



SMMT Trailer Mounted Master Mix



OPERATIONS/MAINTENANCE/PARTS MANUAL

Diesel Burner Systems



Warranty

Stepp Manufacturing Company Inc. hereby warrants to the original purchaser that products manufactured by Stepp Mfg. will be free from defects in material and workmanship for a period of one (1) year from the date of purchase.

Stepp Mfg., at its discretion, will provide for the repair or replacement of any part found upon examination by Stepp Mfg. to be defective, except as noted below. Such repair or replacement will be free of charge to the original purchaser for a period of one (1) year from the date of purchase, except as noted below.

No warranty is extended to cover:

- Product pump wear or damage caused by foreign objects.
- Routine maintenance, cleaning, and adjustments.
- Parts/components that have been altered, misused, or improperly adjusted or maintained.
- Transportation to and from the place of warranty repair.
- Removal of material from equipment.

The following items are covered solely by their manufactures warranty:

- Engines
- Hydraulic components
- Burners
- Pumps
- Tires
- Other component parts

The following items are covered by a pro-rata warranty:

- Hoses that carry heated materials.
- Heating elements for hoses and wands.

Disclaimer of further warranty:

Stepp Mfg. makes no warranty, expressed or implied, other than this warranty. The implied warranties of merchantability and fitness for particular purpose are hereby disclaimed. Repair or replacement of products or parts proving to be defective in material or workmanship shall be the exclusive remedy for breach of this warranty.

Stepp Mfg shall not be liable for incidental or consequential damages including but not limited to: damages for inconvenience, rental or purchase of replacement equipment, for loss of profits, loss of material, or other loss resulting from breach of this warranty.

Stepp Mfg reserves the right to incorporate any changes in design into its products without obligation to make such changes on products previously manufactured.

Please see Warranty section for more details.

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INTRODUCTION

Stepp Master Mix Trailer

Thank you for selecting *Stepp* highway maintenance equipment. We are confident you will be satisfied with the *Stepp Master Mix Trailer*. *Stepp Manufacturing Co., Inc.* is backed by over 70 years of experience in the design and manufacture of highway maintenance equipment. This experience, along with our innovative design and unique features, make the *Stepp Master Mix Trailer* an indispensable piece of equipment for your road repairs.

In order to assure safe operation of this equipment, the operator must read and understand all operating procedures and safety notices contained in this manual. In addition, the operator *must* receive instruction on how to safely operate the *Stepp Master Mix Trailer*. Contact the manufacturer if any questions arise or if you desire training for additional staff members.

Operating instructions, adjustments, and periodic maintenance procedures are given so you, the operator, can keep your unit working like new and expect many years of dependable service from it. Remember, any machine, regardless of design or type, will perform only in relation to the way it is operated and the maintenance it receives.

Read this manual carefully and observe all warnings and cautions. If you have any recommendations or comments regarding this manual, please send them to: Stepp Manufacturing Co. Inc., 12325 River Road, North Branch MN 55056-6225 or call 651-674-4491. All comments we receive are reviewed and may be incorporated into future manuals.

When ordering parts or making any inquiry about the *Stepp Master Mix Trailer*, be sure to include the model and serial number found on the data plate attached to the frame.

WARNING *Do not use the equipment unless the operator has read and understood the operating and safety instructions and has received proper training. Do not operate equipment unless all guards and safety devices are in place and functional.*

WARNING *Do not exceed safe operating temperature of asphalt or bituminous material. Know the "Flash Point" temperature of the material being used and DO NOT exceed this temperature. The recommended operating temperature information is available from the material manufacturer. Exceeding the recommended temperature may cause equipment damage and serious injury or death.*

Dimensions (approx.)

Length.....160 in.
Width.....77 in.
Height.....Operating 82 in.
Weight.....2,803 lbs.

General

Fuel Tank Capacity..... 10 Gallons

Preheat Hopper

Capacity.....5 cu.ft.
Opening Dimensions.....23"x 38"

Loading Conveyor

Belt..... 16" Wide Cleated
Hydraulic Motor.....4.5 cu.in. Hydraulic Motor w\ Forward-Reverse

Mixing Chamber

Chamber Type.....Continuous Batch Mixing
Mixing Style..... Rotating Pugmill
Liner Type.....U-shaped, Replaceable
Combustion Chamber Liner Material.....Replaceable ¼" Wear Resistant AR Steel
Insulation Type and Thickness.....2" Cerwool
Pugmill Drive, Hyd Motor.....24 cu.in. Motor

Pugmill:

Pugmill Dimensions.....Length 48" x Diameter 30"
Shaft Size.....2"
Paddle Size..... Replaceable 2" x 8"
Paddle Material..... Reversible, Replaceable, ¼" Wear Resistant AR Steel
Number of Paddles.....30

Mixing Chamber Heating System

Burner Type Indirect Diesel, Forced Air
Number of Burners.....One
Fuel Type..... Diesel
Manufacturer.....Beckett®
BTU Output250,000 BTU Total

CONTINUED ON NEXT PAGE

Engine

Manufacture..... Honda®
Model.....6x390
Displacement.....81 cubic inch
Number of Cylinders.....(1)
Horse Power.....13 HP
Fuel Type.....Gasoline
Cooling.....Air

Hydraulic System

System Type.....Eaton 26 Series
Control type.....Forward/Reverse Flow Control
Reservoir Capacity.....30 Gallons
Filtration.....10 Microns

Chassis

Number of Axles.....One (1)
Axle Capacity.....6000 lbs.
Tire Size.....225/75R15
Brake Type.....Electric Std (Hyd Optional)
Landing Gear Static Capacity.....5,000 lbs each
Screw jack Quantity.....One (1)
Hitch Type.....3" Pintle Ring or 2-5/16" Ball adjustable from 24" to 31"
Frame Material.....2"x 4"x 10 ga Rectangular Tubing
Lighting.....Approved w/ Breakaway Kit
Recessed Grommeted Lights.....Standard

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IMPORTANT NOTICE!

This manual contains cautions and warnings that alert you to potential safety issues.

WARNING is used to inform you of conditions or operations that could cause serious injury or death.

CAUTION is used to inform you of conditions or operations that could cause damage to the equipment

NOTE is used to provide you with additional information that may be helpful or useful for a particular situation.

Before Starting or Operating this Machine

Understand and observe all the following **Warnings**, **Cautions**, and **Notes**.

WARNINGS

- ◆ This equipment contains mechanical and heating components that may cause serious injury or death if not handled or maintained properly. All personnel must be properly trained in the operation and maintenance of this equipment.
- ◆ Before refueling, shut off the burners and allow all flames in the burner and pilot light to extinguish. Shut off the engine.
- ◆ Check fuel lines, fuel line connections, and all other components for leaks. If any leaks are found, they must be repaired before using the unit.
- ◆ Know the temperature required for the material being used, and do not exceed this temperature. Avoid over heating, as this may cause equipment damage, personal injury, and/or death.
- ◆ Never load a tank with heated oil when moisture is present in the tank. Depending on the temperature of the hot oil, the moisture may instantly boil causing hot oil to foam up and out of the tank causing severe burns.

CAUTIONS

- ◆ Know the materials being used and know the proper handling, heating, application, clean-up, and storage procedures. Not all materials are compatible with each other. Many materials have a very limited shelf life. Most materials require special handling procedures to prevent personal injury and/or equipment damage. Contact your material supplier and/or manufacturer for proper handling instructions. Equipment malfunction or damage due to improper handling or use of the materials is not covered by warranty.
- ◆ Do not exceed the maximum heating temperature or storage time as recommended by the material manufacturer. This may cause emulsion type materials to separate and become difficult or impossible to remove from the machine. Consult with the material manufacturer for recommendations.

NOTES

- ◆ Become familiar with the Material Safety Data Sheet (MSDS) for the material being used in the machine and take appropriate safety precautions. Wear the proper clothing and protective gear as recommended by the MSDS and your safety director.
- ◆ DO NOT use the equipment unless it is in good condition.
- ◆ In case of skin contact with hot materials, dip into **cool, clean water immediately**. Do not wipe the product, as this will spread the burn.
- ◆ Consult the MSDS and contact your safety director for proper extinguishing of petroleum based fires.
- ◆ Carry a fire extinguisher(s) as recommended by your safety director.
- ◆ Notify your supervisor or the manufacturer if any questions arise concerning the operation of this equipment.

OPERATIONS

WARNING: *Before refueling, shut off the burners and the engine.*

CAUTION: *Be sure operators have been properly instructed in starting and operating all equipment before beginning.*

NOTE: *See following pages for specific instructions on operating burners and heating systems.*

Pre-Trip Inspection

1. Check engine fluid levels & grease machine.
2. Check tire pressure.
3. Start optional conveyor check for wear & tracking.
4. Inspect unit for any physical damage.
5. Check pugmill for broken paddles and excessive wear.
6. Check that discharge door is operating properly.
7. Truck hook-up and lights.

Transporting

Trailer Hook-up

1. Connect trailer to towing vehicle
 - a. Assure hitch is engaged properly.
 - b. Attach safety chains to towing vehicle.
 - c. Connect battery charging circuit to tow vehicle if required. (see illustration below)
 - d. Connect electrical plug to towing vehicle.
 - e. Connect breakaway cable to towing vehicle.
 - f. Check operation of lights and brakes.
2. Secure trailer for transport
 - a. Shut OFF the engine and burners.
 - b. Shut OFF all fuel valves.
 - c. Be sure the product temperature is not above the recommended operating temperature.
 - d. Securely latch the tank cover.

WARNING: *Prior to transporting, the driver of the tow vehicle must assure the safety of the operation. The driver must also know, and assure, that the product temperature is within limits.*

1. Start engine (refer to engine operations).
2. Turn on control box main power switch.
3. Start the loading conveyor if equipped.
4. Fill preheat hopper with recyclable asphalt material to a level even with the top edge. Pieces must be small enough to pass through the trap doors. The equipment will provide better performance with smaller pieces. Start conveyor and load hopper with material. **NOTE:** *Check hopper doors. Doors must be closed prior to loading.*
5. Set Timer/Manual Switch to timer mode. This will only allow the burner to fire when the timer is set and or reset to zero. Set desired time on the timer using the up and down arrows. Reset the timer by pressing the F1/RST button on the timer. This will zero the timer and start the batch over.
6. This system is not equipped with automatic temperature controls. It is the operators responsibility to shut off the burners when the product reaches the recommended temperature. Allow for temperature creep when the burners are shut off.

CAUTION: *If you reset the timer and the burner switch is still on the burner will fire and possible overheat could occur.*

CAUTION: *Do not use timer for initial pugmill warm up. This could cause residue in hopper to catch fire. If hopper catches fire, dispense load of material into hopper to smother fire, turn the burners off, and allow the machine to cool down before re-firing.*

7. Start pugmill mix paddles. **NOTE:** *Make sure pugmill paddles are moving freely in both directions, forward and reverse positions.*
8. Engage pugmill mix. Empty contents of the preheat hopper into the recycler mixing chamber using the hand operated trap doors lever.
9. Set the recycler burner timer for desired heating time by using the up and down buttons on the bottom of the timer. The amount of mixing time and heat necessary will be determined through experience. Moisture and material quality varies and will vary the timer setting.
10. Set batch time. **NOTE:** *Set initial batch time for 10 minutes. Normal batch times may vary from anywhere between 8-16 minutes, with the first batch of the day taking longer due to heating the machine up. Press the "F1/RST" button to start the batch timer and activate the burner. If more time is needed, adjust time accordingly. Operator will need to dispense a small amount of material or test through the inspection door to check the temperature with a hand held infrared scanner. When burners are firing, watch the top stack for moisture dissipating. Batch will be very close to temperature once the steam has stopped and you are getting a clean exhaust. **If exhaust starts to smoke or turn blue, the material is overheated or very close to being overheated. If blue smoke is present turn burner switches off and discharge material.***

CAUTION: *Discharge material at 320-350°. If material is at temperature before time is done, shut off the burner switch.*

OPERATIONS

Basic Operation

11. If necessary, add one pound blocks of bituminous binding material to the recycler mixing chamber. Here again, experience is the best indicator of how much to add. Start with 2-6 pounds of oil. Know the material being added and the flash point. We recommend that you use an AC type oil and add the oil in the first three minutes of the batch timer. Reload preheat hopper while you wait for the mixing action to be completed. This will allow for the next batch to be preheated, resulting in faster batch times.
12. Set the hydraulic valve to discharge in order to empty the mixed material onto the shovel platform for easy shoveling. Swinging the shovel platform up out of the way will allow the mixed material to empty directly on the ground. Reload the next batch. Press "F1/RST" button to reset the timer and turn burner switch on in order to start the next batch.
13. To shutdown the machine shut off burner switch. Empty the recycler mixing chamber.

NOTE: *Running a load of coarse rock through the unit will help remove asphalt deposits.*

14. Shut off the engine.

NOTES:

- *Operator must have infrared heat gun to operate machine.*
- *Check "timer" on control panel.*
- *Never have burners on without material in pugmill, unless you are doing start up.*
- *Check material temperature at 8 minutes. Material temperatures will climb quickly once moisture is out of material. Check every minute or two after that.*
- *Normal batch times vary from 6-18 minutes depending on moisture and material quality.*
- *Initial batch could take 2x's longer, due to initial heat up of machine.*
- *2-6 pounds of oil additive is average for material.*
- *Allow cooling at end of the day. (Open hopper doors and run pugmill for 10 minutes in discharge.)*

Helpful Tips to Making Quality Recycled Materials

1. **Have your millings tested for asphalt content.** This will help you decide how much additive you need. The average ton of asphalt top mix has 5-7% oil by weight. This translates into 100-125 pounds of asphalt added to virgin aggregate to make top mix. PG grade asphalts are approximately 7.5 pounds per gallon. So if you convert that to gallons there is approximately 13.3 gallons of asphalt in 100 pounds to make 1 ton of mix. ($100/7.5=13.3333$) Most millings need $1/2$ -1% of new oil to give you a quality patch material. The SMMT makes approximately a 500 pound batch, so on average you need to add 2-6 pounds of asphalt additive to make a quality mix.
2. **Recycled materials have huge variables.** Different asphalt contents, different moisture contents, different aggregates, base material containments, and different size aggregates will all vary the batch times and material quality. Making your first batches in your SMMT will take some experimenting. You will need to find the right recipe. Start with shorter batch times and check your material often on the first batch or two. Start with a little oil and add more as you need it. Once you come up with your recipe for the materials that you are using you should see consistent results. The next batches will be very similar and you should only have to make minor adjustments.
3. **Keep materials dry.** Moisture content is the number one cause for slow batch times. If you can, keep your millings indoors or covered. It takes more BTU's to dissipate a gallon of water than it does to melt a gallon of asphalt. Moisture acts as a refractory in the material and can not be dispersed until turned to a gas (steam). High moisture content can double or triple batch times, so having dry millings is key to higher production.
4. **Quality of materials.** Using quality materials also aids in faster batch times. Materials with large aggregates take longer to drive the heat into the stone. Contaminated materials with base also take longer to heat because of lack of oil in the materials. Materials with higher asphalt contents also heat up faster. The SMMT does not care, it just may affect the heat up times.
5. **The SMMT is capable of making materials from virgin aggregates.** You can make virgin materials with the SRM, you just need more oil. Using the reference above, in #1, you can make your own custom mixes. Sand mixes, fine mixes, and mixes from virgin materials. Again, you will need to do some experimenting to get the right mix design. If making virgin mix, use the 5-7% to get you started (5-7gallons). Always start with a smaller amount of oil; you can always add more oil, but you can't take it away. Different oils will also give you different results in materials.
6. **Pre-made cold mix materials.** You can use your SMMT to warm your cold mix materials. Use extreme caution when doing so. Most cold patch materials have a high content of cutter (solvent) in the oil. This makes the material soft and pliable, but also makes them very easy to catch on fire. If you are using the SMMT to heat cold patch material, only fire the burner in 1-2 minute cycles and check the temperature very often to prevent the material from flashing.

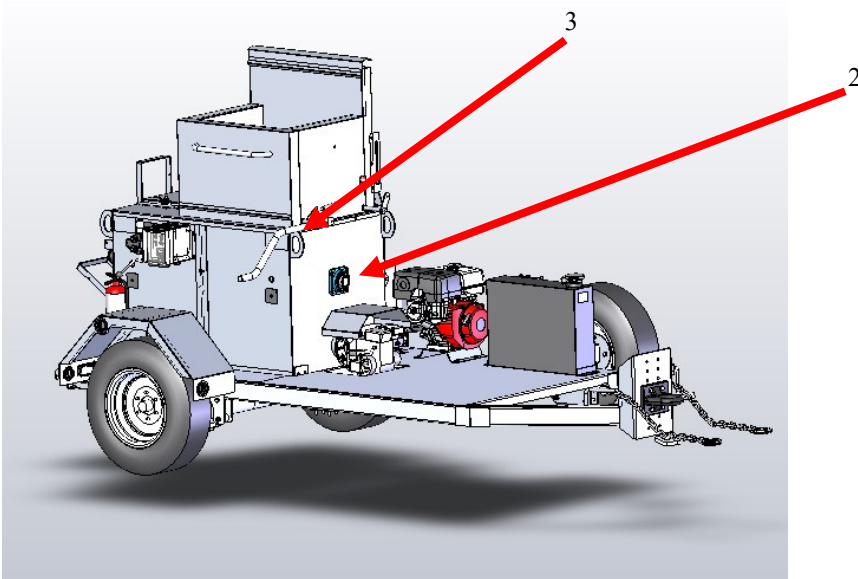
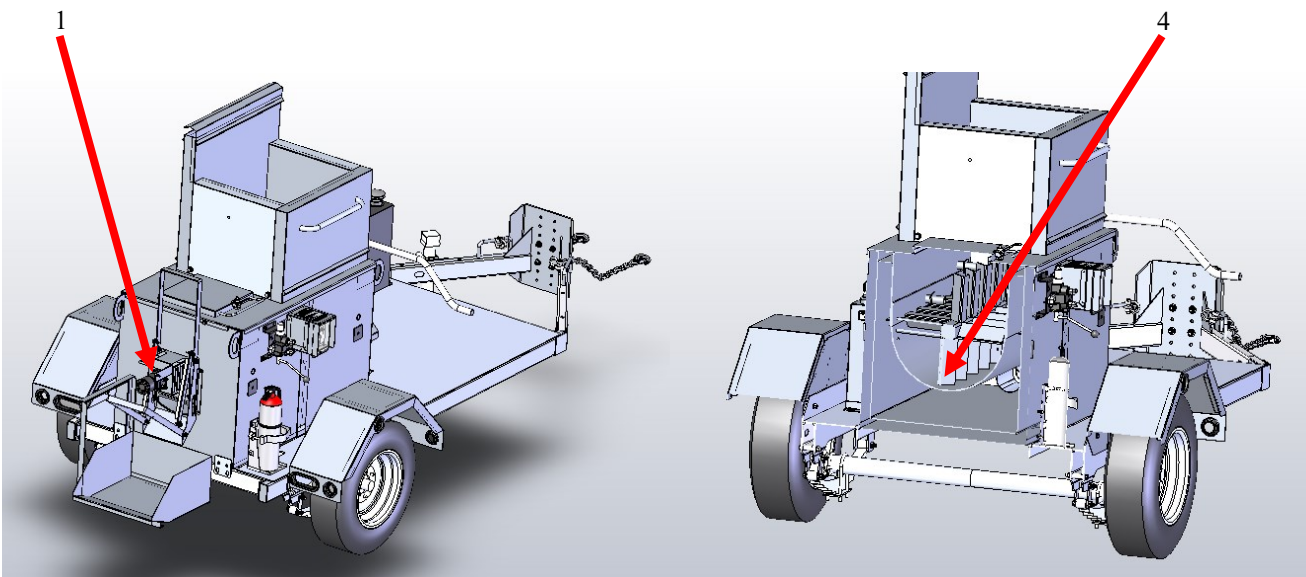
MAINTENANCE

MAINTENANCE

Pugmill Mixer

The SMMT has many high torque moving parts. As a weekly inspection, we suggest that the operators check for loose fittings and loose bolts. Outlined below are some that need to be checked periodically due to the torque and vibration that the unit incurs.

1. Check for tightness of the motor assembly (#1). Because of the torque required to mix the materials, this needs to be checked weekly.
2. Check grease bearing daily (#2). There is a bearing on each end of the pugmill and on each end of the conveyor.
3. Check top discharge door for proper operation (#3).
4. Visually inspect pugmill mixer blades for proper clearance and wear (#4).

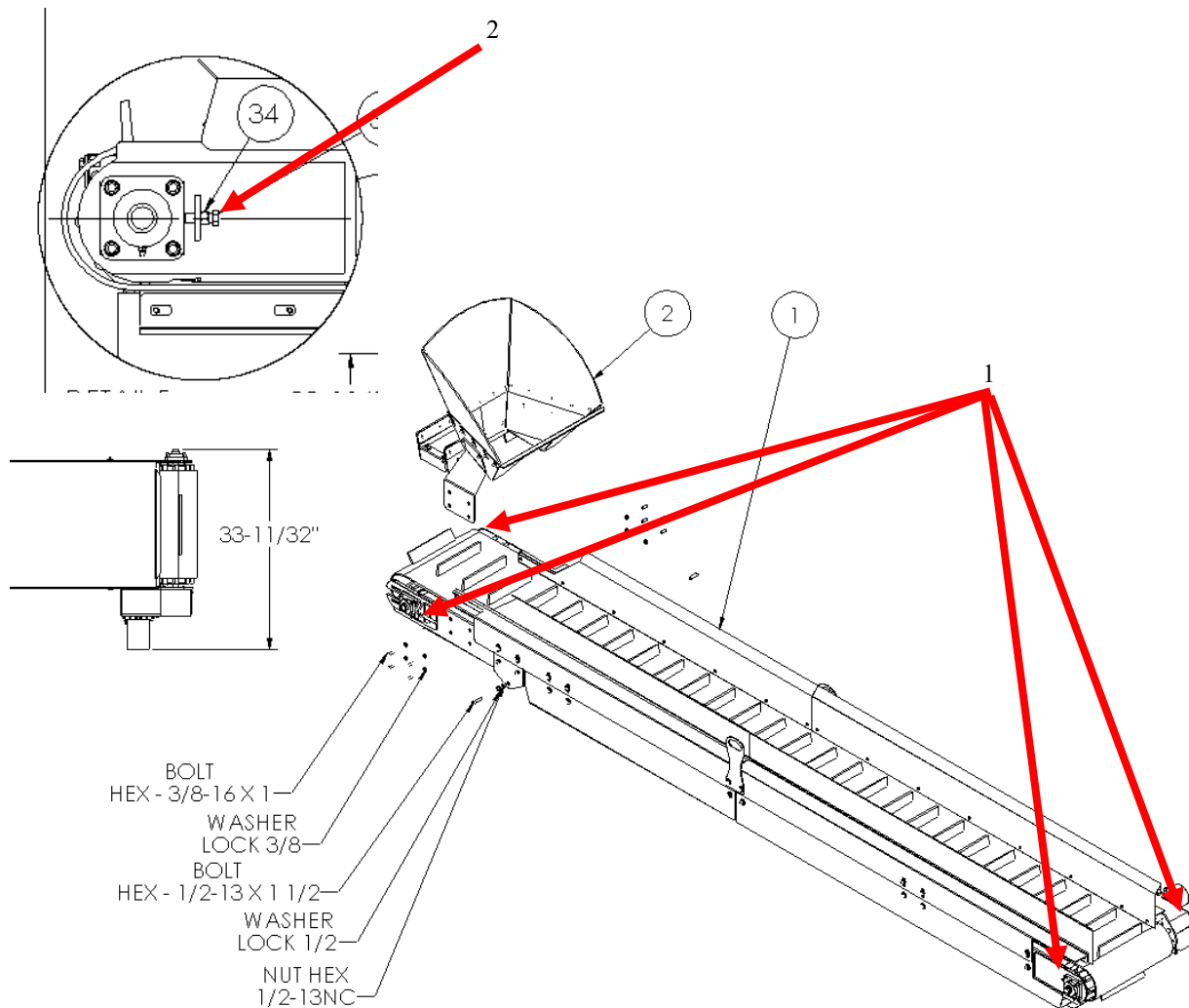


MAINTENANCE

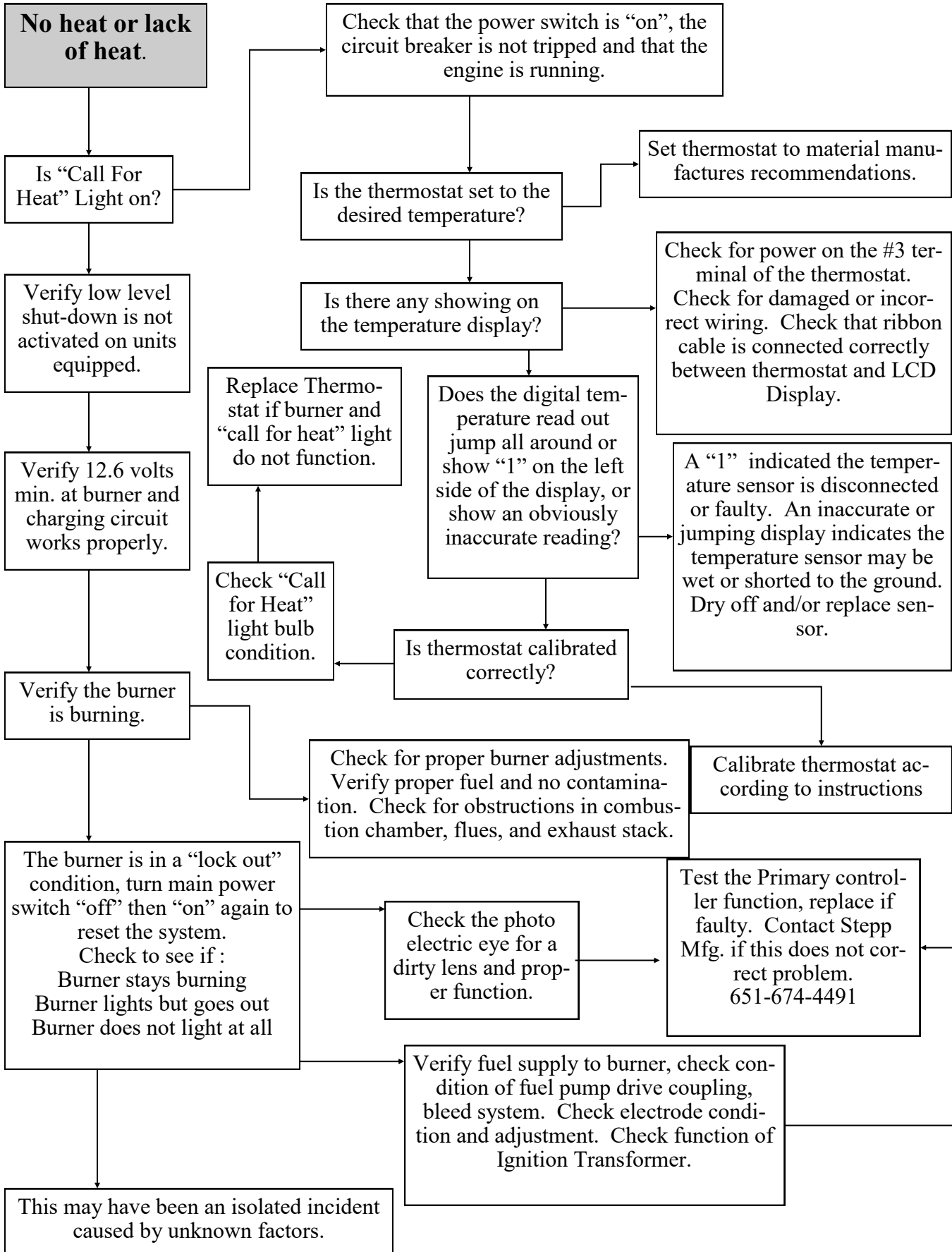
Conveyor

The conveyor needs to be inspected daily for wear, and to make sure that the belt is tracking properly. As the belts are used, they will stretch, requiring tightening.

1. Check grease bearings daily (#1).
2. Check belt tension and tracking (#2). To adjust tracking, you must first loosen the 4 nuts on the bearing. Do not loosen too much, you need a little tension on the nuts. Loosen the jam nut on the tension bolt and tighten or loosen the bolt tensioner the direction that you need the belt to go. Re-tighten the bearing bolts and lock jam nut down. **NOTE: Make all adjustments with the conveyor in the off position.** Once you make the adjustments, start the conveyor to check tracking.



TROUBLE SHOOTING

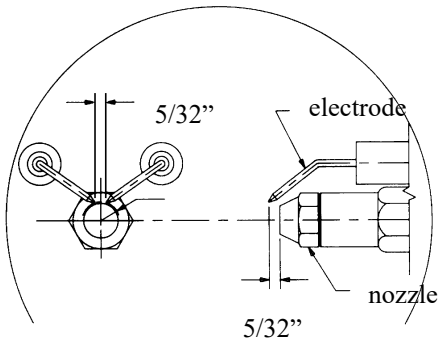


TROUBLE SHOOTING

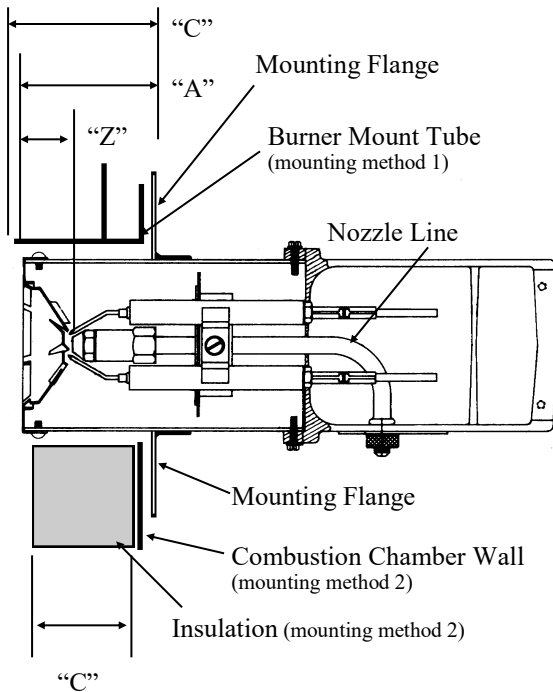
Hydraulic System

	<i>POSSIBLE CAUSE</i>	<i>Items to Check /Service</i>
LACK OF PERFORMANCE	Plugged Strainer Screen	Service strainer screen
	Hydraulic Filter Plugged	Replace hydraulic oil filter
	Collapsed Suction Hose	Replace suction hose and service strainer screen
	Air Leak in Suction Hose	Replace hose
	Low Fluid Level	Fill reservoir to proper level
	Over Heated Hydraulic Fluid	Clean oil cooler fins with pressurized water
	Worn Pump or Hydraulic Motor	Adjust, rebuild, or replace as necessary
	Crushed Hydraulic Lines	Replace line
	Engine at Idle	Speed engine up
HYDRAULIC MOTORS DO NOT TURN OR TURN SLOWLY	Product in Tank not Melted	Allow for more time for product to melt
	Foreign Material Jamming Agitator	Remove foreign material from agitator
	Foreign Material Jamming Product Pump	Remove foreign material from product pump
	Flow Controls on Valve Need to be Adjusted	
	Also see "Lack of Performance"	
UNUSAL NOISES	Low Hydraulic Fluid	Fill reservoir to proper level
	Air Leak in Suction Hose	Replace hose
	Damaged Pump or Hydraulic Motors	Repair or replace as necessary
EXCESSIVE OIL LEAKS FROM PUMP OR HYDRAULIC MOTOR SHAFT	Bad Shaft or Shaft Seal	Replace as necessary
	Loose Fittings	Tighten fittings

Diesel Burner Adjustments



Electrode Adjustment - Fig.1



Dimensional Adjustments - Fig. 2

1. Bleed all air from fuel system through bleeder screw. See Fig. 4 (burner motor must be running).
2. Check and adjust igniter electrodes as shown in Fig. 1.
3. Verify dimensional adjustments. The "Z" in dimension is set to 1 1/8" by repositioning the nozzle line. The "A" dimension is set 1/4" less than the "C" dimension by repositioning the mounting flange. Refer to the mounting methods shown in Fig. 2.
4. Check and adjust fuel pressure to 140 psi. 100 psi minimum may be used to compensate for high altitude operations (refer to Fig. 3).
5. Set initial adjustment of air band and air shutter to number six. Ignite the burner and adjust the air supply until there is a slight amount of smoke. See Fig. 4.
6. Allow temperature to rise to at least 150° F. then readjust air supply until there is just a trace of smoke.
7. Using combustion analyzer, measure the CO₂ or O₂ levels. Then increase the air supply to *reduce* the CO₂ by 1%, or *increase* the O₂ by 1%. If an analyzer is not available, increase the air supply until the smoke just disappears.
8. Tighten all screws after final adjustments are made.

NOZZLE FLOW CHART

100 PSI	.75	.85	.90	1.00	1.10	1.20	1.25	1.35	1.50	1.65	1.75	2.00	2.25	2.50	2.75	3.00
140 PSI	.89	1.00	1.07	1.18	1.30	1.41	1.48	1.60	1.78	1.95	2.07	2.37	2.66	2.96	3.25	3.55

Fig. 3

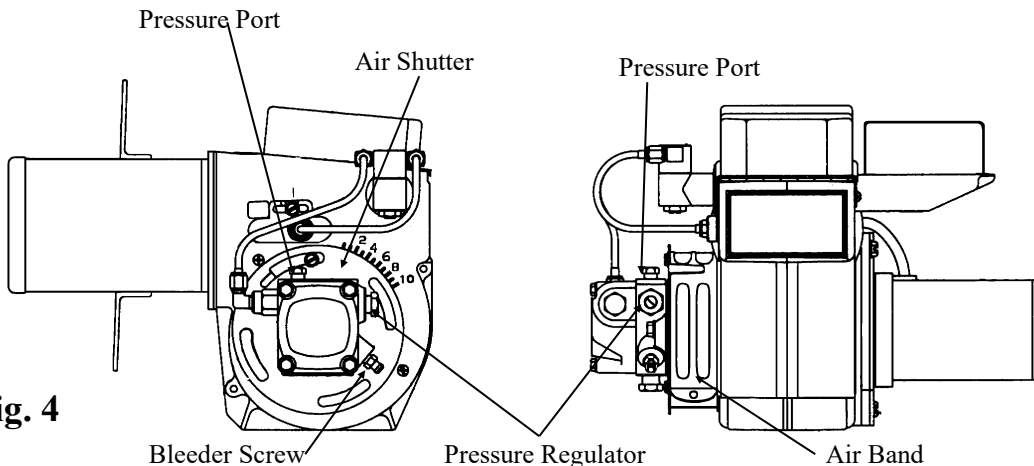
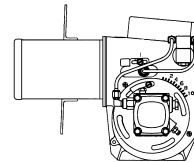


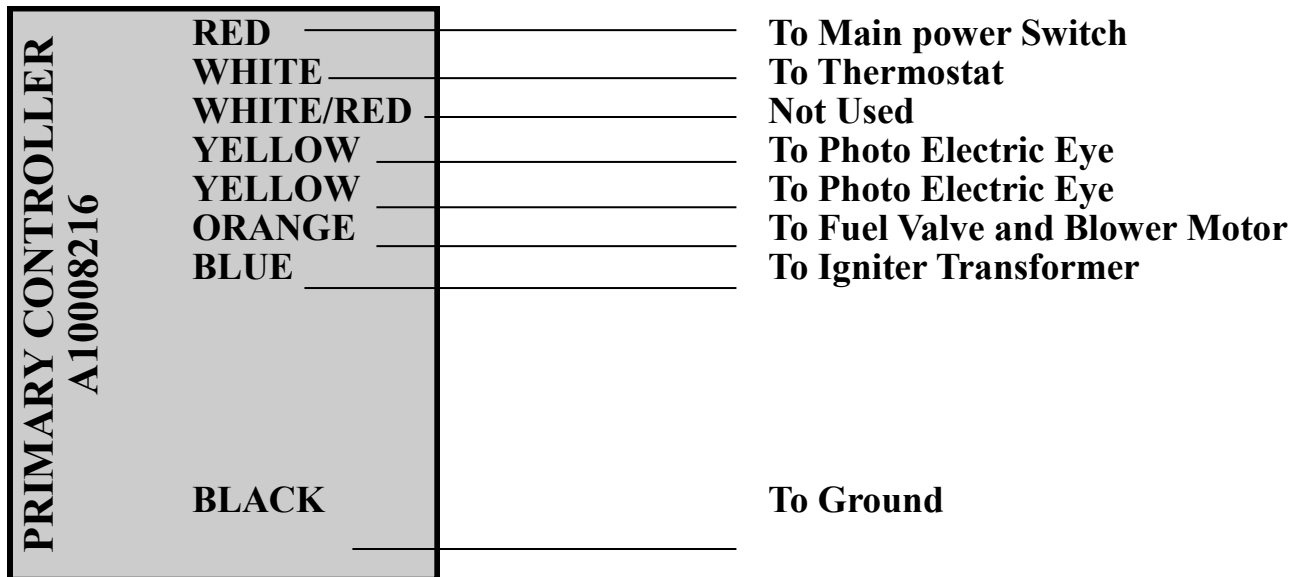
Fig. 4

Primary Controller Burner MTD/Hard Wired

NOTE: *The primary controller can be bench tested for proper operation using an automotive type, 12 volt battery as a power source. Refer to the wiring schematics for wire identification.*



1. Remove controller from burner. Mark all wires for proper reassembly.
2. Using two test lights, or volt meters, connect one to the blue wire, and one to the white/orange wire of the controller. Connect the black leads of your test instruments to the negative (-) terminal of the battery.
3. Connect the black wire from the controller to the negative (-) terminal of the battery.
4. Connect the red, white/red, and the white wires together, then connect these three wires to battery (+) terminal. Both test instruments should show voltage for approximately 15 seconds. After 15 seconds, the controller should "lock out" and no voltage will be present.
5. Repeat step #4, only this time connect the two yellow wires from the controller together three seconds after applying power to the three wires of the controller. (This simulates the controller receiving a "flame" signal from the photo electric eye). The white/orange wire should show voltage as long as the controller is hooked to the battery. The blue wire should only show voltage for about 15 seconds. Replace the controller if it fails any of these tests.



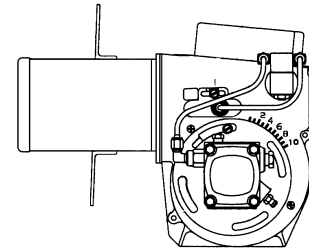
TROUBLE SHOOTING

Diesel Burner

Photo Electric Eye

NOTE: *The Photo Electric Eye can be bench tested for proper operation using an ohm meter. Assure the lens of the Photo Electric Eye is clean prior to testing.*

1. Block off all light to the Photo Electric Eye. Test across the leads with your ohm meter; you should get an infinite resistance reading (a lot of resistance).
2. Point the Photo Electric Eye at a light source, the brighter the light, the less resistance your ohm meter will show.



CAUTION: *Replace the Photo Electric Eye if it does not respond in this way.*

Fuel Valve

NOTE: *The Fuel Valve can be bench tested for proper operation using an automotive type 12 volt battery as a power source.*

1. Disconnect the two leads and remove the fuel lines from the fuel valve.
2. The valve should be closed when no power is available.
3. Apply 12 volts to the two leads and the valve should open.

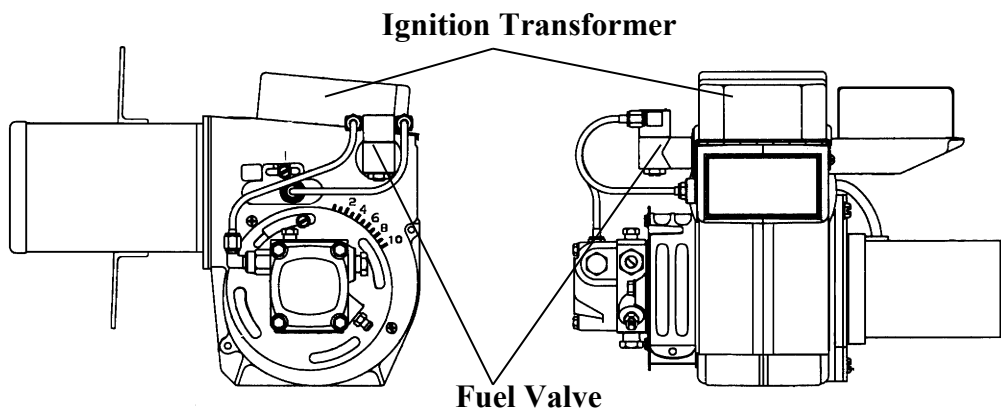
CAUTION: *Replace the fuel valve if it does not respond in this way.*

Ignition Transformer

WARNING: *Shock hazard, high voltage up to 20,000 volts.*

1. Assure that 12 volts is being supplied to the transformer during the ignition cycle. (Refer to the Primary Controller tests.)
2. Check electrode condition and adjustment. Replace or adjust as necessary.

CAUTION: *Replace ignition transformer if unit won't produce sparks.*

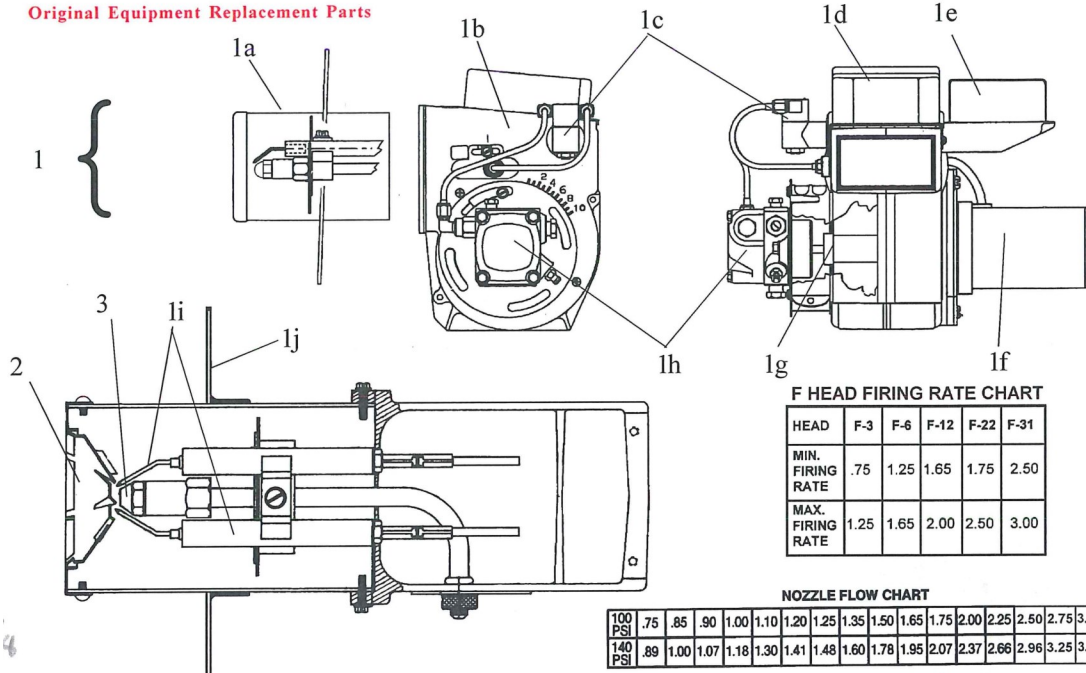


REPLACEMENT PARTS

REPLACEMENT PARTS

12V Diesel Burner

Original Equipment Replacement Parts



F HEAD FIRING RATE CHART

HEAD	F-3	F-6	F-12	F-22	F-31
MIN. FIRING RATE	.75	1.25	1.65	1.75	2.50
MAX. FIRING RATE	1.25	1.65	2.00	2.50	3.00

NOZZLE FLOW CHART

100 PSI	.75	.85	.90	1.00	1.10	1.20	1.25	1.35	1.50	1.65	1.75	2.00	2.25	2.50	2.75	3.00
140 PSI	.89	1.00	1.07	1.18	1.30	1.41	1.48	1.60	1.78	1.95	2.07	2.37	2.66	2.96	3.25	3.55

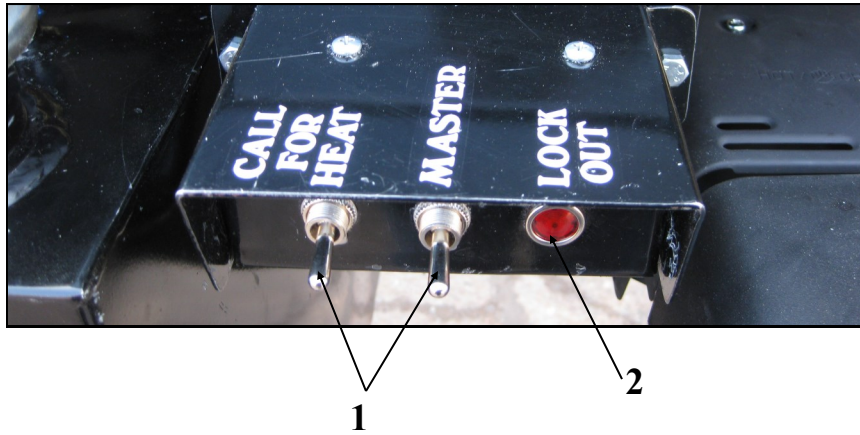
ITEM	QTY	DESCRIPTION	PART#
1	1	Burner assembly w/ Primary Control (less fuel retention head and nozzle) ...	A10008215
1	1	Burner assembly, complete w/ fuel retention head and nozzle	A10008105-015
1a	1	Air Tube	509070
1b	1	Photo electric eye (under ignition transformer)	
		-With Connectors	A10007678
		-Without Connectors	P10007720
1c	1	Valve, fuel control.....	509091
1d	1	Ignition Transformer	509087
1e	1	Primary Controller	P10001034
		-Weather Pack/Weather Pack.....	A10007216
		-Weather Pack/CPC New Style.....	A10008216
1f	1	Motor, blower.....	509092
1g	1	Coupling, pump to motor	509086
1h	1	Pump, burner fuel.....	509094
**	1	Pump, burner fuel- Internal Fuel Shut-off Valve.....	509109
1i	1	Electrode, igniter set.....	509089
1j	1	Mounting Flange	509071
**	1	Blower Fan Wheel.....	509069
2	1	Fuel retention head, F3 (for .75 to 1.25 gph).....	P10005134
3	1	Nozzle, 1.0 gph. 80°	P10005123
**	1	Fuel Filter Element.....	509078

** Not Shown

Note: Indented item numbers with letter suffix are included with preceding item number.
Nozzle GPH rated at 100 psi. Match nozzle and fuel retention head with that installed.

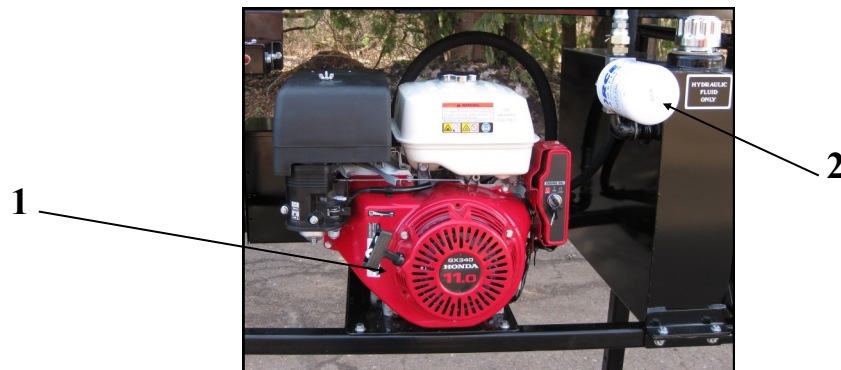
TROUBLE SHOOTING

Misc.



ITEM	QTY	DESCRIPTION	PART#
1	2	ON/OFF Toggle Switch SPST	P10000180
2	1	Lock Out Light	P10000181

QTY	DESCRIPTION	PART #
1	Hydraulic Motor-22.6 ci	510004
1	Chain Coupling Half, 5016x 1 1/2" bore	507009
1	Coupling Chain, 5016	P10006438
1	Chain Coupling Half, 5016 x 1" bore	P10004956-002
2	Key, 3/8" x 3/8"	P10002021
1	Hydraulic Pump .4 Cu In Eaton	P10002735
1	Chain Coupling Half, 4016x 5/8" bore	P10004555-001
1	Coupling Chain, 4016	P10004556
1	Chain Coupling Half, 4016 x 1" bore	P10004555-004



ITEM	QTY	PART#	DESCRIPTION
1	1		HONDA Engine
2	1		Hydraulic Filter



Consumer Warranty Guide



Introduction

Congratulations on your purchase of equipment built by Stepp Manufacturing for your asphalt maintenance needs. Your equipment has been designed and constructed to give you the most in performance, ease of use, and reliability. It is our desire that you will find operating the equipment both productive and profitable.

Warranty Procedures Through A Dealer

If your equipment requires repair, or needs parts for repair, please contact your area dealer. For repairs, the unit must be brought to the dealer for warranty. The dealer will require purchase date information, where the machine was purchased, and the Vehicle Identification Number (VIN) of the equipment. This information is needed so the dealer can submit a warranty claim. The dealer will repair your equipment, once warranty is approved, at no charge to you under the provisions of the warranty policy.

Warranty Procedures Direct Through The Factory *(when no servicing dealer is available in your area)*

Contact Stepp Manufacturing's Customer Service Department at (651) 674-4491.

In this situation, it may be advantageous for you to repair the machine and be reimbursed direct from the factory for warranty repairs. If you do not have the facilities, or the technicians, to perform the repair, the unit can be brought to a local repair facility. In either case, Stepp Manufacturing **MUST** be contacted and authorize the warranty repair **PRI-OR** to any work being performed. If work is done prior to authorization, the warranty will not be honored.

If parts are required for the warranty repair, contact Customer Service at Stepp Manufacturing for replacements. When warranty replacement parts are shipped to you, a Warranty Authorization Number will be issued. If asked to return the defective parts, "tag" the defective parts with the Warranty Authorization Number, then package them in the same box the new parts were shipped in. Ten (10) business days will be allowed for return of the defective parts. If the defective part is not received back at the factory within this allotted time, the warranty will not be honored.

You will be billed for all parts shipped that require returning of defective parts. However, when the defective parts are returned and evaluated, you will receive credit for the cost of the part only. Thus, it is important that all defective parts are turned to Stepp Manufacturing in the allotted ten (10) day period.

Engine Warranty Claims

When a warranty issue develops with the engine, bring the unit to the engine manufacturer nearest authorized service center for repair. Be prepared to supply them with proof of purchase information with purchase dates.

Stepp Manufacturing cannot process engine warranty claims. However, we will be happy to offer assistance in locating the nearest service center.

Equipment Owner Responsibilities

As the equipment owner, you are responsible for:

- Using the equipment in accordance with the correct operating procedures as shown in the operators manual.
- Assuring all maintenance items are completed in accordance with the operators/maintenance manuals.
- Transporting the equipment to the place where warranty repairs can be completed.
- Supplying purchase date and VIN information to establish warranty coverage.



General Warranty Statement
Stepp Manufacturing's One (1) Year Limited Warranty

Stepp Manufacturing Co., Inc. hereby warrants, to the original purchaser of new equipment, that products manufactured by Stepp Manufacturing will be free from defects in material and workmanship for a period of one (1) year from the date of purchase from Stepp Manufacturing.

Stepp Manufacturing, at its discretion, will provide for the repair or replacement of any part found, upon examination by Stepp Manufacturing, to be defective, except as noted below. Such repair or replacement shall be free of charge to the original purchaser of new equipment for a period of one (1) year from the date of purchase, except as noted below.

No warranty is extended to cover:

- Product pump wear or damage caused by foreign objects.
- Routine maintenance, cleaning, and adjustments.
- Parts or components that have been altered, misused, improperly adjusted, or improperly maintained.
- Transportation to and from the place of warranty repair.
- Removal of materials from equipment.

The following items are covered solely by their manufacturer's warranty:

- Engines
- Hydraulic components
- Burners
- Pumps
- Axles
- Tires
- Other component parts not solely manufactured by Stepp Manufacturing

The following items are covered by a pro-rata warranty:

- Hoses that carry heated materials
- Heating elements for material hoses and wands

Disclaimer of further warranty:

Stepp Manufacturing makes no warranty, expressed or implied, other than this warranty. The implied warranties of merchantability and fitness for a particular purpose are hereby disclaimed. Repair or replacement of products or parts proving to be defective in material or workmanship shall be the exclusive remedy for breach of this warranty.

Stepp Manufacturing shall not be liable for incidental or consequential damages. Including, but not limited to, damages for inconvenience, rental or purchase of replacement equipment, loss of profits, or other loss resulting from breach of this warranty.

Stepp Manufacturing reserves the right to incorporate any changes in design into its products without obligation to make such changes on products previously manufactured.



**Twelve (12) Month Pro-Rata Limited Warranty
Heated Asphalt Hose and Heating Elements**

Effective for Equipment Delivered After 5/1/2012

Stepp Manufacturing Co., Inc. hereby warrants to the original purchaser, on a pro-rated basis, that the heated asphalt hose and heating elements installed on NEW Stepp Manufacturing's equipment shall be free from defects in material and workmanship for period of twelve (12) months for the heated asphalt hose and six (6) months for the heating element.

In the event that a heated asphalt material hose or a heating element fails under normal use during the warranty period, Stepp Manufacturing will supply a replacement heated asphalt hose or heating element, along with one-half (0.5) hour for installation labor on a pro-rated adjustment basis.

- If the failure occurs under normal use within the first three (3) months from date of purchase, Stepp Manufacturing will supply a replacement, and provide for one-half (0.5) hour installation labor at no charge to the customer.
- If the failure occurs under normal use within the fourth (4th) through twelfth (12th) months, Stepp Manufacturing will supply a replacement, and provide for one-half (0.5) hour installation labor on a pro-rata basis.

The pro-rated adjustment is based on the total number of months elapsed since the purchase date of the new equipment from Stepp Manufacturing. This rate is then applied to the one-half (0.5) hour labor rate and the current suggested retail price of the proper replacement heated asphalt hose or heating element supplied by Stepp Manufacturing. This is the amount the customer will have to pay. Freight will not be included in the reimbursement. If a new heated asphalt hose or heating element is needed prior to warranty inspection, you will be billed for all parts shipped that require returning of defective parts. However, when the defective parts are returned and evaluated, you will receive credit for the cost of the part only. **Thus, it is important that all defective parts are turned in to Stepp Manufacturing in the allotted ten (10) day period, or warranty will be denied.**

In no case will the warranty coverage extend beyond the six (6) month period for the heating element or the twelve (12) month period for the heated asphalt hose, from the original purchase date of the new equipment from Stepp Manufacturing. *Physical damage is not covered by this warranty.* Physical damage may include, but is not limited to:

- Broken heating element (typically caused by repeated bending to less than a one (1) foot radius).
- Heated asphalt hoses burnt from the inside (typically caused by operating the heating element in an empty hose).
- External cuts or abrasions on the heated asphalt hose (typically caused by dragging on the ground).

The chart below shows the pro-rated amount, by percentage, that will be allowed by warranty, pending examination of the heated asphalt hose or heating element.

Heated Asphalt Hose		
Failure Date	Warranty's Responsibility	Customer's Responsibility
0-3 Months <i>0-90 Days</i>	100%	0%
3-6 Months <i>91-180 Days</i>	70%	30%
6-7 Months <i>181-211 Days</i>	60%	40%
7-8 Months <i>212-242 Days</i>	50%	50%
8-9 Months <i>243-273 Days</i>	40%	60%
9-10 Months <i>274-304 Days</i>	30%	70%
10-11 Months <i>305-335 Days</i>	20%	80%
11-12 Months <i>336-365 Days</i>	10%	90%
After 12 Months	0%	100%

Heating Element		
Failure Date	Warranty's Responsibility	Customer's Responsibility
0-3 Months <i>0-90 Days</i>	100%	0%
3-4 Months <i>91-121 Days</i>	60%	40%
4-5 Months <i>122-152 Days</i>	40%	60%
5-6 Months <i>153-180 Days</i>	20%	80%
After 6 Months	0%	100%



Warranty Claim Authorization Number: _____
 Call Customer Service at 651-674-4491 to obtain prior approval or warranty will be denied.
 Date of Authorization Request _____

Equipment Owner		Warranty to be Performed by	
Customer Name		Company Name	
Street Address		Address	
City/State/Zip		City/State/Zip	
Equipment Model #		Contact Name	
Equipment VIN		Contact Phone #	
Hour Meter Read			
Purchase Date		Date of Malfunction	
Dealer Purchased Form		Date of Repair	

Warranty Authorization		Signature for Authorization	
Date of Malfunction		X	
Date of Repair			

Symptoms / Diagnostics / Action		
Symptoms	Diagnostics	Action
<i>Describe the symptoms in detail, be as specific as possible. Ex: Burner ignites and runs for 35 seconds, then goes out.</i>	<i>Describe issues found, be as specific as possible. Ex: Part failed due to loose connection, resulting in misalignment and premature wear.</i>	<i>Describe action taken, be as specific as possible. Ex: Removed damaged section of wire harness, soldered new leads in place, and insulated splices w/ heat shrink tubing.</i>

Parts and Labor				
Labor Time to Correct Problem (reimbursed at \$55/hour)		Parts Used to Correct Problem		
Labor Time (in hours)	Repair Made	Part Number	Description	Qty

Parts Return

All parts returned must be tagged with the warranty authorization number and a copy of this claim. Retain all parts until credit is received from the factory. When requested, return the parts, along with this claim, to:

Stepp Manufacturing Co., Inc.
Attn: Warranty Department
12325 River Road
North Branch MN 55056

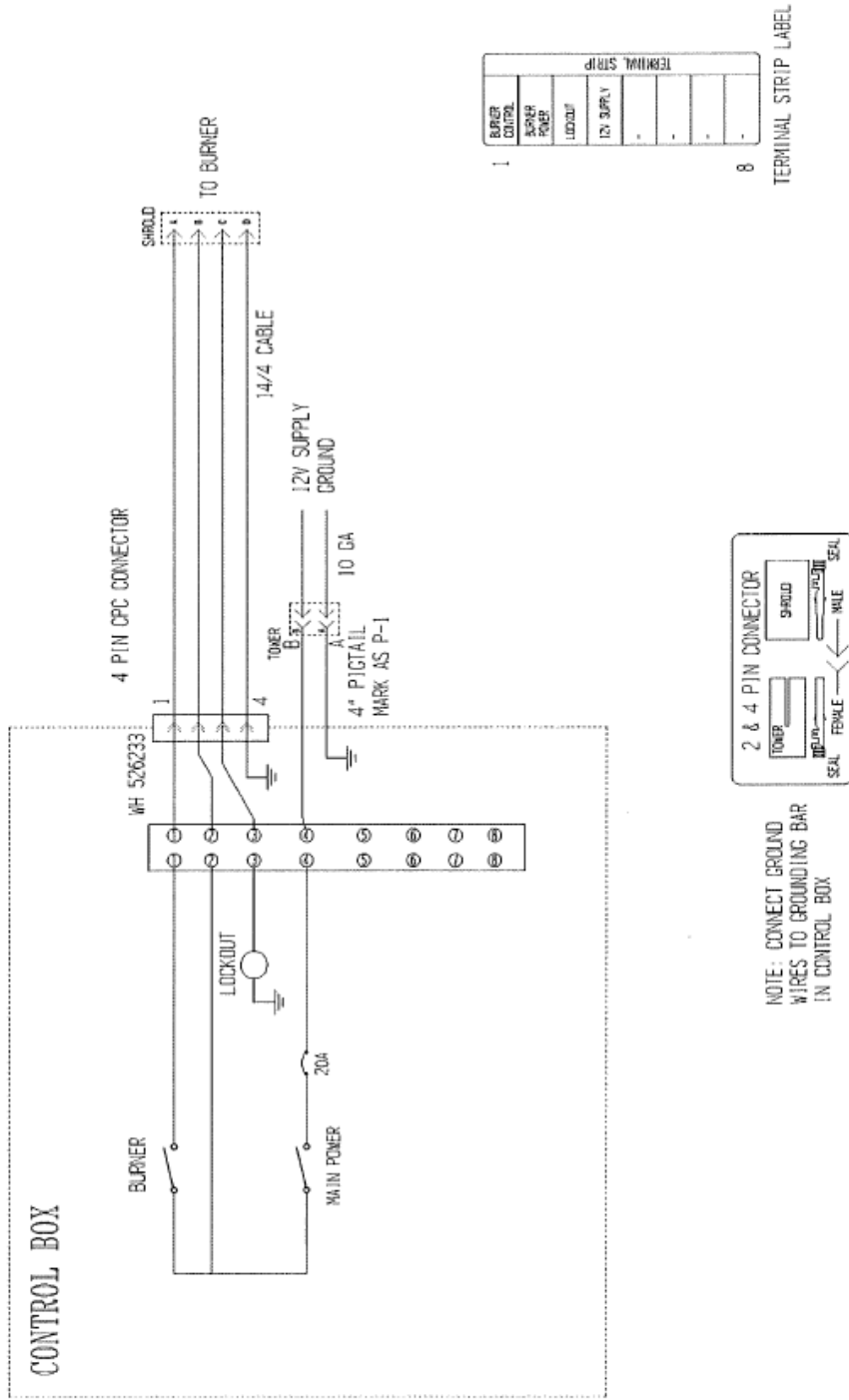
***Note:** If defective parts are not returned within 10 days, or this warranty claim does not accompany the returned parts, the claim will be denied.

Office Use Only			
Date Claim/Parts Received?		Is this a warrantable claim?	Yes No
Claim Reviewed By:		Original Invoice # for Parts	
Date of Review:			

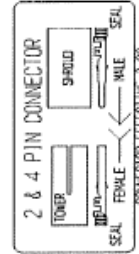
Warranty Totals

SCHEMATICS

MANUAL BURNER CONTROL WIRING



NOTE: CONNECT GROUND WIRES TO GROUNDING BAR IN CONTROL BOX



SHOP NOTES	MACHINE CODE
STANDARD SHOP TOLERANCE	LOCK FORMER: -
UNLESS OTHERWISE NOTED:	WIEDEMANN: -
$\pm 1/16"$ & $\pm 1^\circ$	LARGE BRAKE: -

PROJECT:	MANUAL BURNER CONTROLS
ASS'Y:	MANUAL BURNER CONTROLS
PART NAME:	WIRING DIAGRAM
FILE NAME:	12V18H
INV AMT EA:	-
QTY:	1
JOB NO.:	AS NOTED
MAT'L:	AS NOTED

TIRE SAFETY INFORMATION

1. Tire Safety Information

This portion of the user's manual contain tire safety information as required by 49 CFR 575.6.

Section 2.0 contains “Steps for determining correct load limit-trailer”

Section 2.2 contains “ Steps for determining correct load limit-tow vehicle”

Section 2.3 contains a Glossary of Tire Terminology, including “cold” inflation pressure,” “ maximum inflation pressure” , recommended inflation pressure”, and other non-technical terms.

Section 2.4 contains information from NHTSA brochure entitled “ Tire Safety-Everything Rides On It”. This brochure as well as the preceding subsections, describes the following items:

- Tire labeling, including a description and explanation of each marking on the tires, and information about the DOT Tire Identification Number (TIN)
- Recommended tire inflation pressure, including description and explanation of :
 - A. Cold Inflation Pressure
 - B. Vehicle Placard and location of vehicle
 - C. Adverse safety consequences of under inflation (including tire failure)
 - D. Measuring and adjusting air pressure for proper inflation
- Tire Care, including maintenance and safety practices
- Vehicle load limits, including a description and explanation of the following items:
 - A. Locating and understanding the load limit information, total load capacity, and cargo capacity
 - B. Calculating total and cargo capacities with varying seating configurations including Quantitative Examples showing/ illustrating how the vehicles cargo and luggage capacity decreases as combined number and size of occupant increases. This item is also discussed in section 3
 - C. Determining compatibility of tire and vehicle load capabilities
 - D. Adverse Safety consequences of overloading on handling and stopping tires

1.1 Steps for Determining Correct Load Limit-Trailer

Determining the load limits of a trailer includes more than understanding the load limits of the tires alone. On all trailers there is a Federal Certification/ VIN label that is located on the forward half of the left (road) side of the unit. This certification/ VIN label will indicate the trailer's Gross Vehicle Weight Rating (GVWR). This is the most particular axle can weigh. If there are multiple axles, the GVWR of each axle will be provided.

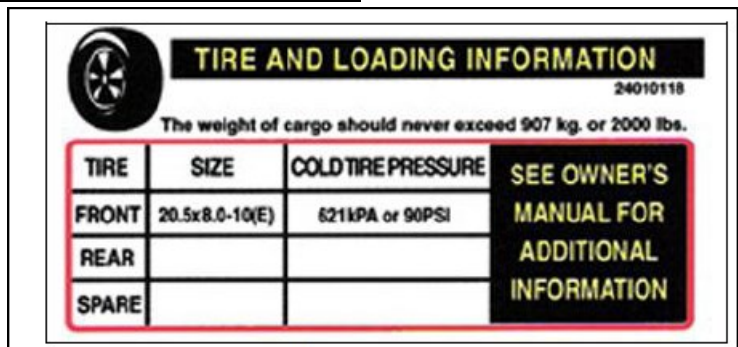
If your trailer has a GVWR of 10,000 pounds or less, there is a vehicle placard located in the same location as the Certification label described above. This placard provides tire and loading information. In addition, this placard will show a statement regarding maximum cargo capacity. Cargo can be added to the trailer, up to the maximum weigh specified on the placard. The combined weigh of the cargo is provided as a single number. In any case, remember: the total weight of a fully loaded trailer can not exceed the stated GVWR.

For trailers with living quarters installed, the weight of water and propane also need to be considered. The weight of fully filled propane containers is considered part of the weight of the trailer before it is loaded with cargo, and is not considered part of the disposable cargo load. Water however, is a disposable cargo weight about 800 pounds. If more cargo is being transported, water can be off-loaded to keep the total amount of cargo added to the vehicle with the limits of the GVWR so as not to overload the vehicle. Understanding this flexibility will allow you, the owner, to make choices that fit your travel needs.

When loading your cargo, be sure it is distributed evenly to prevent overloading front to back and side to side. Heavy items should be placed low and as close to the axle positions as reasonable. Too many items on one side may overload a tire. The best way to know the actual weigh of the vehicle is to weigh it at a public scale. Talk to our dealer to discuss the weighing methods needed to capture the various weights related to the trailer. This would include the weight empty or unloaded, weights per axle, wheel, hitch or king-pin, and total weight.

Excessive loads and/or under inflation cause tire overloading and, as a result abnormal tire flexing occurs. This situation can generate an excessive amount of heat within the tire. Excessive heat may lead to tire failure. It is the air pressure that enables a tire to support the load., so proper inflation is critical. The proper air pressure may be found on the

1.1.1 Trailers 10,000 Pounds GVWR or Less



Tire and Loading Information Placard-Figure 1

1. Locate the statement, “The weight of cargo should never exceed XXX kg or XXX lbs.” on your vehicle’s placard. See figure1-1
2. This figure equals the available amount of cargo and luggage load capacity
3. Determine the combined weight of luggage and cargo being loaded on the vehicle. The weight may not safely exceed the available cargo and luggage load capacity.

The trailer’s placard refers to the tire information placard attached adjacent to or near the trailer’s VIN (certification) label at the left front of the trailer.

1.1.2. Trailers Over 10,000 LBS. GVWR (Note: These are not required to have a tire information placard on the vehicle)

1. Determine the empty weight of your trailer by weighting the trailer using a public scale or other means.
 - This step does not have to be repeated
2. Locate the GVWR (Gross Vehicle Weight Rating) of the trailer on your trailer’s VIN (certification) label.
3. Subtract the empty weight of your trailer from the GVWR stated on the VIN label. That weight is the maximum available cargo capacity of the trailer and may not be safely exceeded.

1.2. Steps for Determining Correct Load Limit-Tow Vehicle

1. Locate the statement, “ The combined weight of occupant and cargo should never exceed XXX LBS., ‘ on your vehicle’s placard
2. Determine the combined weight of the driver and passengers from who will be riding in your vehicle.
3. Subtract the combined weight of the driver and passengers from XXX Kilograms or XXX LBS.
4. The resulting figure equals the available amount of cargo and luggage capacity. For example. If the “XXX” amount equals 1400 LBS. and there are five 150 LB. passengers in your vehicle, the amount of available cargo and luggage capacity is 650 LBS. (1400-750 (5X150) = 650 LBS.)
5. Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo and luggage capacity calculated in step #4
6. If your vehicle will be towing a trailer, load from your trailer will be transferred to your vehicle. Consult the tow vehicle’s manual to determine how this weight transfer reduces the available cargo and luggage capacity of your Vehicle.

1.3 Glossary Of Tire Terminology

Accessory Weight

The combined weight (in excess of those standard items which may be replaced) of automatic transmission, power steering, power brakes, power windows, power seats radio and heater, to extent that these items are available as factory-installed equipment (whether installed or not)

Bead

The part of the tire is made of steel wires, wrapped or reinforced by ply cords and that is shaped to fit the rim

Blas ply tire

A pneumatic tire in which ply cords that extend to the beads are laid at alternate angles substantially less than 90 degrees to the centerline of the tread

Carcass

The tire structure, except tread and sidewall rubber which, when inflated, bears the load

Chunking

The breaking away of pieces of the tread or sidewall

Cold Inflation Pressure

The pressure in the tire before you drive

Cord

The strands forming the piles in the tire

Cord Separation

The parting of cords from adjacent rubber compounds

Cracking

Any parting within the tread, sidewall, or inner liner of the tire extending to cord material

CT

A pneumatic tire with an inverted flange tire and rim system in which the rim is designed with rim flanges pointed radially inward and the tire is designed to fit on the underside of the rim in a manner that encloses the rim flanges inside the air cavity of the tire

Curb Weight

The weight of a motor vehicle with standard equipment including the maximum capacity of fuel, oil, and coolant, and, if so equipped, air conditioning and additional weight optional engine

Extra Load Tire

A tire designed to operate a higher loads and at higher inflation pressures than the corresponding standard tire

Groove

The space between two adjacent tread ribs

Gross Axle Weight Rating

The maximum weight that any axle can support, as published on the certification/VIN label on front left side of the trailer. Actual weight determined by weighing each axle on public scale, with the trailer attached to the towing vehicle

Hitch Weight

The downward force exerted on the hitch ball by the trailer coupler

Interliner

The layer (s) forming the inside surface of a tubeless tire that contains the inflating medium within the tire

Innerliner Separation

The parting of the innerliner from cord material in the carcass

Intended Outboard Sidewall

The sidewall that contains a white-wall, bears white lettering or bears manufacturer, brand, and/or model name molding that is higher or deeper than the same molding on the other sidewall of the tire or the outward facing sidewall of an asymmetrical tire that has a particular side that must always face outward when mounted on a vehicle.

Light Truck (LT) Tire

A tire designated by its manufacturer as primarily intended for use on lightweight trucks or multipurpose passenger vehicles.

Load Rating

The maximum load that a tire is rated to carry for a given inflation pressure

Maximum Load Rating

The load rating for a tire at the maximum permissible inflation pressure for that tire

Maximum Loaded Vehicle Weight

The sum curb weight, accessory weight, vehicle capacity weight, and production options weight

Measuring Rim

The rim on which a tire is fitted for physical dimension requirements

Pin Weight

The downward force applied to the 5th wheel or gooseneck ball, by the trailer kingpin or gooseneck coupler

Non-Pneumatic Rim

A mechanical device which, when a non-pneumatic tire assembly incorporates a wheel, supports the tire, and attaches, either integrally or separably, to the wheel center member and upon which the tire is attached

Non-Pneumatic Spare Tire Assembly

A non-pneumatic tire assembly intended for temporary use in place of one of the pneumatic tires and rims that are fitted to a passenger car in compliance with requirement of this standard

Non-Pneumatic Tire

A mechanical device which transmits, either directly or through a wheel or wheel center member, the vertical load and tractive forces from roadway to the vehicle, generates the tractive forces that provide that directional control of the vehicle and does not rely on the containment of any gas or fluid or providing those functions

Non-Pneumatic Tire Assembly

A non-pneumatic tire, alone or in combination with a wheel or wheel center member, which can be mounted on a vehicle

Normal Occupant Weight

This means 68 kilograms (150 lbs.) time the number of occupants specified in the second column of Table 1 of 49 CFR 571.110.

Occupant Distribution

The distribution of occupants in a vehicle as specified in the third column of Table 1 of 49 CFR 571.110.

Open Splice

Any parting of any junction of tread, sidewall, or innerliner that extends to cord material

Outer Diameter

The overall diameter of an inflated new tire

Overall Width

The linear distance between the exteriors of the sidewalls of an inflated tire, including elevations due to labeling, decorations, or protective bands or ribs

Ply

A layer of rubber-coated parallel cords

Ply Separation

A parting of rubber compound between adjacent plies

Pneumatic Tire

A mechanical device made of rubber, chemicals, fabric and steel or other materials, that when mounted on an automotive wheel, provides the traction and contains the gas or fluid that sustains the load.

Production Options Weight

The combined weight of those installed regular production options weighing over 2.3 Kilograms (5lbs.) in excess of those standard items which they replace, not previously considered in curb weight or accessory weight, including heavy duty brakes, ride levelers, roof rack, heavy duty battery, and special trim.

Radial Ply Tire

A pneumatic tire in which the ply cords that extend to the beads are laid at substantially 90 degrees to the centerline of the tread

Recommended Inflation Pressure

This is the inflation pressure provided by the vehicle manufacture on the Tire Information Label and on the Certification/VIN tag.

Reinforced Tire

A tire designed to operate at higher loads and at higher inflation pressures than the corresponding standard tire.

Rim

A metal support for a tire or a tire and tube assembly upon which the tire beads are seated

Rim Diameter

This means the rim diameter and width

Rim Type Designation

This means the industry of manufacturer's designation for a rim by style or code

Rim Width

This means the normal distance between rim flanges

Section Width

The linear distance between the exteriors of the sidewalls of an inflated tire, excluding elevations due to labeling, decoration, or protective bands.

Sidewall

That portion of a tire between the tread and bead

Sidewall Separation

The parting of the rubber compound from the cord material in the sidewall

Special Trailer (ST) Tire

The "ST" is an indication the tire is for trailer use only

Test Rim

The rim on which a tire is fitted for testing and may be an rim listed as appropriate for use with that tire

Tread

That portion of a tire that comes into contact with the road

Tread Rib

A tread section running circumferentially around a tire

Treadwear Indicators (TWI)

The projections within the principal grooves designed to give a visual indication of the degrees of wear of the tread

Vehicle Capacity Weight

The rated cargo and luggage load plus 68 kilograms (150 lbs.) times the vehicle's designated seating capacity

Vehicle Maximum load On The Tire

The load on an individual tire that is determined by distributing to each axle its share of the curb weight, accessory weight, and normal occupant weight (distributed in accordance with Table 1 of CRF 49 571.110) and dividing by 2

Weather Side

The surface area of the rim not covered by the inflated tire

Wheel Center Member

In the case of a non-pneumatic tire assembly incorporating a wheel, a mechanical device which attaches, either integrally or separably, to the non-pneumatic tire assembly not incorporating a wheel, a mechanical device which attaches, either integrally or separably, to the non-pneumatic tire and provides the connection between tire and the vehicle

Wheel Holding Fixture

The fixture used to hold the wheel and tire assembly securely during testing

1.4. Tire Safety-Everything Rides On It

The national Traffic Safety Administration (NHTSA) has published a brochure (DOT HS 809 361) that discusses all aspects of Tire Safety, as required by CFR 575.6 This brochure is reproduced in part below. It can be obtained and downloaded from NHTSA, free of charge, from the following website:

<http://www.nhtsa.dot.gov/cars/rules/TireSafety/ridesonit/tireindex/html>

Studies of tire safety show that maintain proper tire pressure, observing tire and vehicle load limits (not carrying more weight in your vehicle than your tires or vehicle can safely handle), avoiding road hazards, and inspecting tires for cuts, slashes, and other irregularities are most important things you can do to avoid tire failure, such as tread separation or blowout and flat tires. These actions, along with other care and maintenance activities, can also:

- Improve vehicle handling
- Help protect you and others from avoidable breakdowns and accidents
- Improve fuel economy
- Increase the life of your tires

This booklet presents a comprehensive overview of tire safety, including information on the following topics:

- Basic tire maintenance
- Uniform Tire Quality Grading System
- Fundamental characteristics of tires
- Tire safety tips

Use this information to make tire safety a regular part of your vehicle maintenance routine. Recognize that the time you spend is minimal compared with inconvenience and safety consequences of a flat tire or other tire failure.

1.5. Safety First-Basic Tire Maintenance

Properly maintained tires improve the steering, stopping, traction and load-carrying capability of your vehicle underinflated tires and over loaded vehicles are a major cause of tire failure. Therefore as mentioned above, to avoid flat tires and other types of tire failure, you should maintain proper tire pressure, observe tire and vehicle load limits, avoid road hazards, and regularly inspect your tires.

1.5.1 Finding you vehicle's recommended tire pressure and load limits

Tire information placards and vehicle certification labels contain information on tires and load limits. These limits indicate the vehicle manufacturer's information including:

- Recommended tire size
- Recommended tire inflation pressure
- Vehicle capacity weight (VCW-the maximum occupant and cargo weight a vehicle is designed to carry)
- Front and rear gross axle weight ratings (GAWR-the maximum weight the axle systems are designed to carry)

Both placards and certification labels are permanently attached to the trailer near the left front

1.5.2. Understanding Tire Pressure and Load Limits

Tire inflation pressure is the level of air in the tire that provides it with load-carrying capacity and affects the overall performance of the vehicle. The tire inflation pressure is a number that indicates the amount of air Pressure-measured in pounds per square inch (psi) -a tire requires to be properly inflated. (you will also find this number on the vehicle information placard expressed in kilopascals (kpa), which is the metric measure used internationally)

Manufacturers of passenger vehicles and light truck determined this number based on the vehicle's design load limit, that is , the greatest amount of weight a vehicle can safely carry and the vehicles tire size. The proper tire pressure for your vehicle is referred to as the “ recommended cold inflation pressure” (As you will read below, it is difficult to obtain the recommended tire pressure if your tires are not cold) because tires are designed to be used on more than one type of vehicle, tire manufactures list the “maximum” permissible inflation pressure” on the tire sidewall. This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.

1.5.3. Checking Tire Pressure

It is important to check your vehicle's tire pressure at least once a month for the following reasons:

- Most tire may naturally lose air over time
- Tire can lose air suddenly if you drive over pothole or other object or if you strike the curb when parking.
- With radial tires, it is usually not possible to determine underinflation by visual inspection

For convenience, purchases a tire pressure gauge to keep in your vehicle. Gauges can be purchased at tire dealerships, auto supply stores, and other retail outlets.

The recommended tire inflation pressure that vehicle manufacturers provide reflects the proper psi when a tire is cold. The term cold does not relate to the outside temperature. Rather, a cold tire is one that has not been driven on for at least three hours. When you drive, your tires get warmer, causing the air pressure within them to increase. Therefore, to get an accurate tire pressure reading, you must measure tire pressure when the tires are cold or compensate for extra pressure in warm tires.

1.5.4. Steps For Maintaining Proper Tire Pressure

- **Step 1:** Locate the recommended tire pressure on the vehicle's tire information placard, certification label, or the owner's manual.
- **Step 2:** Record the tire pressure of all tires
- **Step 3:** If the tire pressure is too high in any of the tires, slowly release air by gently pressing on the tire valve stem with the edge of your tire gauge until you get to the correct pressure
- **Step 4:** If the tire pressure is too low, note the difference between the measured and the correct tire pressure. These “missing” pounds of pressure are what you will need to add
- **Step 5:** At a service station, add the missing pounds of air pressure (except in cases in which the front and rear tires are supposed to have different amounts of pressure)

If you have been driving your vehicle and think that a tire is underinflated, fill it to the recommended cold inflation pressure indicated on your vehicle's tire information placard or certification label. While your tire may still be slightly underinflated due to the extra pounds of pressure in the warm tire, it is safer to drive air pressure that is slightly lower than the vehicle manufacturer's recommended cold inflation pressure than to drive with a significantly underinflated tire. Since this is a temporary fix, don't forget to recheck and adjust the tire's pressure when you can obtain a cold reading.

1.5.5. Tire Size

To maintain tire safety, purchase new tires that are the same size as the vehicle's original tires or another size recommended by the manufacturer. Look at the tire information placard, the owner's manual, or the sidewall of the tire you are replacing to find this information. If you have any doubt about the correct size to choose, consult with the tire dealer.

1.5.6. Tire Tread

The tire tread provides the gripping action and action traction that prevent your vehicle from slipping or sliding, especially when the road is wet or icy. In general, tires are not safe and should be replaced when the tread is worn down to 1/16 of an inch. Tire have built-in tread wear indicators that let you know when it is time to replace your tires. These indicators are raised sections spaced intermittently in the bottom of the tread grooves. When they appear "even" with the outside of the tread with Lincoln's head upside down and facing you. If you can see the top of Lincoln's head, you are ready for new tires.

1.5.7. Tire Balance and Wheel Alignment

To avoid vibration or shaking of the vehicle when a tire rotates, the tire must be properly balanced. This balance is achieved by positioning weights on the wheel to counterbalance heavy spots on the wheel-and-tire assembly. A wheel alignment adjusts the angles of the wheels so that they are positioned correctly relative to the vehicle's frame. This adjustment maximizes the life of your tires. These adjustments require special equipment and should be performed by a qualified technician.

1.5.8. Tire Repair

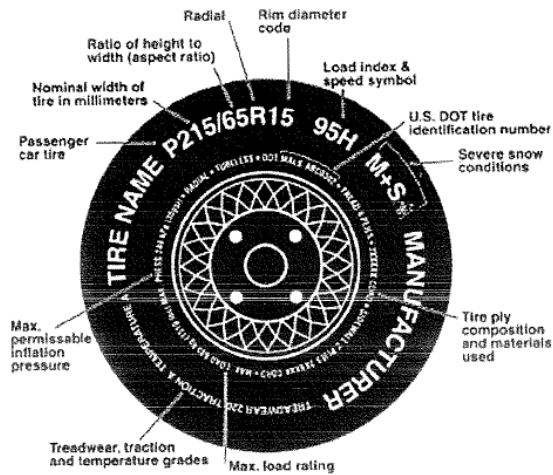
The proper repair of a punctured tire requires a plug for the hole and a patch for the area inside the tire that surrounds the puncture hole. Punctures through the tread can be repaired if they are not too large, but punctures to the sidewall should be repaired. Tires must be removed from the rim to be properly inspected before being plugged and patched.

1.5.9. Tire Fundamentals

Federal Law requires tire manufactures to place standardized information on the sidewall of all tires. This information identifies and describes the fundamental characteristics of the tire and also provides a tire identification number for safety standard certification and in case of a recall.

1.5.9.1. Information on Passenger Vehicle Tires

Please Refer to the Diagram Below



P

The “P” indicates the tire is for passenger vehicles

Next Number

This three-digit number gives the width in millimeters of the tire from sidewall edge to sidewall edge. In general, the larger the number, the wider the tire.

Next Number

This two digit number, known as the aspect ratio, gives the tire’s ration of height to width. Numbers of 70 or lower indicate a short sidewall for improved steering response and better overall handling on dry pavement.

R

The “R” stands for radial. Radial ply construction of tires has been the industry standard for the past 20 years

Next Number

This two-digit number is the wheel or rim diameter in inches. If you change your wheel size, you will have to purchase new tires to match the new wheel diameter.

Next Number

This two-or three digit number is the tire’s load index. It is a measurement of how much weight each tire can support. You may find this information in your owner’s manual.

M + S

The “M + S” or “M/S” indicates that the tire has some mud and snow capability. Most radial tires have these markings; hence they have some mud and snow capability.

Speed Rating

The speed rating denotes the speed at which a tire is designed to be driven for extended periods of time. The ratings range from 99 miles per hour (mph) to 186 mph. These ratings are listed below. Note: You many not find this information on all tires because it not required by law.

Tire Safety Information

Letter Rating	Speed Rating
Q	99 Mph
R	106 Mph
S	112 Mph
T	118 Mph
U	124 Mph
H	130 Mph
V	149 Mph
W	168* Mph
Y	186* Mph

* For tires with a maximum speed capability over 149 mph, tire manufacturers sometimes use the letters ZR. For those with a maximum speed capability over 186 mph, tire manufacturers always use the letters ZR

U.S. DOT Tire Identification Number

This begins with the letters “DOT” and indicates that the tire meets all federal standards. The next two numbers or letters are the plant code where it was manufactured, and the last four numbers represent the week and year the tire was built. For example, the numbers 3197 means the 31st week of 1997. The other numbers are marketing codes used at the manufacturer’s discretion. This information is used to contact consumers if a tire defect requires a recall.

Tire Ply Composition and Materials Used

The number of plies indicates the number of layers of rubber-coated fabric in tire. In general, the greater the number plies, the more weight a tire can support. Tire manufacturers also must indicate the materials in the tire, which include steel, nylon, polyester, and others

Maximum Load Rating

This number indicates the maximum load in kilograms and pounds that can be carried by the tire

Maximum Permissible Inflation Pressure

This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions

1.5.9.2. UTQGS Information

Treadwear Number

This letter indicates the tire’s wear rate. The higher the treadwear number is, the longer it should take for tread wear down. For example, a tire graded 400 should last twice as long as a tire graded 200.

Traction Letter

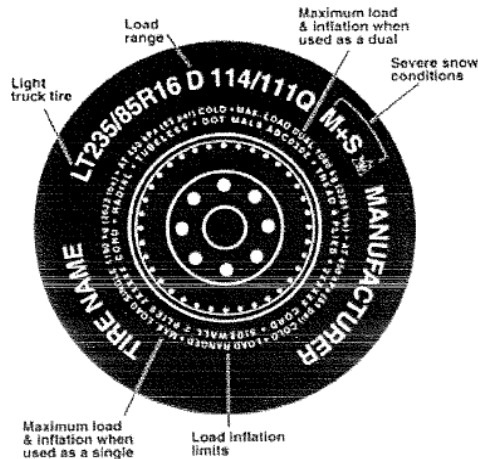
This letter indicates a tire’s ability to stop on wet pavement. A higher graded tire should allow you to stop your car on wet roads in a shorter distance than a tire with lower grade. Traction is graded from highest to lowest as “AA”, “A”, “B”, and “C”.

Temperature Letter

This letter indicates a tire’s resistance to heat. The temperature grade is for a tire that is inflated properly and not overloaded. Excessive speed, underinflation or excessive loading, either separately or in combination, can cause heat build-up and possible tire failure. From highest to lowest, a tire’s resistance to heat is graded as “A”, “B”, or “C”

1.5.9.3. Additional Information on Light Truck Tires

Please refer to the following diagram



Tire for light trucks have other markings besides those found on the sidewalls of passenger tires.

markings besides those found on

LT

The “LT” indicates the tire is for light truck or trailers.

ST

An “ST” is an indication the tire is for trailer use only

Max. Load Dual KG (lbs.) at kPa (psi) Cold

This information indicates the maximum load and tire pressure when the tire is used as a dual, that is, when four tires are put on each rear axle (a total of six or more tires on the vehicle)

Max. Load Single KG (lbs.) at kPa (psi) Cold

This information indicates the maximum load and tire pressure when the tire is used as a single

Load Range

This information identifies the tire’s load-carrying capabilities and its inflation limits

1.6. Tire Safety Tips

Preventing Tire Damage

- Slow down if you have to go over a pothole or other objects in the road
- Do not run over curbs or other foreign objects in the roadway, and try not to strike the curb when parking.

Tire Safety Checklist

- Check tire pressure regularly (at least once a month), including the spare
- Inspect tires for uneven wear patterns on the tread, cracks, foreign objects, or other signs of wear or trauma
- Remove bits of glass and foreign objects wedged in the tread
- Make sure your tire valves have valve caps
- Check tire pressure before going on a long trip
- Do not overload your vehicle. Check the tire information and loading placard or user’s manual of the maximum recommended load for the vehicle

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