

Coolant Heater

## **Thermo Top (TTC)**

Operating Instructions  
Installation Instructions



## Contents

<b>1. Introduction</b>	
1.1 General Description .....	101
1.2 Legal Provisions .....	102
1.3 Meaning of Warning, Caution and Note.....	102
<b>2. Operating the Webasto Thermo Top C (TTC)</b>	
2.1 Switching On.....	201
2.2 Switching Off.....	202
2.3 Operation with Optional Digital Timer .....	202
2.4 Digital Timer Setting / Operating Instructions .....	204
2.5 SmarTemp Control fx / Operating Instructions.....	205
<b>3. Technical Data</b>	
3.1 Technical Data .....	301
3.2 Heater Dimensions .....	302
3.3 Fuel Pump Dimensions.....	302
<b>4. Installation</b>	
4.1 General Information .....	401
4.2 Installation Locations .....	401
4.3 Mounting the Heater .....	402
4.4 Exhaust Pipe Connection .....	403
4.5 Combustion Air Supply .....	403
4.6 Plumbing the System.....	404
4.6.1 General Information .....	404
4.6.2 Plumbing the Thermo Top C into The Coolant System.....	405
4.6.3 Contents - Engine Connections .....	407
4.7 Fuel System.....	415
4.7.1 General Description .....	415
4.7.2 Fuel System Limitations .....	415
4.9 Initial Operation.....	
4.7.4 Fuel Standpipe .....	416
4.7.5 Fuel Line .....	418
4.7.6 Fuel Filter .....	418
4.8 Wiring Connections.....	419
4.8.1 General Information .....	419
4.8.2 Power Connection to Battery .....	419
4.8.3 Switch and Timer Connections .....	419
4.8.4 Circuit Diagrams.....	421
4.8.5 Wiring Diagram - Thermo Top C (12 Volt) with On/Off Toggle Switch.....	423
4.8.6 Wiring Diagram - Thermo Top C (12 Volt) with Optional Digital Timer .....	425
4.8.7 Wiring Diagram - Thermo Top C (12 Volt) with SmarTemp Control fx.....	427
4.9 Initial Operation.....	428
<b>5. Maintenance of the Heater</b>	
5.1 Annual Maintenance .....	501

## Contents

6.	Basic Troubleshooting	
6.1	General Information .....	601
6.2	General Failure Symptoms .....	601
6.3	Heater Lockout Reset Procedure .....	602
6.4	PC Diagnostics Kit .....	602

## List of Figures

101	Webasto Thermo Top C Coolant Heater .....	101
201	Optional 7-Day Timer .....	203
301	Heater Dimensions .....	302
302	Fuel Pump Dimensions .....	302
401	Installation Locations .....	401
402	Permissible Heater Installation Positions .....	402
403	Engine Block Preheating and/or Boost Heating .....	405
404	Fuel System Limitations .....	415
405	Fuel Pump Mounting (DP 30) .....	416
406	Fuel Standpipe .....	417
407	Fuel Line Connection .....	418
408	On/Off Toggle Switch .....	420
409	Optional 7-Day Digital Timer .....	420
410	Optional SmarTemp Control fx .....	420
411	Control Unit Connector Pin Assignment (Thermo Top C) .....	421
412	Automatic switching Circuit for Thermo Top C, 12V Timer .....	422
413	Wiring Diagram - Thermo Top C (TTC) with ON/OFF Toggle Switch .....	423
414	Wiring Diagram - Thermo Top C (TTC) with Optional Digital Timer .....	425
415	Wiring Diagram - Thermo Top C (TTC) with SmarTemp Control fx .....	427

## List of Tables

201	Digital Timer Setting Instructions .....	204
301	Technical Data - Heater .....	301
302	Technical Data - Circulating Pump .....	301
601	General Failure Symptoms .....	601

Item No. 907512

Org. 9/1/99 Subject to modification.

## 1. Introduction

### 1.1 General Description

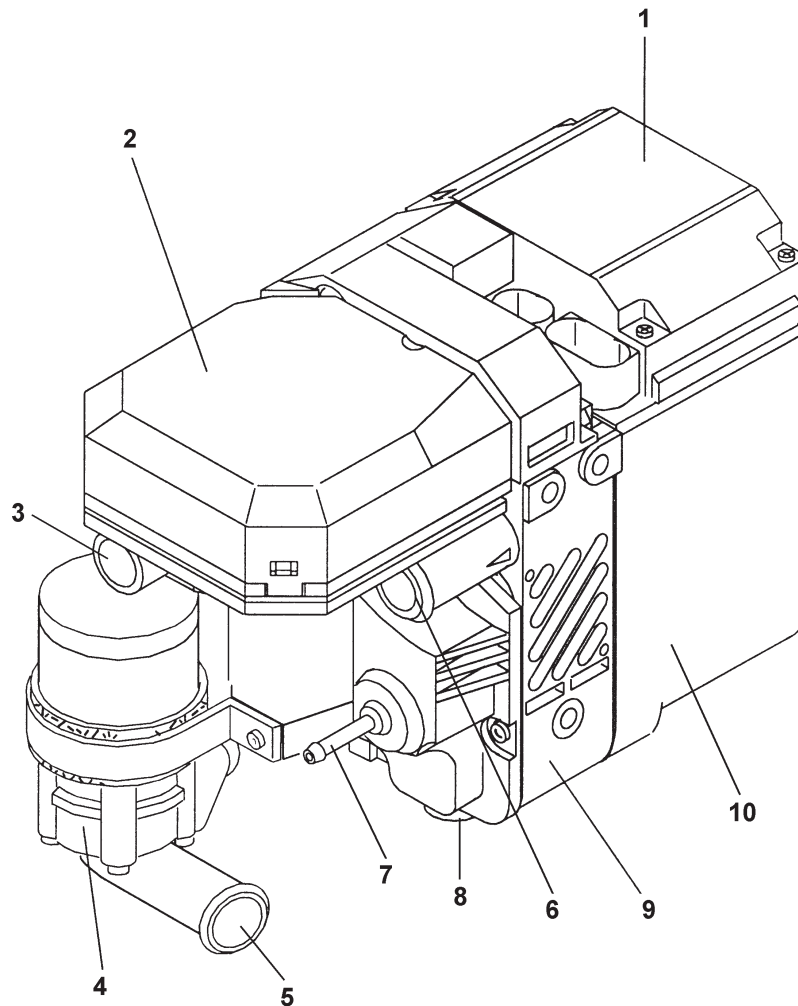


Fig. 101: Webasto Thermo Top C Coolant Heater

- |   |                                   |
|---|-----------------------------------|
| 1. Control Unit.                        | 6. Coolant Outlet Connection Pipe |
| 2. Combustion Air Fan Assembly          | 7. Fuel Inlet Connection Pipe     |
| 3. Combustion Air Inlet Connection Pipe | 8. Exhaust Outlet Pipe            |
| 4. Coolant Circulating Pump             | 9. Combustion Chamber             |
| 5. Coolant Inlet Connection Pipe        | 10. Heat Exchanger                |

The Webasto TTC is designed for Class 3-7 vehicles. This dynamic system allows you to preheat engines on or offsite. The TTC offers high performance with low power and fuel consumption. Approximately 2-hours of operation eliminates overnight idling for heating and the need for expensive electrical plug-ins. The compact design allows the heater to be frame rail or engine compartment mounted. The TTC is easy to install, maintain and operate. The universal package fits most of today vehicles.

## 1.2 Legal provisions

Heater installation must be performed in accordance with the manufacturer's installation instructions.

Any deviation from these instructions are only permitted with the written approval from Webasto Thermo & Comfort N.A., Inc.

It is the dealer's responsibility to approve installations not performed by Webasto trained personnel.

Installation not complying with the installation instructions release Webasto Thermo & Comfort N.A., Inc. from any product liability.

OEM installations must be approved by Webasto Thermo & comfort N.A., Inc.

## 1.3 Meaning of Warning, Caution and Note

### **WARNING!**

This heading is used to highlight that noncompliance with instructions or procedures may cause injuries or lethal accidents to personnel.

### **CAUTION!**

This heading is used to highlight that noncompliance with instructions or procedures may cause damage to equipment.

### **NOTE:**

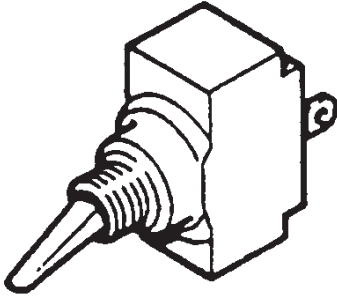
This heading is used to highlight and draw specific attention to information.

## 2. Operating the Webasto Thermo Top C (TTC)

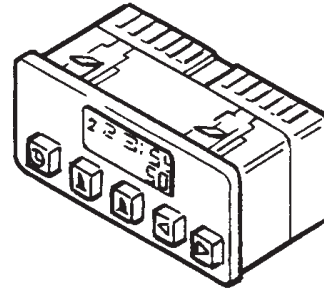
Before switching on the TTC, set vehicle heating system to the heat position and open any shut off valves. Depending on the type of control installed in the dashboard of the vehicle, the TTC can be operated by the following methods.

### 2.1 Switching On

#### Using a Switch:



#### Using the Optional Digital Timer:



#### Using the Switch:

When the switch is used for turning ON the TTC, the operation indicator (toggle) lights up. Shortly thereafter, the heater begins operation and delivers heated coolant to the engine.

#### Using the Optional 7-Day Digital Timer:

1. Set the timer up to 2 hrs. before you want to start the engine. The heater will start at set time. (See timer operating instructions.)  
Or switch fiinstan onf 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 TTC heater OFF The TTC will go through the after-run cycle.

Pushing the Instant Heat button or when timer setting reaches desired start time, the Heat indicator on the timer will light, signaling that the heater is in operation.

See section 2.3 Operation with 7-Day Digital Timer for complete instructions.

#### **NOTE:**

If heater is being switched on while the engine is warm only the circulating pump will run, coolant temperature must fall below 86 °F. (30 °C.) before heater starts.

#### Startup Sequence:

The coolant circulating pump, ceramic igniter and combustion air fan start operation and after approximately 60 seconds combustion starts (audible combustion sound).

After the coolant temperature has reached the set point of 170 °F (77 °C) the TTC will automatically adjust its heat output to a lower operating range (part-load heat output).

If the temperature of the coolant continues to rise and climb over 174 °F (79 °C) at the heater outlet, the heater will cycle off.

When the temperature falls below 149 °F (65 °C) the heater will restart and repeat the heating cycle.

**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 or ventilation.

**The Thermo Top C (TTC) will cycle on and off until:**

1. The toggle switch is switched OFF
2. The Instant Heat button is pressed once again, signaling heater to shut off.
3. Time has elapsed on the timer.
4. The vehicle battery voltage drops below 9.6 V or the TTC runs out of fuel.

**WARNING!**

Explosion hazard! The heater must be switched OFF while refueling and at fueling stations.

**WARNING!**

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

**2.2 Switching Off**

**Manually:** When heating is no longer required, switch the TTC heater off by means of the toggle switch or by pressing the Instant Heat button on the optional timer.

The indicator light turns off, combustion is extinguished followed by an after run cycle of approximately 90 seconds.

**Automatically:** When the optional timer has reached the end of the timed cycle (up to 2 hours).

**NOTE:**

Restarting the heater during the after-run period is permitted.

**2.3 Operation with Optional 7-Day Digital Timer**

The timer enables you to preset the start time of the heater up to 7 days in advance.

In addition, the timer enables the heater to be switched on and off instantly thereby eliminating the need for a separate switch.

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

The timer features a wake up alarm function.

**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 of which only one can be activated at any one time.



### Preselected Starting Times

The preselected starting time is the time at which the timer switches the heater 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.

### 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 preselected 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.



### Setting the Digital Timer

After the power has been connected, all symbols on the digital display will be flashing.

The time of the day and the day of the week must be set.

The Timer can be programmed in that all flashing symbols can be adjusted by means of the  and  buttons.

If the 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.

See table 201 on following page for setting reference or full instructions supplied with timer.

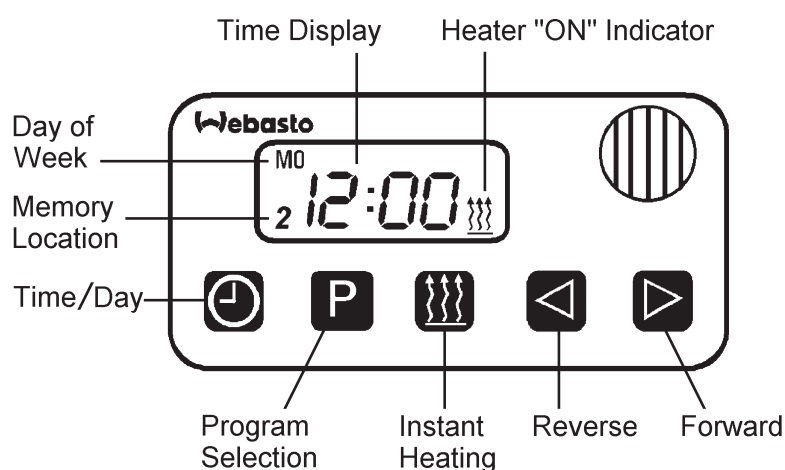


Fig. 201: Optional 7-Day Digital Timer

## 2.4 Digital Timer Setting / Operating Instructions


























Switching the heater on	Manually: by pressing the  button (continuous heating mode) Automatically: by programming the heater starting time
Switching the heater off	Manually: by pressing the  button Automatically: after the programmed operating time has elapsed. With the heater running: by programming the remaining operating time.
Setting time / day of the week	Press the  button for more than 2 seconds - time of the day is flashing - and set the clock using the  and  buttons. After 10 seconds, day of the week begins flashing - set the day of the week in the same manner as the time.
Viewing the time	With the ignition switched off: press the  button (bus wiring only).
Programming heater starting time	Press the  button - the memory location is flashing - using the  and  buttons set start of the heater operating time. After 10 seconds, day of the week begins flashing - set the day of the week on which the heater is to turn on. By repeatedly pressing the  button, memory locations 2 and 3 can be programmed or the time display mode can be reached.
Recalling / erasing preset times	Repeatedly press the  button until the desired memory location is displayed. To erase the preset time, press the  button several times until the time of the day is displayed instead of the memory location.
Programming duration of operating time	The heater must be switched off. Press the  button for 3 seconds - operating time is flashing - and set the desired operating time (10 to 120 minutes) using the  and  buttons.
Setting the remaining operating time (Bus wiring Option)	Set the desired remaining operating time (1 to 120 minutes) using the  and  buttons. The remaining operating time refers to the time the heater still continues to remain in operation after the vehicle ignition is turned off. It can only be changed while the heater is in operation and the ignition switched off.
Setting the wake up time (Digital Comfort Timer Only)	A wake up time can only be programmed on the 1531 comfort digital timer. The wake up time is not bound to a specific day of the week. Repeatedly press the butt  until the bell symbol  appears on the display. Set the desired wake up time using  the and  buttons. The alarm clock turns off after 5 minutes or when one of the buttons is pressed.
Recalling / erasing the wake up time	To recall the wake up time, repeatedly press  the button until bell symbol  appears on the display - read off wake up time. To erase the wake up time: press  the button until the bell symbol  is no longer visible on the display.
Remote control	Possible by means of an optional external signal.

Table 201: Digital Timer Setting Instructions

## 2.5 Operation with Optional SmarTemp Control fx

### Preselected Starting Times

The preselected starting time is the time at which the timer switches the heater on automatically. The Webasto SmarTemp Control fx allows for preset start-up cycles of your Webasto heater up to 7 days in advance with 4 unique programs for each day.

### 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 preselected for any time from as little as 10 minutes 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. This can be changed with duration menu feature explain further in menu descriptions on page 206.

### Setting the SmarTemp Control fx

The Webasto SmarTemp Control fx can be operated using a single rotary dial around the outside of the unit to browse through different menu options. Simply click the selection button (□) to make your choice. The following sections will define each menu item and its default setting.

Once the power has been connected, the time and date must be set. This can be done by using the rotary knob and the selection button as mentioned above. Within the timer menu, select the day or the specific timer program (T1 – T4) using the rotary knob. Once the day, time, and duration have been entered within the calendar table, press the selection button to set. A checkmark will confirm the program has been saved. Each program can be edited or removed simply by selecting the box again.



\* The micro USB Service Port is used for Webasto heater diagnostic purposes only. This adaptor cannot be used to charge cell phones or other electronic devices.

### 2.6 SmarTemp Control fx / Operating instructions

	Definitions	Default
<b>Time &amp; Date</b>	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 modes.	AM / PM (12 Hour)
<b>Mode</b>	<p>Two modes are possible:</p> <ul style="list-style-type: none"> <li>Auto mode will allow the heater to turn ON/OFF based on the pre-defined timer programs. Manual ON/OFF operation is still possible while in this mode.</li> <li>Manual Mode allows the heater to be manually operated via the Webasto button on the SmarTemp Control fx. While in Manual Mode, all Auto Mode functionality is disabled (Timers inactive).</li> </ul> <p><b>Note:</b> 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.</p>	Manual
<b>Duration</b>	<p>Duration allows for the selection of timed heater run-time. Set range is between 10 – 120 minutes selectable by 10 minute increments.</p> <p>While using Manual Mode, the "Duration" setting will be used for the run-time of the heater when the Webasto button is pressed.</p>	60 minutes
<b>Timer</b>	<p>Timer allows the user to set 4 heater start-up cycles per day up to 7 days in advance. Select the day or the specific timer program (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 program has been saved. Each program can be edited or removed simply by selecting the box again.</p> <p><b>Note:</b> 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.</p>	No Presets
<b>Skip</b>	<p>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 <u>one</u> cycle (7 day period). Preset timer programming will reactivate after this one-time skip cycle.</p> <p><b>Note:</b> To permanently remove a program, refer to the "Timer" section.</p>	N/A
<b>LVD</b>	<p>LVD "Low Voltage Disconnect" allows the user to adjust the battery voltage level at which the Webasto SmarTemp Control fx will shut down heater functionality.</p> <p>If battery voltage is equal to or less than the threshold selected +0.1v, the heater will not start. i.e. if an 11.5v threshold is selected the heater cannot be started until B+ has reached 11.7v.</p> <p>12 volt - Range between 11v – 12.5v 24 volt - Range between 21v – 25.5v</p>	12.1v 24.2v
<b>Error Codes</b>	<p>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.</p> <p>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. Refer to the heater service manual for resetting an error code.</p> <p><b>Note:</b> Error code functionality <u>does not</u> apply to <u>Thermo Top C</u> heaters. Errors codes for this product can still be obtained using PC Diagnostics. Refer to the applicable service manual by visiting <a href="http://www.techwebasto.com">www.techwebasto.com</a> for detailed PC diagnostics information.</p>	No Errors
<b>Hour Meter</b>	<p>The hour meter logs the operating hours that the heater is commanded "ON" from the SmarTemp Control fx.</p> <p><b>Note:</b> For warranty purposes a diagnostic printout is still required where applicable. This hour meter is for reference only!</p>	N/A
<b>Default</b>	Default allows the user to perform a factory reset of the control settings and saved timer program data.	N/A
<b>SW Version</b>	This displays the firmware version of the Webasto SmarTemp Control fx.	Installed Version
<b>Back</b>	Select this to return to the previous screen.	N/A

Table 202: SmarTemp Control Setting Instructions

### 3. Technical Data

#### 3.1 Technical 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 at nominal voltage.

Heater	Thermo Top C (TTC) Diesel
Design	Coolant heater with evaporator burner (Ferro-Tech Technology)
Heat Rating: Input Output	- full load 6.14 kW (20,960 Btu/hr) - partial load 3.1 kW (10,480 Btu/hr) - full load 5.0 kW (17,200 Btu/hr) - partial load 2.5 kW (8,600 Btu/hr)
Fuel	Diesel #1 Diesel #2 and Arctic
Fuel Consumption: - full load - partial load	0.61 l/hr (0.16 US gal/hr) 0.30 l/hr (0.08 US gal/hr)
Rated Voltage	12 Volts
Operating Voltage	9.6... 15 Volts
Rated Power Consumption Including Circulating Pump: - full load - partial load	46 Watts (3.8 Amps) 32 Watts (2.6 Amps)
Maximum Permissible Ambient Temperature: Heater: Fuel Pump	- operation - 40... +60 °C (- 40...+140 °F) - storage -40... +120 °C (- 40...+248 °F) - operation - 40... +20 °C (- 40...+68 °F)
Maximum Allowable Working Pressure (Coolant System)	0.4... 2.5 bar (6.0... 36 psi)
Capacity of Heat Exchanger	0.15 Liters (.04 US gal)
Minimum Capacity of Coolant System	4.0 Liters (1 US gal)
Minimum Volume of Flow	250 l/hr (66 US gal/hr)
CO <sub>2</sub> Content in Exhaust Gas	8... 12.0 Vol.-%
Dimensions of Heater	Length 232 mm (9.1 in) Width 105 mm (4.1 in) Height 163 mm (6.4 in)
Weight	3.2 kg (7.0 lbs.)

Table 301: Technical Data -Heater

Circulating Pump	Model U 4847
Volume Flow Against 0.13 bar (1.9 lbs.)	450 l/hr (2.0 US gal/min)
Rated Voltage	12 Volts
Operating Voltage Range	9.6... 15 Volts
Rated Power Consumption	14 Watts (1.16 Amps)
Dimensions of Circulating Pump	L 95 mm x W 61 mm x H 61 mm (3.7f x 2.4f x 2.4f)
Weight	0.3 kg (.66 lbs)

Table 302: Technical Data -Circulating Pump

## 3.2 Heater Dimensions

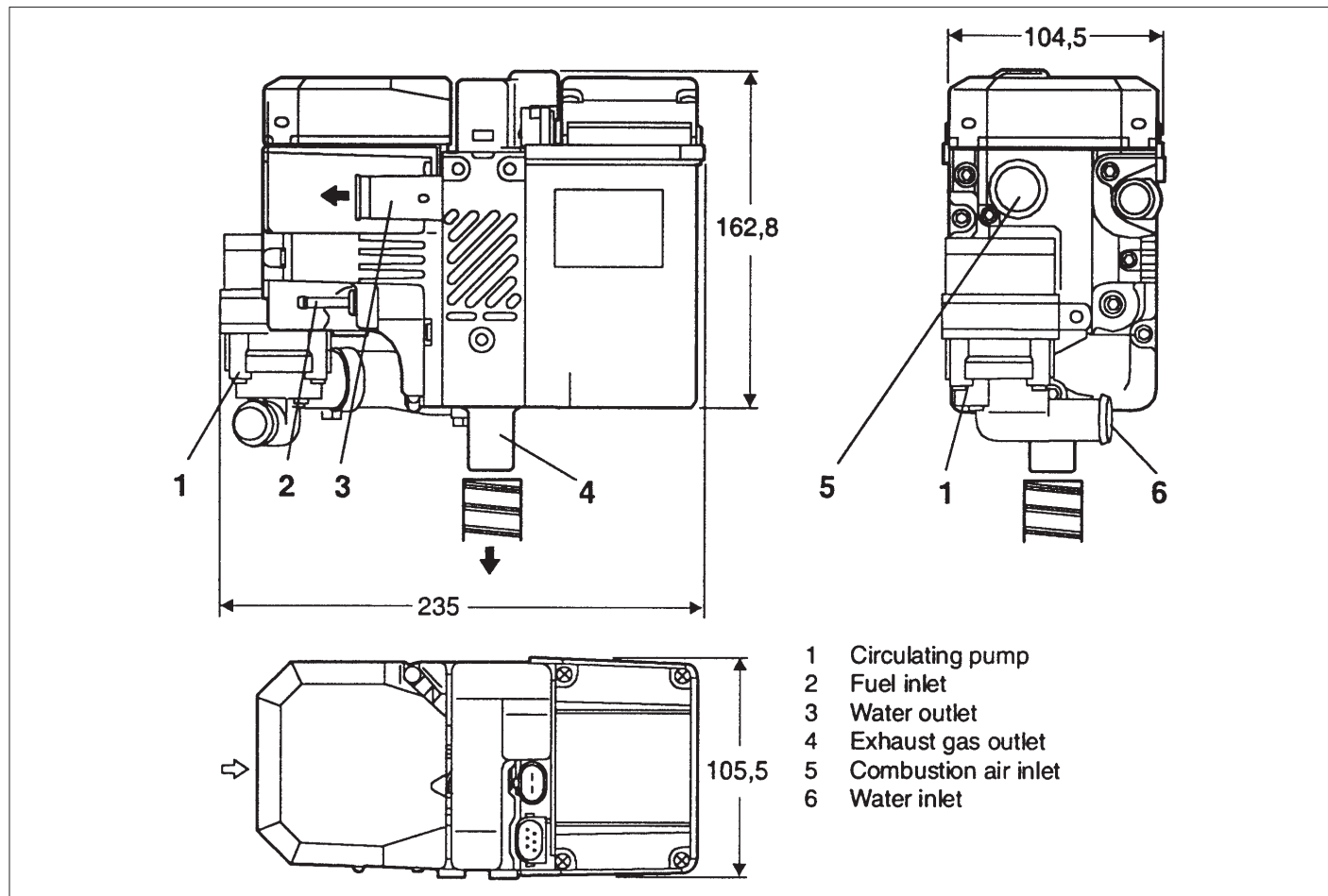


Fig. 301: Heater Dimensions

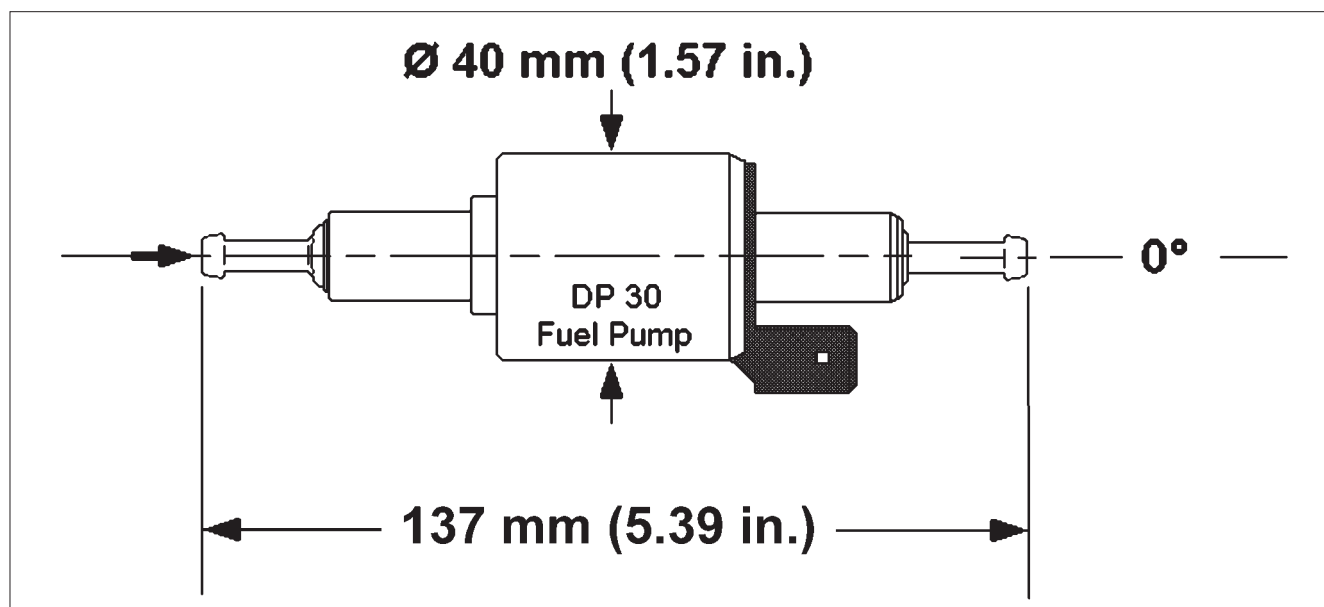


Fig. 302: Fuel Pump Dimensions

## 4. Installation

### 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.

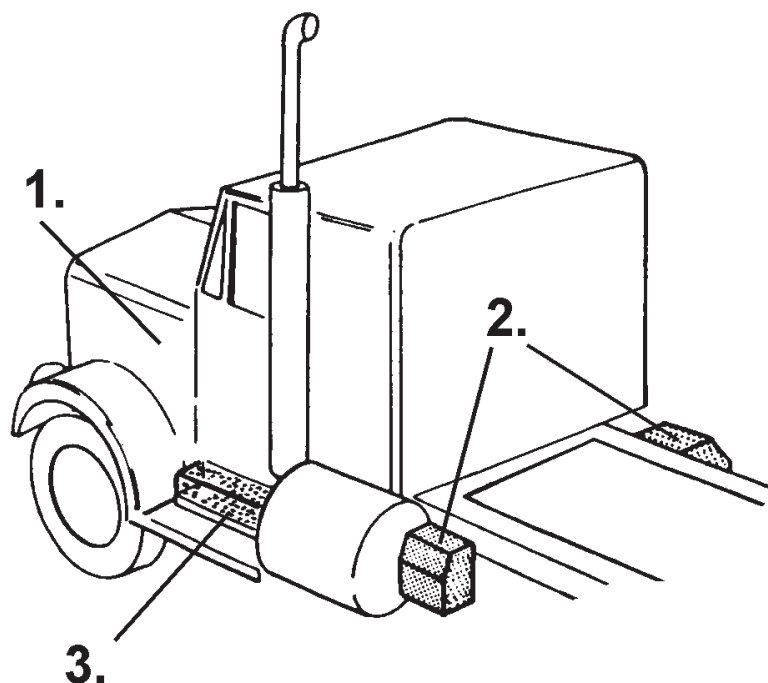
#### **WARNING!**

Asphyxiation risk! The heater must not be installed in either the driver's compartment or in the passenger area of the vehicle.

#### **NOTE:**

This manual does not cover all possible installations. For special applications use this manual as a general guideline only. Contact an authorized Webasto dealer or Webasto Thermo & Comfort N.A., directly at USA: 1-800-555-4518 Canada: 1-800-667-8900

### 4.2 Installation Locations



#### **CAUTION!**

Do not mount the heater directly to the engine! Heavy, constant vibration produced by the engine may interfere with the proper operation of the heater and lead to heater component damage.

Fig. 401: Installation Locations

1. Inside of the engine compartment in a splash protected area (Preferred).
2. On left/right side of the frame.
3. Inside under-step compartment.

### 4.3 Mounting the Heater

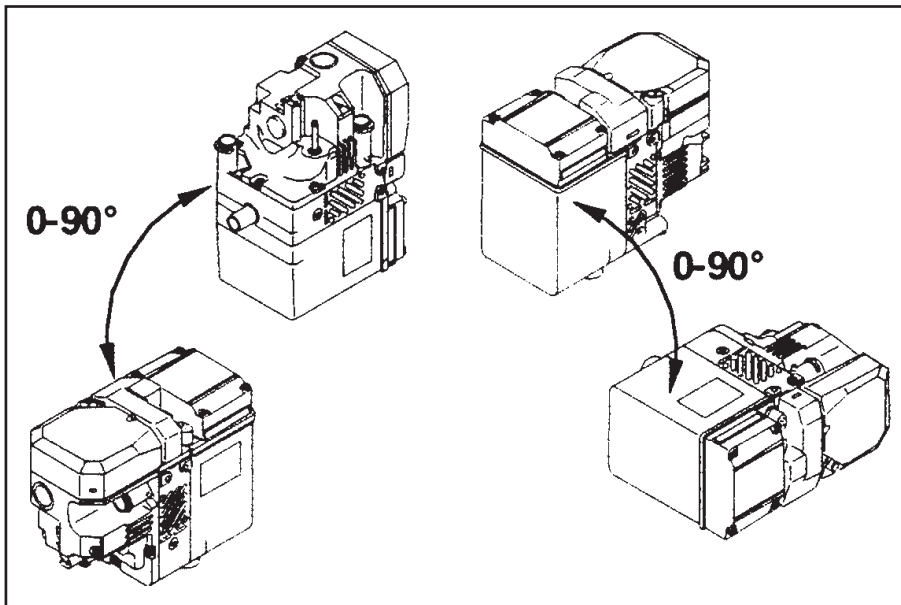


Fig. 402: Permissible Heater Installation Positions

**WARNING!**

Asphyxiation risk! DO NOT mount heater inside passenger, sleeper or storage areas.

**CAUTION!**

The openings of the water connecting pipes must never point in a downward direction in any installation position. Damage to heater will result due to trapped air in heat exchanger.

**CAUTION!**

The heater must not be installed in the immediate vicinity of or above hot vehicle parts.  
The heater must not be installed in the direct splash water area of the wheels.

The heater should be mounted as low as possible in the vehicle to assure automatic purging of air from circulating pump and coolant lines. The coolant pump is not self-priming. Preferably, the heater should be mounted in the engine compartment.

1. Ensure adequate clearance for heater and components in existing enclosure or mounting area.
2. Carefully layout proposed heater mounting position and mark all holes for drilling keeping in mind location for exhaust, coolant lines and wiring access. Once all requirements are met, drill holes.
3. Mount heater and components according to your plan, fasteners for mounting heater are provided.

**NOTE:**

Heavy Duty frame rail bracket is available. Order under part number 901088.



## **4.4 Exhaust Pipe Connection**

### **WARNING!**

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

### **CAUTION!**

Route the exhaust pipe in such a way as to prevent touching or being directed toward any part of the vehicle that may be damaged by heat (i.e., brake lines, electrical wiring, hoses).

### **NOTE:**

Additional flexible exhaust tubing is available from your Webasto Distributor or Dealer under part number 900126.

One meter (39 inches) of flexible exhaust tubing has been supplied with the heater. Attach tube to the heater with exhaust clamp supplied.

The exhaust tube should be routed in a gradual downward slope away from heater allowing condensation to drain.

Secure exhaust tube to vehicle with P-clip supplied. Keep exhaust tube at least 2 in. (50 mm) away from heat sensitive materials.

The outlet opening of the exhaust tube must not point in the direction of travel to avoid any possible clogging caused by snow, mud or foreign materials.

## **4.5 Combustion Air Supply**

### **WARNING!**

Never draw combustion air from inside the vehicle, or from areas where fumes or gases can accumulate. Drawing of combustion air from areas where people are present is strictly prohibited!

A combustion air tube has been supplied with the heater. Looking at the tube, you will see one end has a staple holding the inner liner and outer casing together.

The stapled end is the inlet end of the tube, the other end is to be attached to the heater.

To attach tube to the heater, stretch the outer casing about an inch further than the inner liner.

This will then slip over the inlet pipe of the heater and clamped in place.

Do not make any bends immediately after the attachment point to the heater. Doing so may cause a restriction where the inner liner of the tube begins. Make all bends at least 3 inches away or further from heater connection point.

The combustion air tube should be routed in a gradual downward slope away from heater allowing moisture to drain.

The intake opening of the combustion air tube must not point in the direction of travel to avoid any possible clogging caused by snow, mud or foreign materials.

Combustion air should always be taken from a clean area protected from road splash.

## 4.6 Plumbing the System

### 4.6.1 General Information

The TTC with coolant circulating pump must be mounted at least 6" (15 cm) below the lowest permissible coolant level of the vehicles cooling system.

Minimum amount of coolant in the cooling system should be at least 1.0 US gal. (4.0 l). Independent heating systems require a minimum of 3.0 US gal. (12.0 l). A minimum of 10% of a good quality antifreeze should be maintained in the cooling system at all times.

Heater and water pump fit 3/4" (19 mm) I.D. heater hose meeting SAE 20 R3 specifications. Silicone hose requires special hose clamps.

**WARNING!**

Burn risk! When working on the coolant system, allow the engine to cool down and open the radiator cap

**NOTE:**

Heater hose must meet SAE 20 R3 specifications.

**NOTE:**

Hose clamps must be tightened to 45 in/LB. (5 Nm) torque. Silicone hose requires special hose clamps.

#### 4.6.2 Plumbing the TTC into The Coolant System

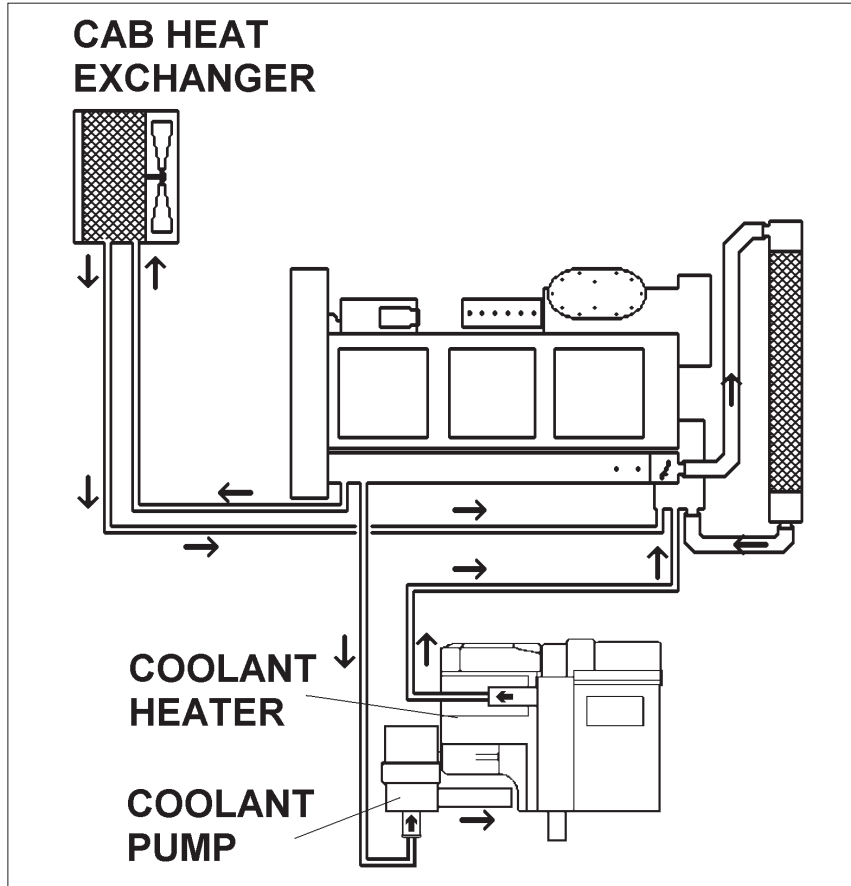


Fig. 403: Engine Block Preheating

##### Engine Block Preheating:

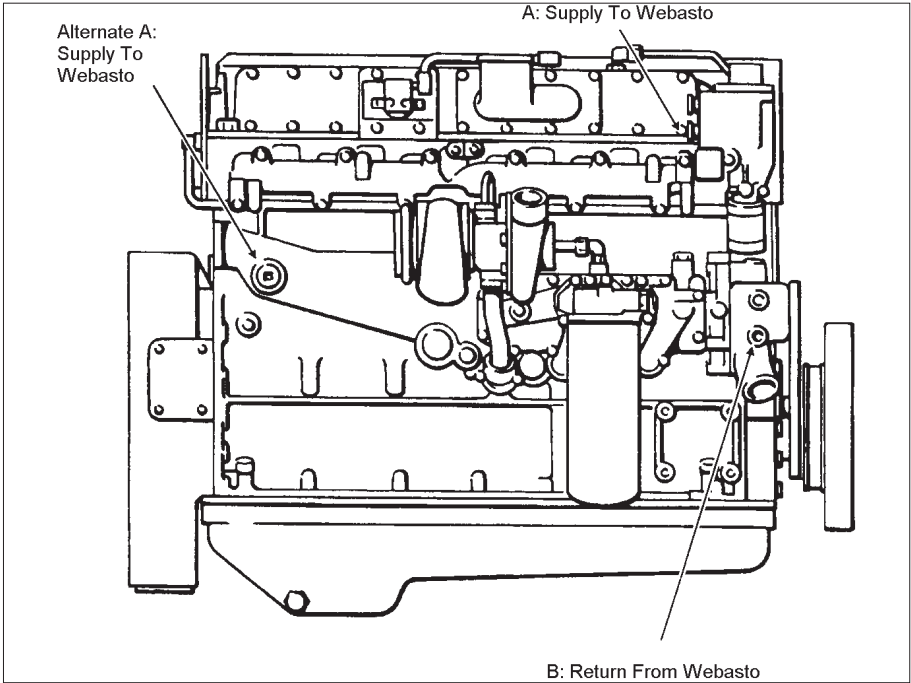
1. Remove radiator pressure cap and release system pressure.
2. Drain coolant from engine.
3. Plumb the Webasto system as shown above.
4. Refill engine coolant as per engine manufacturer's recommendations and reinstall the radiator pressure cap.



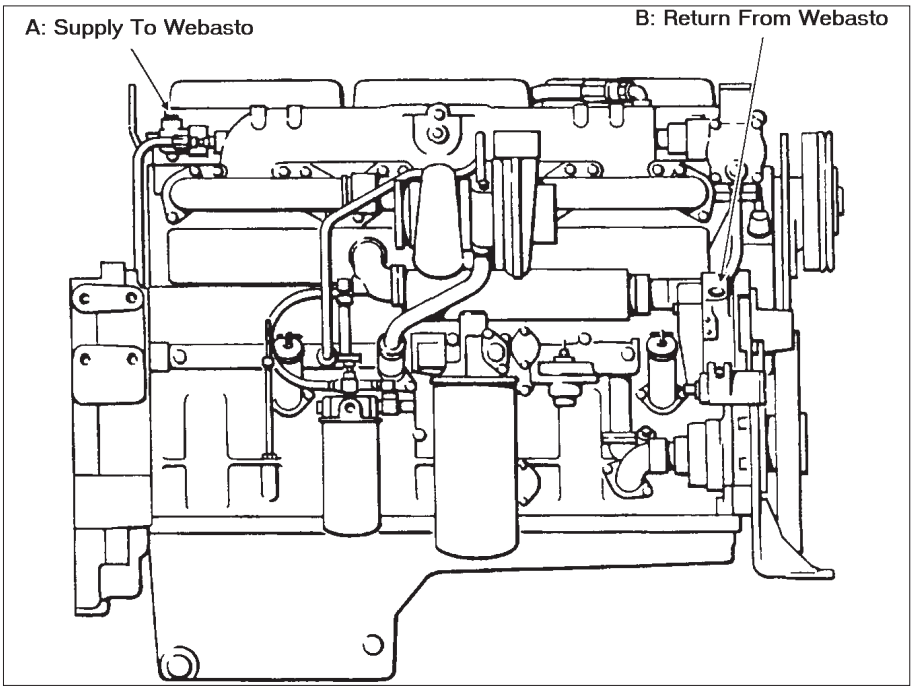
**4.6.3 Contents -Engine Connections**

Caterpillar	
3116 .....	408
3176 .....	408
3306 .....	409
3408 .....	409
C-10/C-12 .....	410
Cummins	
B Series .....	411
C Series .....	412
Detroit Diesel	
Series 50.....	413
Series 55.....	413
Mack	
E6 / E7 .....	414

Caterpillar

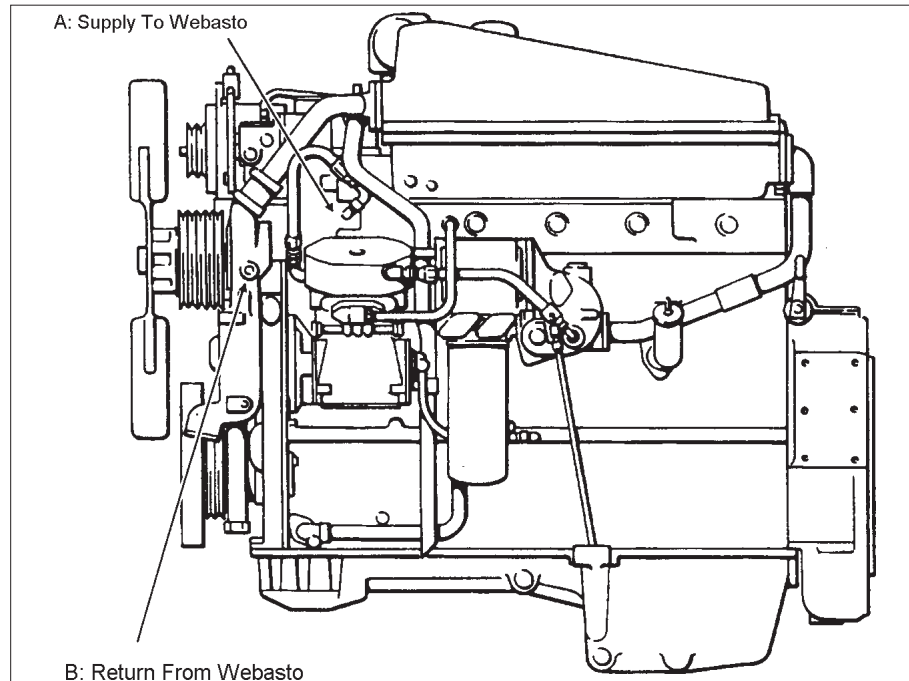


Caterpillar 3116

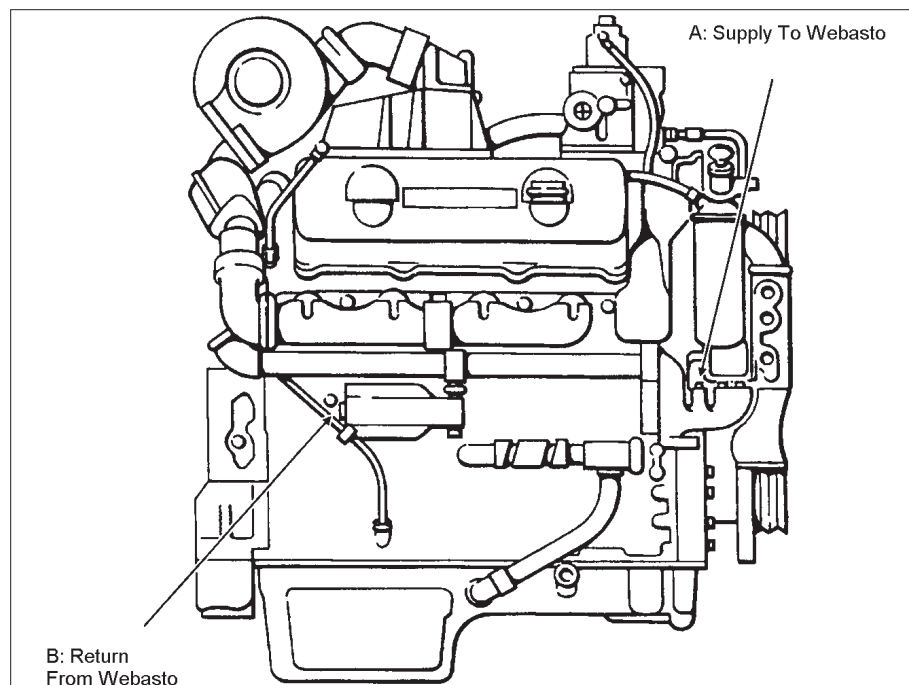


Caterpillar 3176

## Caterpillar

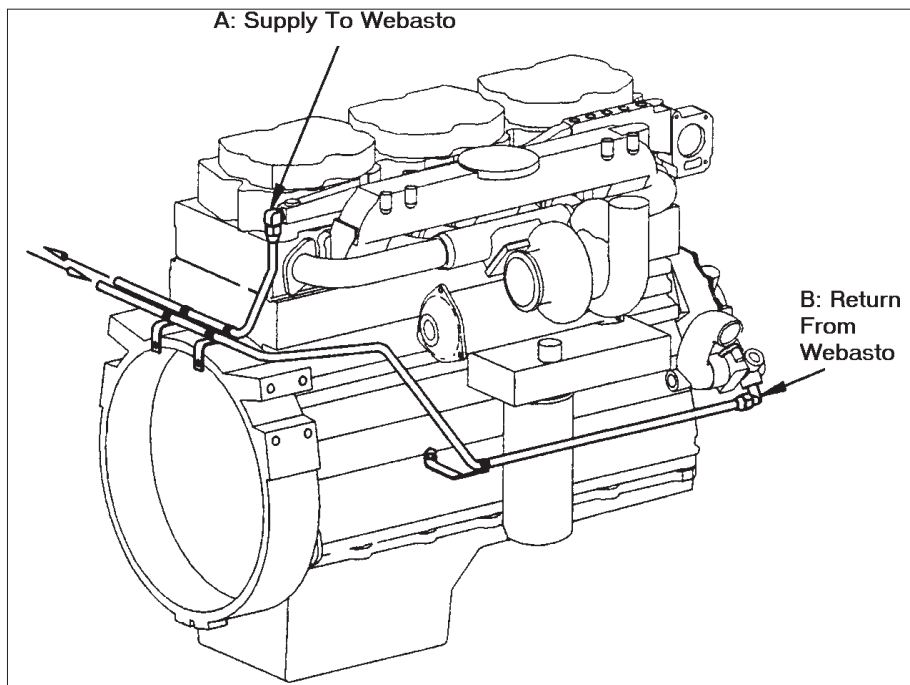


Caterpillar 3306



Caterpillar 3408

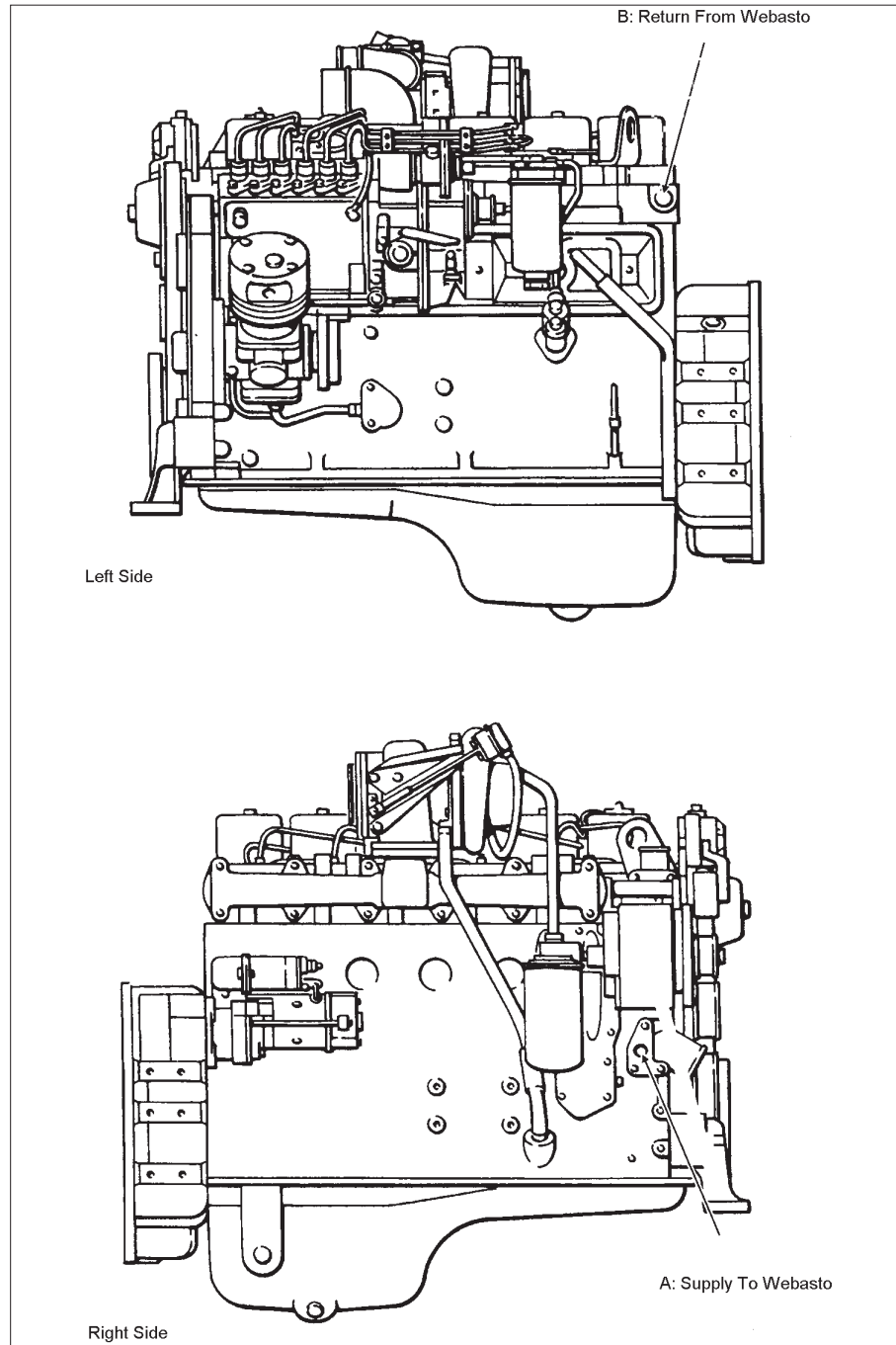
## Caterpillar



Caterpillar C-10, C-12

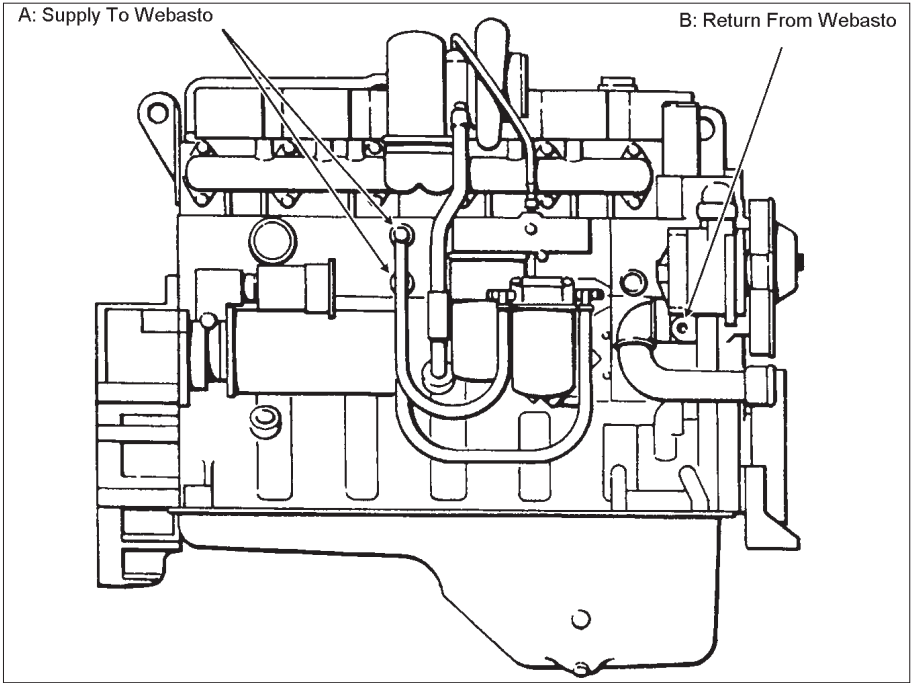


Cummins



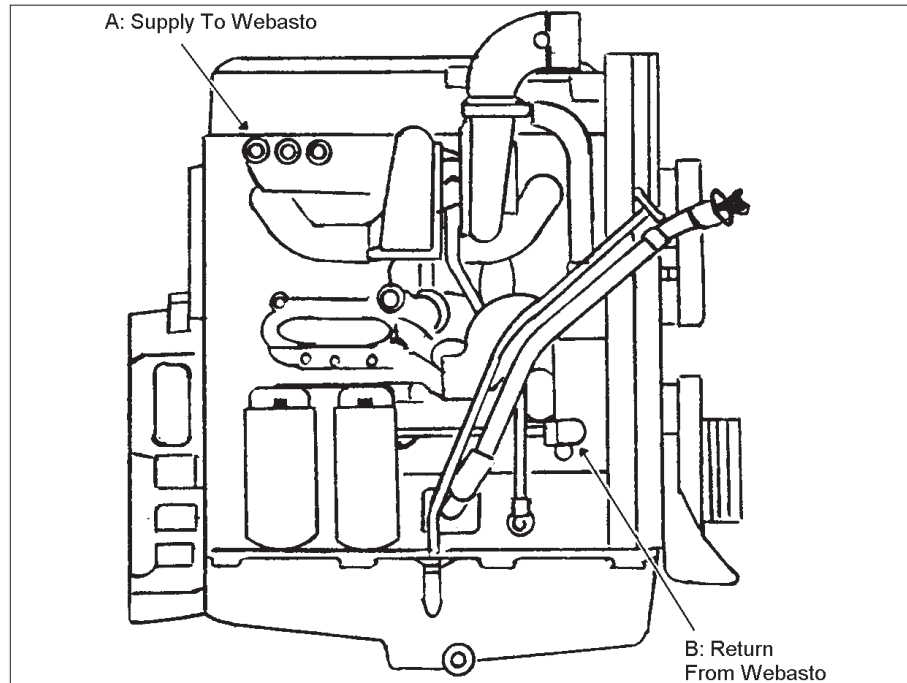
Cummins B Series

Cummins

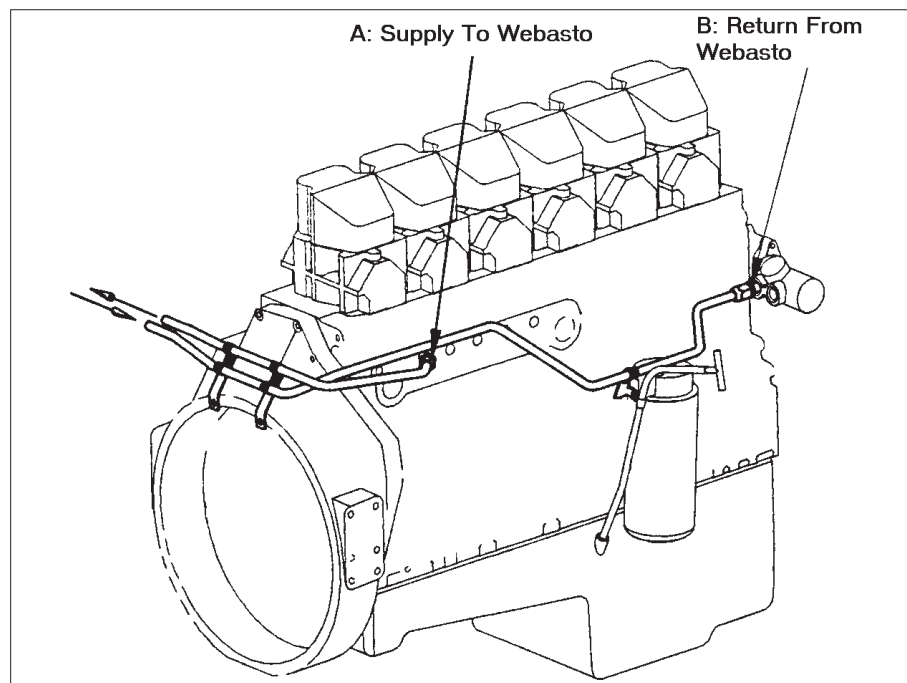


Cummins C Series

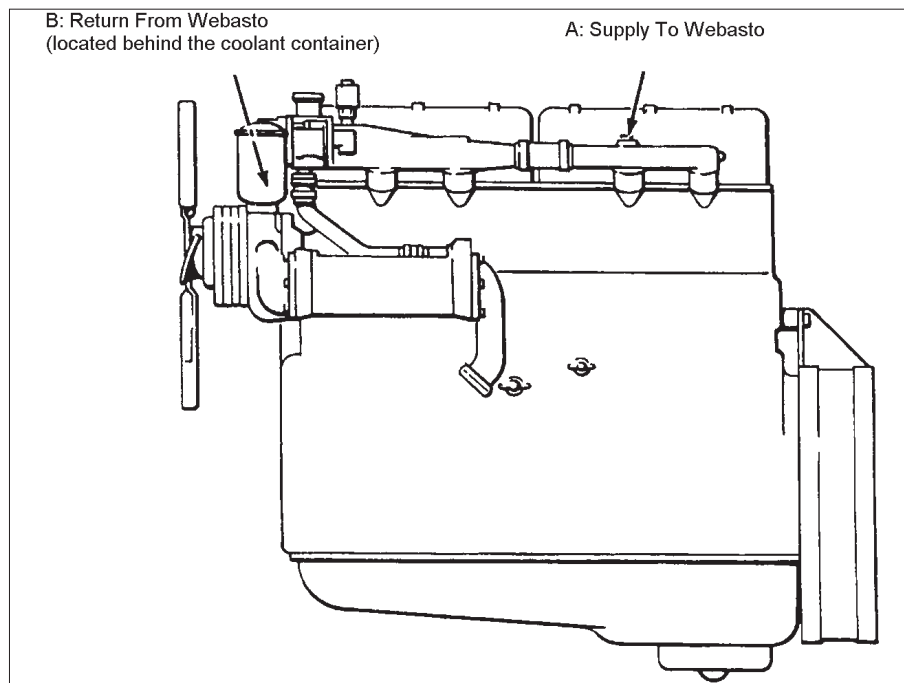
**Detroit Diesel**



**Detroit Diesel Series 50**



**Detroit Diesel Series 55**

**Mack**

Mack E6 / E7

## 4. Installation

### 4.7 Fuel System

#### 4.7.1 General Description

The pump, fuel line and fuel standpipe are integral to the systems reliability and must be installed according to these instructions to ensure proper heater operation.

#### 4.7.2 Fuel System Limitations

##### CAUTION!

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

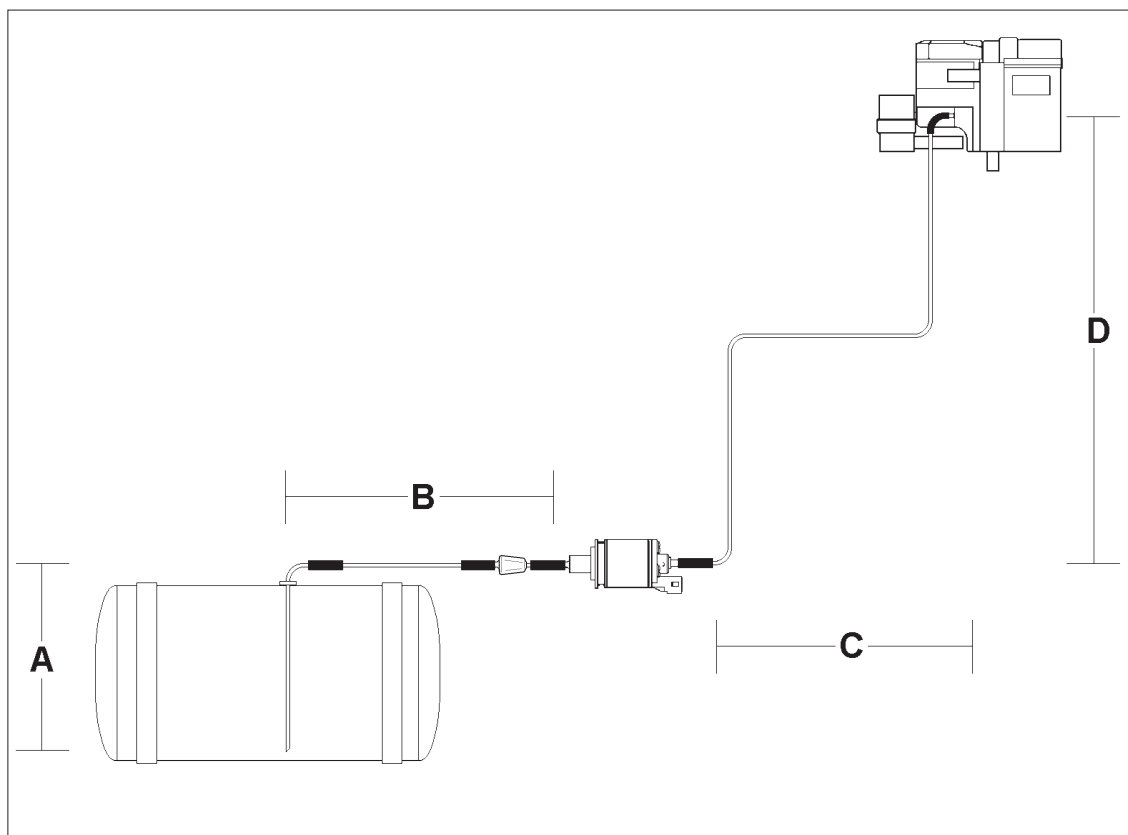


Fig. 404: Fuel System Limitations

Maximum suction height (A) = 3' 3" (1m)

Maximum suction length (A + B) = 6' 6" (2m)

Maximum delivery length (C + D) = 19' 6" (6m)

Maximum delivery height (D) = 9' 9" (3m)

### 4.7.3 Fuel Pump

The fuel pump **MUST** be mounted in a horizontal position in order to function correctly and deliver the proper quantity of fuel.

Mount the fuel pump as close to the fuel source as practicable.

Do not mount fuel pump near heat sources (exhaust pipes, hot coolant lines, etc.)

Pay particular attention to the fuel line and pump limitations as covered in sections 4.7.2. and 4.7.3.

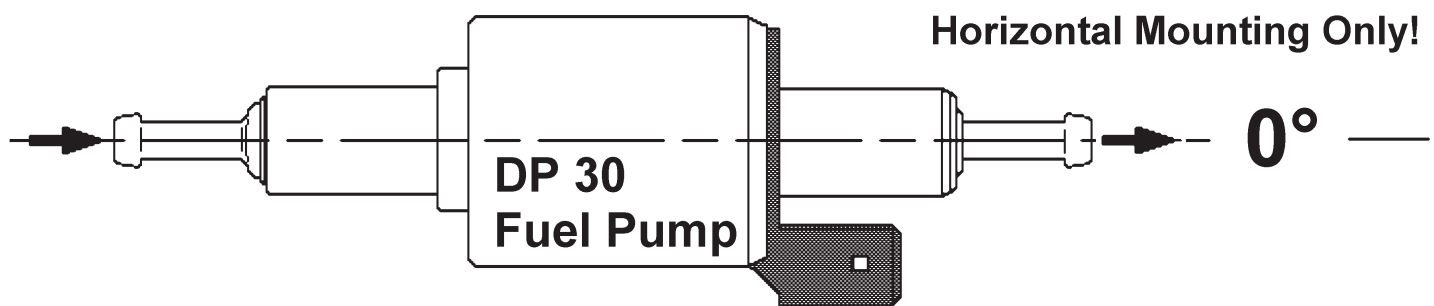


Fig. 405: Fuel Pump Mounting (DP 30)

### 4.7.4 Fuel Standpipe

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, or if no threaded port is available, a 1" hole can be drilled into the tank and the universal tank boss installed as shown in figure 407. Keep the fuel standpipe 2" from the bottom of fuel tank.

#### Fuel standpipe installation:

1. Cut or extend fuel standpipe to length, approx. 2" off fuel tank bottom. Angle the cut to prevent clogging. Remove burrs from cut end.
2. Install the universal fuel standpipe
  - use 1/4" or 1/2" spare port on fuel tank (if available) and install fuel standpipe
  - or
  - drill 1" hole on top of tank (assemble tank-boss and fuel standpipe) and install assembled universal fuel standpipe
3. Connect fuel line from fuel metering pump to fuel standpipe using rubber connectors and clamps.
4. Route and secure fuel line from heater to fuel tank.

#### NOTE:

Fuel standpipe with universal tank boss can be installed from outside of tank. First assemble fuel standpipe and tank-boss and then insert at an angle through the 1 hole previously drilled into tank. Tighten down with nut provided. Do not over-tighten.

## Fuel Standpipe

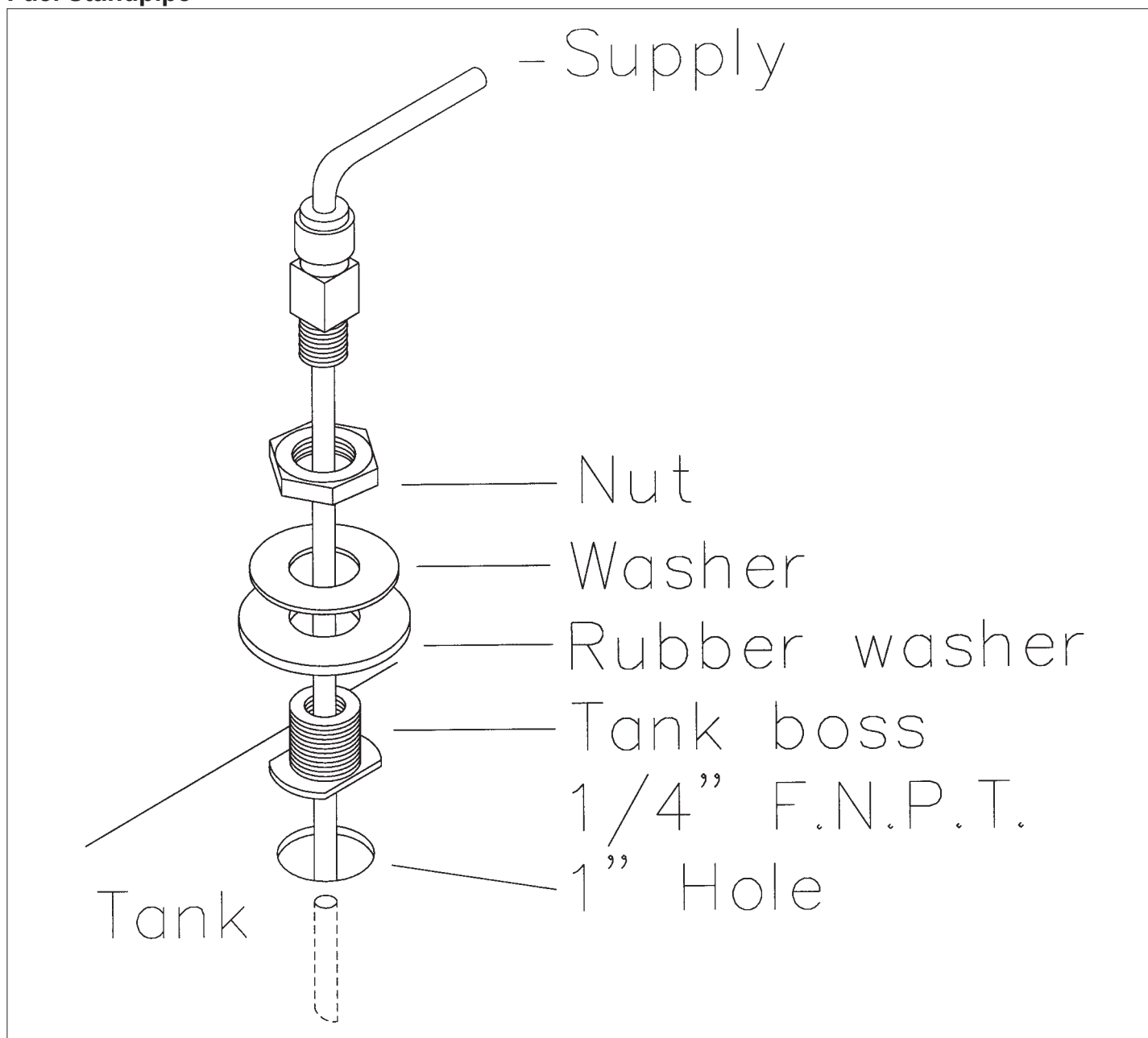


Fig. 406: Fuel Standpipe

#### 4.7.5 Fuel Line

Fuel line, couplers and clamps are provided in the installation kit and are required for proper operation.

**CAUTION!**

Fuel line must be secured every 12f (30 cm) and kept away from hot exhaust and moving parts (drive shaft, wheels, etc.)

**NOTE:**

Use supplied hose clamps to secure all fuel line connections.

The TTC has been equipped with fuel line meeting the required specifications for proper operation.

The inside diameter of this fuel line is 0.08" (2.0 mm) and must not be substituted for fuel line of a larger diameter. Doing so will result in improper fuel delivery and the formation of air pockets in the fuel system which will interfere with heater operation.

Fuel line connections must be made as shown in figure 407, fuel line connection.

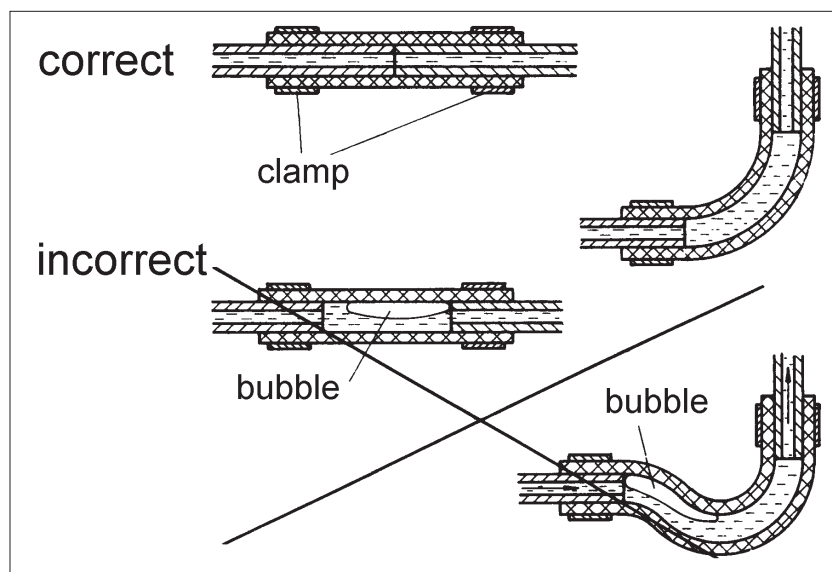


Fig. 407: Fuel Line Connection

#### 4.7.6 Fuel Filter

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

**NOTE:**

If heater is equipped with a fuel filter, change filter at least annually.



## **4.8 Wiring Connections**

### **4.8.1 General Information**

The control unit is equipped with low voltage protection, therefore it is imperative to keep the vehicle's battery connections and battery in good condition.

**NOTE:**

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

### **4.8.2 Power Connection to Battery**

**Power harness connection instructions:**

1. Route and secure wire harness from Webasto heater to battery box and cut harness to length.
2. Strip wires and crimp supplied ring tongue terminals to the positive (red) and negative (brown) wire leads.
3. Clean any corrosion from battery terminals.
4. Connect the leads to the battery terminals.
5. Protect connections with an anticorrosion compound designed for use with electrical connections and battery terminals.

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

**CAUTION!**

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

### **4.8.3 Switch and Timer Connections**

**CAUTION!**

When drilling holes on the vehicle, do not drill into existing wiring or other mechanical components.

**Switch Installation:**

1. Select a suitable location in the vehicle dash for the On/Off toggle switch.
2. Drill a 1/2" hole through the dash for the toggle switch.
3. Route harness between heater and dash, secure harness along its length with wire ties.  
If possible, use existing hole in fire wall or drill in suitable location. Protect the harness with a grommet at the fire wall.
6. Connect the terminals of the harness to the switch. See figure 408 on next page and wiring diagram figure 410 for reference.

Timer installation Instructions:

- 1. Select a suitable location in the vehicle dash for the timer.
- 2. Temporarily affix timer drilling template to dash or see timer dimensions.
- 3. Cutout hole to dimensions on template or timer dimensions.
- 4. Mount timer bezel to dash.
- 5. Route harness between heater and dash, secure harness along its length with wire ties. If possible, use existing hole in bulk head or drill in suitable location. Protect the harness with a grommet at the bulk head.
- 6. Connect the terminals of the harness to the timer. See figure 409 below and wiring diagram figure 411 for reference.
- 7. Push timer into place in dash bezel.

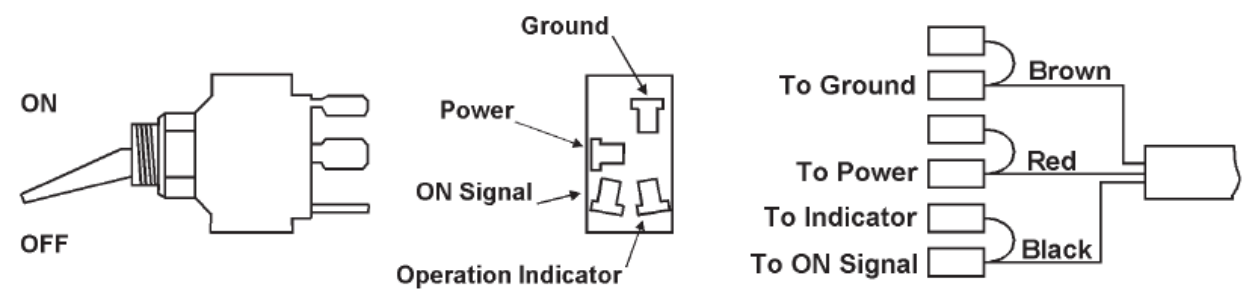


Fig. 408: On/Off Toggle Switch

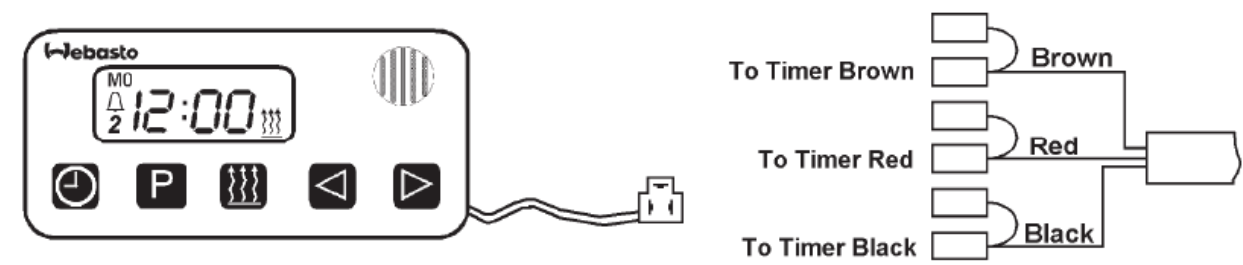


Fig. 409: Optional 7-Day Digital Timer


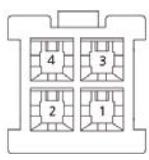
	Pin Number	Description	Wire Color	
	1	+12 / 24V	Red	
	2	GND	Brown	
	3	Heater Output	Black	
	4	Diagnostic Blink Code	Green	

Fig. 410: Optional SmarTemp Control fx

Relay Connection: (If applicable)

Heaters requiring a higher amperage signal will require a relay to accommodate different heater specifications. If the connected heater requires more than a 1A signal to start use the pin-out of a standard relay below.

Relay	Output
Relay Pin 30	Battery (B+) power source
Relay Pin 85	Ground
Relay Pin 86	Switched 1A signal wire from pin 3 of SmarTemp Control fx harness.
Relay Pin 87	Output source to heater (on/off signal)

## 4.8.4 Circuit Diagrams

The connector pin assignment of control unit for Thermo Top C is shown in fig. 411.

The circuit diagrams (fig. 411 and 412 show the electrical circuit of the heater in the combination with a timer.

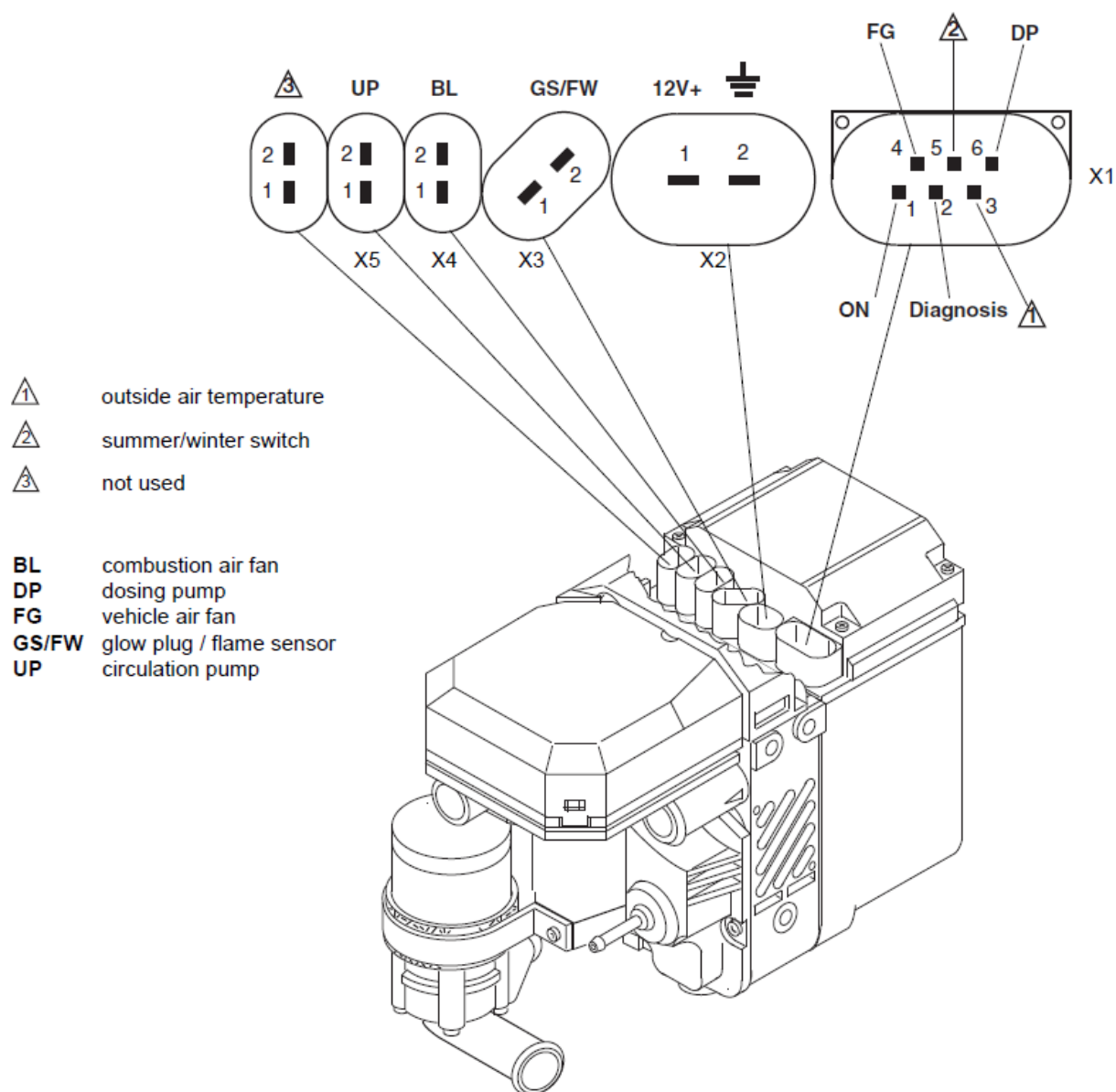
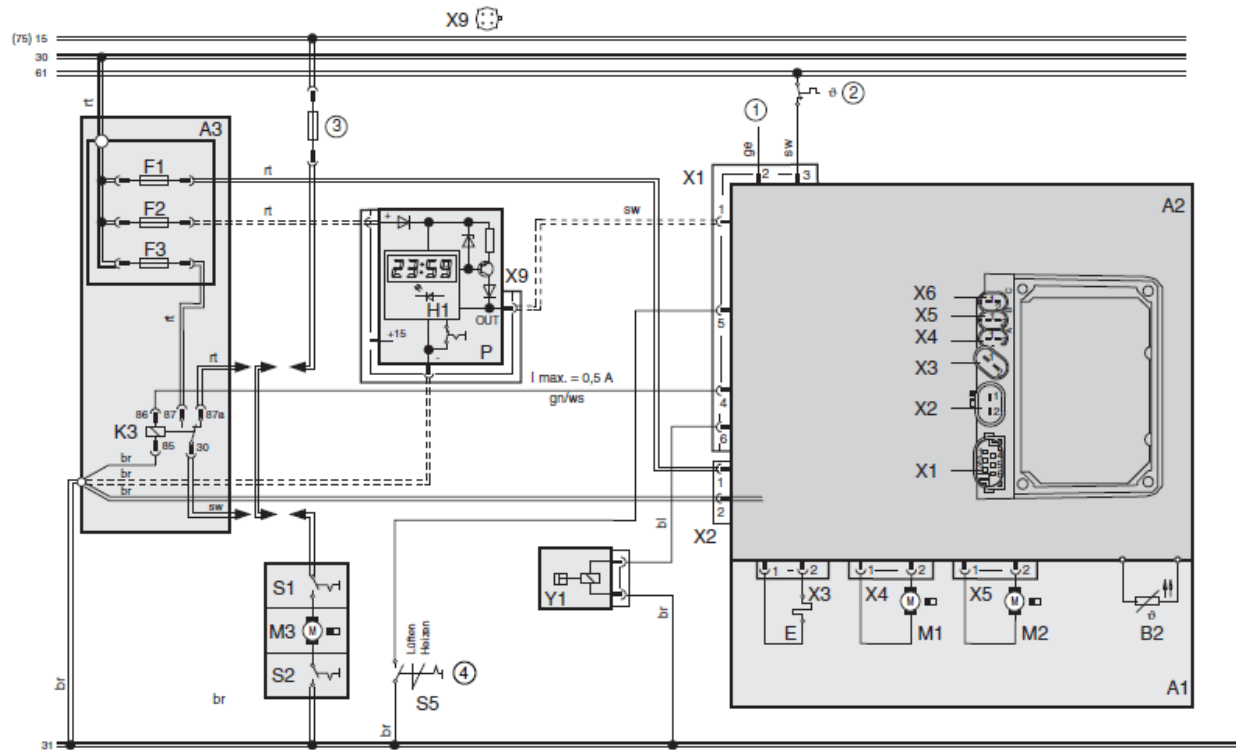


Fig. 411 Control Unit Connector Pin Assignment (Thermo Top C)



Item	Nomenclature	Remark
A1	Heater	Thermo Top E or Z/C
A2	Control unit	
A3	Connector box	
B2	Temperature sensor	
E	Glow plug / flame sensor	
F1	Fuse 20 A	Flat fuse SAE J 1284
F2	Fuse 1 A	Flat fuse SAE J 1284
F3	Fuse 25 A	Flat fuse SAE J 1284
H1	LED (in item P)	operating indicator light
K3	Relay (in item A3)	vehicle air fan
M1	Motor	combustion air fan
M2	Motor	circulation pump
M3	Motor	vehicle air fan
P	Timer, digital	for timer operation
S1	Switch for vehicle air fan	depending on vehicle S1 or S2
S2	Switch for vehicle air fan	depending on vehicle S1 or S2
S5	Switch	summer/winter switch
X1	Connection, 6-pole	
X2	Connection, 2-pole	water repellent
X3	Connection, 2-pole	water repellent
X4	Connection, 2-pole	water repellent
X5	Connection, 2-pole	water repellent
X6	Connection, 2-pole	water repellent
X9	Connection, 4-pole	
Y1	Dosing pump	

Wire Gauges		
	< 7.5 m	7.5 - 15 m
=====	0,5 mm <sup>2</sup>	0,75 mm <sup>2</sup>
=====	0,75 mm <sup>2</sup>	1,5 mm <sup>2</sup>
=====	1,5 mm <sup>2</sup>	2,5 mm <sup>2</sup>
=====	2,5 mm <sup>2</sup>	4,0 mm <sup>2</sup>
=====	4,0 mm <sup>2</sup>	6,0 mm <sup>2</sup>

Wire Colours	
bl	blue
br	brown
ge	yellow
gn	green
gr	grey
or	orange
rt	red
sw	black
vi	violet
ws	white

## Legend for circuit diagrams

- ① Diagnosis
- ② Outside air temperature
- ③ Vehicle heating air fan fuse provided in vehicle
- ④ Option

Fig. 412 Automatic switching Circuit for Thermo Top C, 12V Timer

#### 4.8.5 Wiring Diagram - Thermo Top C TTC) (12 Volt) with On/Off Toggle Switch

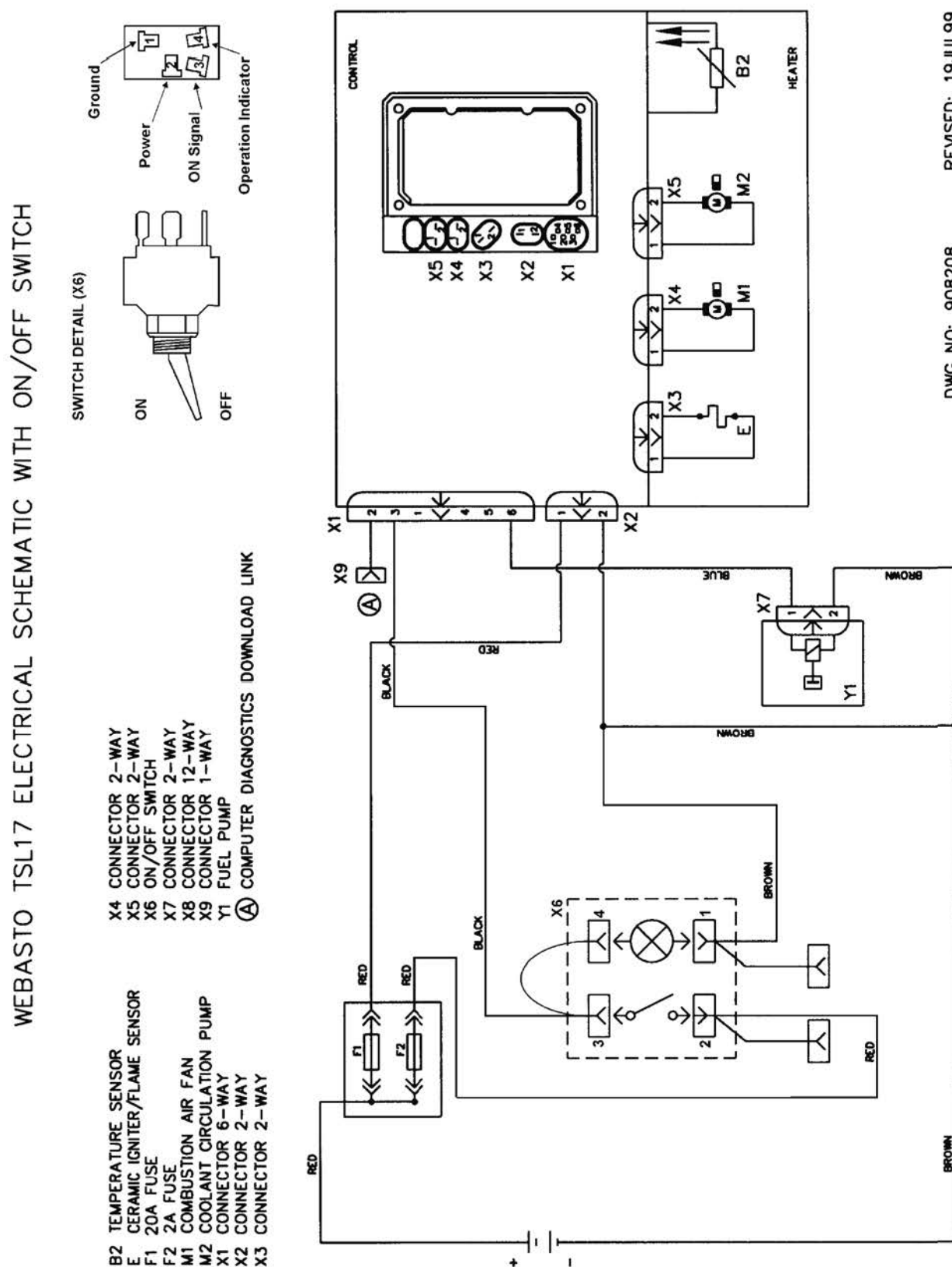
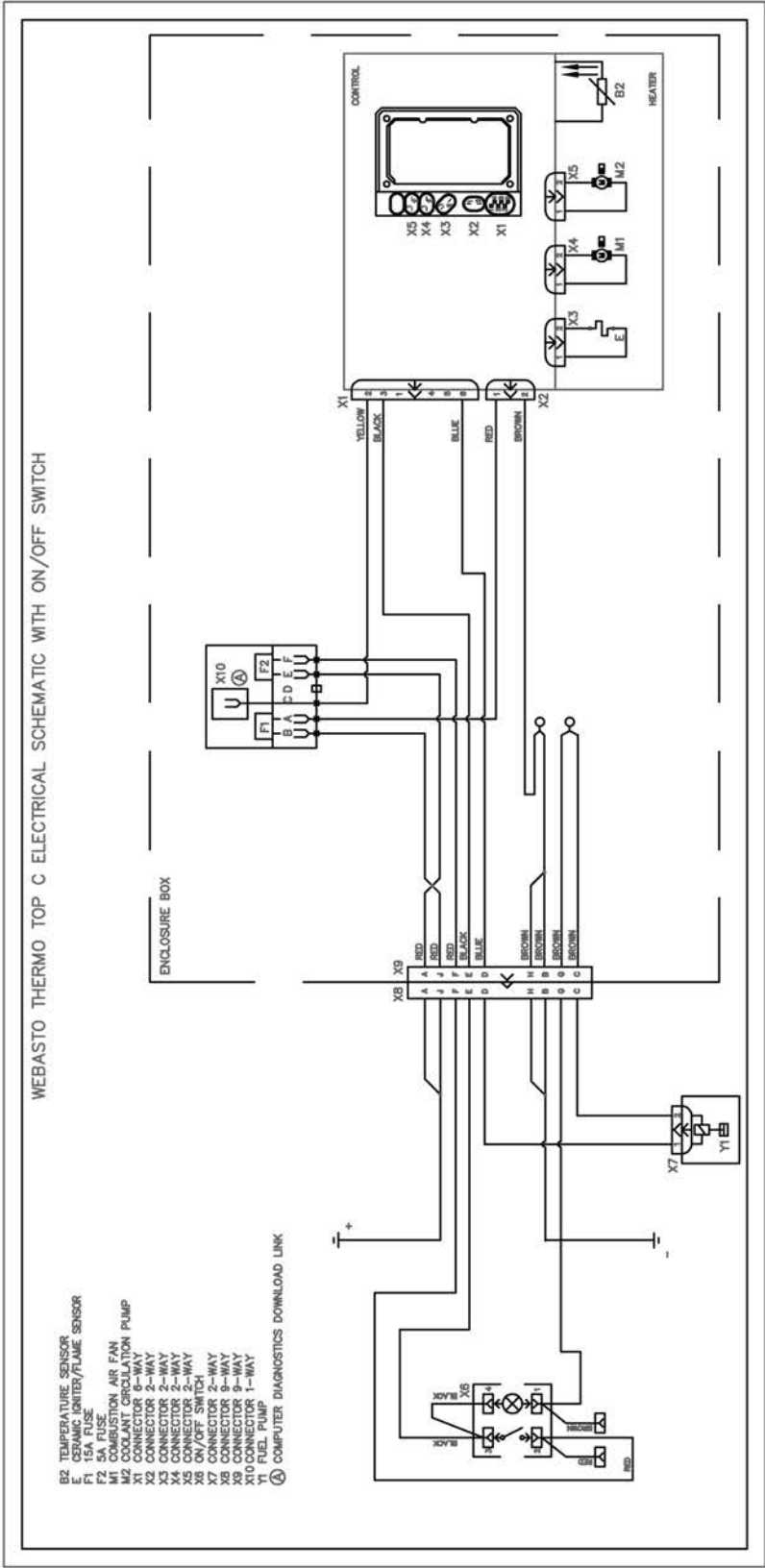


Fig. 413 Wiring Diagram - Thermo Top C (TTC) with On/Off Toggle Switch

REVISÉ: 19 JUL 99

DWG NO: 908208

4.8.5a | Wiring Diagram – Thermo Top C TTC (12 Volt) with ON/OFF Switch



## 4.8.6 Wiring Diagram - Thermo Top C (TTC) (12 Volt) with Optional Digital Timer

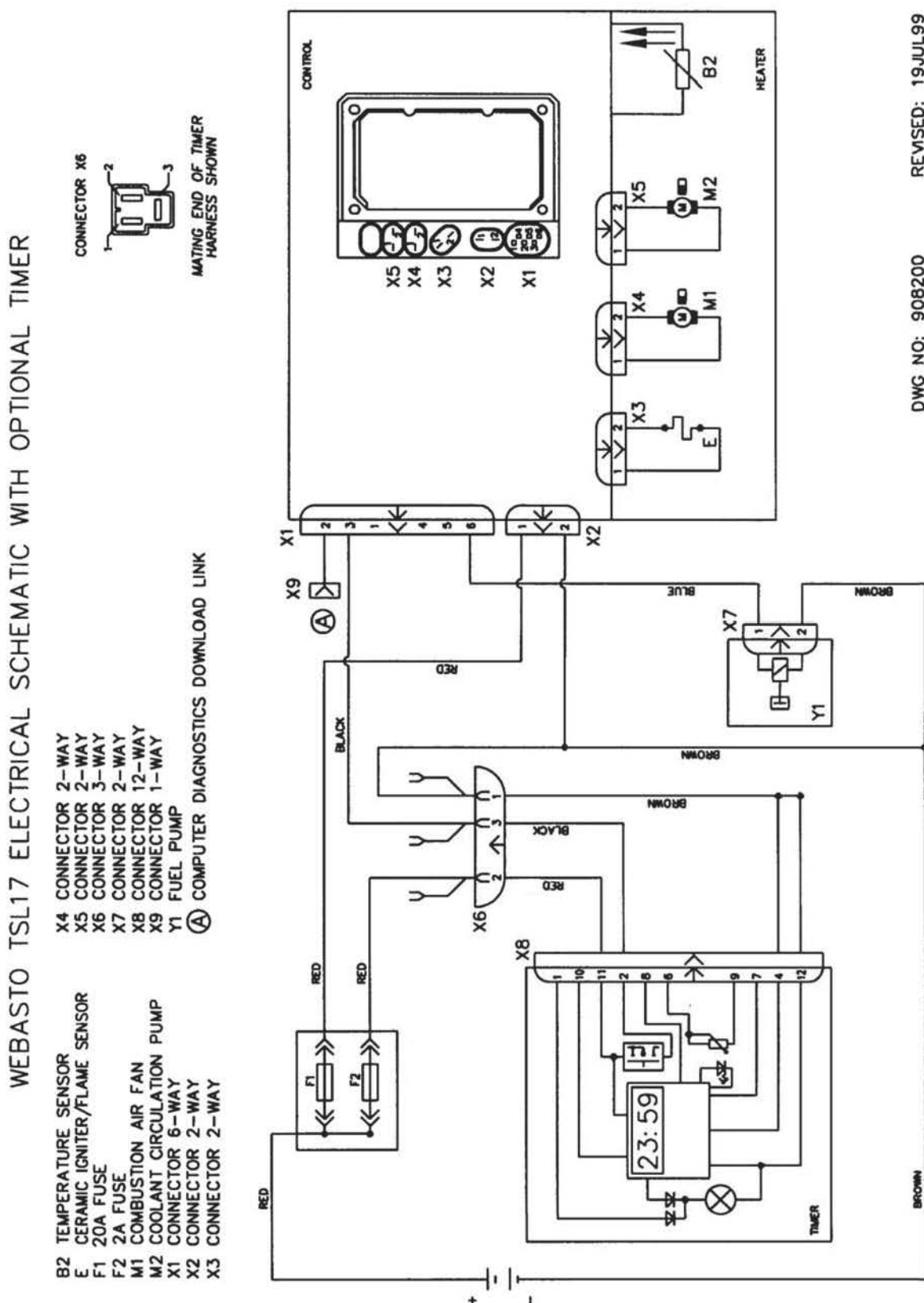
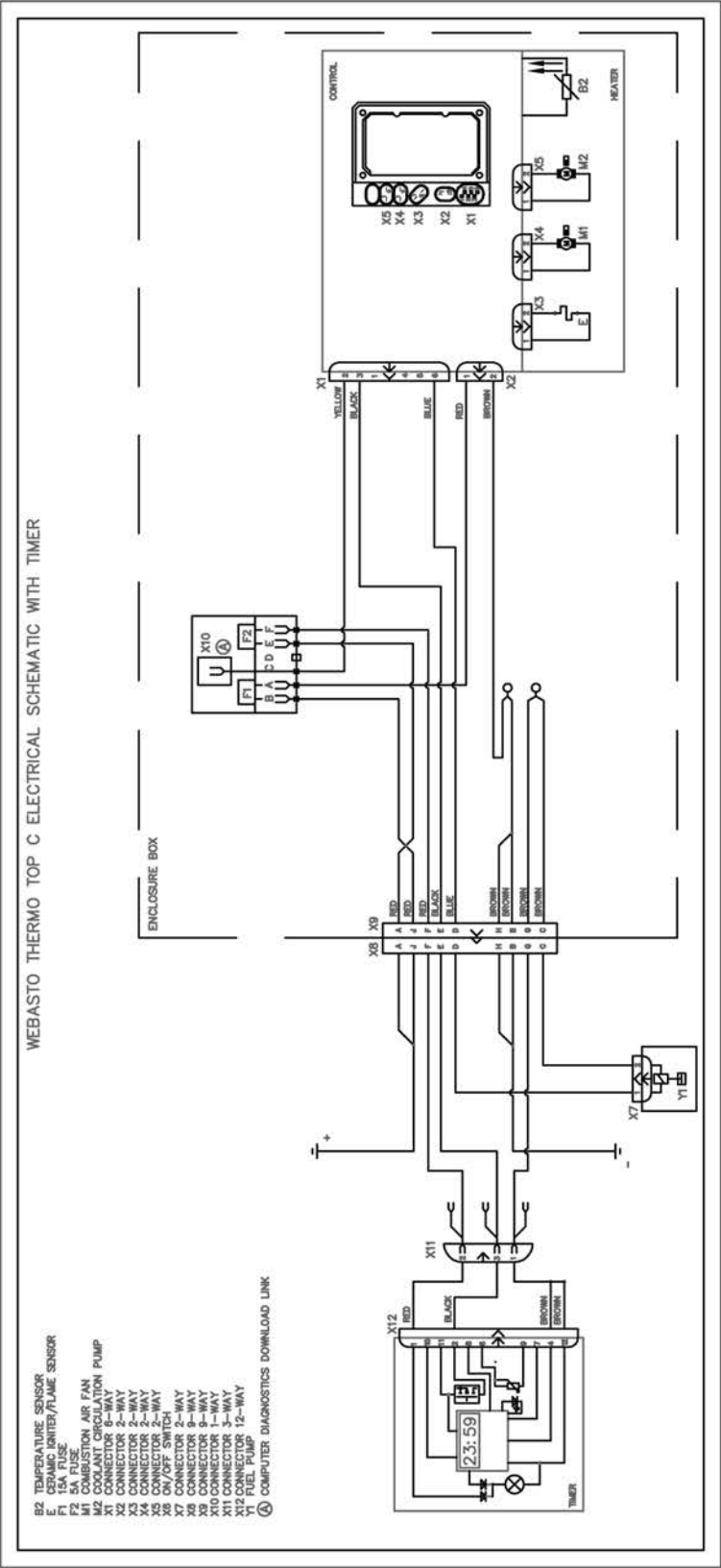


Fig. 414 Wiring Diagram - Thermo Top C (TTC) with Optional Digital Timer



4.8.6a Wiring Diagram – Thermo Top C TTC (12 Volt) with Timer







## **4.9 Initial Operation**

1. Check your installation for:
  - loose nuts and bolts.
  - exhaust system routing and clamp tightness.
  - loose hose clamps.
  - routing and securing of wiring and heater hoses.
  - kinked or pinched hoses.
  - routing and securing of fuel lines.
  - battery connection and polarity.
2. Top off or refill cooling system with coolant as per engine manufacturers recommendations.
3. Open shutoff valves.
4. Set heater valve to max. heat position and turn off Air Conditioning in cab and sleeper.
5. Start the vehicle engine and run it at a fast idle for 10 minutes to purge air from the TTC and the heat exchanger. While the engine is running check:
  - hose connections for leaks.
  - coolant level in the expansion tank and add coolant as needed.
6. Shut off the engine.
7. Switch on Webasto heater using the toggle switch or the Instant Heat button on timer and check:
  - Switch toggle or instant heat button illuminates.
  - circulating pump in operation.
  - initiation of start up sequence.
  - successful start up and operation.
8. Temperature differential between water inlet and outlet should not exceed 10 °C (18 °F).

**NOTE:**

Coolant temperature must be below 86 °F (30 °C) to start up.

**NOTE:**

Installation with long fuel lines may need a second start attempt to prime the fuel lines. Cycle ON/OFF switch to reset control unit.

**NOTE:**

The engine temperature gauge may read lower than actual heater output temperature. This is due to the location of the temperature gauge sensor on the engine.

10. Switch OFF TTC heater.

11. Re-tighten hose clamps to 45 in/LB. (5 Nm) and inspect installation for leaks. 12.

Complete the warranty card and send to Webasto Thermo & Comfort N.A., Inc.

**NOTE:**

Necessary information to complete warranty card and ensure full warranty coverage can be found on the heater name plate.

## **5. Maintenance of the Heater**

### **5.1 Annual Maintenance**

TheTTC heater requires a minimum of maintenance to keep in good operating condition. The following maintenance procedures should be performed annually before each heating season:

#### **NOTE**

For major repair and spare parts, return to your authorized Webasto Specialist.

#### **Enclosure Box and Heater**

- Clean the heater and enclosure box from any accumulated debris or dust with compressed air.
- Inspect all components for wear and damage.

#### **Electrical System**

- Check wiring harnesses for damage, repair or replace if damaged.
- Check the condition of the batteries and the connections.
- Load test the batteries and replace if necessary.

#### **NOTE**

The heater will not function properly with weak batteries.

#### **Combustion Air System**

- Check for obstructions at air intake port.
- Check air intake tube carefully for restrictions and damage. Repair or replace if damaged.

#### **Exhaust System**

- Check the exhaust system carefully for restrictions or corrosion. Replace damaged parts.

#### **Fuel System**

- Change fuel filter if equipped. Inspect fuel line for damage, restrictions, routing or loose connections. Repair or replace if damaged.

#### **Coolant System**

- Inspect all coolant lines and clamps for leakage, restrictions or damage. Repair or replace.
- Inspect coolant circulation pump for leakage. Repair or replace if damaged.

#### **Operational Test**

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

#### **NOTE**

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



## 6. Basic Troubleshooting

### 6.1 General Information

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

#### CAUTION

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

#### Before troubleshooting, check for and eliminate these defects:

- blown fuses
- fuel supply (plugged fuel filter)
- corrosion on battery terminals, electrical wiring, connections and fuses
- loose contact on connectors
- wrong crimping on connectors

#### NOTE

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

### 6.2 General Failure Symptoms

The following table lists possible failure symptoms.

Failure Symptom	Probable Cause	Remedy
Coolant heater switches off automatically (Fault lockout)	No combustion after start or automatic repeat start	Switch off heater momentarily and switch on <u>once</u> again
	Flame extinguishes during operation	Switch off heater momentarily and switch on <u>once</u> again
	Heater overheats	Check coolant lines for obstructions, closed valves and kinks. Check coolant level. Allow heater to cool down, reset over heat limiter, switch off heater momentarily and switch on <u>once</u> again
	Vehicle electrical system voltage too low	Charge battery Switch off heater momentarily and switch on <u>once</u> again
Heater expels black fumes from exhaust	Combustion air and/or exhaust ducting blocked	Check combustion and exhaust ducting for obstructions

Table 601: General Failure Symptoms

### 6.3 Heater Lockout Reset Procedure

The TTC is designed with a lockout safety feature built in to the control unit. After 3 consecutive unsuccessful startup attempts, the heater will lock itself out from any further start attempts. The heater may also enter the lockout mode after experiencing an overheat condition.

The following procedure will clear the lockout mode and reset the heater for normal operation:

1. Remove fuse F1 (15 Amp), refer to wiring diagram figure 411 for identification.  
Wait 10 seconds before reinserting. This is done to prepare the control unit for resetting.
2. Wait a further 10 seconds after reinserting fuse F1. Now turn the heater on using the On/Off switch or the Instant On button of the optional timer.
3. Wait 10 seconds after turning the heater on and remove fuse F1 again.
4. Wait a further 30 seconds and then turn the heater off at the switch or optional timer.
5. Reinsert fuse F1 after waiting 3 to 10 seconds of shutting off the heater.
6. Wait a further 10 seconds and turn the heater back on again.

The lockout mode should now be canceled and the heater operating normally.

### 6.4 PC Diagnostics Kit

#### **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 TTC memory. This is achieved through the use of a diagnostic interface kit connected to the TTC and an IBM compatible computer having the necessary software installed.

The PC Diagnostic Interface Kit comes complete with connecting hardware, software and instructions. Also available are several interface connectors for use with Webasto heaters equipped with internal diagnostics capabilities such as theTTC.

Order PC Diagnostics Kit under part number 1320920A .

Kit does not include required adapter, please order adapter under part number 92566B.

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 instructions for use with the TTC heater, see instruction manual supplied with the PC Diagnostics Kit.









Webasto Thermo & Comfort N.A., Inc.  
15083 North Road  
Fenton, MI 48430

Technical Assistance Hotline  
USA: (800) 860-7866  
Canada: (800) 667-8900

[www.webasto.us](http://www.webasto.us)  
[www.techwebasto.com](http://www.techwebasto.com)