OPERATION MANUAL

OPERATION MANUAL — MIKUNI MY16 HEATER

OPERATION MANUAL

MIKUNI

MIKUNI HEATER

MY 16

MIKUNI CORPORATION

MIKUNI HEATER MY 16 OPERATION MANUAL

Order Number OPM-0052 (CTH)

Second Edition (April 1991)

MIKUNI CORPORATION

UENO FUJIBLDG. 16-5, UENO 3-CHOME, TAITO-KU
TOKYO, 110 JAPAN.
PHONE: +81 (3) 3833-2738
FACSIMILE: +81 (3) 3834-3977

PREFACE

Thank you very much for purchasing the MIKUNI Heater.

The MIKUNI Heater can be used as an auxiliary heat source for construction machines and small-sized vehicles like vans and passenger cars, thereby providing its excellent effectiveness in energy-saving and comfortable cab-heating.

This Operation Manual is published as reference both for persons carrying out operation and maintenance of the Heater for the first time and for those who are familiar with these procedures but still require access to reference material. Carefully read this Manual before commencing any work on the Heater, and keep it handy.

Most accidents associated with the operation of the Heater are caused by disregarding basic safety rules or warnings. Such accidents can, in most cases, be prevented by being aware of dangerous conditions.

Before attempting to operate the Heater, be sure to thoroughly read this Manual with your most careful attention paid to the "CAUTION" and "WARNING."

Basic matters of caution regarding safety are described as "WARNING" in various parts of this manual. By neglecting these "WARNINGS," specific accidents may occur resulting in bodily injury to yourself and possibly to other persons.

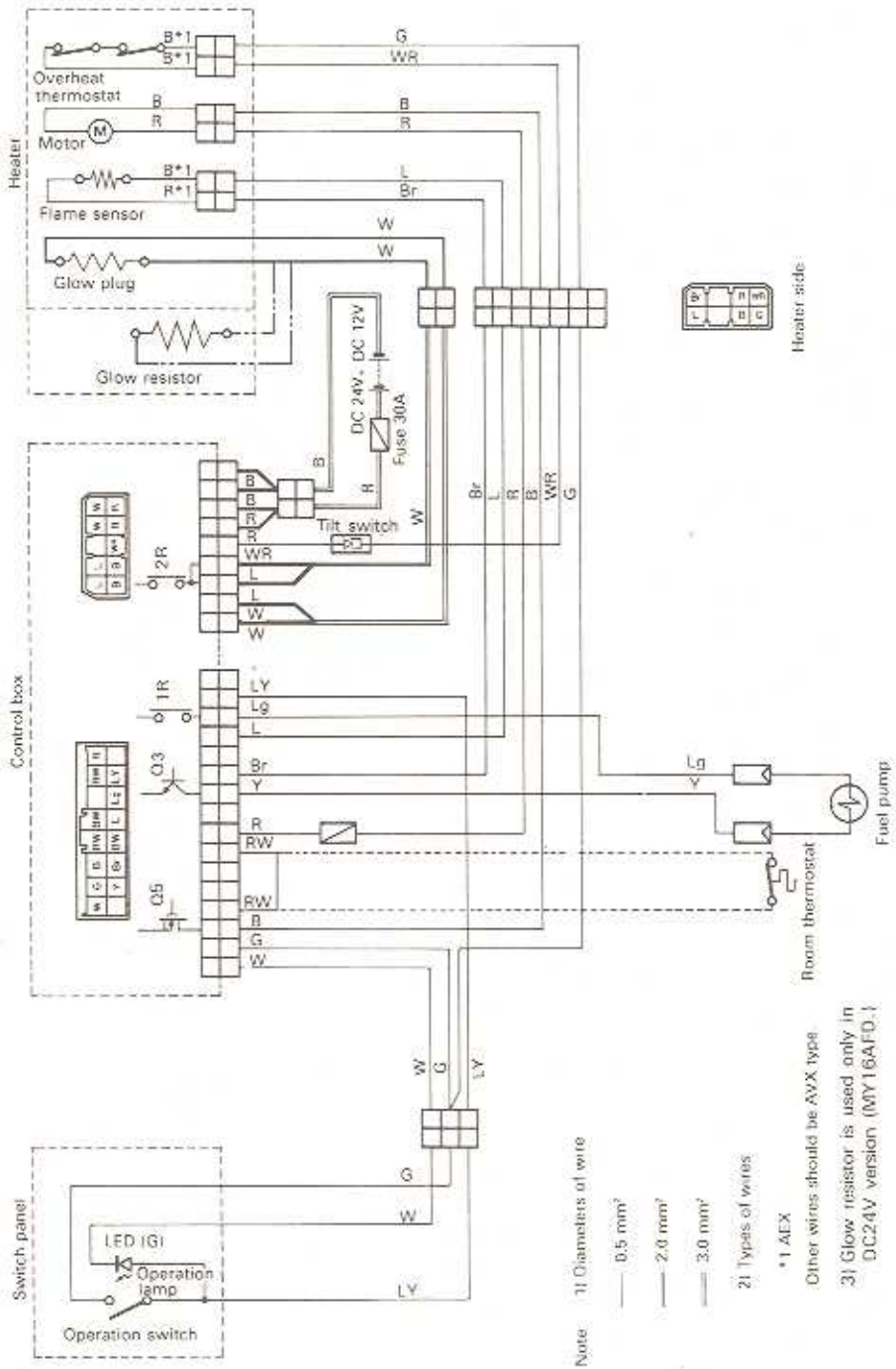
Any actions which may cause damage to machines are indicated as "CAUTION" in this Manual.

MIKUNI cannot predict every potentially dengerous situation. Therefore, "WARNINGS" contained in this Manual do not cover all conceivable situations. Any person using the procedures, tools, operational methods or control techniques that are not recommended by MIKUNI must take full responsibility for safety.

In addition, any non-recommended procedures which may be adopted must be such as will not damage the Heater or cause danger.

Furthermore, certain pictures used in this Manual may be different in detail from the actual Heater you are using. As a result of

12. WIRING DIAGRAM



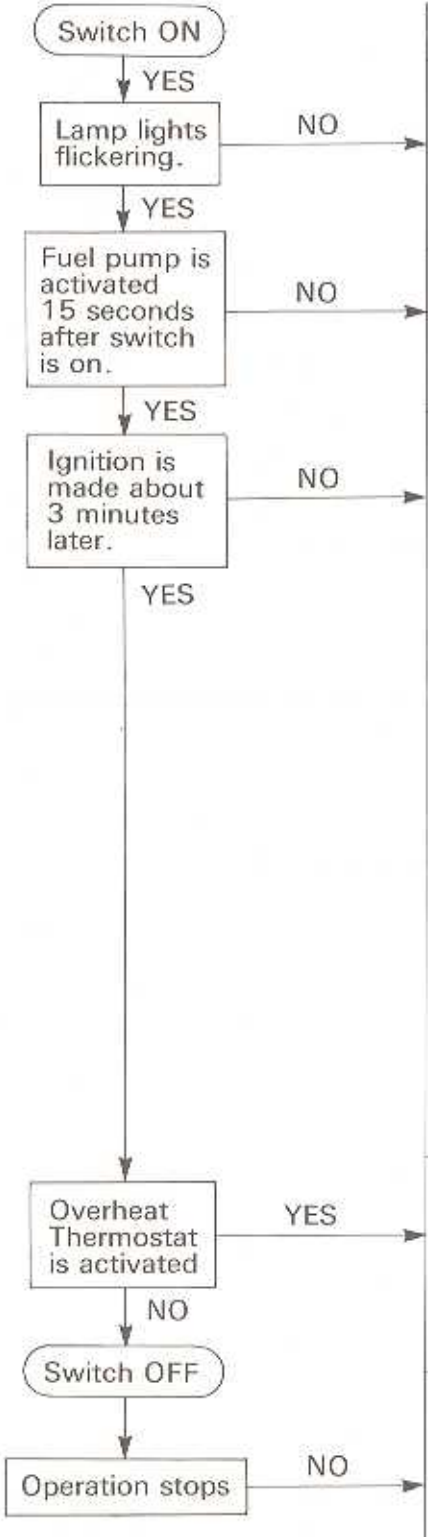
continual improvements in product design, your particular machine may have been altered. Such alterations are sometimes not shown in this Manual.

If you have any question about the Heater or this Manual, consult a local MIKUNI dealer.

⚠ WARNING:

* MIKUNI is not responsible and will not be held liable for any damage or accident caused by installing or using the Heater in such a manner as is not instructed or suggested in this Manual.
* Installation of the Heater should be performed only by an authorized MIKUNI service technician.
* To prevent serious accidents such as exhaust gas poisoning, be extremely careful not to allow exhaust gas to enter the vehicle.
* Do not operate the Heater in a garage or any other closed space.
* Except when testing the Heater operation, be sure to disconnect the battery during the maintenance work.
* When operating the Heater, ensure no flammable material is near the Heater. In particular, any flammable material near the exhaust outlet can immediately begin to burn, possibly leading to a fire. Use extreme caution.
* Be sure to stop the Heater operation when filling fuel.
* Do not attempt to carry out difficult maintenance works not mentioned in this manual to protect yourself from unexpected accidents. Whenever you feel the maintenance is too difficult, ask an authorized MIKUNI dealer to carry it out.

11. TROUBLESHOOTING



	Cause	Remedy
1	Connectors out of place	Secure connection
2	Fuse blown	Replace fuse
3	Switch failure	Replace Switch assy (# 056543)
1	Connectors out of place	Secure connection
2	Fuel pump failure	Replace fuel pump
3	Control unit failure	Replace control unit
1	Short of fuel	Fill fuel
2	Fuel pump malfunctioning	Replace fuel pump
3	Fuel filter clogged	Replace fuel filter
4	Wiring disconnected	Secure connection
5	Combustion air inlet blocked	Clean air inlet
6	Exhaust pipe blocked	Clean exhaust pipe
7	Battery voltage low	Charge battery (Min. 21V for 24V, min. 10.5V for 12V at controller terminal)
8	Battery voltage high	Adjust vehicle regulator
9	Ambient temperature too low	Operate the Heater at -40° C(-40° F) or higher
10	Fuel frozen	Replace the fuel with fuel of suitable grade
11	Water in fuel frozen	Replace the fuel. Clean fuel tank.
1	Inlet air temperature too high	Stop heater. Do not operate heater when it is warm.
2	Piping blocked	Correct or clean the piping.
3	Overheat thermostat failure	Replace the thermostat
1	Switch failure	Replace Switch assy.
2	Fuel is not shut off due to fuel pump failure	Replace fuel pump
3	Control unit failure	Replace control unit

This phenomenon occurs particularly early in units with low fuel consumption such as the Heater, and develops comparatively later on the main engine where fuel consumption is higher.
(It may sometimes occur that the same fuel will start the main engine, but not the heater.)

⚠ WARNING:
As a safety precaution, turn OFF Heater operation when fuel is added to the tank.

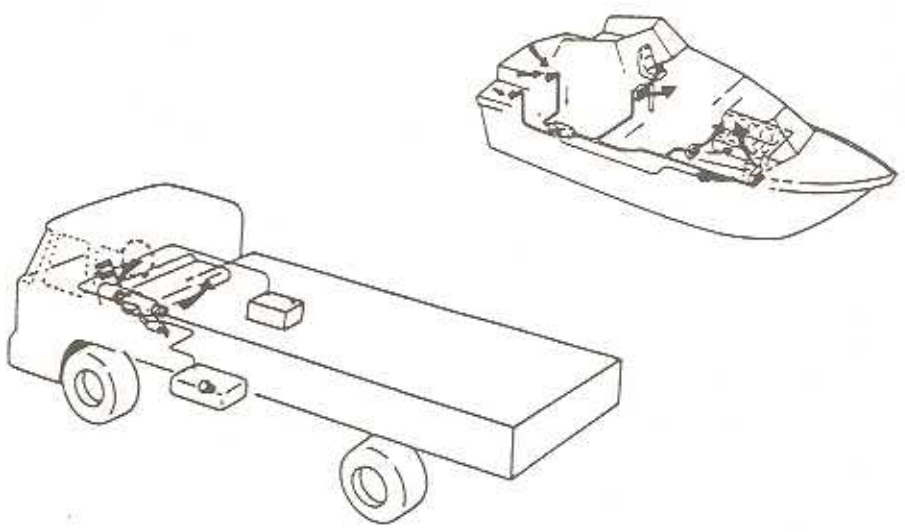
MIKUNI MY16 Heater is equipped with the self-diagnosis lamp inside the control box to make it easy to determine the part in failure. If the Heater does not work properly, open the control box and you will find a red LED on the circuit board at the center. If the LED is lighting on and off, it shows that some part of the Heater is faulty. Count the frequency of the LED lighting ON and OFF, and refer it to the table presented below to check where the failure is. When you contact the authorized MIKUNI dealer on the Heater failure, give them the frequency of the LED. This will greatly speed up the solution to the problem.
Do not fail to set the heater switch to the OFF position before opening the control box. Doing this with the switch ON can cause you an electric shock and do some damage to the Heater.

ON / OFF Freq.	Cause
1	Ignition failure
2	Flame sensor burnt out, false flame
5	Motor burnt out
6	Fuel pump burnt out
7	Glow plug burnt out or short
8	Battery voltage abnormal
9	Overheating, heater overturned

CONTENTS

1. OUTSTANDING FEATURES OF MIKUNI MY16 HEATER

* Constructed mainly of aluminium, it has been designed into a compact and lightweight apparatus.
* Operation and control are made easy by the use of a simple automatic operation system, thereby providing an economical cab heating system.
* Through the use of the optional room thermostat, the interior of the cab can be constantly maintained at a comfortable temperature.
* Two automatic shut-off safety devices, one for ignition failure and the other to prevent overheating, are provided to ensure its safe use at all times.
* The combustion chamber is completely sealed to prevent the entry of combustion gas into the heating air, thereby ensuring safe, clean cab heating.
* To maintain stable combustion, abnormal-voltage protective device is installed which automatically shuts off operation of the Heater when the voltage drops below the specified level.



* Check that all duct pipes are not collapsed or clogged.

d. Check that the battery is charged enough to operate the Heater.

e. Start the Heater and check all functions, then leave it running for approx. one hour, adjusting where necessary, and check for leaks.

f. The Heater should be subjected to periodical operation once a month for about 5 minutes during the off season.

[3] Overhauling

Overhaul the Heater every two years after it is delivered to you. Be sure to ask a MIKUNI authorized dealer for overhauling the Heater. Use MIKUNI genuine parts when replacement is needed.

Overhauling key points:

* Replace the fuel filter and the filter in the fuel pump.
* Remove carbon deposit on the combustion chamber, heat exchanger and glow plug.
* Listen to the motor and fuel pump for abnormal noise, and replace them if necessary.

10. FUEL

Use diesel fuel. Never use gasoline or heavy oil A or a mixture of both. It not only presents a safety hazard, but also leads to damage of the Heater.

CAUTION:

Do not mix anti-freeze agent with the fuel. Hazardous, incomplete combustion may occur.

When diesel fuel is used as fuel for the Heater, make sure the grade and condition of the diesel fuel is checked when travelling from a flat area to a mountainous one or from a warm region to a cold one. For instance, if standard diesel fuel is used at an outdoor temperature of 0° C (32° F) or below, paraffin will be extracted from the diesel fuel before the latter freezes, and the paraffin will clog the filter to cause faulty combustion.

When the Heater is stopped due to overheating, first remove the cause of the overheating. Then set the switch to the "ON" position again.

After this switch resetting, if heater will not operate normally, check another overheat thermostat by the following method:

Remove the hot air duct from the hot air outlet and depress the reset button at the top of the overheat thermostat located in teh hot air outlet.

[2] Periodic checking (Once a year)

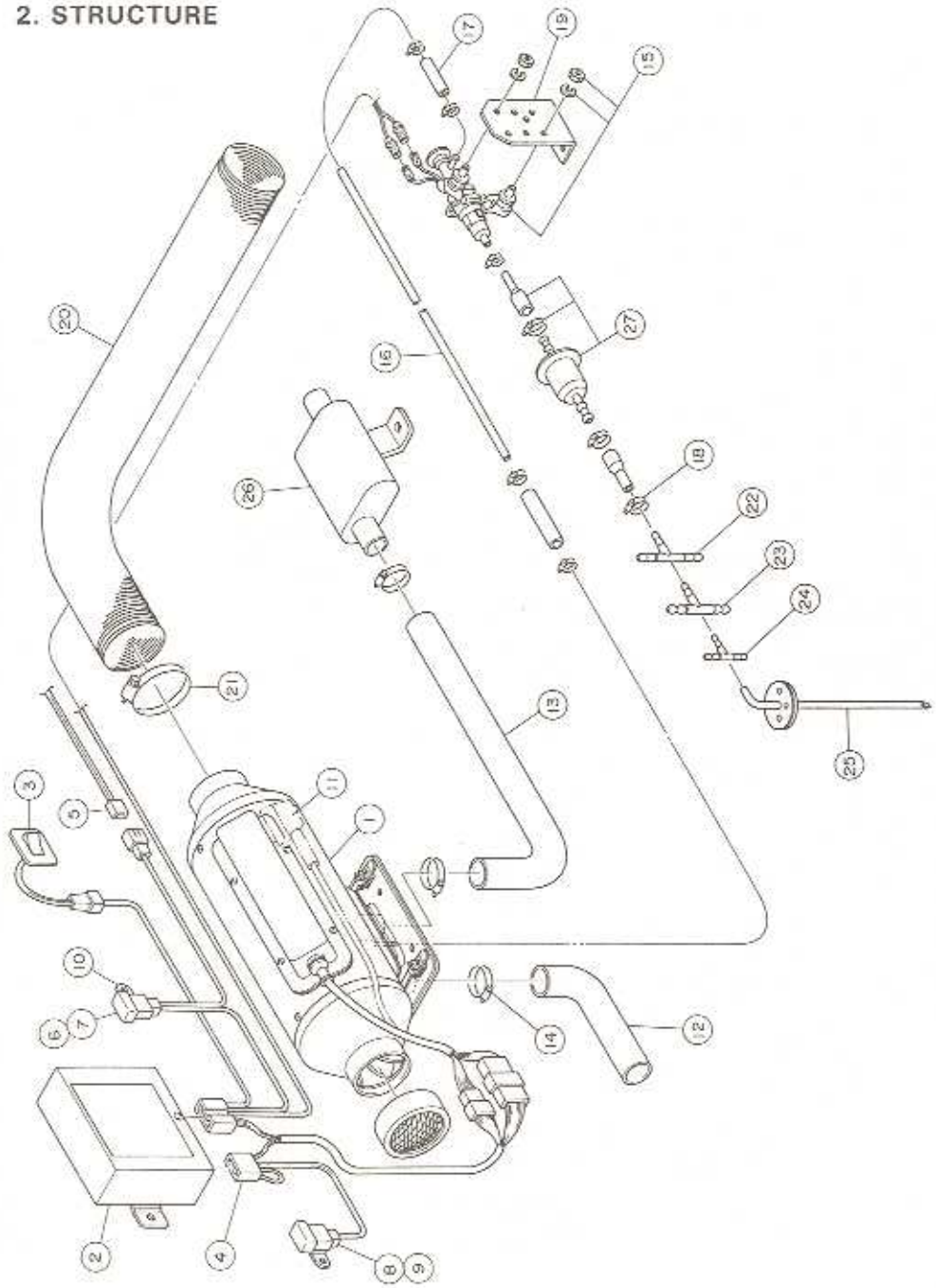
a. Replace the fuel filter element with a new one before every winter season. Normally, the filter is replaced once a year, but it should be replaced whenever it is clogged or when water gets into it.

b. Make sure that fuel hose joint is securely connected at all times and check routinely for leaks. If fuel leakage is left unattended, the fuel which has leaked out may ignite and cause a very hazardous situation.

c. Check the following points:
(Clean, adjust or replace the parts securely after checking, whenever necessary.)

* Check that no carbon has deposited on the glow plug and that no damage has been caused to the glow plug due to burning.
* Check that no carbon has deposited on the glow plug boss and that no damage has been caused to the metallic mesh due to burning.
* Check that the heat exchanger is not damaged and that no carbon or other deposits have formed.
* Check that the Heater body and the air and fuel pipes are securely fixed.
* Check that all electrical wires are correctly connected to the Heater and that terminals are not corroded.
* Check that all safety devices for the Heater operate properly.
* Check that the heater exhaust system is not clogged and that the exhaust pipe is not in contact with other parts of the vehicle.
* Check that sufficient combustion air is supplied.

2. STRUCTURE



ACCESSORY PARTS LIST (standard model)

		Voltage	12V	24V	Remarks
		Heater Kit Ass'y	MY16CFD2-03	MY16AFD2-03	
Main Unit	1	Heater Ass'y	MY16CFD-2	MY16AFD-2	
Electrical Equipment	2	Control Box	057 457A	057 458A	
	3	Switch Panel	056 543	〃	
	4	Cable Ass'y	063 896	〃	
	5	Cable Ass'y	063 898	〃	
	6	Fuse Holder	065 101	〃	
	7	Fuse	065 102	〃	30A
	8	Fuse Holder	065 116	065 108	
	9	Fuse	065 111	065 115	5A
	10	Bracket	065 087	〃	
	11	Glow Resistor	——	060 197	Built in the Heater Unit
Combustion Air System	12	Inlet Pipe	005 182	〃	Stainless Steel Flex Tube φ22×200mm
Exhaust System	13	Exhaust Pipe	005 179	〃	Stainless Steel Flex Tube φ22×1000mm
	14	Clamp	007 272	〃	
Fuel System	15	Fuel Pump	503 247	503 248	
	16	Fuel Pipe	016 267	〃	ℓ=6000mm
	17	Connection Pipe	016 188	〃	
	18	Band	BDG-8	〃	
	19	Bracket	510 600	〃	
Optional Parts	20	Hot Air Duct	005 183	〃	φ55×1000mm
	21	Clamp	007 015	〃	
	22	T-joint	020 333A	〃	φ8×φ8×φ6
	23	T-joint	020 334A	〃	φ10×φ10×φ6
	24	T-joint	020 339	〃	φ6×φ6×φ6
	25	Fuel Pipe	501 696A	〃	for Fuel Tank ℓ=350mm
	26	Muffler	548 050	〃	
	27	Fuel Filter Kit	990 685	〃	

[1] Routine inspection

CHECKING AND CLEANING GLOW PLUG

Remove and check the glow plug. If carbon has deposited on the heat coil, clean it off taking care not to damage the coil. Since the glow plug is a consumable part, it should be replaced as soon as its coil is found deformed or thinned from burning. For replacement, always use the MIKUNI genuine part (Glow plug #061121).

CHECKING AND CLEANING GLOW PLUG BOSS

Be sure to check and clean the glow plug boss along with the glow plug. If carbon has deposited on the glow plug boss, insufficient fuel evaporation will result, liable to cause incomplete combustion. Clean the boss carefully with a brush and compressed air.

CAUTION:

If the metallic mesh in the boss is burnt, the boss must be replaced immediately since this defect may cause incomplete combustion. Do not attempt to use it again.

CHECKING FUEL FILTER

Be sure to replace the fuel filter at least once a year before the winter season. If the filter element is found dark in color, the filter must be replaced immediately.

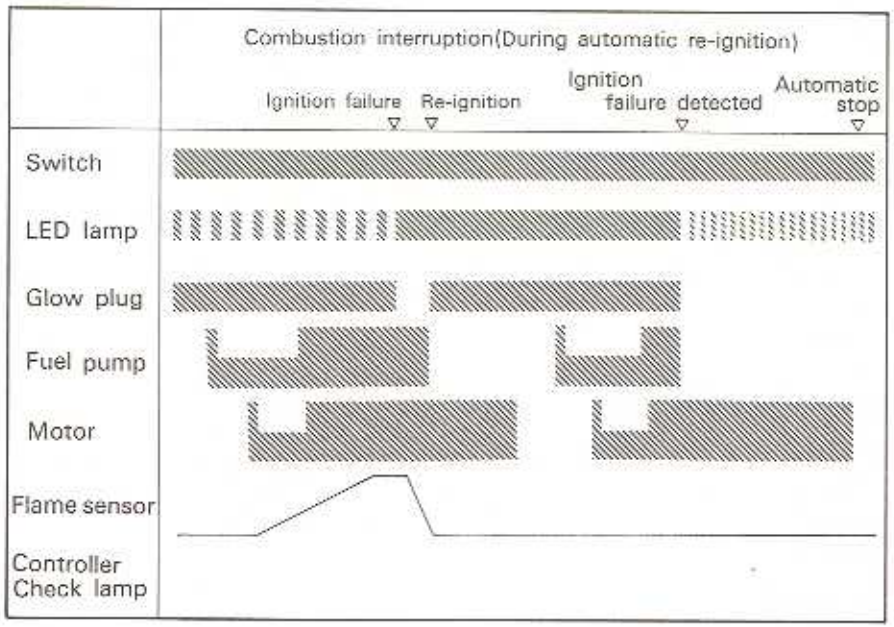
CAUTION:

When a fuel tank is used for both Diesel engine and the Heater, the returned fuel from the injection pump of the engine can be contaminated, and the fuel filter will be clogged earlier than usual. It is necessary, therefore, to replace the fuel filter more often.

CHECKING WHEN THERMOSTAT IS ACTIVATED BY OVERHEATING

The MIKUNI MY16 Heater has two overheat thermostats as s dual system. Any one of these safety devices is actuated to stop fuel supply, perform after purging and automatic stop the Heater. One is located on the heat exchanger, the other is in the hot air outlet.

Note that the two overheat thermostats are equipped serially in electric circuit, therefore any one of them which detects overheating earlier actuates to stop the Heater.



9. MAINTENANCE

Since the system is operated for lengthy periods throughout the winter season, and is installed under the vehicle floor where corrosion may occur, its conditions of use are quite severe.

In order for this Heater to perform safely and at full capacity at all times, routine and periodical inspections as well as maintenance of various parts are therefore indispensable.

The following indicates the necessary inspection standard for the Heater, its various parts requiring maintenance, and a basic guide as to when to carry out checking and maintenance. Be sure they are carried out.

The inspection standard mentioned below should not be considered all-inclusive. It covers the standard for use in climatically and geographically normal conditions where the maximum annual operation of heaters is estimated at 1,000 hours. If the Heater is used in more severe conditions, i.e. for more hours or at higher altitude (over 1,500 m), then the checks and maintenance should be more frequent and elaborate.

3. SPECIFICATIONS

Specifications \ Model		MY16AFD-2	MY16CFD-2
Heat output	kcal/h (kw/h)	1,600 (1.9)	
Air flow	m^3/h	60	
Rated voltage	D.C.V	24	12
Operating voltage	D.C.V	21~28	10.5~14
Current consumption	A	1.7	3.4
Fuel		Diesel fuel	
Fuel consumption	ℓ/h Gallon/h	0.22 0.06	
Permissible ambient temperature	°C °F	−40~ +40 −40~+104	
Permissible storage temperature	°C °F	−40~ +80 (Control box:−40~ +50) −40~+176 (Control box:−40~+122)	
CO_2 value in exhaust gas	Vol%	10~11.5	
Smoke value in exhaust gas	No.	Max:3	
Safety device		Automatic shut off at ignition failure, overheating, and low-voltage, high-voltage, glow plug burnout, fuel pump burnout motor burnout and flame sensor burnout	
Weight	kg	3.8	
Heater dimensions	mm	364×146×141	364×130×141

(The above specifications are subject to change without prior notice.)
(The above data, except where specially indicated, contains a ±10% tolerance)

4. BEFORE OPERATING THE HEATER

Before operating the heater, check the following:

* Is fuel sufficient? Isn't there any leak in the fuel line from the fuel tank and the Heater? Is it completely sealed?
* The filter elements in the fuel filter and the fuel-pump inlet. Aren't they fouled, or clogged with anything?
* Are the terminals and the connectors in the electrical wiring completely fixed?
* Aren't the inlet or discharge ports of the Heater clogged with cloth, paper, etc.?

Preparation is now complete. Operation can now begin according to the following operation and control procedures.

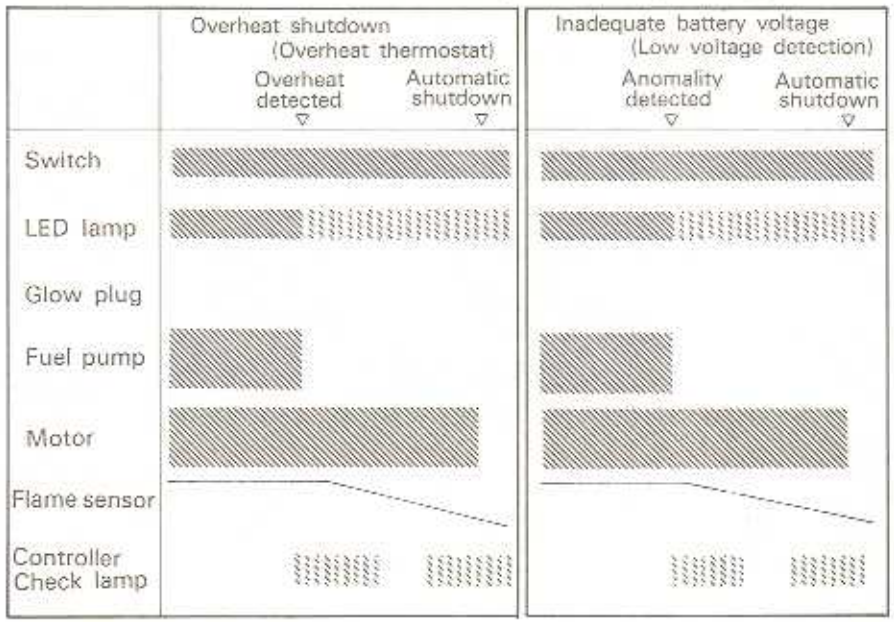
5. OPERATION PROCEDURES

Operation of the Heater is performed with the switch on the switch panel.

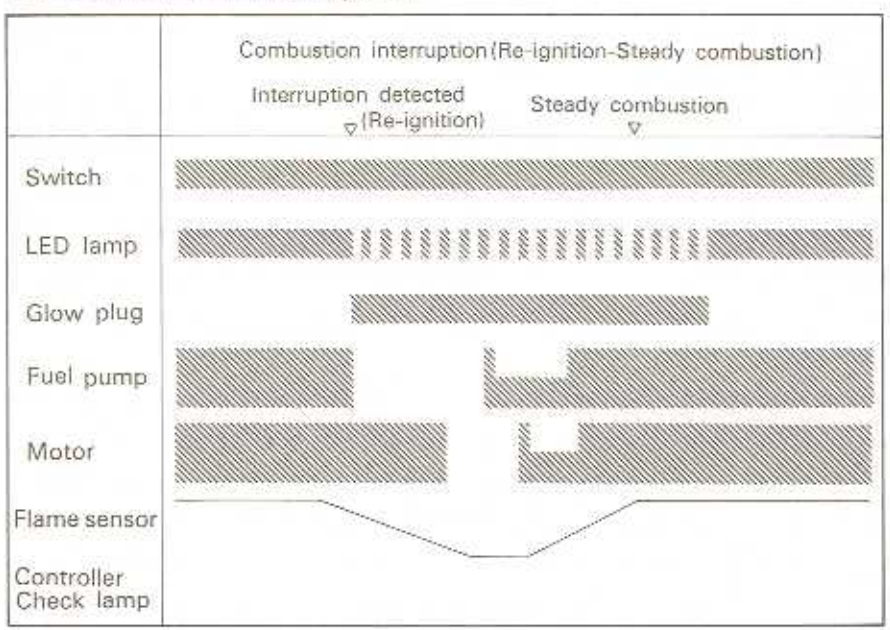
5-1 Starting up the Heater

Set the switch to the "ON" position, and the Heater will automatically ignite vaporized fuel and start combustion. When the switch is placed to the "ON" position, the lamp (green) inside the switch starts flickering indicating that the glow plug is being heated. About 30 seconds later, the motor begins operation and fuel and combustion air are fed to initiate combustion. About 2 minutes after that, the flame sensor senses the combustion flame and lights up the green lamp inside the switch. This time, the lamp stays lighting continuously to indicate that normal combustion has started.

8-3 Overheat shutdown (or Inadequate battery voltage)

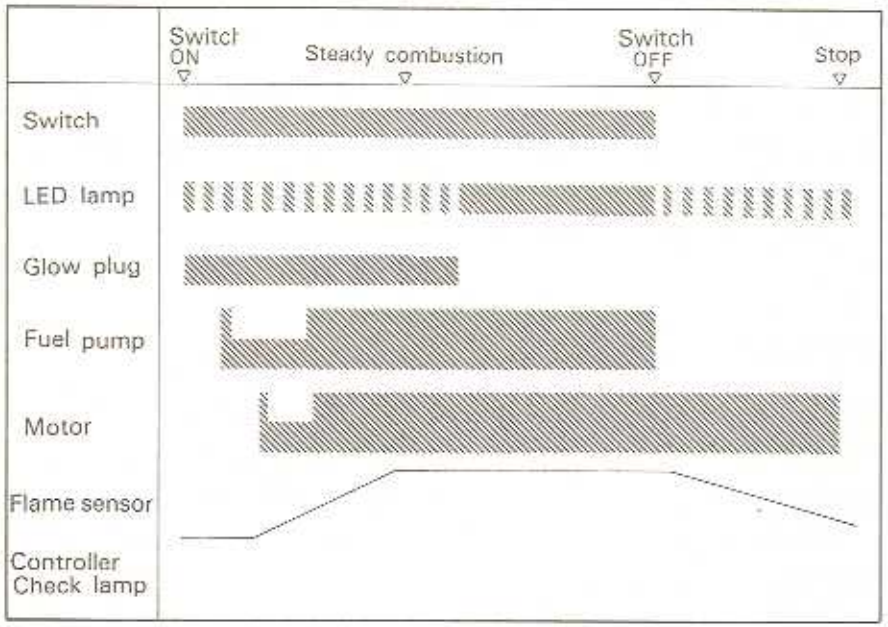


8-4 Combustion interruption

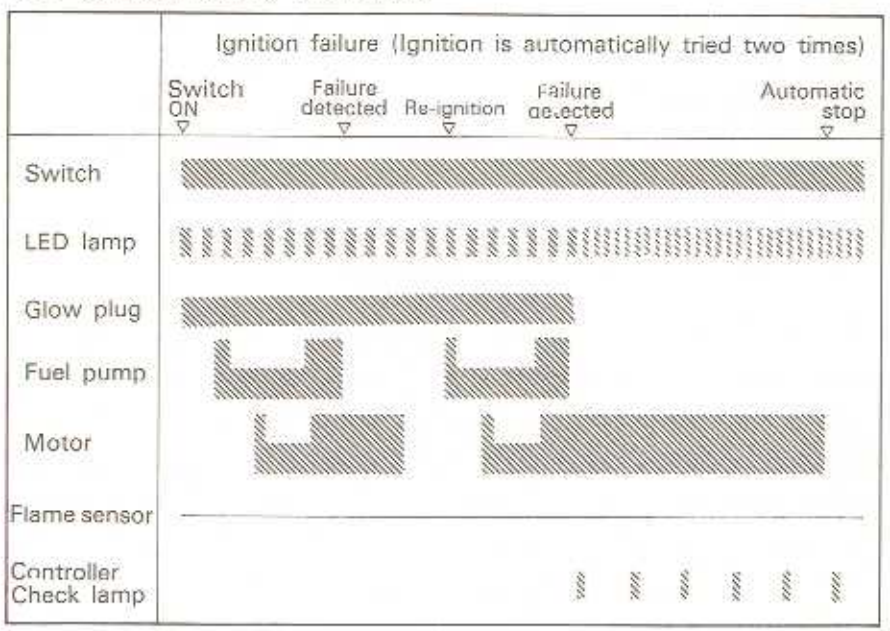


8. SWITCH OPERATION AND FUNCTIONS OF COMPONENTS

8-1 Operation (Startup to stop)



8-2 Ignition failure shutdown



CAUTION:

If the Heater does not establish the steady combustion within 3 minutes after the switch was set to the "ON" position, the lamp will start flickering and the Heater will automatically stop. In this case, place the switch to "OFF," then to "ON" again to resume the Heater operation. If the Heater should still fail to start the normal combustion after repeating this procedure twice, be sure to investigate the cause and correct the failure by referring to "11. Troubleshooting." Repeating the OFF/ON procedure more than two times is very dangerous, because this can feed excessive fuel to the Heater.

5-2 Stopping the Heater operation

Set the switch to the "OFF" position, and the combustion will stop. When air inside the combustion chamber is thoroughly purged and the Heater is cooled down, the green lamp will go out and the Heater will automatically stop operation.

CAUTION:

To stop the Heater operation, be sure to set the heater switch to "OFF." Do not shut off the main power (battery switch). This will also stop the post-purging and cooling operation and result in the overheating and carbon build-up, thus damaging the Heater or leading to the future operational failure.

⚠ WARNING:

If you turn OFF the key switch while the Heater is still in operation, not only will the life of the Heater be considerably shortened, but the Heater itself will overheat, thereby bringing about potentially dangerous situations such as fire or burns.

5-3 When overheating occurs

If the Heater overheats during operation for whatever reason, the overheat thermostat will be actuated, and Heater operation will stop after post-purging 2 or 3 minutes. In such a case, return the switch to OFF, investigate the cause of overheating and take appropriate countermeasures. To restart the Heater, first check to see that the Heater has cooled down.

CAUTION:

(1)Never turn OFF the key switch (battery switch) while the Heater is operating or in the process of post-purging. If the engine needs to be stopped for refueling or parking the vehicle, make certain that the Heater motor has been stopped before turning OFF the key switch.

(2)Do not attempt to operate the Heater before fuel is primed up. Otherwise, the life of the fuel pump and glow plug will be considerably shortened. For quick priming, the use of MIKUNI SP-21 vacuum pump is recommended.

(3)White exhaust smoke may be emitted right after the ignition. This occurs because the combustion chamber is still cold.

(4)When carrying out electric welding on a vehicle fitted with the Heater, be sure to disconnect (+) and (−) battery cables. This precaution is aimed at protecting the control circuits of the Heater.

(5)Make certain that the temperature around the control unit does not exceed 40° C (104° F). This can occur when the vehicle is coated.

(6)Using the Heater with the engine stopped will exhaust the battery soon. It is recommended, therefore, that you run the engine while the Heater is operated. Check the battery periodically and charge it as and when necessary.

(7)Even in the off-season, operate the Heater at least once a month for about five minutes. Otherwise, the Heater may fail to be well-conditioned when it is necessary.

(8)If the vehicle has not been used for over three days, it is recommended to run the engine for more than 30 minutes to stabilize the battery condition. Be cautious of the battery voltage especially in the cold season.

6. SAFETY DEVICES

6-1 Ignition-failure Safety Device

When ignition failure is caused by the glow plug burnout or for whatever reason, this device works to stop fuel from accumulating in the combustion chamber. While this safety device is working, the lamp stays flickering quickly.

6-2 Overheating prevention Auto-shutoff Device

Overheating of the Heater body is caused mostly by the blockage of the hot air inlet or exhaust outlet and can damage cables and other parts.

This device prevents the overheating and the resultant failures. While this safety device is working, the lamp stays flickering quickly.

7. USE OF THE ROOM THERMOSTAT

The room thermostat is an optional accessory designed to keep the temperature inside the vehicle at a comfortable level. The room thermostat automatically switches on and off the heat output according to the preset temperature of the place where it is installed. When using the room thermostat, cut the jumper cable [RW] on the control box at the center. Then, extend the separated cables and connect them to each contact point of the room thermostat. The MY16 heater stays in operation while the contact point is closed.