

BN4 Heater with fuel metering pump (a gasoline hot air heater for universal installation)

Part No. 20 1462 - 12 volt
20 1463 - 24 volt

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TECHNICAL DESCRIPTION

The BN4 is a gasoline operated hot air heater with its own heat source. It can be operated independently of the vehicle engine.

TECHNICAL DATA

Heating capacity in BTU	4,000-16,000
Hours per gallon) U.S.	6-16.5
of Fuel) IMP.	7-18
Power consumption	50 Watt
Voltage	12/24 V

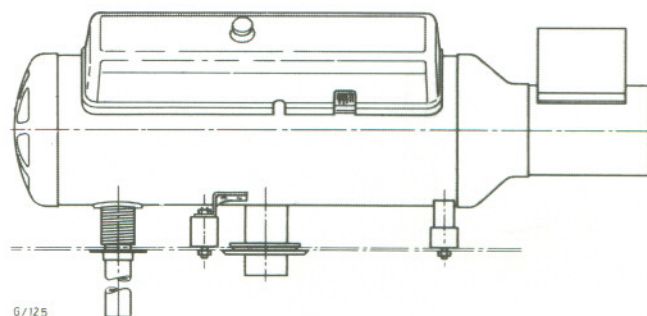
DESIGN AND OPERATION

A complete heating system comprises a basic unit and the additional parts for installation, air ducting, exhaust, fuel supply and controls. After switching on the heater with the push-pull switch (14a) a pilot light (14) lights up and the blower motor (1) receives current. The fresh air blower (25) supplies heating air and the impeller (22) combustion air.

The fuel metering pump (28) supplies fuel in accurately metered quantities to the combustion chamber (21). It is solenoid powered and controlled by the impulses of a circuit breaker in the blower motor. (reduction ratio 33:1).

The fuel forms an ignitable mixture together with the combustion air, is preheated by a glow-plug (5) and ignited by a spark plug. The ignition coil (6) provides the high voltage. It receives its impulses from a second circuit breaker (24) in the blower motor. (ratio 1:1). The combusted gases flow through the heat exchanger (19) and heat up the sensor of the thermoswitch (10), which switches off the glow plug and the resistor in the safety switch after about 45 sec. operation. The combustion process now continues on its own, assisted by the high voltage ignition.

The air supplied by the fresh air blower is heated at the heat exchanger and then routed to the passenger compartment, past the bi-metal coil of the regulating switch (12). Depending on the temperature of the hot air and position of the regulating knob (15) the bi-metal coil actuates the regulating switch which switches off the heater, when the required temperature is exceeded or switches it on again as soon as the hot air has cooled off below the set temperature. After each regulating



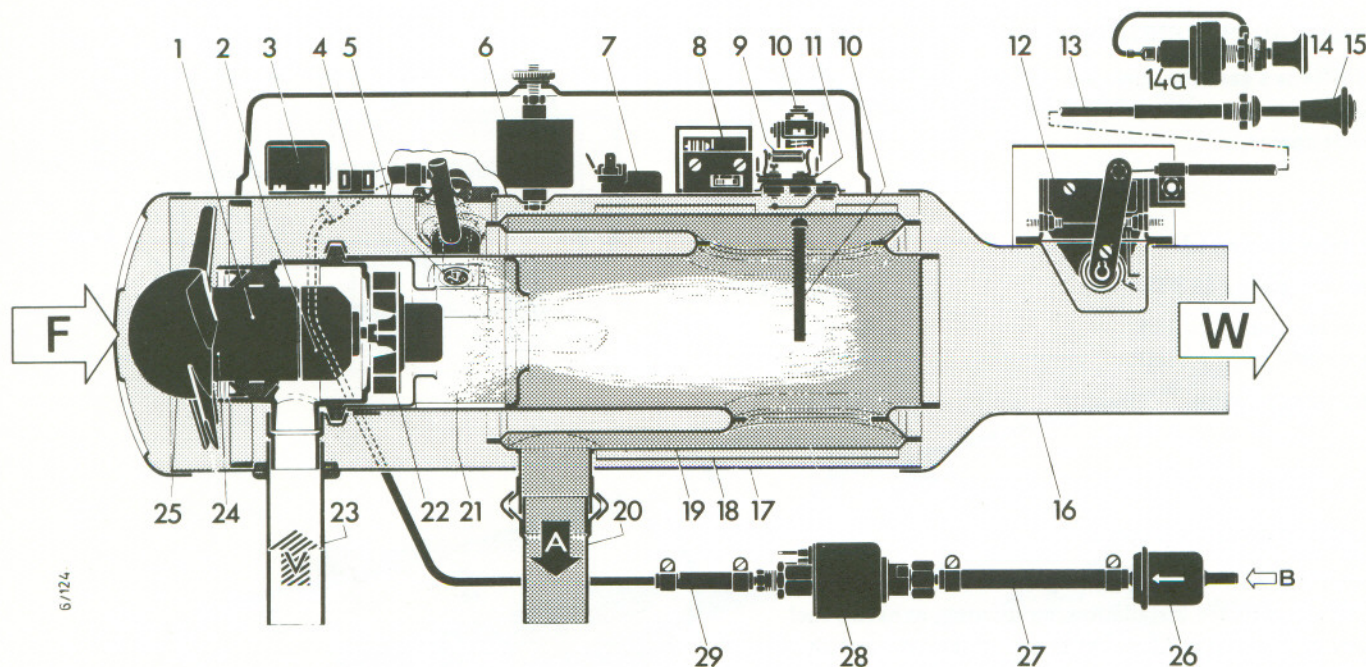
cycle the flame is ignited by the high voltage ignition. After switching off the push-pull switch the pilot light is extinguished. The blower motor however keeps on running until the heat exchanger has cooled down to approx. 40°C and has been blown clear of residual gases. It is then automatically switched off by the thermoswitch.

Safety Devices are as follows:

1. The safety switch (8). It interrupts the current supply to the heater if no ignition occurs 2 - 3 minutes after switching on. (e.g. owing to a faulty glow plug coil or lack of fuel). It can be reset by the lever projecting from the side after the bi-metal strip has cooled down.

2. The overheating switch (11) interrupts the current flow to the fuel pump by short circuiting the 8 Amp fuse (9) if the heater should overheat (e.g. owing to blocking of the hot air ducts). After the cause of overheating has been eliminated and a new 8 Amp fuse installed, the heater is again ready to operate.

3. The static pressure in the hot air ducts is higher than in the combustion chamber and heat exchanger. Owing to this no exhaust gases can penetrate the hot air even if the exchanger should be leaking.



F = Fresh Air
W = Warm Air
A = Exhaust
V = Combustion Air
B = Fuel

- 1 Electric motor
- 2 Breaker 33:1
- 3 Relais
- 4 Connector
- 5 Glowsparkplug
- 6 Coil
- 7 Condensor
- 8 Safety switch
- 9 8 AMP fuse (24V 1A)
- 10 Thermoswitch
- 11 Overheat switch
- 12 Temp. regulator switch
- 13 Bowden cable
- 14a Off/On switch
- 14 Control lamp
- 15 Button for regulator switch

- 16 Outlet
- 17 Housing
- 18/19 Heatexchanger
- 20 Exhaust pipe
- 21 Combustion chamber
- 22 Impeller
- 23 Combustion air pipe
- 24 Breaker 1:1
- 25 Blower
- 26 Fuel filter
- 27 Suction line
- 28 Fuel dosing pump
- 29 Pressure line

OPERATION

Switching On Heater

Pull out the pull-push switch. The pilot light comes on and indicates that the heater is switched on.

Switching Off Heater

Push in the pull-push switch. The pilot light goes out. The 2 – 3 minute cleaning cycle ends automatically.

Operating with Room Thermostat

To keep the passenger compartment temperature constant a room thermostat can be installed.

The heater is started by pulling the pull-push switch. The pilot light then comes on. As soon as the temperature which has been set at the thermostat has been reached, it switches the heater off. After the temperature has dropped, the thermostat switches the heater on again.

The heater remains off when the push-pull switch is pushed in and the pilot light is extinguished. The cleaning cycle always follows to cool the heating system down and to clean out all residue gases.

MAINTENANCE

Please switch the heater on during the warm season (once a month) for a short period to avoid gumming up of the fuel line.

INSTALLATION INSTRUCTION

The BN4 heater is a universal heater for heating gasoline operated vehicles, especially freight compartments of cargo vehicles, etc., **ONLY AUTHORIZED DEALERS SHOULD INSTALL THEM.**

Its universal use provides a host of installation possibilities. A few rules however must always be observed in order to operate the heater safely and successfully.

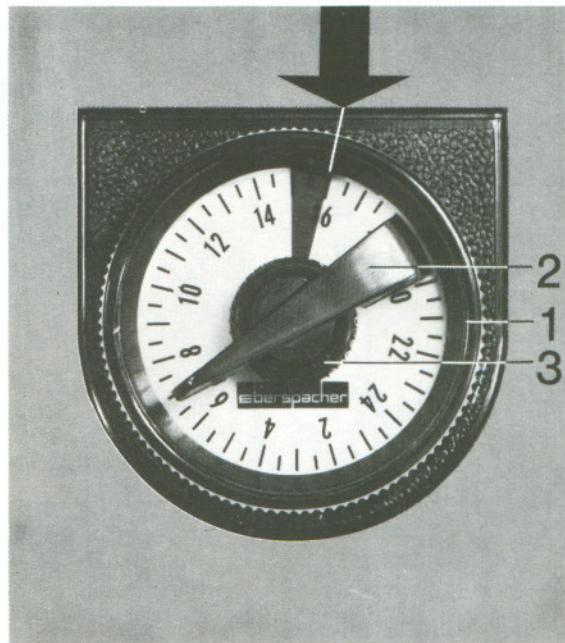
Please pay special attention to the following:

1. Will the heat output be adequate?
2. How can the heater be installed?
3. What additional parts are required?

Pre-selection of heater operation

A time switch is available as an accessory. It permits pre-selecting the time when the heater switches on up to a period of 19 hours.

The heater switches on punctually and switches off automatically after 2 hours operation if not switched off manually in the meantime.



1. – Knurled ring for setting the time.
2. – Rotary handle for setting switch-on time.
3. – Knurled ring for switching on lighting.

Time Switch Part No. 20 1217 00 00 00

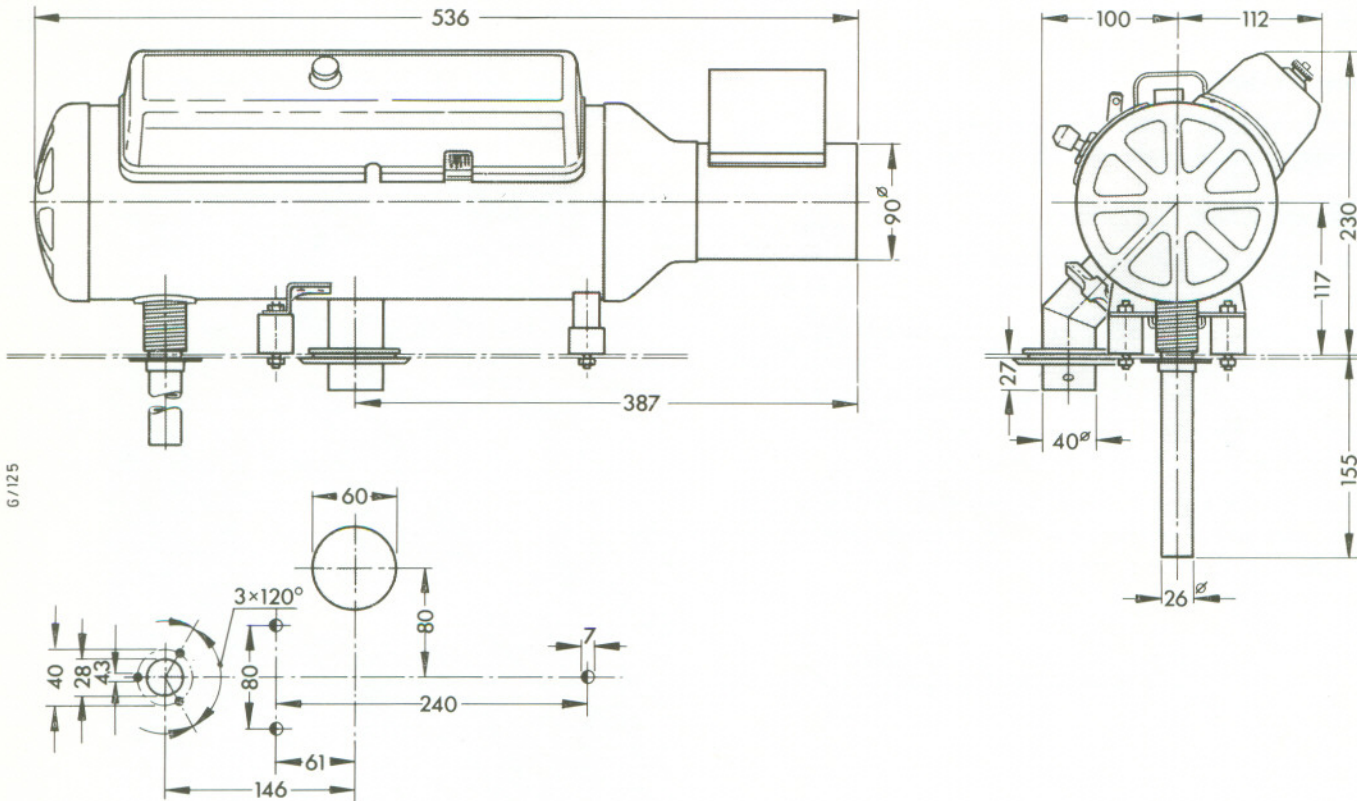
4. How will fuel be supplied to the heater?
5. How will the exhaust be directed and the combustion air supplied?
6. How can the hot-air ducts be installed?
7. How shall the wiring be arranged?

1. Will the heat output be adequate?

The heat output of the BN4 heater is adequate for vehicles with about $7\text{m}^3 = 63$ cubic feet.

2. How can the heater be installed?

To assist you in selecting the most suitable location for the heater, consult the diagrams below for dimensions. All measurements in mm.



Depending on the available space it is suggested to use the fresh air system (air from outside) or the recirculating system (air from the heated space).

Advantages of the recirculating system

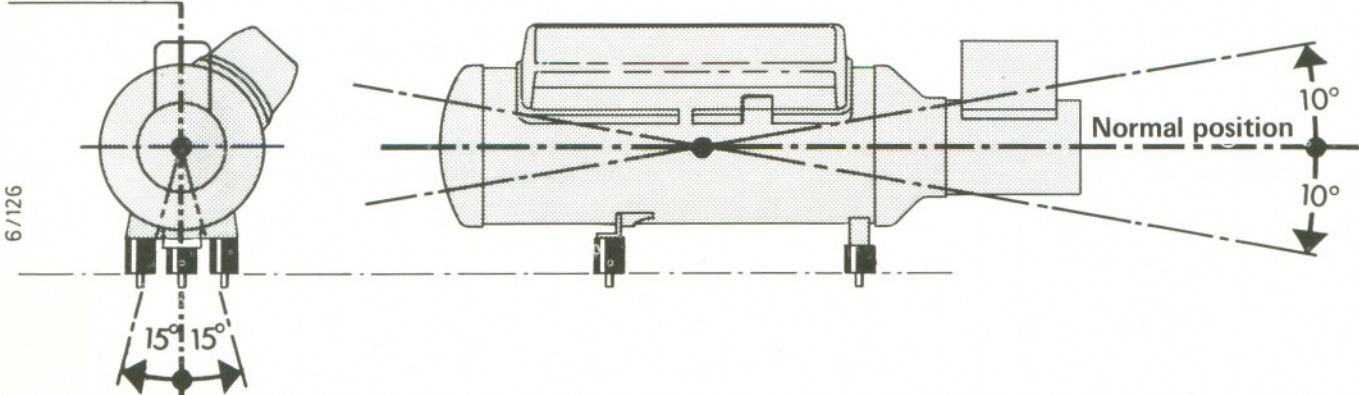
Faster heating up and simpler exhaust arrangement. The fresh air system on the other hand would require that the exhaust must be installed in such a way, that the fumes do not get into the fresh air intake when parked or when travelling.

Installation of the heater in a space used by persons is not recommended.

The heater should be installed if possible in a horizontal position.

Deviations are allowed in accordance with the following drawings.

Normal position

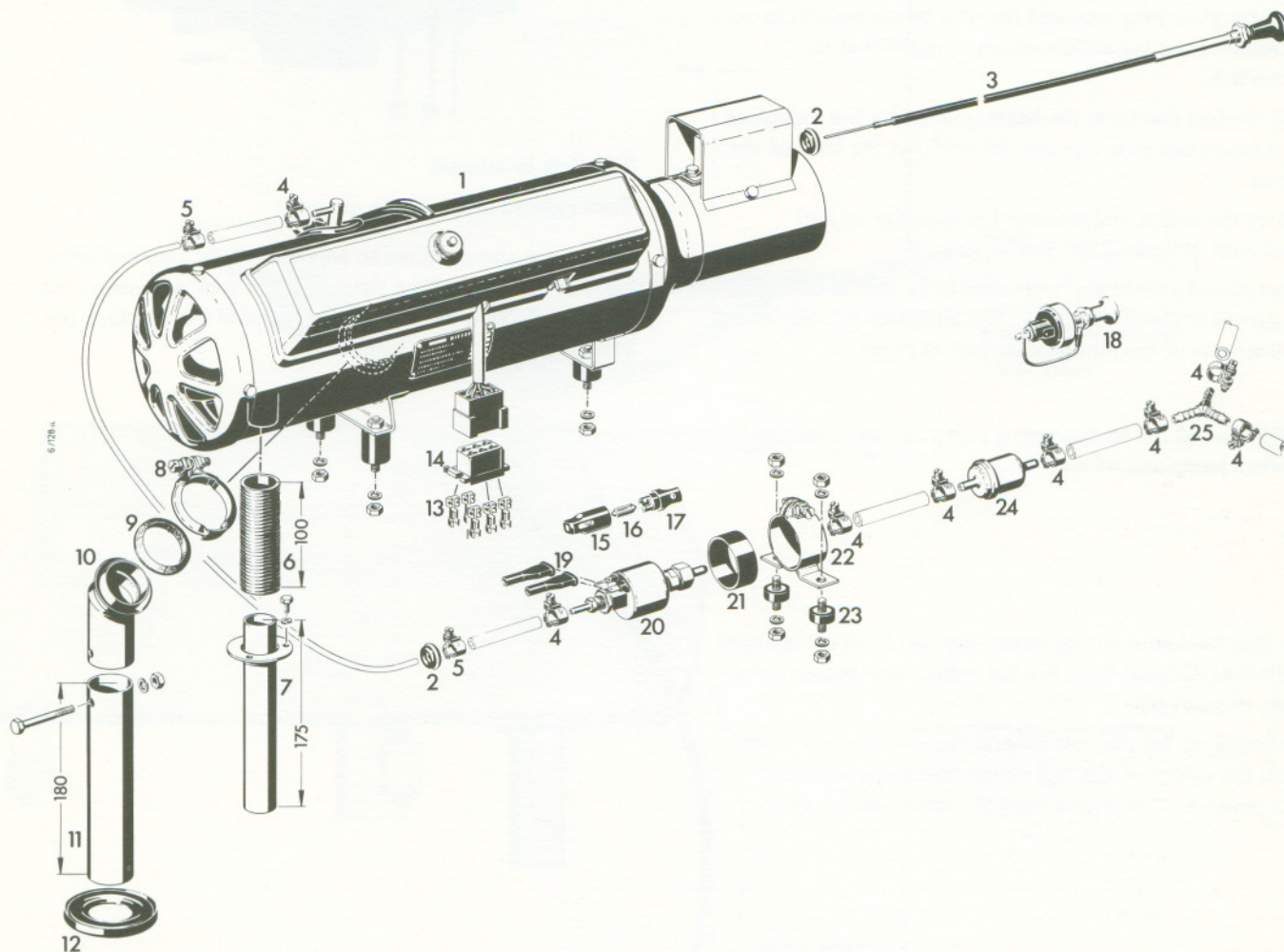


3. What additional parts are required?

With Model No. 20 1462 — 12 volt
or 20 1463 — 24 volt

you receive the parts in the illustrated drawing which are heavily marked, and numbered. Additional parts needed for installation, air ducting, exhaust, fuel supply and wiring may

differ depending on the installation. Listed on the pages 8 — 11, are the parts with numbers most commonly used. A complete listing of our accessories you will find in our accessories catalogue.



1. Basic heater
2. Grommet
3. Bowden cable for regulating switch
2700 mm long (106")
4. Hose clip 10 mm
5. Hose clip 9 mm
6. Flexible tube for combustion air
7. Combustion Air Intake Pipe
8. Hose clip
9. Seal
10. Exhaust pipe
11. Exhaust pipe
12. Silicon sleeve

13. Push on connector
14. Push on connector housing
15. Fuse holder (half section)
16. Fuse
17. Fuse holder (half section)
18. Push-pull switch
19. Rubber cover
20. Fuel metering pump
21. Rubber ring
22. Pump holder
23. Rubber mounting
24. Fuel filter
25. Y-piece for fuel line

4. How will fuel be supplied to the heater?

Since the installation conditions (fuel feeding height, installation location, length of fuel lines etc.) influence the fuel supply to the metering pump to a certain extent, the pumps are only preadjusted by the manufacturer. After successful installation a check of the fuel supply must be carried out and if necessary the pump should be adjusted as follows:

Remove the glow plug wire and the wire to the resistor in the safety switch from the middle connection (NO) at the thermoswitch.

Pull off the fuel line from the heater, bleed the line and place it into a measuring glass (approx. 20 cm³.) at the level of the glow plug.

Switch on the heater and measure the quantity of fuel supplied with 200 pump strokes.

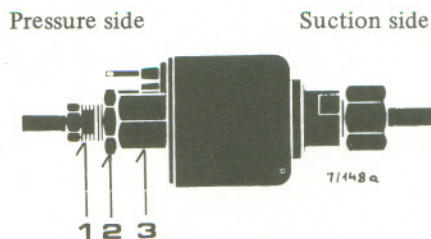
Nominal value 13 to 15 cm³. In order to be able to count the pump strokes without difficulty, it is advisable to mark off each 20 strokes of the pump on a piece of paper.

- a) Installation of the fuel metering pump and the fuel line between pump and heater.

Ensure that the fuel metering pump and fuel lines are installed at a sufficient distance from the hot vehicle and heater parts. (exhaust, exhaust pipe).

When starting up for the first time, if the fuel line is not yet filled up, the safety-switch will switch the heater off after about 3 minutes. If necessary reset the safety-switch again.

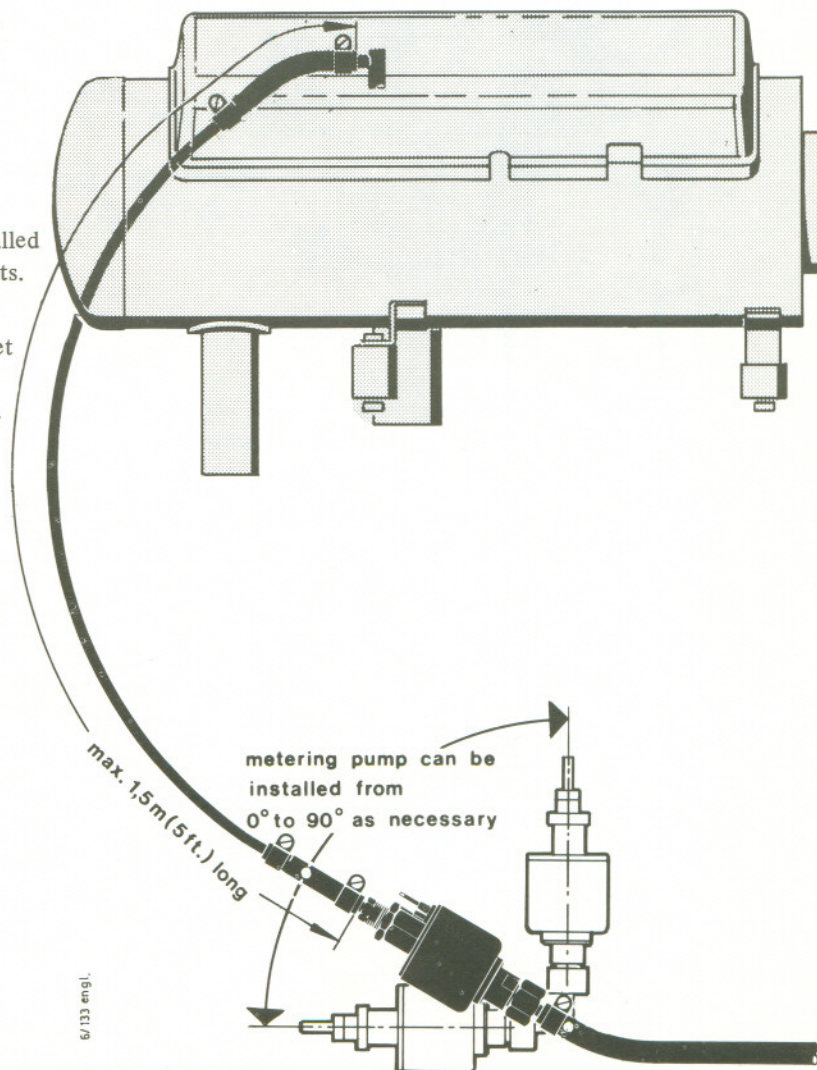
To adjust pump, turn the valve body (1) 1/4 to 1/2 turn. To do so hold pump and loosen the lock nut (2).



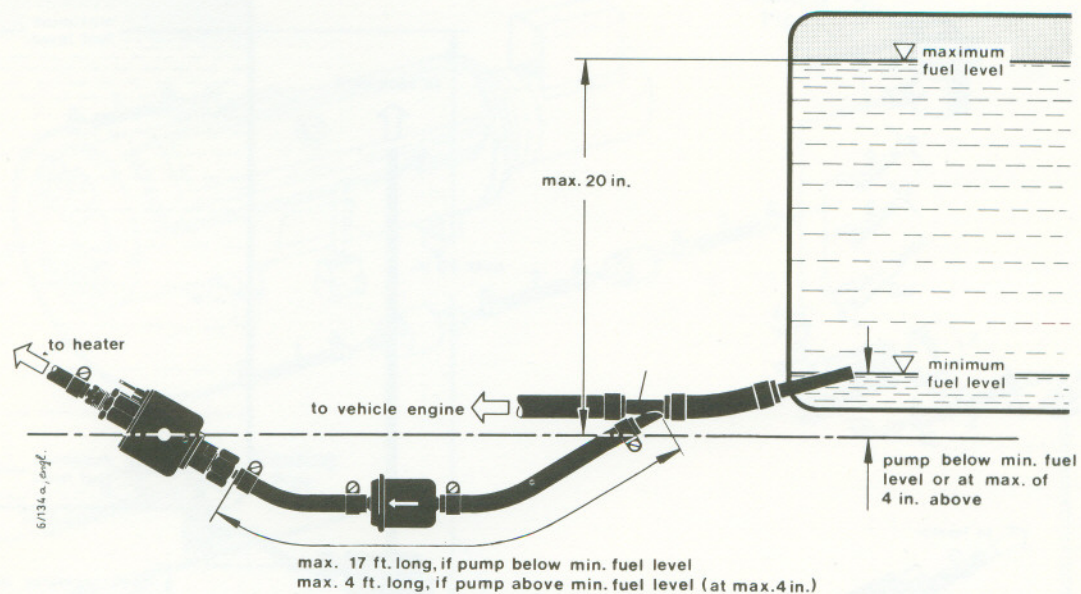
Turn left to increase

Turn right to decrease the quantity

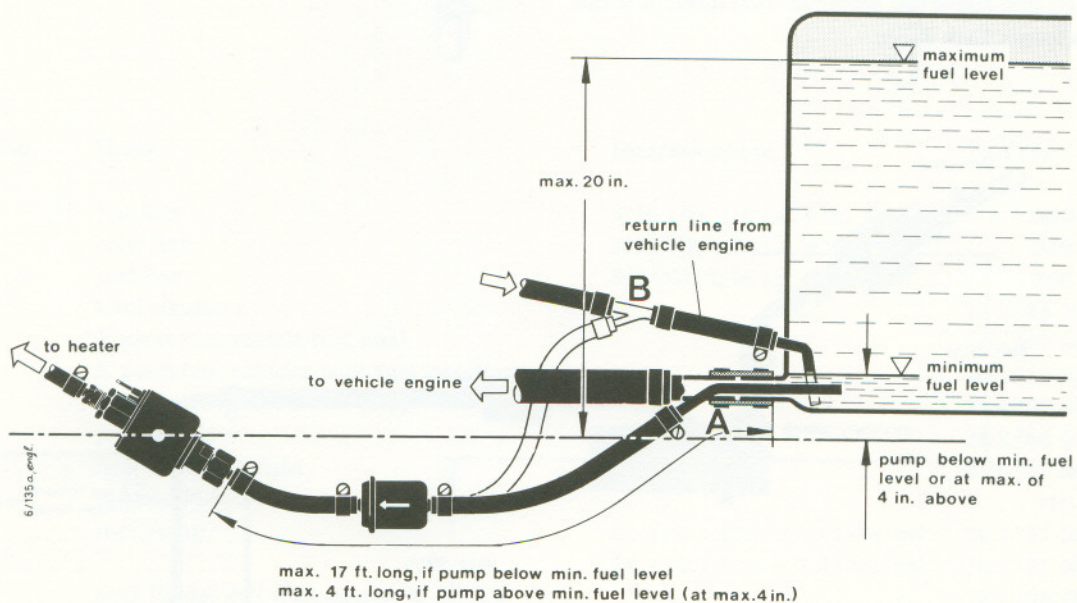
Remeasure and continue to adjust until the nominal value has been reached. When tightening the lock nut ensure that the valve body is not also turned. Finally seal the lock nut with paint.



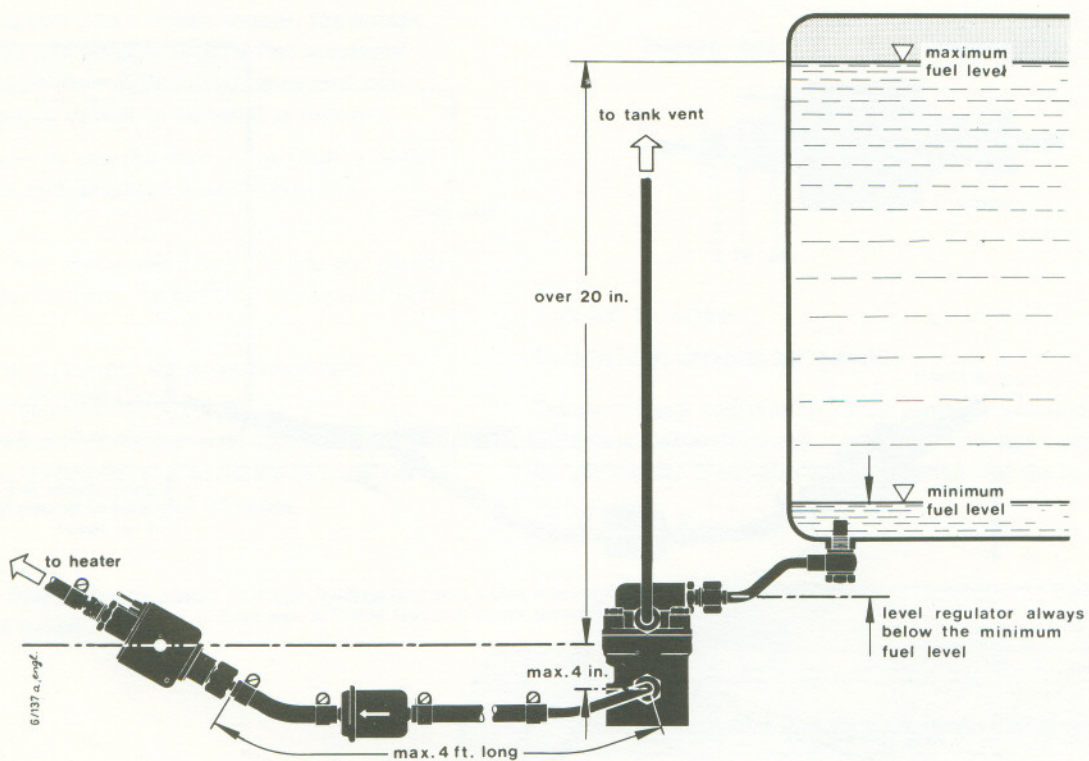
b) Fuel connection for vehicles with carburetor engines.



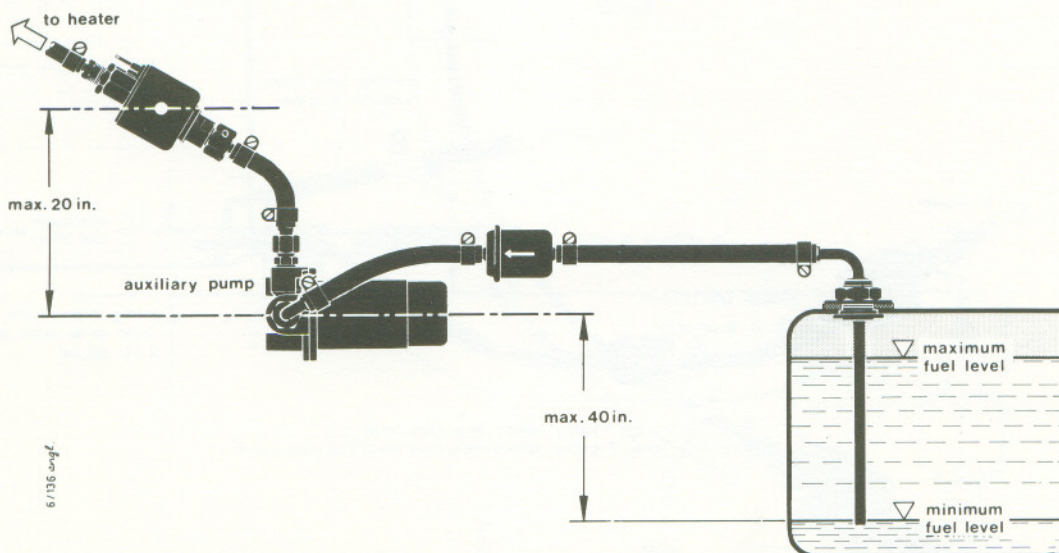
c) Fuel connection for vehicles with fuel injection engines.



- d) Fuel connection for a very high tank (level regulator necessary).



- e) Fuel connection if the metering pump has to be installed higher than 100 mm above the minimum fuel level, or if the suction line is longer than 1.2 m.



f) Accessories for Fuel Supply

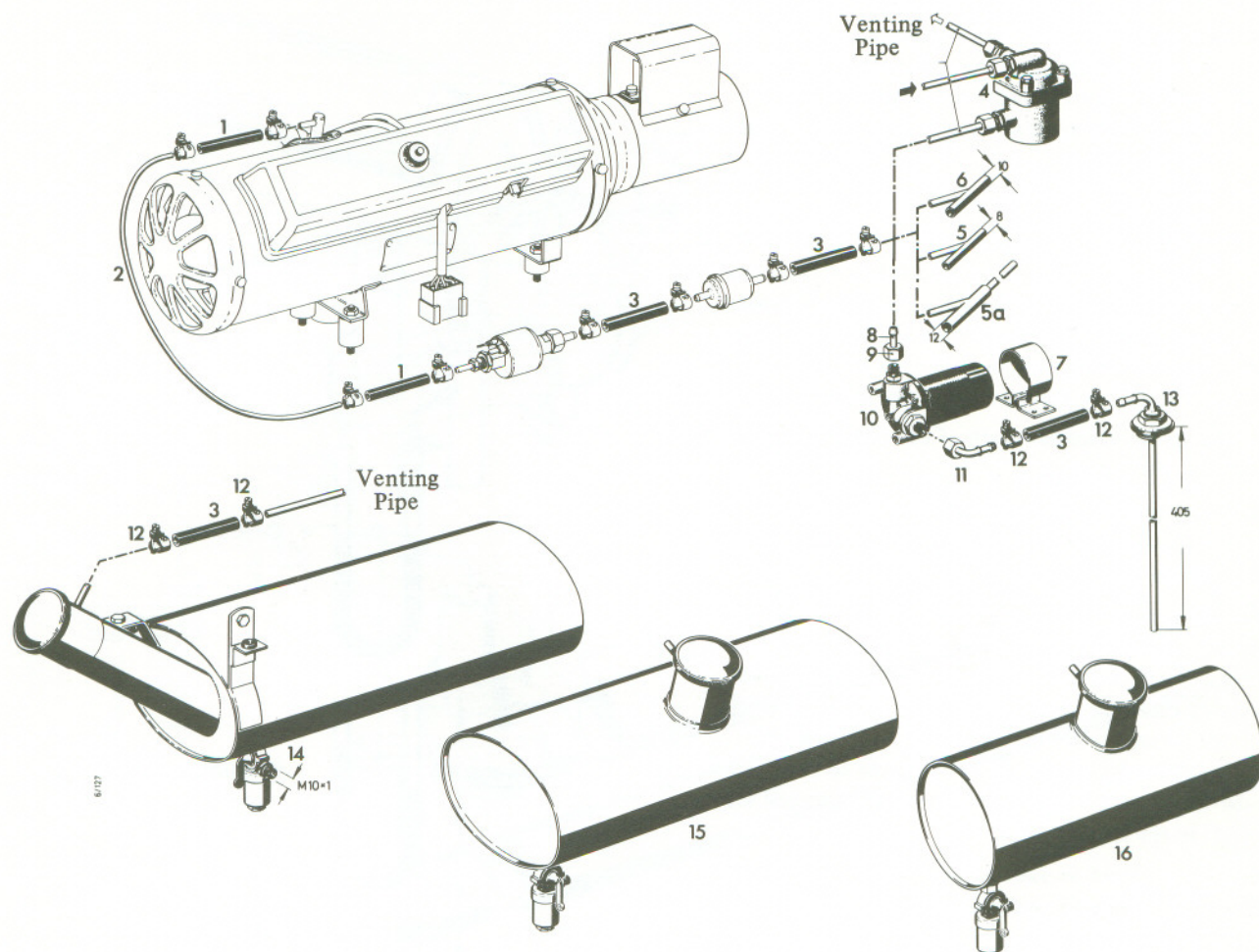


Diagram No.	Name	Dimensions etc.	Part No.
1	fuel line	5/16 OD, 1/8 i.d. ϕ lin. ft.	360 75 110
2	steel line	5/32 ID, 1.16 i.d. ϕ lin. ft.	049 10 004
3	fuel line	3/8 OD, 3/16 i.d. ϕ lin. ft.	360 75 130
4	level regulator		25 8585 36 00 00
5	Y piece (for vehicle fuel line)		20 1307 02 06 00
5a	Y piece (for vehicles with fuel injection)		20 1316 02 01 00
6	Y piece (for vehicle fuel line)		25 1202 03 01 00
7	pump bracket		20 8546 07 00 27
8	hose fitting straight		25 0187 00 00 00
9	cap nut M 10 X 1		116 10 002
10	fuel pump	12 V. 0.1 atue = 1.41 lbs. psi 24 V. 0.1 atue = 1.41 lbs. psi	20 1122 04 01 00 20 1123 04 01 00
11	hose fitting 90° with capnut M 10 X 1		25 1156 20 03 00
12	hose clamp	15/32" ϕ	10 2061 01 00 90
13	fuel tank connection		25 1156 27 00 00
14	fuel tank	7 liter ca 1 1/2 gallons	20 1462 89 10 00
15	fuel tank	7 liter ca 1 1/2 gallons	20 1462 89 20 00
16	fuel tank	4 liter ca 1 gallon	20 1462 89 15 00

5. How will the exhaust be directed and the combustion air supplied?

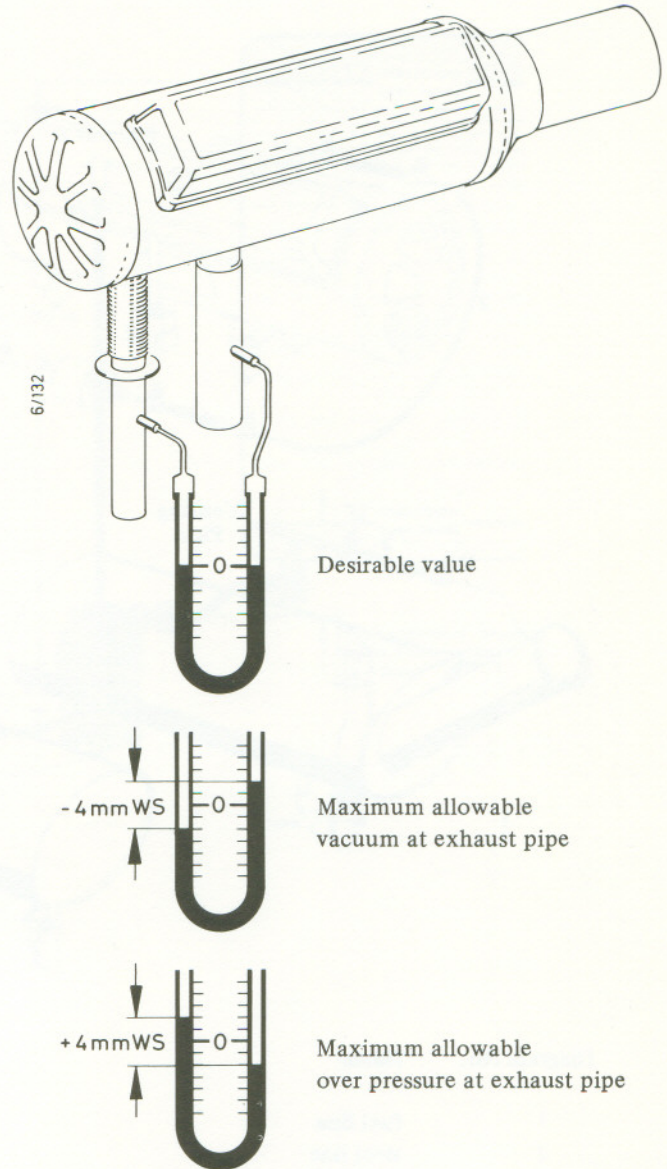
Exhaust and combustion air intake must be balanced to ensure a smooth, soot-free combustion process. Make sure that no combusted air enters the fresh air intake while you are driving or parked. It is important that the heater does not interfere with vital parts of the vehicle, (brake lines, fuel lines etc.). The combustion air must be picked up from the outside.

Therefore, please observe the following:

- Should the supplied exhaust pipes have to be extended, an elbow with an injector should be installed first. You can then connect a pipe up to 3 ft. to it. A further extension requires the installation of an exhaust blower, to which a pipe up to 6 ft. can be attached. The cross section ($55 \text{ mm } \phi$, $2 \frac{5}{32}''$) of the pipe must not be reduced.
- The maximum permissible length of the combustion air intake pipe is 600 mm. (23.4").
- Exhaust and combustion air intake must be located in such a way that no exhaust fumes can be sucked in by the combustion air intake.
- The exhaust pipe and combustion air intake pipe must be located in a similar pressure area. At all speeds the differential pressure between the combustion air intake and exhaust outlet must not exceed $+4 \text{ mm WC}$ ($5/32''$) (max. over pressure at exhaust pipe) and -4 mm WC ($5/32''$) (max. under pressure). Solder close to the heater one tube $1/16'' \phi$ i.d. to the combustion air pipe and one $1/16'' \phi$ i.d. to the exhaust pipe.

At least 2" of pipe must be allowed beyond the measuring point. Drill a $1/16''$ hole through both pipes and deburr them.

The tubes are connected by hoses to a manometer (e.g. U-tube) at which the differential pressure can be read off. By moving the exhaust pipe and the combustion air intake pipe to another location or by cutting the pipes diagonally the pressure differential can be influenced due to a change of speed. Do not install the exhaust pipe facing the direction of travel.



Accessories for exhaust and combustion air intake.

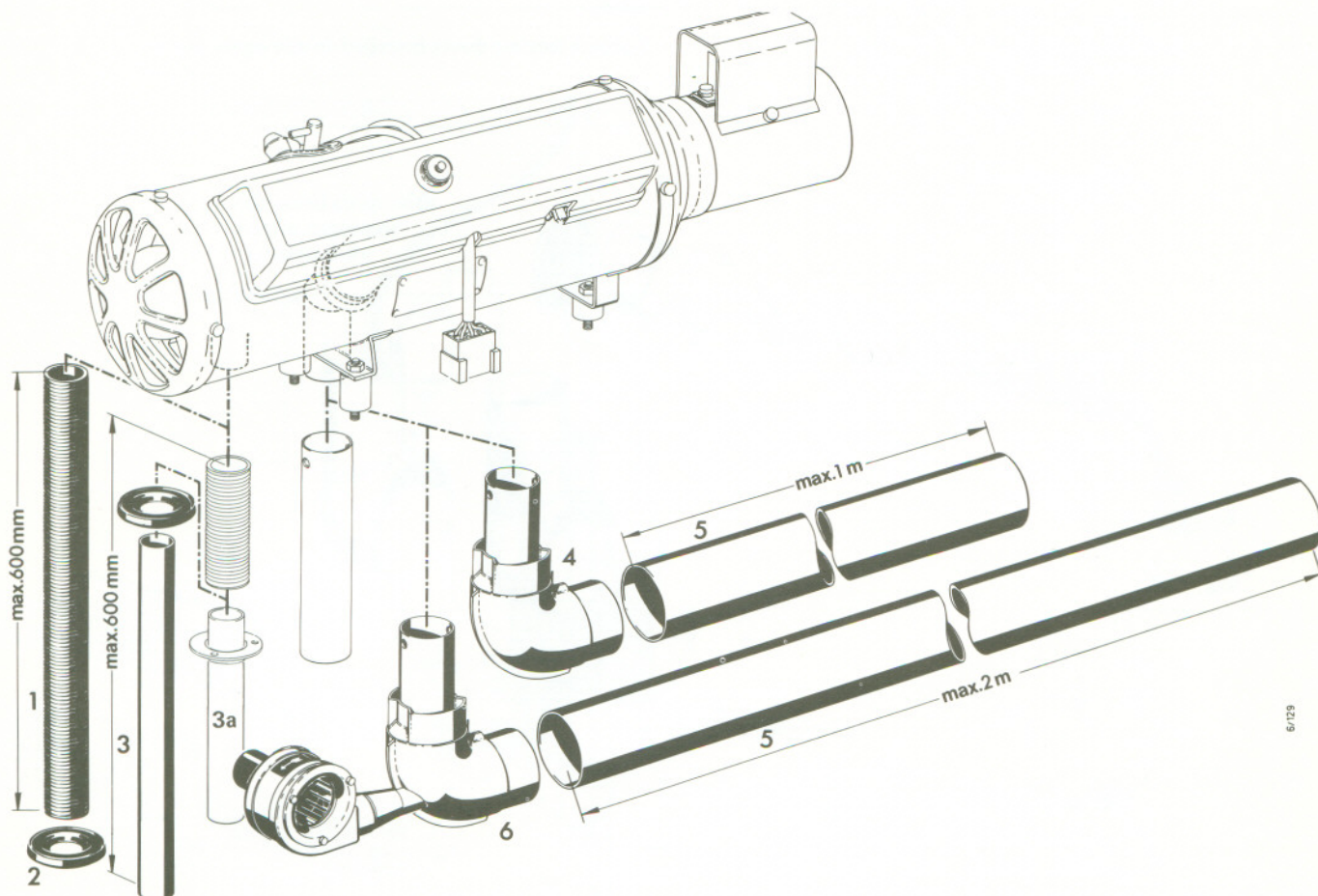


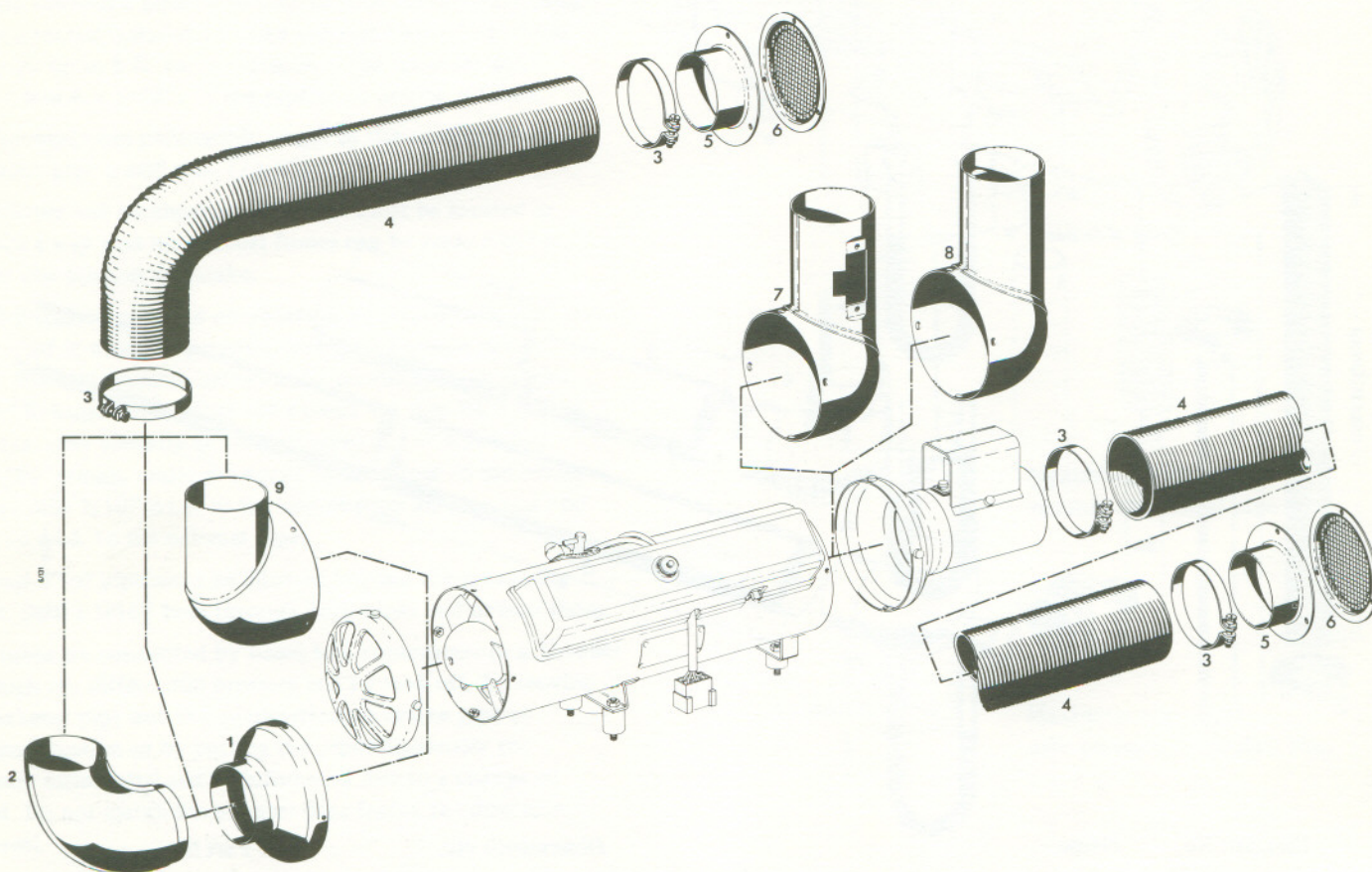
Diagram No.	Name	Dimensions etc.	Part No.
1	Flexible Combustion Air Intake Pipe	1 1/32" ϕ I.D. in ft.	10 2112 02 00 00
2	Seal		20 1282 20 00 00
3	Combustion air intake pipe	1 1/32" ϕ O.D. in ft.	047 05 023
3a	Exhaust Elbow with Injector		20 1121 07 01 00
4	Exhaust Pipe	2 5/32" ϕ I.D.	25 8585 33 03 00
5	Exhaust Blower	12 volt	047 05 069
6		24 volt	25 1202 24 00 00
			25 1202 25 00 00

6. How can the hot air ducts be installed?

The resistance of the hot air ducts (wall friction and losses due to variation in direction) and the outlet and intake hood should not exceed a static pressure of 6mm WC (1/4" WC). This resembles a 9ft. flexible pipe with 90mm = 3 9/16" i.d. with 1 or 2 bends and with an outlet and intake hood. Hot air ducts should not exceed the above lengths (minimum cross section $64 \text{ cm}^2 = 90 \text{ mm i.d.} = 3 \frac{9}{16} \text{ i.d.}$)

With a fresh air system draw in the fresh air from a level as high as possible, not in the region of the exhaust, and not from a location which is under ram-air pressure or vacuum. With a recirculation system, locate the circulating air intake so that the outflowing hot air cannot be directly drawn in again.

Insulate hot air ducts installed in the open against heat loss.

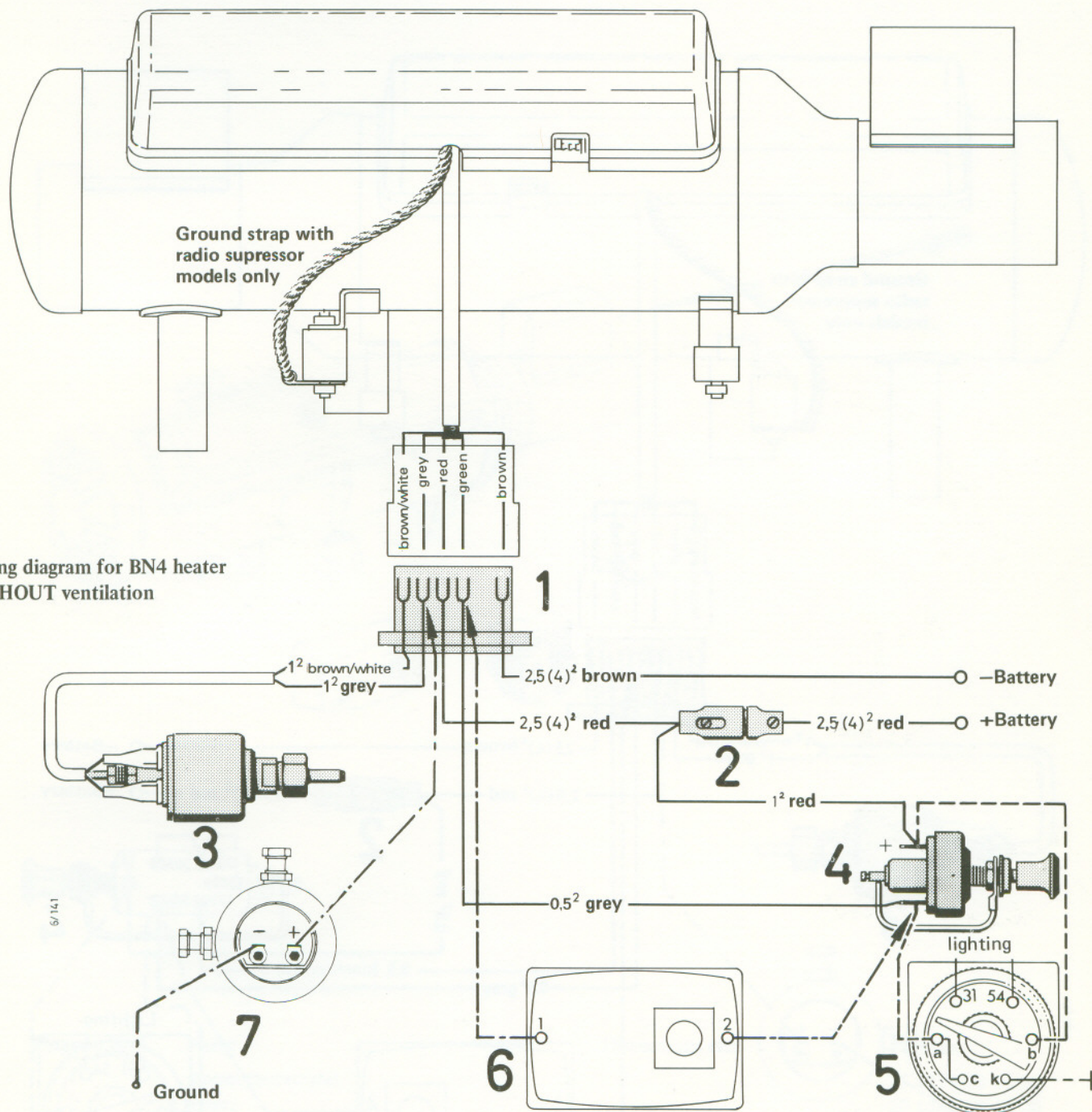


No.	Description	Measurements and other Data	Part Number
1	Hood		20 1127 01 01 01
2	Elbow		25 8585 29 00 00
3	Clamp		10 2060 09 51 52
4	Flexible duct for hot air	90 mm I.D. in ft.	10 2112 15 00 00
5	Flange for flexible duct		20 1297 00 00 01
6	Screen		20 1297 00 01 00
7	Spherical Elbow Left		20 1462 89 06 00
8	Spherical Elbow Right		20 1462 89 02 00

7. How shall the wiring be arranged?

Connect the heater to the power supply according to the wiring diagram (check the voltage).

The additional connection of a time switch and a room thermostat is indicated by dotted lines.



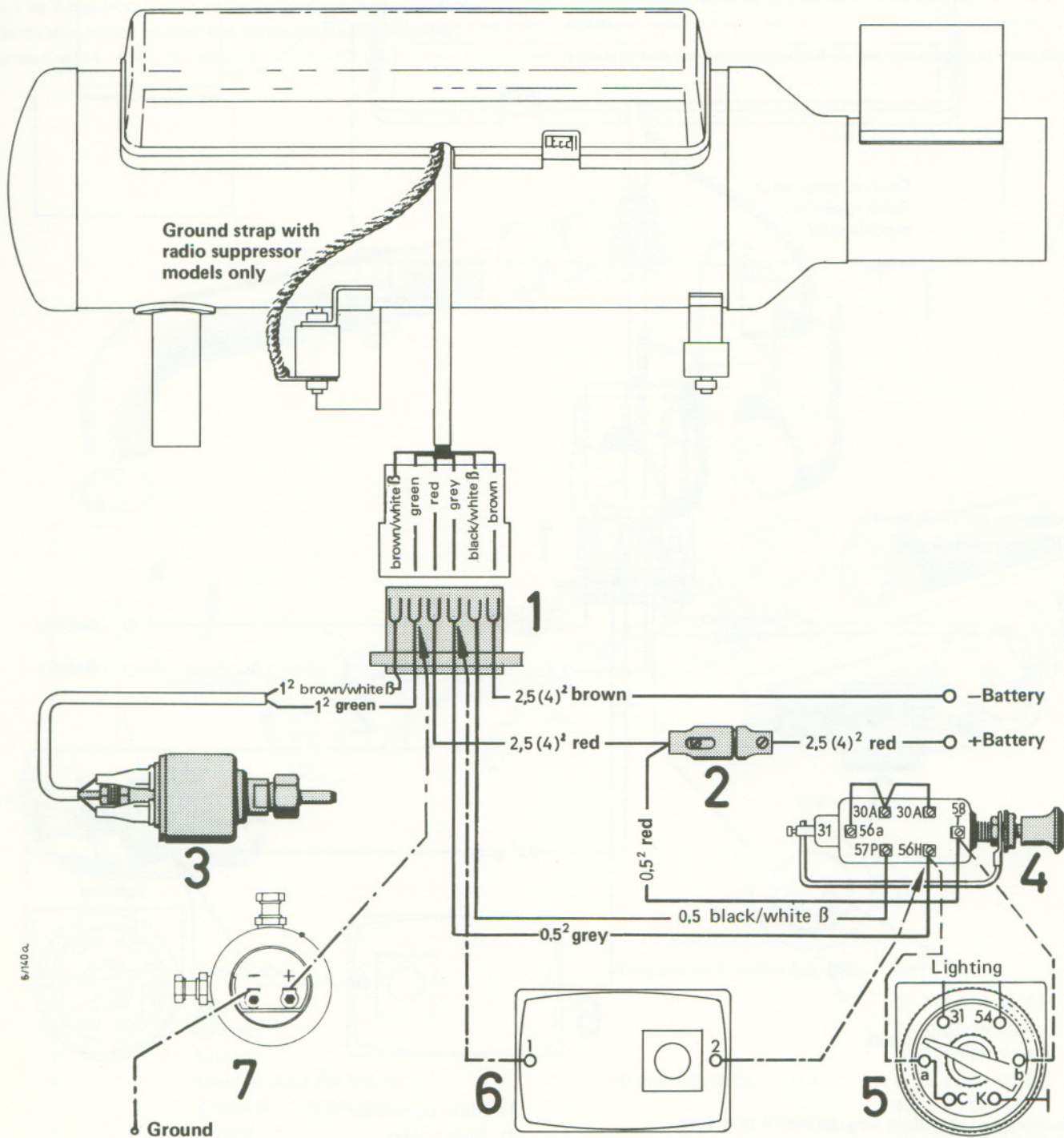
Wiring diagram for BN4 heater
WITHOUT ventilation

Cross sections in () for duct lengths over 4 m = feet

To connect the room thermostat remove wire 0.5 grey
between switch and six-connection plug.
All diameters given in sq. mm.

- 1) Multi connector
- 2) Fuse holder
- 3) Fuel metering pump
- 4) Off/On Switch
- 5) Timer (accessory)
- 6) Room thermostat (accessory)

Wiring diagram for BN4 heater WITH ventilation



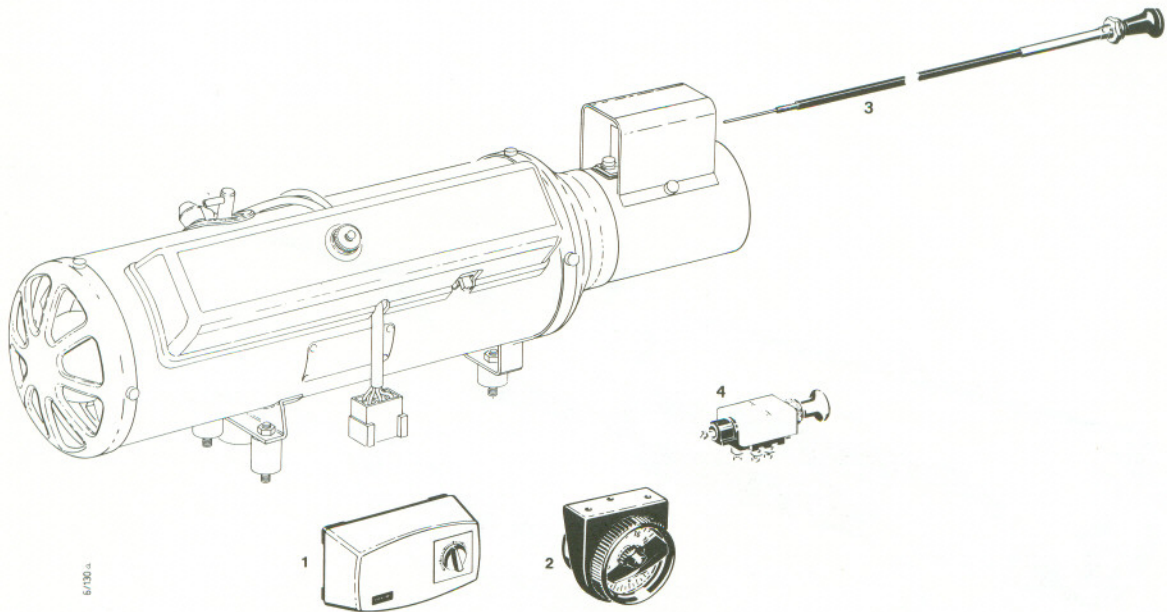


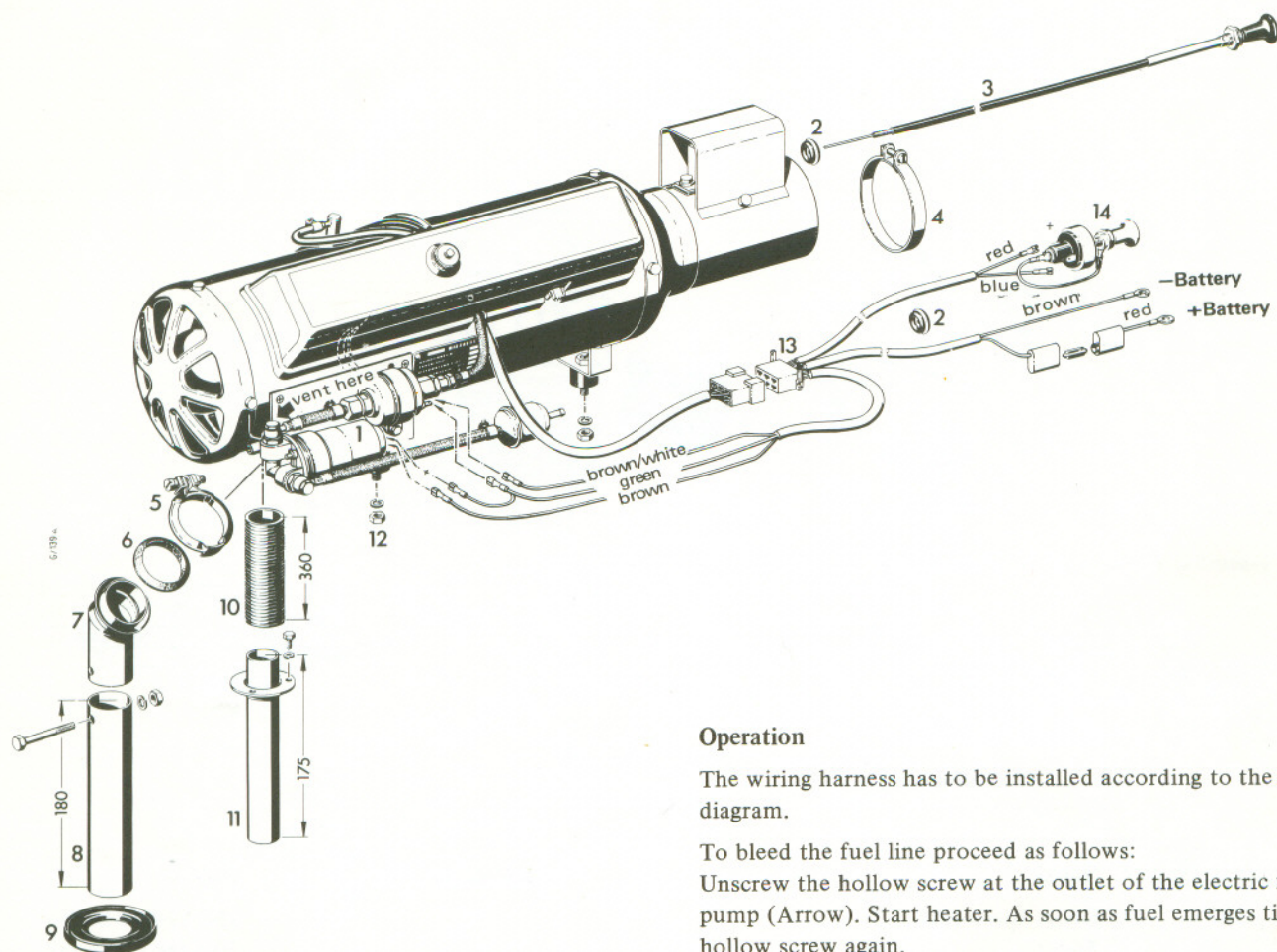
Diagram No.	Name	Dimensions etc.	Part No.
1	Room thermostat		25 1179 32 00 00
2	Timer		20 1348 03 16 00
3	Bowden cable for temperature control switch	13 ft.	20 1104 26 00 01
4	Off/On Switch	12 volt (heating & ventilation) 24 volt (heating & ventilation)	20 1121 09 00 01

BN4 – Compact Heater – 12V Model No. 20 1547
24V Model No. 20 1548

These heaters are already equipped with the following accessories: Metering pump, electric fuel pump to overcome greater suction heights, fuel filter, and rubber mounting, all premounted. In addition the following parts are included:

2. Grommet (2) for fuel line and wiring harness
3. Bowden cable for regulating with 2700'
4. Clamps (3 9/16" – 4 5/16")
5. Clamp
6. Gasket
7. Exhaust Elbow
8. Exhaust pipe
9. Silicon seal

10. Flexible combustion air intake pipe
11. Combustion air intake pipe
12. Hexagon nuts & washers
13. Wiring harness 15 feet with 16 Amp fuse
14. Push-pull switch



Operation

The wiring harness has to be installed according to the above diagram.

To bleed the fuel line proceed as follows:
Unscrew the hollow screw at the outlet of the electric fuel pump (Arrow). Start heater. As soon as fuel emerges tighten hollow screw again.