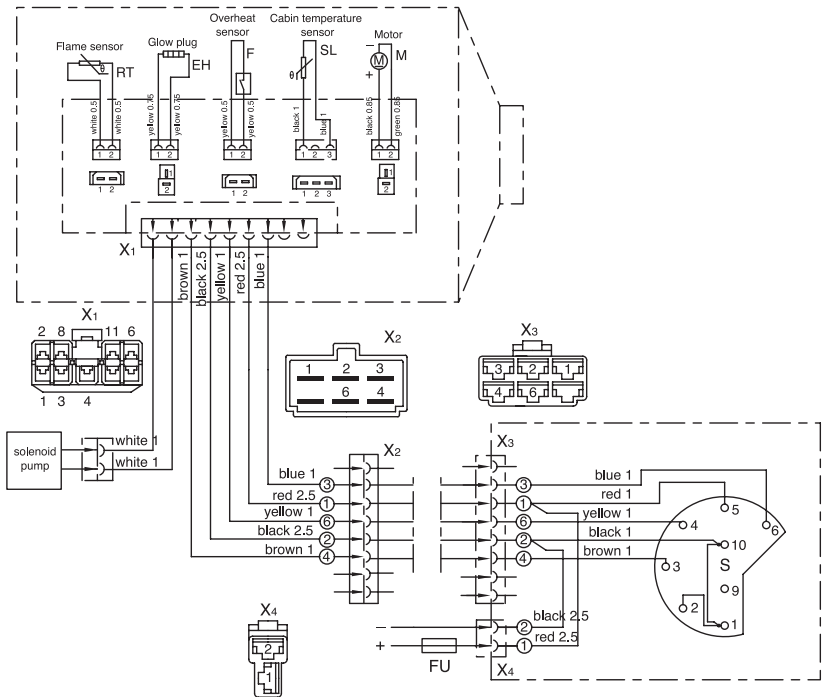


Outline of switch



Dimension of switch hole

Wiring diagram



Wiring diagram of Heater FJH-5B

Description on wiring diagram of Automatic control heater

Symbol	Name	Type	Quantity	Remarks
S	Potentiometer	KW-1.0	1	With indicator light
EH	Glow plug		1	
YP	Solenoid Pump		1	
M	Motor		1	
RT1	Igniting Sensor		1	PT1000
RT2	Temperature Sensor		1	RT103
F	Overheat Cutoff		1	
FU	Fuse		1	

V.Trouble Shooting

This heater controlled by an independent switch and protected by a suitable fuse uses power supply of the vehicle and its case must be ground wired.

Before turning on of the heater a close check should be made that whether connection of wiring is good, fuel is enough, and whether the hose line is jammed or leaking. If it is possible turn the heating fan by hand to check whether it is blocked.

Before long time free of heater, its air intake/outlet, combustion air pass and exhaust outlet shall be closed over against dirt which affects next use of heater.

In case of Operation in area of thin air or operation with black smoke from exhaust outlet, loose the bolt on regulating valve of combustion air and adjust the valve counterclockwise.

Indicator light flash code for FJH-5B heaters

Short flash of light: 0.2s Spacing: Short flash: 0.2s

Long flash of light: 0.5s Spacing: Long flash: 0.5s

F01	Ignite failure. 1 long - 5 short ----- — -----
F02	Flame loss (5 times), 2 long - 5 short ----- — — -----
F03	Under voltage or over voltage of power, 3 long - 5 short ----- — — — -----
F05	Ignition sensor open circuit, 5 long - 5 short ----- — — — — -----
F07	Solenoid valve open circuit or short circuit, 7 long - 5 short ----- — — — — — -----
F08	Motor open circuit or short circuit, 8 long - 5 short ----- — — — — — — -----
F10	Overheating sensor open circuit or short circuit, 10 long - 5 short ----- — — — — — — — -----
F11	Ignition spark generator open circuit or short circuit, 11 long - 5 short ----- — — — — — — — — -----
F12	Flame not extinguished during delayed shutoff, 12 long - 5 short ----- — — — — — — — — — -----