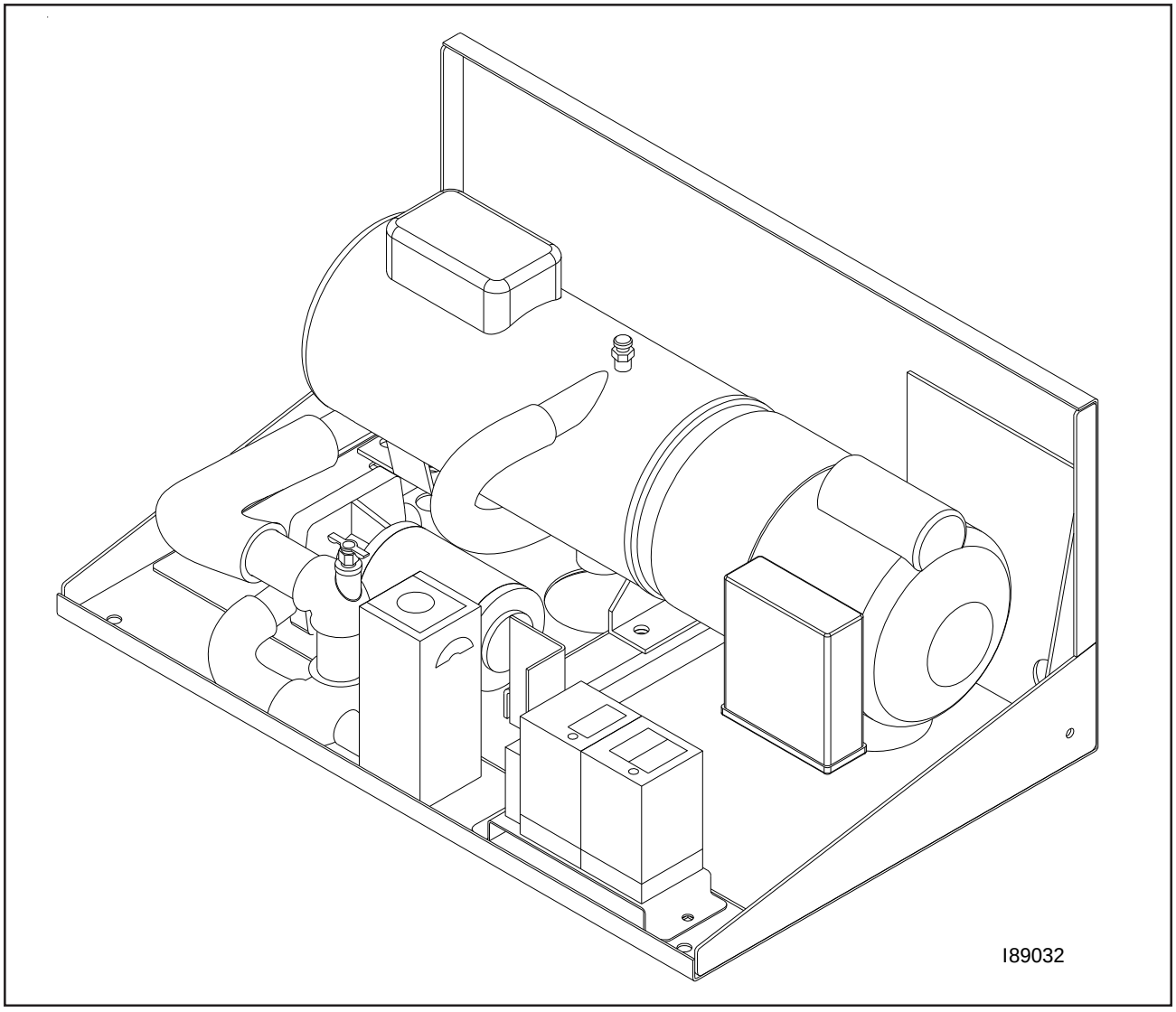
CLEAN BURN
ENERGY SYSTEMS

# INSTALLER'S MANUAL

## CLEAN BURN TRANSPORT HEATER
## MODEL: 45 TH




**PUBLICATION DATE: 4/14/09, Rev. 1** **CLEAN BURN PART # 43217**

# WARRANTY INFORMATION

Clean Burn, Inc., MANUFACTURER, hereby warrants that MANUFACTURER's products shall be free from defect in material and workmanship under normal use according to the provisions and limitations herein set forth.

MANUFACTURER warrants **all Clean Burn component parts** for a period of **one (1) year** from the date of purchase by the purchaser.

All Webasto Heater components are covered according to the Warranty information found in the Webasto Heater Operating Instructions. Contact your local Webasto dealer for warranty claims on any Webasto Heater components.

### LIMITATIONS:

The obligation of MANUFACTURER for breach of warranty shall be limited to products manufactured by MANUFACTURER (1) that are installed, operated and maintained according to MANUFACTURER's instructions furnished and/or available to the purchaser upon request; (2) that are installed according to all other applicable Federal, State and local codes or regulations; and (3) that the purchaser substantiates were defective in material and workmanship notwithstanding that they were properly installed and correctly maintained as set forth above and were not abused or misused.

The obligation of MANUFACTURER shall be limited to replacing or repairing the defective product, at the option of the MANUFACTURER. MANUFACTURER shall not be responsible for any labor or costs of removal or reinstallation of its products and shall not be liable for transportation costs to and from its plant at Leola, Pennsylvania.

Use of parts for modification or repair of the product or any component part thereof not authorized or manufactured by MANUFACTURER specifically for such product shall void this warranty.

This warranty shall not apply to any damage to or defect in any of MANUFACTURER's products that is directly or indirectly caused by (1) *force majeure*, Act of God or other accident not related to an inherent product defect; or (2) abuse, misuse or neglect of such product, including any damage caused by improper assembly, installation, adjustment, service, maintenance or faulty instruction of the purchaser.

Other than as expressly set forth hereinabove, MANUFACTURER makes no other warranty, express or implied, with respect to any of MANUFACTURER's products, including but not limited to any warranty of merchantability or fitness for a particular purpose.

And in no event shall MANUFACTURER be responsible for any incidental or consequential damages of any nature suffered by purchaser or any other person or entity caused in whole or in part by any defect in any of MANUFACTURER's products. Any person or entity to whom this warranty extends and who claims breach of warranty against MANUFACTURER must bring suit thereon within one year from the date of occurrence of such breach of warranty or be forever barred from any and all legal or other remedies for such breach of warranty.

MANUFACTURER is not responsible for and hereby disclaims any undertaking, representation or warranty made by any dealer, distributor or other person that is inconsistent with or in any way more expansive than the provisions of this limited warranty.

This warranty grants specific legal rights and shall be read in conformity with applicable state law. In some jurisdictions, the applicable law mandates warranty provisions that provide greater legal rights than those provided for herein. In such case, this limited warranty shall be read to include such mandated provisions; and any provision herein that is prohibited or unenforceable in any such jurisdiction shall, as to such jurisdiction, be ineffective to the extent of such prohibition or unenforceability without invalidating the remaining provisions and without affecting the validity or enforceability of such provision in any other jurisdiction(s).

# TABLE OF CONTENTS

# SECTION 1: INTRODUCTION

## Guide to this Manual

***IMPORTANT! This manual provides all the instructions necessary to install the Clean Burn Transport Heater. Use this manual as the "master guide" for the entire installation project referring to the Webasto manual when directed to do so for more detailed information on the Transport Heater.***

***IMPORTANT! Refer to Section 1 in the Webasto manual for additional safety information.***

Consult the Table of Contents for a detailed list of topics covered in this manual. You'll find the step-by-step procedures easy to follow and understand. Should questions arise, please contact your Clean Burn dealer before starting any of the procedures in this manual.

Following is an outline of the Transport Heater installation process:

- **UNPACKING**
- **INSTALLING THE TRANSPORT HEATER**
- **INITIAL START-UP**
- **MAINTENANCE**

**WARNING:** Improper installation can adversely affect the proper, safe operation of your Transport Heater. It is critical that the Transport Heater installer reads and follows the instructions provided in this manual and in the Webasto manual.

**DANGER!** DO NOT create a fire or explosion hazard by storing or using gasoline or other flammable or explosive liquids or vapors near the Transport Heater.

**WARNING:** Never alter or modify the Transport Heater without prior written consent of Clean Burn, Inc. Unauthorized modifications or alteration can adversely affect the proper, safe operation of the Transport Heater.

**WARNING:** ***The Best Operator is a Careful Operator!*** By using common sense, observing general safety rules, and adhering to the precautions specific to the equipment, you, the operator, can promote safe equipment operation. ***Failure to use common sense, observe general safety rules, and adhere to the precautions specific to the equipment may result in equipment damage, fire, explosion, personal injury and/or death.***

**WARNING:** The installation, operation, and maintenance of this equipment must be accomplished by qualified personnel and in compliance with the specifications in the Clean Burn Operator's Manual and in the Webasto manual.


***Please read all sections in this manual carefully--including the following safety information--before beginning any installation procedures; doing so ensures your safety and the optimal performance of your Clean Burn Transport Heater.***

## For Your Safety...

For your safety, Clean Burn documentation contains the following types of safety statements (listed here in order of increasing intensity):

- **NOTE:** A clarification of previous information or additional pertinent information.

**WARNING:** A *strong* safety statement indicating that a hazard exists which can result in injury or death if proper precautions are not taken.

**DANGER!** *The utmost levels of safety must be observed;* an extreme hazard exists which would result in high probability of death or irreparable serious personal injury if proper precautions are not taken.

**IMPORTANT! Review the list of general safety precautions provided in Section 1 of the Webasto manual. These precautions *must be heeded* to ensure proper, safe Transport Heater operation.**

# SECTION 2: UNPACKING

Before assembling your Transport Heater, you should take some time to carefully unpack your shipment from Clean Burn.

## Unpacking and Inspecting All Components

Carefully open all shipping containers and inspect all components. Immediately notify the freight company and your Clean Burn dealer in case of shipping damage or shortage(s). Keep all components together so you will have them as needed for assembly and installation.

For your convenience, Transport Heater components are listed in Section 3 (in related groupings) throughout the installation process. Detailed illustrations with labeled components should enable easy assembly/installation.

# SECTION 3: INSTALLING THE TRANSPORT HEATER

## Understanding the Installation Process

Installation of the Transport Heater involves several steps including coolant connections, fuel line hook up, and electrical hook up. To aid your understanding of the process, each specific installation activity is described in a separate "chapter" within this section--use the subheadings as a guide.

- **INSTALLING THE TRANSPORT HEATER**
    - Positioning the Transport Heater
    - Mounting the Transport Heater on the Truck
    - Securing the Transport Heater to the Truck
    - Exhaust Pipe Connection
    - Combustion Air Supply
    - Plumbing into the Coolant System
    - Fuel Supply Connection
    - Wiring Connection
    - Initial Operation

**IMPORTANT! Throughout the Transport Heater installation process, you will be instructed to refer to the Webasto manual for specific assembly or installation information. Read all instructions in both manuals *carefully* to ensure that the installation is performed correctly and safely.**

## Positioning theTransport Heater

The location you select for your Transport Heater must allow the following:

- Unobstructed, safe flow of exhaust fumes.
- Safe, easy access for servicing. *DO NOT restrict service access to the Transport Heater; periodic maintenance is required.*
- Easy access to connect the fuel line.
- Easy access to connect the coolant lines.
- Easy access to make the electrical connections.
- Proper clearances from combustibles.
- Adequate combustion air.

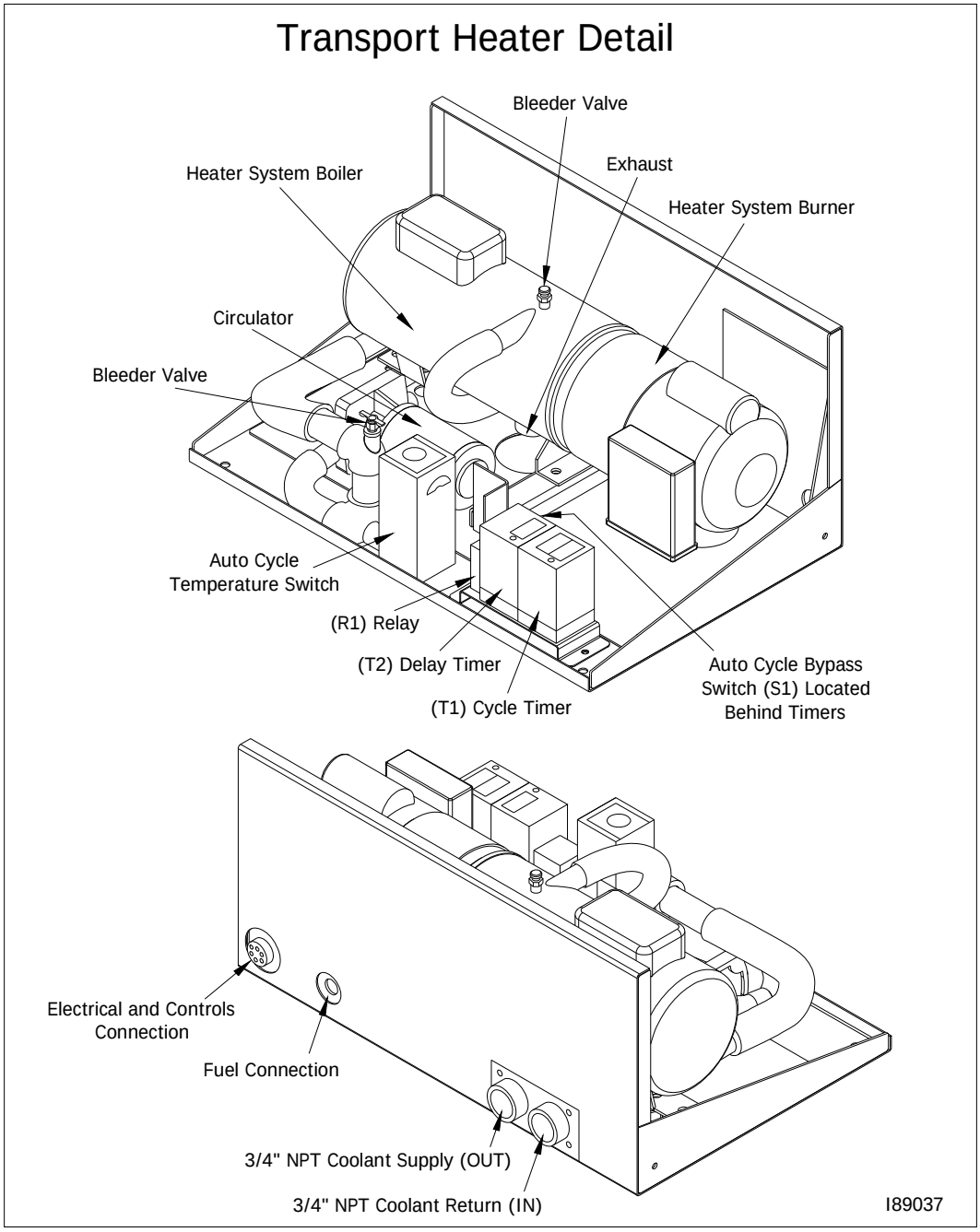



**Figure 3A - Transport Heater Component Detail**

## Mounting the Transport Heater on the Truck

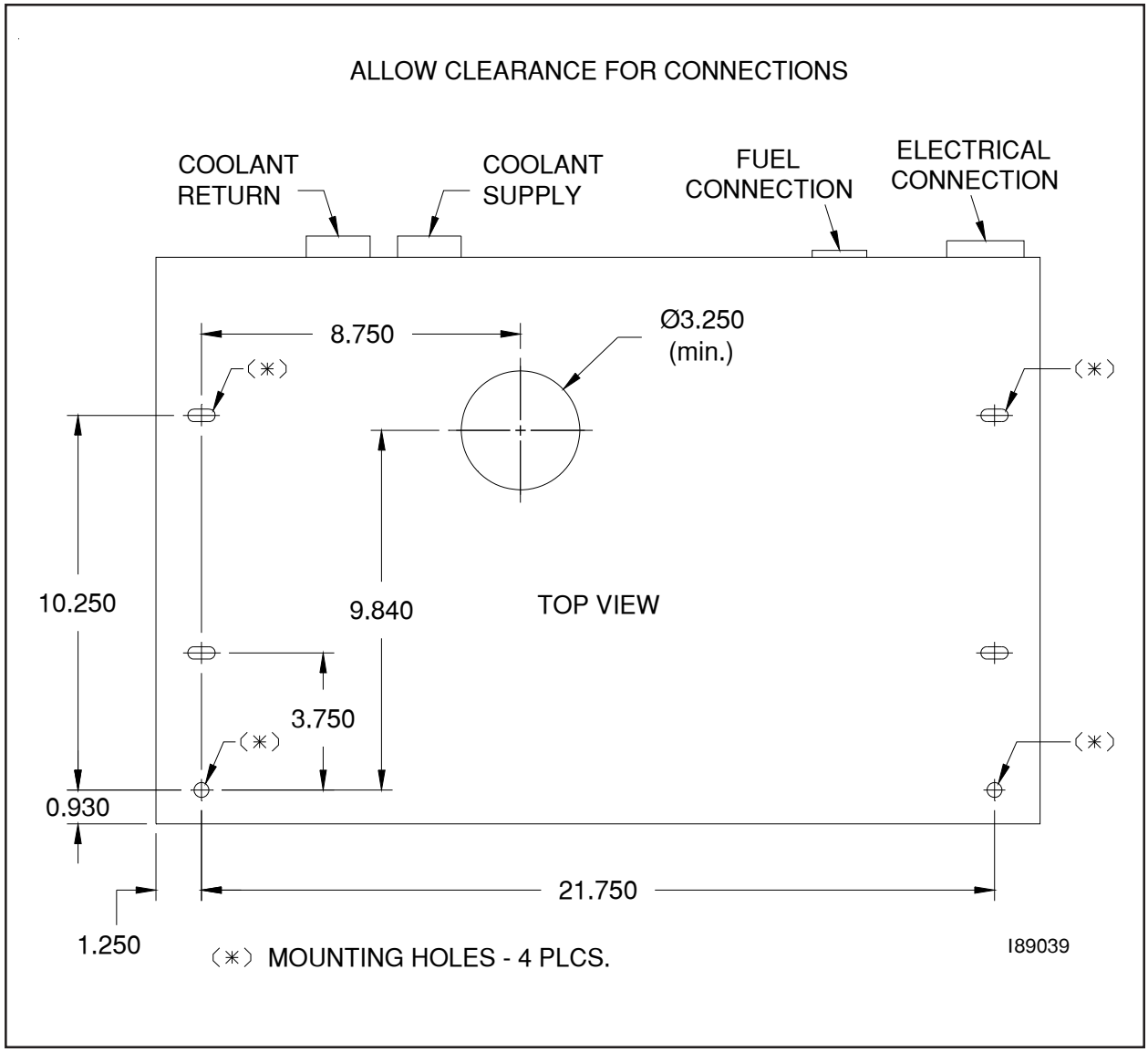



**Figure 3B - CB-45 TH Mounting Base Dimensions**

Mount the Transport Heater so that the bottom of the enclosure is at least 6" below the lowest coolant level of the vehicles cooling system to assist bleeding of the heater and circulator. In most cases the Transport Heater may be mounted on the deck behind the cab or on the side of the frame rails (check manufacturer requirements before drilling holes into frame rails).

NOTE: Bolts may need to be removed from the rear slots and longer bolts inserted for secure mounting.

**WARNING:** The Transport Heater must have a solid mounting. Failure to mount the Transport Heater adequately can adversely affect the proper, safe operation of your Transport Heater.

## Mounting the Transport Heater on the Truck (continued)

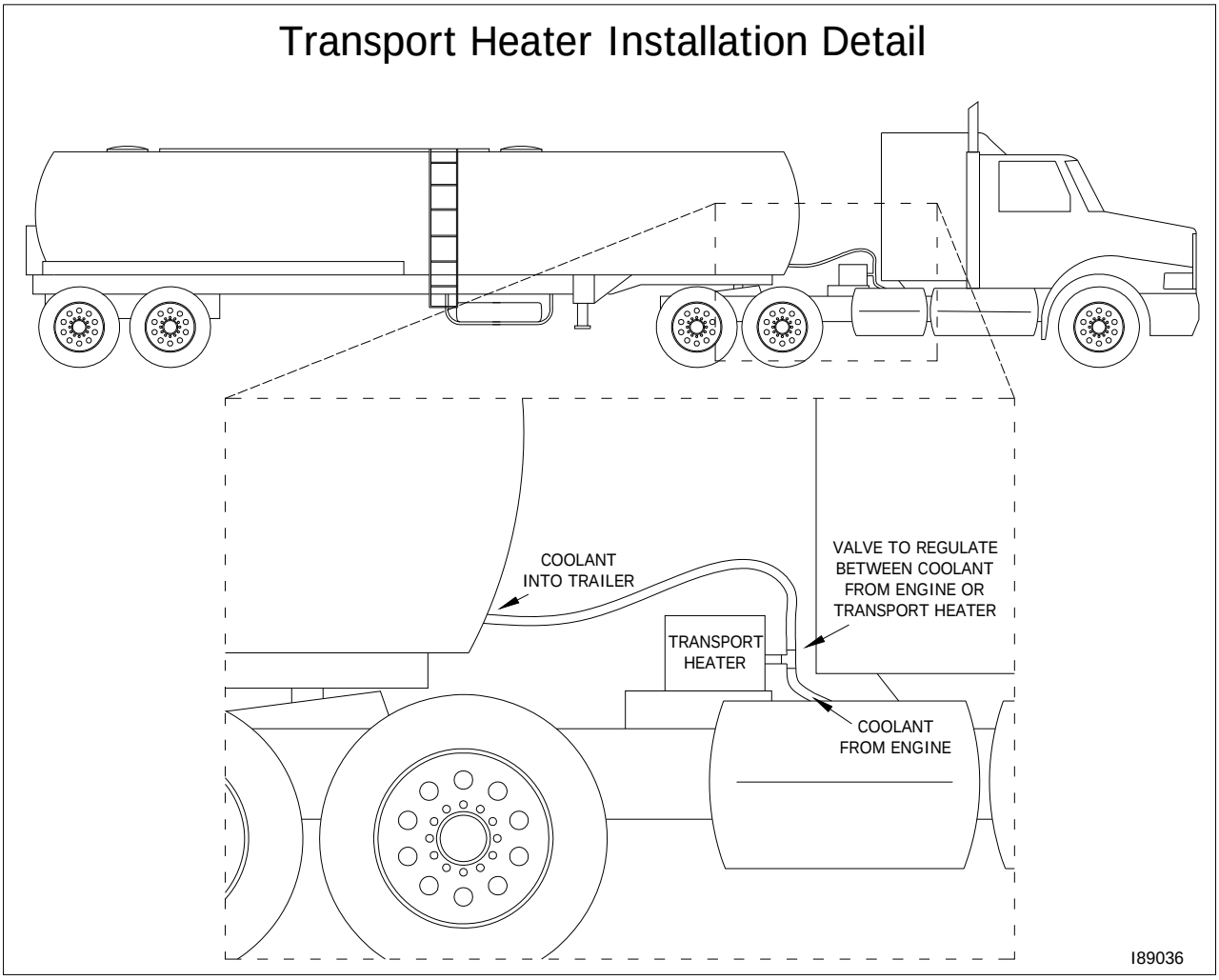



**Figure 3C - Detail of Transport Heater Location**

## Exhaust Pipe Connection

**WARNING:** The exhaust pipe must be mounted in a way that ensures no exhaust gases will enter the cab of the truck.

Refer to the Installation Instructions in the Wabesto manual for directions on making the exhaust pipe connection.

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

## Combustion Air Supply

**WARNING:** To prevent carbon monoxide from entering the cab of the truck, never draw combustion air from inside the passanger compartment.

## Plumbing Into the Coolant System

The 45 TH Transport Heater is equipped with a high performance circulating pump designed specifically for transport applications and needs to be plumbed in accordance with the following instructions.

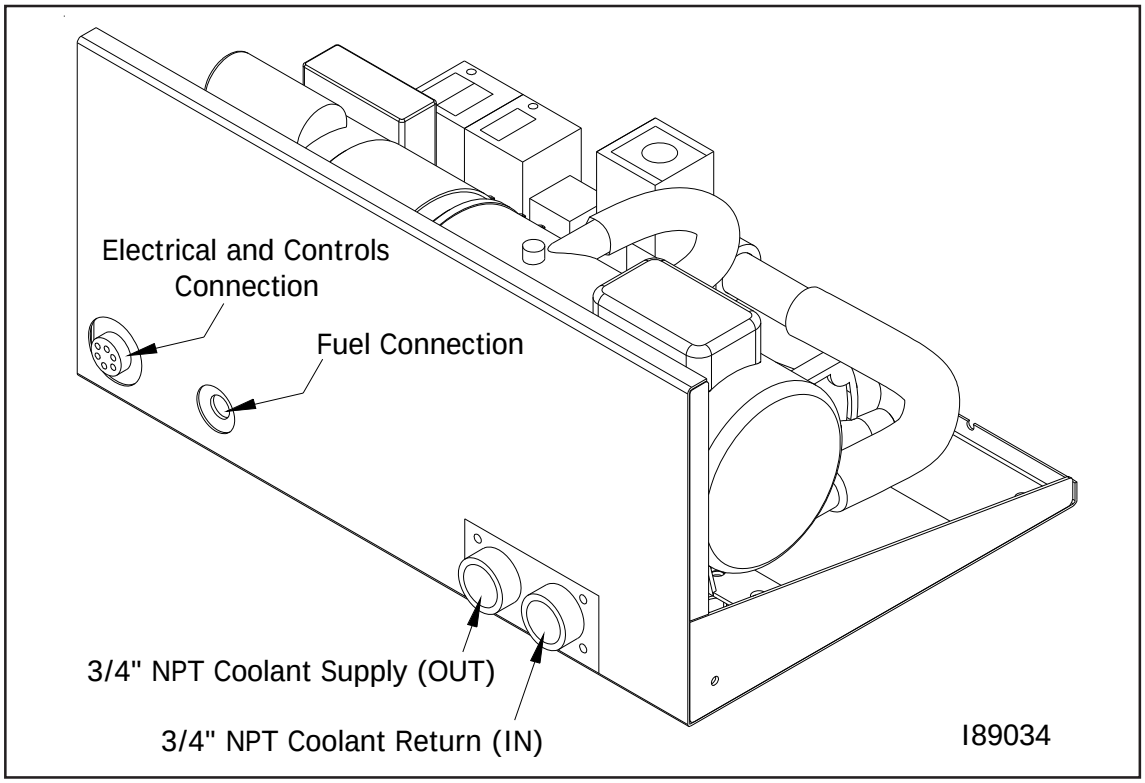



**Figure 3D - Transport Heater Installation Connections**

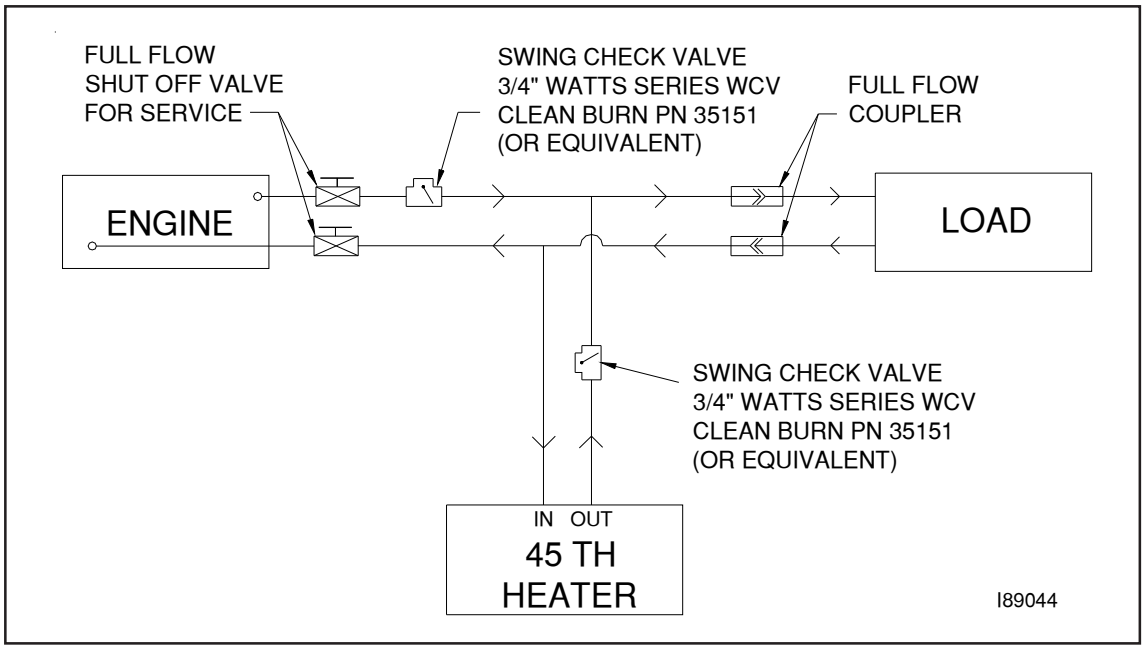



**Figure 3E - Transport Heater Coolant Flow Schematic**

## Plumbing Into the Coolant System (continued)

The Transport Heater is plumbed into the truck coolant system as shown in Fig. 3D and 3E. The coolant connecting ports are 3/4" NPT and may be plumbed with 3/4" I.D. SAE 20 R3 heater hose. Swing check valves (Watts Series WCV) may be used in place of manual valves to direct flow so that the engine or the heater can be used to heat the load. Do not use other types of check valves as they may have a high resistance and reduce the flow. Full flow shut-off valves may be installed for service but must be fully open when the heater is to run. Never close off the lines between the Transport Heater and the truck engine radiator when the heater is to run as this could cause high pressure in the system. Check with the truck engine manufacturer as to where to connect into the truck coolant system. The quick couplers must not rust and must be of the type with low resistance to through flow.

Clean Burn can supply the correct quick couplers and check valves.

1. Carefully remove the radiator cap and release the system pressure.
2. Close off ports or lines before connecting into the coolant system to reduce loss.
3. Plumb the system as shown in Figure 3D and 3E.
   a. Make appropriate connections to the truck engine coolant system.
   b. Check and verify the direction of the check valves during installation.
   c. Use an appropriate sealant on all pipe threads.
   d. The heater flow direction must match the flow direction of the engine coolant circulation system.
   c. Hoses must be installed without kinks and bends that restrict flow and trap air. Secure all hose connections with hose clamps to prevent chaffing and damage.
4. Fully open ports or lines to the coolant system.
5. See Figure 3A. Purge all the air from the transport heater by opening the bleed valves - one on top of the boiler and one on top of the tube next to the circulator. Failure to completely bleed the system may cause the boiler to overheat and the overheat fuse to fail.
6. Top off engine coolant as per truck manufacturer recommendations and reinstall radiator cap.
7. After the initial start-up check all fittings and joints for leaks and tighten hose clamps as needed.

Refer to the Wabesto Installation Instructions for additional directions on making the coolant system connections.
NOTE: Heater and water pump fit 1" ID heater hose meeting SAE 20 R3 specifications. Silicone heater hose requires special hose clamps. Hose clamps must be tightened to 45 in./lb torque.

## Fuel Supply

1. Refer to Figure 3D to locate the fuel supply connection.
2. Refer to the Wabesto Installation Instructions for making the fuel supply connections.

## Wiring Connections

1. Refer to Figure 3A to locate the electrical and controls connection.
2. Refer to the Wabesto Installation Instructions and the wiring diagram in Appendix A for directions on making the wiring connections. Follow the instructions for the On / Off Switch (Dash Switch) when connecting the Heater Control Harness.

# SECTION 4: INITIAL START-UP

Follow instructions in the Wabesto manual for initial start-up and operation.

**NOTE:** With the addition of the Auto-Cycle timers the heater start-up sequence for the CB-45 TH varies slightly from the sequence described in the Webasto manual.

Review Section 6 and Appendix A for the operating sequence of the Transport Heater.

# SECTION 5: MAINTENANCE

Follow instructions in the Wabesto manual for Annual Maintenance procedures in the following areas:

- Enclosure Area
- Electrical System
- Exhaust System
- Fuel System
- Burner System
- Operational Check

# SECTION 6: TROUBLESHOOTING

## Transport Heater Sequence of Operation

When the power switch is turned on, the cycle timer (T1) energizes the delay timer (T2) and the circulator pump. The pump moves heated water from the heat exchanger. After one to two minutes (see setting the Time Delay Relays to adjust this time) the delay timer (T2) cycles and engages the temperature switch. If the water temperature is above the set point of the temperature switch the circulator will shut down until the cycle timer (T1) starts it again. If the water temperature is below the set point of the temperature switch, it will cycle the relay (R1) into the run position as long as there is a call for heat and turns the boiler on. As the boiler starts it will go through a warm up cycle before firing and bringing the load up to temperature.

When the desired temperature is reached the boiler will turn off and go into cool down cycle. At the end of the cool down cycle the circulator pump will turn off.

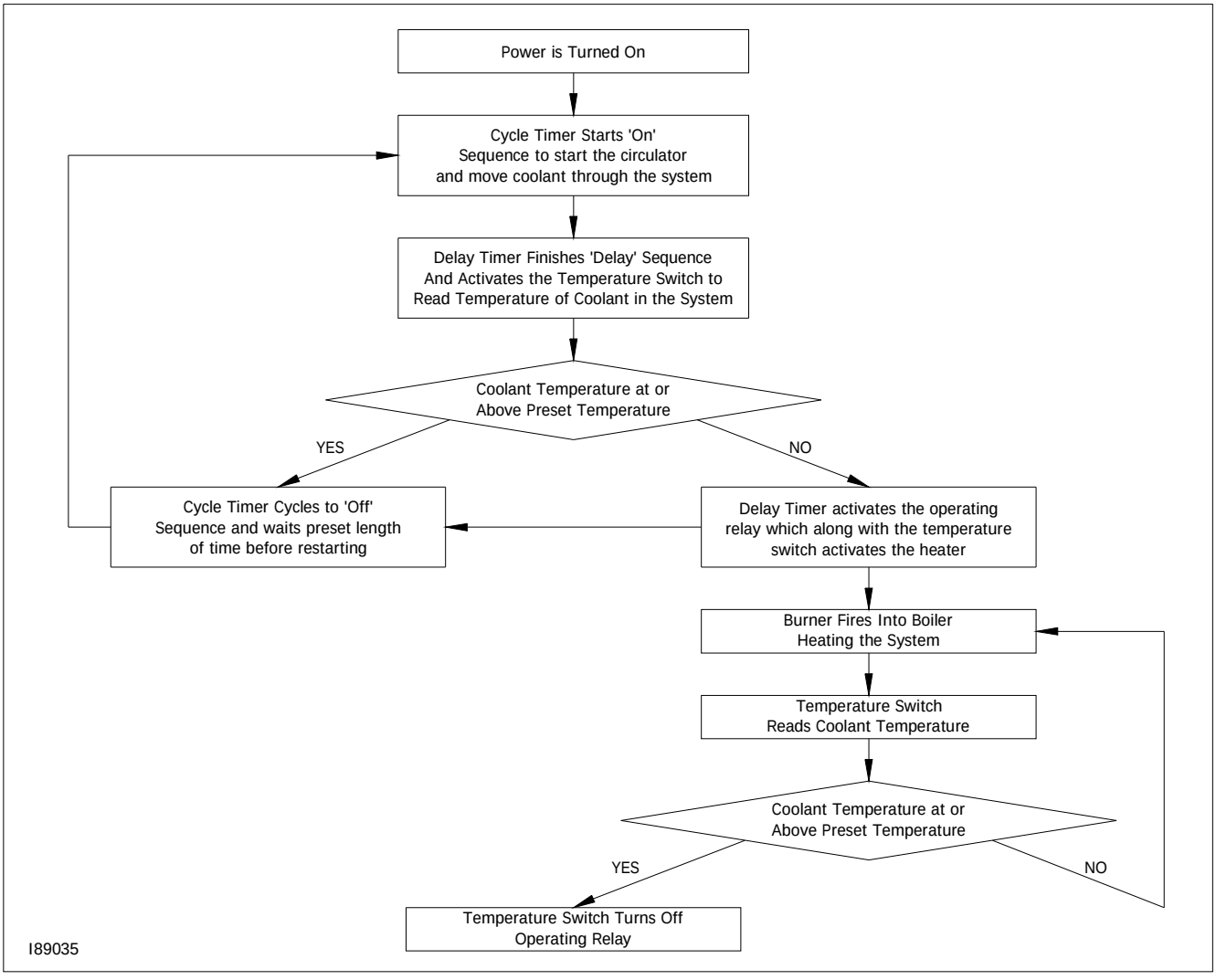



**Figure 6A - Transport Heater Sequence of Operation**

## Basic Troubleshooting

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

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

Refer to the Wabesto manual for additional troubleshooting instructions.

The Auto Cycle feature can be bypassed using the Auto Cycle Bypass Switch when the heater is to run constantly or when troubleshooting the system. The Auto Cycle Bypass Switch is located behind the (R1) Relay. It is in the bypass mode when the switch is up. The auto cycle feature is operational when the switch is in the down position.

NOTE: When the auto cycle feature is bypassed and the dash switch is on, the boiler operating temperature is set for 167 °F.

Refer to Figure 3A. The auto cycle temperature switch can be adjusted by inserting a screwdriver in the slotted screw type head located beneath the window in the cover. Turn the scale to the desired temperature setting. (Usable range 100 - 167 °F)

# APPENDIX A

## CB-45 TH Technical Data

NOTE: All data is approximate and may vary with temperature and voltage

| | |
|---|---|
| Heater | 45 TH |
| Design | Coolant heater with high-pressure nozzle |
| Heat Output | 45,000 Btu/hr (13.1 kW) |
| Fuel | Diesel #1 Diesel #2 Arctic |
| Fuel Consumption | 0.4 gal / hr (1.5 Liters/hr) |
| Rated Voltage | 12 Volts |
| Operating Voltage | 10 – 14 Volts |
| Power Consumption without Water Pump | 60 Watts |
| Permissible Ambient Temperature during Operation | -40 °F ... +140 °F (-40 °C ... +60 °C) |
| Storage Temperature | 185 °F max. (+85 °C max.) |
| Minimum Capacity of cooling system | 2.6 gal (10 Liters) |
| Permissible Operating Pressure of Coolant | 6 psi – 29 psi (0.4 bar – 2 bar) |
| Boiler Operating Temperature | 167 °F |
| Auto Cycle Operating Temperature | 100 – 167 °F |
| Weight With Enclosure | 92.5 lbs. (42 kg) |
| Dimensions of Heater Enclosure (L X W X H) | 24.625 in. X 15.625 in. X 12.0 in.<br>(625 mm X 397 mm X 305 mm) |

Circulator (Water Pump)

| | |
|---|---|
| Power Consumption | 60 Watts |
| Connections to Enclosure | ¾" NPT |
| Flow Rate | 4 GPM @ 12.5 Ft. – Total Head<br>(908 L/Hr @ 3.8 Meters – Total Head)<br><br>10 GPM @ 7 Ft. – Total Head<br>(2271 L/Hr @ 2.1 Meters – Total Head) |

**NOTE:** Refer to the Webasto manual for additional Technical Data.

# APPENDIX A

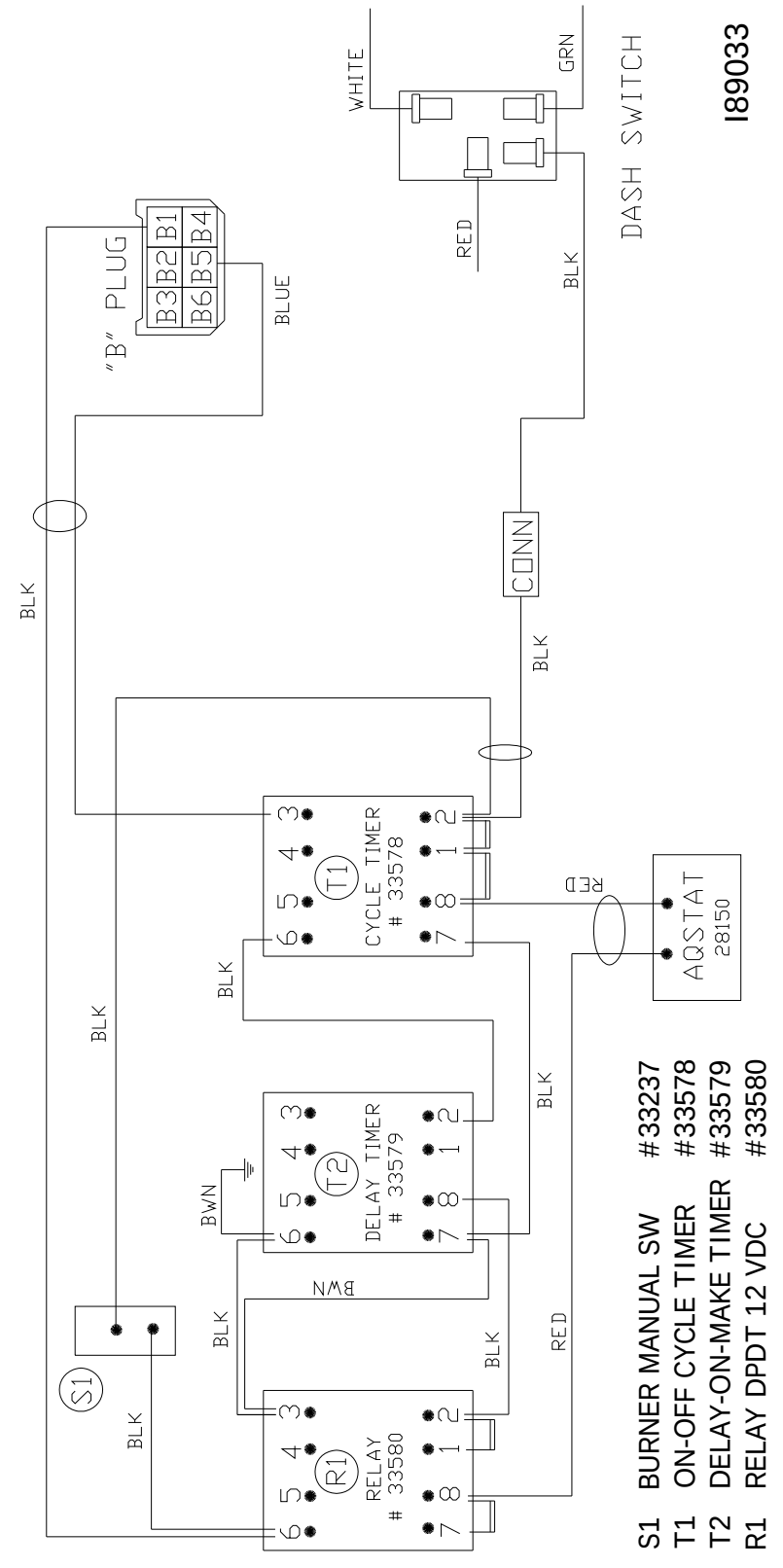



**Figure A1 - CB-45 TH Transport Heater Auto Cycle Wiring Diagram**

**NOTE:** Also refer to *on / off Switch - connection diagram* in the Webasto manual.

## CB-45 TH Parts List

| PART # | DESCRIPTION |
|---|---|
| 15060 | BASE |
| 15062 | COVER |
| 15064 | CIRCULATOR |
| 28150 | AQUASTAT (TEMPERATURE SWITCH) |
| 31266 | HOSE SPRING (INSERT) |
| 31267 | 1" X 16-3/4" HOSE |
| 31268 | 1" X 6-7/8" HOSE |
| 31269 | 1" HOSE – SHORT ELL ASSEMBLY |
| 31270 | 1" HOSE – LONG ELL ASSEMBLY |
| 14332 | PIPE ASSEMBLY |
| 33237 | S1 - AUTO CYCLE BYPASS SWITCH |
| 33577 | RELAY SOCKET 8 PIN |
| 33578 | T1 - ON-OFF CYCLING TIMER |
| 33579 | T2 - TIMER DELAY |
| 33580 | R1 - RELAY DPDT 12 VDC |
| 220113 | RUBBER LATCH HANDLE |
| 32500 | HOSE CLAMP |
| 12302 | CONTROL BASE ASSEMBLY |

**NOTE:** Also refer to the Webasto manual for additional parts lists.

## Operating Sequence and Setting the Time Delay Relays

The purpose of the Auto-Cycle control is to reduce the load on the battery by allowing the heater and circulator to remain off when the water temperature is above the set point of the water temperature switch. At predetermined intervals the Auto-Cycle control starts the circulator and takes temperature readings of the load and if necessary starts the burner allowing it to run until the heating requirement is fulfilled.

When the heater on/off switch is turned on it energizes the T1 cycle timer which continues repeating the on / off cycle (it always begins with the ON cycle after it has been energized). The T1 cycle timer determines the frequency at which the load temperature readings are taken (usually set for every one to three hours). A temperature reading is taken after the water pump circulates the coolant.

When the T1 cycle timer is energized it also starts the T2 delay timer. The T2 delay timer determines how much time elapses from when the circulator starts to when a temperature reading is taken (usually set for two minutes).

## Operating Sequence and Setting the Time Delay Relays (continued)

To set the T2 Delay Timer for a two minute delay:

Set switch 11 "on" and switch 12 "off" for a time range of 1 to 1024 minutes. Set switch 1 "on" and set switches 2 through 10 "off". The built in 1 minute completes the full two minute delay.

To set the T1 cycle timer for a one hour repeat cycle:

Set the ON cycle for 3 minutes (ON row):

Set switch 11 "on" and switch 12 "off" for a time range of 1 to 1024 minutes. Set switch 2 "on" and switches 1,3,4,5,6,7,8,9 and 10 "off". The built in 1 minute completes the three minutes ON cycle for a one minute over lap with the above T2 delay timer setting.

Set the OFF cycle for 57 minutes (OFF row):

Set switch 11 "on" and switch 12 "off" for a time range of 1 to 1024 minutes. Set switches 4,5 and 6 "on" and switches 1,2,3,7,8,9 and 10 "off". The built in one minute completes the 57 minutes OFF cycle.

Add the ON cycle (3 minutes) to the OFF cycle (57 minutes) for the *one hour repeat cycle*.

## Adjusting the Timer Settings

**On-Off Cycling Timer (T1)**

*(Perform the following instructions for both the ON and OFF cycles)*

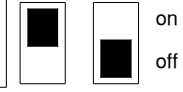
Select Time Range:

Set switch 11 to "on" and switch 12 to "off" for a time range of 1 to 1024 Minutes.

Setting Time Period:

Slide switches to the "on" position that will total the desired delay in accordance with the chart below. Note: The timer has an internal delay equal to the value of switch number one.

| Switch Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit of Time With Switch in the ON Position | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | | |

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Example: to set for 30 minutes - Switch 11 "on" (closed) and switch 12 "off" (open) for minutes time delay range. Then close ("on" position) switches 5,4,3, and 1 for a total of 29 minutes. All the other switches remain open ("off" position). The built in 1 minute completes the full 30 minutes.

**Delay Timer (T2)**

Select Time Range: Same as above

Setting Time Period: Same as above