KM 4000TEDD ASPHALT HOTBOX RECLAIMER

OPERATORS MANUAL

KM INTERNATIONAL

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THE CHOICE OF ASPHALT PROFESSIONALS WORLDWIDE

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INTRODUCTION

The KM International Team would like to take this opportunity to **THANK YOU** for your purchase of the **KM 4000TEDD**. We at KM International are confident that our Asphalt Hotbox/Reclaimers heater will offer years of safe, reliable and cost effective "ASPHALT HEATING and RECLAMATION."

The KM 4000 Asphalt Hotbox/Reclaimers are designed to maintain Hot Mix Asphalt (HMA) at working temperature for up to three days. Our Hotbox/Reclaimers are specially designed and manufactured at our North Branch Michigan facility to recycle cold-chunked HMA. Solid welded construction stands up to a lifetime of commercial use.

The simple, straight forward design has little to go wrong and makes maintenance easy and cost effective. Safety is a main concern when working with any fuel combustion system and the KM 4000TEDD's diesel system should be no exception.

KM International, Inc. has acquired and developed a number of strengths that has fostered KMI's worldwide reputation in the "ASPHALT REPAIR" industry as the "Gold" and "Green" standards. We are the preeminent authority on the "infrared process" of in-place "surface heating" and "recycle and repair." We have fostered an ongoing industry standard of quality and excellence that continually exceeds our customers' expectations in all of our other product offerings including our "Hot Box/Reclaimer" line of equipment.

Our commitment to the design and manufacture of the highest quality surface maintenance and repair equipment in the market is not just a "quote on the wall" but rather the driving force for the entire KMI team. Our 26 years in the "Asphalt Maintenance" industry has provided KM INTERNATIONAL the necessary experience to provide our customers the "peace of mind" that only knowledge through experience can accomplish; know how that our customers have come to rely on. The Management Team at KM INTERNATIONAL is confident that YOUR purchase of the **KM 4000TEDD** will be the basis for a long standing and profitable relationship.

The Goal at KM INTERNATIONAL has, and will always be, the manufacture of Hotbox/Reclaimers that provide our customers cost savings, purchase justification and profitability.

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SAFETY AND WARNING INFORMATION

NOTICE: ***READ and UNDERSTAND*** all instructions carefully before starting the **KM 4000TEDD**. ***FAILURE TO FOLLOW*** these instructions may result in a possible **fire hazard** and will void the warranty.

WARNING: Any safety screen or guard removed for servicing must be replaced before operating the **KM 4000TEDD**. ***DO NOT USE*** the **KM 4000TEDD** if any part has been damaged or placed under water. Immediately ***CALL*** a qualified service technician to inspect the appliance and to replace any part of the control system which has been damaged.

NOTICE: Maintenance or repair should be performed by a qualified service person. The **KM 4000TEDD** system should be ***INSPECTED*** before initial use and at least annually by a professional **KMI** service person. It is ***IMPERATIVE*** that the unit's control compartment, burners, and circulating air passageways ***ARE KEPT CLEAN*** to provide for adequate combustion and ventilation air. Always keep the **KM 4000TEDD** clear and free from combustible materials, gasoline, and other flammable vapors and liquids. The Combustion chamber should be inspected annually or when evidence of excessive heat exists. This can be evidenced by paint discoloration near or around your KEM101 Beckett burner.

NEVER OBSTRUCT the flow of combustion and ventilation air. Keep the front of the **KM 4000TEDD** ***CLEAR*** of all obstacles and materials for servicing and proper operation.

NOTICE: Children and adults should be alerted to the hazards of high surface temperature and should ***STAY AWAY*** to avoid burns or clothing ignition.

WARNING: Always wear protective clothing, including eye and ear protection, leather protective gloves, long sleeved protective shirt, long pants, and leather protective boots when operating this or any other equipment.

NOTICE: The **KM 4000TEDD** is designed to heat asphalt to a working temperature that should not exceed 350 degrees Fahrenheit. The heated asphalt and the unit will become DANGEROUSLY hot quickly; care and caution must be observed at all times. Be aware of your surroundings. Use caution around buildings, utility wires, combustibles, landscaping, etc. to prevent damage.

IT IS HIGHLY RECOMMENDED THAT YOU HAVE A FIRE EXTINGUISHER ON YOUR JOB SITE AT ALL TIMES.

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Reporting Safety Defects

If you believe that your vehicle has a defect that could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying KM International Inc.

If the NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, the NHTSA cannot become involved in individual problems between you, your dealer, or KM International, Inc.

To contact the NHTSA, you may either call the Vehicle Safety Hotline toll-free at 1-888-327-4236 (TTY:1-800-424-9153), go to http://www.safercar.gov; or write to: NHTSA, 1200 New Jersey Ave SE, Washington, DC 20590. You can also obtain other information about motor vehicle safety from http:www.safercar.gov.

THE KM 4000T IS A TRAILER UNIT

⚠ NOTICE: It is necessary to learn and know all applicable Department of Transportation regulations prior to towing this vehicle.

AXLE RATING:	7,000 LBS. (EACH)
GVWR:	14,000 LBS.
TIRES:	3,520 LBS. capacity each (load range E)
TIRE PRESSURE:	80 PSI cold inflation
BRAKES:	12V Electric; all four tires; safety breakaway feature Optional: Hydraulic brakes; all four tires

⚠ WARNING: Use of a tow vehicle with a towing capacity less than the load rating of the trailer can result in loss of control, and may lead to death or serious injury. Ensure your hitch and tow vehicle are rated for the Gross Vehicle Weight Rating identified on the VIN tag of your trailer.

⚠ WARNING: Be sure that the tow hitch load rating meets or exceeds the GVWR of the trailer. Inspect the tow hitch for wear. Replace if worn, cracked, or corrosion exists. Inspect and ensure that all connecting hardware is tightened and serviceable.

⚠ NOTICE: When connecting the tow vehicle to the trailer ensure to match the tow hitch and trailer hitch size. Inspect that the hitch is securely coupled and safety chains are properly attached before travel.

⚠ WARNING: Inspect and test the safety chains and safety breakaway system before travel. The safety breakaway cable must connect to the vehicle, never connect to the hitch.

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LIGHTS & BRAKES

⚠ NOTICE: Inspect all trailer lighting prior to travel. Inspect rear running tail lights, marker lights, turn signals and brake lights. Ensure that trailer light plug is properly connected to the tow vehicle.

⚠ WARNING: For electric brakes it is necessary for the tow vehicle to signal the trailer electric brakes. Inspect the trailer brakes for operation before travel. Failed trailer brakes can result in a hazardous accident causing injury, or death.

⚠ WARNING: For hydraulic actuated brake systems it is necessary to inspect the hitch actuator, hydraulic tube lines and connections. Inspect for leaks. Inspect the hydraulic fluid level in the brake actuator. . Inspect the trailer brakes for operation before travel. Failed trailer brakes can result in a hazardous accident causing injury, or death.

⚠ NOTICE: A qualified mechanic should inspect the brakes and braking system for proper service and wear.

WHEELS & TIRES

⚠ WARNING: Improper tire pressure can result in loss of control which can lead to death or serious injury. Ensure tires are inflated to the pressure indicated on the side wall of the tire before towing the trailer.

⚠ WARNING: Be sure lug nuts are tight before each trip. Lug nuts can loosen after initial installation. Check lug nuts for tightness after new tire installation at intervals of the first 10, 25 and 50 miles of travel.

⚠ NOTICE: Tighten the lug nuts to 100 ft/lbs. torque. Over tightening will result in breaking the lugs or cause permanent damage resulting in possible wheel failure. Use a calibrated torque wrench to tighten the lug nuts.

The Trailer Handbook, A Guide to Understanding Trailers & Towing Safely, can be purchased through the National Association of Trailer Manufactures, available at www.natm.com.

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KM ASPHALT HOTBOX RECLAIMER

The KM 4000T Asphalt Hotbox/Reclaimer is designed to maintain hot mix asphalt at working temperature for up to three days as well as reclaim, or recycle, cold-chunked hot mix asphalt. The KM 4000T will safely maintain cold mix asphalt at workable temperatures during all seasons. The solid welded construction and straight forward design is simple to use and requires little maintenance.

⚠ NOTICE: Safety is always a concern when working with any fuel combustion system and the KM 4000T diesel fuel burner system is no exception. **WARNING: DIESEL FUEL LEAKS PRESENT A DANGER** and must be corrected prior to operating the burner. Fuel spills should be properly cleaned up prior to system operation.

The burner is designed to burn **No.1 or No.2 Heating Oil (ASTM D396) ONLY.**

⚠ **DANGER: NEVER USE GASOLINE** in the burner as an explosion could result. NEVER use crankcase or waste oil in this burner; contamination could cause burner malfunction.

HOW THE HOT BOX RECLAIMER HEATS

The KM 4000T Diesel heated unit uses a 105,000 BTU, 12 VDC powered fuel oil combustion burner to produce heat inside of the combustion chamber. The heat energy circulates throughout the combustion chamber area heating the asphalt storage bin. Energy is then transferred by conduction through the storage bin walls into the asphalt.

The burner is thermostatically controlled and will automatically cycle on and off to maintain the selected temperature. A full fuel tank should provide 30+ hours of continuous burner operation. Actual operating time between refueling could be longer depending on ambient temperature, temperature setting, and volume of asphalt in the storage bin.

Heat energy circulation and transfer is key to maintaining proper asphalt temperature. Air flow intake and exhaust should never be obstructed. The interior of the asphalt hopper should be kept clean daily to allow optimal conduction from the interior combustion chamber into the asphalt load.

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CLEAINING THE HOTBOX AND TRAILER

NOTICE: Keep the interior asphalt compartment clean daily by scraping with a flat shovel or spade. Use of any release agent, cleaning solvent, or other product on this equipment is not recommended and can damage paint, coatings, lighting, hardware and other equipment components.
Use of any release agent or cleaning solvent will void all specific and implied warranties of this equipment.

CAUTION HOT: The asphalt compartment is heated. Proper personal protective equipment is required.
Allow to sufficiently cool before performing any service or maintenance.

DANGER: Never use gasoline or flammable solvents, including diesel fuel, to clean the asphalt compartment. Fire or explosion can occur resulting in property damage, severe injury or death.

LOADING/UNLOADING THE KM 4000T

WARNING: Always wear protective clothing, including eye and ear protection, leather protective gloves, long sleeved protective shirt, long pants, and leather protective boots when operating this or any other equipment. Be aware of local safety notices including hard hat and eye protection zones.

WARNING: Hot mix asphalt temperatures exceed 300° Fahrenheit (148 Celsius).

LOADING

1. Prior to entering under the asphalt plant, unlatch and open the top filling lids. NOTE: Be sure the filling doors are in the safety latch position when open.

WARNING: NEVER WORK UNDER THE PLANT!
Consult the asphalt plant operating procedures for entering and working within the authority of the asphalt plant or other agencies.

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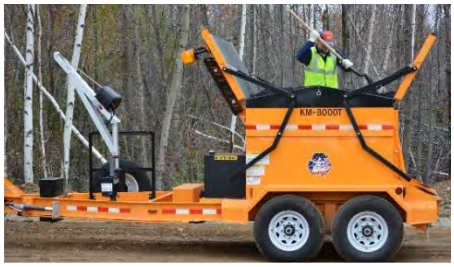
	2. Approach entering the plant while obeying the plant operators' signals and advisements.
	3. Once in position the plant operator will begin filling the hotbox to the requested amount. ⚠ **WARNING: DO NOT LEAVE VEHICLE DURING THIS OPERATION.** 4. Once the hotbox load is achieved the plant operator will signal you to advance from under the plant to a designated area to prepare for travel.
	5. It may be required to manipulate or level the load in order to close the hotbox lids. Before closing the lids be sure there is no debris on the ledge of the hopper that could interfere with the closing operation.
	6. Set desired temperature on controls and inspect the trailer for travel.

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UNLOADING

⚠ **WARNING:** The KM 4000TEDD should always be properly secured to the towing vehicle when unloading asphalt. It is dangerous to lift the dump body when not securely attached to the vehicle.

When it is not required to utilize the dump feature of the hotbox to unload the asphalt. It is simply achieved by an operator by opening the shovels doors until to latch open and using a proper flat asphalt grade shovel to manually shovel the required amount of asphalt into the desired repair.

The 12 Volt powered scissor dump hoist is equipped with a 10' long remote control and RC transmitter that is secured in a weatherproof enclosure. Be aware of your surroundings and stand alongside of the unit when operating the dump.

To operate the corded control just simply depress extend or retract while standing along the side of the machine in a safe viewing area. The machine may be optionally equipped with an RC style remote which can be operated in a 15’ radius from the hydraulic power unit. To operate the RC style unit just depress the “On/Off” button on the remote until a blue LED illuminates. At this point the operator can either extend or retract the hoist. Install the safety prop rod once unit is raised.

⚠ **WARNING:** Never lift the dump when persons are behind the trailer.

⚠ **NOTICE:** Always install the safety prop rod when servicing the hoist.

⚠ **WARNING:** Never go under a raised dump. Injury or death can result.

⚠ **NOTICE:** Always Power off the RC when not in use, this will greatly extend battery life.

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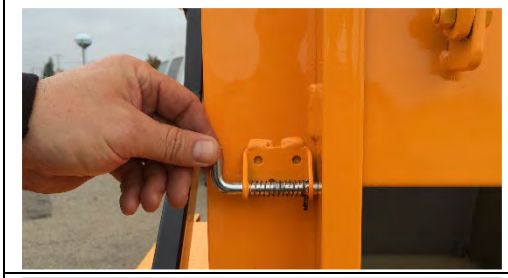

1. Open one or both shovel doors and latch in the open position. Lids must be closed during dumping operation.

⚠ **WARNING: DO NOT OPERATE THE DUMP FEATURE WITH THE SHOVEL DOORS CLOSED. THE LOAD SHIFT CAN CAUSE THE UNIT TO TIP OR CAUSE INTERIOR DAMAGE. ONLY PROPERLY TRAINED PERSONELL SHOULD OPERATE THE DUMP FEATURE.**

2. Using either the RC transmitter or corded remote control, begin to raise the hotbox until the load begins to unload at the user's desired rate.

⚠ **WARNING: STAY CLEAR FROM REAR OF HOTBOX WHILE USING DUMPING METHOD OF UNLOADING.**

⚠ **WARNING: HOTMIX ASPHALT EXCEEDS 300°F (148.89°C). PROPER PROTECTIVE CLOTHING AND EQUIPMENT IS NECESSARY.**

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<table>
<tr>
<td>  </td>
<td>3. Once the desired amount of asphalt has been applied to the repair area, simply disengage the latch for the shovel port door and it will close.

⚠ WARNING: STAY CLEAR FROM REAR OF HOTBOX WHILE USING DUMPING METHOD OF UNLOADING.

4. Pull the hotbox forward away from repair area to allow an operator to continue repair. If the hotbox is desired to be left in the raised position for continued unloading or maintenance/repair, always install the prop rod.</td>
</tr>
<tr>
<td>  </td>
<td>6. Once completely unloaded, lower the hotbox all the way down. At this point it may be required to clean the hopper of any built up asphalt. This is very important step to reduce any potential build up over time that would require more in depth cleaning.

⚠ NOTICE: KEEP THE INTERIOR ASPHALT COMPARTMENT CLEAN DAILY BY SCRAPING WITH A FLAT SHOVEL.

⚠ CAUTION HOT: THE ASPHALT RESEVOIR IS HEATED. PREPER PROTECTIVE CLOTHING IS REQUIRED.

⚠ DANGER: NEVER USE GASOLINE OR FLAMMABLE SOLVENTS, INCLUDING DIESEL FUEL, TO CLEAN THE ASPHALT COMPARTMENT. FIRE OR EXPLOSION CAN OCCUR RESULTING IN PROPERTY DAMAGE, SEVERE INJURY, OR DEATH.</td>
</tr>
</table>

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HOTBOX CONTROLS AND COMPONENTS

	E-Stop		Red Keyed Switch (Battery Disconnect)
	2-Way ON/OFF Toggle Switches		3-Way Momentary Toggle Switch
	Embedded LCD Controller CPC3		Rotary Encoder Switch
	Burner Cover		29 Gallon Fuel Tank
	Diesel Burner		Fuel Level Gauge
	Diesel Fuel Filter		12v DC Deep Cycle Gel Marine Battery
	12 VDC LiFePO4 Battery (Optional)		

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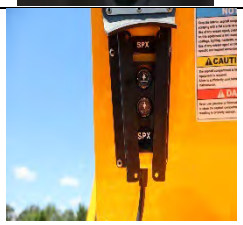
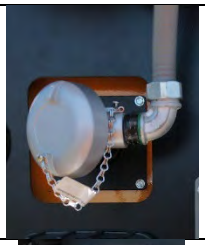
	On-Board Battery Charger		110V AC Power Port
	Corded Dump Controller		2.9 Lbs. Fire Extinguisher
	Hi Limit Thermocouple		Dump Hydraulic Power Unit
	Directional Arrow Bar Control (Optional)		Front Lockable Storage Compartment
	Directional Arrow Bar (Optional)		Trailer Safety Breakaway Battery
	Fuel Deaerator with Filter		Trailer Safety Breakaway Switch

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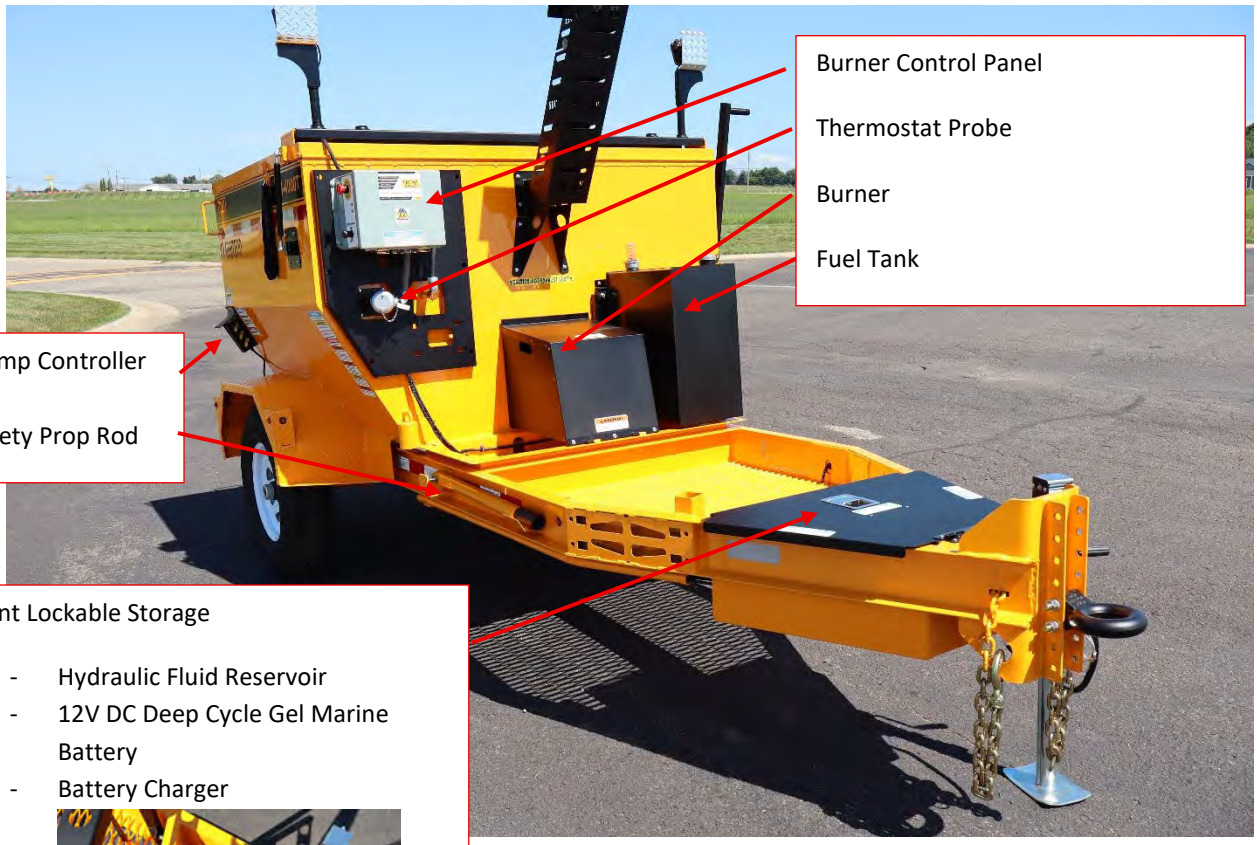
KM 4000TEDD COMPONENT FEATURES



Burner Control Panel

Thermostat Probe

Burner

Fuel Tank

Dump Controller

Safety Prop Rod

Front Lockable Storage

- Hydraulic Fluid Reservoir
- 12V DC Deep Cycle Gel Marine Battery
- Battery Charger

Cantilever Lid Handle

110V AC Power Port

Built In Fender Step and Handle

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BURNER OPERATING INSTRUCTIONS

NOTICE: Only properly trained personnel should operate this equipment. Use No.1 or No.2 Heating Oil (ASTM D396) ONLY.

NEVER USE GASOLINE! WARNING: **Gasoline is more combustible than diesel fuel oil and could result in an explosion**. NEVER use crankcase or waste oil. Fuel unit malfunction could result from contamination.

The KM 4000T Diesel is equipped with a 12 VDC Marine Deep Cycle gel battery to power the fuel oil burner. **CAUTION: Proper burner operation requires 12 Volt minimum**. During mobile operation it is necessary to maintain proper battery voltage through the towing vehicle charging system. A charge wire has been prewired from the battery to the vehicle 7-pin plug. The unit is equipped with a battery charger and should be used every night to ensure the unit has full charge for a day's work.

NOTICE: Never operate burner under 12v DC. Monitor voltage on HMI. For overnight heating or extended heating periods, the unit must be connected to a suitable 12v DC charging system. (110 volt charger supplied with unit.)

HMI (Human Machine Interface)

The KM 4000T is equipped with an HMI that is located on the interior of the control panel. The HMI allows the user to adjust setpoints and obtain technical information such as asphalt temperature, combustion chamber temperature, voltage, and runtime. It is recommended to become familiar with the HMI control and burner operating features before attempting to use the equipment in service.

The temperature reading on the combustion chamber temperature will exceed the asphalt chamber temperature and thermostat setting. This is normal during operation. Should the combustion chamber overheat, the controls will lock out the burner for safety.

NOTICE: If combustion chamber overheating occurs it is recommended to consult a properly trained service technician before attempting to continue operating the burner. Damage may occur that is not covered by the warranty.

NOTICE: Consult state and local codes for the lawful transport of this unit while the burner is operating.

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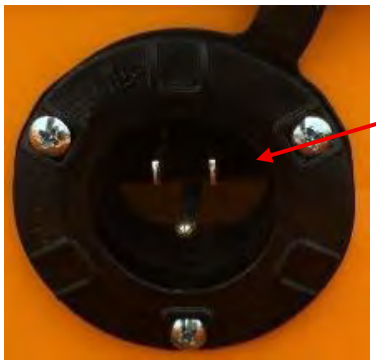
BATTERY OPERATING SYSTEM

The KM Diesel Burner Hotbox is equipped with a 12 VDC battery power supply rated at a minimum of 80 amp hours of capacity. An on board 110 V compatible charging system is equipped for battery maintenance. It is necessary to properly maintain the onboard battery power system for proper equipment and burner operation.

It is necessary to plug the on-board battery charger into a standard 110 VAC, 50/60 Hz grounded outlet during equipment storage and when operating the KM Diesel Hotbox for overnight heating. A standard 15 Amp – 125V - 14 gauge heavy duty extension cord is required to plug into the supplied 110V AC Port socket on the battery charger box.

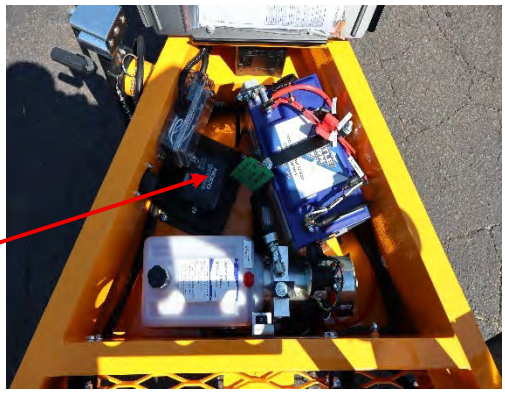
⚠ CAUTION: Failure to maintain battery voltage to a minimum of 12 VDC during burner operation can result in burner or component failure

⚠ NOTICE: Component failure and equipment service caused by low battery voltage due to battery negligence may not be covered by warranty.



110V AC Port Adapter
(Located Front Driver Side of Trailer)

On Board Battery Charger



The standard KM Hotbox trailer is factory wired to support the onboard battery operating system by the tow vehicle auxiliary power supplied at the vehicle trailer plug. It is necessary to consult the tow vehicle manual to confirm availability of the auxiliary power along with the amperage output. The hotbox trailer vehicle charge line includes an inline ATC 20A fuse. Note: Inspect the tow vehicle charging system to ensure it is operating correctly. Inspect all fuses.

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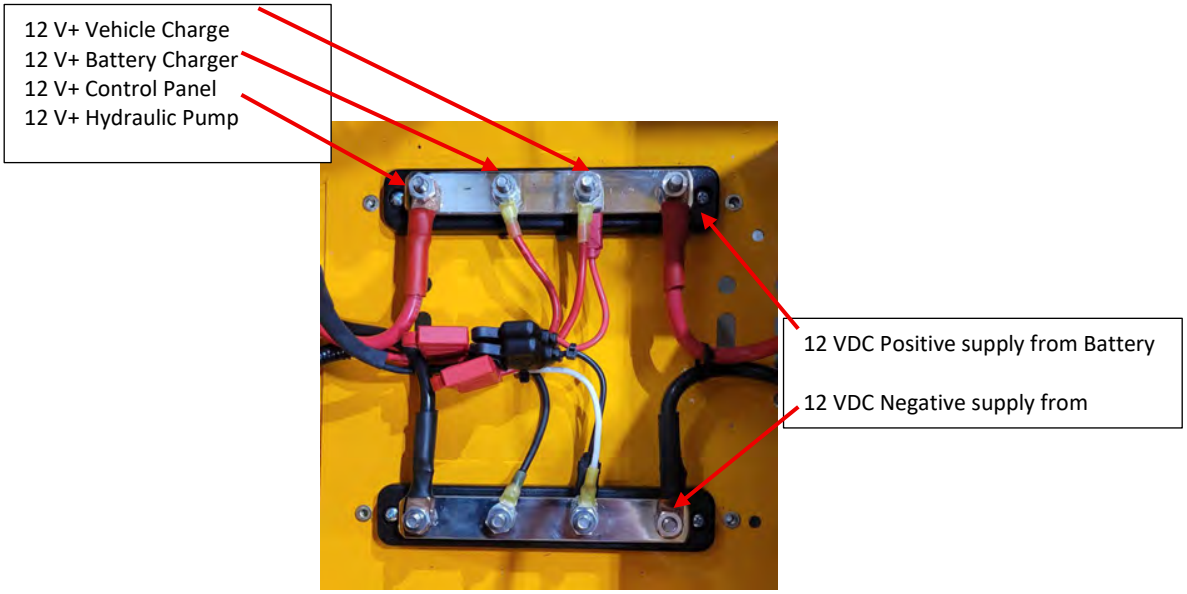
ON BOARD POWER DISTRIBUTION BUSBAR

The KM Hotbox Trailer is equipped with 150A – 70V Busbar distribution connections. Loads are protected with inline automotive style fuses as needed. Pictures below show the busbar power distribution connections and fuse sizing for standard equipment features.

⚠ CAUTION: Busbar power distribution is shown with the cover removed. Always disconnect power at the battery source when servicing. Never operate with covers removed.



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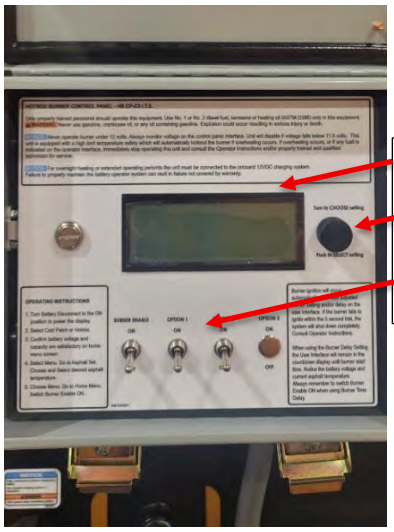
HB CPC3 CONTROL PANEL FEATURES

E-Stop Switch
Pull out to operate burner control.
Battery Disconnect Keyed Switch
Turn to ON position for operations.



Embedded LCD Controller

Rotary Encoder Switch

ON/OFF Toggle Switches

Embedded LCD Controller
Displays and monitors the burner operating features. Monitors temperature and state of battery voltage.

Rotary Encoder Switch
TURN to scroll and choose functions.

PUSH to select functions.

ON/OFF Toggle Switches
BURNER ENABLE – Switch ON to operate burner.
OPTION 1 – Typically used to control accessory lighting.
OPTION 2 – Typically used to control accessory lighting.
OPTION 3 – Unused. Consult Factory.

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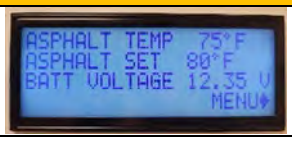
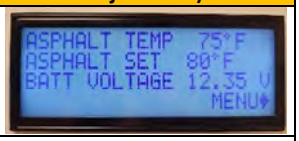
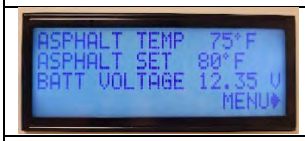
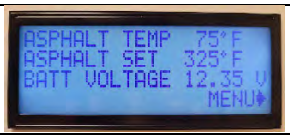
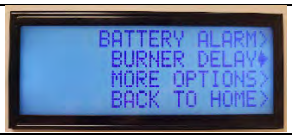
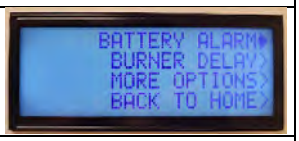
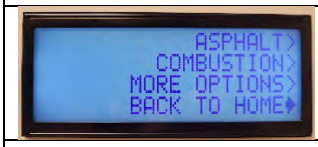
HB CPC3 BURNER CONTROL OPERATING INSTRUCTIONS – Embedded Processor Control

Start Up- Cold Patch Temperature Selection	Start Up- Hotmix Temperature Selection.	Burner Delay Setting	Battery Alarm Preset (Service Screen. Not Adjustable.)
			
Key On Boot up screen 5 seconds.	Key On. Boot Up Screen 5 seconds.	From the Home screen select MENU.	From the Home screen select MENU.
			
Push to select COLD PATCH.	Push to select HOT MIX.	Select MORE OPTIONS.	Select MORE OPTIONS.
			
From the Home screen select MENU.	From the Home screen select MENU.	Select BURNER DELAY.	Select BATTERY ALARM.
			
Select ASPHALT.	Select ASPHALT.	Adjust time setting.	Battery Voltage Alarm Screen.
			
Adjust temperature. Default temp is 80 *F. High limit temp is 100 *F. Select SET TEMP.	Adjust temperature. Default temp is 325 *F. High limit temp is 350 *F. Select SET TEMP.	Select START COUNTDOWN.	Return to Home Screen.
			
Select BACK TO HOME.	Select BACK TO HOME.	Burner Delay On screen.	

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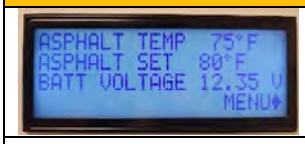
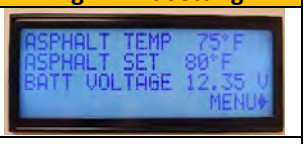
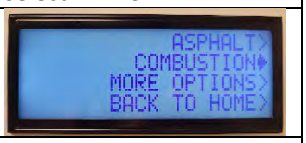
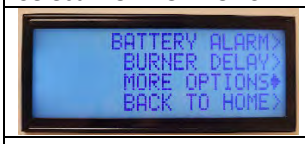
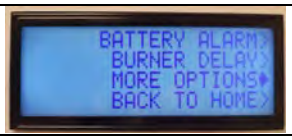
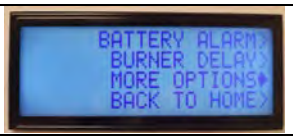
HB CPC3 BURNER CONTROL OPERATING INSTRUCTIONS - Continue

Start up. Cold Patch Temperature Selection	Start up. Hotmix Temperature Selection	Burner Delay Setting	Battery Alarm Preset (Service Screen. Not Adjustable.)
			
Toggle BURNER ENABLE to ON.	Toggle BURNER ENABLE to ON.	Toggle BURNER ENABLE to ON.	
			
		CANCEL to return to Home Screen.	
			

HB CPC3 BURNER CONTROL OPERATING INSTRUCTIONS

Fahrenheit and Celsius Unit Selection	Control Panel History	Burner History	Combustion Temperature. High Limit Setting
			
From the Home screen select MENU.	From the Home screen select MENU.	From the Home screen select MENU.	From the Home screen select MENU.
			
Select MORE OPTIONS.	Select MORE OPTIONS.	Select MORE OPTIONS.	Select COMBUSTION.
			
Select MORE OPTIONS.	Select MORE OPTIONS.	Select MORE OPTIONS.	Combustion Temperature and High Limit displays.

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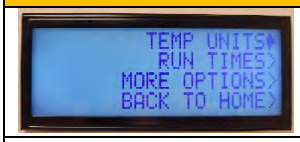
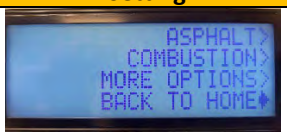
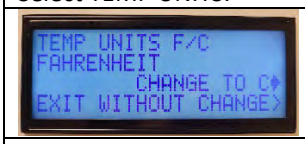
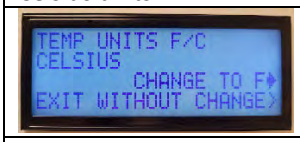
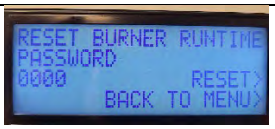
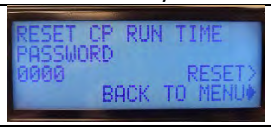
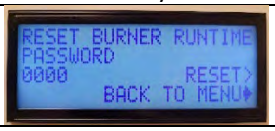
HB CPC3 BURNER CONTROL OPERATING INSTRUCTIONS - Continue

Fahrenheit and Celsius Unit Selection	Control Panel History	Burner History	Combustion Temperature High Limit Setting
			
Select TEMP UNITS.	Select RUN TIMES.	Select RUN TIMES.	Select Back To Home.
			
Select CHANGE TO C for Celsius units.	Select CONTROL PANEL.	Select BURNER.	
			
Select CHANGE TO F for Fahrenheit units.	Select Reset.	Select Reset.	
			
	Password required. Consult factory.	Password required. Consult factory.	
			
	Select BACK TO MENU prompts to return to Home Screen.	Select BACK TO MENU prompt to return to Home Screen.	

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RECLAIMING & STORAGE of HOTMIX ASPHALT

Reclaiming "cold chunked" asphalt and storing hot mix asphalt in your KM Hotbox can be done efficiently and effectively by following some guidelines and suggestions. Some of the factors that should be considered when reclaiming or storing in the KM hotbox are quantity of asphalt, quality of asphalt and surrounding (outside) temperature. Remember that these are suggested averages. As a user of the equipment it will be best to develop your own knowledge of reclaiming and storing asphalt by frequency of usage and the "trial and error" method.	Suggested temperatures (°F) for storage of hotmix asphalt 2+ Ton 300° F 1 ½ Ton 275° F 1 Ton 275° F ½ Ton 275° F
Depending on the quality of asphalt, storage of hot mix asphalt at heated temperatures can last up to three days (72 hours). **NOTE: It is strongly recommended to keep hot mix heated no more than 48 hours to minimize the potential of drying out the material and hardening inside of the asphalt chamber.**	





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Operation – Equipment Options

KM International offers a variety of options for the Hotbox reclaimer lines. These options allow the user to complete their jobs safer and more efficiently.

LIGHT BAR – DIRECTIONAL ARROW BOARD

The light bar feature is a great option to incorporate into your hotbox reclaimer to help better direct and warn road traffic. The light bar is equipped with 168 individual LEDs for increased illumination. The controller is housed in a weather sealed box and has 5 different directional functions.

Operating this feature is as simple as powering on the manual On/Off switch
12 VDC (Red Key). Depressing the “Power” button on the light bar controller face. At that point just make a directional selection which will be confirmed by the LED display on the controller face.

⚠ NOTICE: The use of this or any warning device does not insure that all drivers can or will observe or react to the signal. Remember to use caution while working in traffic.

STROBE - AMBER

The strobe light feature is an excellent option of visually warning traffic and pedestrians of your work zone.

Operating this feature is as simple as powering on the manual On/Off switch
12 VDC (Red Key). Switching the “Option #1” toggle switch to the “On” position will power on the strobe.

⚠ NOTICE: The use of this or any warning device does not insure that all drivers can or will observe or react to the signal. Remember to use caution while working in traffic.

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LOADING HOIST – ELECTRIC 12 VDC

A loading hoist allows an operator to safely load and unload tools and materials that are being transported on the hotbox trailer. The hoist is equipped with a corded controller that is stored in a weather proof enclosure that is mounted directly to the hoist.

P1-P5	Load (lbs)	Load (kg)	Height (ft)	Height (cm)	Reach (ft)	Reach (cm)
P1	700 lbs	317.5 kg	3'9"	114.3 cm	3'11"	118.7 cm
P2	750 lbs	340.1 kg	4'4"	132.08 cm	3'9"	114.3 cm
P3	800 lbs	362.8 kg	5'	152.4 cm	3'5"	104.14 cm
P4	850 lbs	385.5 kg	5'8"	172.72 cm	2'11"	88.9 cm
P5	900 lbs	408.2 kg	6'5"	195.58 cm	1'10"	55.88 cm

The hoist arm has 5 positions available depending on your load and need for reach. Each position has a specified load rating and the chart above should be strictly obeyed. To operate the winch it is as easy as depressing the "In" and "Out" button on the controller.

⚠ WARNING: Never go under a raised load. Injury or death can result.

⚠ NOTICE: The operator should keep a safe distance from the load and should never overload the hoist.

SOLVENT TANK

The solvent tank option is a great addition to allow operators to quickly dip and clean your tools. It is vital for users to keep their asphalt tools clean to prevent asphalt build up and prolonging tool life. The solvent tank should only be filled with an environmentally friendly release agent. Only fill the tank high enough to coat tool, overfill solvent tank runs the risk of spillage during transport. Never store tools in solvent tank while traveling.

⚠ NOTICE: Spillage can occur during travel if tank is overfilled.

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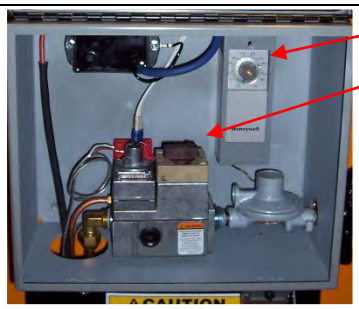
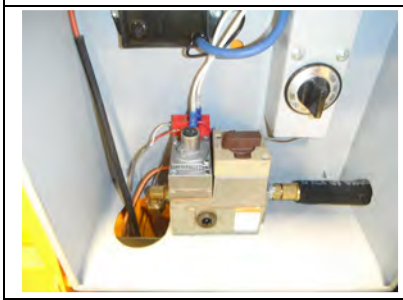
ASPHALT THERMOMETER

When provided, an optional temperature thermometer is located on the rear side of the unit. The Thermometer is a temperature reading only of the Asphalt Chamber temperature.

HEATED TACK TANK 30 GALLON – GRAVITY FED STD.

Using tack coat with your patch ensures that a more permanent bond is made to the existing asphalt. This propane fired tank is very user friendly and can operate in all conditions.

LIGHTING INSTRUCTIONS

	**1**. Slowly open the propane cylinders. Be sure not to activate the safety excess flow valves in the bottle fittings. Note: Opening a cylinder too quickly will activate a safety excess flow valve caused by a surge in fuel flow. This will limit the amount of fuel allowed to leave the hose fitting.
	**2**. Set the thermostat to lowest setting. **3**. Push in the gas control knob slightly and turn clockwise to "OFF." Note: Knob cannot be turned from "PILOT" to "OFF" unless knob is pushed in slightly. DO NOT FORCE. **4**. Turn the knob on gas control counterclockwise to PILOT.
	**5**. Push the control knob all the way in and hold. Immediately push the electric igniter button. Continue to hold the control knob while visually checking to see that the pilot light has lit inside the heating chamber along the burner. Once the pilot has lit, hold the control knob in for one (1) minute. Release the knob and it will pop back up. The pilot should remain lit. If it goes out, wait two minutes to allow gas to clear, repeat steps three through five (3-5).
	**6**. Turn the gas control knob counterclockwise to "ON." **7**. Set the thermostat to desired temperature setting. Refer to material manufacture specifications.

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	**8**. Once your material reaches specified temperature open feed valve to fill container for use. ⚠ NOTICE: Spillage can occur during travel if tank is overfilled. ⚠ WARNING: Wear proper protective clothing, hot tack can cause serious injury.
	Shown is a view of the burner during operation. Notice clean blue flames (3/4" - 1" tall) from end to end on the burner. The pilot flame will be yellow and aim toward the burner and straight up, heating the 750 mV generator.

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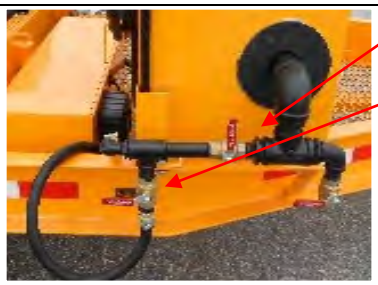
HEATED TACK SPRAY

The tack spray option allows the user to easily and evenly apply heated tack to large areas over the traditional bucket and brush method.

	**1**. Close all ball valves. **2**. Open valve to supply pump.
	**3**. Start engine. Never run pump dry. **4**. Increase engine throttle to reach desired spray pressure.
	**5**. Hold wand over application area and slowly open ball valve. **6**. Once desired coverage has been met. Close the wand's ball valve and shut down the engine.
	**7**. To clean the system. Close the supply ball valve. **8**. Open the solvent ball valve. **9**. Insert the solvent suction hose into a supply of desired environmentally solvent. **10**. Start Honda engine and open wand valve to spray used solvent into desired waste container.

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MAINTENANCE SCHEDULE

The following maintenance schedule is a recommendation from KM International and when maintenance is being performed a qualified technician needs to consult the specific manufactures manuals for each component. Performing routine maintenance will extend equipment and component life along with reducing unwanted down time.

⚠ NOTICE: Maintenance or repair should be performed by a qualified service technician.

Hotbox					
Daily	-Clean asphalt hopper of all asphalt build up. -Clean hotbox exterior				
Annual	-Lubricate lid hinge. -Lubricate cantilever handles. -Inspect gas springs for wear and/or failure.				
Trailer					
Daily	-Inspect lighting for proper operation. -Inspect hitch condition. -Clean frame of dirt and loose debris.				
Annual	-Inspect overall condition of frame work.				
Axles					
Daily	-Inspect tire and wheel condition. -Confirm brake operation.				
3 Months or 3000 Miles	-Adjust brakes. -Torque wheel nuts. -Grease suspension.				
6 Months or 6000 Miles	-Inspect suspension condition.				
12 Months or 12000 Miles	-Inspect and grease wheel bearings. -Inspect brake linings. -Inspect brake wiring.				

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Diesel Burner					
Daily	-Inspect burner condition and operation. -Inspect for any signs of overheating.				
6 Months or 325 Hours	-Inspect and clean CAD eye cell.				
12 Months or 650 Hours	-Inspect and Clean pump strainer. -Inspect and clean ignition electrodes. -Inspect ignition spring contact. -Inspect and clean blower wheel and air intake. -Inspect and clean exhaust stack.				
Diesel Controls					
Daily	-Confirm operation of all controls.				
12 Months or 650 Hours	-Inspect and clean battery -Confirm battery quality (Load Test).				
Fuel Supply					
Daily	-Inspect tank for condition and leaks. -Inspect fuel line for condition and leaks. -Clean exterior of tank.				
12 Months or 650 Hours	-Replace fuel filter element. -Clean out fuel tank. -Flush out fuel line.				
Dump Hoist/Hydraulic Power Unit					
Quarterly	-Grease hoist and frame hinges. -Inspect Hydraulic lines.				
Annually	-Change ATF in hydraulic power unit. -Inspect hoist and hinges.				

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Loading Hoist/Winch/Davit					
Quarterly	-Inspect belt for damage				
Annual	-Lubricate Motor. -Inspect structure for wear.				
Tack Tank					
Daily	-Inspect fuel lines for leaks with soap water solution.				
Quarterly	-Inspect burner quality. -Clean funnel to reduce tack build up				
Annually	-Inspect structure for wear				
Tack Spray Unit					
Daily	-Flush system with environmentally safe solvent. -Inspect for leaks.				
Annually	-Change engine oil. -Clean engine air filter.				

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TROUBLESHOOTING KM DIESEL HOTBOX CPC3

⚠ NOTICE: Maintenance or repair should be performed by a qualified service technician.

PROBLEM	INSPECT FOR SOLUTION
(A) Nothing happens when unit is powered on. No Power.	Dead battery. Check voltage. Charge or replace battery if necessary.
	Blown Fuse. Inspect 20A fuse at battery power supply.
	Loose wire. Inspect wire connections beginning at battery power supply.
	Inoperable red keyed switch). Inspect/Test and replace if necessary.
	Blown Fuse. Inspect and replace if necessary.
(B) Control Panel Powers on but Burner will not attempt to initiate.	Low Voltage Lockout (Cycle power to reset). Inspect wire connections beginning at battery terminal connections. Inspect vehicle charging system from trailer plug to battery. The vehicle charging system will maintain the battery during travel when properly operating. Blown fuse on charge line. Ensure battery charger is plugged when not running vehicle. Inspect battery charger and connections. Inspect battery. Replace if necessary.
	"E-Stop engaged". Displayed on HMI. Inspect/Test and replace if necessary.
	Burner enable toggle switch has failed. Test/By-Pass and replace if necessary.
	Blown Fuse. Inspect fuses at burner controller (Located on burner). Replace burner controller if fuses are in operable condition.
	Asphalt chamber probe has failed. "Asphalt Thermocouple!" displays on asphalt temperature screen. Inspect and replace if necessary.
	Combustion chamber probe has failed. Displays "Temperature Lockout" on Combustion chamber temperature screen. Inspect and replace if necessary.
(C) Burner will initiate but will not lite or stay lit.	Out of fuel. Re-fill fuel with #2 Diesel. Purge fuel system and reset power.
	Air in fuel line. Purge fuel line by loosening the fuel bleeder valve during trial for ignition. Note: Catch the fuel in an empty container. Tighten the fitting when air has been purged from the supply system and a steady stream of fuel is present. Several trial cycles may be required
	Consult burner manual - Appendices A through D.
(D) Burner ignites but quickly goes out (5-10 seconds).	Low fuel or air in fuel line. See above (C).
	Cad cell detector may be dirty or failed. Remove power from system (Red Key) access Cad cell and wipe clean. Retry for ignition.
	Replace Cad cell. Consult burner manual - Appendices A through D.
(E) Burner will not re-initiate after operating.	The burner has locked out. The burner ignition control is designed with a safety lockout. If the burner does not light after trial for ignition, the burner will lockout. Reset power (Red Key) from the entire system for five seconds, then re-try for ignition.

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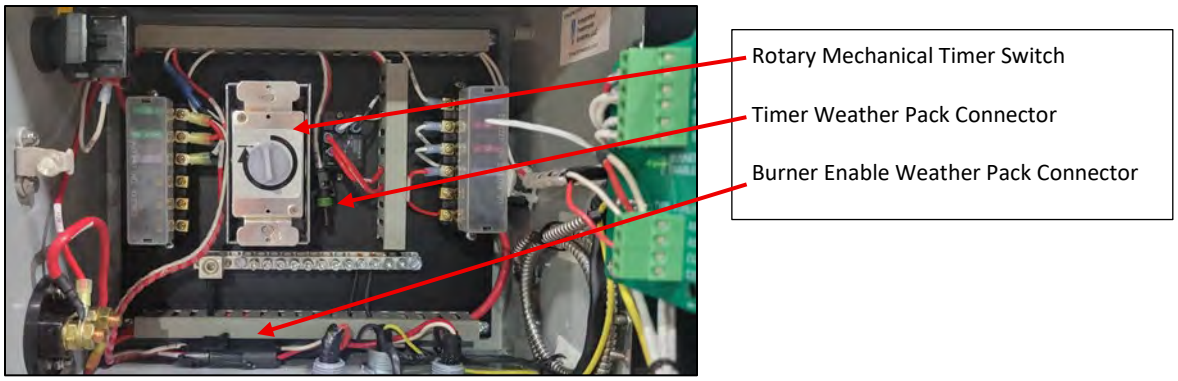
	The burner has locked out after running out of fuel. Re-fill fuel with #2 Diesel. Purge fuel system and reset power.
	Asphalt chamber probe has failed. “Asphalt Thermocouple!” displays on asphalt temperature screen. Inspect and replace if necessary.
	Combustion chamber probe has failed. Displays “Temperature Lockout” on Combustion chamber temperature screen. Inspect and replace if necessary.
	Unit has high limited and “Temperature Lockout” is displayed on Combustion Chamber Temperature Screen. The combustion chamber must cool down below 650 *F and power must be reset before it will allow the burner fuel valve to open. It is unusual for the combustion chamber to reach this high limit. The combustion chamber insulation within the interior of the hotbox may have failed. Inspection and repair may be necessary by a qualified technician only.

SINGLE USE MECHANICAL TIMER

The KM HB CPC3 Control panel is equipped with an emergency single shot 30-minute Rotary Mechanical Timer Switch. The timer can be connected to the burner output weather pack connector inside of the control panel in the occurrence of the HMI control failure to signal the burner enable ON for 30 minutes.



⚠ NOTICE: The Single use mechanical timer is for emergency heating only and should only be used to allow job completion. Consult a qualified service technician or the factory to properly service the control panel and equipment. Failure to do so can result in equipment failure not covered by warranty.

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TROUBLESHOOTING (OPTIONS)

Dump Hoist

PROBLEM	INSPECT FOR SOLUTION
(A) Unit won't Raise/extend	Low Battery Voltage
	Low on Fluid
	Controller malfunction
	Solenoid Failure
(B) Unit won't Lower/retract	Low Battery Voltage
	Controller malfunction
	Flow limiter restricted or faulted

Light Bar

PROBLEM	INSPECT FOR SOLUTION
(A) Light bar does not function	Low Battery Voltage
	Blown Fuse
	Failed Controller
	Failed Light Bar
(B) Sections of light bar do not operate	Inspect failed module for voltage, if voltage is present then replace

Strobe

PROBLEM	INSPECT FOR SOLUTION
(A) Strobe does not function	Low Battery Voltage
	Blown Fuse
	Failed toggle switch
	Failed strobe

Loading Hoist

PROBLEM	INSPECT FOR SOLUTION
(A) Hoist won't function	Low Battery Voltage
	Tripped circuit breaker
	Failed controller
	Failed winch
(B) Hoist only functions in one direction	Failed controller
	Failed relay

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Tack Tank

PROBLEM	INSPECT FOR SOLUTION
(A) Pilot will not light.	Ensure propane bottles have fuel and valves are open.
	Propane cylinders have not been purged of air. Consult propane supplier.
	Ensure change over regulator lever is entirely switched to one side or another.
	Propane bottle excess flow valve – Be sure gas is flowing to the regulators. If the bottle(s) is turned on too quickly it can trigger the excess flow of safety valve in the bottle and shut off the flow of gas. Close propane bottle valve; safely relieve line pressure, then slowly reopen valve.
	Allow enough time to evacuate air from pilot line and let propane flow to pilot.
⚠ **NOTICE:** Maintenance or repair should be performed by a qualified service person.	No spark at pilot light assembly. ⚠ **NOTICE:** Close gas cylinder and turn gas valve to off position. Inspect the electronic igniter, check all wire connections include the ground wire. An audible "clicking" should be heard when button is depressed. If not, igniter unit may need to be replaced. If equipped with an electric Piezo igniter, check all electrical connections. Ensure that the Piezo is grounded. "Snap" the push button igniter; it is capable of producing a three – sixteenth (3/16") inch blue spark. If no spark, then check the spark gap at pilot assembly. If you are unable to produce a spark, then it will be necessary to replace the electric Piezo igniter.
	No Spark at pilot light assembly. ⚠ **NOTICE:** Close gas cylinder and turn gas valve to off position. Inspect spark igniter electrode. Remove burner access safety panel and locate igniter electrode. Inspect spark wire connection. Inspect the ceramic spark electrode for a crack or broken ceramic insulation. Replace burner access safety panel after servicing.
⚠ **NOTICE:** Maintenance or repair should be performed by a qualified service person.	Pilot orifice is plugged. ⚠ **NOTICE:** Close gas cylinder and turn gas valve to off position. Remove burner access safety panel and locate the pilot light orifice connection at the end of the 1/4" (small) propane fuel line. Remove the fuel line, then remove the pilot orifice. Clean the orifice of debris. Note: It may be necessary to entirely remove and clean or replace the 1/4" pilot fuel line. Reinstall the pilot orifice and pilot fuel line. Inspect for leaks before returning the unit to service. ⚠ **WARNING: PROPANE FUEL LEAKS PRESENT A DANGER** and must be corrected prior to operating the burner. Replace burner access safety panel after servicing.
(B) Pilot goes out when gas control knob is released.	Ensure gas control knob is held at least one minute to allow the generator time to heat.
	Inspect the 750 Millivolt Generator. A consistent flame must surround the generator cartridge. If it seems abnormally small then the pilot orifice needs cleaning. See above.
⚠ **NOTICE:** Maintenance or repair should be performed by a qualified service person.	Inspect Millivolt Generator output. The most effective test of the pilot generator requires a Multi-meter with 0-1000 Millivolt (mV) scale. Connect the meter leads to the valve of relay terminals to which the pilot generator wires are attached while maintaining the pilot flame by continually depressing the gas control knob. If the meter needle moves to the left of zero or no reading is indicated, reverse meter probes. The meter must read 400 mV or more to effectively operate the gas control valve. If the reading is low replace mV generator cartridge.
	Ensure the gas control knob is turned to the ON position.

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(C) Burner will not ignite when signaled by thermostat. ⚠ **NOTICE:** Maintenance or repair should be performed by a qualified service person.	Inspect thermostat. Remove thermostat cover to access the wire connections. Use a multi-meter to check for continuity across the wire terminals when the thermostat signals on. Voltage input and output can also be checked. If a multi-meter is unavailable, a short jumper wire can be used to make contact across the thermostat terminals. If the burner immediately operates, then replace the thermostat.
	Inspect the Millivolt Generator output. Potential across the valve with the pilot light on should be 400 mV or more. If it is, yet valve does not open, replace valve. If the potential is less than the minimum, check thermostat wire connections. Replace thermostat if necessary.
	Inspect Venturi Air Mixer - Ensure the Venturi air shutter is open and adjusted for proper flame size. If the packing nut has come loose and the air shutter has closed not allowing air to enter the Venturi, the burner may not have enough pressure to ignite along the burner. Adjust the air shutter and re-set the packing nut. Replace burner access safety panel after servicing.
	Inspect the Burner Orifice. ⚠ **NOTICE:** Close gas cylinder and turn gas valve to off position. Locate the burner orifice in the Venturi Air Mixer. Remove the spud and orifice. Inspect, clean of debris and re-install. It may be necessary to inspect, clean and replace the 3/8" burner fuel line. ⚠ **WARNING: PROPANE FUEL LEAKS PRESENT A DANGER** and must be corrected prior to operating the burner. Replace burner access safety panel after servicing.
(D) Burner ignites but flame is lazy, incomplete, or erratic across the burner tube.	Inspect Venturi Air Mixer - Ensure the Venturi air shutter is open and adjusted for proper flame size. If the packing nut has come loose and the air shutter has closed not allowing air to enter the Venturi, the burner may not have enough pressure to ignite along the burner. Adjust the air shutter and re-set the packing nut. Replace burner access safety panel after servicing.

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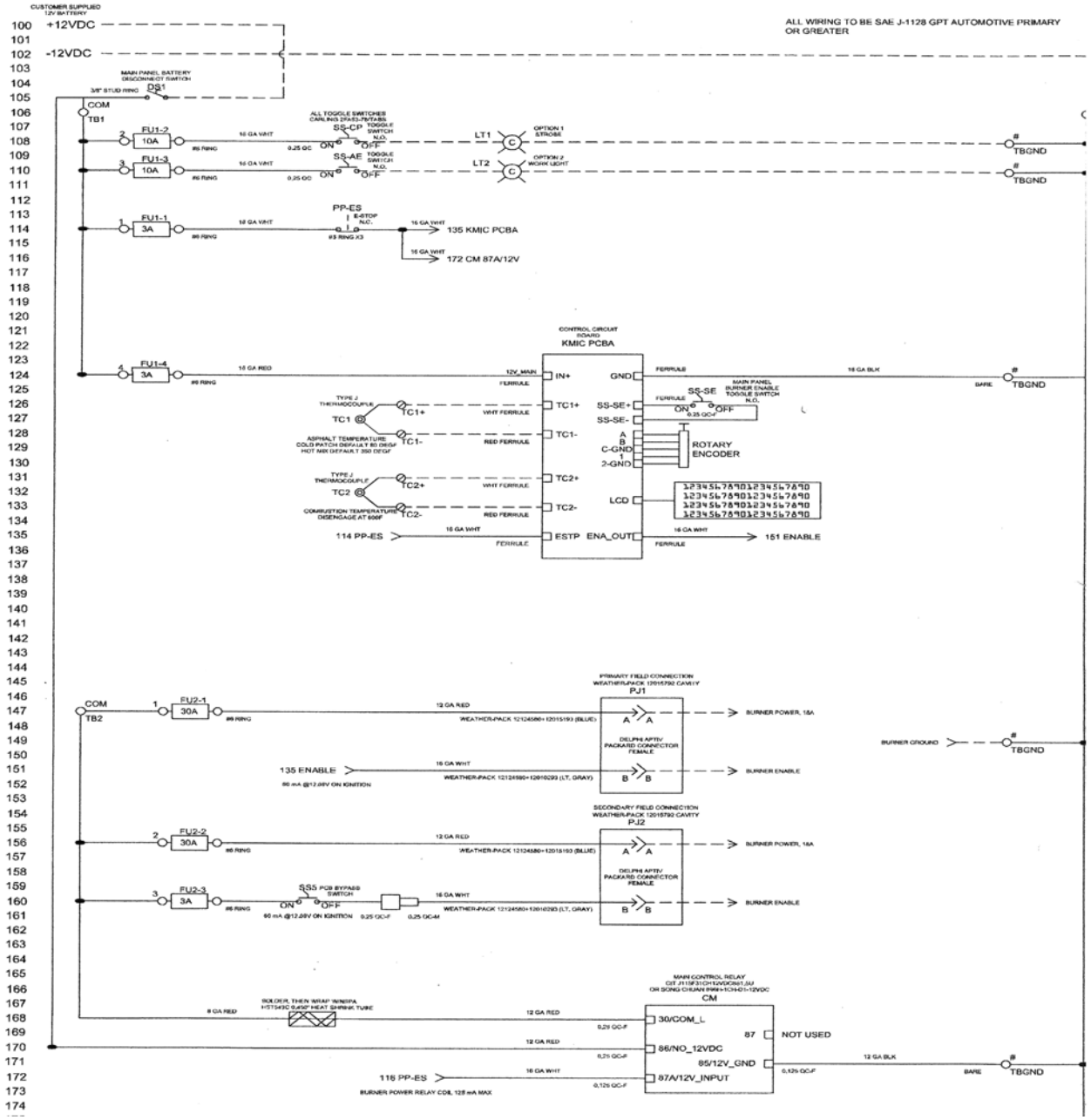
TECHNICAL DRAWINGS

BURNER CONTROL PANEL CPC3



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LIMITED WARRANTY

KEIZER-MORRIS INTERNATIONAL, INC. (hereinafter called KMII) warrants the equipment manufactured by KMII to be free from defects in material and workmanship on the invoice date to the original purchaser. KMII will, for a period of twelve (12) months from the invoice date, repair or replace any serviceable or consumable parts determined by KMII to be defective. These parts include, but are not limited to, insulation, fuel lines, bearings, filters, ignition components, power supplies, axle components, oil, fuels and lubricants. All components, with the exception of the previously listed twelve (12) month warrantied parts, will be covered under this warranty for a period of twenty-four (24) months. The trailer frame components, hotbox body and workmanship is warrantied for a period of five (5) years from the invoice date. This warranty applies only when the claim is approved and repaired by a KMII representative.

KMII will not be liable for general wear and tear, or any malfunction, damage or wear caused by misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-KMII component parts. This warranty applies only when the equipment is used for its intended purpose and properly maintained.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized KMII distributor or the factory direct, for verification of the claimed defect. If the claimed defect is verified, KMII will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser standard ground prepaid, expedited shipping will not be covered. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which may include the cost of parts, labor, and transportation. This warranty does not cover labor for component replacement or freight charges for structure and workmanship claims.

KMII will in no event be liable for indirect, incidental, special or consequential damages resulting from KMII supplying equipment hereunder, or the furnishing performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of KMII or otherwise.

KMII's sole obligation and buyer's sole remedy for any breach of warranty shall be set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential lost) shall be available. Any action for breach of warranty must be brought within two (2) Year(s) of date of invoice. THIS WARRANTY IS EXCLUSIVE, NON TRANSFERABLE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED.

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TRAINING POLICY

The optimal and efficient operation of your KM Asphalt Hotbox Reclaimer requires instruction on the operation and maintenance of the equipment. We at KMI are very much aware that time is a precious commodity and will take all the steps necessary to ensure that equipment training is done in a professional and expedient manner. We are in the process of developing a library of instructional videos that will be available shortly. We encourage our customers to take advantage of our extremely knowledgeable staff as needed for trouble shooting or to answer equipment operation questions. We are available during normal business hours, 8:30 a.m. to 4:30 p.m. EST, Monday through Friday by phone – (810) 688-1234 or by e-mail at kmi@kminternational.com. We encourage you to contact our sales staff to schedule a convenient training session for your staff prior to operation.

If you are using the KMI infrared equipment for applying thermo-plastic, similar product or any use other than asphalt reheating and repairing, our technicians are unable to answer specific questions on those application processes. We would encourage the user to contact the applications manufacturer.

Additionally, we encourage our customers to take advantage of our hands on training classes made available to all purchasers and their staff as requested and/or necessary. We have incorporated a small fee associated with on sight training in an effort to encourage education without making the process cost prohibitive or too time consuming for our staff. This small charge will help to keep KMI equipment price competitive and user friendly. KM International will train FREE OF CHARGE any customer or customer employees that travel to the KMI manufacturing facility within the first 90 days of purchase. We would be happy to schedule an appointment for a free ½ day of training on every aspect of equipment maintenance and operation. The customer would be responsible for travel and expenses to the KMI location. Our technical staff is available to schedule an instructional full day of training at the customers site if that is preferred but would require the following:

1. All travel and expense to and from the customer requested location as required, including Hotel and Airfare as necessary. KMI reserves the sole right to determine appropriate and reasonable accommodations and travel.
2. A per-diem food allowance per technician.
3. Off-site man charge per technician, to be paid in advance.

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EQUIPMENT INFORMATION & NOTES

MODEL	
SERIAL NUMBER	
PURCHASER	
DATE OF PURCHASE	
NOTES:	

Thank you again for your purchase of KM asphalt maintenance equipment. We are happy to have you as a customer and are confident that you will have years of efficient operation by following the above parameters and guidelines. We encourage an open dialogue with our customers and prize any feedback. Our commitment to our customers is second to none and our desire to improve our equipment is an integral part of our ongoing growth strategy.

Sincerely,
The KM International Management Team.

KM International, Inc.
6561 Bernie Kohler Drive
North Branch, Michigan 48461
(810) 688-1234 * www.kminternational.com

Please call the Team at KM International anytime for questions, comments or to just talk "Infrared."

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Appendix A. Maintain & Service Burner

A. Owner's Information

WARNING: Have your equipment inspected at regular intervals by a qualified service agency to assure continued proper operation. The burner should be adjusted using dedicated combustion test equipment. Failure to properly set the burner could result in inefficient operation, and/or conditions that could potentially cause severe personal injury, death or substantial property damage.

The following could result in fire hazard, severe personal injury, death or substantial property damage. Read carefully.

- Never attempt to use gasoline in your burner.
- Never store gasoline or combustible materials near the burner.
- Never attempt to light the burner by throwing burning material into the fire chamber.
- Never attempt to use crankcase or waste oil or material other than the approved fuel oils in this burner.
- Never restrict the air ventilation openings in the room.

B. Owner service and maintenance

Properly installed and maintained, your ADC burner will provide years of efficient, trouble-free operation. Please take care of your equipment by following the warnings provided and by doing the following (notify your qualified service agency if your burner is not operating properly):

WARNING: This equipment should be serviced only by a qualified service agency. The appropriate test instrument must be used. Failure to do so could result in burner or equipment failure could potentially cause severe personal injury, death or substantial property damage.

C. Daily

Check the area around your burner/equipment to make sure:

- Air ventilation openings are clean and unobstructed
- Nothing is blocking the burner inlet air openings
- No combustible materials are stored near the equipment
- There are no signs of oil or water leakage around the burner or equipment

D. Extended down time

If the equipment will be stored for an extended period of time, insure that the fuel tank is full and add a fuel stabilizer to the tank.

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E. Regular Service/Maintenance

Have your burner, power washer, crack seals, etc. serviced annually by your qualified service agency.

The following components/assemblies should be checked/adjusted/replaced on a regular basis. Refer to the replacement parts exploded view at the end of this section for part locations.

- □ Replace the oil supply line filter if applicable. The line filter cartridge must be replaced to avoid contamination of the pump and nozzle.
- □ Inspect the oil supply system. All fittings should be leak-tight. The supply lines should be free of water, sludge and other restrictions.
- □ Remove and clean the pump strainer.
- □ Replace the nozzle with one having the same specifications from the same manufacturer.
- □ Clean and inspect the electrodes for damage, replacing any that are cracked or chipped.
- □ Check electrode tip settings. Replace electrodes if tips are rounded.
- □ Inspect the igniter spring contacts. Clean or replace if corroded.
- □ Clean the cad cell, if applicable.
- □ Make sure Low Firing Rate Baffle is in place if required for the burner application. Omitting the baffle can result in unacceptable burner combustion.
- □ Inspect all gaskets including the igniter base plate gasket. Replace any that are damaged or missing.
- □ Clean the blower wheel, air inlet, air guide, retention head and static plate of any dirt, asphalt or other material.
- □ Check motor current. The amp draw should not exceed the nameplate rating by more than 10%.
- □ Check all wiring for loose connections or damaged insulation.
- □ Check the pump pressure and cutoff function.
- □ Check primary control safety lockout timing if applicable. Refer to the information supplied by the control manufacturer for procedures.
- □ Check ignition system for proper operation.
- □ Inspect the exhaust system for soot accumulation or other restriction.
- □ Clean the equipment thoroughly according to the manufacturer's recommendation.
- □ Check the burner performance.
- □ It is good practice to make a record of the service performed and the combustion test results

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Appendix B. Burner Troubleshooting

Oil burners that are designed for use in pressure washing are built to take temperature extremes, vibration, and rough handling. When performing the following troubleshooting steps, we assume that the oil burner motor and ignition transformer operate continuously and the oil solenoid valve, which control oil flow, is cycled by the trigger on the wand. We also assume that there is power to the burner, and fuel in the tank.

In addition to normal mechanic's tools, it is recommended to have the following equipment on hand: an electrical meter capable of measuring volts, ohms, and amps, an ignition transformer tester, a smoke pump tester, combustion analyzer and a zero to 200 psi oil pressure gauge.

Troubleshooting Chart

Symptom	Possible Cause
Oil not igniting	If the burner is not igniting, the burner motor, drive coupling, and oil pump are operating and oil is flowing to the nozzle through the solenoid valve, check the following possibilities: 1. Check the air shutter adjustment. If the air shutter is opened too far, the flow of air may prevent the igniter from reaching the oil spray. This may appear as a white vapor exhaust from the coil. 2. The ignition system may have failed to supply an adequate arc to ignite the oil. Check the battery and charging system to insure a continuous supply of 11 to 16 volts DC (15 amps). 3. Check the electrodes for wear and damage. Insure that the electrodes are adjusted properly.
No Flame	If there is no flame, the burner motor and ignition transformer operate continuously and the oil solenoid valve, which controls oil flow, is cycled by the trigger in the wand, check the following possibilities. 1. Check for a plugged oil nozzle. 2. If the coil on the solenoid valve is actuating, insure that the valve is opening. 3. Check for sufficient fuel pressure. Pressure is 100 psig unless otherwise noted. 4. Check the pump pressure. Check for air in fuel lines. 5. Check burner for broken motor coupling. If the coupling s broken check pump rotation prior to replacing the coupling. 6. Check for contaminated fuel and/or partially plugged fuel filter.
Motor not operating	If the blower motor is not operating, check the following possibilities. 1. Check voltage at the motor to insure that switches are relays, in line with the motor, are operating properly. 2. Check pump and motor shaft operation. They should work freely without binding. 3. Check the fuse and/or breaker on the motor.

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No oil spray	If the blower motor is operating, there is fuel in the reservoir, but oil does not spray out the end of the nozzle, check the following possibilities. 1. Check for a broken or stripped coupling between the pump and the motor. 2. Check the pump output for oil. 3. Check operation of the oil valve. 4. Check for a plugged nozzle 5. Check for air in the oil line 6. Check for fuel contamination or plugged filter
Fluctuating or no pump pressure	If the pump pressure, as determined by a pressure gauge, is erratic or does not exist, check the following possibilities. 1. Check motor rotational speed. Low rpm's can cause erratic or no pump pressure. 2. Check for a broken or worn motor coupling 3. Check that the pump turns freely 4. Check for air leaks in the lines 5. Check for oil froth within the reservoir 6. Check voltage at the motor 7. Check for fuel contamination or partially plugged filter

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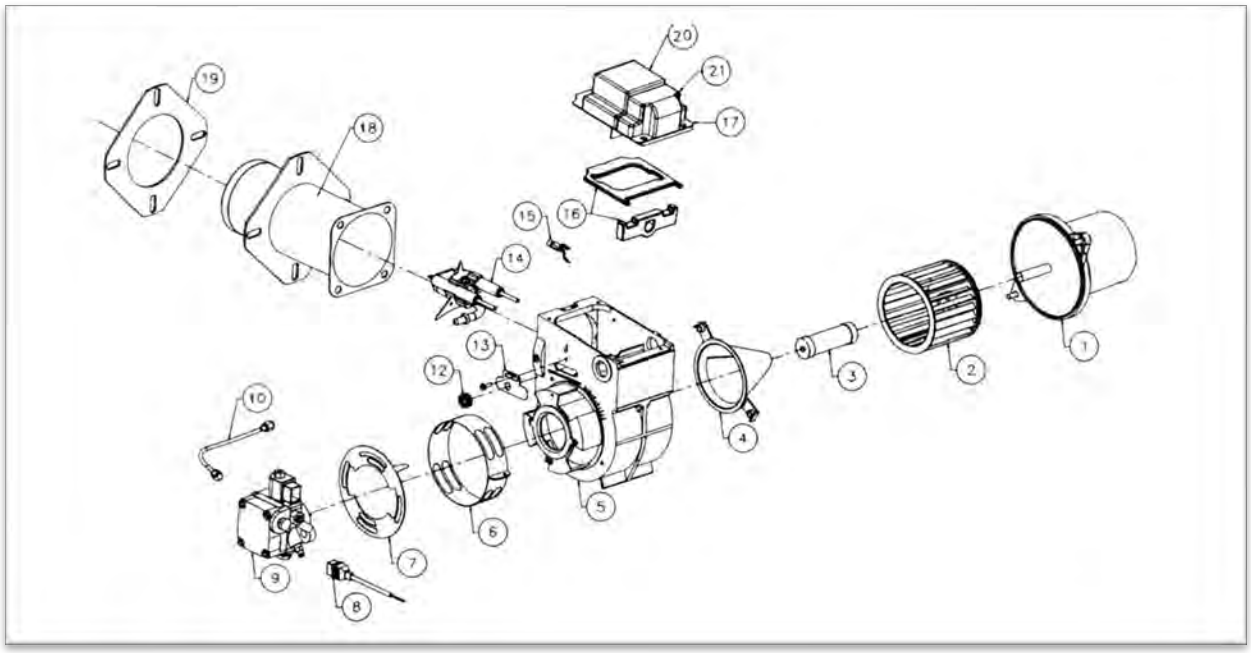
Appendix C. Replacement Parts



#	Description	Part #
1	DC Motor	21699UF
2	Blower Wheel	2140401
3	Coupling	21405
4	Air Guide	31231U
5	Burner Housing --Black --Gray	 5874BKU 5877
6	Air Band	5151501
7	Air Shutter 4 slot Air Shutter 8 slot	3709 3494
8	Cord set	21807
9	Pump (CleanCut)	218440ZU
10	Tube assembly	21877U

#	Description	Part #
11	12 volt Coil	21754U
12	Escutcheon plate spline nut	3666
13	Escutcheon plate	3493
14	Electrode kit	5700
15	Cad cell detector	7492/7006
16	Igniter gasket kit	51411
17	Igniter w/ICB Igniter w/o ICB	51776U 51777U
18	Air tube assemblies	Specify
19	Flange mounting gasket	
20	Ignitor only	7435U
21	Ignitor control board	51663

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1. TIRE SAFETY INFORMATION

This portion of the User's Manual contains tire safety information as required by 49 CFR 575.6. Section

Section 1.1 contains "Steps for Determining Correct Load Limit - Trailer".

Section 1.2 contains "Steps for Determining Correct Load Limit – Tow Vehicle".

Section 1.3 contains a Glossary of Tire Terminology, including "cold inflation pressure", "maximum inflation pressure", "recommended inflation pressure", and other non-technical terms.

Section 1.4 contains information from the 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 a description and explanation of:
  A. Cold inflation pressure.
  B. Vehicle Placard and location on the 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 occupants' 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 on 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 weight the fully loaded trailer can weigh. It will also provide the Gross Axle Weight Rating (GAWR). This is the most a particular axle can weigh. If there are multiple axles, the GAWR of each axle will be provided.

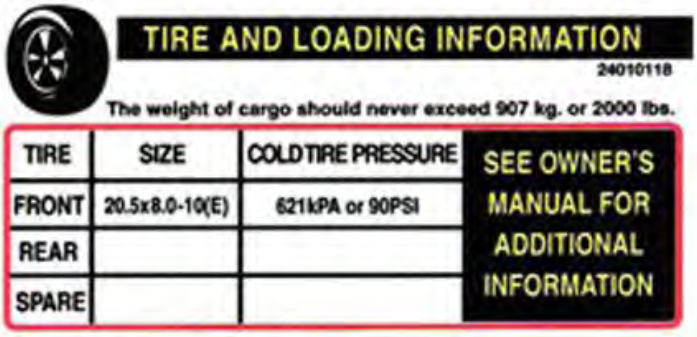
If your trailer has a GVWR of 10,000 pounds or less, there is a vehicle placard located in the same location as the certification label described above. This placard provides tire and loading information. In addition, this placard will show a statement regarding maximum cargo capacity. Cargo can be added to the trailer, up to the maximum weight specified on the placard. The combined weight of the cargo is provided as a single number. In any case, remember: the total weight of a fully loaded trailer cannot 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 and is treated as such. If there is a fresh water storage tank of 100 gallons, this tank when filled would weigh 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 within 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 weight of the vehicle is to weigh it at a public scale. Talk to your 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 certification/VIN label and/or on the Tire Placard. This value should never exceed the maximum cold inflation pressure stamped on the tire.

1.1.1. Trailers 10,000 Pounds GVWR or Less



Tire and Loading Information Placard – Figure 1-1

1. Locate the statement, “The weight of cargo should never exceed XXX kg or XXX lbs.,” on your vehicle’s placard. See figure 1-1.
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. That 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 Pounds GVWR (Note: These trailers are not required to have a tire information placard on the vehicle)

1. Determine the empty weight of your trailer by weighing 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 occupants and cargo should never exceed XXX lbs.,” on your vehicle’s placard.
2. Determine the combined weight of the driver and passengers who will be riding in your vehicle.
3. Subtract the combined weight of the driver and passengers from XXX kilograms or XXX pounds.

4. The resulting figure equals the available amount of cargo and luggage capacity. For example, if the "XXX" amount equals 1400 lbs. and there will be five 150 lb. passengers in your vehicle, the amount of available cargo and luggage capacity is 650 lbs. (1400-750 (5 x 150) = 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

Term	Definition
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 the extent that these items are available as factory-installed equipment (whether installed or not).
Bead	The part of the tire that is made of steel wires, wrapped or reinforced by ply cords and that is shaped to fit the rim.
Bead separation	This is the breakdown of the bond between components in the bead.
Bias ply tire	A pneumatic tire in which the 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.
Term	Definition
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 plies 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 at higher loads and at higher inflation pressures than the corresponding standard tire.

Groove	The space between two adjacent tread ribs.
Gross axle weight rating (GAWR)	The maximum weight that any axle can support, as published on the Certification/VIN label on the front left side of the trailer. Actual weight determined by weighing each axle on a public scale, with the trailer attached to the towing vehicle.
Gross vehicle weight rating (GVWR)	The maximum weight of the fully loaded trailer, as published on the Certification/VIN label. Actual weight determined by weighing trailer on a public scale, without being attached to the towing vehicle.
Hitch weight	The downward force exerted on the hitch ball by the trailer coupler.
Innerliner	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.
Term	Definition
Maximum permissible inflation pressure	The maximum cold inflation pressure to which a tire may be inflated.
Maximum loaded vehicle weight	The sum of 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 the requirements 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 the roadway to the vehicle, generates the tractive forces that provide the directional control of the vehicle, and does not rely on the containment of any gas or fluid for 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 kg (150 lb) times the number of occupants specified in the second column of Table I of 49 CFR 571.110.
Occupant distribution	The distribution of occupants in a vehicle as specified in the third column of Table I of 49 CFR 571.110.
Open splice	Any parting at 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.
Term	Definition
Production options weight	The combined weight of those installed regular production options weighing over 2.3 kg (5 lb) 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 manufacturer 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 nominal diameter of the bead seat.
Rim size designation	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 nominal 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; it may be any rim listed as appropriate for use with that tire.
Tread	That portion of the tire that comes in contact with the road.
Tread rib	A tread section running circumferentially around a tire.
Tread separation	Pulling away of the tread from the tire carcass.
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 kg (150 lb) 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 maximum loaded vehicle weight and dividing by two.
Vehicle normal 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 I of CRF 49 571.110) and dividing by 2.
Term	Definition
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 rim and provides the connection between the non- pneumatic rim and the vehicle; or, in the case of a 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 web site:

http://www.nhtsa.dot.gov/cars/rules/TireSafety/ridesonit/tires_index.html

Studies of tire safety show that maintaining 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 the 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 the 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 overloaded 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 YOUR VEHICLE'S RECOMMENDED TIRE PRESSURE AND LOAD LIMITS

Tire information placards and vehicle certification labels contain information on tires and load limits. These labels 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 trucks determine this number based on the vehicle's design load limit, that is, the greatest amount of weight a vehicle can safely carry and the vehicle's 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 manufacturers 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 tires may naturally lose air over time.
- Tires can lose air suddenly if you drive over a 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, purchase 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 the 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 in 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 tire pressure 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 to each tire that is underinflated.
- Step 6: Check all the tires to make sure they have the same 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 with 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 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. Tires have built-in treadwear 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, it is time to replace your tires. Another method for checking tread depth is to place a penny in 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

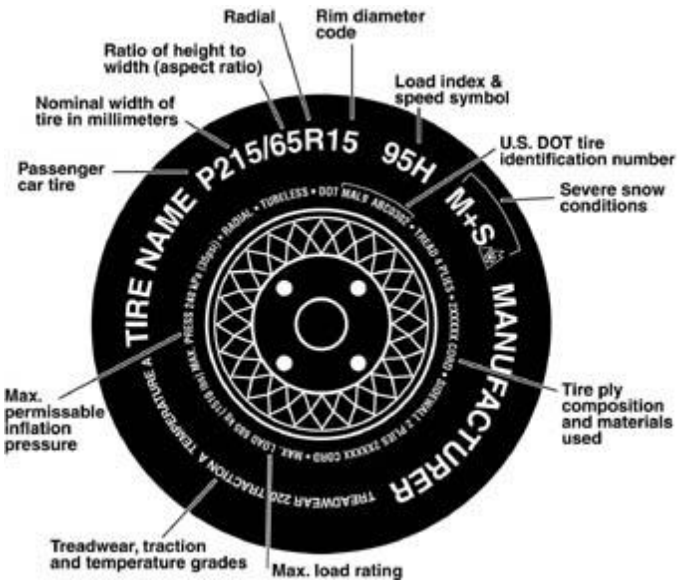
The proper repair of a punctured tire requires a plug for the hole and a patch for the area inside the tire that surrounds the puncture hole. Punctures through the tread can be repaired if they are not too large, but punctures to the sidewall should not be repaired. Tires must be removed from the rim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

1.5.9. TIRE FUNDAMENTALS

Federal law requires tire manufacturers 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 ratio 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. If not, contact a local tire dealer. Note: You may not find this information on all tires because it is not required by law.

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 may not find this information on all tires because it is 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 the tire. In general, the greater the number of 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.

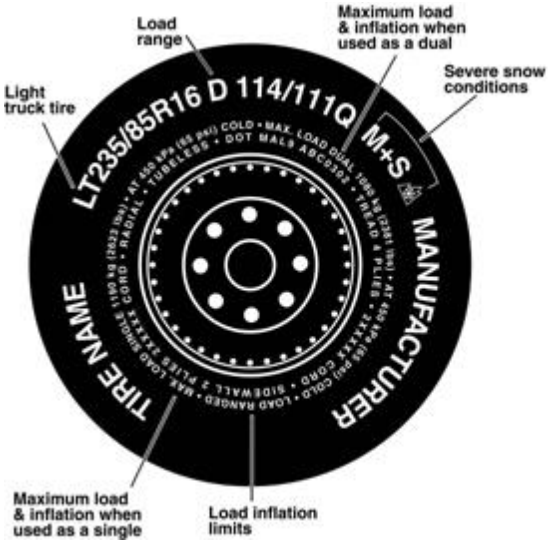
1.5.9.2. UTQGS Information

Treadwear Number This number indicates the tire's wear rate. The higher the treadwear number is, the longer it should take for the tread to 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 a 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.



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

LT The "LT" indicates the tire is for light trucks 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 ThisER 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 object 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 for the maximum recommended load for the vehicle.