Webasto
Feel the drive

The Scholastic Series School Bus Heater

Operating Instructions
Installation Instructions
Service Parts Listing

For:

BLUE BIRD®

Conventional Model
Transit Model (Engine Front)
Transit Model (Engine Rear)

Table of Contents

List of Figures

List of Tables

1. Introduction

1.1 Scope and Purpose

This manual is intended to support authorized Webasto trained distributors, dealers and personnel in the installation of the Scholastic Series coolant heater.

Webasto Thermosystems, Inc. does not recommend the installation and servicing of Webasto products by untrained, unauthorized personnel or end-users.

Installations and servicing of Webasto products by untrained, unauthorized personnel and end-users will release Webasto Thermosystems, Inc. and Webasto authorized distributors, dealers and personnel from responsibility for damage to Webasto product or collateral property and personal injury.

Any use, operation, installation, modification or application of the product not described in Webasto manuals, or subjecting the product to extreme or unusual conditions beyond the limits of specified performance characteristics is misuse of the product.

Failure to comply with all installation instructions is a misuse of Webasto product. The same applies for repairs without using genuine Webasto service parts. This will void the coolant heaters “Official Marks of Conformity.”

1.2 Meaning of Warnings, Cautions, and Notes

Warnings, Cautions and Notes in this manual have the following meaning:

⚠WARNING
This heading is used to highlight that non-compliance with instructions or procedures may cause injuries or lethal accidents to personnel.

⚠CAUTION
This heading is used to highlight that non-compliance with instructions or procedures may cause damage to equipment.

NOTE:
This heading is used to highlight and draw specific attention to information.

1.3 Additional Documentation to be Used

This manual contains all of the information and procedures necessary for the installation of the Scholastic Series heater.

The use of additional documentation is normally not necessary. Vehicle specific installation guides (when available) may be used as complementary information if necessary.

1.4 General Safety Regulations and Information

The general safety regulations for the prevention of accidents and relevant operating safety instructions must be observed at all times.

The specific safety regulations applicable to this manual are highlighted in the individual chapters by Warnings, Cautions and Notes.

1.4.1 General Safety Notes

The heater may only be installed in vehicles, with a minimum coolant capacity of 10 litres (2.6 US Gal.).

The heater must not be installed in the passenger compartments of the vehicle. Should the heater be installed in such a compartment, the installation box must be sealed tight against the vehicle interior. There must be sufficient ventilation of the installation box from the exterior in order not to exceed a maximum temperature of 60 °C (140 °F) in the installation box. Excessive temperatures may cause malfunctions.

⚠WARNING
Due to the danger of poisoning and suffocation, the heater must not be operated in enclosed areas, such as garages or workshops, without an exhaust venting system, not even if the start-up is activated by the timer or remote start device.

At filling stations and fuel depots the heater must be switched off as there is a potential danger of explosions.

Where flammable fumes or dust may build up (e.g. in the vicinity of fuel, coal, wood, cereal grain deposits or similar situations) the heater must be switched off to prevent explosions.

In the vicinity of the coolant heater, a temperature of 85 °C (185 °F) must not be exceeded under any circumstances (e.g. during body paint work). A violation of this temperature limit may cause permanent damage to the electronics.

When checking the coolant level, proceed in accordance with the vehicle manufacturer's instructions.

The coolant in the heating circuit of the heater must contain a minimum of 10% of a quality brand glycol based anti-freeze.

Extracting combustion air from the vehicle interior is not permissible under any circumstance.

The exhaust line outlet is to be positioned below the vehicle floor, to the nearest possible location of the vehicle's left side. Exhaust pipes must be routed so that exhaust fumes will not penetrate into the vehicle's interior.

The function of any parts vital for vehicle operation must not be impaired. Condensation accumulation in the exhaust line must be directly drained. A condensation drain hole may be provided as required.

Electrical lines, switch gear, and control gear of the heater must be located in the vehicle so that their proper function cannot be impaired under normal operating conditions.

The coolant heater may only be operated within the specified operating voltage range designated by type.

The coolant heater may only be operated with the specified fuel (Diesel 1, Diesel 2, Arctic grade, Kerosene and certain military spec. fuels).

For the routing of fuel lines, the following important regulations must be adhered to:

- Fuel lines are to be installed in such a way that they remain unaffected by torsional stresses created by vehicle and engine movement. They must be protected against mechanical damage. Fuel lines must be securely fastened to the vehicle every 30 cm. (12 inches) or more often along the total length from heater to fuel tank. Fuel-carrying parts are to be protected against excessive heat and are to be installed so that any dripping or evaporating fuel can neither accumulate nor be ignited by hot components or electrical equipment.
- In buses, fuel lines are not to be located in the passenger area or in the driver's compartment. Fuel supply must not be by means of gravity or pressurization of the fuel tank.
- The fuel tank must either be equipped with a vent cap or be ventilated in another way (ventilation line).
- The operational state of the heater, i.e. an indication "On" or "Off", must be clearly visible to the operator.

2. General Description

2.1 Scholastic Heater Description

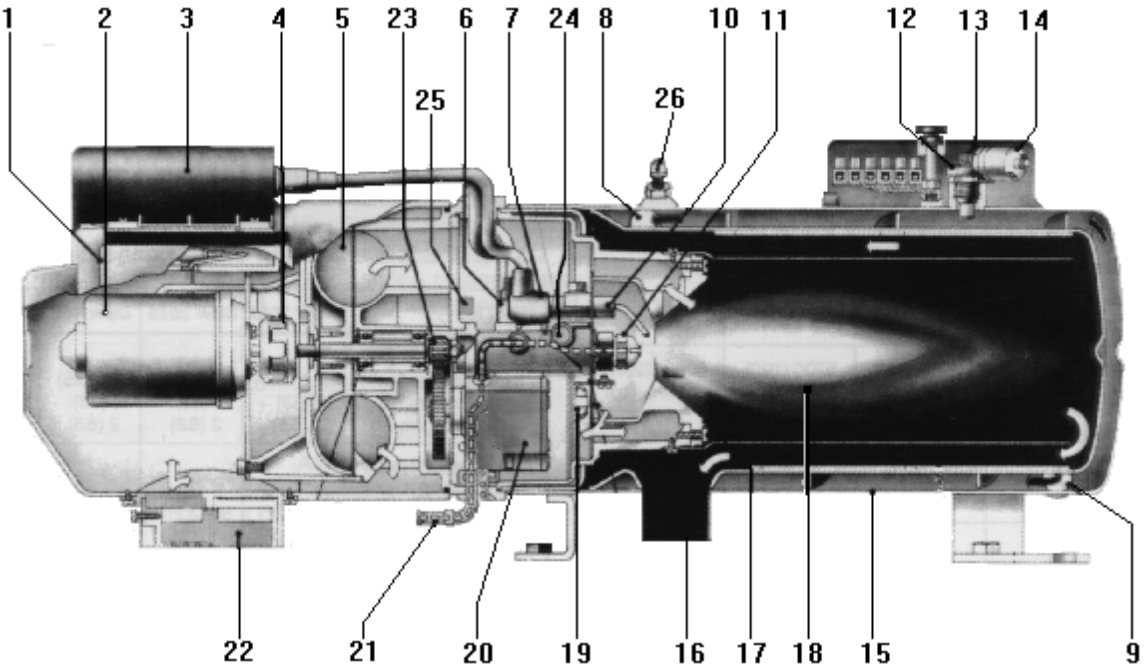


Fig. 2-1: Webasto Scholastic Series Heater

1 Electronic control unit
2 Motor
3 Electronic ignition coil
4 Coupler
5 Combustion air fan
6 Solenoid valve
7 Electrode holder
8 Outlet water pipe - 25 mm (1 in. OD.)
9 Inlet water pipe - 25 mm (1 in. OD.)
10 Ignition electrodes
11 Fuel nozzle
12 Overheat fuse
13 Control thermostat
14 Overheat limiter
15 Heat exchanger
16 Exhaust pipe
17 Combustion air swirler
18 Combustion tube
19 Flame detection photocell
20 Fuel pump (single line, no return)
21 Fuel connection pipe (JIC #4)
22 Combustion air intake
23 Reduction gearing
24 Nozzle preheat cartridge
25 Preheat thermostat
26 Bleed screw

The Webasto Scholastic Series Heater has been designed for use on diesel powered school buses. Equipped with 1-inch coolant line connections, heavy-duty coolant pump, single fuel line and additional safety features makes this an ideal choice for school bus applications.

Webasto Scholastic Series Heaters are designed to:

1. Preheat Engine block of liquid cooled engines to ensure reliable starting in cold weather and to reduce cold start wear and emissions (white smoke).
2. Boost heating levels with the engine running. The heater will boost the heating system in cold weather when an engine is running at light loads, even at high speeds or idling. The heat rejection of modern diesel engines to the coolant, especially in school buses, is often not adequate to heat the vehicle's interior.
3. Increase Safety by providing higher levels of heat for quick defrosting of windshield and side glass for greatly improved visibility.

3. Functional Description

3.1 Operating your Webasto Scholastic Heater

⚠WARNING
Due to the risk of carbon monoxide poisoning and asphyxiation, the heater must never be operated in closed spaces such as garages and workshops without adequate exhaust extraction.

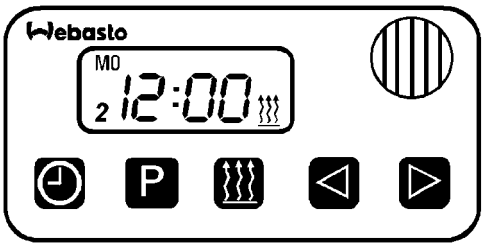
⚠WARNING
Due to the risk of fire or explosion, the heater must be switched off while refueling and at fueling stations.

⚠WARNING
Due to the risk of explosion, the heater must never be operated in areas where explosive materials, fumes or dusts may be present.

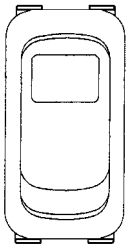
Before switching the Webasto heater on, set vehicle-heating system to the “Heat” position and open any shut off valves. Depending on the type of control installed in the instrument panel of the vehicle, the heater can be operated by the following methods.

3.2 Switching On

Timer:



Switch:



Using a Timer:

Upon pressing the “Instant Heat” button on the timer face, the “Operation Indicator” on the timer lights up and the heater begins operation.

Using a Switch:

When the switch is used for switching “ON” the Webasto heater, the “Operation Indicator” integrated in the switch is illuminated.

Heater Start-up Sequence:

The heater motor and coolant circulating pump begin operation. After approximately 10 to 25 seconds the fuel solenoid valve opens and fuel is sprayed into the combustion chamber. At the same time, the electronic ignition coil produces a high voltage (8000 V) spark at the tip of the ignition electrodes and the mixture of fuel and air in the combustion chamber is ignited. As soon as combustion is detected by the photo resistor (flame detector), the electronic ignition coil is de-energized and combustion continues on its own (ignition process is only required to ignite the flame). At this point the heater is working and producing heat.

The Webasto heater will cycle on and off until:

1. The Webasto heater is switched off.
2. Time has elapsed on the timer.
3. The vehicle battery voltage drops below 10.5V.
4. The Webasto heater runs out of fuel.
5. A fault lock out occurs, indicated by the operating indicator light being off during the cool down cycle (as would happen during an overheat situation).

NOTE:
If the heater is switched on while the engine is at operating temperatures above 68 °C (155 °F) only the operation indicator and the coolant circulation pump will be activated. The engine coolant temperature must fall below 68 °C (155 °F) at the heater before the heater will begin heating operation.

NOTE:
Switching the Webasto heater on during the cool-down or "after-run" period is allowed. The heater will revert to normal operational mode.

3.3 Switching Off

When heating is no longer required, switch the Webasto heater off. The fuel solenoid valve halts the fuel supply, combustion stops and the indicator light turns off. The Combustion air fan and the water pump remain on for another 2-3 minutes (after run cycle) purging the combustion chamber of any fumes.

3.4 Engine Preheating

1. Set the timer 30 min. to 1 hr. before you want to start the engine. The heater will start up at the set time. (See timer operating instructions). Or switch the toggle switch or "Instant On" switch on your timer in the vehicle dash to "ON". The heater will start up.

2. When the run time has elapsed on your timer or engine preheating is no longer required, switch the Webasto heater "OFF". The heater will begin a brief after-run (cool down) cycle.

3.5 Boost Heating for Engine and Passenger Compartment

1. Switch the toggle switch (or the "Instant On" button of the timer) in the vehicle dash to "On". The heater will start up if the coolant temperature is below 75 °C (167 °F). Above this temperature only the water pump will run.

2. When boost heating is no longer required, switch the Webasto heater "Off". The heater will begin a brief after-run (cool-down) cycle.

3.6 Operation with 7-Day Digital Timer Model 1531

The digital timer with 3 time settings permits the Webasto heater to be switched on and off instantly, or automatically at 3 programmable starting times.

The operating time of the heater can be pre-selected. It is possible to program 3 different heating programs according to your individual needs.

Only one preset starting time can be activated at any one time. When the ignition is switched on, the current time of the day and the day of the week are displayed.

When the heater is in operation, the display and the buttons of the timer are illuminated.

Programmed Heater Operation

Three memory locations numbered 1 to 3 are available. Each memory location can be assigned a given time together with the day of the week.

Pre-selected Starting Times

The pre-selected starting time is the time at which the heater will be switched on automatically.

We recommend that memory locations 1 and 2 be used for presetting starting times within 24 hours of setting the timer.

Memory location 3 can be used for a starting time within the next 7 days of setting the timer.

NOTE:
We recommend that memory locations 1 and 2 be used for presetting starting times within a 24 hour period of setting the timer. Memory location 3 can be reserved for a starting time within the next 7 days of setting the timer. Location 3 is useful for occasional weekend or field trip operations outside of the normal schedule. By repeatedly pressing the P *button, starting time program 1, 2 or 3 can be viewed and preset.*

Operating Time

The period of time during which the heater is in operation is referred to as operating time. The heater remains in operation for as long as the operating time has been preset.

Heater operation can be pre-selected for any time from as little as 1 minute to a maximum of 120 minutes (factory preset is 60 minutes).

Remaining Operating Time

The remaining operating time refers to the period of time the heater still continues to remain in operation. It can only be changed while heater is in operation.

NOTE:
If the ignition is switched off while the heater is in operation, the remaining operating time of 5 minutes flashes on the timer display and the heater continues to operate for this period of time. See "Remaining Operating Time" to adjust this time setting.

Setting the Digital Timer

After the power has been connected, all symbols on the digital display are flashing. The time of the day and the day of the week must be set.

All flashing displays and symbols of the timer can be set by means of the ◁ and ▷ buttons.

If the ◁ and ▷ buttons are not pressed within 5 seconds, the currently displayed time or function will be stored. When the ◁ and ▷ buttons are pressed for more than 2 seconds, the quick digit advance mode is activated.

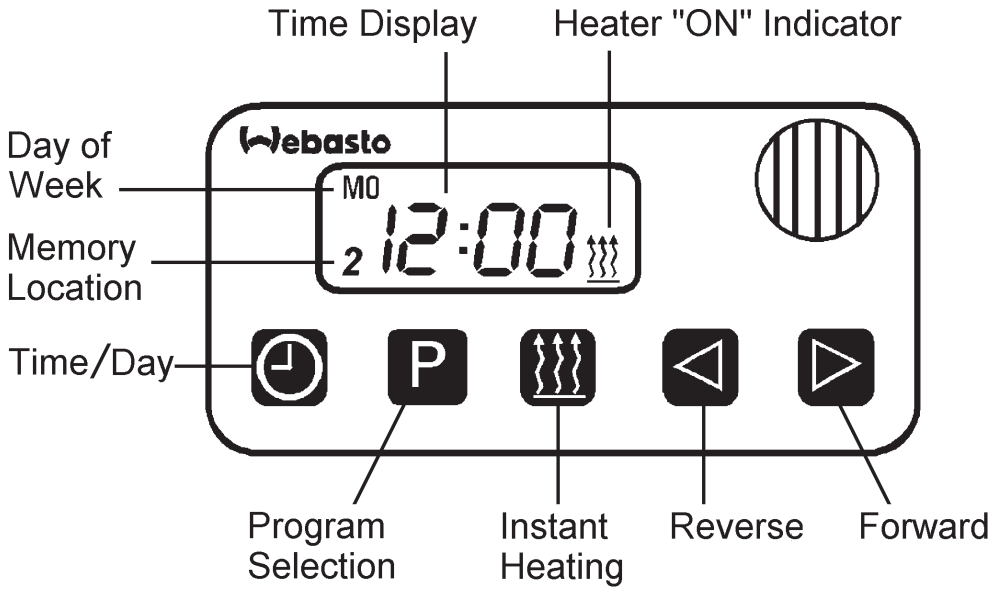


Fig. 3-1: 7-Day Digital Timer Model 1531

3.7 7-Day Digital Timer Programming and Operating Instructions

Setting the time and day of the week	Press the ◴ button for more than 2 seconds. Time display flashes. Press the ◁ or ▷ button to set time of day. Wait 5 seconds. Time is now stored. Day of week flashes. Press ◁ or ▷ button to set day of week. Wait 5 seconds. Day of week is now stored.
Viewing the time	With ignition "ON": Continuous display of current time and day of the week. With ignition "OFF": Briefly press ◴ button. Display of current time and weekday appears for 5 seconds.
Switching heater on for instant heater operation	With ignition "ON": Press ▥ button. Heater is switched on (continuous heating) and continues to operate until ▥ button is pressed again or ignition is switched off. With ignition "OFF": Press ▥ button. Heater is switched on for the preset operating time (the factory-set heater operating duration is 60 minutes).
Switching the heater off	Press ▥ button. Heater begins cool-down (after-run) cycle and is switched off thereafter.
Programming heater-starting time	Press P button. Memory location number flashes. Press ◁ or ▷ button to preset starting time. Wait 5 seconds. Preset starting time is now stored. Day of week flashes. Press ◁ or ▷ button to set day of week. Wait 5 seconds. Day of week is now stored. The number of memory location remains on the display. The timer is now in the programmed mode and switches heater on at the preset time.
Recalling/canceling pre-selected times	To recall: Press P button until the desired memory location number is displayed. Read off preset time. To cancel: Press P button repeatedly until no memory location numbers are visible on the display.
Programming duration of operating time	The heater must be switched off. Press the ◁ button. Operating time flashes. Press ◁ or ▷ button to set operating duration time (between 1 and 120 minutes).
Setting the remaining operating time	Heater must be in operation. Press ◁ button. Remaining operating time flashes. Press ◁ or ▷ button to set remaining operating time. Wait 5 seconds. Remaining operating time is now stored.

Table 3-1: Digital Timer Instructions

4. Technical Data

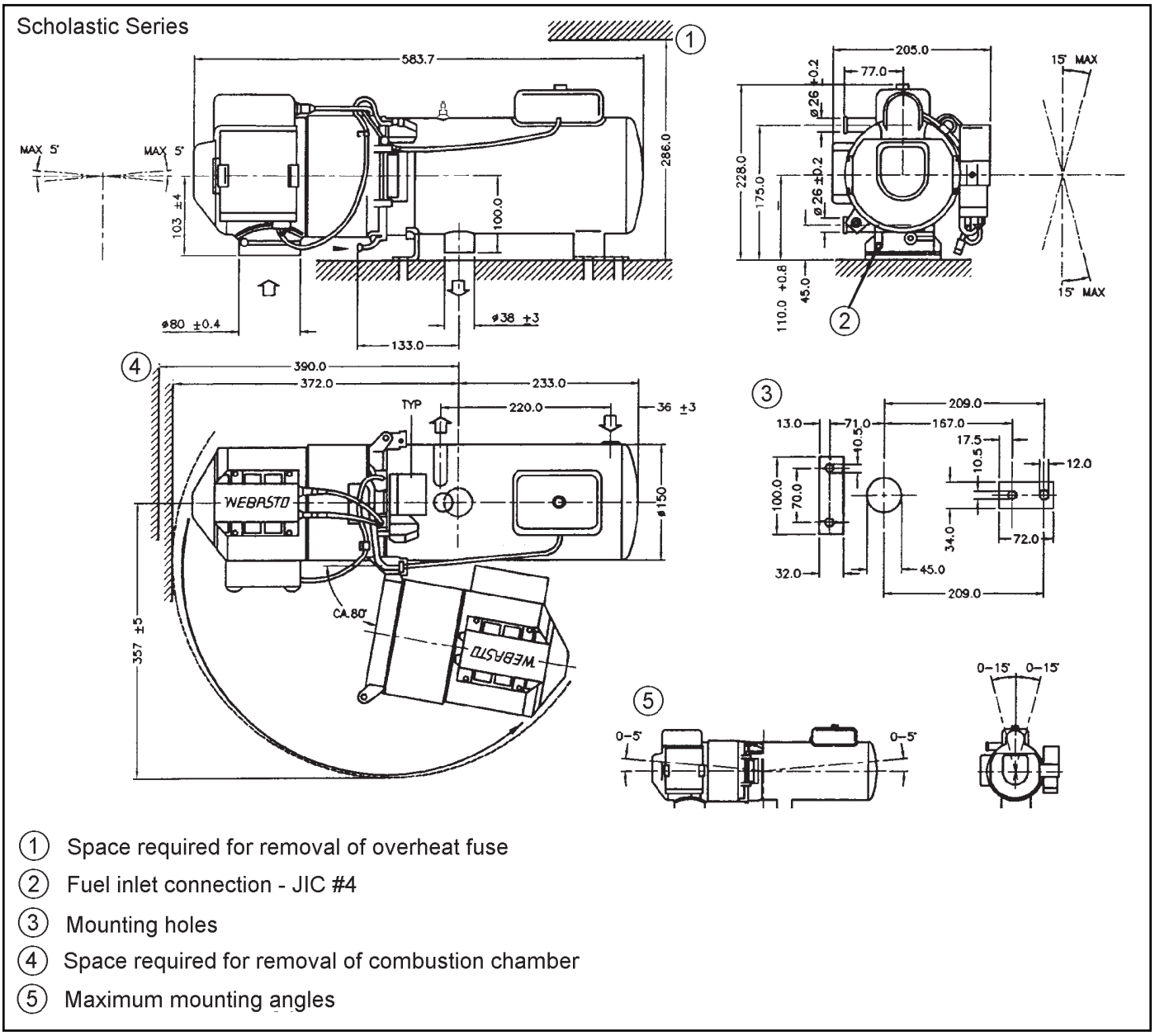
4.1 Scholastic Series Heater Data

The following data is subject to the normal tolerance for heaters, if no tolerance is specified. This is approximately +/-10% in an ambient of 20 °C (68 °F) at nominal voltage.

Heater		Scholastic Series
Design		Coolant heater with high-pressure nozzle
Heat Output	kW (BTU/hr)	13.1 (45,000)
Fuel		Diesel #1 Diesel #2 and Arctic
Fuel Consumption	l/hr (gal/hr)	1.5 (0.4)
Rated Voltage	(V)	12
Operating Voltage	(V)	10 - 14
Power Consumption w/o Water pump	(W)	60
Permissible Ambient Temperature during Operation	°C (°F)	-40 ... +60 (-40 ... +140)
Storage Temperature	°C (°F)	+85 max. (185 max.)
Min. Capacity of Cooling System	l (gal)	10 (2.6)
Permissible Operating Pressure of Coolant	bar (psi)	0.4 - 2 (06 - 29)
CO in Exhaust Gas	ppm	32
CO2 in Exhaust Gas	% by Vol.	10 +/-0.5
NOx in Exhaust Gas	ppm	70
HC in Exhaust Gas	ppm	<5
Emission Bacharach		1
Dimensions of Heater mm (inch)	L W H	584 (23) 205 (8.1) 228 (9)
Dimensions of Heater Enclosure mm (inch)	L W H	603 (23.75) 305 (12) 254 (10)
Dimensions of Heater Tray Mount mm (inch)	L W H	603 (23.75) 305 (12) 228 (9)
Weight on Tray	kg (lb.)	27 (60)
Weight of Heater incl. Control Unit	kg (lb.)	15 (33)

Table 4-1: Scholastic Series Heater Data

4.1.1 Scholastic Series Heater Dimensions



1. Space required for removal of overheat fuse
2. Fuel inlet connection - JIC #4
3. Mounting holes
4. Space required for removal of combustion chamber
5. Maximum mounting angles

Fig. 4-1: Scholastic Series Heater Dimensions (Millimeters)

4.2 Coolant Circulation Pump Data

Flow Rate	l/hr (US gal/min)	3406 - 4542 (15 - 20)
Rated Voltage	(V)	10 - 14
Power Consumption	(W)	72
Dimensions mm (inch)	L W H	214 (8.42) 106 (4.16) 106 (4.16)
Weight	kg (lb.)	2.5 (5.5)
Hose connection	mm (inch) OD.	28.5mm (1-1/8)

Table 4-2: Coolant Circulation Pump Data

4.2.1 Coolant Circulating Pump Dimensions

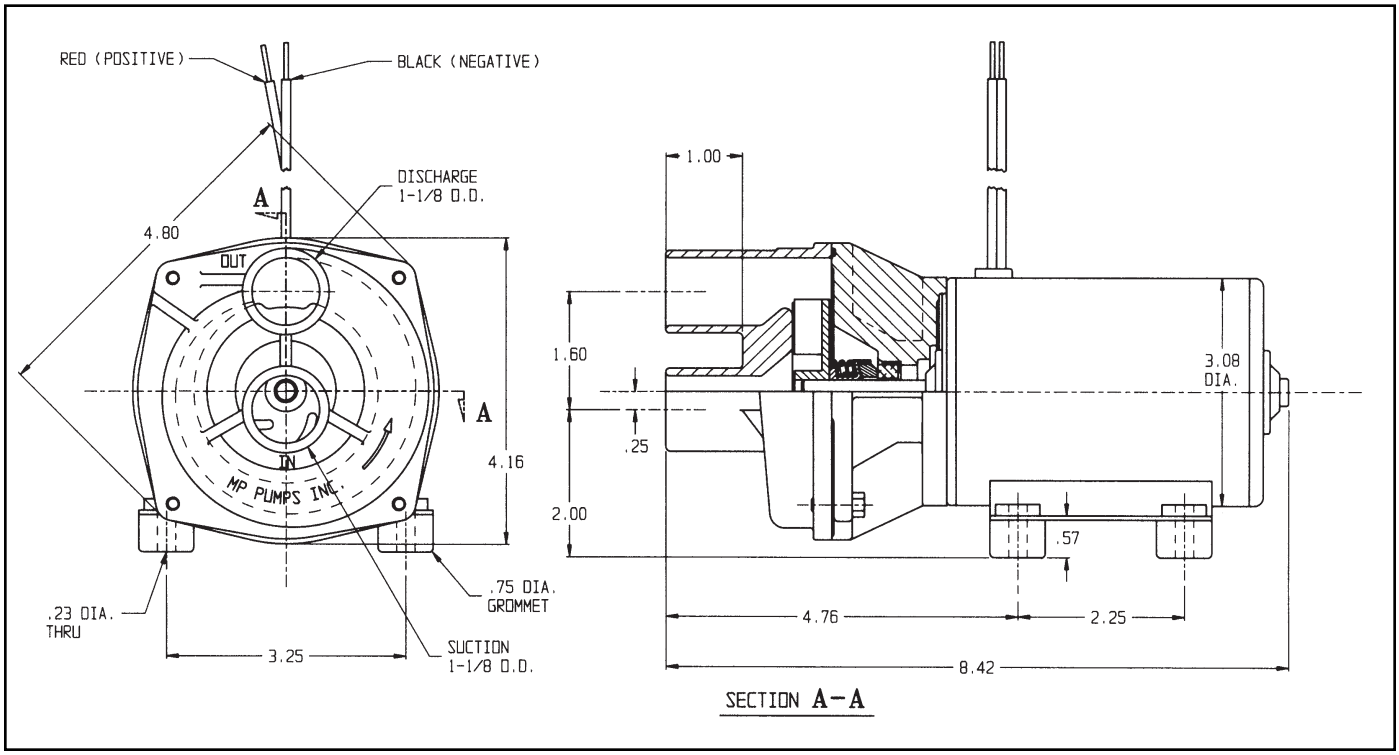


Fig. 4-2: Coolant Circulating Pump Assembly (P.N. 906017) Dimensions (Inches)

4.3 Tray Mount Dimensions

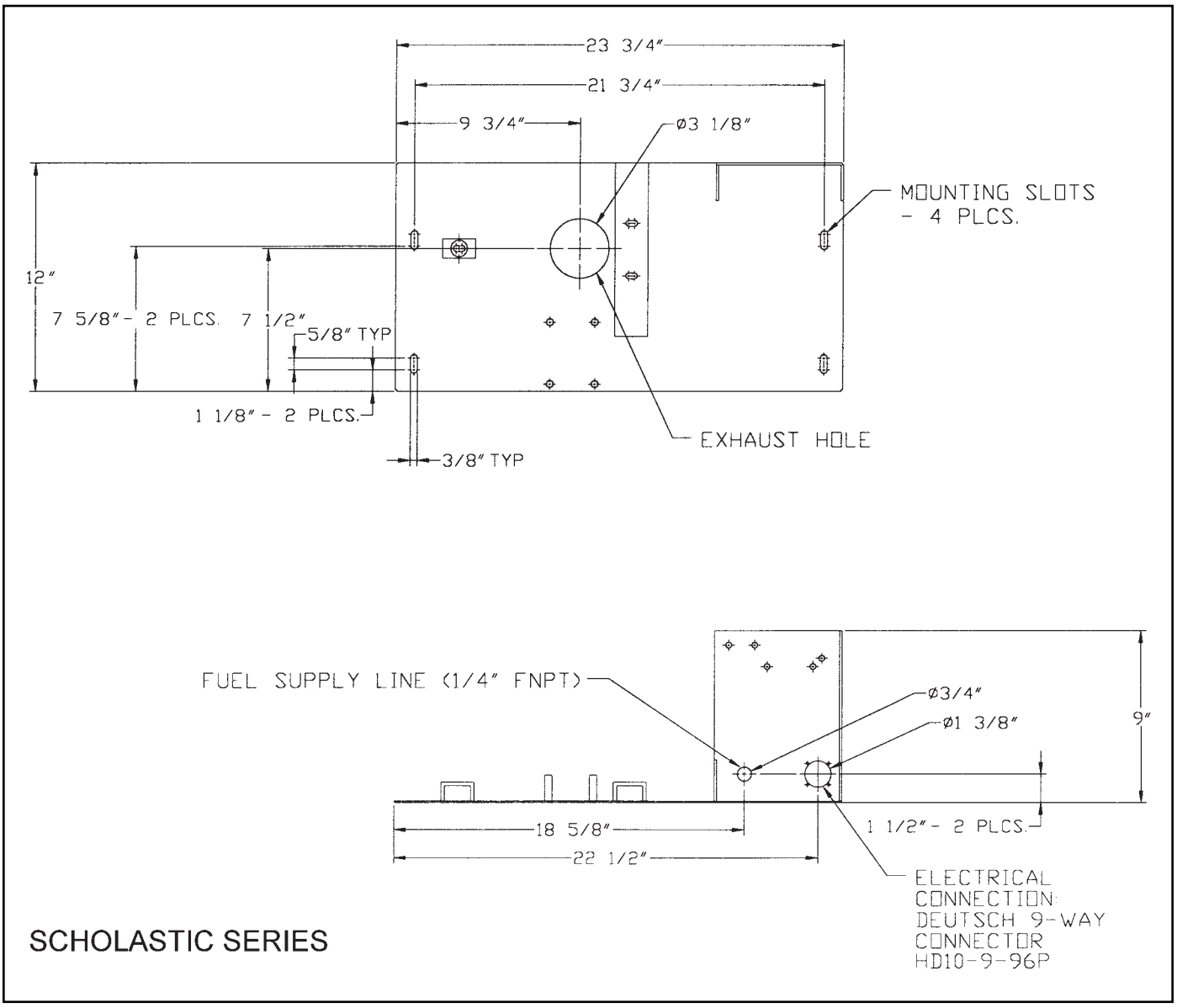


Fig. 4-3: Tray Mount Dimensions (Inches)

5. Installation

5.1 General Information

Webasto will take you step by step through the installation process to ensure successful operation for years to come. The installation must be performed in accordance with the installation instructions provided in this manual.

NOTE:
This manual does not cover all possible installations. This manual is a general guideline only. For special applications or installations differing from what is described in this manual, contact Webasto Thermosystems directly at 1-800-555-4518 for further information.

5.2 Installation Locations

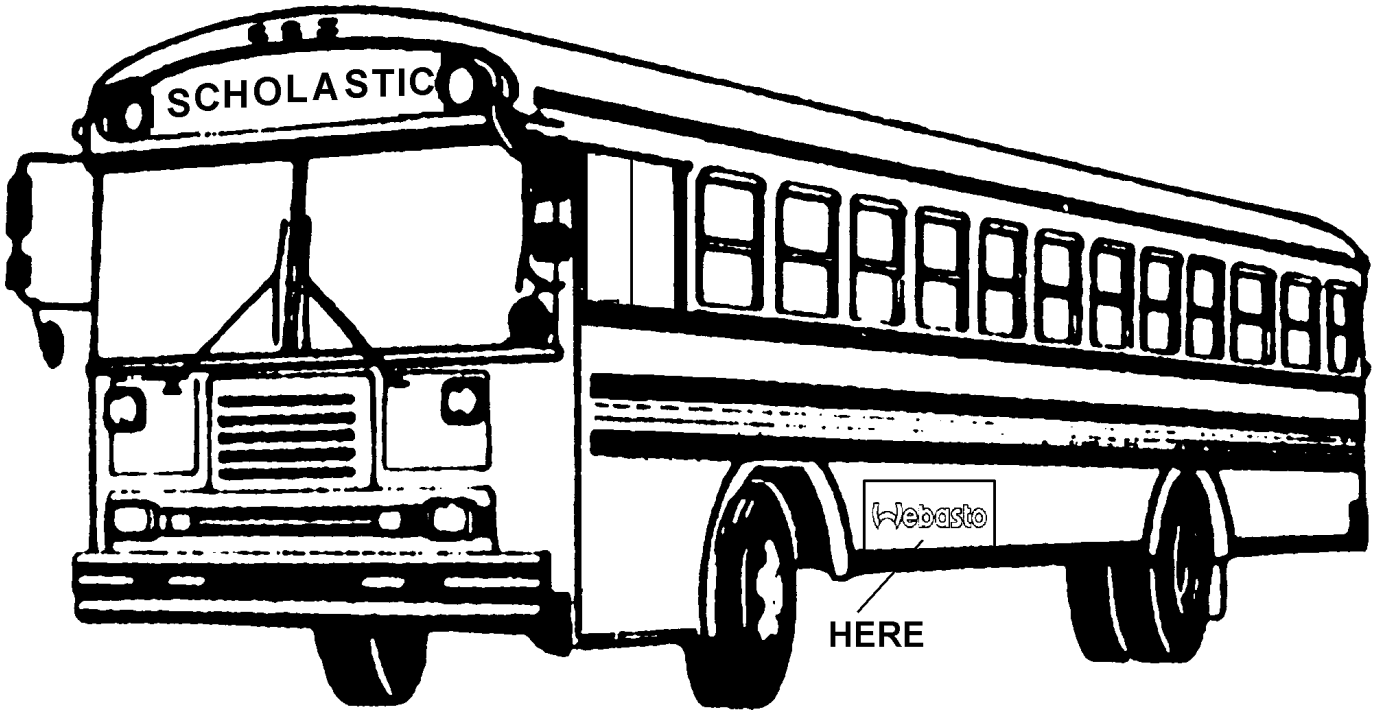


Fig. 5-1: Installation Locations

⚠WARNING
Due to the risk of carbon monoxide poisoning and asphyxiation, the heater must never be installed inside the passenger compartment.

Heater is to be installed in an existing enclosure (spare battery compartment) on the driver's (road) side of vehicle. The installation template provided with heater kit must be used.

Do not mount to the slide-out tray. The heater and tray must be mounted solidly. The heater inertia safety switch will only function properly if the heater and tray are mounted solidly.

The heater should be installed as low as possible in the cooling system to assure static bleeding of the heater and the circulating pump.

NOTE:
The coolant circulating pump is not self-priming. Always prime coolant circulating pump, heater and cooling circuit before initial starting of heater. See section 5.9 "Initial Operation."

5.3 Mounting the Heater

Tray Kit mounting in existing enclosure on vehicle, i.e. battery box.

1. Ensure that the enclosure is large enough to accommodate the heater. Use the installation template provided with the heater kit.
2. The installation enclosure must provide adequate ventilation for combustion air requirements [20 cm² (4 in²)].
3. Lay the supplied installation template in the enclosure. Center punch the exhaust, fuel, electrical and 4 mounting hole locations.
4. Drill all required holes to the dimensions as shown on the template.
5. Solidly bolt the tray with heater mounted inside the enclosure.

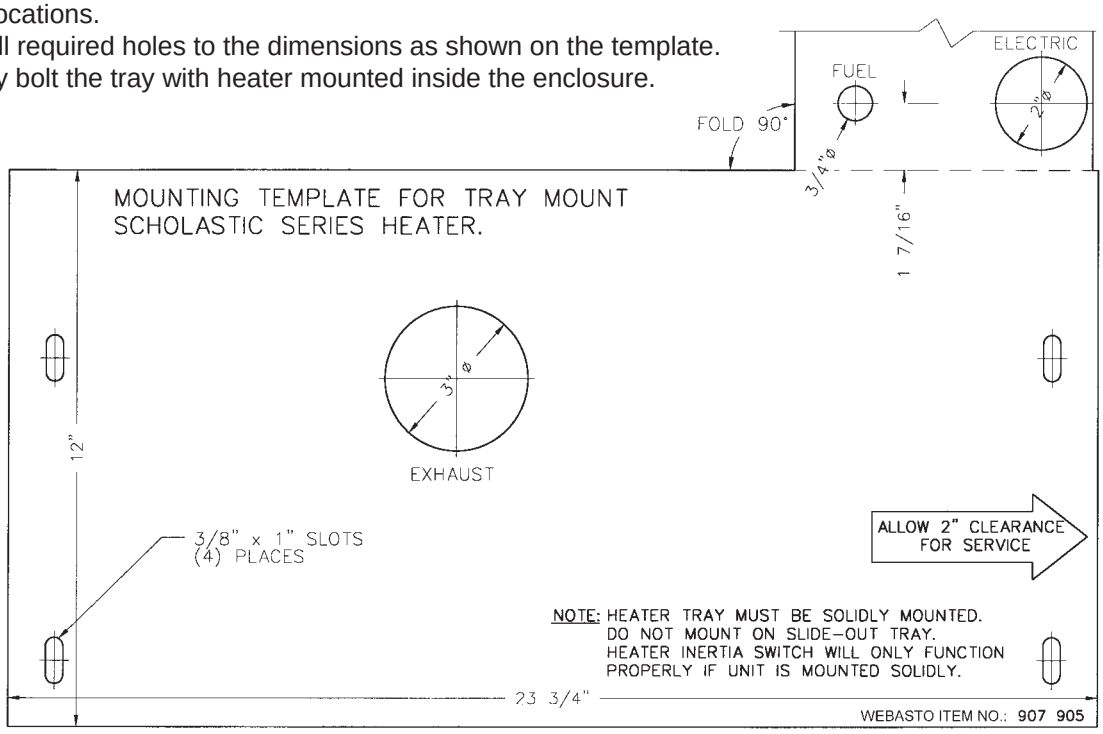


Fig. 5-2: Tray Mount Template (Supplied with Heater Kit)

5.4 Exhaust Pipe Connection

⚠WARNING

Due to the risk of carbon monoxide poisoning and asphyxiation, exhaust system components must be routed in a manner that prevents exhaust fumes from entering the passenger compartment.

1. Insert the supplied flexible exhaust pipe to the heater and fasten with the exhaust clamp. Fasten the outlet end to the chassis with the “P” clamp provided.
2. The exhaust system must discharge on the street (driver) side of vehicle. The discharge opening of the exhaust pipe must not point in the direction of travel, and so located that any clogging caused by snow or mud is not to be expected.

The exhaust pipe I.D. 38 mm (1 1/2”) can have a length up to 5 m (16’) and may have several bends totaling no more than 270° overall.

Rigid exhaust pipe may be used; bends must be formed (smallest bending radius 85 mm (3 3/8”). Do not weld pipe to make 90° corners. Any condensation water in the exhaust pipe must be discharged. If necessary, drill a drain hole at the lowest point.

NOTE:

Route the exhaust components in a way that prevents them from touching vehicle parts that may be damaged by heat (brake lines, electrical wiring, hoses, etc.). Do not direct exhaust outlet towards heat sensitive vehicle components.

5.5 Combustion Air Supply

⚠WARNING

Due to the risk of carbon monoxide poisoning and asphyxiation, never draw combustion air from inside the vehicles passenger compartment.

1. Never draw combustion air from inside the vehicle, or from areas where fumes or gases can accumulate.
2. The installation housing must provide adequate ventilation for combustion air requirements [20 cm² (4 in²)].

5.6 Plumbing into the Coolant System

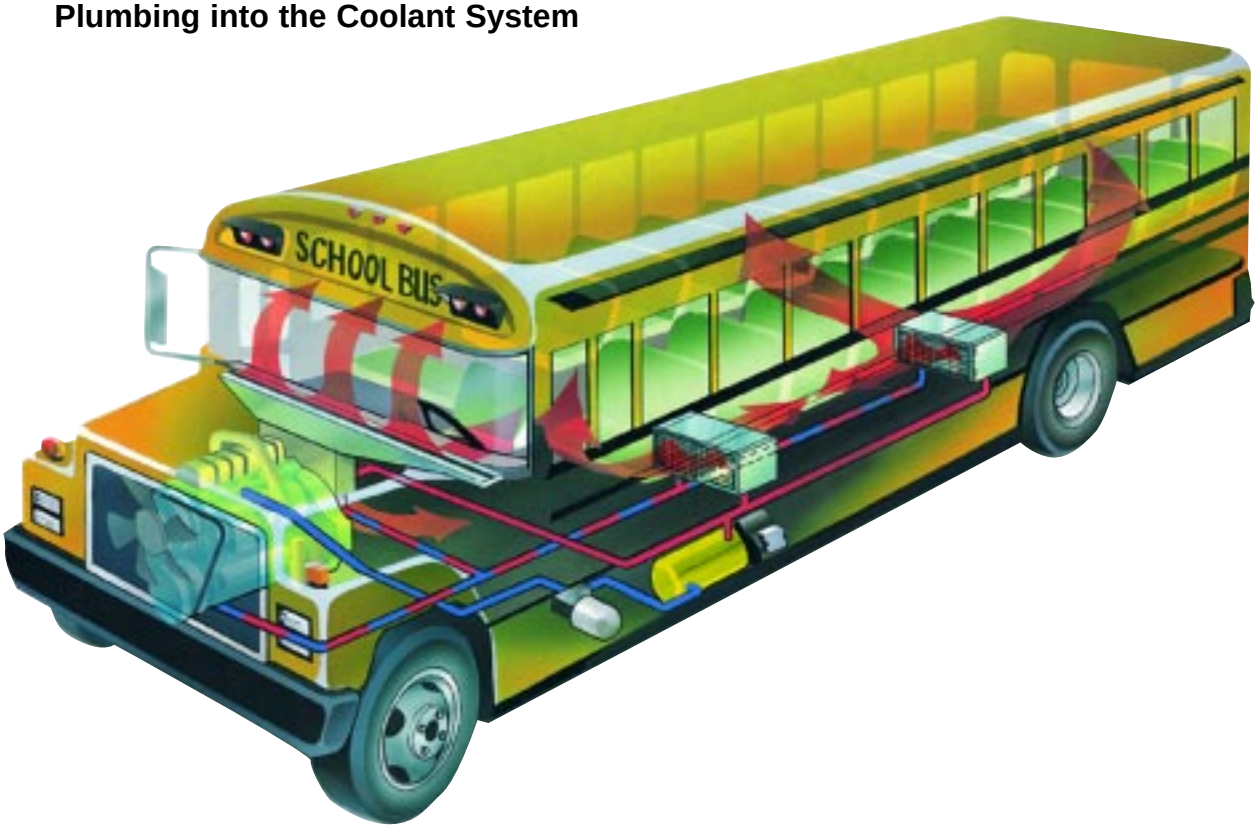


Fig. 5-3: Typical School Bus Heating Circuit

5.6.1 General Information

An efficient heating system must have an adequate supply of hot water to all heater cores. The amount of hot water available to a typical three or four heater-core system depends on the water pumps capability and the amount of restriction within the coolant system.
The Webasto heater is equipped with a high-performance circulating pump designed specifically for bus heating applications, and when plumbed in accordance with the following instructions, will maximize the heating systems efficiency.

The coolant-circulating pump (bottom of Enclosure or Tray) must be mounted at least 150 mm (6”) below the lowest permissible coolant level of the vehicles cooling system. A minimum of 10% of a good quality antifreeze should be maintained in the cooling system at all times. Heater and water pump fit 25.4 mm (1”) ID. heater hose meeting SAE 20 R3 specifications. Silicone hose requires special hose clamps.

NOTE:

Heater hose must meet SAE 20 R3 specifications. Silicone heater hose requires special hose clamps. Hose clamps must be tightened to 5 Nm (45 lb/in.) torque.

5.6.2 Engine and Passenger Compartment Heating

⚠WARNING

Potential skin and eye burn risk. When working on the coolant system, allow the engine and coolant to cool down and open the radiator cap carefully.

Heater Cores arranged in Series

A series heating system works in this fashion:
Heated water (coolant) from the engine travels through the first heater core in the circuit, then on to the next heater core in the circuit, and on to the next, etc. Each core adds some restriction, resulting in decreased water flow. Not only is water flow reduced, but also water temperature is reduced by each successive heater core resulting in the last core receiving water that is usually too cool to be effective. A fuel fired Webasto heater equipped with a high capacity coolant pump can significantly increase the available heat supplied to a series plumbed system. The advantages are increased coolant volume and flow through the system ensuring efficient interior heating through all heater cores.

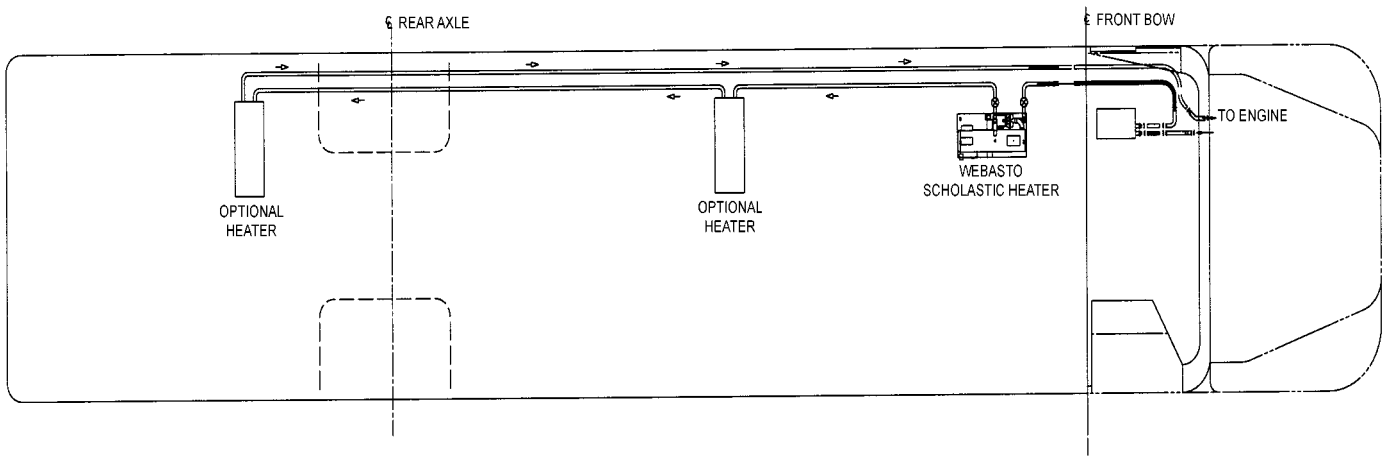


Fig. 5-4: Series Plumbing Circuit - Conventional Model

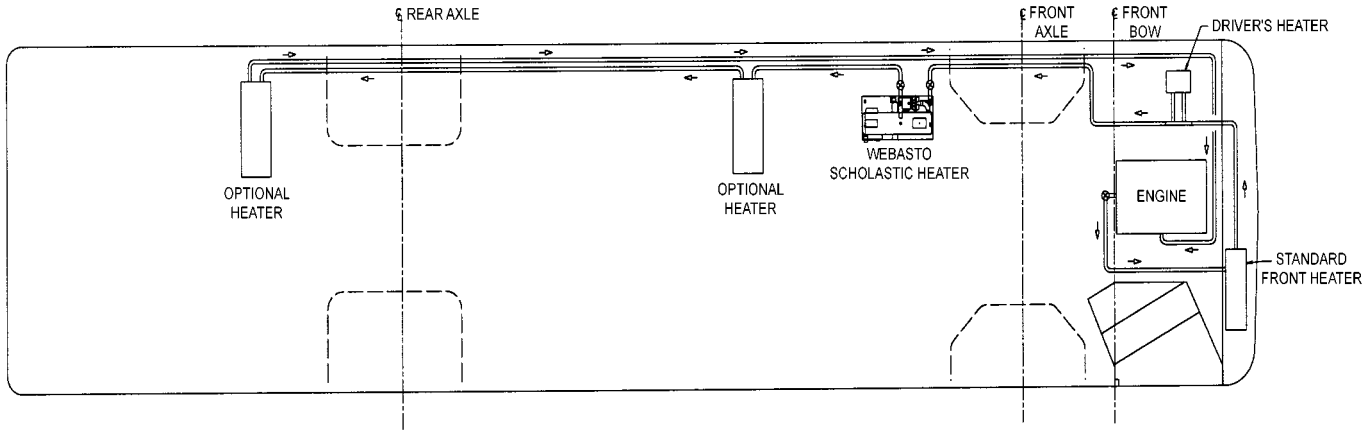


Fig. 5-5: Series Plumbing Circuit - Transit Model (Engine Front)

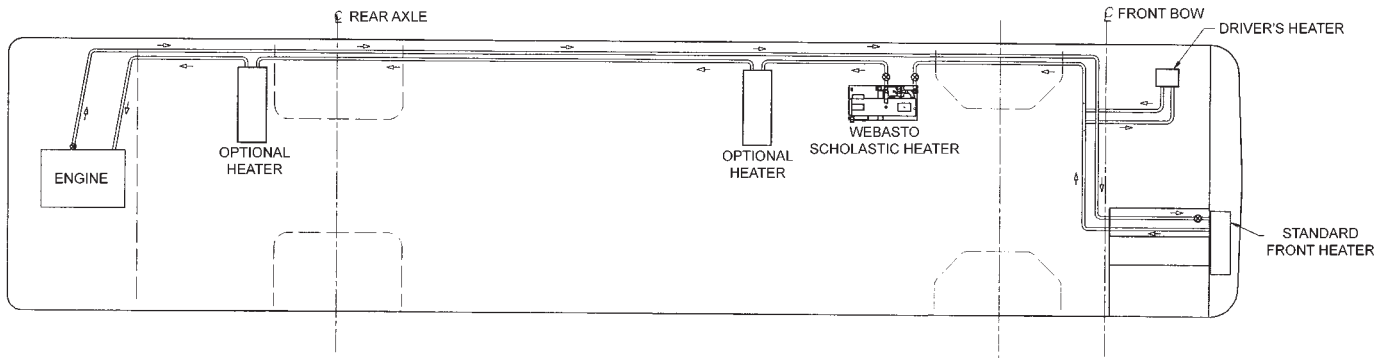


Fig. 5-6: Series Plumbing Circuit - Transit Model (Engine Rear)

5.6.3 Instructions for Integrating into the Coolant System

STOP!

CAREFULLY READ AND UNDERSTAND THE FOLLOWING INSTRUCTIONS BEFORE PROCEEDING WITH INSTALLATION!

1. Remove the radiator cap and release system pressure.

2. Close the shut off valves for heating system, if so equipped, or pinch off the supply and return line with hose clamping pliers.

3. Plumb into the system as shown in figure 5.4 or 5.5.
   Two long brass 90° elbows with mounting flanges have been provided for making connections into existing coolant lines. To install:
   - remove heater hose access cover(s) running down left side of floor inside bus at a location over top of heater installation.
   - find and identify heating circuit supply hose. This is the hose you will use to plumb the Webasto heater into the system.
   - locate and mark suitable location on floor (above heater) where brass elbows will be installed.

NOTE: When properly installed, the elbows should protrude down into the heater enclosure area where they can be easily connected to the coolant pump inlet and heater outlet.

   - once you are satisfied with the location, making certain there are no obstructions, you can now bore 2 holes 32 mm (1-1/4") through the floor.
   - from inside the bus, drop elbows down through the floor and align with the heating circuit supply hose, inlet elbow pointing forward and outlet elbow rearward.
   - secure elbow flanges to floor with sheet metal screws.

4. From inside the heater enclosure, connect the inlet elbow (supply) to the coolant pump and the outlet elbow to the Webasto heater outlet with rubber elbows and fittings provided.

5 From inside the bus, cut the previously identified heating supply hose at a point where it can be connected to the inlet and outlet elbows.

6. Connect the heater supply line running from the engine to the inlet elbow. Connect the other cut end of the supply line to the outlet elbow.

7 . Secure all hose connections with hose clamps.

8 Remove hose clamping pliers and/ or open shut off valves.

9. Purge air from the Webasto heater by opening the bleeder valve screw (see page 2-1, figure 2-1, item 26).

10. Top off engine coolant as per engine manufacturer's recommendations and re-install the radiator cap.

Do not install the previously removed heater hose access covers at this time. Hose connections will require inspection and re-tightening of clamps once installation is completed and tested (see section 5.9 "Initial Operation").

NOTE:
Heater hose must meet SAE 20 R3 specifications. Silicone heater hose requires special hose clamps. Hose clamps must be tightened to 5 Nm (45 lb/in.) torque.

5.7 Fuel System

5.7.1 General Description

The fuel is drawn from the vehicles fuel tank through a fuel standpipe. This standpipe can be utilized on vehicles with a threaded port in the fuel tank for this purpose.

IMPORTANT! Keep the fuel standpipe 50 mm (2”) from bottom of the fuel tank.

5.7.2 Fuel Supply

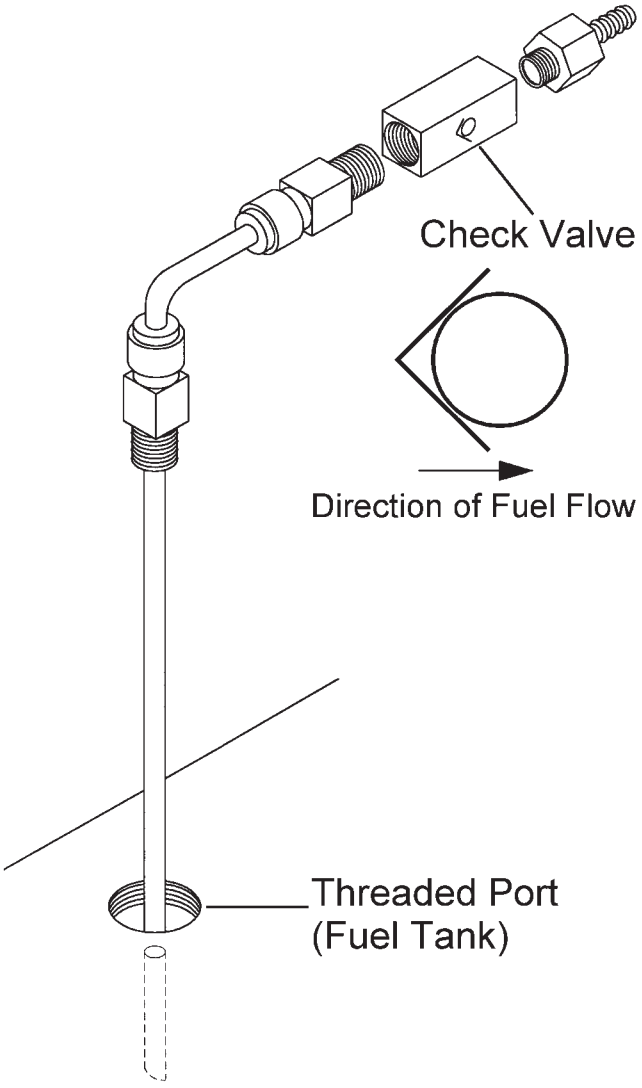


Fig. 5-7: Fuel Standpipe Installation

The fuel standpipe and fuel line must be installed according to these instructions to ensure proper heater operation.

1. Cut or extend universal fuel standpipe to length, approx. 50 mm (2”) off fuel tank bottom. Slash cut standpipe end on a 45° angle to help prevent clogging.

NOTE:
After fuel standpipe has been cut to length, remove all burrs from cut inlet end. Check valve directional indication mark (arrow or symbol) must point in direction of fuel source (fuel tank).

2. Install the universal fuel standpipe and 3/8” check valve. Check valve directional indication mark (arrow or symbol) must point in direction of fuel source (fuel tank).
   - use 1/4” or 1/2” spare port on fuel tank and install fuel standpipe securely in fuel tank, use pipe thread sealant on all pipe threads.

3. Route and secure fuel line from heater to fuel tank. Do not route fuel line over frame rails, always route through or under the frame rail. Use grommets to protect fuel line whenever routed through holes.

4. Connect fuel line to fuel standpipe using 3 mm (1/8”) fuel hose meeting SAE 30RI specifications.

⚠CAUTION

On School Bus applications, fuel lines must not cross over top of the vehicle frame rails. Check local and State codes and regulations for exceptions.

⚠CAUTION

Fuel lines must be secured every 30 cm (12 inches) or less and kept clear of hot exhaust components and moving parts (driveshaft, wheels, etc.).

NOTE:

Use supplied hose clamps to secure fuel line connections.

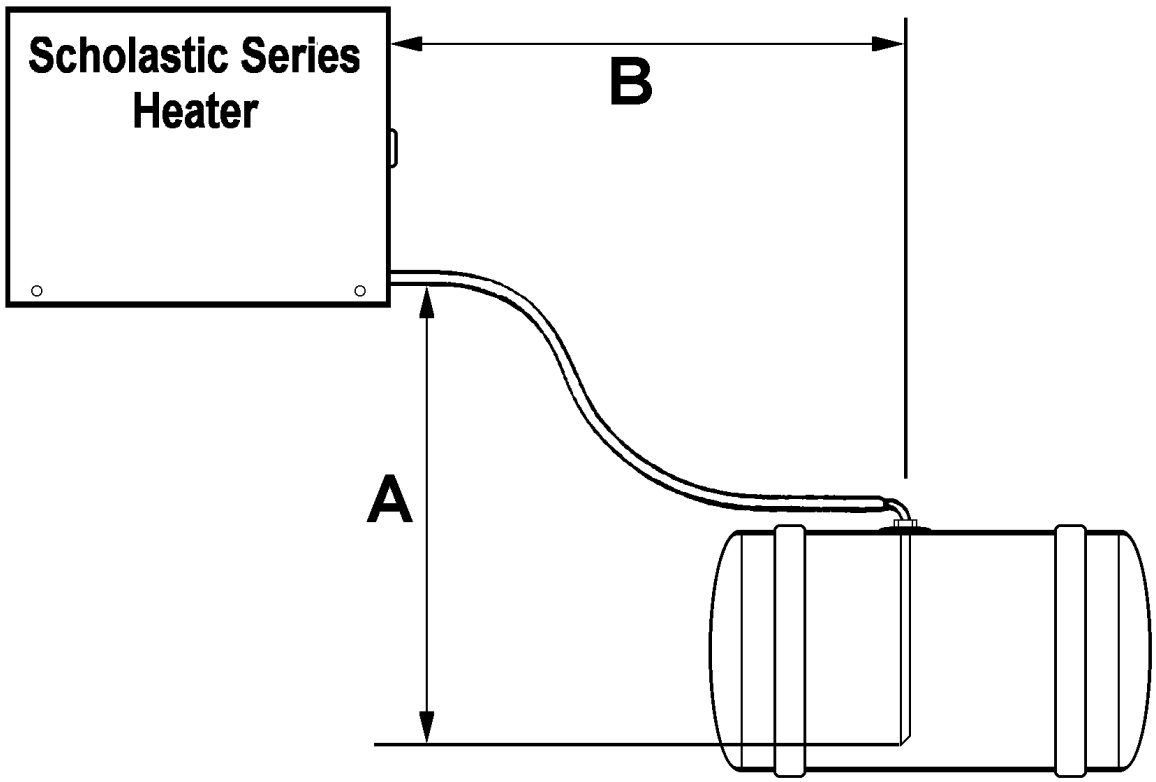


Fig. 5-8: Fuel Line Parameters

A = Suction height 2.0 m (6’6”) maximum
A+B = Suction length 10 m (33’) maximum

5.7.3 Fuel Filter

⚠CAUTION

Check local and State codes and regulations for fuel filter mounting locations.

⚠CAUTION

To prevent fuel nozzle failure, always use CLEAN fuel from a known CLEAN source for priming fuel systems and filters.

Your heater is equipped with a spin-on fuel filter. Fuel filters require changing at least annually and in cases of dirty fuel more often.

The fuel filter assembly should be mounted securely between the vehicle frame rails close to the fuel tank. After installation, before the heater is fired for the first time, the fuel filter MUST be filled with CLEAN diesel fuel. When replacing the fuel filter, this procedure must be repeated to ensure proper firing and operation.

NOTE

The Webasto Scholastic Series heater is equipped with an internal self-priming fuel pump.

5.8 Wiring Connections

5.8.1 General Information

The control unit is equipped with low voltage protection, therefore it is imperative to keep vehicle batteries in good condition. Red labeling or markings indicating 12 volts identify electrical components for the Scholastic Series heater. Green labeling or markings indicates 24 volt components, which are not suitable for this version of heater.

⚠CAUTION

To protect the electronic control unit when welding is performed on the vehicle, the heaters main power supply wires must be disconnected from the main power source and temporarily grounded to the chassis.

NOTE

The Webasto heating system will not perform to your satisfaction with weak batteries.

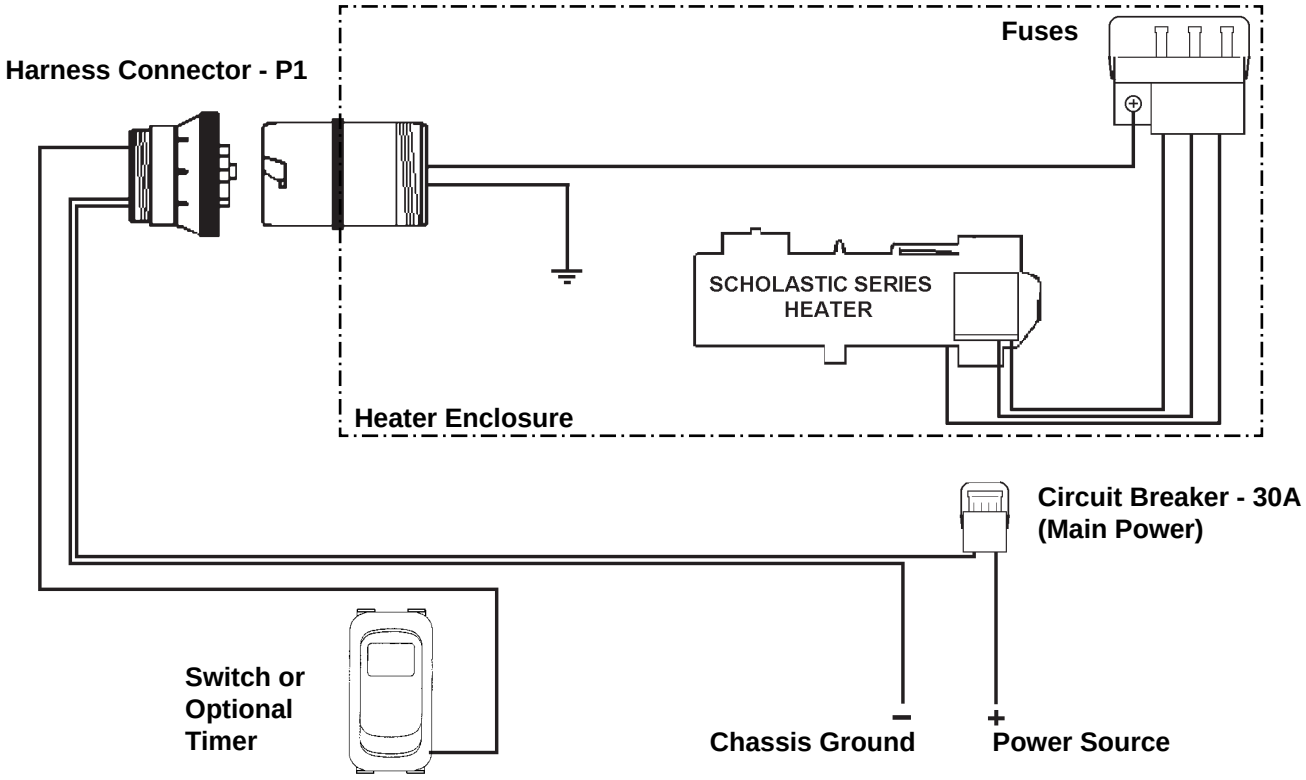


Fig. 5-9: Harness Connection Points (Overview)

5.8.2 Connecting Power Harness to a Constant Power Source

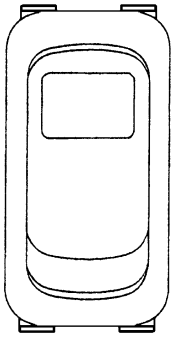
⚠CAUTION

Leave round waterproof harness to heater enclosure connector (P1) uncoupled until completion of heater installation.

1. Route and secure the wire harness from the Webasto heater to constant power source and cut harness to length.
2. Connect the positive leads to a 30 amp. circuit breaker connected to a constant power source.
3. Connect ground lead to ground stud.

Refer to wiring diagrams on pages 5-13, 5-14, 5-15 and 5-16 appropriate to your installation.

5.8.3 Timer and Switch Connections



For switch connection details (pin-outs) see wiring diagrams (fig.5-13, 5-14) on pages 5-13 and 5-14 appropriate to your installation.

Fig. 5-10: On/Off Switch

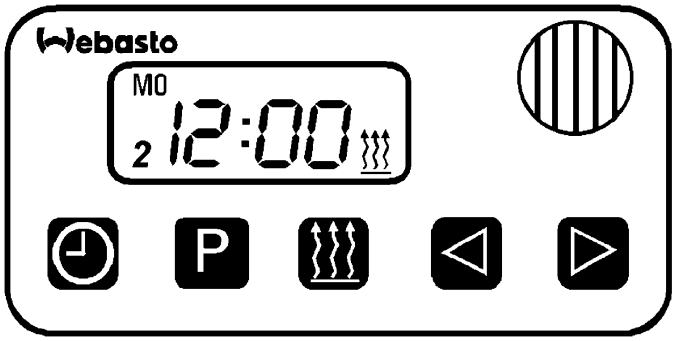


Fig. 5-11: 7-Day Digital Timer Model 1531

Pin-Out	Connect To:
1	Vehicle Dash Lights (Optional)
2	Terminal 86 of Relay K1
4	Chassis Ground (Negative)
8	To Control Unit Terminal Location B3
10	To Vehicle Ignition Signal (Positive)
11	Terminal 87 of Relay K1 or Constant
12	Chassis Ground (Negative)
3, 5, 6, 7 and 9	Not Used

For timer connection details (pin-outs) see wiring diagrams (fig.5-15, 5-16) on pages 5-15 and 5-16 appropriate to your installation.

5.8.4 Timer and Switch Installation

⚠CAUTION

Make sure there is enough space behind the dash for the switch or timer and wire connections before cutting any holes.

⚠CAUTION

To prevent damage to electrical and mechanical components, check for clearance before drilling into panels and frame members.

1. Locate appropriate switch knock-out (blank) on instrument panel for heater On/Off switch or select a suitable location in the vehicle dash for the (optional) timer.

2. Remove switch knock-out and replace with appropriate switch. Timer is supplied with a removable stick-on drilling template.

3. Route and secure switch harness from the heater to the vehicle dashboard. If possible use existing hole in fire wall/ panel or drill in suitable location. Protect the harness with a grommet whenever passing through fire wall/ panel holes.

4. Connect the terminals to the switch or timer. See pages 5-13, 5-14, 5-15 and 5-16 for complete wiring details.

5.8.5 Wiring Diagram – Scholastic Series Heater

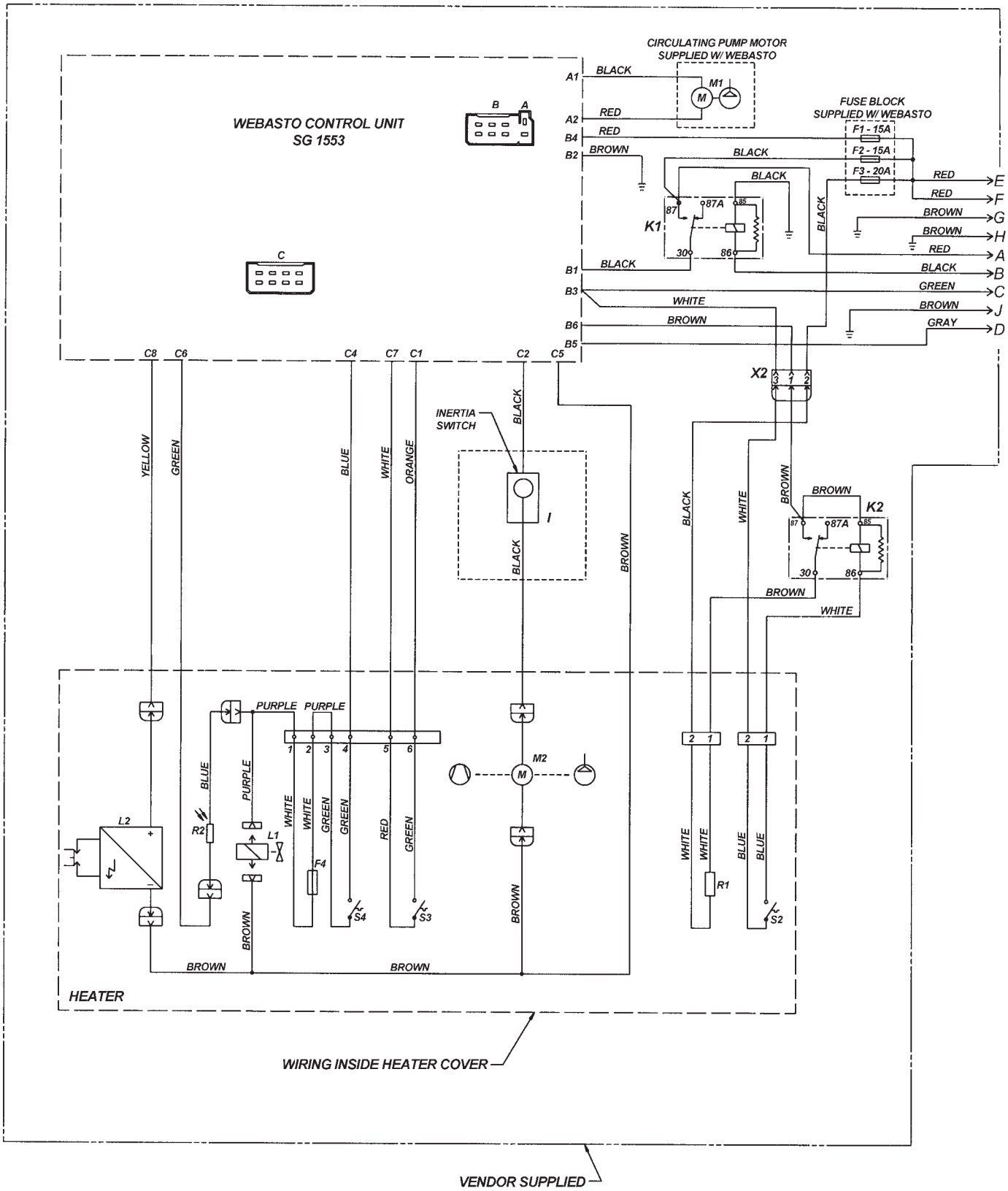
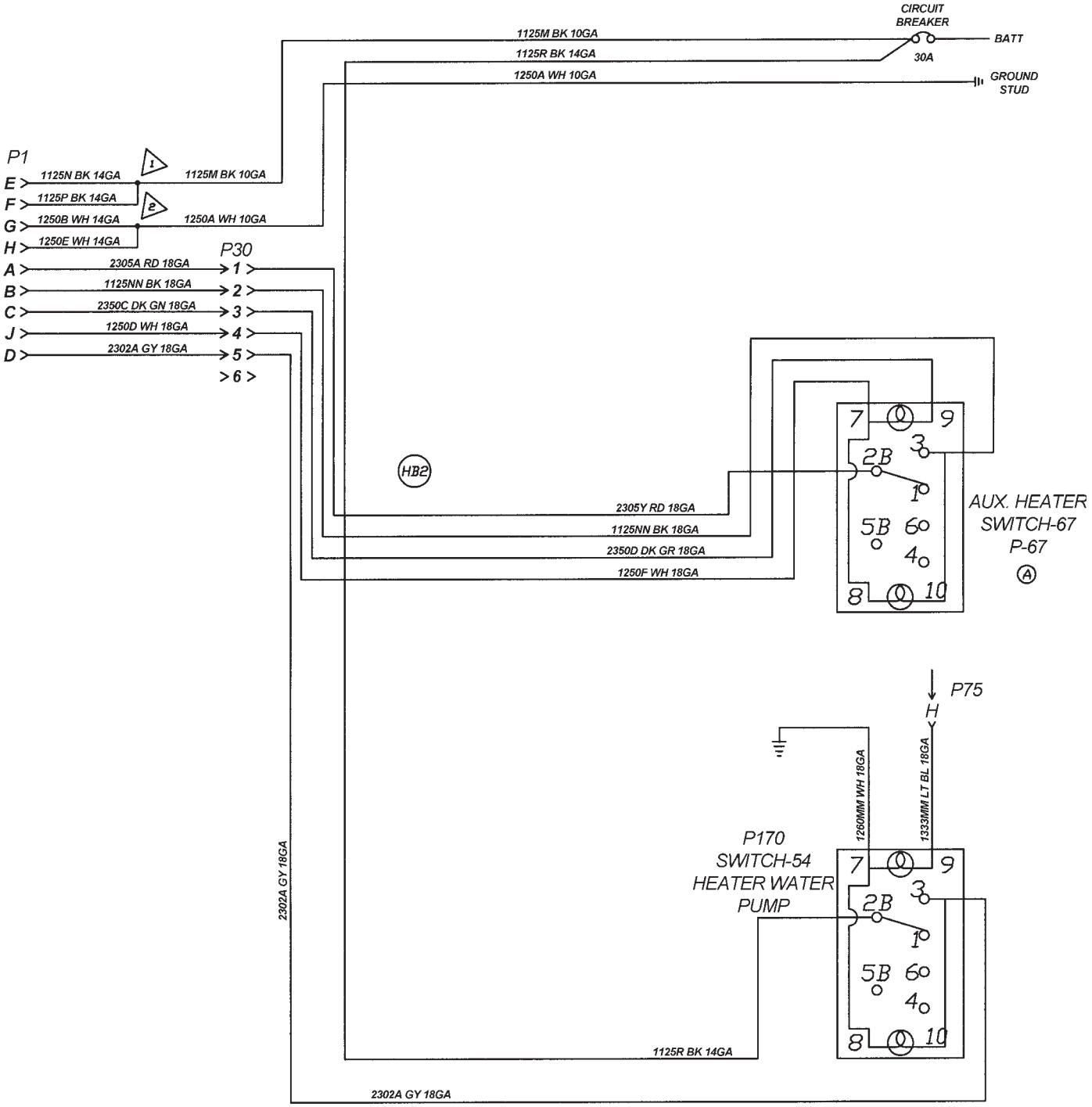


Fig. 5-12: Wiring Diagram - Scholastic Series Heater

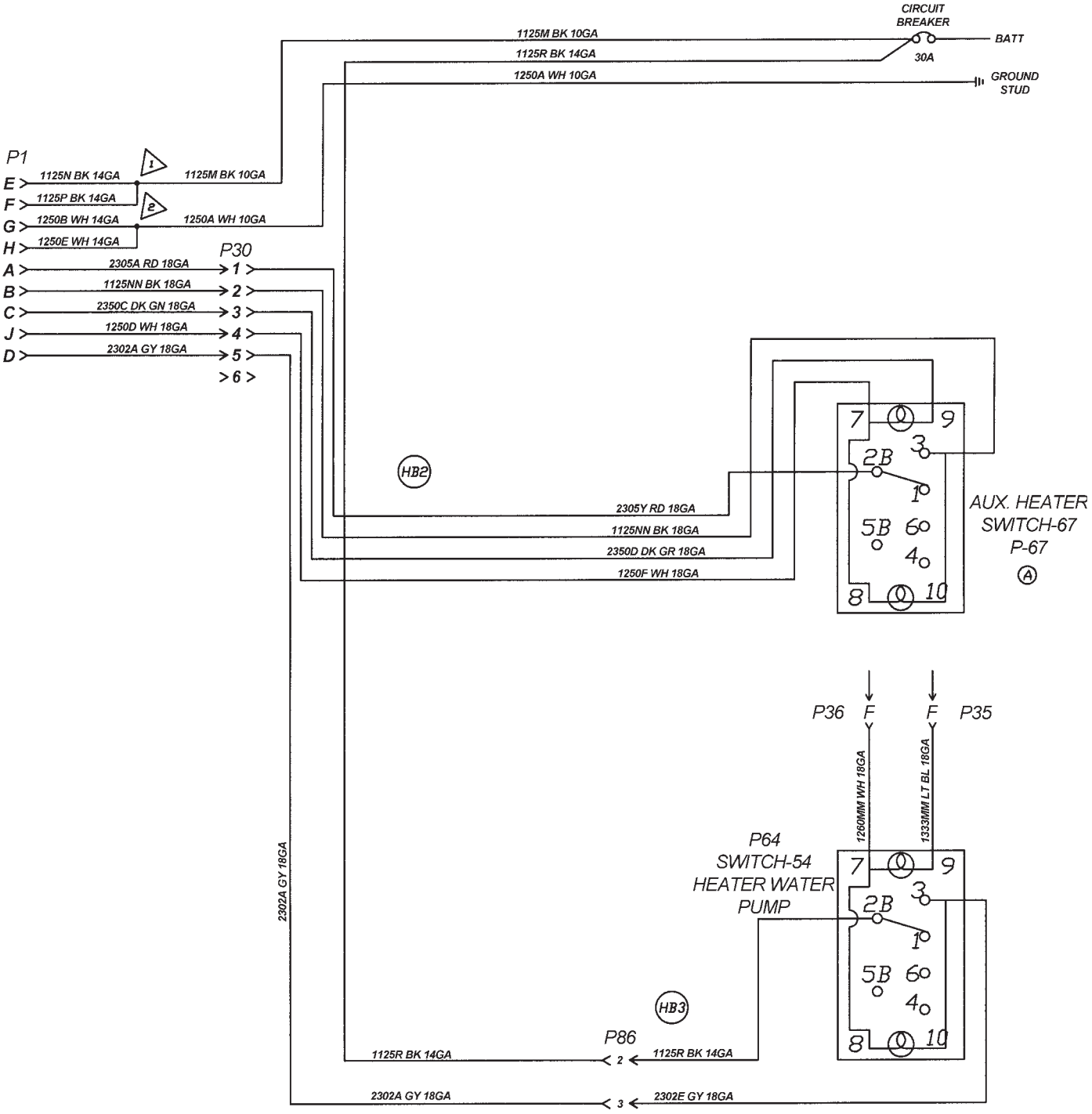
5.8.6 Wiring Diagram – Chassis / Power Harness with Switch



0030777A
Option 1345-03

Fig. 5-13: Wiring Diagram - Chassis / Power Harness with Switch

5.8.7 Wiring Diagram – Chassis / Power Harness with Switch



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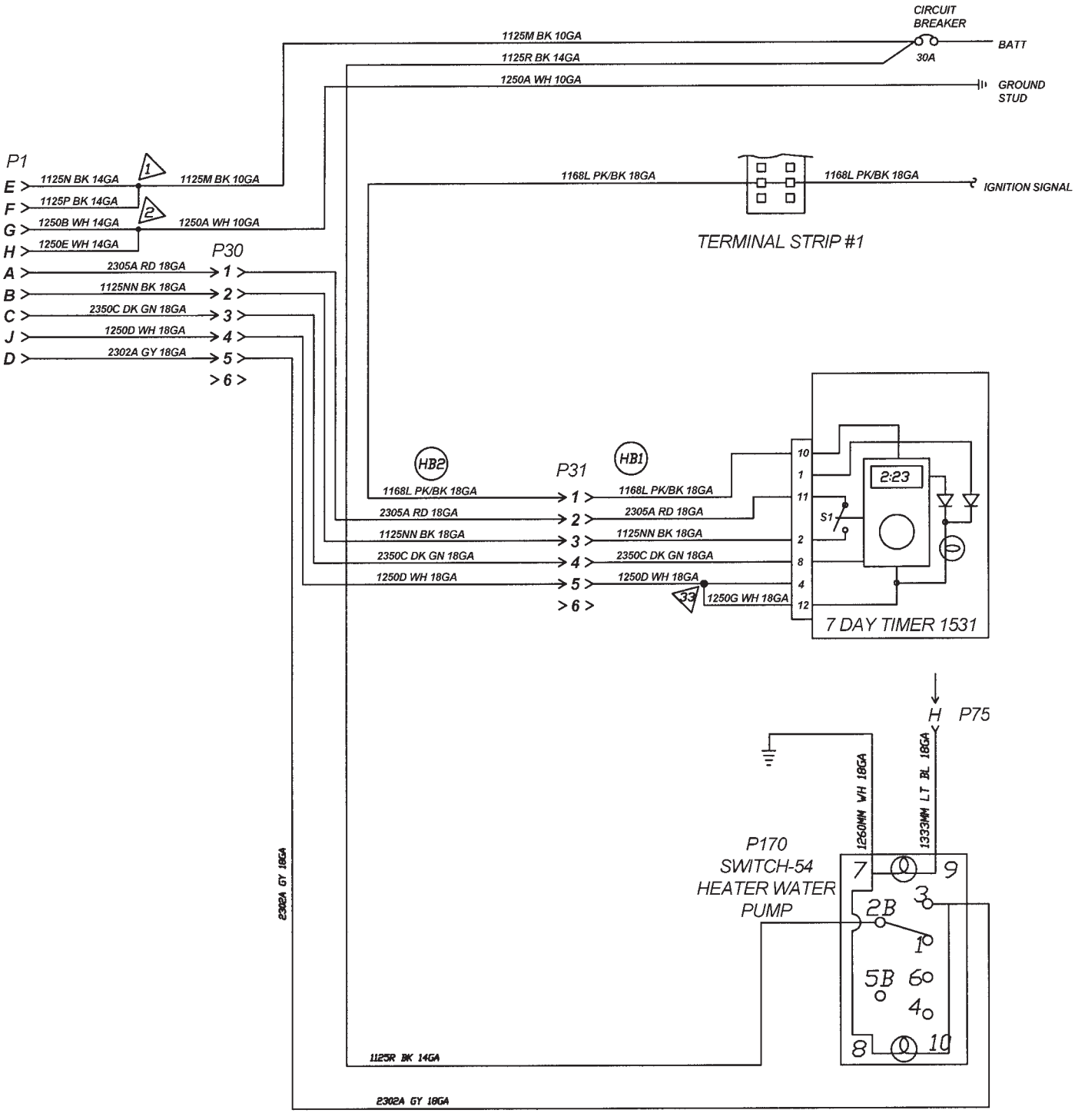
Option 1345-03

Fig. 5-14: Wiring Diagram - Chassis / Power Harness with Switch

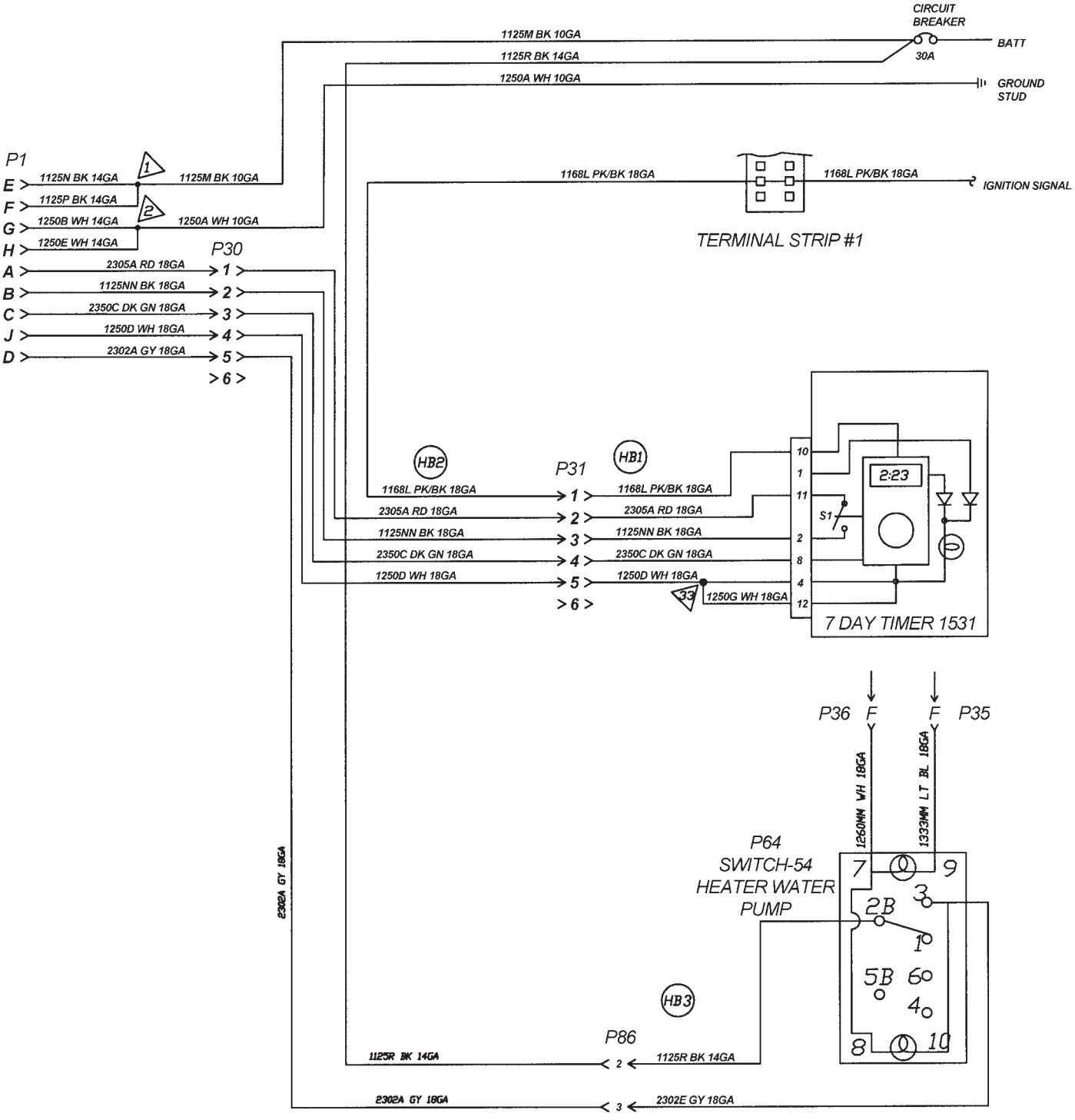
5.8.8 Wiring Diagram – Chassis / Power Harness with Digital Timer Model 1531



0030778
Option 1345-04

Fig. 5-15: Wiring Diagram - Chassis / Power Harness with Digital Timer Model 1531

5.8.9 Wiring Diagram – Chassis / Power Harness with Digital Timer Model 1531



0030512
Option 1345-04

Fig. 5-16: Wiring Diagram - Chassis / Power Harness with Digital Timer Model 1531

5.9 Initial Operation

1. Check your installation for:
   - loose nuts and bolts.
   - exhaust pipe routing and clamp tightness.
   - loose hose clamps.
   - routing and securing of wiring and heater hoses.
   - kinked or pinched hoses.
   - battery connection and polarity.
   - disconnect control thermostat on Webasto heat exchanger (red and green wire, see page 2-1, figure 2-1, position 13).

2. Top off or refill cooling system with coolant as per engine manufacturer's recommendations.

3. Connect power/ switch extension harness to waterproof plug.

4. Open shut-off valves and driver's heater valve.

5. Set heater controls to maximum heat position and turn off Air Conditioning if applicable.

6. Switch "On" Webasto heater and check:
   - green indicator light on.
   - circulating pump in operation.

7. Start the vehicle engine and run it at a fast idle for 10 minutes to purge air from the Webasto coolant heater and all of the heat exchangers. While the engine is running check:
   - hose connections for leaks.
   - coolant level in the expansion tank and add coolant as needed.
   - use bleeder valve screw on top of Webasto heat exchanger to purge out any trapped air (see page 2-1, figure 2-1, item 26).

8. Shut off the engine.

9. Plug in control thermostat, the blower motor starts and the fuel pump primes the fuel lines. After 10 to 25 sec. the fuel solenoid opens and the electronic ignition coil ignites the air fuel mixture.

NOTE

Installations with long fuel lines may require a second start attempt to prime the fuel system. Cycle switch or timer off and on to reset control unit. Coolant temperature must be below 68 °C (155 °F) at heater before heater will begin heating operation.

10. Allow heater to run until coolant is hot and heater cycles off. During this period, monitor system for any coolant or fuel leaks.

NOTE

The engine temperature gauge may read a lower temperature depending on the location of the temperature sensor on the engine.

11. Temperature differential between water inlet and outlet should not exceed 10 °C (18 °F) during heating operation.

12. Switch "Off" Webasto heater.

13. Re-tighten hose clamps to 5 Nm. (45 lb/in.) and inspect installation for leaks.

14. Install any panels and access covers removed during installation.

15. Complete the warranty card and send to Webasto Thermosystems (There is an area on the last page of this manual for recording information that is useful when calling for technical support).

NOTE

Necessary information to complete the warranty card can be found on the name plate on top of the heater burner head. The completion of the warranty card will ensure full warranty coverage. Please mail completed warranty card within 30 days of purchase to register your heater.

16. Install the enclosure cover if equipped. Installation is now complete.

6. Heater Maintenance

6.1 Annual Maintenance

⚠CAUTION

Annual maintenance requires basic product knowledge and maintenance procedures and should only be performed by Webasto trained and certified, skilled personnel. Ask your Webasto representative about training clinics.

The Webasto heater requires a minimum of maintenance to operate.
To keep your Webasto heater in good working order, the following maintenance procedures should be performed annually before each heating season:

NOTE

For major repairs and service parts, return to your authorized Webasto Thermosystems Specialist.

Enclosure Area

- clean the heater and enclosure area of any accumulated debris or dust with compressed air.
- inspect all components for wear and damage.

Electrical System

- check all wiring harnesses for damage and corrosion, repair or replace if required.
- check the condition of the batteries and the connections.
- load test the batteries and replace if necessary.

NOTE

The heater will not function properly or to your satisfaction with weak batteries.

Exhaust System

- check the exhaust system carefully for restrictions or corroded areas. Replace worn or damaged exhaust components as necessary.

Fuel System

- replace the fuel filter (prime) and inspect the fuel line for wear and damage. Repair or replace if necessary.

Burner System

- swing open the burner head, clean the flame detection (photo eye), pull out the combustion chamber, inspect and clean the inside area of the heat exchanger. Replace the fuel nozzle if necessary (annually). Reinstall the combustion chamber and close up the burner head.

Operational Check

- Run your heating system for at least 15 minutes.
- Check all water and fuel connections for leakage. Check tightness of all hose clamps if necessary.

NOTE

Operate your Webasto heater at least once a month for 10 minutes.

7. Basic Troubleshooting

7.1 General Information

⚠CAUTION

Troubleshooting requires profound knowledge about structure and theory of operation of the heater. Troubleshooting may only be performed by Webasto trained and certified, skilled personnel.

This section describes troubleshooting procedures for the Scholastic Series coolant heater. Troubleshooting is normally limited to the isolation of defective components.

Before troubleshooting, check for and eliminate the following causes for problems:

- **fuel supply (plugged fuel filter or pinched fuel line)**
- **corrosion of battery terminals**
- **corrosion of electrical wiring, connections and fuses**
- **loose contacts or wrong crimping on connectors**
- **shut-down initiated by temperature limiter (automatic reset)**
- **shut-down initiated by overheat fuse (replace fuse)**
- **shut-down initiated by inertia switch (manual reset)**

NOTE

After the correction of a problem or defect, a functional test of the heater as installed in the vehicle must be performed.

7.2 Quick Check Troubleshooting Matrix

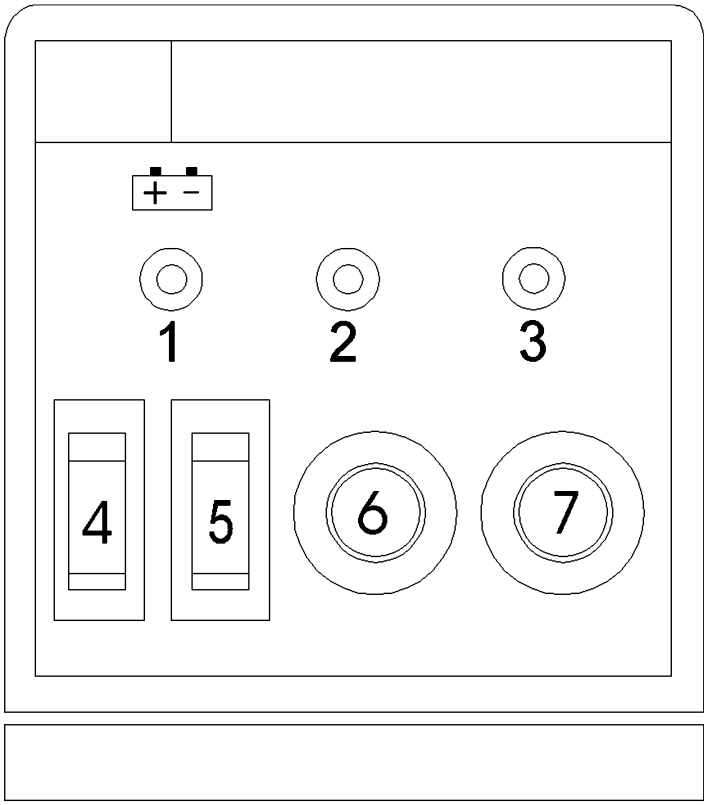
PROBLEM		CHECK, REPAIR OR REPLACE IF NECESSARY																		
		Check Voltage Supply	Electrical Fuse	Electrical Harness and Connection	Switch	Overheat Fuse or Temperature Limiter (green wires)	Control Thermostat (green and red wires)	Flame detector	Control Unit	Ignition Electrodes	Ignition Coil – Coil Wire	Electric Motor	Fuel Supply	Fuel Pump	Fuel Solenoid Valve	High Pressure Nozzle	Coolant Circulating Pump	Combustion Air Intake	Exhaust System	Heating System	Inertia Switch
Switch On	No Function	●	●	●	●		●		●												●
Control Light	OFF after 30 Seconds					●		●	●	●	●	●	●	●	●						
Blower Motor in Unit	Does Not Run	●	●	●			●		●			●									●
Blower Motor in Unit	No Prime Cycle	●							●												●
Blower Motor in Unit	No After Run								●												●
Coolant Circulation Pump	Does Not Run	●	●	●					●			●									
Ignition Spark	Absent		●	●				●	●		●										
Combustion	Does Not Take Place					●			●	●	●		●	●	●	●					
Combustion	Stops after 30 Seconds	●		●			●		●												
Combustion	Cannot Be Stopped				●				●						●						
During Combustion	Light Colour Smoke											●	●		●						
During Combustion	Dark Colour Smoke	●			●							●	●					●	●		
Heating Unit	Overheating			●			●		●							●				●	

Table 7-1: Quick Check Troubleshooting Matrix

7.3 Heater Test Unit (Webasto P.N. 440280)

The tester unit has been designed to quickly check the proper operation of the various heater components. By using the tester in place of the heater control unit, you are able to manually control the heater to test components and actually operate the unit in heating mode.

The actual testing is completed in two steps, first you perform an individual component test and then a manual start and run test, both designed to pinpoint actual problems in the heater system.



① LED - input power to heater
② LED - control thermostat
③ LED - flame detector
④ On/Off switch - water pump
⑤ On/Off switch - motor
⑥ Push button - ignition spark coil
⑦ Push button - fuel solenoid valve

Fig. 7-1: Test Unit P.N. 440280

7.4 Test Procedures

⚠WARNING

Do not attempt to test fire or run heater with burner head open. Ensure burner head is properly closed and secured in place.

NOTE

Make sure the Water Pump and Motor Switches ④, ⑤ are in the off position before connecting to the heater.

1. Setup
   - Remove connector blocks from heater control unit, inspect for loose wires, corrosion and proper wire connections.
   - Plug control unit connector blocks into tester.
   - Set heater switch/timer to “ON” and turn vehicle heater valve to “FULL” mode (if equipped).
   - Proceed to component test procedures.

2. Component Test Procedures and Results

Test Step	Result	If not
Tester connected	BATTERY LED ① unit lights up	- test input voltage at control terminals B4(+) and B2(-) - check battery connections - check battery voltage
	CONTROL THERMOSTAT LED ② lights up	- test switch/ timer - test control thermostat on heater Normal operating range - approx. 75 °C (167 °F) or higher open (no heat required) - approx. 68 °C (155 °F) or lower closed (heat required)
Push FUEL SOLENOID VALVE button ⑦ several times	clicking of solenoid should be heard	- test temperature fuse (if equipped) - test overheat limiter - test solenoid valve
Push IGNITION SPARK COIL button ⑥	sparking should be heard	- check electrode gap - test ignition spark coil
Turn MOTOR switch ⑤ “ON“	motor should run	- reset *inertia switch - test motor
Turn WATER PUMP switch ④ “ON“	pump should run	- test pump

Table 7-2: Test Procedures and Results

* Inertia Switch:

All 12 volt Scholastic Series heaters are equipped with a manual reset inertia switch usually located in the vicinity of the burner head (look for a device with a round diaphragm red in color and about the size of a 25 cent piece on top). The purpose of this switch is to stop heater operation in the event the vehicle is involved in an accident or receives a strong impact shock, i.e. hitting a curb. This is done automatically by opening the combustion fan motor circuit, stopping air and fuel delivery.

When troubleshooting, check to make certain inertia switch has not been tripped. Resetting is accomplished by depressing the red diaphragm on top of the switch. You should hear an audible click when switch resets.

3. Manual test running of heater
   - Turn the WATER PUMP switch ④ "ON"
   - Turn the MOTOR switch ⑤ "ON"
   - Push and hold the FUEL SOLENOID VALVE button ⑦ "ON" (starts fuel flow to combustion chamber)
   - Push and hold the IGNITION SPARK COIL button ⑥ "ON" (starts electrodes sparking) until combustion has taken place.

NOTE:

Hold IGNITION SPARK COIL button ⑥ ON until FLAME DETECTOR LED ③ Lights or combustion is heard, then release; in any case do not hold button on for more than 15 seconds or damage to the coil may result.

Test Results:

- LED ③ lights and combustion achieved
  - operation normal
- Combustion achieved but no LED ③ light
  - check flame detector
- Combustion not achieved and no LED ③ light
  - check fuel nozzle
  - check fuel pressure
  - check for blocked fuel lines (dirt or ice)
  - check ignition electrodes for damage and set gap

- Heater should now be in heating mode and will continue to run until you release the fuel solenoid valve button ⑦ which stops fuel flow and extinguishes the flame immediately.

NOTE:

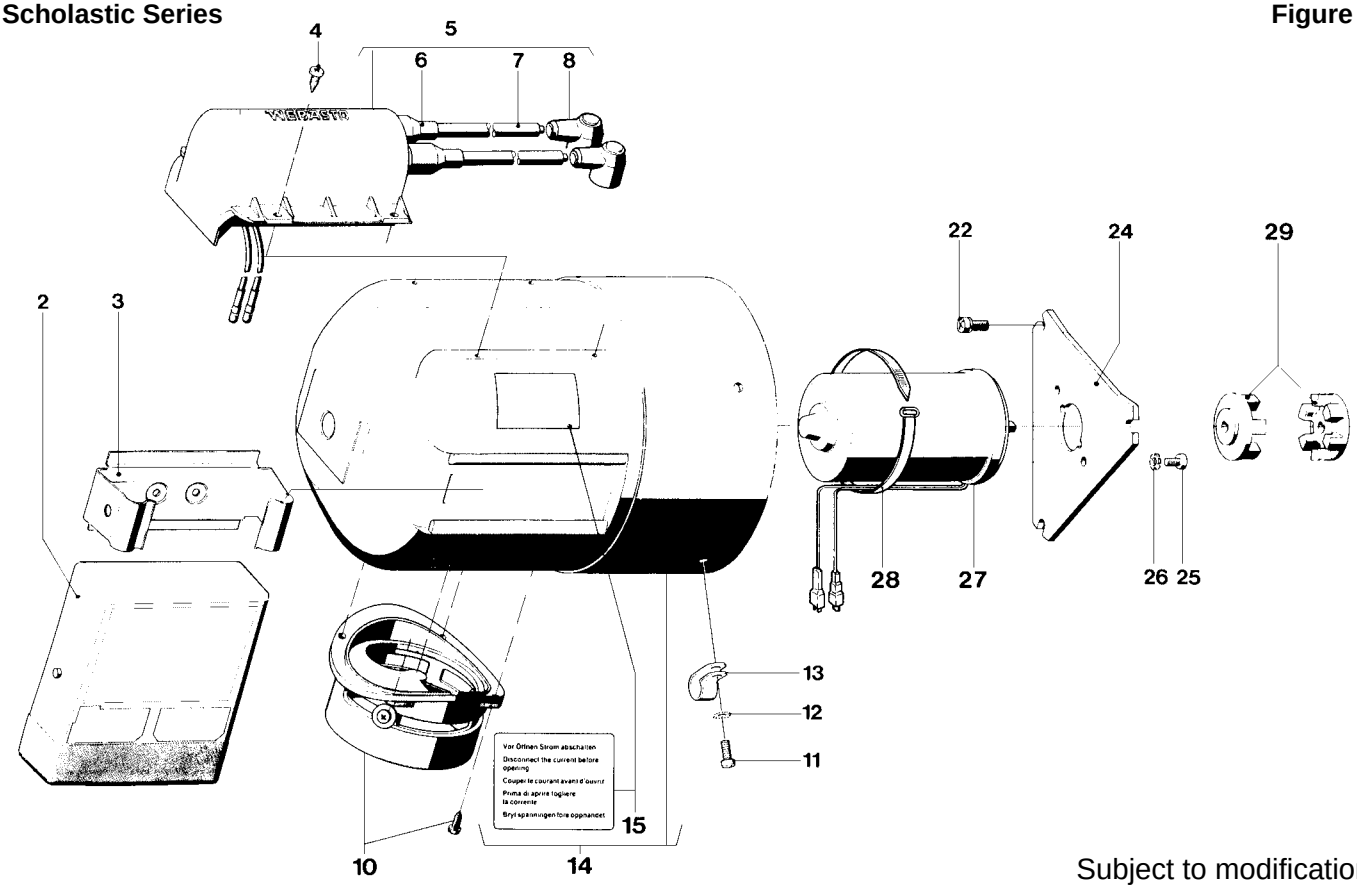
If flame does not stop when the FUEL SOLENOID VALVE button ⑦ is released, turn MOTOR switch ⑤ OFF to stop heater. Check and repair fuel solenoid valve accordingly.

- Allow the heater to continue running for approximately 30 seconds (cool down) after which, turn the WATER PUMP switch ④ and the MOTOR switch ⑤ "OFF".
- Once the manual test run has been successfully completed, set the heater switch/ timer to "OFF", remove the tester and reconnect the control unit. Once done, set the switch/timer to "ON"; if heater or a heater component does not respond, the control unit is defective; replace the control unit and retest the heater.

NOTE:

Since the heater operates in the 68 °C (155 °F) to 75 °C (167 °F) On to Off/ Off to On range, and the vehicle engine may be hot [e.g. coolant above 75 °C (167 °F)], the heater will not start until the coolant temperature is below 68 °C (155 °F). THIS IS NORMAL and does not indicate a problem.

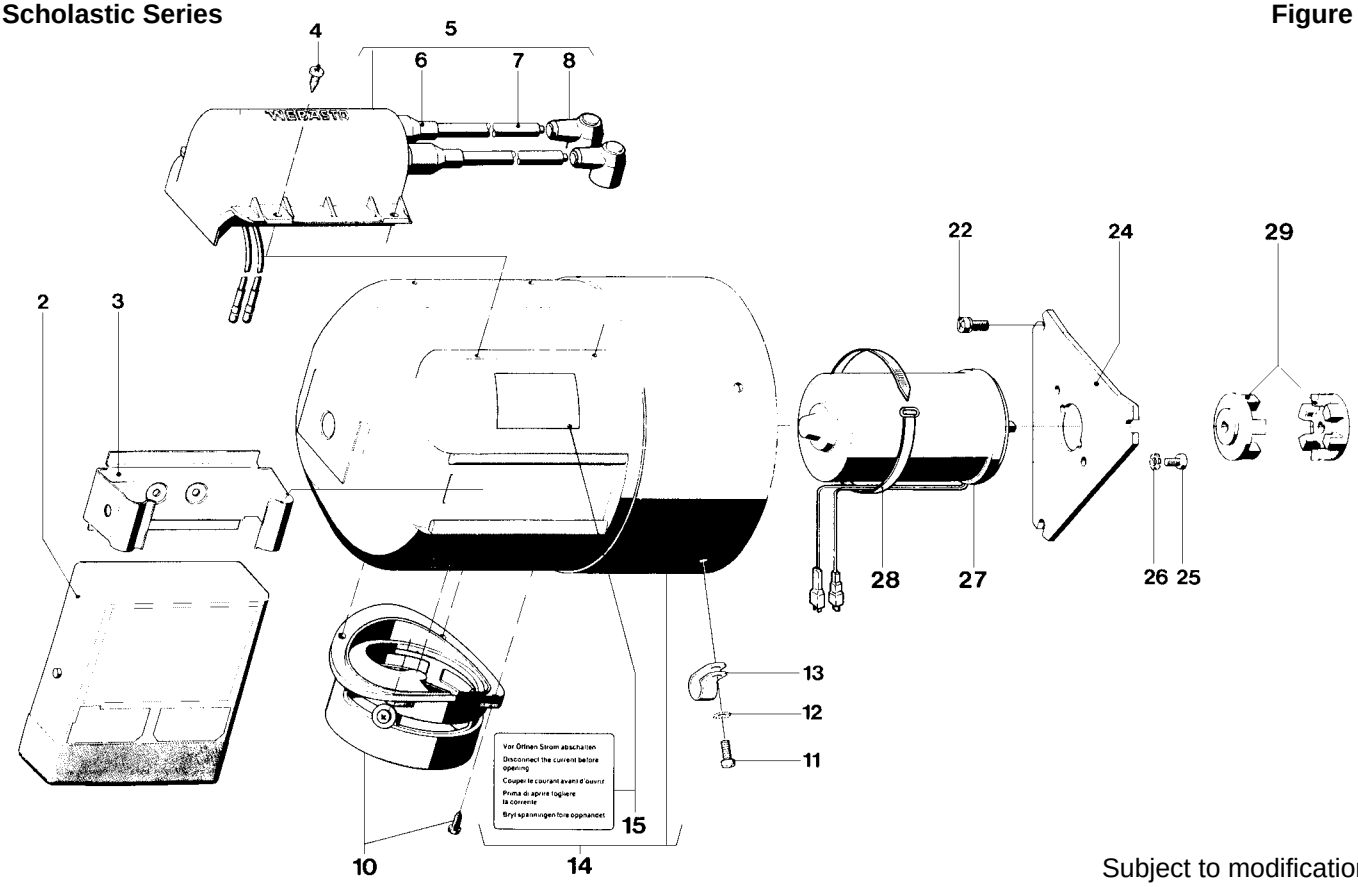
Scholastic Series **Figure 1**



Subject to modification

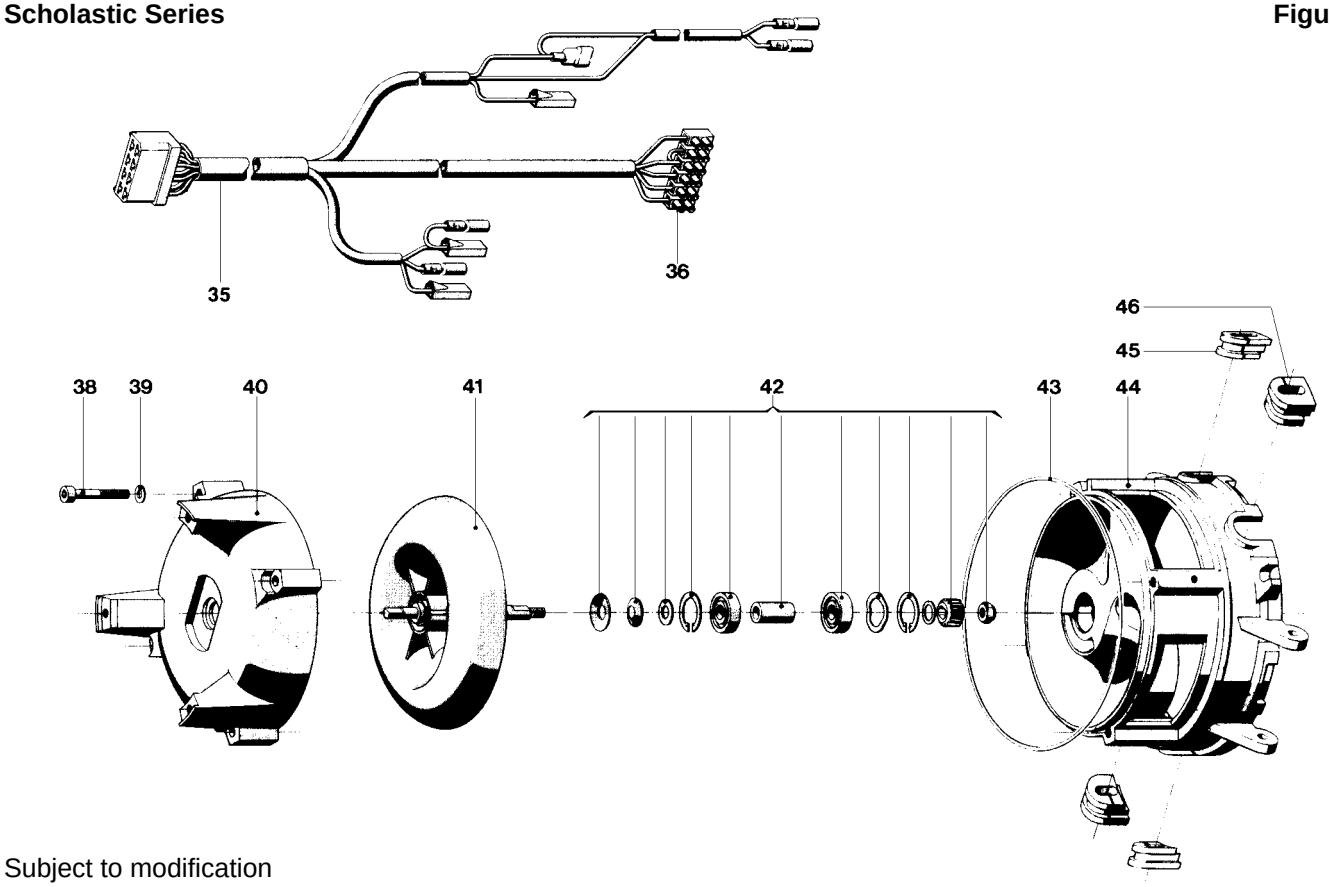
ITEM	QUANTITY	PART NO.	DESCRIPTION	REMARKS
No Fig.	1	92119B	Basic Scholastic Heater 12V	Complete – replacement heater only.
No Fig.	1	NA	Burner Head with Control Unit 12V	Completely mounted and connected.
2	1	287962	Control Unit 12V	
3	1	362107	Clip for Control Unit	
4	4	470562	Screw	Self-tapping M3.5 x 14
5	1	101838	Electronic Ignition Unit 12V	
6	2	404918	Socket	
7	X	178624	High Tension Ignition Cables	Ø 7mm; per meter
8	2	176494	Electrode Plug	
10	1	350427	Air Intake Bellows	
11	4	432377	Screw	M4 x 12
12	4	152269	Serrated Lock Washer	
13	1	316199	Clamp	
14	1	436216	Protection Cap	
15	2	101660	Warning Label	
22	3	488631	Screw with Washer	M5 x 12
24	1	42505A	Flange	

Scholastic Series **Figure 1**



ITEM	QUANTITY	PART NO.	DESCRIPTION	REMARKS
25	2	432377	Screw	M4 x 12
26	2	152269	Serrated Lock Washer	M4.3
27	1	425060	Motor 12V	
28	1	113665	Plastic Tie	
29	2	350516	Coupling	Exchange in pairs

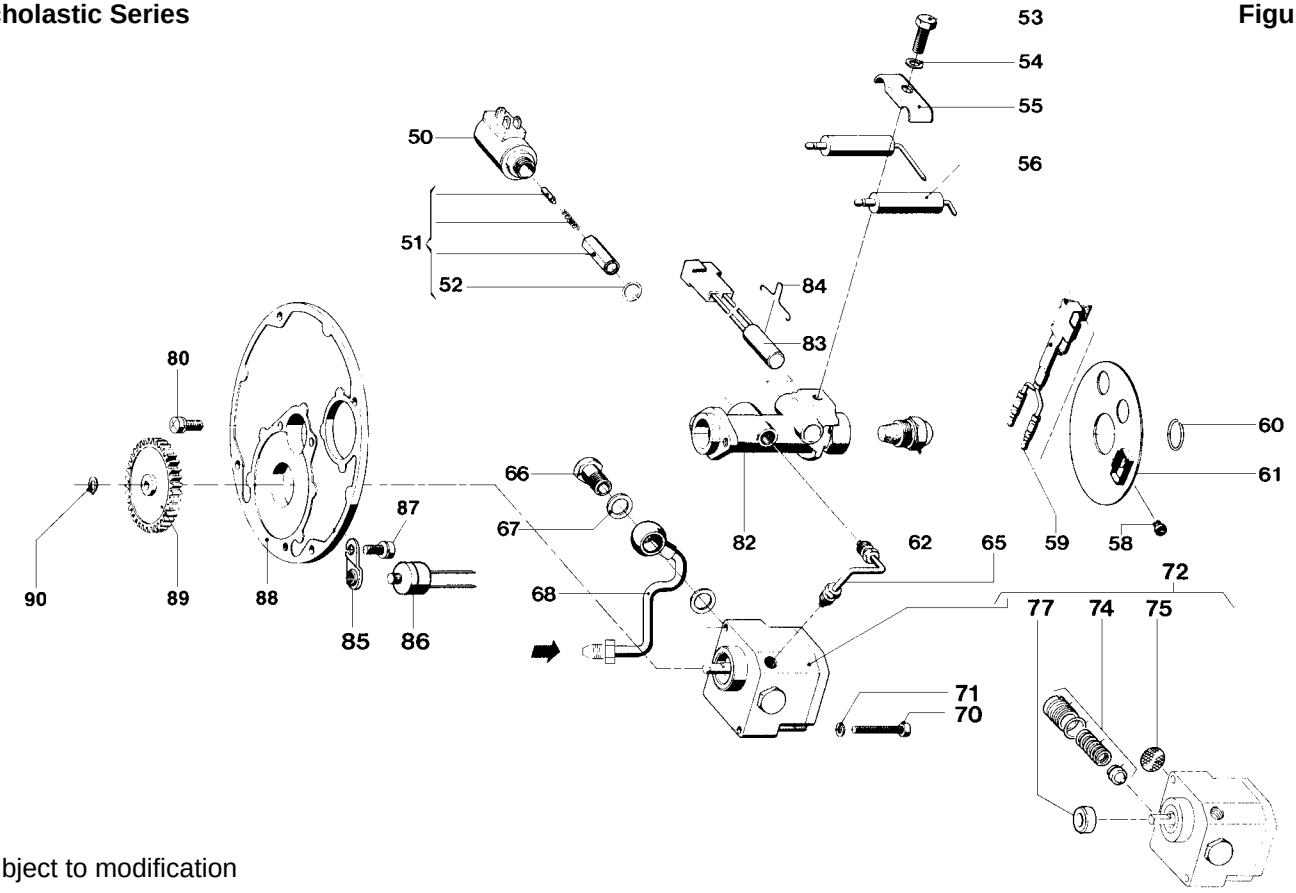
Scholastic Series **Figure 2**



Subject to modification

ITEM	QUANTITY	PART NO.	DESCRIPTION	REMARKS
35	1	412147	Cable Harness	6 Way plug (Item 36)
36	1	352969	Terminal Block	6 Way
38	4	148210	Hex Socket Head Cap Screw	M5 x 35
39	4	152552	Spring Washer B5	
40	1	301841	Motor Support	
41	1	373001	Impeller with Shaft	
42	1	378313	Bearing Set	Parts for mounting the fan shaft assembly.
43	1	412244	O-ring	
44	1	22567A	Blower Casing	
45	2	298964	Rubber Grommet	Left side
46	2	299995	Rubber Grommet	Right side

Scholastic Series **Figure 3**

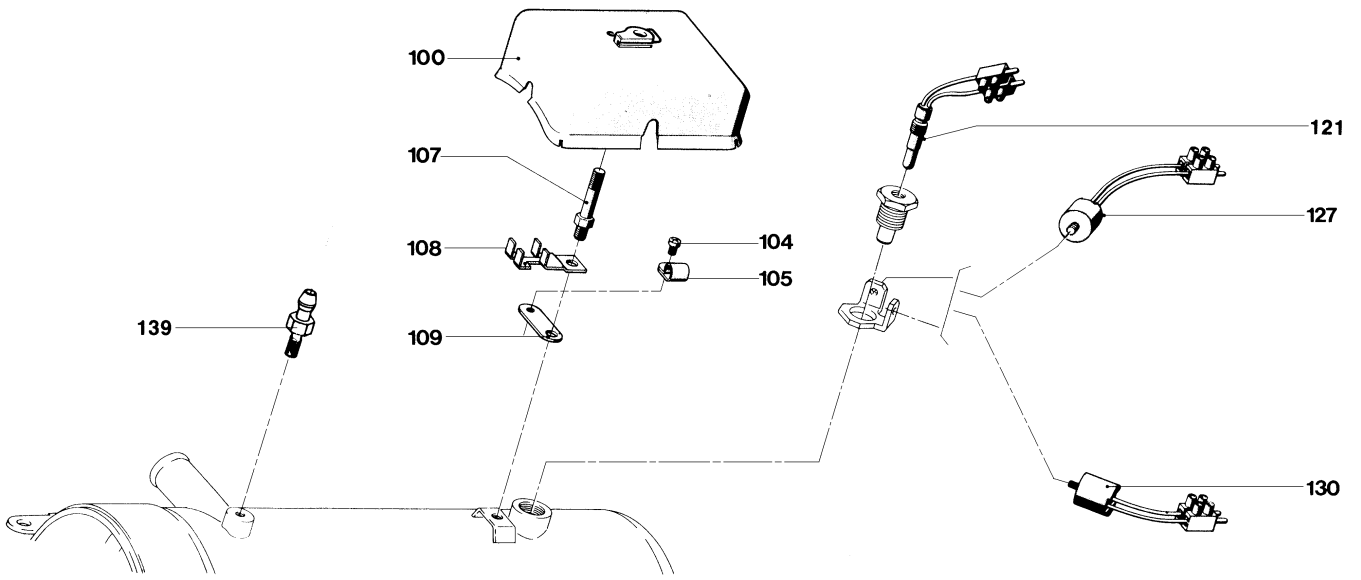


Subject to modification

ITEM	QUANTITY	PART NO.	DESCRIPTION	REMARKS
50	1	322083	Solenoid Valve 12V	
51	1	386650	Small Parts for Solenoid Valve	For item 50
52	1	260487	O-ring	12 x 1.5
53	1	267279	Hexagon Screw	M6 x 16
54	1	152560	Spring Washer	B6
55	1	278971	Clamp	
56	2	274313	Ignition Electrode	
58	1	147699	Screw	M4 x 6
59	1	215171	Flame Detector	
60	1	453048	Retaining Ring	
61	1	378232	Disc	
62	1	88641A	High Pressure Fuel Nozzle	0.35 GPH 60°
65	1	275476	Pressure Pipe Complete	
66	1	150754	Banjo Screw	
67	2	151157	Gasket Ring	A10 x 14
68	1	92170A	Fuel Supply Line Complete (# 4 JIC)	
70	2	277282	Hexagon Socket Head Cap Screw	M4 x 30
71	2	152544	Spring Washer B4	
72	1	63314A	Fuel Pump	Single line, 10 bar (145 psi)
74	1	355836	Pressure Control Valve	

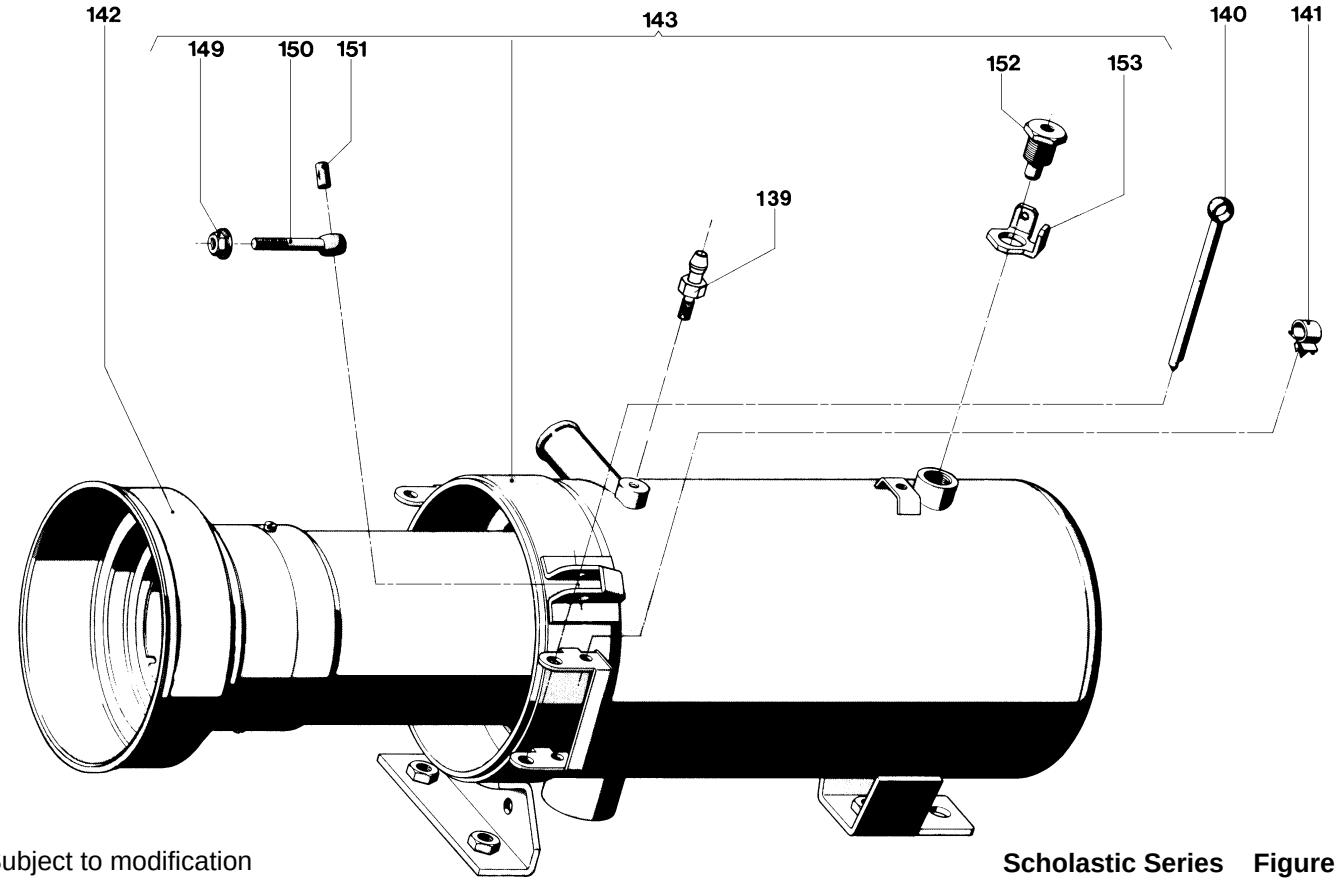
ITEM	QUANTITY	PART NO.	DESCRIPTION	REMARKS
75	1	310344	Filter Screen	
77	1	260738	Gasket	
80	2	488631	Screw with Washer	
82	1	412198	Nozzle Holder	
83	1	410799	Pre-heat Element 12V	
84	1	19723B	Holding Strap	
85	1	298816	Bracket	
86	1	104012	Pre-heat Thermostat	
No Fig.	1	82399A	Pre-heat Harness	See item 186 for reference
87	4	488631	Screw with Washer	
88	1	102861	Nozzle Holder Plate	
89	1	371289	Straight Spur Gear	
90	1	152390	Retaining Ring	6 x 0.7
No Fig.	X	143820	ISOFLEX LDS 18	Special Hi-temp Grease In 100g tube. Use on fuel pump gears.

Scholastic Series **Figure 4**



Subject to modification

ITEM	QUANTITY	PART NO.	DESCRIPTION	REMARKS
100	1	487627	Protection Cap	
104	1	147702	Screw	M4 x 8
105	1	319430	Clamp	Ø 8mm
107	1	273481	Screw	
108	1	273473	Bracket	
109	1	298816	Joint	
121	1	406287	Overheat Fuse	138 °C: Identification color – white wires
127	1	354902	Control Thermostat	75 °C: Green and red wires
130	1	608719	Temperature Limiter	104 °C: Green wires

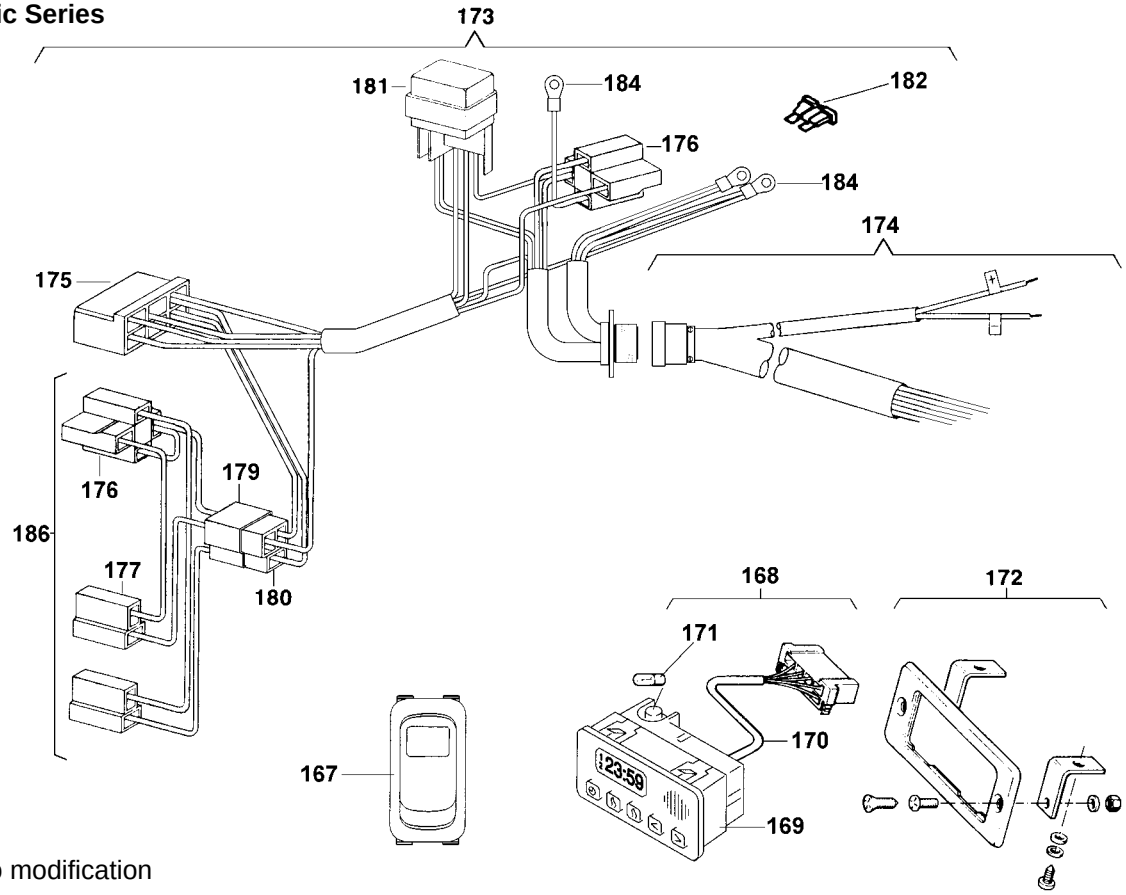


Subject to modification

Scholastic Series Figure 5

ITEM	QUANTITY	PART NO.	DESCRIPTION	REMARKS
139	1	114499	Bleeding Valve	
140	1	352497	Securing Cotter Pin	6.3 x 90
141	1	352152	Cable Clamp	
142	1	26553A	Combustion Chamber	
143	1	91216A	Heat Exchanger Assembly	Yellow color with 1 inch coolant connections
149	2	461555	Nut with Washer	M6
150	2	32087A	Eye Bolt	AM6 x 45
151	2	420565	Slotted Pin	6 x 16
152	1	279110	Well Plug	
153	1	289329	Angle Support	

Scholastic Series **Figure 6**

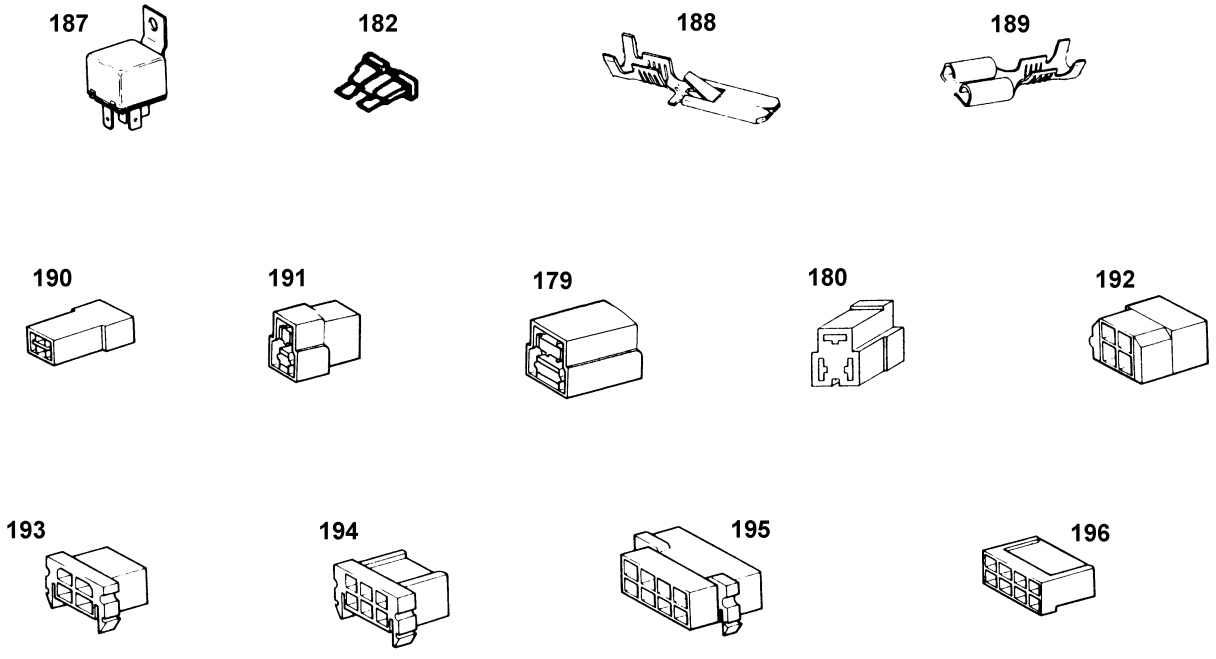


Subject to modification

ITEM	QUANTITY	PART NO.	DESCRIPTION	REMARKS
167	1	905103	ON / OFF Switch 12V	
168	1	905797	7-Day Digital Timer Kit	Model 1531 12V Includes harness item 170 and frame item 172
169	1	88195A	7-Day Digital Timer	Model 1531 12V Timer only
170	1	88436A	Harness – Timer	To item 168, 169
171	1	467936	Light Bulb 12V	To item 168, 169
172	1	474630	Mounting Frame	To item 168, 169 (for flush panel mounting)
No Fig.	1	475866	Mounting Housing	To item 168, 169 (for under, over or surface of panel mounting)
173	1	906008	Harness – Internal (from control unit to main power/ switch connector)	Use in conjunction with external harness item 174
174	1	905815	Harness – External (from main power / switch connector to batteries and switch/ timer)	Use in conjunction with internal harness item 173
175	1	328529	6-Pin Female Connector Housing	From control unit to vehicle wiring
176	2	901542	5-Pin Female Connector Housing	To relay
177	1	178713	2-Pin Female Connector Housing	
179	1	620286	3-Pin Female Connector Housing	Preheat harness
180	1	620285	3-Pin Male Connector Housing	
181	1	14878A	Fuse Box Use with item 182	

ITEM	QUANTITY	PART NO.	DESCRIPTION	REMARKS
182	2	24981A	Fuse 15 Amp	Use with item 181
182	1	103992	Fuse 20 Amp	Use with item 181
183	7	178705	1-Pin Female Connector Housing	
184	3	620295	Ring Connector	Yellow M8
186	1	82399A	Preheat Harness	
No Fig.	1	900012	Inertia Switch	
No Fig.	1	906026	Inertia Switch Harness	

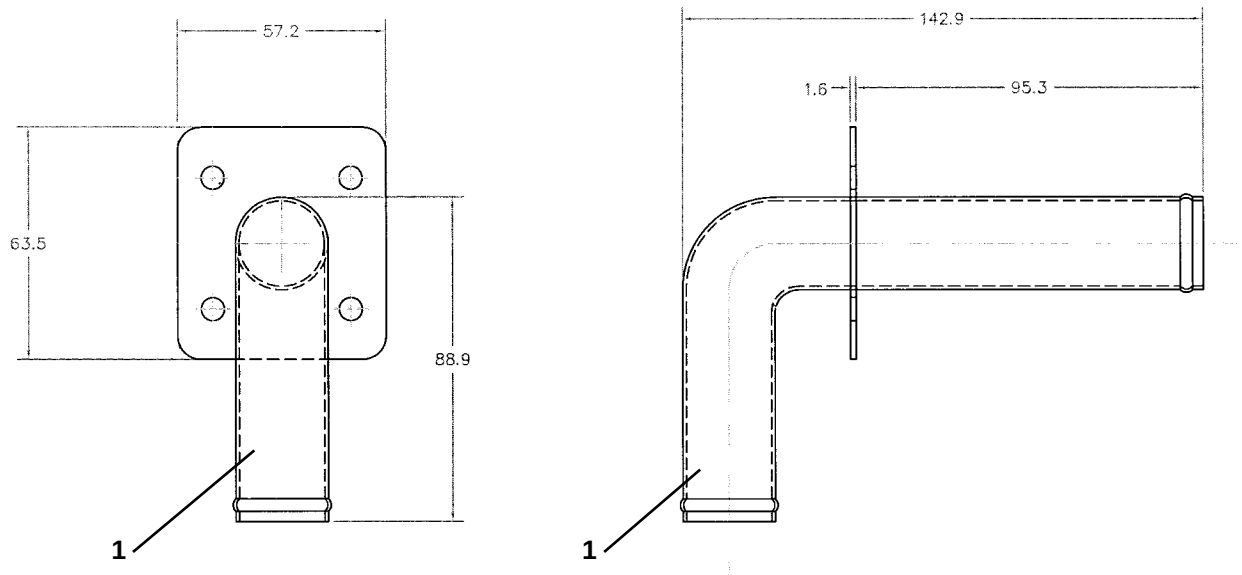
Scholastic Series **Figure 7**



Subject to modification

ITEM	QUANTITY	PART NO.	DESCRIPTION	REMARKS
179	1	620286	3-Pin Female Connector Housing	Used on preheat harness item 186
180	1	620285	3-Pin Male Connector Housing	Used on item 173 at preheat connection
182	2	24981A	Fuse 15 Amp	Used with item 181
182	1	103922	Fuse 20 Amp	Used with item 181
187	2	901398	Relay 12V	Used with item 176
188	4	176389	Connector – Male	Used with male connector housings
189	16	176591	Connector – Female 6.3	Used with female connector housings
190	1	178799	1-Pin Male Connector Housing	Used on inertia switch harness
195	1	342777	8-Pin Male Connector Housing	Used on timer harness item 170

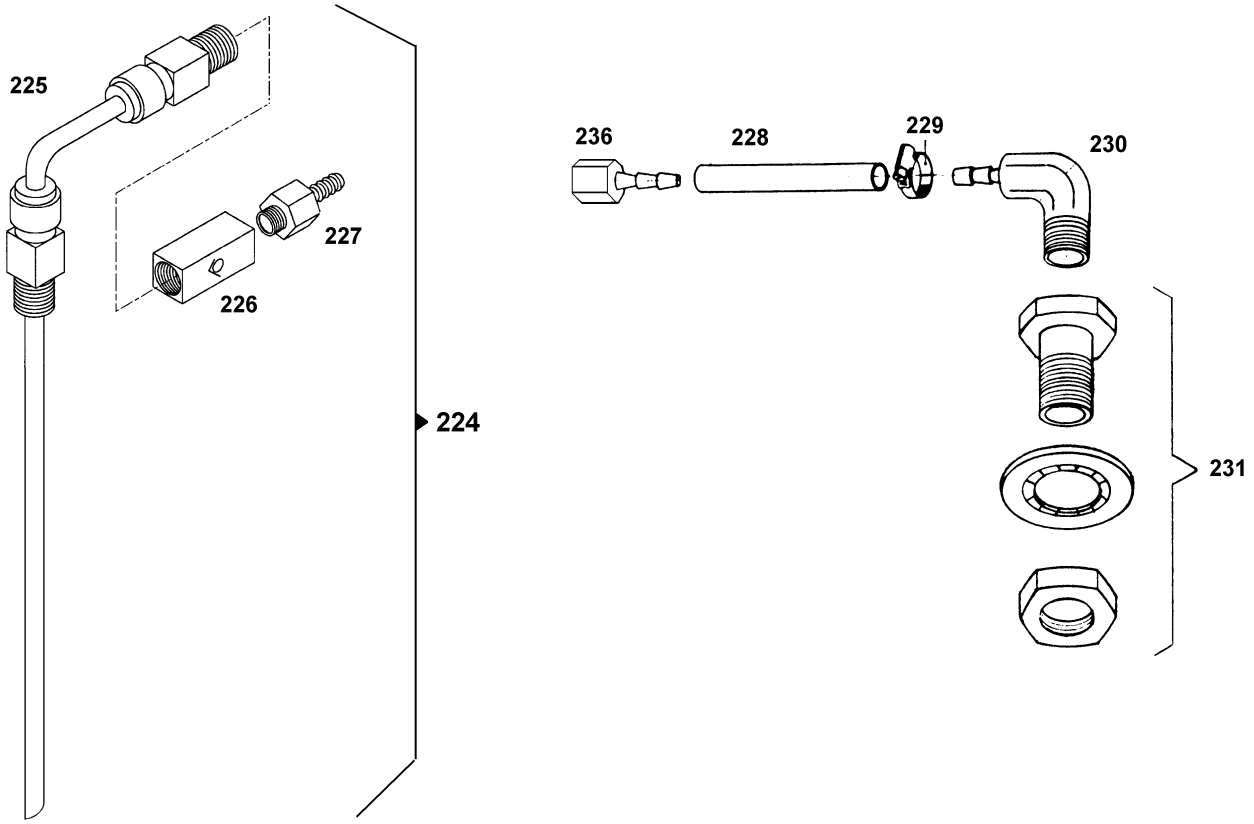
Scholastic Series **Figure 8**



Subject to modification

ITEM	QUANTITY	PART NO.	DESCRIPTION	REMARKS
1	2	901265	Elbow – Brass 90° with Mounting Flange	Through floor connection
No Fig.	1	901045	Formed Hose	Coolant pump to heat exchanger inlet
No Fig.	2	901213	Formed Hose	Gates 21488
No Fig.	8	902024	Hose Clamp ET-20	

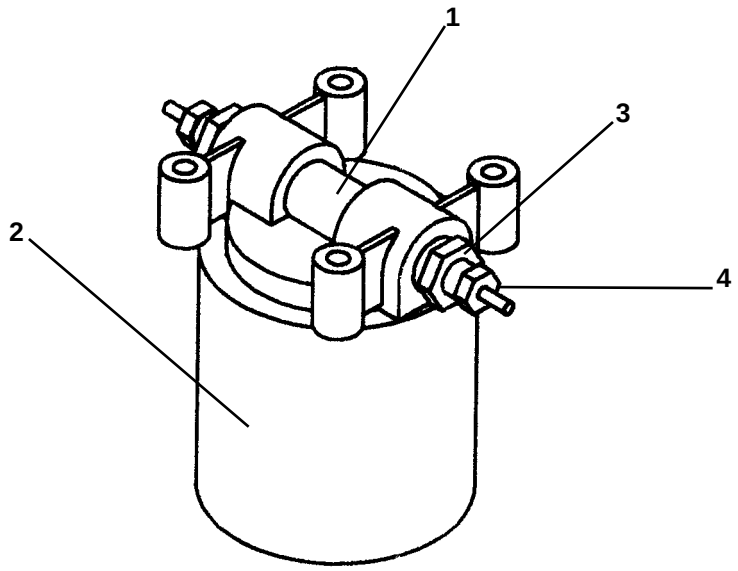
Scholastic Series **Figure 9**



Subject to modification

ITEM	QUANTITY	PART NO.	DESCRIPTION	REMARKS
224	1	906647	Fuel Standpipe – Complete	Includes items 225,226, 227, 232, 233, 234, 235 Includes 1/2 x 1/4 NPT bushing (not shown)
225	1	906118	Fuel Standpipe – Single Line	Standpipe only – does not include tank-boss
226	1	900029	Check Valve – One way	
227	1	900004	Barb Fitting	
228	X	903709	Fuel Line 1/4” ID. Per meter	
229	6	379670	Clamp – Fuel Line 12 mm	
230	1	603362	Barb Fitting 90° – Fuel Line	
231	1	603364	Bulkhead Fitting Assembly – NPTF	Used with mounting tray/ enclosure
232	1	902014	Nut	
233	1	902015	3/4” Flat Washer	
234	1	902016	Rubber Gasket	
235	1	902013	Tank-Boss Fitting	
236	1	901299	Barb Fitting JIC #4 x 1/4” Hose	Connects fuel line to heater

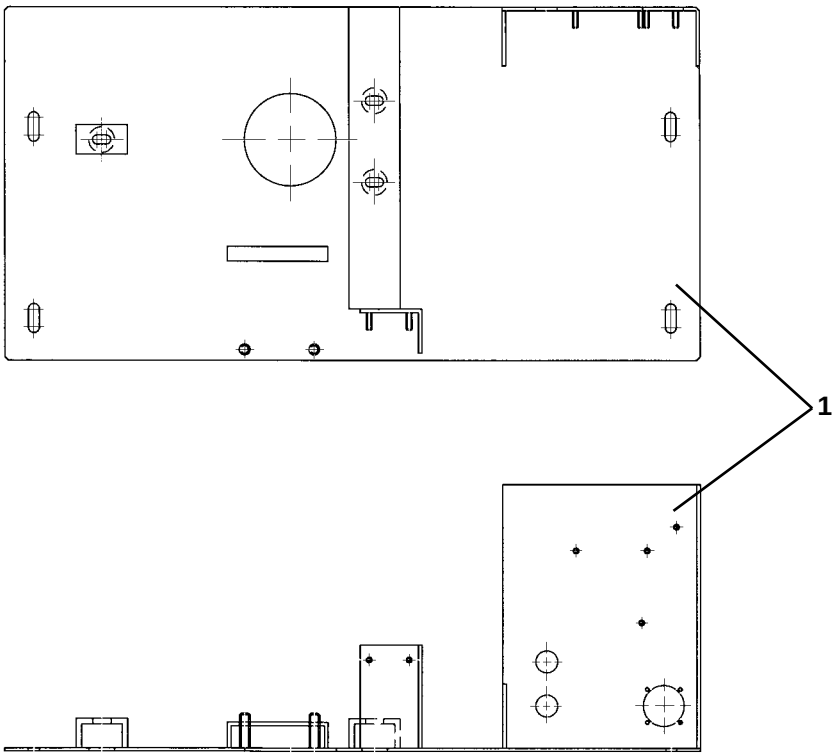
Scholastic Series **Figure 10**



Subject to modification

ITEM	QUANTITY	PART NO.	DESCRIPTION	REMARKS
1	1	900400	Fuel Filter Head	Used with part 900001
2	1	900001	Fuel Filter – FF 104	Used with part 900400
3	2	900401	1/2 x 1/4 Bushing	Used with part 900400
4	2	901293	Barb Fitting 1/4” MNPT x 1/8” Hose	Used with part 900400
No Fig.	1	905707	Mount Bracket for Fuel Filter Head	Used with part 900400

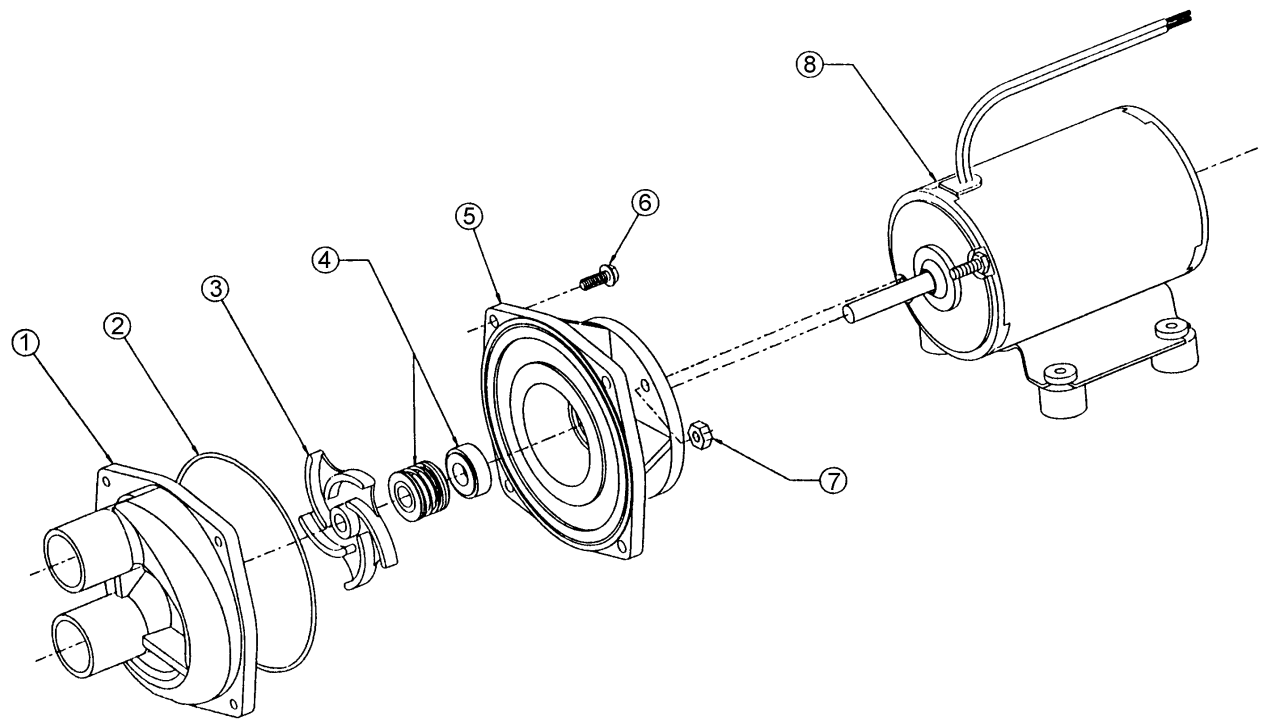
Scholastic Series **Figure 11**



Subject to modification

ITEM	QUANTITY	PART NO.	DESCRIPTION	REMARKS
1	1	900731	Tray Mount	
No Fig.	1	901235	Enclosure Cover	
No Fig.	1	901233	Enclosure Base	
No Fig.	4	905388	Rubber Grommet 1-3/4” Dia. Groove	
No Fig.	1	15527A	Stainless Steel Exhaust Tube ø38mm x 1m	Includes end-cap
No Fig.	X	353221	Stainless Steel Exhaust Tube ø38 mm	Per meter
No Fig.	1	367400	Exhaust Clamp	ø39... 42 mm
No Fig.	1	126830	P-Clamp	To secure exhaust tube to vehicle
No Fig.	1	24046A	End-cap (open)	Exhaust tube outlet
No Fig.	1	600050	Frame Mounting Brackets – 1 Pair	To mount heater to vehicle frame (some modification required)

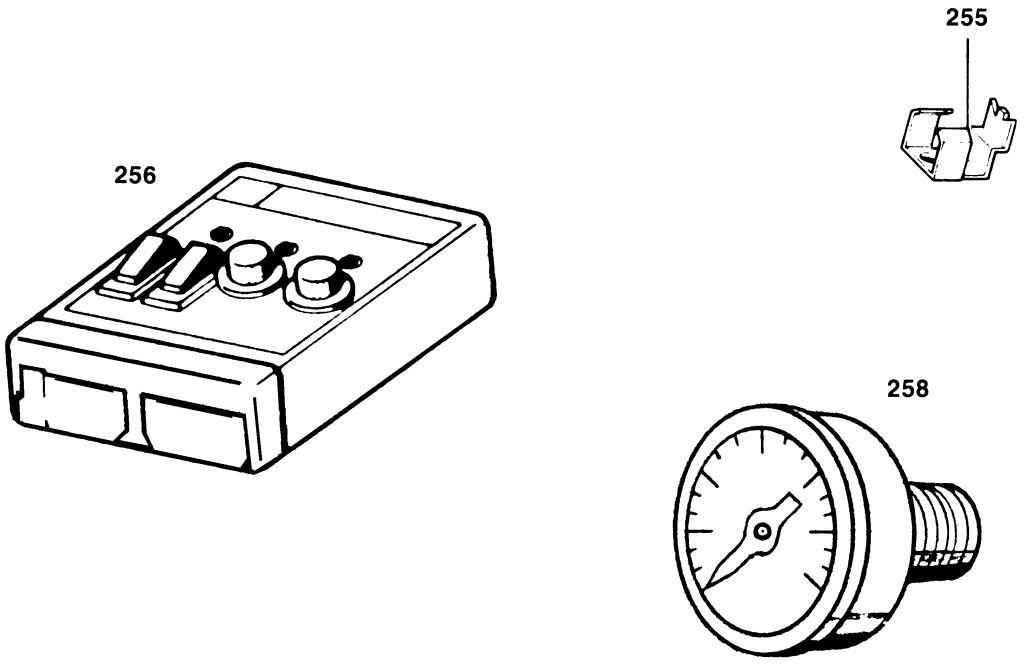
Scholastic Series **Figure 12**



Subject to modification

ITEM	QUANTITY	PART NO.	DESCRIPTION	REMARKS
1	1	901000	Housing – Impeller	MP # 28842
2	1	901013	O-ring	MP # 28613
3	1	901015	Impeller	MP # 28727
4	1	901017	Seal Assembly	MP # 28984
5	1	901019	Adapter	MP # 28733
6	4	901021	Screw	MP # 28834
7	2		Hex Nut – 10-32	
8	1	901023	Motor 12V	MP # 28985
No Fig.	2	176591	Connector – Female 6.3	
No Fig.	1	178713	Female Connector Housing	
No Fig.	1	620322	Insul Tube ø8mm x 42mm	Protective loom for wires

Scholastic Series **Figure 13**



Subject to modification

ITEM	QUANTITY	PART NO.	DESCRIPTION	REMARKS
255	1	310646	Gauge for Setting Ignition Electrodes	
256	1	440280	Diagnostic Testing Unit	
258	1	600190	Fuel Pressure Gauge with Adapter	
No Fig.	1	905491	Extension Harness for Testing Unit	5 feet in length
No Fig.	1	406244	Combustion Chamber Puller	
No Fig.	1		Exhaust Gas Analyzer	
No Fig.	1	699745	Workshop Manual	

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