

# **BT400-NEX-G2**



## **Installation – Operation Maintenance Instructions And Parts List**

**READ INSTRUCTIONS PRIOR TO STARTING HEATERS**

## Table of Contents

<b>SECTION 1</b>	<b>INTRODUCTION</b>	<b>Page</b>
	1.1 General	5
	1.2 Scope	5
	1.4 Safety Precautions	5
<b>SECTION 2</b>	<b>DESCRIPTIONS</b>	
	2.1 General	6
	2.2 Scope	6
	2.4 Power Unit	6
	2.6 Fuel System	7
	2.8 Heat Exchanger	9
	2.10 Cabinet	10
	2.12 Trailer	10
	2.14 Leading Particulars	11
<b>SECTION 3</b>	<b>PREPARATIONS FOR USE AND STORAGE</b>	
	3.1 General	12
	3.2 Scope	12
	3.4 Inspection and Servicing of Equipment	12
	3.5 Tires	12
	3.7 Trailer Frame and Cabinet	12
	3.9 Honda Engine	12
	3.11 Heater	12
	3.13 Preparation for Storage	13
<b>SECTION 4</b>	<b>OPERATION INSTRUCTIONS</b>	
	4.1 General	14
	4.2 Scope	14
	4.4 Theory of Operation	14
	4.6 General Theory	14
	4.9 Controls	14
	4.10 Choke	15
	4.12 Engine Start Switch	15
	4.14 Recoil Starter Handle	15
	4.16 Burner Control Valve	15
	4.18 Temperature Control Valve	15
	4.20 Discharge Air Temperature Gauge	15
	4.22 High Temperature Switch	16
	4.24 Thermostat Control	16
	4.26 Detailed Theory	17
	4.27 Fuel System	17
	4.28 Fuel Pump	17
<b>SECTION 4</b>	<b>OPERATION INSTRUCTIONS</b>	
	4.30 Burner Control Valve	17
	4.32 Fuel Atomizing Head	18
	4.34 Temperature Control Valve	18

## Table of Contents

<b>SECTION 4</b>	<b>OPERATION INSTRUCTIONS</b>	
	4.36 Thermostat	18
	4.38 Discharge Air Temperature Gauge	18
	4.40 Fuel Gauge	18
	4.42 Operation under Normal Conditions	18
	4.44 Preparation for Starting	19
	4.46 Engine Start-up	19
	4.48 Heater Operation	20
	4.50 Shutting Down Heater	20
	4.51 Heater Combustor	20
	4.53 Engine Shut Down	20
	4.55 Operation in Extreme Cold	20
	4.57 Operation in Dusty or Sandy Areas	20
	4.59 Operation in Salt Water and High Humidity Areas	21
<b>SECTION 5</b>	<b>MAINTENANCE INSTRUCTIONS</b>	
	5.1 General	22
	5.2 Scope	22
	5.4 Cleaning	22
	5.6 Flexible Ducts	22
	5.8 Lubricating	22
	5.10 Wheel Bearings	22
	5.12 Engine Oil Level Check	23
	5.14 Engine Oil Change	23
	5.16 Engine Oil Recommendations	23
	5.18 Preventive Maintenance	24
	5.20 Troubleshooting	25
	5.25 Air Filter Cleaning	27
	5.28 Honda Engine	28
	5.30 Drive Coupling	28
	5.32 Drive Coupling Removal	28
	5.33 Cleaning, Inspection and Repair	28
	5.34 Drive Coupling Installation	28
	5.35 Engine Mounting Brackets	28
	5.37 Engine Mounting Brackets Removal	29
	5.38 Cleaning, Inspection and Repair	29
	5.39 Engine Mounting Brackets Installation	29
	5.41 Engine Installation	29
	5.43 V-Belt	29
<b>SECTION 5</b>	<b>MAINTENANCE INSTRUCTIONS</b>	
	5.45 Adjustment of V-Belt	29
	5.48 Cleaning and Inspection	29
	5.50 Fan and Mounting Ring	30
	5.52 Removal of Fan and Mounting Ring	30
	5.54 Cleaning, Inspection and Repair	31
	5.56 Installation of Fan and Mounting Ring	31

<b>SECTION 5</b>	<b>MAINTENANCE INSTRUCTIONS</b>	
	5.58 Heat Exchanger Assembly	31
	5.59 Removal	31
	5.61 Installation	32
	5.63 Heat Exchanger	32
	5.64 Removal	32
	5.66 Cleaning, Inspection and Repair	32
	5.68 Installation	32
	5.70 Carbon Monoxide Test	32
	5.72 Heater Ignition System	33
	5.74 Coil	33
	5.76 Ignition Cable and Igniter Plug	33
	5.78 Removal	33
	5.80 Cleaning and Inspection	33
	5.82 Installation	34
	5.84 Fuel System	34
	5.86 Fuel Pump	35
	5.87 Pressure Test and Adjustment	35
	5.89 Fuel Pump Removal	35
	5.91 Fuel Pump Installation	35
	5.93 Fuel Atomizing Nozzle	35
	5.95 Removal	35
	5.97 Cleaning and Inspection	35
	5.99 Installation	36
	5.101 Heater Fuel Filter	36
	5.103 Fuel Filter	36
	5.105 Fuel Tank	36
	5.107 Removal	36
	5.109 Cleaning and Inspection	36
	5.111 Installation	37
	5.113 Trailer Components	37
	5.115 Trailer Wheels	37
	5.117 Removal	37
	5.119 Disassembly	37
	5.121 Cleaning, Inspection and Repair	37
	5.123 Reassembly	38
	5.125 Installation	38
<b>SECTION 6</b>	<b>PARTS LIST</b>	
	6-1 Heater Part 1	40
	6-2 Heater Part 2	41
	6-3 Heater Right Side	42
	6-4 Heat Exchanger (rear)	43
	6-5 Control Box	44
	6-6 Fan Assembly	45
	6-7 Engine Compartment Part 1	46
	6-8 Engine Compartment Part 2	47
	6-9 Heat Exchanger (front)	48

## Section 1

### Introduction

#### 1.1 General

#### 1.2 Scope

- 1.3** These instructions are for use by personnel who have purchased the BT400-NEX-G2 heater manufactured by **AEROTECH HERMAN NELSON INC.** Contained within is the information on the operation and maintenance of the heater as well as the description of the major components and their functions in relation to other parts in the heater. In addition, a list of repair parts which may be required for maintaining the heater is provided in Section 6.

#### 1.4 Safety Precautions

- 1.5** Precautionary measures to be taken during operation and maintenance of the heater are contained in the appropriate paragraphs of the manual. In addition, all safety precautions are listed in the front of this manual.
- 1.6** Listed below are the definitions of commonly used terms in this manual.

**DANGER:** You will be subject to serious injury or death if you fail to follow instructions!

**WARNING:** You could be subject to serious injury or death if you fail to follow instructions!

**CAUTION:** You can be hurt if you fail to follow instructions!

**NOTICE:** Your heater or other property could be damaged if you fail to follow instructions!

#### **CAUTION**

#### 1.7 Moving heaters while in operation

- 1.8** It is strongly recommended by **AEROTECH HERMAN NELSON** that our heaters **NOT** be moved while in operation. There is a strong possibility that the fuel being sloshed around inside the fuel tank can leak out of the vents and come in contact with the flame in the combustion chamber causing a fire. The fuel pick up line in the tank may suck in air which will cause cavitation of the fuel pump, which will stall the engine; the flame in the combustion chamber will go out, causing the heat exchanger to warp due to lack of cooling air, which will decrease the life of the heat exchanger. If the engine has stopped because of a cavitation the fuel system will need to be bled to remove the air. When the fuel pump has no fuel the gears may become damaged introducing metal filings into the fuel system. These metal filings can then get into the engine causing major damage to a host of major components on your heater.

## Section 2

### Description

#### 2.1 General

#### 2.2 Scope

- 2.3** The model **BT400-NEX-G2** heater (*see figure 2-1 and 2-2*) is a fully enclosed, portable heater shown on the optional trailer. The heater is intended for use in the heating of maintenance shelters, portable hangers, aircraft engines and fuselages, and other similar enclosures.

#### 2.4 Power Unit

- 2.5** The model **BT400-NEX-G2** heater is supplied with a 5.5 hp **HONDA** engine. The engine supplies all the power necessary for operation of the heater. Air is drawn through the air inlet louvers (*see figure 2-1*), passes through and around the heat exchanger, and is discharged through ducts mounted on the duct adapter assembly (*see figure 2-2*). The engine has a coupling attached to the drive shaft. A drive coupling is connected to the driven coupling by a flexible rubber sleeve which mates with the two. The driven coupling drives the heater fan directly as well as an integral pulley with a V-belt that drives the fuel pump mounted ahead of the fuel service point on the left side. The heater ignition coil is located on the opposite side of the unit.



**Figure 2-1 Right Front View**

## Section 2

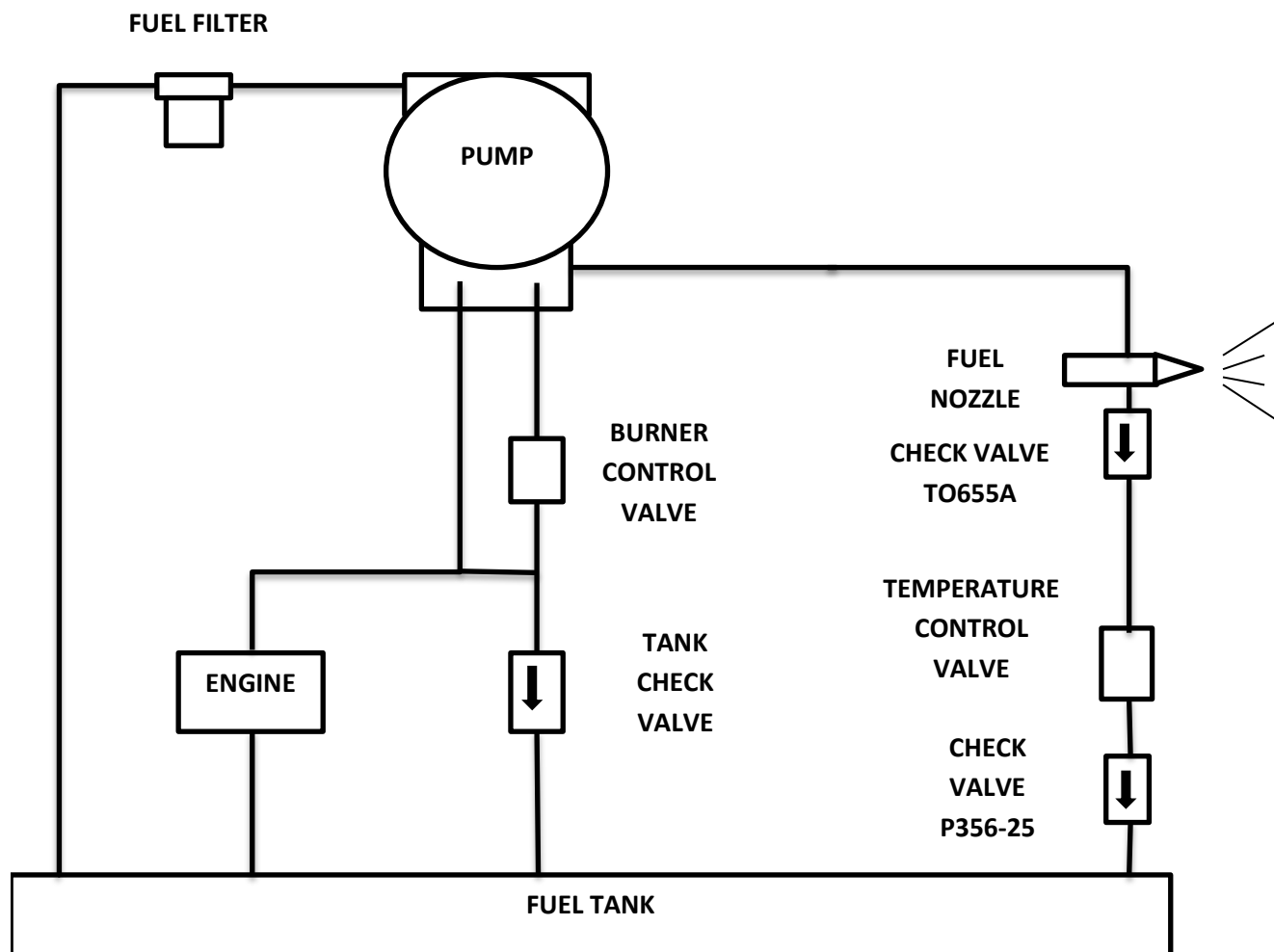


**Figure 2-2 Left Rear View**

### 2.6 Fuel System

- 2.7** The fuel system (*see figure 2-3*) supplies fuel for the heater and to the engine. Fuel is drawn from a removable 16 gallon fuel tank suspended by straps in the base of the heater, through an automotive type fuel filter. A belt-driven fuel pump draws fuel through the filter and delivers it under constant pressure to the heater combustor and gasoline engine. A burner fuel valve is provided to activate the combustors, and to automatically shut down the combustor in the event of dangerously high discharge air temperature. A temperature control valve is provided to control discharge air temperatures between 150°F and 250°F. The fuel nozzle is contained in a holder with inlet and bypass fuel lines. Fuel flows through the nozzle and is atomized. As the fuel leaves the nozzle it is ignited by the igniter plug in the combustor. Fuel is also bypassed from the nozzle, through a check valve, to the temperature control valve. This check valve prevents a reverse flow of fuel to the nozzle.

## Section 2



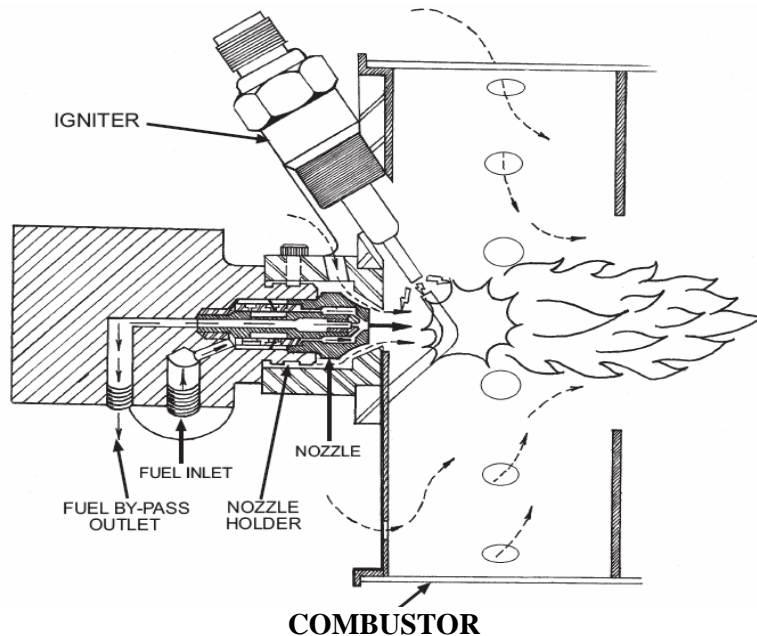
**Figure 2-3 Fuel System Flow Schematic**



## Section 2

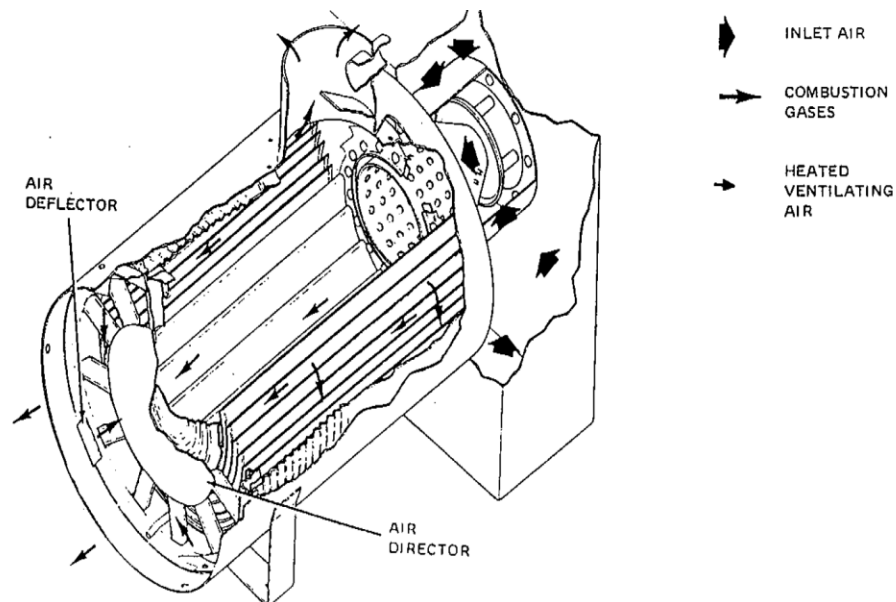
### 2.8 Heat Exchanger

- 2.9 Fuel flowing from the nozzle is ignited in the combustion chamber (*see figure 2-4*). The burning fuel strikes a plate or target in the combustor and is diffused into the heat exchanger. Air from the fan enters holes in the side of the combustor in a manner that will ensure proper fuel-air mixture. From the combustor, the burning fuel flows through the heat exchanger in a spiral path between the surfaces of the ventilating air tubes and is expelled through the parallel tubes and the space between the surfaces of the ventilating air tubes and is expelled through the exhaust opening at the top of the casing. (*See figure 2-5*) The ventilating or heating air is forced through the parallel tubes and the space between the heat exchanger shell and the casing. Heat is exchanged between the hot exhaust gases and the ventilation air. At the discharge end of the heat exchanger is the temperature sensing elements. The air control assembly consists of a baffle and a series of radial tubes. Air traveling between the walls of the heat exchanger and the casing is directed radially inward behind the baffle where it is mixed with warmer air leaving the parallel tubes of the heat exchanger. This mixing ensures a more uniform temperature throughout the discharge airstream. A duct adapter assembly is installed on the discharge end of the heater to connect the flexible duct (*see figure 2-2*).



**Figure 2-4 Sectional View of Nozzle & Combustor**

## Section 2



**Figure 2-5 Air Flow**

### 2.10 Cabinet

- 2.11** The Honda engine is enclosed in the cabinet (see figure 2-1) which affords protection against the elements and prevents damage during storage or transit. The cabinet is hinged and is provided with cabinet supports. When the heater is in operation, the cabinet must be **closed**. The control box, located on the right of the heater has a hinged cover which opens to allow access to the controls.

### 2.12 Trailer

- 2.13** A two-wheeled trailer is provided as an option to transport the heater when moving from worksite to worksite. The duct holders located on the side of the trailer (*see figure 2-1 and 2-2*) hold the six-inch ducts when they are not in use. The 12-inch ducts and duct adapter are stored in the basket. An adjustable tow bar serves as a support when the trailer is at rest.

**NOTE**  
**DO NOT EXCEED 20 M.P.H. WHEN TOWING**

## Section 2

### 2.14 Leading Particulars.

**2.15** The leading particulars for the model **BT400-NEX-G2** heater are as follows:

#### A – Heater

Manufacturer	AEROTECH HERMAN NELSON INC.
Model	BT400-NEX-G2
Fuel	Gasoline
Discharge air temperature range	150°F to 250°F

#### B – Engine

Manufacturer	Honda Power Equipment
Model	GX 160
Max output	5.5 hp @ 3600rpm
Cooling System	Forced Air
Ignition System	Transistorized magneto
PTO Shaft Rotation	Counter clockwise

#### C – Igniter Plug

Point Setting	0.1250 to 0.1876
---------------	------------------

#### D – Tires

Size	5.3-12
Pressure	35 psi

#### E – Fuel Tank

Capacity	16 Imperial gal
----------	-----------------

#### F – Shipping Dimensions & Weight

<b>BT400-NEX-G2</b>	<b>with MA-1Trailer</b>
Weight 405 lbs	Weight 615 lbs.
Length 55"	Length 84"
Width 25"	Width 43"
Height 35"	Height 45"

## Section 3

### Preparation for Use & Storage

#### 3.1 General

#### 3.2 Scope

**3.3** The heater unit is shipped on a skid or in a packing crate. Unloading should be accomplished as follows:

- (a) Remove all tie downs and blocks securing packing crate to carrier.
- (b) Use cable slings and hoist, with a capacity of 1,000 lbs., to lift heater from carrier.

#### **CAUTION**

**Be careful when using crowbars, pinch bars, and hammers while uncrating the equipment to prevent damage to the heater. Be careful when removing cardboard boxes from packing crate.**

#### 3.4 Inspection and Servicing of Equipment

#### 3.5 Tires

**3.6** Inspect tires for leaking valves, cuts, or improper inflation.

#### 3.7 Trailer Frame and Cabinet

**3.8** Perform the following:

- (a) Inspect trailer frame and cabinet for broken welds, dents, and loose or missing hardware.
- (b) Inspect cabinet to see that no damage has occurred during shipment.
- (c) Inspect fuel tank for breaks or dents.

#### 3.9 Honda Engine

**3.10** Perform the following:

- (a) Inspect for exterior damage and loose or missing hardware.
- (b) Turn engine over several times with the recoil starter to ensure that the piston moves

#### 3.11 Heater

**3.12** Inspection and servicing of the heater consists of the following:

- (a) Performing the required preventive maintenance services. (*Refer to section 5.*)
- (b) Fill fuel tank with the proper grade of gasoline.

#### **WARNING**

**When filling the fuel tank, do not smoke or use an open flame in the vicinity.**

## Section 3

### 3.13 Preparation for Storage

- 3.14** Proper storage preparation is essential for keeping the heater trouble-free and looking good. The following steps will keep rust and corrosion from impairing the heaters' function and appearance.
- (a) Clean all exterior surfaces with a mild detergent and water.

#### NOTE

**Water contacting a hot engine can cause damage. If the engine has been running, allow it to cool for at least half an hour before washing.**

- (b) Drain fuel from tank

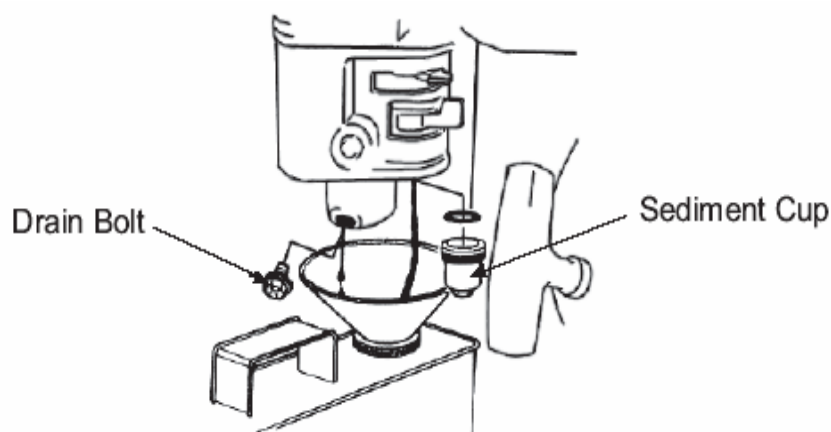
#### NOTE

**Old gasoline will cause hard starting, and it leaves gum deposits that clog the fuel system. If the gasoline deteriorates during storage, you may need to have the carburetor and other fuel components serviced or replaced.**

- (c) Drain fuel from carburetor by removing the drain bolt with the sediment cup, and then move the fuel valve lever to the "ON" position. Reinstall the drain bolt and sediment cup after all the fuel has drained (*see figure 3-1*).

#### WARNING

**Gasoline is highly flammable and explosive. You can be burned or seriously injured when handling fuel. Keep heat, sparks, and flame away. Handle fuel only outdoors. Wipe up spills immediately.**



**Figure 3-1**

## Section 4

### Operation instructions

#### 4.1 General

#### 4.2 Scope

- 4.3 This section describes the theory of operation, operating controls and indicators and the operative procedures for the heater.

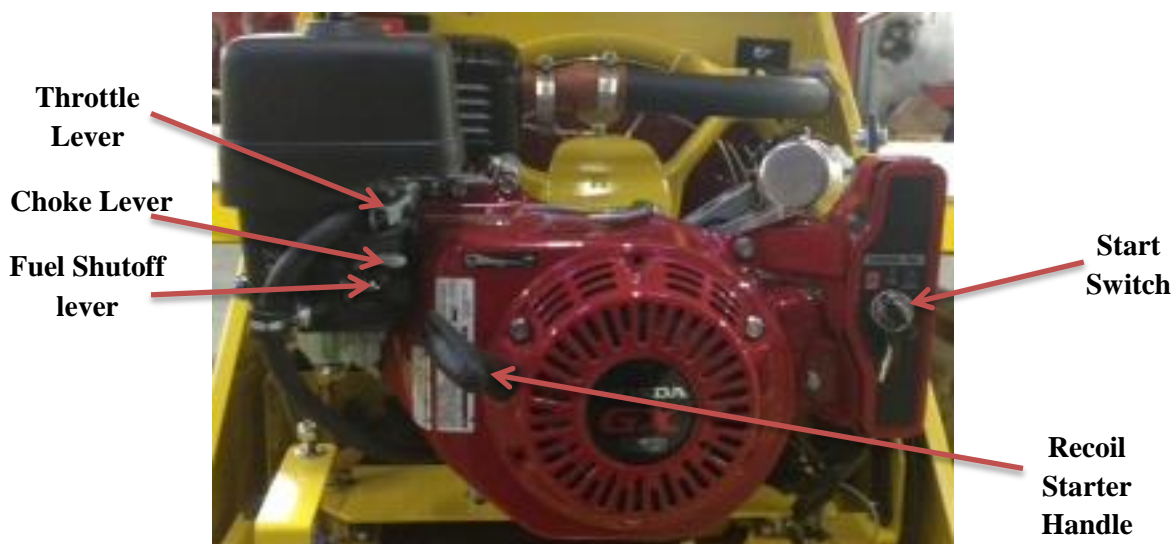
#### 4.4 Theory of Operation

- 4.5 The description will be presented in two parts; (1) **General Description** and (2) **Detailed Description**. The general description explains the interrelationship of functional components at an operation level. Functions of individual components and unique assemblies are given in the detailed description.

#### 4.6 General Theory

- 4.7 Fuel is drawn from the fuel tank through the fuel filter and delivered under constant pressure to the variable discharge combustion nozzle. The ignition system produces a high voltage spark at the igniter plug to ignite the fuel and air mixture. The resultant flame heats the heat exchanger. Ambient air is forced through the heat exchanger by the fan assembly. As the ambient air passes through the heat exchanger it is heated to the desired temperature. When the heated air leaves the heat exchanger it is directed through the heat deflector to the heat exchanger outlet.
- 4.8 As the heated air leaves the heat exchanger outlet, it passes over the temperature and temperature indicating elements.

#### 4.9 Controls



**Figure 4-3 Engine Controls**

## Section 4

### 4.10 Choke

- 4.11** The choke (*see figure 4-3*), installed on the engine, enables the operator to enrich the fuel mixture for cold weather starting. The choke is attached to a lever on the engine carburetor.

### 4.12 Engine Start Switch

- 4.13** The engine “START” switch is installed on the engine shroud. The switch is connected in the ignition circuit to enable the operator to start and stop the engine.

### 4.14 Recoil Starter Handle

- 4.15** The recoil starter handle (*see figure 4-3*) is attached to the engine for the purpose of manual starting.

### 4.16 Burner Control Valve

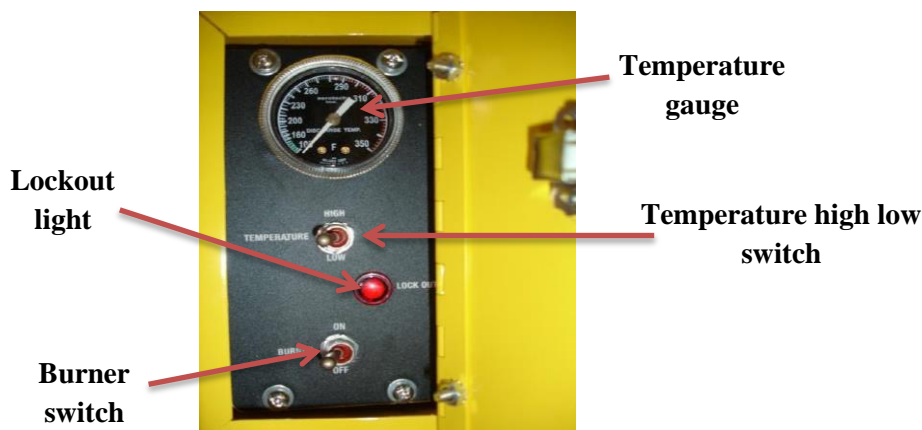
- 4.17** The burner valve is an electrically operated, electronically controlled normally open valve that when energized turns the combustor on.

### 4.18 Temperature Control Valve

- 4.19** The temperature control valve is an electrically operated, electronically controlled normally open valve that when energized maintains a selected discharge temperature, from approximately 150°F to 250°F.

### 4.20 Discharge Air Temperature Gauge

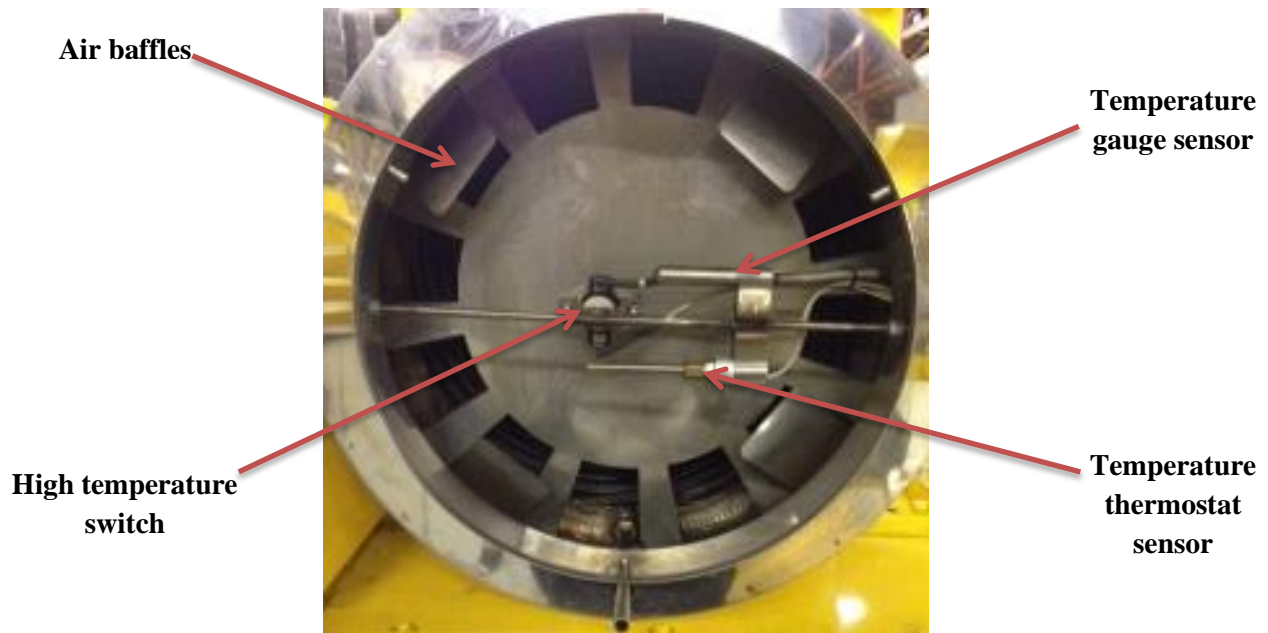
- 4.21** The discharge air temperature gauge (*see figure 4-4*) is located in the control box. The temperature gauge is a dial type instrument which indicates the actual temperature (+/- 10°F) of the discharge air in degrees Fahrenheit. The temperature gauge sensing element is mounted in the discharge air stream. (*See figure4-5*)



**Figure 4-4 Heater Fuel Controls**



## Section 4



**Figure 4-5 Heater Discharge Controls**



**Figure 4-6 Thermostat control**

### 4.22 High Temperature switch

**4.23** A high temperature switch is installed in the outlet air stream to limit the maximum temperature that can be reached. (Maximum temperature is 250°F) (*Figure4-5*)

### 4.24 Thermostat Control

**4.25** The thermostat is a 12 volt electronic controller that supplies the voltage to the temperature control valve. (*Figure4-6*)

AEROTECH HERMAN NELSON INTERNATIONAL INC. 100 Eagle Drive, Winnipeg, Manitoba Canada R2R 1V5

Phone: 204-633-1999 (24 Hours) Fax: 204-694-1612 Email: [sales@hermannelson.com](mailto:sales@hermannelson.com)

Check Out Our Web site [www.hermannelson.com](http://www.hermannelson.com).



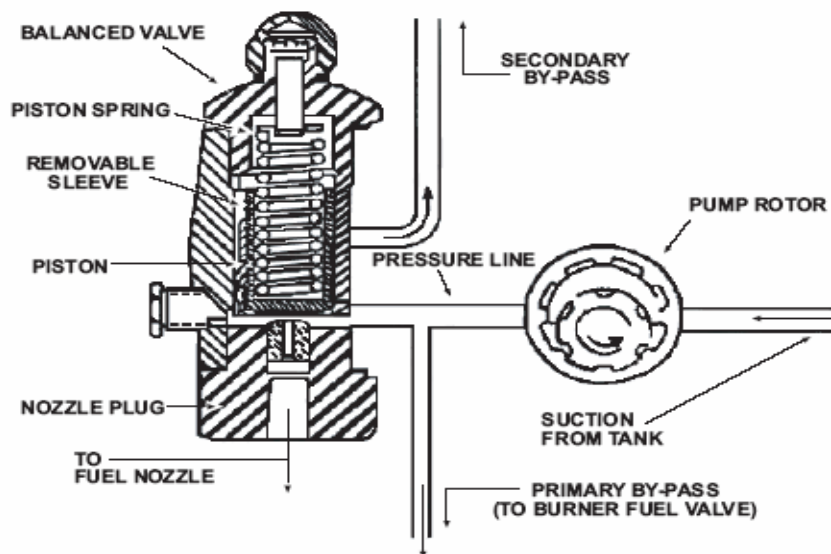
## Section 4

### 4.26 Detailed Theory

### 4.27 Fuel System

### 4.28 Fuel Pump

- 4.29** The fuel pump is mounted on a bracket to the left of the engine. The pump is belt driven by the gas engine. There are three outlet ports and two inlet ports (*see figure 4-7*). A primary by-pass will handle all the flow if the balanced valve is closed. The burner valve, which is in the primary by-pass line, is closed to obtain fuel flow to the nozzle. When the primary by-pass line is closed, the fuel will flow into the balanced valve and out through both the nozzle fuel line and the secondary by-pass line. Closing the burner valve allows the pump to build up pressure to the point where the valve opens allowing fuel flow in the nozzle fuel line. The pressure at which the balanced valve opens is determined by the compression of the piston spring, normally the spring is adjusted to 150 psi. The secondary by-pass supplies fuel to the engine and returns surplus back to the fuel tank. When the burner valve is open the pump cannot build up sufficient pressure to open the balanced valve and effect flow through the nozzle fuel line. Since the pump delivers fuel in excess of the maximum nozzle capacity maximum nozzle capacity there will always be flow through the secondary by-pass line when the burner valve is on.



**Figure 4-7 Schematic Diagram of Fuel Pump**

### 4.30 Burner Control Valve

- 4.31** The burner control valve is a 12 volt DC normally open electrically operated electronically controlled valve. When 12 volts is applied the valve closes and allows the pressure to build up in the balanced valve of the fuel pump. The valve is fail-safe to the open position.

## Section 4

### 4.32 Fuel Atomizing Head

- 4.33** The fuel nozzle screws into a nozzle holder, the combination being known as the fuel atomizing head. Fuel from the inlet line enters the nozzle supply chamber through a strainer screen then flows through slots in the inner head through which impacts a whirling motion to the fuel so that it partially atomizes as it enters the swirl chamber. Atomization is completed as the fuel sprays through the discharge orifice into the combustor. A portion of the fuel is also forced into a by-pass chamber which leads to the by-pass outlet passage in the nozzle holder. A check valve connected between the outlet and by-pass fuel line prevents a reverse fuel flow to the nozzle from the by-pass line. Fuel is discharged from the nozzle at a fixed continuous rate and a continuous fixed flame is obtained. A change in heat output is obtained by varying the volume of fuel discharged from the nozzle. This is accomplished indirectly by controlling the pressure of fuel flowing through the by-pass fuel line through the action of the temperature valve.

### 4.34 Temperature Control Valve

- 4.35** The temperature control valve is a 12 volt DC electrically operated valve. This valve controls the bypass fuel pressure from the nozzle. The pressure should be between 25psi in low flame to 80psi in high flame.

### 4.36 Thermostat

- 4.37** The thermostat is a 12 volt electronic controller that supplies the voltage to operate the temperature control valve. The temperature range is from 150° F to 250°F. When a temperature is first selected 12 volts is sent to the temperature control valve. The valve closes and the pressure goes up to about 80psi or high flame. When the desired temperature is reached the voltage is removed from the temperature control valve and the pressure drops to about 25psi or low flame.

### 4.38 Discharge Air Temperature Gauge

- 4.39** The discharge air temperature gauge is located in the control box. The temperature gauge is a dial-type instrument which indicates the actual temperature (100°F to 350°F+/- 10°) of the discharge air in degrees Fahrenheit. A sensing element mounted in the discharge air outlet.

### 4.40 Fuel Gauge

- 4.41** The fuel gauge is a needle-indicating type, direct reading gauge. Graduations on the gauge indicate “E” (empty), 1/4, 1/2, 3/4, and “F” (full).

### 4.42 Operation under Normal Conditions

- 4.43** The instructions that follow are provided for personnel responsible for operation of the **BT400-NEX-G2** heater. The operator must know how to perform all of the operating procedures for which the heater is designed. Instructions are provided for starting and stopping the heater, operation of the heater, temperature regulation, and operation under unusual conditions.

## Section 4

### WARNING

**Do not operate heater in explosive vapor area.**

#### 4.44 Preparation for Starting

**4.45** Preparation for starting is accomplished as follows:

- (a) Perform the required preventive maintenance services. (*Refer to section 5*)
- (b) Open cabinet. Remove air outlet and exhaust stack covers. Install 12" duct and exhaust stack extension.
- (c) Fill fuel tank with gasoline.

### WARNING

**Improperly maintaining this engine, or failing to correct a problem before operation, could cause a malfunction in which you could be seriously injury. Always perform a pre-operation inspection before each operation, and correct any problems.**

- (d) Check the general condition of the engine.
  - 1. Look around and underneath the engine for signs of oil or gasoline leaks.
  - 2. Remove any excessive dirt or debris, especially around the muffler and recoil starter.
  - 3. Look for signs of damage.
  - 4. Check that all shields and covers are in place, and all nuts, bolts, and screws are tightened.
- (e) Check the engine oil level

### NOTE

**The oil alert system will automatically stop the engine before the oil level falls below safe limits. However, to avoid an unexpected shutdown, always check the engine oil level before start-up.**

### WARNING

**Carbon monoxide gas is toxic. Breathing it can cause unconsciousness and even kill you. Avoid any area or actions that expose you to carbon monoxide.**

#### 4.46 Engine start- up

**4.47** Start the gasoline engine as follows:

- (a) Move the fuel valve lever to the "ON" position.
- (b) Move the throttle lever away from the "SLOW" position, about 1/3 of the way toward the "FAST" position.
- (c) Turn the key to the **START** position, and hold it there until the engine starts. If the engine fails to start within 5 seconds, release the key, and wait at least 10 seconds before operating the starter again.

## Section 4

### NOTE

**Using the electric starter for more than 5 seconds at a time will overheat the starter motor and can damage it.**

- (d) When the engine starts, release the key, allowing it to return to the **ON** position.
- (e) If the choke lever has been moved to the **CLOSED** position to start the engine, gradually move it to the **OPEN** position as the engine warms up.
- (f) After the engine is started move the throttle to the fast position, close cabinet and allow engine to warm up for 2-3 minutes.

### 4.48 Heater Operation

**4.49** Start heater as follows:

- (a) Set thermostat selector knob to **“LOW”**. Start the heater combustor by moving the burner switch to the **“ON”** position.

### NOTE

**During initial operation of a new heater, white smoke may be observed coming from the exhaust stack. This will continue until the preservative compound is burned out.**

- (b) Rotate thermostat selector knob **“SLOWLY”** until temperature gauge is set to the desired temperature.

### 4.50 Shutting down heater

### 4.51 Heater Combustor

**4.52** To stop the combustor, rotate the temperature selector knob to **“LOW”**. Then move the burner switch to the **“OFF”** position.

### NOTE

**Allow the gasoline engine to operate for two minutes after the burner valve is in the “OFF” position or until the temperature gauge reads in the green.**

### 4.53 Engine shut-down

**4.54** To stop the gasoline engine under normal conditions, use the following procedure:

- (a) Prop the cabinet top open.
- (b) Move the throttle lever to the **“SLOW”** position. Allow engine to cool down.
- (c) Turn the engine switch to the **“OFF”** position.
- (d) Turn the fuel valve lever to the **“OFF”** position.
- (e) Perform the required preventative maintenance service. (*Refer to section 5*).
- (f) Remove ducts and store.
- (g) Close cabinet and install exhaust stack and air outlet covers.

## Section 4

### 4.55 Operation in Extreme Cold

**4.56** General instructions for operation of the heater in extreme cold are as follows:

- (a) Ensure the fuel tank is full to prevent condensation. Remove snow or ice from fuel tank cap and dispensing equipment before filling fuel tank.
- (b) Check oil every five hours in operation above 0°F, every three hours in operations below 0°F.
- (c) Change oil every 100 hours in operation.
- (d) Operate heater a short time each day to prevent water from settling in the heater controls.
- (e) Cover heater with tarpaulin to protect it from the weather when not in use.
- (f) Park heater in a sheltered spot out of the wind, or park indoors, if possible.

### 4.57 Operation in Dusty or Sandy Areas

**4.58** General instructions for operation in dusty or sandy areas are as follows:

- (a) Before operating, if water is available, wet the surrounding area with water to keep down the accumulation of dust.
- (b) Take all necessary precautions to prevent dust or sand from entering the fuel tank while filling.
- (c) Perform more frequent inspections and lubrication. Wipe off all excess lubricant.
- (d) Remove accumulations of sand and dirt at frequent intervals.

### 4.59 Operation in Salt Water and High Humidity Areas

**4.60** General instructions for operation in salt water and high humidity areas are as follows:

- (a) Wipe all accessible exposed areas frequently.
- (b) Coat all exposed machined surfaces with oil.
- (c) Keep fuel tank cap tightly closed.
- (d) Keep electrical connections dry.

## Section 5

# Maintenance Instructions

## 5.1 General

### 5.2 Scope

- 5.3** This section contains instructions for maintaining the **BT400-NEX-G2**. If performed on a regular basis will insure proper operation and extend the life of the heater.

### 5.4 Cleaning

- 5.5** For access to the heater components for cleaning, proceed as follows:
- (a) Prop open the cabinet top.
  - (b) Brush dirt and dust from the components with a soft bristle brush or blow dirt and dust away using dry compressed air.

### **Warning**

**Compressed air used for cleaning will not exceed 30 psi and then only with approved personnel protective equipment such as safety goggles or face shield.**

- (c) With hood and access doors closed tightly, wash heater using a soft bristle scrub brush to apply a solution of detergent mixed in warm water. Remove the detergent solution with clean water.

### 5.6 Flexible Ducts

- 5.7** Wash ducts with soap or detergent and water. Dry with a soft cloth. Ensure ducts are thoroughly dry before putting them away.

### 5.8 Lubricating

- 5.9** Lubrication of the **BT400-NEX-G2** heater consists of greasing the wheel bearings, and changing the oil in the Honda engine.

### 5.10 Wheel Bearings

- 5.11** Lubrication of the wheel bearings is accomplished as follows:
- (a) Remove the rubber grease cap from hub assembly.
  - (b) Using a grease gun add grease.

### 5.12 Engine Oil Level Check

- 5.13** Check the engine oil level with the engine stopped and in a level position.
- (a) Remove the filter cap/dipstick and wipe it clean. (**Figure 5-1**)
  - (b) Insert and remove the dipstick without screwing it into the filter neck. Check the oil level shown on the dipstick.
  - (c) If the oil level is low, fill to the edge of the oil filler hole with the recommended oil.

- (d) Screw in the filler cap/dipstick securely.

## Section 5

### NOTE

**The Oil Alert system will automatically stop the engine before the oil level falls below safe limits, to avoid the inconvenience of an unexpected shutdown; always check the engine oil level before start-up.**

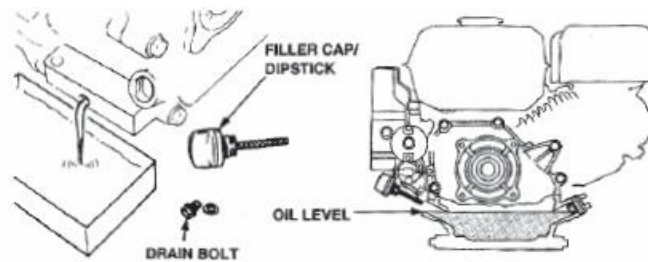
#### 5.14 Engine Oil Change

- 5.15** Drain the used oil while the engine is warm. Warm oil drains quickly and completely.
- (a) Place a suitable container below the engine to catch the used oil, and then remove the filler cap/dipstick and the drain plug.
  - (b) Allow the used oil to drain completely, and then reinstall the drain plug, and tighten it securely. (*Figure 5-1*)
  - (c) Dispose of used motor oil in a manner that is compatible with local by-laws. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation.

### NOTE

**Do not throw oil into the trash; pour it on the ground, or down a drain.**

- (d) With the engine in a level position, fill to the outer edge of the oil filler hole with the recommended oil. Engine oil capacity: 0.63 US quarts (0.6 l)
- (e) Screw in the filler cap/dipstick securely.



**Figure 5-1**

#### 5.16 Engine Oil Recommendations

- 5.17** Oil is a major factor affecting performance and service life. SAE 0W-30 Arctic oil is recommended for general use.

#### 5.18 Preventive Maintenance

- 5.19** The preventive maintenance checks for the **BT400-NEX-G2** heater are contained in **table 5-1**. The intervals indicated are recommended requirements under normal operating conditions. If the heater is operated under unusual conditions, consult **AEROTECH HERMAN NELSON INC.** for recommendations applicable to your individual needs.

## Section 5

### INSPECTION CHECKS

COMPONENT	INSPECTION, CHECK OR SERVICE	INTERVAL
Heater unit	Visually inspect for loose or missing hardware.	Daily
Air ducts	Visually inspect for damage or wear. Replace as necessary.	Daily
Engine Crankcase	Check oil level, add oil if necessary.	Daily
Engine Air Filter	Check for dirt. Clean if necessary.	Daily
Tires	Check for abnormal or uneven wear, cuts and embedded foreign material. Check for proper air pressure.	Daily
Controls and Instruments	Visually inspect for damage. Replace if necessary.	Daily
Fuel Gauge	Visually inspect for damage. Replace if necessary.	Daily
Exhaust system	Inspect for secure mounting, cracks or dents. Inspect exhaust stack and extensions for damage. Check screen for damage. Clean or replace as necessary.	Weekly
Fuel System	Inspect all lines for kinks, breaks, and loose connections. Tighten or replace as required.	Weekly
Fan, Mounting Ring and Pulley	Inspect for security, cracks, or other damage. Check for vibration during operation. Inspect flexible rubber sleeve for cracks, broken teeth or deterioration. Repair or replace defective parts.	Monthly
V-belt	Check for proper adjustment. Inspect for wear, fraying and stretching. Replace if necessary.	Monthly
Engine Crankcase	Change oil.	Yearly or 100hrs
Fuel Filter	Replace Filter	3 Months
Fuel Pump	Check pump for proper operation.	Yearly
Ignition System	Check system for loose or bad connections, broken insulators, kinks, or breaks in shielding. Check point gap.	6 Months
Heat Exchanger	Inspect for carbon deposits or other defects. Clean or replace as necessary.	Yearly
Ventilating Air	Perform carbon monoxide test.	Yearly

Table 5-1



## Section 5

### 5.20 Troubleshooting

**5.21** Table 5-2 provides information useful in diagnosing unsatisfactory operation or failure of the **BT400-NEX-G2** heater and its components. Each trouble symptom stated is followed by a list of probable causes. The possible remedy recommended is described opposite the probable cause.

**TABLE 5-2 TROUBLESHOOTING GUIDE**

	<b>TROUBLE</b>	<b>PROBABLE CAUSE</b>	<b>REMEDY</b>
<b>1</b>	<b>Engine will not start</b>	<b>1.Fuel valve in OFF position</b>	<b>Move lever to ON position</b>
		<b>2.Choke OPEN</b>	<b>Move lever to CLOSED position</b>
		<b>3.Insufficient fuel supply</b>	<b>Fill tank with appropriate fuel</b>
		<b>4.Faulty spark plug</b>	<b>Clean, gap, or replace spark plug</b>
		<b>5.Dead battery</b>	<b>Charge or replace battery</b>
<b>2</b>	<b>Engine turns over but fails to start or starts then stops</b>	<b>1. Insufficient fuel supply.</b>	<b>Fill tank with appropriate fuel.</b>
		<b>2. Clogged filter.</b>	<b>Replace filter.</b>
		<b>3. Fuel return check valve dirty.</b>	<b>Clean or replace check valve.</b>
		<b>4. Faulty fuel pump.</b>	<b>Check fuel pump</b>
		<b>5. V-belt slipping</b>	<b>Adjust v-belt.</b>
		<b>6. Engine fault</b>	<b>Refer to engine supplement</b>
<b>3</b>	<b>Engine stops suddenly</b>	<b>1. Insufficient fuel supply.</b>	<b>Fill fuel tank with appropriate fuel</b>
		<b>2. Contaminated fuel.</b>	<b>Drain and flush tank. Refill and replace fuel filter</b>
		<b>3. Incorrect fuel supply</b>	<b>Drain and flush tank. Fill with appropriate fuel.</b>
<b>4</b>	<b>Burner fails to ignite</b>	<b>1. Insufficient fuel supply.</b>	<b>Fill fuel tank with appropriate fuel</b>
		<b>2. Defective fuel pump.</b>	<b>Check fuel pump or replace</b>
		<b>3. Fuel pump pulley slipping</b>	<b>Tighten set screw on pulley.</b>
		<b>4. Defective burner valve.</b>	<b>Replace burner valve.</b>
		<b>5. Defective coil</b>	<b>Replace with serviceable coil.</b>
		<b>6. Defective ignition cable.</b>	<b>Replace cable.</b>
		<b>7. Defective igniter plug.</b>	<b>Adjust igniter plug or replace.</b>
		<b>8. Fuel nozzle dirty or defective.</b>	<b>Replace nozzle</b>
		<b>2. Defective control box</b>	<b>Replace control box</b>

## Section 5

**TABLE 5-2 TROUBLESHOOTING GUIDE**

	<b>TROUBLE</b>	<b>PROBABLE CAUSE</b>	<b>REMEDY</b>
5	Burner ignites by itself	1. Defective burner control valve	Clean or replace burner control valve
		2. Defective control box	Replace control box
6	Excessive smoke emitted from exhaust	1. Air flow restricted	Remove restriction
		2. Engine operating below normal speed	Check engine speed
		3. Incorrect nozzle spray pattern	Replace nozzle
		4. Carbon buildup in exhaust system	Clean exhaust system
		5. Excessive fuel pressure	Adjust pump pressure
7	Combustor flame cuts out	1. Air flow restricted	Remove restriction
		2. Discharge air restricted	Remove restriction
		3. Defective high limit switch	Replace high limit switch
8	Combustor flame fails to go out or unit overheats	1. Defective burner valve	Replace valve
		2. Defective high limit switch	Replace high limit switch
		3. Defective burner switch	Replace switch
		4. Thermostat not wired correctly	Rewire as per wiring diagram
		5. Control set point too high	Adjust the control set point
		6. Sensor shorted	Replace sensor
9	Maximum heat output not obtainable	1. Fuel system leak	Inspect fuel lines, tighten loose connections. Replace damaged fuel lines.
		2. Defective fuel pump	Check pump or replace
		3. Clogged fuel filter	Inspect and replace filter
		4. Defective temperature control valve	Replace valve
		5. Heat exchanger clogged	Clean heat exchanger
10	After burning in combustion chamber	1. Nozzle check valve being held open by contaminant.	Clean or replace valve
		2. Defective nozzle	Clean or replace nozzle
		3. Fuel leak in nozzle holder or fuel lines at nozzle holder.	Tighten or replace fuel lines.
11	No temperature control or heater will not go into high flame	1. Thermostat not wired correctly	Wire as per wiring diagram
		2. Control set point too low	Adjust control set point
		3. Open sensor	Replace sensor
		4. Control power is incorrect	Check battery voltage
		5. Defective temperature valve	Replace valve

## Section 5

### 5.25 Air Filter Cleaning

- 5.26** A dirty air filter will restrict air flow to the carburetor, reducing engine performance. If you operate the engine in very dusty areas, clean the air filter more often than specified in the **MAINTENANCE SCHEDULE**.

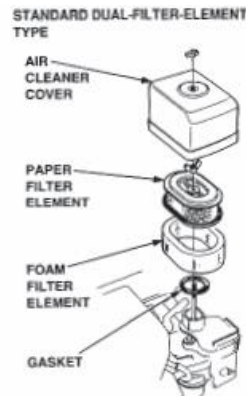
#### **NOTE**

**Operating the engine without an air filter, or with a damaged air filter, will allow dirt to enter the engine, causing rapid engine wear.**

### **5.27** Dual-Filter-Element Types (*figure 5-2*)

- (a) Remove the wing nut from the air cleaner cover, and remove the cover.
- (b) Remove the wing nut from the air filter, and remove the filter.
- (c) Remove the foam filter from the paper filter.
- (d) Inspect both air filter elements, and replace them if they are damaged. Always replace the paper air filter element at the scheduled interval.
- (e) Clean the air filter elements if they are to be reused.
  - 1. Paper air filter element: Tap the filter element several times on a hard surface to remove dirt, or blow compressed air [not exceeding 30 psi (207 kpa) through the filter element from the inside. Never try to brush off dirt; brushing will force dirt into the fibers.
  - 2. Foam air filter element: Clean in warm soapy water or clean in non-flammable solvent, rinse, and allow too dry thoroughly. Dip the filter element in clean engine oil, and then squeeze out all excess oil. The engine will smoke when started if too much oil is left in the foam.
- (f) Wipe dirt from the inside of the air cleaner base and cover, using a moist rag. Be careful to prevent dirt from entering the air duct that leads to the carburetor.
- (g) Place the foam air filter element over the paper element, and reinstall the assembled air filter. Be sure the gasket is in place beneath the air filter. Tighten the air filter wing nut securely.
- (h) Install the air cleaner cover, and tighten the cover wing nut securely.

## Section 5



**Figure 5-2**

### 5.28 Honda Engine Removal

**5.29** Remove the Honda engine power unit as follows:

- (a) Open heater cabinet.
- (b) Remove the three thumb screws securing gasoline engine to the resilient mounts.
- (c) Disconnect engine fuel line quick disconnect coupling.
- (d) Remove the engine with attached mounting brackets from heater.

### 5.30 Drive Coupling

**5.31** Removal and repair of the drive coupling is described as follows.

#### 5.32 Removal of drive coupling

- (a) Remove drive coupling from crankshaft, using a suitable puller.
- (b) Remove tapered bushing from drive coupling.

#### 5.33 Cleaning, Inspection and Repair

- (a) Clean all parts and dry thoroughly.
- (b) Check drive coupling for cracks and damaged teeth.
- (c) Inspect tapered bushing for cracks and distortion.
- (d) Replace all damaged parts.

#### 5.34 Installation of drive coupling

- (a) Install tapered bushing into drive coupling.
- (b) Place key into engine crankshaft.
- (c) Install assembled bushing and coupling onto engine crankshaft.

### 5.35 Engine Mounting Brackets

**5.36** Repair of the engine mounting brackets is described in the paragraphs that follow.

## Section 5

### 5.37 Removal of Engine Mounting Brackets

- (a) Remove drive coupling.
- (b) Remove four nuts, washers, lock washers and bolts securing mounting bracket to engine.
- (c) Remove four bolts, washers and lock washers securing front mounting bracket to engine.

### 5.38 Cleaning, Inspection and Repair

- (a) Inspect brackets for cracks, bends, distorted screw holes, rust, and other damage.
- (b) Weld cracks and straighten bent bracket. Paint exposed metal surfaces.
- (c) Replace all damaged parts.

### 5.39 Installation of Engine Mounting Brackets

**5.40** Installation of engine mounting brackets is the reverse of removal.

### 5.41 Engine Installation

**5.42** Install the Honda engine by reversing the removal procedures.

### 5.43 V-Belt

**5.44** The v-belt encircles the driven coupling, and fuel pump pulley.

### 5.45 Adjustment of V-Belt

**5.47** Adjust the V-belt as follows:

- (a) Open cabinet.
- (b) Loosen two bolts securing the fuel pump to the fuel pump mounting bracket.

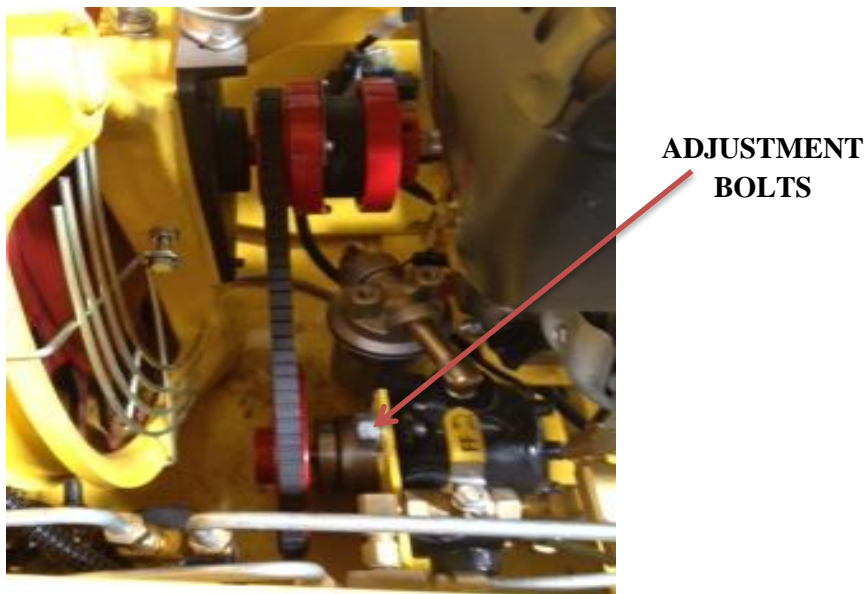
#### NOTE

**Do not overtighten V-belt.**

- (c) Move the fuel pump to the left to tighten V-belt or to the right to place slack in the belt.  
The elongated mounting slots in the bracket allow for this adjustment.
- (d) Check belt tension.
- (e) Tighten fuel pump mounting screws to secure adjustment.
- (f) Install cabinet.

### 5.48 Cleaning and Inspection

**5.49** Clean V-belt with a clean, damp cloth. Check for wear, fraying, and stretching. Replace as necessary.



**Figure 5-3 V-Belt & Fuel Pump Adjustment**

### **5.50 Fan and Mounting Ring**

**5.51** The fan supplies the air for both the combustion and heating. A cast aluminum mounting ring supports the fan and associated parts. Power for the fan is transmitted by a flexible rubber coupling sleeve which mates with a drive coupling on the power unit and a driven coupling which is pressed on the fan bearing shaft. The fan hub is fastened to the fan and is pressed on the fan bearing shaft.

### **5.52 Removal of Fan and Mounting Ring**

- 5.53** Remove the vane axial fan and mounting ring as follows:
- (a) Remove the Honda engine.
  - (b) Remove v-belt from fan and bearing support assembly from heater.
  - (c) Remove mounting ring with attached fan and bearing support assembly from heater.
  - (d) Remove screws, self-locking nuts, and lock washers and remove air straightening vane from mounting ring.
  - (e) Remove three screws and lock washers and remove fan from fan hub.
  - (f) If guards, thumb screw or attaching parts are damaged, remove the three screws, lock washers, two nuts, two lock washers, and remove three guards from mounting ring. Remove thumb screws.
  - (g) Remove four screws and lock washers and remove bearing support from mounting ring.
  - (h) Remove four screws and lock washers and remove two retainers. Remove flexible rubber coupling sleeve from driven coupling.

## Section 5

### 5.54 Cleaning, Inspection and Repair

**5.55** Cleaning, inspection and repair are accomplished as follows:

- (a) Clean all parts, **except** the flexible rubber coupling sleeve, using a solvent and dry thoroughly.
- (b) Inspect fan for cracks or broken blades, distortion and other damage. Replace a damaged fan.
- (c) Inspect fan hub for cracks and distortion. Replace a damaged hub.
- (d) Inspect mounting ring for breaks, cracks, and other damage. Replace the mounting ring if it is damaged.
- (e) Inspect air straightening vane for cracks or bent conditions. Replace if vanes are damaged.
- (f) Inspect drive coupling for cracks and damaged teeth. Replace damaged coupling.
- (g) Inspect flexible rubber sleeve coupling for broken teeth, distortion, deterioration, and cracks. Replace damaged coupling or insert.
- (h) Inspect resilient mount for damage and hardening of cushion. Replace damaged or hardened resilient mount.

### 5.56 Installation of Fan and Mounting Ring

**5.57** Install the vane axial fan and mounting ring as follows:

- (a) Install fan on hub and secure with three screws and lock washers.
- (b) Install air straightening vane with associated fastening hardware.
- (c) Install fan and bearing support assembly.
- (d) Position resilient mount on bearing support and secure with two screws. Install three guards and secure with three screws, three lock washers, two lock washers and two nuts.
- (e) Install sleeve bushing in flexible rubber coupling sleeve and place flexible rubber coupling sleeve in driven coupling. Install two retainers and secure with four screws and lock washers.
- (f) Install mounting ring, with attached parts in casing and secure with three screws and lock washers.
- (g) Install the Honda engine by performing the removal procedures in reverse order.

### 5.58 Heat Exchanger Assembly

### 5.59 Removal

**5.60** To remove the heat exchanger assembly, proceed as follows:

- (a) Remove hood assembly by removing the 16 bolts and washers that secure hood to heater. Remove capillary tube cover. Lift hood from heater.
- (b) Remove the 4 bolts from mounting brackets of heat exchanger assembly.
- (c) Remove clamps from flexible exhaust hose and remove hose.
- (d) Remove V-belt by slipping belt from pulley.
- (e) Remove duct adapter at rear of heat exchanger assembly. Remove sensing elements.
- (f) Remove heat exchanger assembly from skid base assembly.

## **Section 5**

### **5.61 Installation**

**5.62** To install heat exchanger assembly, proceed as follows:

- (a) Place heat exchanger on base assembly and align with engine. Using shims under heat exchanger mounting brackets may be required to obtain proper alignment. Maximum parallel misalignment is 0.015 inches. Maximum angular misalignment is 0.056 inches.
- (b) Tighten the 4 mounting bolts.
- (c) Install sensing element in discharge air stream and install duct adapter.
- (d) Install V-belt. Ensure proper belt tension.
- (e) Install hood and capillary tube cover.

### **5.63 Heat Exchanger**

### **5.64 Removal**

**5.65** To remove the heat exchanger, proceed as follows:

- (a) Remove heat exchanger assembly.
- (b) Remove fan and mounting ring assembly.
- (c) Disengage clamp from notches in combustion chamber. Remove nozzle holder and combustor plate.
- (d) Remove fuel lines from nozzle holder.
- (e) Remove ignition cable from igniter plug.
- (f) Remove exhaust stack and cover by removing the 12 screws and washers. Remove gasket.
- (g) Remove heat exchanger from heat exchanger housing by pulling the heat exchanger from the front of housing.

### **5.66 Cleaning, Inspection and Repair**

**5.67** Cleaning, inspection and repair are accomplished as follows:

- (a) Clean heat exchanger using a carbon cleaner.
- (b) Inspect for cracks, distortion and other damage. Replace damaged heat exchanger.

### **5.68 Installation**

**5.69** To assemble the heat exchanger, reverse the removal procedures.

### **5.70 Carbon Monoxide Test**

**5.71** To check the ventilating air stream of the heater for carbon monoxide contamination, proceed as follows:



## Section 5

### NOTE

**On units that are used on a seasonal basis, this test shall be performed prior to the unit being put into service. A second test will be required if the heating season is longer than six month. Additional tests shall be performed any time contamination is suspected or if maintenance has been performed on the exhaust system.**

- (a) Attach one twelve inch duct to the heater. Attach a 3-way duct adapter to the twelve inch duct and attach three six inch ducts to adapter. Ensure there are no kinks in the ducts.
- (b) Start heater using proper start procedures. Rotate thermostat selector to obtain a discharge temperature of 200°F.
- (c) Using a carbon monoxide tester, measure the carbon monoxide level at one of the six inch ducts. The carbon monoxide level will not exceed 35 PPM.

### 5.72 Heater Ignition System

- 5.73** A sparking type igniter plug within the combustor ignites the atomized fuel. The flame, once established, is self-sustaining and ignition would normally be required only when the burner is started. As a safety precaution, constant spark ignition is provided to ensure re-ignition in the event of a momentary interruption of fuel flow. Components of the ignition system are the coil, ignition cable, and igniter plug.

### 5.74 Coil

- 5.75** The coil is mounted on a bracket installed opposite the fuel pump.

### 5.76 Ignition cable and Igniter plug

- 5.77** The igniter plug produces the spark necessary for fuel ignition within the combustor. Electrical current flows from the coil to the igniter plug through the ignition cable.

### 5.78 Removal

- 5.79** Remove the ignition cable and igniter plug as follows:
- (a) Remove vane axial fan and mounting ring.
  - (b) Disconnect the ignition cable from the igniter plug and coil.
  - (c) Remove the grommet from casing and remove the ignition cable.
  - (d) Remove the igniter plug from the combustor back plate.
  - (e) Disengage the combustor clamp from notches in the combustor can. Remove the clamp and nozzle holder from the combustor back plate and remove the plate.

### 5.80 Cleaning and Inspection

- 5.81** Cleaning and inspection are accomplished as follows:

## Section 5

- (a) Clean the igniter plug and ignition cable with a cloth dampened in an electronic cleaner and dry thoroughly
- (b) Inspect igniter plug for burning or pitting, cracks, or other damage. Clean the points with a fine emery cloth and polish with crocus cloth. Replace a cracked or damaged igniter plug.
- (c) Inspect ignition cable for breaks, damaged threads, or frayed or broken insulation. Replace damaged ignition cable.

### 5.82 Installation

**5.83** Install igniter plug and ignition cable as follows:

- (a) Install igniter plug in combustor back plate. Measure the point gap. The gap should be 1/8 to 3/16 inch. Bend electrode on combustor plate to obtain correct gap.

#### NOTE

**Do not bend igniter plug electrode.**

- (b) Install combustor back plate on combustor. Insert nozzle holder with clamp attached in bore of plate. Install combustor clamp in notches on combustor to secure nozzle.
- (c) Insert ignition cable through hole in casing, and secure grommet around cable. Connect ignition cable to igniter plug.
- (d) Install the vane axial fan and mounting ring.



**BEND THIS  
ELECTRODE**

**Figure 5-4 Igniter Plug Adjustment Point**

### 5.84 Fuel System

**5.85** The heater fuel system consists of a fuel tank mounted in the base, fuel filter, tube assemblies, and hose assemblies, fuel pump, fuel control valves, and combustor. The fuel pump draws fuel from the fuel tank, through the fuel filter, and delivers it under constant high pressure to the variable discharge fuel nozzle in the combustor. Unused fuel is bypassed at the pump and the nozzle and is returned to the fuel tank.

## Section 5

### 5.86 Fuel Pump

### 5.87 Pressure Test and Adjustment

**5.88** Pressure testing and adjustment should be performed as follows:

- (a) Start engine and allow it to warm up. During warmup, observe pressure gauge; normal reading will be about 20 psi due to flow resistance in fuel piping system.
- (b) Engage burner, check fuel pressure gauge. If pressure is not within 150 (+/-2) psig, adjust pump pressure to secure proper reading. Adjustment is performed by removing nut and turning adjustment screw clockwise to increase pressure, or counter-clockwise to decrease pressure.

### 5.89 Fuel Pump Removal

**5.90** To remove the fuel pump, proceed as follows:

- (a) Remove the v-belt by slipping it off the fuel pump pulley.
- (b) Remove the fuel lines on the pump.
- (c) Remove the pulley by loosening the set screw.
- (d) Remove the two mounting bolts from the fuel pump and remove the pump.

### 5.91 Fuel Pump Installation

**5.92** To install the fuel pump, reverse the removal procedures.

#### NOTE

**Check belt tension after installing the fuel pump. Adjust if necessary.**

### 5.93 Fuel Atomizing Nozzle

**5.94** The fuel atomizing nozzle supplies fuel to the combustor. The atomized fuel is combined with air and ignited.

### 5.95 Removal

**5.96** Remove the fuel atomizing nozzle as follows:

- (a) Remove vane axial fan and mounting ring.
- (b) Disengage combustor clamp from notches in combustor and remove nozzle holder.
- (c) Remove fuel nozzle from nozzle holder.

### 5.97 Cleaning and Inspection

**5.98** Cleaning and inspection are accomplished as follows:

- (a) Clean nozzle holder with a carbon cleaner and dry thoroughly.
- (b) Inspect all parts for brakes, cracks, obstructions, damaged threads, or other damage. Replace as necessary.
- (c) Replace fuel nozzle.

## Section 5

### 5.99 Installation

**5.100** Install fuel atomizing nozzle by performing the removal procedures in reverse order.

### 5.101 Heater Fuel Filter

**5.102** Fuel from the tank passes through an automotive type filter before entering the fuel pump. The filter has a replaceable element which should be removed and replaced at periodic intervals.

### 5.103 Fuel Filter

**5.104** Replace the fuel filter as follows:

- (a) Remove the Honda engine.
- (b) Unscrew metal bowl from top casting.
- (c) Remove filter element and gasket.
- (d) Replace filter element.
- (e) Install gasket and filter element on top casting.
- (f) Install metal bowl on top casting.
- (g) Install the Honda engine.

### 5.105 Fuel Tank

**5.106** The fuel tank is suspended within the heater base. Outlets are provided for the tube assemblies, and openings are provided for the fuel tank cap/gauge. A drain plug is provided at the rear of the heater near the bottom on the tank.

### 5.107 Removal

**5.108** Remove the heater fuel tank as follows:

- (a) Remove Honda engine power unit.
- (b) Remove the cabinet.
- (c) Remove both side panels.
- (d) Disconnect all fuel hoses.
- (e) Remove inline fuel filter and check valve.
- (f) Remove fuel tank cap/gauge from tank.
- (g) Remove drain plug and drain fuel into a suitable container.
- (h) Remove all bolts from the skid top cover.
- (i) Lift heater from skid base and set on supports to suspend fuel tank below heater.
- (j) Remove four bolts and lock washers and remove the fuel tank.

### 5.109 Cleaning and Inspection

**5.110** Cleaning and inspections are accomplished as follows:

- (a) Install drain plug and fill the tank half full with cleaning solvent. Agitate the solvent, immediately tip fuel drain end of tank as low as possible and drain, inspect for leaks. Run cleaning solvent through the tank until it comes out clean and clear.
- (b) Wash the exterior of the fuel tank dry thoroughly.

## Section 5

### 5.111 Installation

**5.112** Install the fuel tank by performing the removal procedures in reverse order.

#### NOTE

**Care should be taken in assembling the fuel tank to skid base top and heater support so that tightening cap screws in tank supporting nuts, does not distort skid base top.**

**Distortion of skid base top makes engine and fan alignment very difficult.**

### 5.113 Trailer Components

**5.114** The framed trailer is designed to transport the heater. An adjustable tow bar is mounted on the front of the frame to be used in towing the trailer. A basket mounted on the front of the heater carries the 12-inch duct adapter. Duct holders on the sides support and store the 6-inch ducts when not in use.

### 5.115 Trailer Wheels

**5.116** The two trailer wheels are mounted on the axle and are the pneumatic-tire type. The wheels are free running, with no driving or braking components attached.

### 5.117 Removal

**5.118** Remove the trailer wheels as follows:

- (a) Remove the four nuts and lock washers securing the wheel to the hub assembly.
- (b) Remove wheel and tire.

### 5.119 Disassembly

**5.120** Disassembly is accomplished as follows:

- (a) Remove valve cap and valve core from valve stem and allow air to escape.
- (b) Remove tire from the rim.

### 5.121 Cleaning, Inspection and Repair

**5.122** Cleaning, inspection and repair are accomplished as follows:

- (a) Clean tire and tube with mild soap and water and dry thoroughly. Remove rust and scale from inside the tire with a wire brush.
- (b) Clean all metal parts and dry thoroughly.
- (c) Install valve core, inflate tube, and submerge in water. Check for air bubbles which will indicate a leak in the tube. Repair the tube if it is leaking.
- (d) Inspect tires for wear, holes, cuts, broken cords, deterioration, or other damage. Replace as necessary.
- (e) Inspect all metal parts for cracks, breaks, wear, damaged threads, corrosion, distortion, or other damage.

## **Section 5**

### **5.123 Reassembly**

**5.124** Reassembly is accomplished as follows:

- (a) Install valve core in valve stem.
- (b) Position tire on rim.
- (c) Inflate to proper pressure.

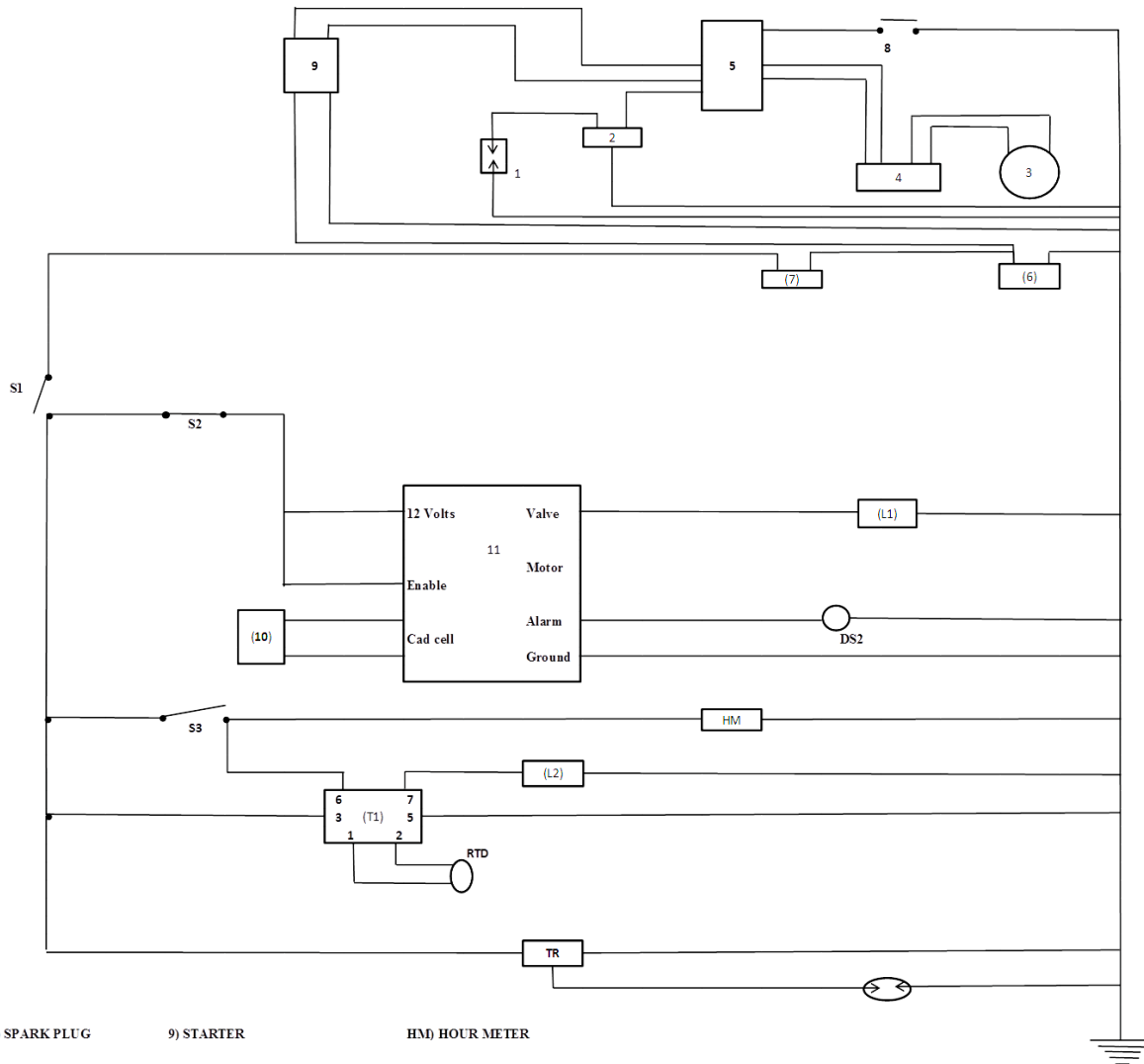
### **5.125 Installation**

**5.126** Install the trailer wheels by reversing the removal procedure.

#### **CAUTION**

**When inflating trailer tires remain to one side of tire rather than directly in front of it, serious injury may result if tire blows out.**

## Section 5



- |                     |                         |                     |
|---------------------|-------------------------|---------------------|
| 1) SPARK PLUG       | 9) STARTER              | HM) HOUR METER      |
| 2) IGNITION COIL    | 10) CAD CELL            | T1) TEMP CONTROLER  |
| 3) ALTERNATOR       | 11) PRIMARY OIL CONTROL | TR) INGITION COIL   |
| 4) REGULATOR        | S1) BUNER SWITCH        | S3) HIGH LOW SWITCH |
| 5) CONTROL BOX      | S2) HIGH LIMIT SWITCH   |                     |
| 6) BATTERY          | L1) BURNER VALVE        |                     |
| 7) FUSE 15 AMP      | L2) TEMERATURE VALVE    |                     |
| 8) OIL LEVEL SWITCH | DS2) LOCK OUT LIGHT     |                     |

## Section 6

### Parts List

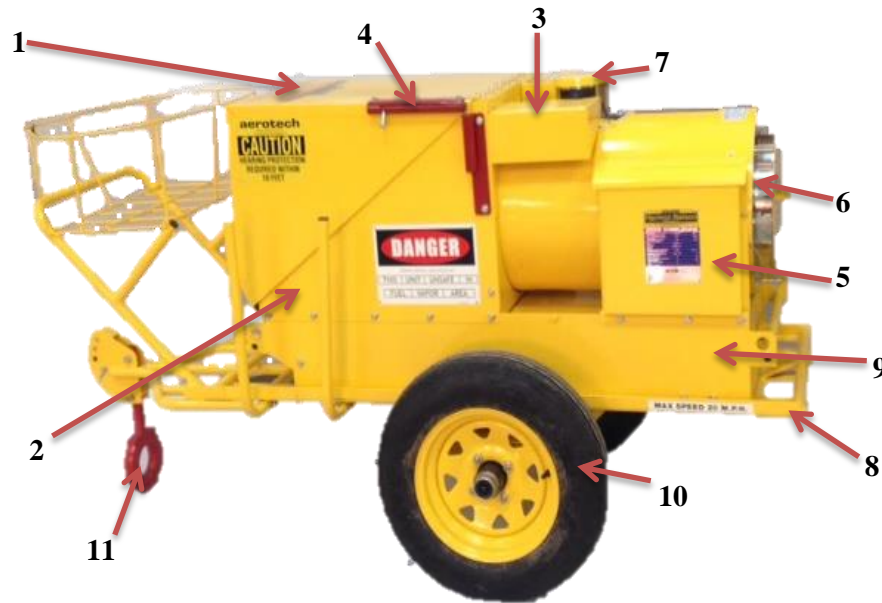


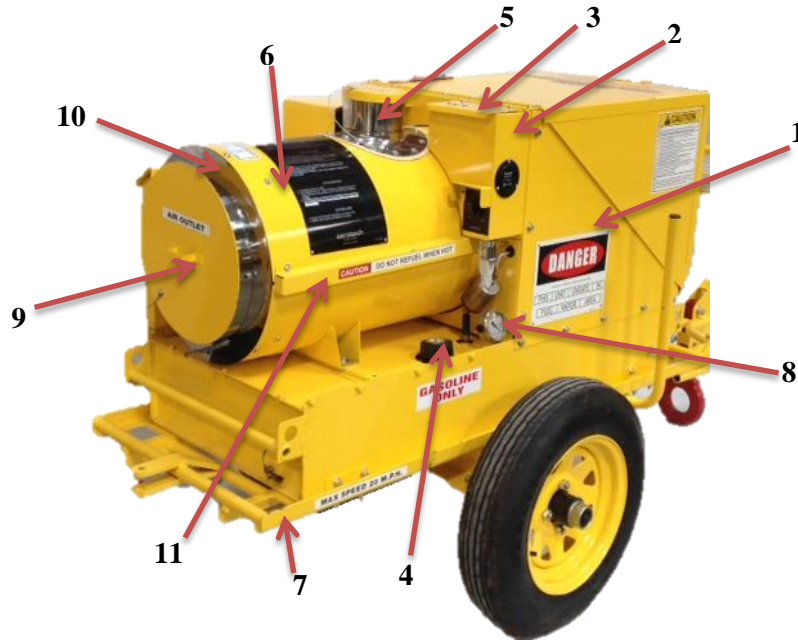
Figure 6-1 Heater Part 1

Item	Part Number	Description	Quantity
1	TCF3225MODA	UPPER CABINET	1
2	TCF3266-100	SIDE PANEL RIGHT	1
3	TCF3267-100	EXHAUST SHIELD	1
4	05000154	HOOD, SUPPORT	1
5	05000120-1MODA	MANUAL BOX	1
6	04040020	DUCT ADAPTER	1
7	TR3313	EXHAUST STACK COVER	1
8	MA-1	TRAILER, TWO WHEELED (OPTIONAL)	1
9	TCF3220MODA	SKID BASE & TOP	1
10	05300990	TIRE & RIM	2
11	TR260	TOW BAR	1



## Section 6

### Parts List



**Figure 6-2 Heater Part 2**

Item	Part Number	Description	Quantity
1	TCF3266-101	SIDE PANEL LEFT	1
2	TCF3224MODA	CONTROL BOX	1
3	TCF3228MODA	ACCESS DOOR	1
4a	05340007	POLY FUEL TANK	1
4b	05340009	FUEL GAUGE	1
5	TR3304	EXHAUST STACK W/HOLE	1
6	04050033AT	HEAT EXCHANGER CASING	1
7	MA-1	TRAILER, TWO WHEELED (OPTIONAL)	1
8	05300250	PRESSURE GAUGE	1
9	04040011	OUTLET COVER	1
10	04040020	DUCT ADAPTER	1
11	TA3300	CAPILLARY SHIELD	1

## Section 6

### Parts List

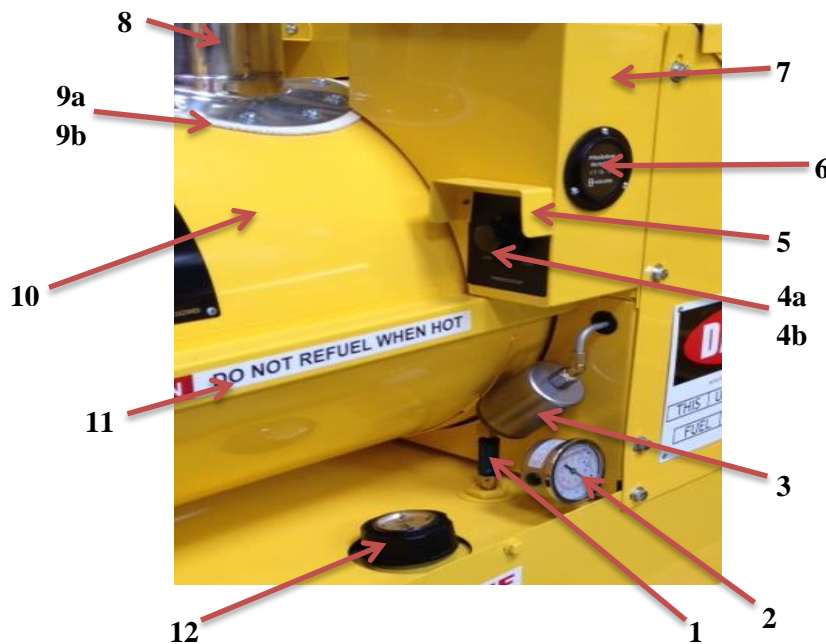
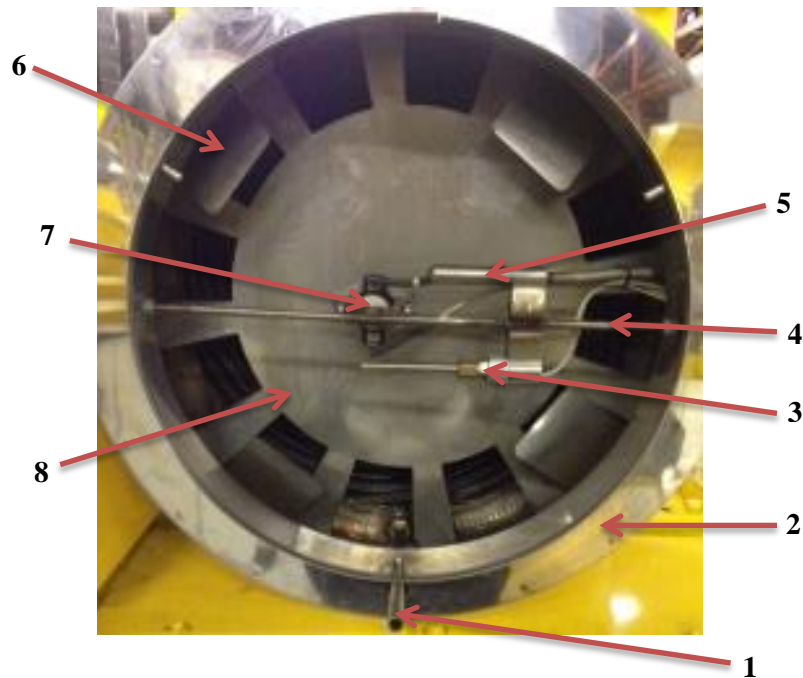


Figure 6-3 Heater Right side

Item	Part Number	Description	Quantity
1	05300180	CHECK VALVE	1
2	05300250	PRESSURE GAUGE	1
3	TRA3057-100	IN LINE FUEL FILTER	1
4a	05300370	THERMOSTAT KNOB	1
4b	05300350	12 VOLT DC THERMOSTAT	1
5	05300375	THERMOSTAT COVER	1
6	MILM3971-1-1	HOUR METER	1
7	TCF3224MODA	CONTROL BOX	1
8	TR3304	EXHAUST STACK W/HOLE	1
9a	TX592	EXHAUST STACK GASKET	1
9b	TX595	HEAT EXCHANGER GASKET	1
10	04050033AT	HEAT EXCHANGER CASING	1
11	TA3300	CAPILLARY SHIELD	1
12a	05340007	POLY FUEL TANK	1
12b	05340009	FUEL GAUGE	1

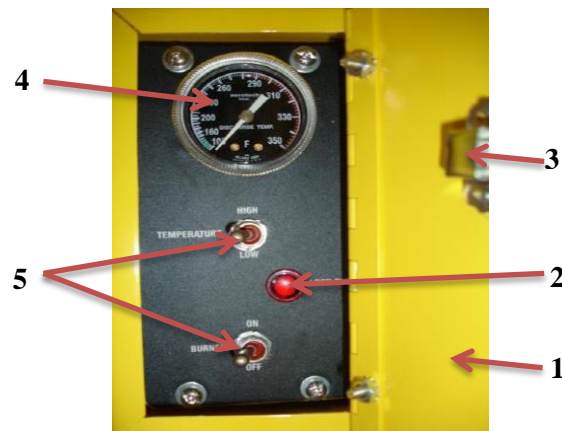


**Figure 6-4 Heat Exchanger (Rear)**

<b>Item</b>	<b>Part Number</b>	<b>Description</b>	<b>Quantity</b>
<b>1</b>	<b>TRF3094</b>	<b>DRAIN TUBE</b>	<b>1</b>
<b>2</b>	<b>04040020</b>	<b>DUCT ADAPTER</b>	<b>1</b>
<b>3</b>	<b>05300360</b>	<b>THERMOSTAT PROBE</b>	<b>1</b>
<b>4</b>	<b>TAF3157MODD</b>	<b>SUPPORT BULB &amp; COIL</b>	<b>1</b>
<b>5</b>	<b>TR3276</b>	<b>DISCHARGE TEMPERATURE GAUGE PROBE END</b>	<b>1</b>
<b>6</b>	<b>TA235</b>	<b>HEAT CONTROL BAFFLES</b>	<b>4</b>
<b>7</b>	<b>05300085</b>	<b>HIGH TEMPERATURE SWITCH</b>	<b>1</b>
<b>8</b>	<b>TAF3154-MODA</b>	<b>RADIATION SHIELD</b>	<b>1</b>

## Section 6

### Parts List



**Figure 6-5 Control Box**

Item	Part Number	Description	Quantity
1	TCF3228MODA	ACCESS DOOR	1
2	05300301	LOCKOUT LIGHT	1
3	TC628	FRICTION CATCH	1
4	TR3276	DISCHARGE TEMPERATURE GAUGE	1
5	MS24523-22	TOGGLE SWITCH	2

## Section 6

### Parts List

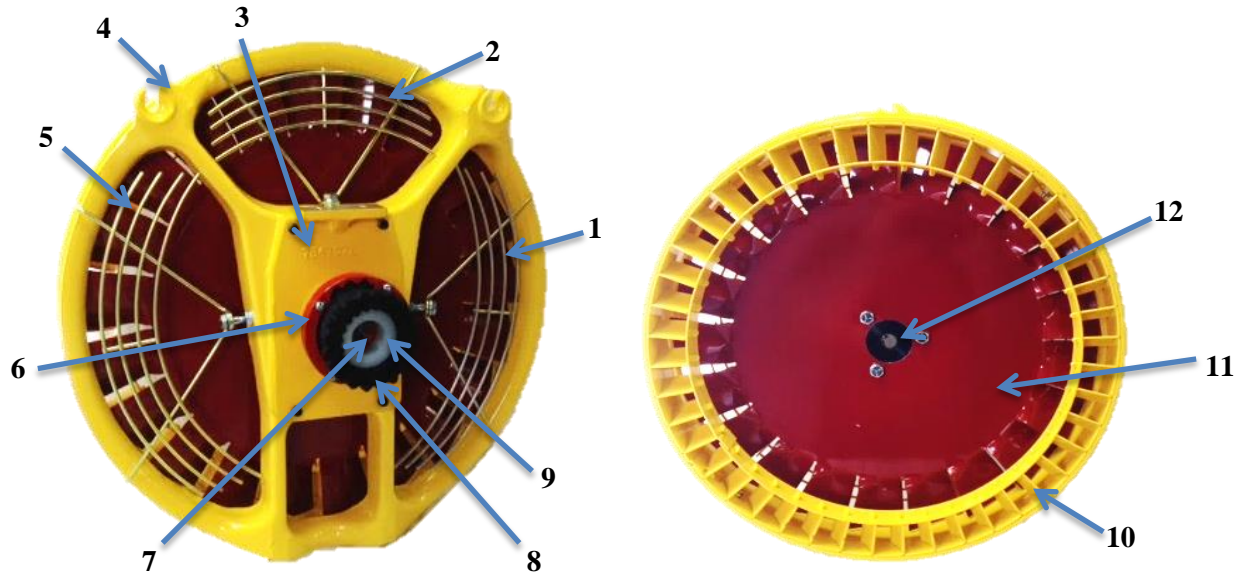
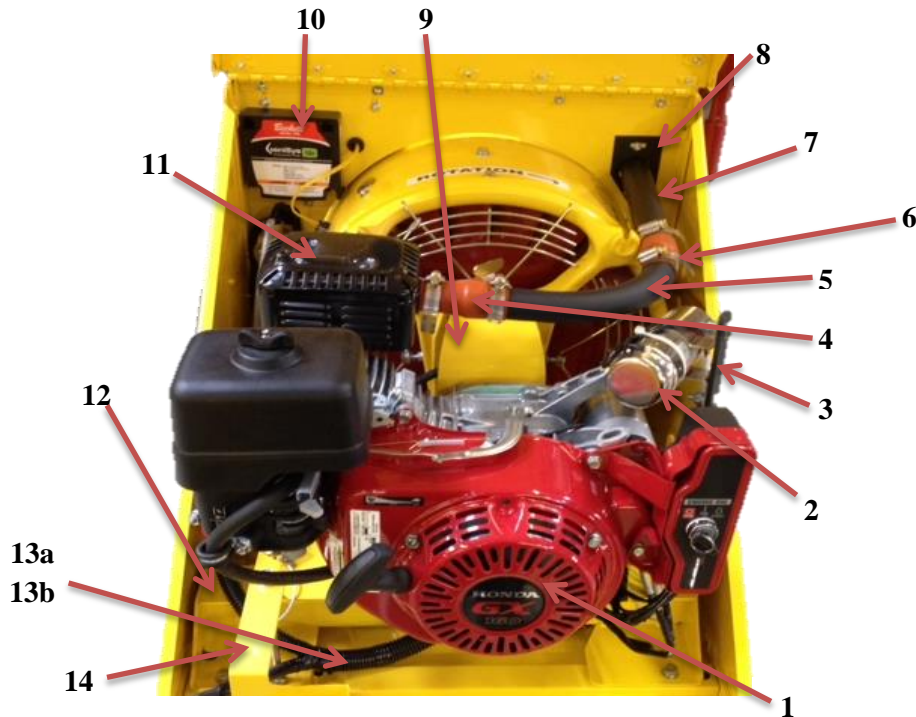


Figure 6-6 Fan Assembly

Item	Part Number	Description	Quantity
1	04020173	FAN GUARD (RIGHT)	1
2	TMF106	FAN GUARD (CENTER)	1
3	04030002	BEARING SUPPORT	1
4	04010017	FAN RING	1
5	04020174	FAN GUARD (LEFT)	1
6	TM3917-1	DRIVEN COUPLING	1
7	TM3916	BEARING SHAFT	1
8	TM3917-2	SLEEVE COUPLING (RUBBER)	1
9	TM3927	SLEEVE BUSHING	1
10	04040022	AIR STRAIGHTENING VANE	1
11	04040018	FAN	1
12	TM3921	FAN HUB	1

## Section 6

## Parts List



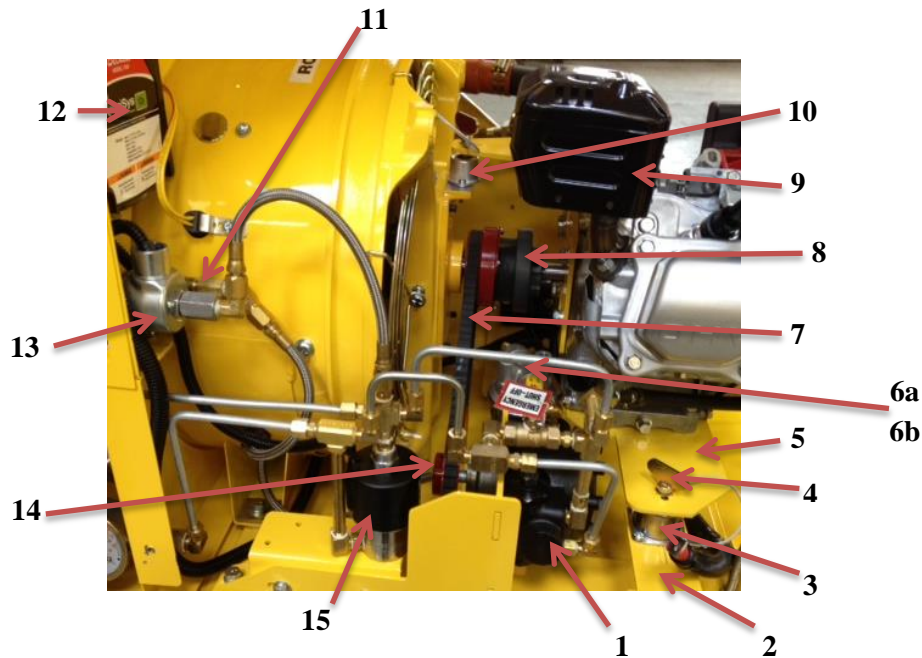
### Figure 6-7 Engine Compartment Part 1

Item	Part number	Description	Quantity
1	GX160UQXE5	HONDA ENGINE W/UPGRADED CHARGING SYSTEM	1
2	04100112	IGNITION COIL	1
3	05000152	COIL MOUNTING BRACKET	1
4	TAH45	FLEX EXHAUST HOSE	2
5	TMF3232MODB	EXHAUST PIPE	1
6	62020	HOSE CLAMP	4
7	TMF3240	EXHAUST PIPE TO STACK	1
8	TM4031-1	EXHAUST PIPE FLANGE	1
9	TM4004MODB	ENGINE BRACKET	1
10	05300050	BURNER CONTROL	1
11	GX160MM	HONDA MODIFIED MUFFLER	1
12	05300591	ENGINE BRACKET	1
13a	05200155NEX	WIRE HARNESS-ENGINE SIDE	1
13b	05300156	WIRE HARNESS- CONTROL SIDE	1
14	13215	BATTERY TRAY	1



## Section 6

### Parts List

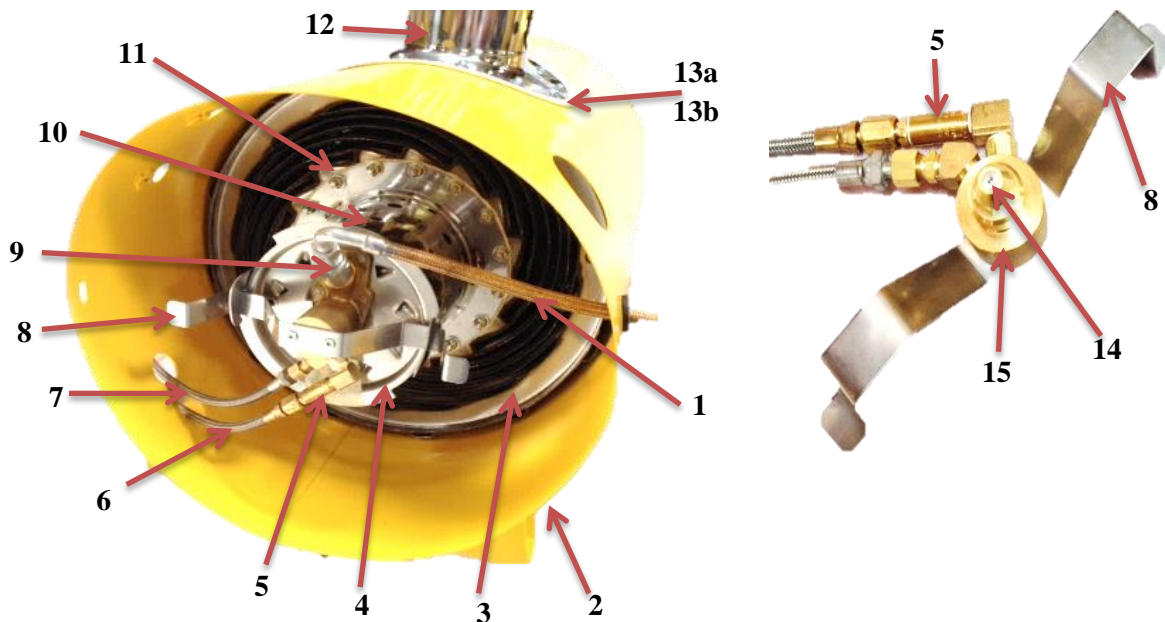


**Figure 6-8. Engine Compartment Part 2**

Item	Part Number	Description	Quantity
1	TR3277	FUEL PUMP	1
2	05300591	ENGINE BRACKET	1
3	TR3375-1	RESILIENT MOUNT	2
4	TC4021	THUMBSCREW	3
5	05300587	ENGINE SUPPORT	1
6a	TRA3056	FUEL FILTER ASSEMBLY	1
6b	5650960	FILTER ELEMENT	1
7	MS15290	FAN BELT	1
8	TM3917-3 MOD B	DRIVE COUPLING	1
9	GX160MM	HONDA MODIFIED MUFFLER	1
10	TM3939	RESILIENT MOUNT	1
11	P356-25	25 PSI CHECK VALVE	1
12	05300050	BURNER CONTROL	1
13	05300265	TEMPERATURE CONTROL VALVE	1
14	TM3919	PUMP PULLEY	1
15	05300255	BURNER CONTROL VALVE	1

## Section 6

### Parts List



**Figure 6-9. Heat Exchanger (Front)**

Item	Part Number	Description	Quantity
1	04100156	IGNITION CABLE	1
2	04050033AT	HEAT EXCHANGER CASING	1
3	8227028-10	HEAT EXCHANGER	1
4	TRF762 MOD A	COMBUSTOR PLATE	1
5	T0655A	5 PSI CHECK VALVE	1
6	05300410	16 INCH FUEL LINE	1
7	04100157-1	FUEL LINE	1
8	T0553C	COMBUSTOR NOZZLE CLAMP	1
9	TE1010B	IGNITER PLUG	1
10	TRF763	COMBUSTOR	1
11	TR776A	COMBUSTOR GASKET	1
12	TR3304	EXHAUST STACK	1
13a	TX595	HEAT EXCHANGER GASKET	1
13b	TX592	EXHAUST STACK GASKET	1
14	TR775	FUEL NOZZLE 2.5 GPH	1
15	05300144	NOZZLE HOLDER	1