Webasto
Feel the Drive

Coolant Heaters

Thermo 230.036
Thermo 300.066

Diesel - 24 Volts

Installation Instructions

➢ While a Webasto heater is in use, the product surface, connected hoses, ducting and air outlet(s) may become hot to the touch. Contact with skin may cause burns.

➢ Improper installation or repair of Webasto heating systems can cause fire or the leakage of deadly carbon monoxide leading to serious injury or death.

➢ NEVER attempt to install or repair a Webasto heating system unless you have successfully completed Webasto factory training and have the technical skills, technical information, tools and equipment required to properly complete the necessary procedures. Only genuine Webasto parts may be used.

➢ Webasto rejects any liability for problems and damage caused by the system being installed by untrained personnel.

➢ Webasto products produce temperatures high enough to ignite surrounding combustible materials such as inflammable liquids, gases, vapor, and other combustible matter. The heater must be switched off when loading or unloading inflammable materials to prevent the risk of explosion.

➢ ALWAYS and carefully follow Webasto installation and repair instructions and heed all WARNINGS.

WARNING: Cancer and Reproductive Harm
www.P65Warnings.ca.gov

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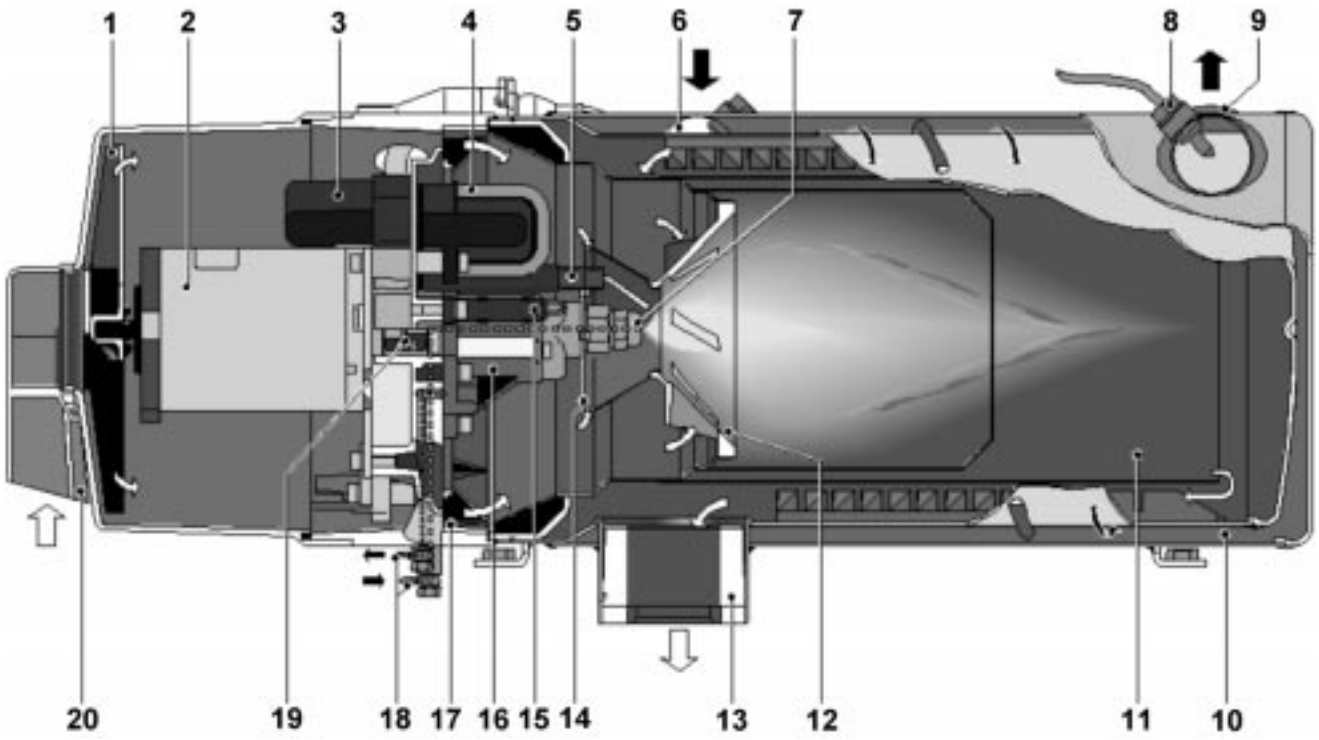
1. Introduction

1.1 General Description



1 Combustion air fan
2 Motor
3 Electronic control unit
4 Electronic ignition coil
5 Ignition electrodes
6 Water pipes
7 Fuel nozzle
8 Temperature sensor
9 Overheat thermostat
10 Heat exchanger
11 Combustion chamber
12 Combustion air swirler
13 Exhaust pipe
14 Photo disc
15 Flame detector
16 Fuel pump w/ solenoid valve
17 Combustion air adjusting shutter
18 Fuel supply / return
19 Coupler
20 Combustion air intake

Fig. 101: Webasto Thermo 230/300 Heater

The Webasto Thermo 230 and 300 Heaters for use on diesel powered transit buses and coaches 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 buses, is often not adequate to heat the vehicle's interior.
3. **Increase Driver Visibility** in poor weather conditions by providing higher levels of heat for quick defrosting/defogging of windshield and side glass.

1.2 Legal provisions

Heater installation must be performed in accordance with the manufacturer`s installation instructions.
Meets FMCSA Motor Vehicle Heater Requirements when installed in accordance with 49 CFR 393.77. For more information visit https://www.govinfo.gov/content/pkg/CFR-2012-title49-vol5/pdf/CFR-2012-title49-vol5-sec393-77.pdf

Any deviations from these instructions are only permitted with written approval from Webasto Thermosystems.
Installations not complying with the installation instructions will release Webasto Thermosystems from any product liability.
OEM installations must be approved by Webasto Thermosystems.

1.3 Meaning of Warning, Caution and Note

WARNING
This heading is used to highlight that non-compliance with instructions or procedures may cause accidents leading to severe injury or death.

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.

2. Operating your Webasto Heater

Before switching the Webasto water 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 of the vehicle, the heater can be operated by the following methods.

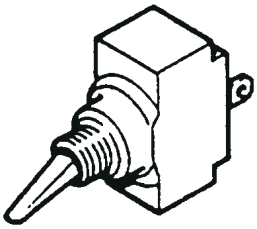
WARNING
Due to the danger of poisoning and asphyxiation the heater must not be operated in enclosed spaces such as garages or workshops without adequate exhaust extraction.

2.1 Switching On

Using a timer:

Timer

Using a switch:



Switch

WARNING
The heater must be switched "OFF" while refueling and at fueling stations.

WARNING
Do not operate any Webasto heater in an area where toxic or explosive materials or fumes may be present.

Upon actuation of the "instant heat" button the "operation indicator" on the timer lights up.

Or

When the switch is used for switching "ON" the Webasto heater, the operation indicator integrated in the switch is illuminated.

The heater motor and coolant circulating pump begin to run. After approximately 10-25 seconds the solenoid valve opens and fuel is sprayed into the combustion chamber. At the same time, the electronic ignition coil produces high voltage (8000 V) and the mixture of fuel and air in the combustion chamber is ignited by a spark produced at the tip of the ignition electrodes. The flame is detected by the photo cell, then the electronic ignition coil stops producing high voltage and combustion continues by itself (spark on electrodes is only required to ignite the flame). At this point the heater is working and produces 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 21V.
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 (i.e. overheat).

2.2 Switching Off

When heating is no longer required, switch the Webasto heater off. The solenoid valve interrupts 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.

NOTE
Restarting the Webasto during the after-run period is allowed.

2.3 Engine Pre-heating

1. Set the timer 30 min. to 1 hr. before you want to start engine. The heater will start up at set time. (See timer operating instructions beginning on page 203).
   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 time is elapsed on your timer or engine preheat is no longer required, switch the Webasto heater "OFF". The heater will go through the after-run cycle.

2.4 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 heat the coolant to a temperature of 185°F (85°C). 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.

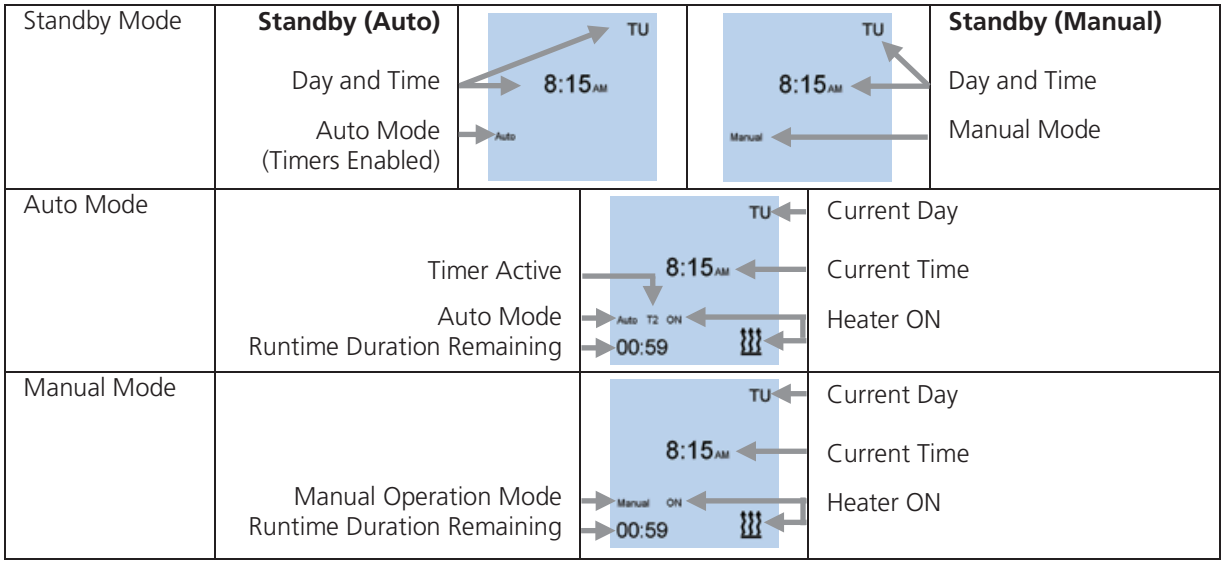
2.5 Operation with 7-Day Digital 4 Program SmarTemp Control fx

The SmarTemp Control fx enables operator to preset start-up cycles of your Webasto heater 7 days a week with 4 individual times each day. The SmarTemp Control fx is controlled using a rotary dial around the outside of the unit to browse through different menu options. Simply click the selection button to make your choice. An additional button labeled "Webasto" controls the manual ON/OFF functionality of the heater.

Component Description

***** The micro USB service port is not used for Webasto heater diagnostic purposes on SmarTemp Control fx.

LCD Screen Legend



Operation

	Definitions	Default
Time & Date	Time & Date allows user to properly set the current date and time. User also has the ability to switch between AM/PM and 24 hour format. If the 24 hour format is selected the date format will change to dd/mm/yyyy.	AM/PM mm/dd/yyyy
Mode	Two modes are possible: – Auto mode enables the pre-defined timer programs. Standard ON/OFF functionality is still possible while in this mode. – Manual Mode allows the heater to be operated via the Webasto button on the SmarTemp Control fx. While in Manual Mode, all Auto Mode functionality is indefinitely disabled. **Note:** While in manual mode the heater will continue to operate based on the pre-defined "Duration" set by the user. See "Duration" for further detail.	Manual
Language	Language changes between English, French, and Spanish	English

Operation (Continued)

Duration	Duration allows user to select heater runtime of the heater. Set range is between 10 – 120 minutes selectable by 10 minute increments. While using Manual Mode, the "Duration" setting will be used for the runtime of the heater when the Webasto button is pressed. **Note:** Setting the Duration run-time (in the Duration section) before setting a timer program will default all new programs to the user defined duration time.	60 minutes
Timer	There are 4 heater start-up cycles possible 7 days per week. Select the day or the specific timer (T1 – T4) using the rotary knob and the selection button. Once the day, time, and duration have been entered, press the selection button to set. A checkmark will confirm the timer has been saved. To turn the timer OFF, select the timer checkmark and dial the duration down to the OFF position and click the selection button.	Calendar Fields Empty
Skip	The Skip feature looks similar to timer programming; however when a specific timer program is selected, it will update the checkmark to an "s" for skipped. When a program has been skipped, it will disable that specific timer program for one cycle (7 day period). Preset timer programming will reactivate after this one-time skip cycle. **Note:** To permanently turn a timer OFF, refer to the "Timer" section.	Calendar Fields Empty
LVD	LVD "Low Voltage Disconnect" allows the user to adjust the battery voltage level at which the Webasto SmarTemp Control fx will shut the heater off. A warning (LED and message) will appear after 8 minutes of low voltage. The warning will remain on for 2 minutes before the heater is shut off. If battery voltage is equal to or less than the threshold selected +0.1v, the heater will not start. i.e. if an 23.5v threshold is selected the heater cannot be started until B+ has reached 23.7v. **24 volt** - Range between 21v – 25.5v	24.2v
Error Codes	This section will log the last 5 error codes and the date that it was set. Highlight and select an error code for a full description. If the heater produces an error code, the status indicator lights will flash red and the error will display on the main screen. Error codes cannot be reset through the Webasto SmarTemp Control fx on the heater. Refer to the heater service manual for resetting an error code. **Note:** Diagnostics via blink code is not available on all coolant heaters. Codes on products with no blink code functionality can still be obtained using the PC Diagnostics test tool. Refer to the applicable service manual by visiting www.techwebasto.com for detailed PC diagnostics information.	No Errors
Hour Meter	The hour meter logs the operating hours of an active ON signal to the heater. This does not reflect the true runtime of the heater itself. **Note:** For warranty purposes a diagnostic printout is still required where applicable. This hour meter is for reference only!	N/A
Default	Default allows the user to perform a reset to the default values. Refer to default column. **Note:** A power loss will not reset user programmed values.	N/A
SW Version	This displays the firmware version of the Webasto SmarTemp Control fx.	Installed Version
Back	Select this to return to the previous screen.	N/A

3. Technical Data

3.1 Thermo 230/300 Heater Data

Heater		**Thermo 230**	**Thermo 300**
Design		Coolant Heater with High Pressure Fuel Nozzle	
Heat Output	BTU/hr (kW)	80,000 (23)	104,000 (30)
Fuel		Diesel #1, Diesel #2, Arctic and Kerosene	
Fuel Consumption max.	Kg/hr (US. gal/hr)	2.5 (0.8)	3.3 (1.2)
Rated Voltage	(V)	24	
Operating Voltage	(V)	20 ... 28	
Power Consumption without Water Pump	(W)	65	110
Permissible Ambient Temperature during Operation	°C (°F)	-40 ... +60 (-40 ... +140)	
Storage Temperature	°C (°F)	+85 max. (+185 max.)	
Minimum Capacity of Cooling System	l (US. gal)	10.0 (2.64)	
Permissible Operating Pressure of Coolant	bar (psi)	0.4 ... 2.0 (06 ... 29)	
CO_2 in Exhaust Gas	% by Volume	10.5 ±0.5	
Dimensions of Heater mm (inch)	L W H	610 mm (24.01 in.) 246 mm (9.69 in.) 220 mm (8.66 in.)	
Weight of Heater including Control Unit	kg (lb)	19 (41.88)	

Table 301: Thermo 230/300 Heater Data

3.1.1 Thermo 230/300 Heater Dimensions

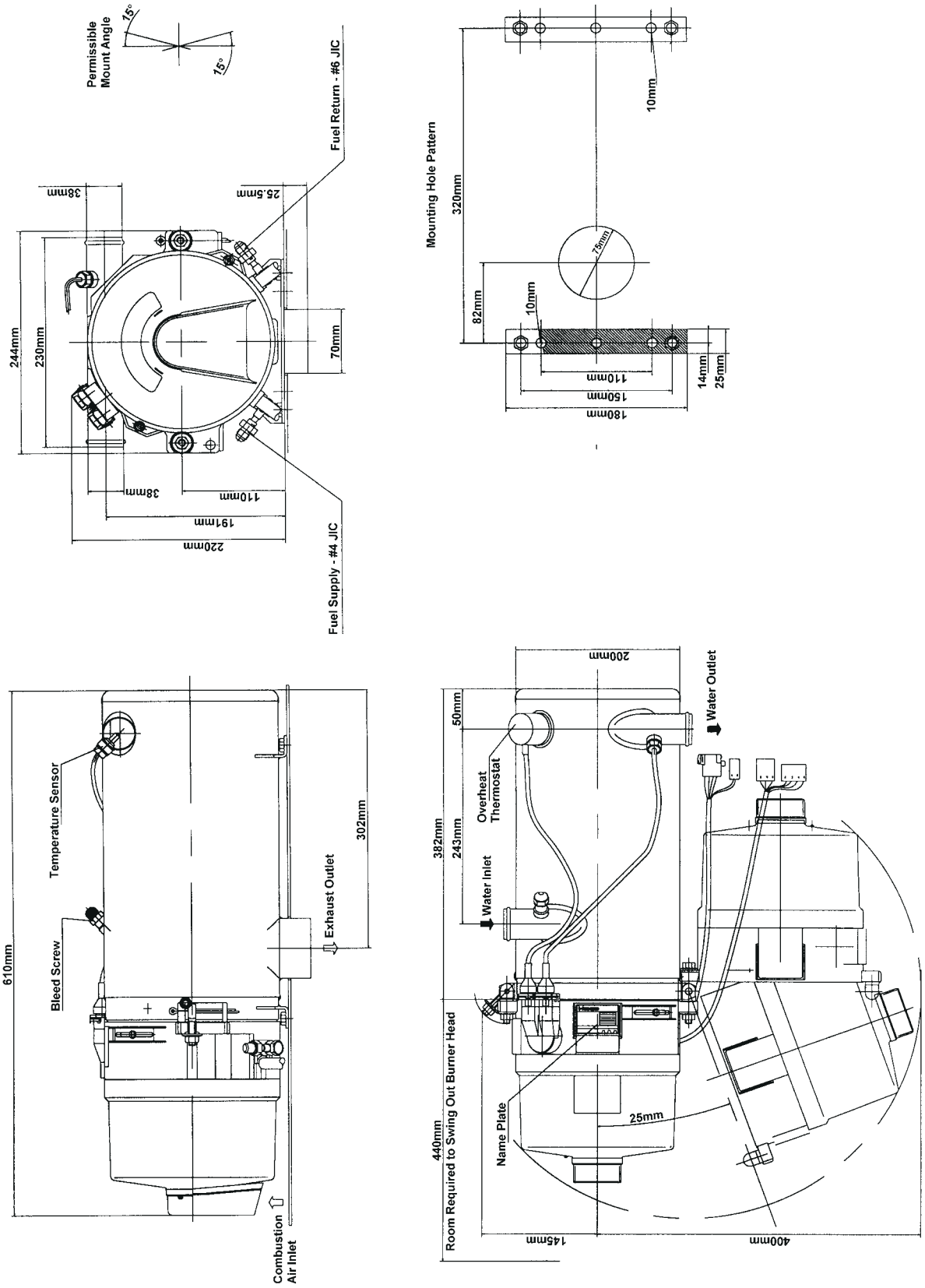


Fig. 301: Thermo 230/300 Heater Dimensions

3.2 Coolant Circulation Pump Data

Circulating Pump		**U 4814**	**U 4851***
Flow Rate l/hr	l/h (gal/min)	5200 (22.9) against 0.2 mbar	6000 (26.4) against 0.4 mbar
Rated Voltage	(V)	24	24
Operating Voltage Range	(V)	20 ... 28	18 ... 32
Power Consumption	(W)	104	209
Dimensions mm (inch)	L W H	221 mm (8.7 in.) 100 mm (3.94 in.) 105 mm (4.14 in.)	285 mm (11.22 in.) 115 mm (4.52 in.) 110 mm (4.33 in.)
Hose connection	mm (inch) O.D.	38.0 (1.5)	38.0 (1.5)
Weight	kg (lb)	2.1 (4.63)	2.7 (5.95)

Table 302: Coolant Circulation Pump Data
*NOTE: U 4851 Pump has been superseded to U 4855 Pump.

3.2.1 Coolant Circulation Pump Dimensions

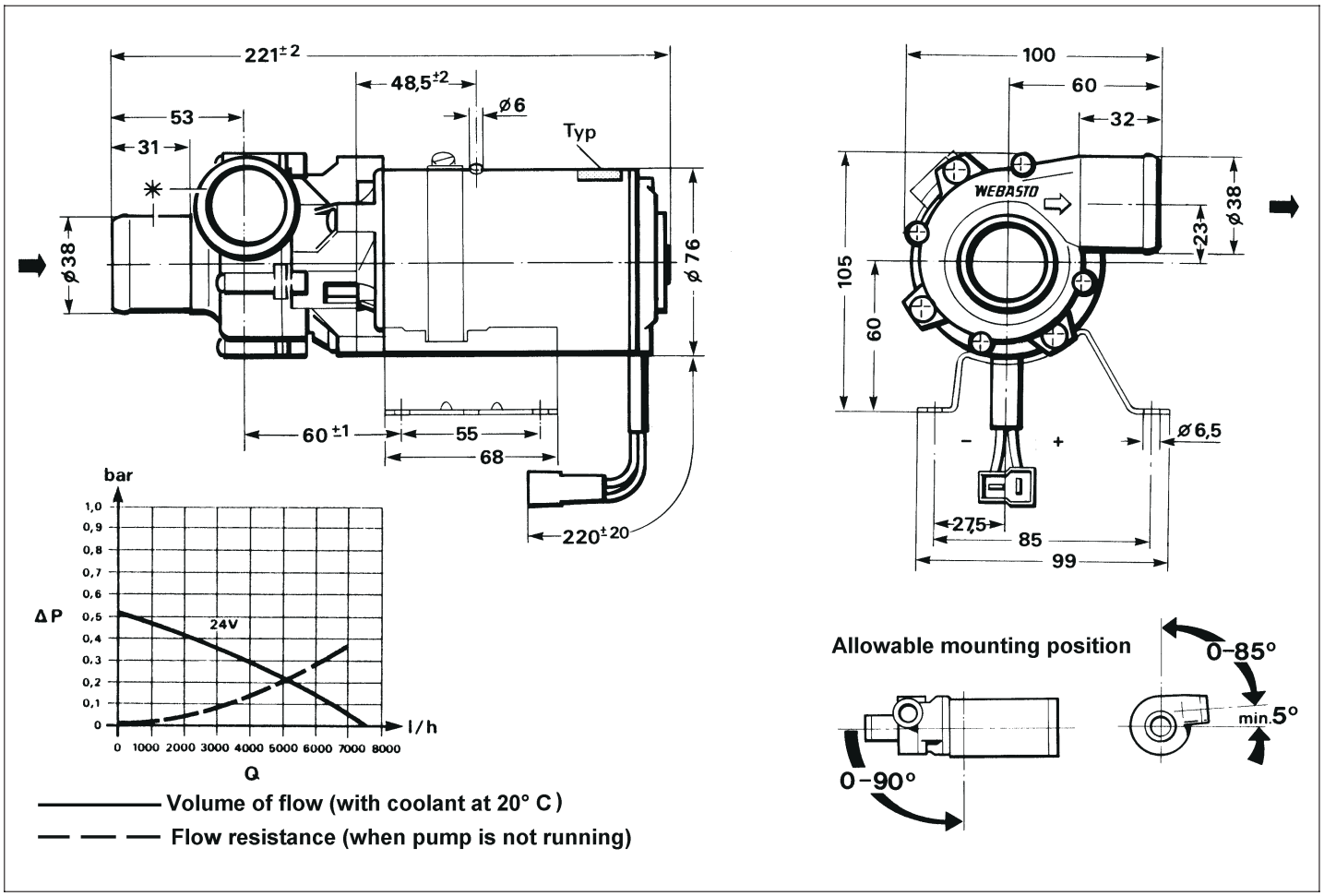


Fig. 302: Coolant Circulating Pump Assembly - U 4814

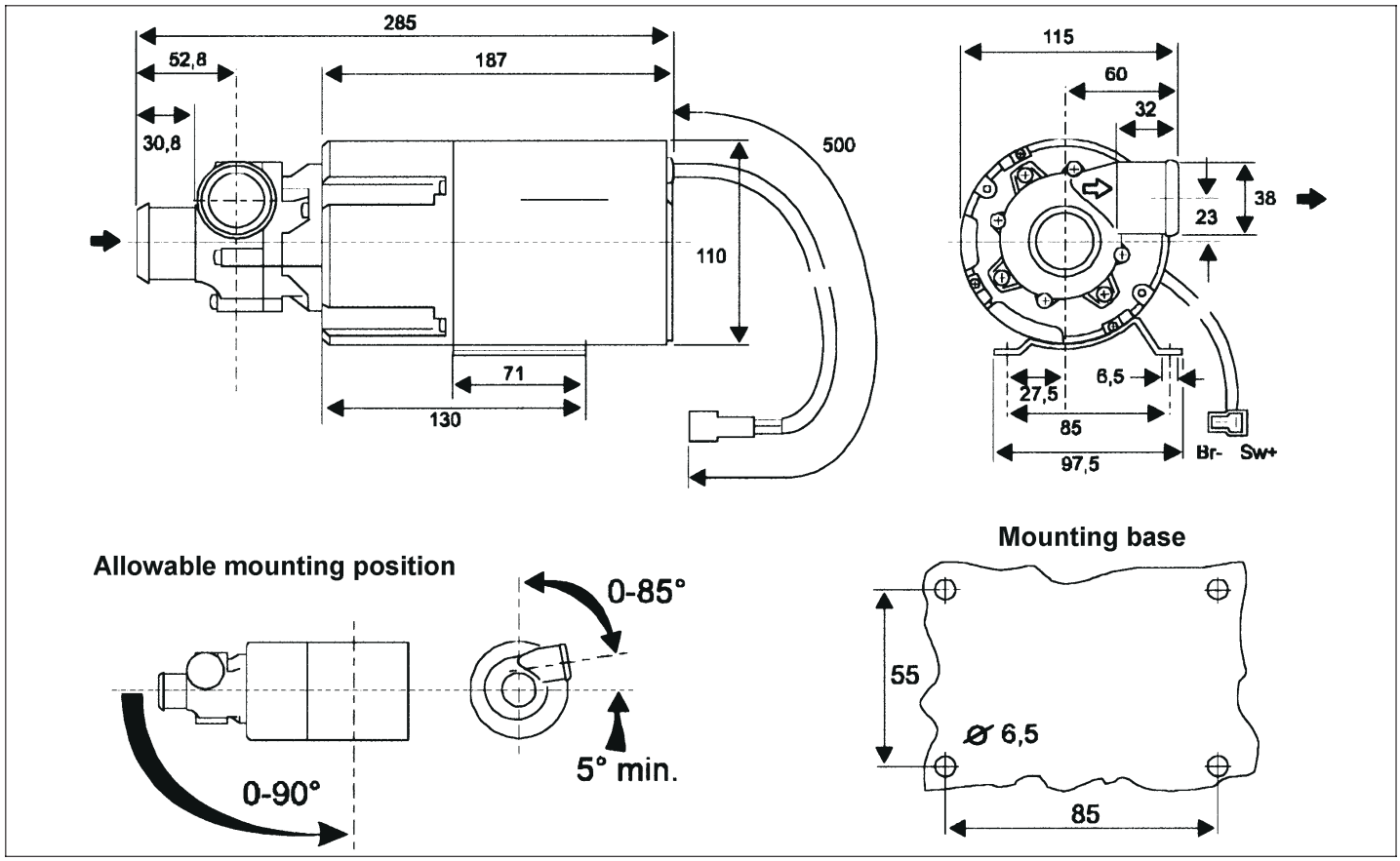


Fig. 303 Coolant Circulating Pump Assembly - U 4851*

*NOTE: U 4851 Pump has been superseded to U 4855 Pump.

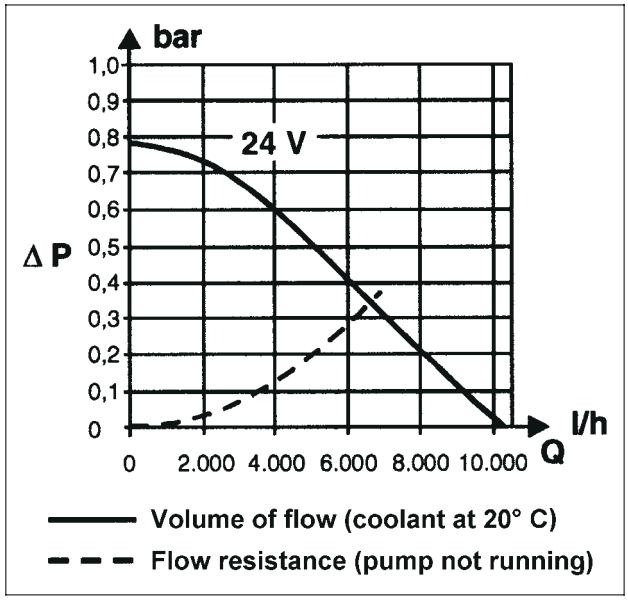


Fig. 304 Pump Operating Data - U 4851*

*NOTE: U 4851 Pump has been superseded to U 4855 Pump.

4. Installation

NOTE
This manual does not cover all possible installations. For special applications use this manual as a general guideline only. Contact Webasto Thermosystems directly at 1-800-555-4518.

4.1 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.

IMPORTANT! The proposed heater installation must be approved by Webasto Thermosystems.

4.2 Installation Location

WARNING
The heater must not be installed in either the driver's compartment or in the passenger area of vehicles.

The heater and circulation pump are to be integrated into the coolant system (or into a separate heating circuit, if applicable) of the vehicle. The heater should be installed as low as possible in the coolant system to assure static bleeding of the heater and the circulating pump.

NOTE
The circulating pump is not self priming.

The heater is to be installed in a clean and dry environment, usually a separate compartment, accessible for service, typically towards the rear of the vehicle. The heater may also be located in the engine compartment. The installation enclosure must provide adequate ventilation for combustion air requirements [4 in² (20 cm²)].
When installing the heater, make certain that the clearances required for accessing the unit for servicing are observed (e.g. removal of the combustion chamber). See figure 301, page 302.

4.3 Mounting the Heater

1. Drill all required holes to dimensions shown in figure 301, page 302.
2. Bolt heater rigidly inside enclosure or engine compartment.

4.4 Exhaust Pipe Connection

Rigid exhaust pipe is recommended in installations where the use of an exhaust deflector is not suitable. The exhaust pipe must have a minimum internal diameter no less than 2 3/4" (70mm) and a length no greater than 16' (5m). The pipe may have several bends totaling no more than 270° overall. Do not cut and weld pipe to make 90° angled corners.

WARNING
Exhaust pipes must be so routed that the possibility of exhaust fumes entering the vehicle is unlikely.

1. Install exhaust deflector on heater exhaust outlet or install exhaust pipe.
2. Route the exhaust system so that the possibility of discharged exhaust gasses entering the vehicle is prevented.
3. Direct the discharge opening of the exhaust system in such a way as not to be pointed in the direction of travel, and so located that the possibility of clogging caused by snow, mud or debris is prevented.
4. Any condensation water collecting in the exhaust pipe must be discharged. If necessary, drill a drain hole at the lowest point to allow drainage.

WARNING
Route the exhaust system away from any parts of the vehicle that may be damaged by heat (i.e., brake lines, electrical wiring, hoses and fuel lines). Use fire resistant materials or heat shields when necessary.

NOTE
Additional flexible exhaust tubing Webasto part number 479 721.

4.5 Combustion Air Supply

Never draw combustion air from inside the passenger area of a vehicle, or from areas where fumes and gasses can accumulate.

WARNING
Never draw combustion air from inside the vehicle, or from areas where fumes or gases can accumulate

Where heater is installed in a sealed compartment, adequate ventilation for combustion air requirements [4 in² (20 cm²)] must be provided.

Combustion air can be drawn from a remote (protected) area in order to provide a clean air supply.
For installations requiring remotely drawn combustion air, use approved ducting with an unrestricted internal diameter no less than 2 1/4" (55mm) and a length no greater than 16’ (5m). The ducting may have several bends totaling no more than 270° overall.
Approved combustion air ducting can be ordered through Webasto under part number 887 29A.

CAUTION
Combustion air ducting must be non-restrictive. Do not connect to existing vehicle air ducting or filtration systems.

NOTE
Approved combustion air ducting can be ordered under Webasto part number 887 29A.

To connect combustion air intake ducting [2 1/4" (55mm)] to the heater, several types of fittings are available that snap directly onto the combustion air inlet of the heater.

For a straight connection, order a straight adapter under part number 101 377 and snap it onto the combustion air inlet and attach air ducting.

In the event there is insufficient room for a straight attachment, a 90° snap-on fitting (P.N. 101 404) and an adapter ring (P.N. 823 15A) are available. Simply snap them onto the combustion air inlet of the heater and attach ducting.

For installations where ducting is not required, the heater is factory equipped with a splash deflector that simply snaps onto the combustion air inlet.

4.6 Plumbing Into the Coolant System

WARNING
When working on the coolant system, allow the engine to cool down and open the radiator cap carefully.

4.6.1 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 more heater core system depends on the water pumps capability and the amount of restriction within the coolant system.

Webasto high performance circulating pumps designed for extensive heating applications are available. Installing a Webasto heater and circulating pump in accordance with the following instructions will maximize the heating systems efficiency.

CAUTION
The Webasto heater relies on coolant flow to transfer heat from the heater to the vehicle's heating system. The coolant pump(s) must be operating and there must be a path for coolant to flow or the heater will overheat.

Coolant typically is routed out of the engine, through the Webasto coolant heater and then through the vehicle's heating system.
A path for coolant flow must always be maintained while the Webasto heater is in operation. A bypass loop will be required if an uninterrupted coolant flow path cannot be assured due to valves being closed while the Webasto heater is in operation. The coolant circulating pump(s) must operate while the Webasto heater is "ON."

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

The coolant circulating pump must be mounted as low as possible in the vehicle's 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 1.5" (38 mm) I.D. heater hose meeting SAE 20 R3 specifications. Silicone hose requires special hose clamps.

4.6.2 Engine and Passenger Compartment Heating

A: Heater Cores arranged in Series (fig. 401)
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 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.

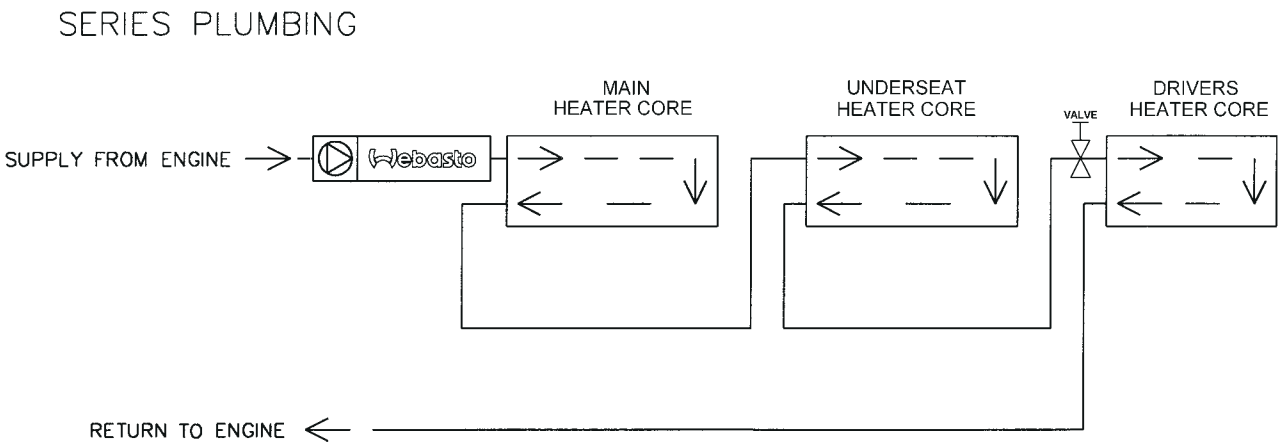


Fig. 401: Series Plumbing Circuit (Shown with heater installed)

CAUTION
A path for coolant to flow must be provided whenever the Webasto heater is operating.

B: Heater Cores arranged in Parallel (fig. 402)
A parallel heating system works in this fashion:
Heated water (coolant) from the engine travels through a common supply and return circuit, but unlike a series system, the heater cores are connected across the circuit at intervals along its length.
Each core shares the available coolant and heat equally, resulting in increased heating efficiency and decreased coolant restriction.

CAUTION
Water pump(s) must be operating when the Webasto heater is in operation..

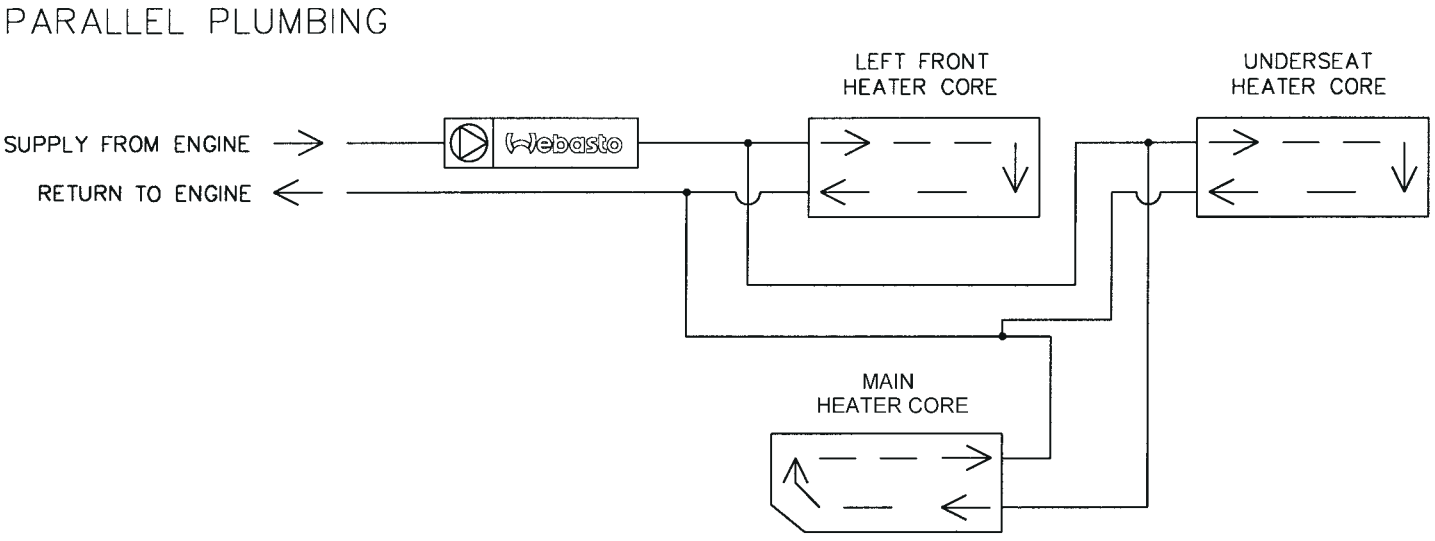


Fig. 402: Parallel Plumbing Circuit (Shown with heater installed)

A fuel fired Webasto heater used in conjunction with a high capacity coolant pump can significantly increase the available heat and coolant volume supplied to both series and parallel systems increasing interior heating efficiency. With the addition of a timer, the above systems can also provide pre-heating capability.

C: Engine pre-heating and/or Boost Heating Only (fig. 403)
This type of installation is used where engine pre-heating and or system boost heating is the primary requirement. The heater can be installed across the heating circuit before any of the vehicle heating cores or installed independently of the vehicles heating circuit by plumbing directly from and returning back into the engine. Depending on how the Webasto heater is controlled (timer, switch, vehicle system), heat can be supplied for engine pre-heating and maintaining higher operating temperatures. Interior heating efficiency will be enhanced by the higher operating temperatures provided by boost heating.

WARNING
When working on the coolant system, allow the engine to cool down and open the radiator cap carefully.

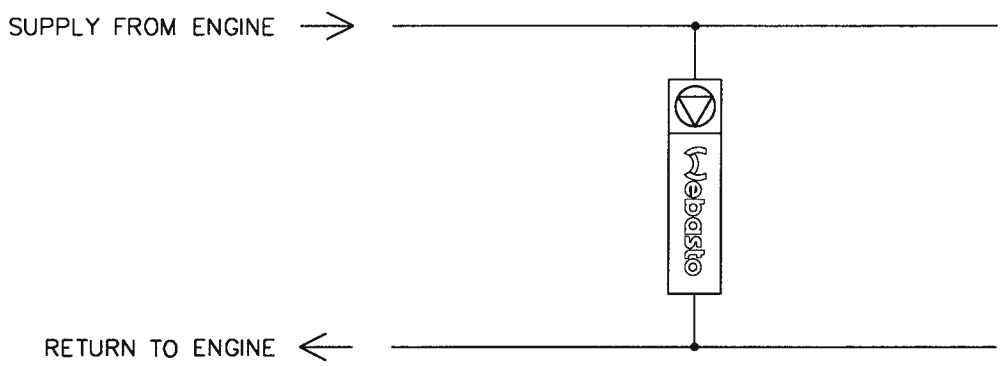


Fig. 403: Engine Preheat/Boost Heating Circuit

Instructions for options A, B or C (Typical installations)

On typical systems, the coolant supply will originate at the engine. From there, it will travel through the supply hose to the Webasto coolant pump (or vehicle manufacturer supplied boost pump), through the pump and into the fuel fired heater where the coolant is heated during operation. The heated coolant then leaves the heater at the outlet and continues on through the vehicles heating system and returns to the engine.

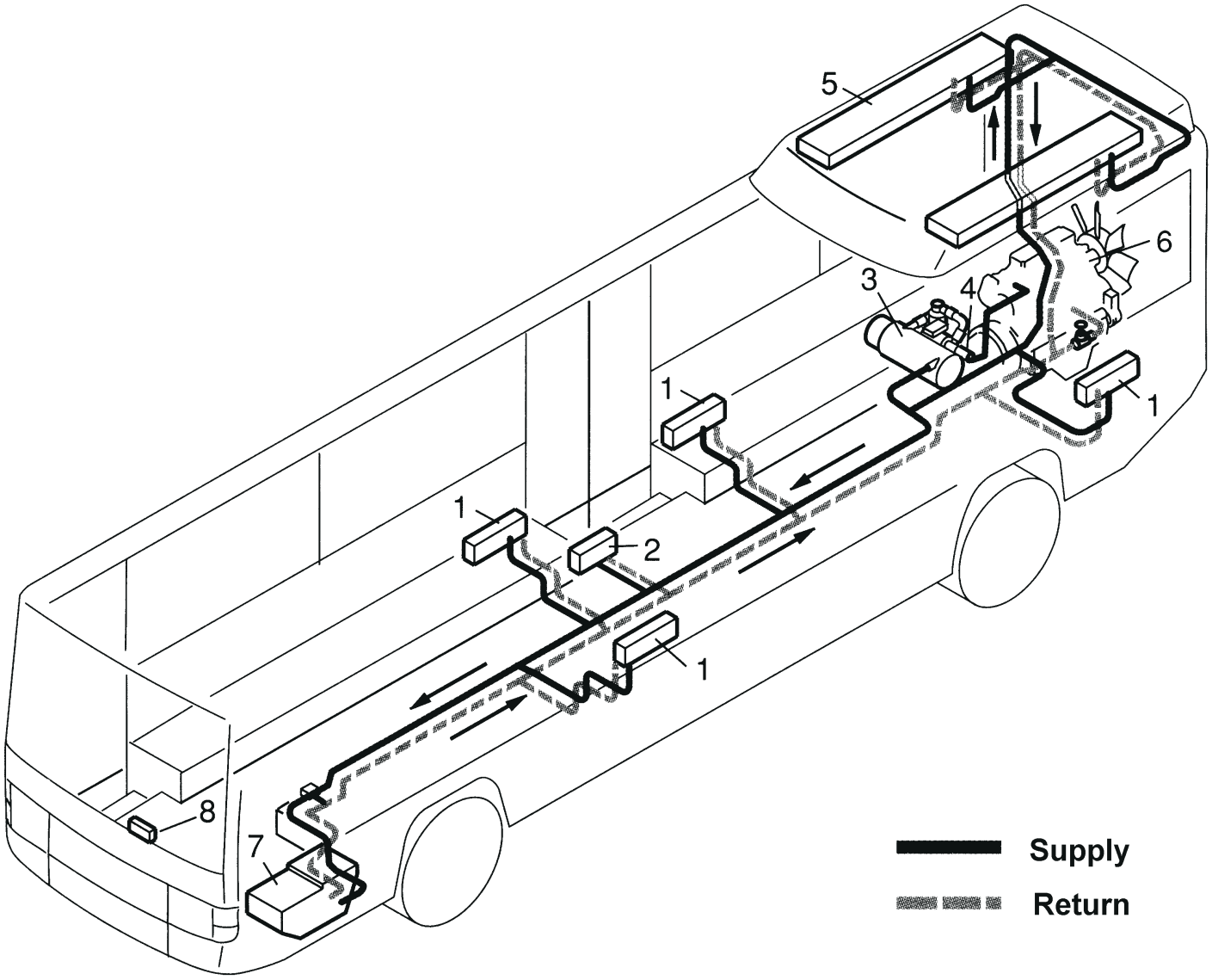
NOTE
Silicone hose requires special hose clamps.

NOTE
Heater hose must meet SAE 20 R3 specifications.

1. Identify the type of system you are working with to determine the appropriate type of installation as shown in figures 401, 402 or 403.
   - find and identify heating circuit supply hose. This is the starting point for determining the type of plumbing configuration you will choose.
2. Connect heater into the system according to the examples shown in figures 401, 402 or 403.

NOTE
Hose clamps must be tightened to to 45 in/lb. (5 Nm) torque.

4.6.3 Example of a Heater Installation in a Bus



1 Heat Exchanger with Fan
2 Stepwell Heater
3 Webasto Coolant Heater
4 Circulation Pump
5 Heat Exchanger, Roof
6 Vehicle Engine
7 Drivers Heater
8 Heater Control

Fig. 404: Example of Heater Installation

4.7 Fuel System

NOTE
The heater is equipped with an internal self priming fuel pump.

4.7.1 General Description

The fuel is drawn from the vehicles fuel tank through a fuel standpipe. This standpipe can be utilized on vehicles with a spare threaded port as shown in figure 405. The Webasto heater utilizes 37° flare JIC fuel connection fittings. The fuel supply line fitting is a JIC #4 and the return line is a JIC #6.

4.7.2 Fuel Supply

IMPORTANT!
Keep the submerged end of fuel standpipe at least 2" from bottom of fuel tank.

CAUTION
If the fuel tank is higher than the Webasto heater, the top of the tank may not be more than 20" above the heater.

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

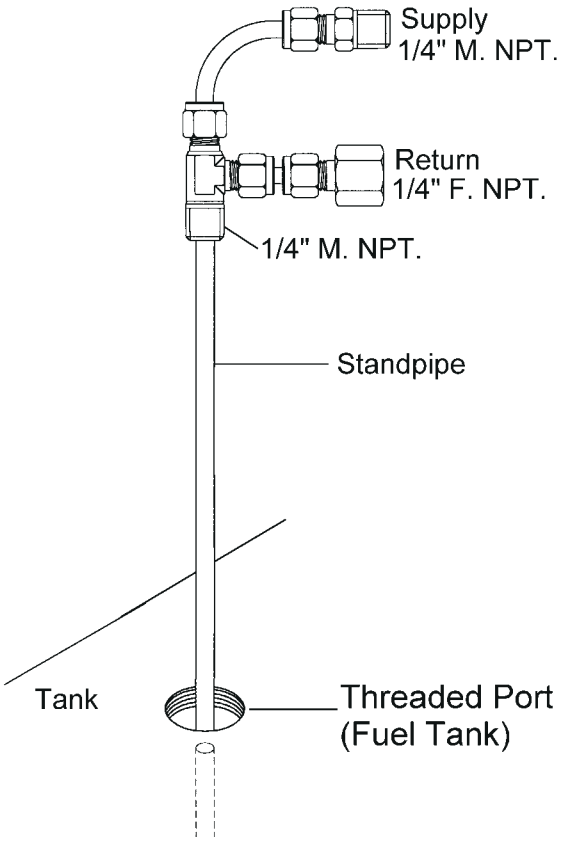


Fig. 405: Fuel Standpipe Installation

1. Cut fuel standpipe to length, approx. 2" off fuel tank bottom.
2. Install the fuel standpipe.

NOTE
After fuel standpipe has been cut to length, remove any burrs.

- use 1/4" or 1/2" spare port on fuel tank (if available) and install fuel standpipe securely in fuel tank, use pipe thread sealant on all pipe threads.

3. Route and secure fuel lines from heater to fuel tank. Route according to applicable regulations.
   Use grommets to protect fuel lines whenever routed through holes.
4. Connect fuel lines to fuel standpipe and heater using 1/4" (6 mm) I.D. fuel line. Steel braided fuel lines are recommended for installations where the heater is located in the engine compartment.

CAUTION
Fuel line must be secured every 12" and kept away from hot exhaust and moving parts (drive shaft, wheels, etc.).

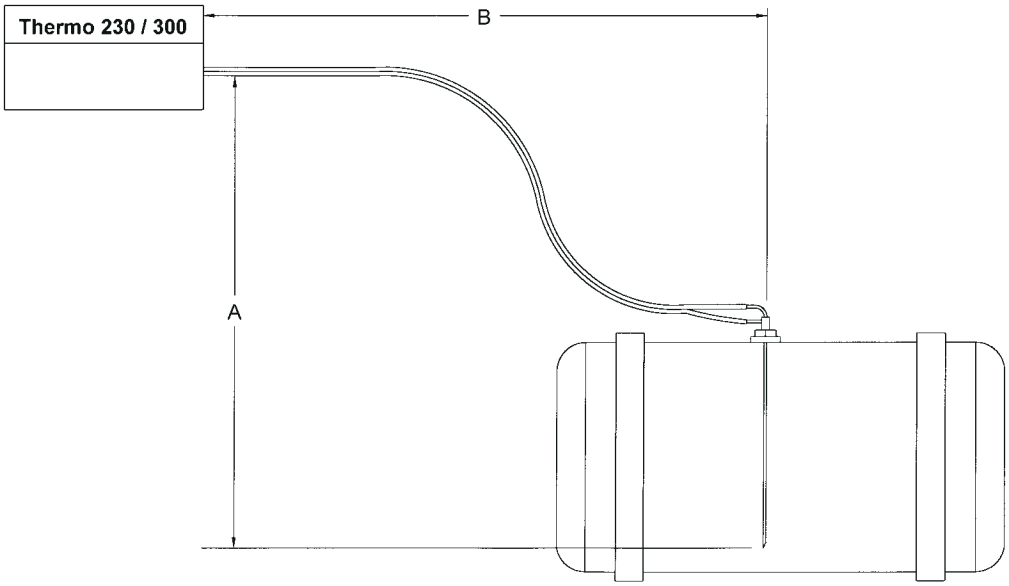


Fig. 406: Fuel Line Parameters

A = Suction height 6’6" (2,0 m)
A+B = Suction length and height not to exceed 33’ (10 m)

4.7.3 Fuel Filter

The heater must be equipped with a fuel filter. Fuel filters require changing at least annually and in cases of dirty fuel more often.

NOTE
Change the fuel filter at least annually.

The fuel filter assembly should be mounted near the heater.

After installation, before the heater is fired for the first time, the fuel system and filter will require priming. In most cases, this will be achieved by turning on the heater and allowing it to self prime.
In some cases the fuel filter may require filling with CLEAN diesel fuel before installation to assist system priming.

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

4.8 Wiring Connections

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

CAUTION
If welding is done on the vehicle, the main battery cables must be disconnected from the battery to protect the electronic control unit.

4.8.1 General Information

The control unit is equipped with low voltage protection, therefore it is imperative to keep vehicle batteries in good condition.

IMPORTANT: All power connections must be fused within 14" of the battery.

Thermo 230/300 heaters are available in 24 volt configurations only.

4.8.2 Timer and Switch Connections

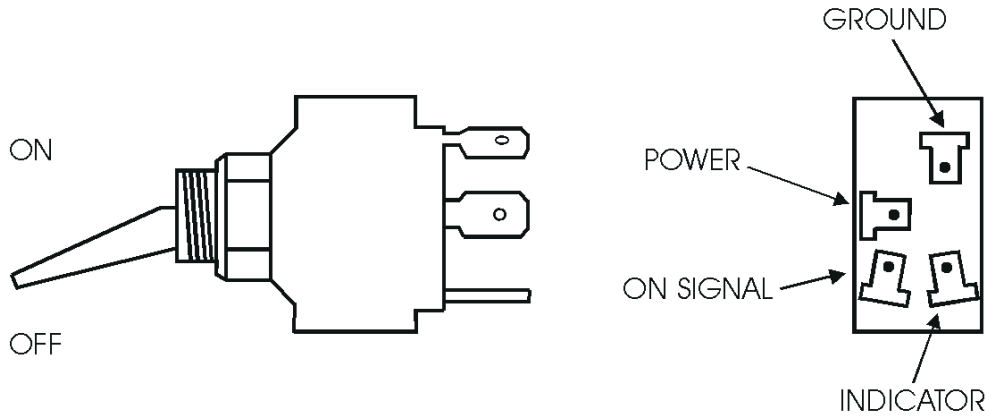


Fig. 407: On/Off Switch

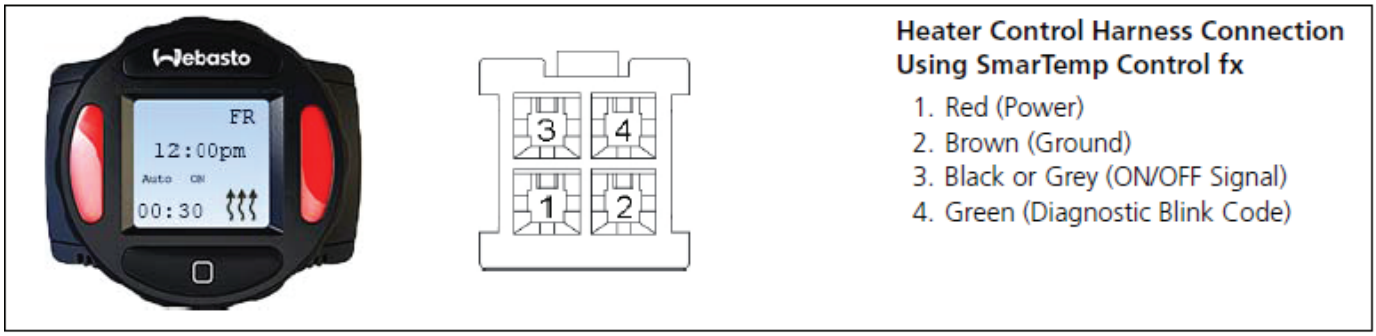


Fig. 408: 7-Day 4 Program SmarTemp Control fx Timer

4.8.3 Timer or Switch Installation

1. Select a suitable location in the vehicle for the timer or On/Off switch.
2. Connect the harness to the timer, or switch.

4.8.4 Wiring Diagram - with Switch

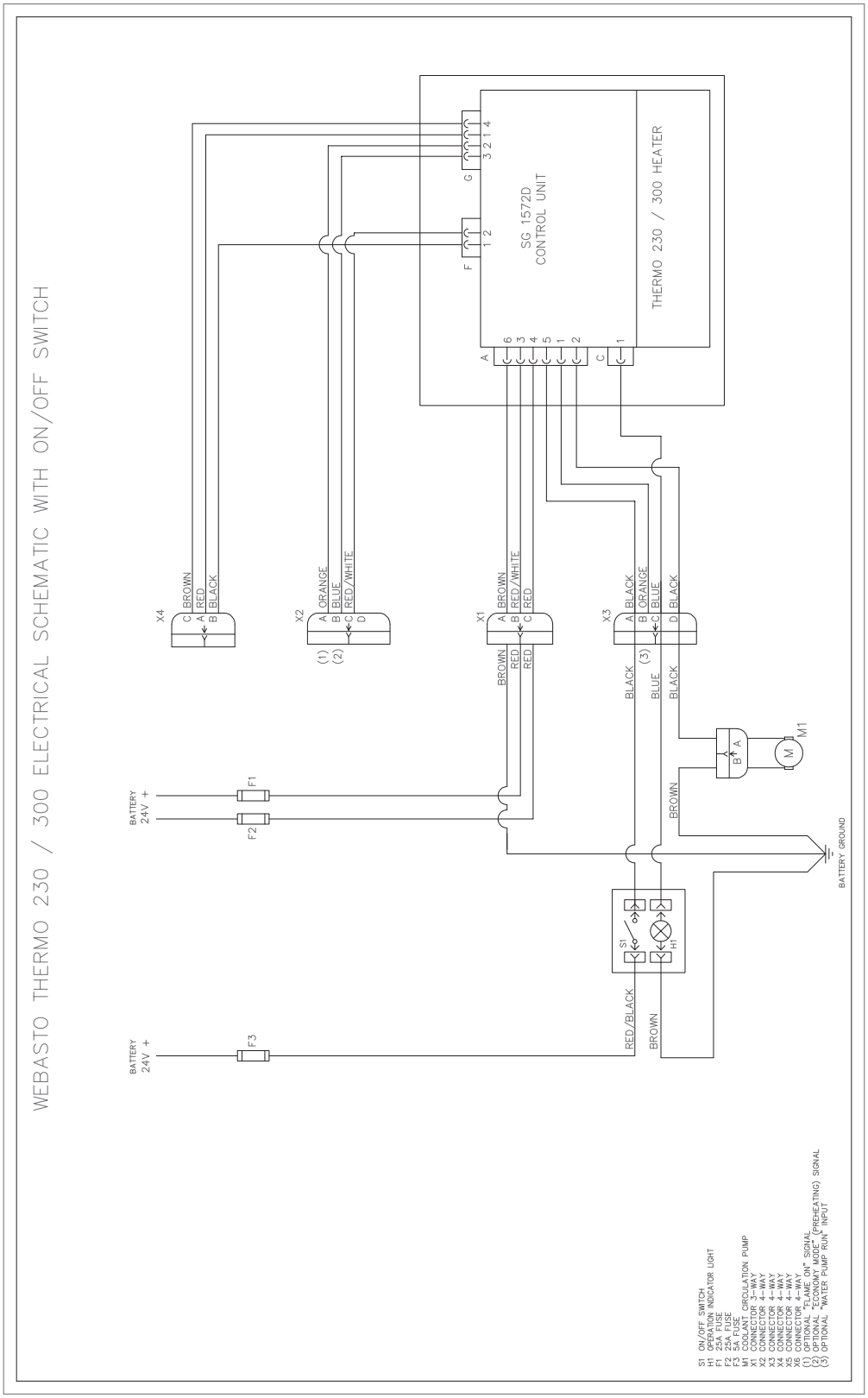


Fig. 409: Wiring Diagram with Switch

4.8.5 Wiring Diagram - with 7-Day 4 Program SmarTemp Control fx Timer

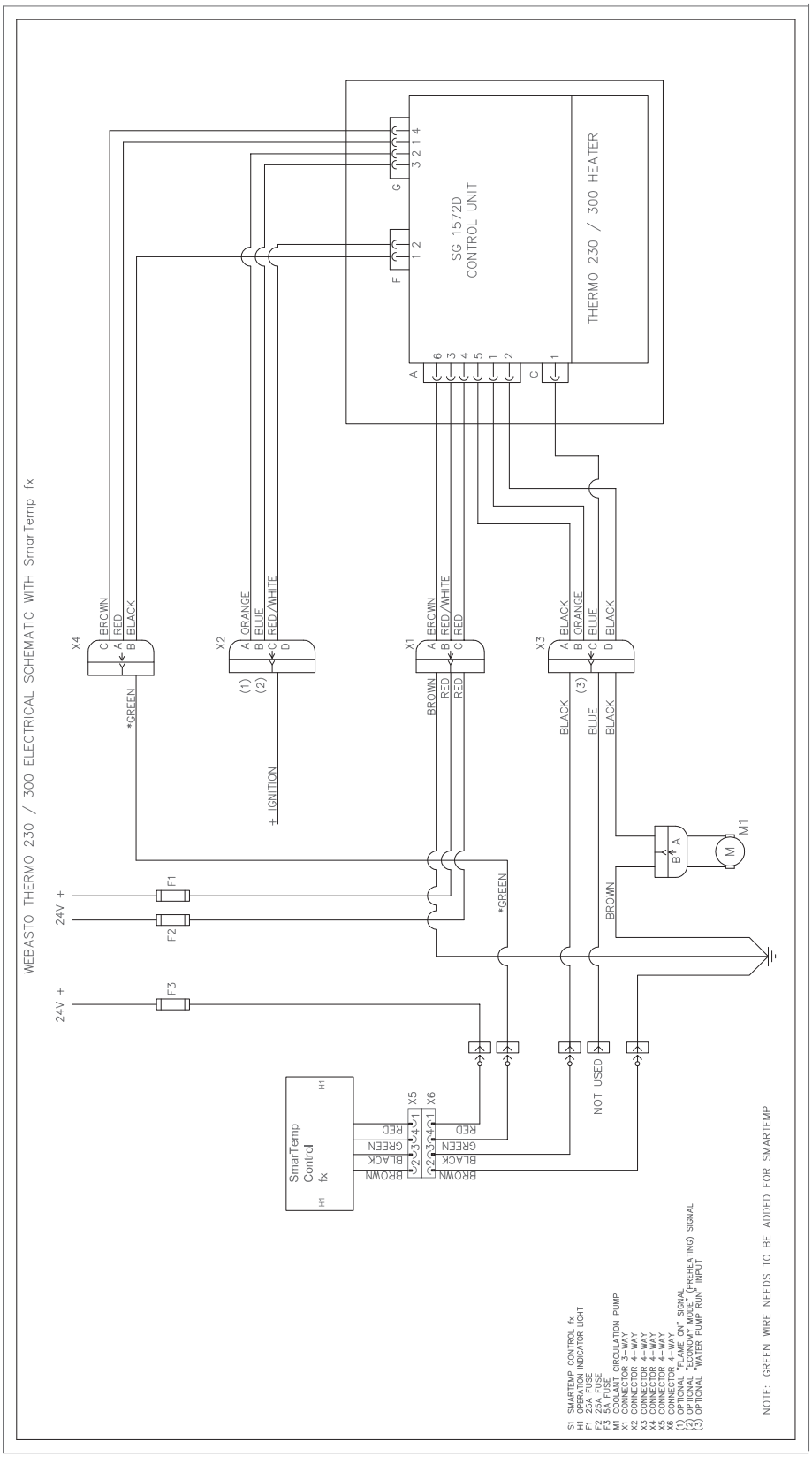


Fig. 410: Wiring Diagram with SmarTemp Control fx Timer

4.9 Initial Operation

⚠ DANGER

HEATER MUST BE SWITCHED "OFF" WHEN REFUELING AT FILLING STATIONS AND/OR WHILE LOADING OR UNLOADING FLAMMABLE MATERIALS FOR TRANSPORT, TO PREVENT THE RISK OF EXPLOSION. PLEASE REVIEW OWNER'S MANUAL FOR SAFETY AND USE INSTRUCTIONS.

Prior to starting heater for the first time, completed the checklist below.

	HEATER MOUNTING	**Complete (Yes/No/Comments)**
1	Is the heater installation safely secure / rigid? (Ensure that all bracket bolts are tight)	
2	Is there a safe clearance from heat generating Components? (I.e. exhaust, etc...)	
3	Is there sufficient clearance between heater and any vehicle moving components under all operating conditions? (steering cranked to extreme positions, torqued engine, suspension, etc...)	
4	Is the heater mounted in an acceptable position according to the limitations noted in the installation manual?	
5	Is the heater installed in a protected location from road debris and splash-water or items stored in the same area?	
6	Is there a sufficient amount clearance between the heater and the ground? (Coolant heaters only)	

	COOLANT SYSTEM	**Complete (Yes/No/Comments)**
1	Is there a safe clearance (min 4 in.) from heat generating components? (exhaust, etc...)	
2	Is there a safe clearance from sharp edges / objects? Ensure a heat protective has been installed (if applicable)	
3	Are there any kinks, sharp bends or the possibility for pinched hoses or harnesses, cuts and rub through?	
4	Have all the hose clamps been properly positioned and tightened?	
5	Has the coolant system been topped off and bleed per the **vehicle manufacture's specifications for proper mixture and type?**	
6	Has a pressure test been performed on the coolant system under all operating conditions?	
7	Have the coolant hoses been installed so that they are below the coolant filler cap?	
8	Has the coolant flow direction been verified?	

ELECTRICAL		Complete (Yes/No/Comments)
1	Has all wiring been safely secured away from moving components and / or heat sources?	
2	Check for proper power and ground connections.	
3	Has blower motor functionality been tested (if applicable)?	
4	Check for proper fuse tap connection.	
5	Verify the correct fuses are in the specified locations per the installation manual.	
6	Ensure heater and vehicle fuse boxes are closed and secure. Was the Webasto fuse block installed in a location protected from water and / or moisture?	
7	Ensure blower motor resistor (1.0Ω) is securely mounted and has sufficient clearance from any plastic component and battery.	
8	Ensure battery is mounted securely and connections are properly tightened.	
9	Ensure battery is at ≥ 12.2Vdc.	

FUEL SYSTEM		Complete (Yes/No/Comments)
1	Is the standpipe properly mounted in the fuel tank? (sealed, structural integrity maintained).	
2	Validate the standpipe does not interfere with function of sending unit by checking fuel gauge for proper operation before completing installation of tank.	
3	Verify that all fuel lines are properly secured and are a safe distance (min. 4 in.) from exhaust systems and / or moving components.	
4	Check all fuel lines for leaks or kinks.	
5	Check fuel line clamps for proper positioning and tightness. Ensure fuel system is free of leaks.	
6	Ensure fuel pump is securely mounted in a cool location **NOTE:** Vehicle fuel tank area is generally a location with minimal sound transfer path to vehicle interior.	

EXHAUST SYSTEMS		Complete (Yes/No/Comments)
1	Is the muffler and clamps securely tightened?	
2	Has muffler and exhaust tube been routed a safe distance (min. 2 in.) from flammable material?	
3	Ensure drain-holes are drilled in low bend areas of exhaust tube.	
4	Ensure exhaust is venting a safe distance from any vehicle interior openings.	
5	Ensure exhaust is venting in the direction that will not cause back pressure while driving.	

COMBUSTION AIR INTAKE		Complete (Yes/No/Comments)
1	Is the combustion air intake drawing fresh air from a non-turbulent location? (i.e. not in direction of travel)	
2	Ensure air intake system is securely fastened.	

HEATER FUNCTION		Complete (Yes/No/Comments)
1	Ensure heater starts and runs for a minimum of 20 minutes.	
2	Ensure vehicle blower turns "ON".	
3	Ensure warm air is blown out of interior vents after blower is activated.	
4	Ensure timer (control device) is functioning.	
5	Check and Modify CO2 setting as needed based on altitude (will the heater "live" or spend a lot of time above XXXXXX Feet) **(See service manual for instructions to make adjustment)**	

COSMETICS		Complete (Yes/No/Comments)
1	Has the vehicle interior, engine compartment, trunk & glove compartment been inspected for cleanliness after installation.	
2	Has user manual placed in glove box?	
3	Is the vehicle clock time correct after disconnecting the battery?	

If you have any questions, contact our technical support team at (800) 860-7866 or via email at: info-us@webasto.com.

NOTE:
Complete the warranty card and mail to Webasto Thermo & Comfort N.A., Inc.. *Necessary information to complete warranty registration card and ensure full warranty coverage can be found on the name plate on top of the burner head.*

NOTE:
Installation with long fuel lines may require a second start attempt to initially prime the fuel system. Cycle ON/ OFF switch or timer to reset control unit.

NOTE:
Coolant temperature must be below 70 °C (158 °F) to start up heater.

NOTE:
The engine temperature gauge may read a lower temperature than actual coolant temperature at heater outlet. This difference depends on the location of the temperature sensor on the engine in relation to coolant flow.

5. Maintenance of the Heater

5.1 Annual Maintenance

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

NOTE
For major repairs and spare parts, return to your authorized Webasto Thermosystems servicing Specialist.

Enclosure Area

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

Electrical System

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

NOTE
The heater will not function properly with weak batteries.

Exhaust System

- check the exhaust system carefully for restrictions or corroded areas. Replace exhaust pipe if necessary.

Fuel System

- change fuel filter and inspect fuel lines for wear and damage. Repair or replace if necessary.

Burner System

- swing open burner head, clean flame detector (photo eye), pull out combustion chamber and inspect and clean heat exchanger. Replace nozzle if necessary (annually). Re-install combustion chamber and close up burner head.

Operation Test

- Run your heating system for at least 15 minutes.
- Check water and fuel connections for leakage. Re-tighten clamps and fittings if necessary.

NOTE
Operate your Webasto at least once a month for 20 minutes.

6. Basic Troubleshooting

CAUTION
Troubleshooting requires profound knowledge about structure and theory of operation of the heater components and should only be performed by skilled personnel.

6.1 General Information

This section describes troubleshooting procedures for the Thermo 230/300 coolant heater.
Troubleshooting is normally limited to the isolation of defective components.

Before troubleshooting, check for and eliminate these defects:
- **fuel supply (plugged fuel filter)**
- **corrosion on battery terminals**
- **blown fuses**
- **corrosion on electrical wiring, connections and fuses**
- **loose contacts, or improper crimping on connectors**
- **shut down initiated by temperature limiter thermostat (automatic reset)**

NOTE
After any correction of a defect a functional test has to be performed in the vehicle.

NOTE
Coolant temperature must be below 158°F (70°C) to start up.

6.2 Operational Failure Symptoms (reading the flash code)

A flash code will be generated on the indicator light of the control (on / off) switch in the event of an operational failure. In order to make a correct analysis it's necessary to understand the flash code event. The flash code event is only visible during the after run (cool down) period of operation.

During the flash code event you will see the following:

Five quick flashes followed by a slower sequence of flashes, the slower sequence of flashes is the actual fault code. The first five quick flashes are only an indication that a fault code has been registered and will be displayed. Count only the slower sequence of flashes to obtain the current fault code.

For example (flashes = ¤):
Fault code 7X (F 07): ¤¤¤¤¤ ... ¤ ... ¤ ... ¤ ... ¤ ... ¤ ... ¤ ... ¤

The flash code sequence will be repeated during the Thermo 230/300 after run (cool down) period and will remain visible once heater stops in the lock out mode. Once the heater is cycled "OFF" and "ON" the fault code will no longer be visible on the indicator light but will be stored in memory.

6.2.1 Reading a Fault Codes with SmarTemp Control fx Timer Installed

Using the rotary dial and selection button choose Error Codes from the Menu. This section will log the last 5 error codes and the date that it was set. Highlight and select an error code for a full description.

If the heater produces an error code, the status indicator lights will flash red and the error will display on the main screen. Error codes cannot be reset through the Webasto SmarTemp Control fx on the heater. Refer to the heater service manual for resetting an error code.

CAUTION
Troubleshooting requires profound knowledge about structure and theory of operation of the heater components and may only be performed by skilled personnel.

NOTE
After any correction of a defect a functional test has to be performed in the vehicle.

6.2.2 Storing a Fault Code in Memory

Once the Thermo 230/300 completes the after run (cool down) period initiated by a failure event, the current flash code will be downloaded
(stored) in memory.
The Thermo 230/300 can store up to ten fault codes.
Once the memory is “full”, any additional fault code will replace the earliest code stored thereby continually updating the fault codes
stored in memory with the four most recent faults.

6.2.3 Heater Lockout Reset Procedure

The control unit continuously monitors the heater operation. The control unit identifies errors on individual heater components and faults during operation. Should the control unit experience component errors and operational faults, the heater may be shut down.

Heater Lockout Reset Procedure:

1. Switch the heater ON
2. Within 10 seconds disconnect power from the heater (unplug the harness, disconnect the battery, remove the fuse)
3. Wait 10 seconds
4. Switch the heater OFF
5. Reconnect power
6. Switch the heater ON.
7. Rectify the cause of the fault

IMPORTANT: Heater fault codes can be read using PC Diagnostics, however, the heater lockout reset must be manually performed using the procedure stated above.
If you have any questions, contact our technical support team at:
(800) 860-7866 or via email at: info-us@webasto.com.

IMPORTANT: Heater fault codes can be read using PC Diagnostics, however, the heater lockout reset must be manually performed using the procedure stated above.

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6.3 Operational Failure Symptoms via Fault/Flash Code

The following table lists the possible faults which can be read by flashing code or read directly off of an appropriate timer or with the PC diagnostics kit.

Failure Symptom	Probable Cause	Check and Correct
1X Flash (F 01) No combustion after completion of start up sequence.	- Fuel system - Combustion air - Electronic ignition	- Fuel level - Type of fuel being used - Fuel filter - Fuel line connections (air bubbles in fuel lines) - fuel nozzle plugged - Air intake or exhaust, restricted or plugged - incorrect electrode gap
2X Flashes (F 02) Flame out during burner operation no restart possible	- Fuel supply (shortage of fuel)	- Restriction in the fuel system - Fuel filter - Fuel line connections (air bubbles in fuel lines) - Type of fuel being used
3X Flashes (F 03) Low voltage for more than 20 seconds	- Electrical system	- Load test batteries - Corrosion at connections - Loose connections
4X Flashes (F 04) Flame detector recognizes false flame signal during pre-start or shut-down cycle	- Defective flame detector	- Replace flame detector
5X Flashes (F 05) Flame detector	- Wiring - Defective flame detector	- Damaged wiring, open or short circuit - Replace flame detector
6X Flashes (F 06) Temperature sensor	- Wiring - Defective temperature sensor	- Damaged wiring, open or short circuit - Replace temperature detector
7X Flashes (F 07) Fuel solenoid valve	- Wiring - Defective solenoid valve	- Damaged or corroded wiring, open or short circuit - Replace solenoid valve
8X Flashes (F 08) Combustion air fan motor	- Wiring - Wrong RPM - Defective combustion air fan motor	- Damaged wiring, open or short circuit - Replace combustion air fan - Replace combustion air fan
9X Flashes (F 09) Circulation pump motor	- Wiring - Defective circulation pump motor	- Damaged wiring, open or short circuit - Replace circulation pump motor
10X Flashes (F 10) Temperature limiter	- Overheat condition - Coolant flow - Wiring - Defective temperature limiter	- Reset temperature limiter - Coolant level or flow restriction - Air trapped in coolant circuit - Damaged or corroded wiring, open or short circuit - Replace temperature limiter
11X Flashes (F 11) Electronic ignition coil	- Wiring - Defective electronic ignition coil	-Damaged wiring, open or short circuit -Replace electronic ignition coil
12X Flashes (F 12) Heater lock out	3 repeated faults/flame-outs or 5 repeated start attempts	Follow heater lockout reset procedure (6.2.3 above).

Table 601: Operational Failure Symptoms (Control Unit SG 1572 D)

6.4 Reading and Removing Fault Codes Stored in Memory with the Webasto PC Diagnostics Kit and Adapter

CAUTION
Diagnostics equipment is intended for use by Webasto trained personnel at authorized Webasto Distributor, Dealer and End User service facilities.

It is possible to read and remove (reset) stored fault codes from the Thermo 230/300 memory.
This is achieved through the use of a diagnostic interface kit connected to the Thermo 230/300 and an IBM compatible computer having the necessary software installed.

The PC Diagnostic Interface Kit comes with software and instructions for use with Webasto heaters equipped with internal diagnostics capabilities such as the Thermo 230/300.

Order PC Diagnostics Kit under part number 925 42A and adapter under part number 208 65A.

System requirements:
- IBM compatible PC with 80286 processor or higher
- DOS version 3.0 or higher including *MS Windows (*Not required)
- at least 1 MB RAM
- hard disk with at least 3 MB space available
- 3 1/2 inch, 1.44 MB floppy disk drive for installation of program files
- VGA graphics board with 640 x 480 pixel resolution and at least 16 colors
- unused serial port
- monitor, keyboard (mouse or other pointing device recommended)

In addition to working with stored fault codes, the PC Diagnostics Kit allows you to do several other functions such as reading values while the heater is in operation or testing individual components. Printing out of fault codes is also available (User supplied printer required).

For further capabilities and detailed instructions for use with the Thermo 230/300 heater, see instruction manual supplied with the PC Diagnostics Kit.

Product registration:
The heater can be registered by visiting www.techwebasto.com
or by scanning the code.
A proof of purchase is required for all heaters that are not registered.

THIS WARRANTY IS NON-TRANSFERABLE.

Webasto
Feel the Drive

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USA: (800) 555-4518
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