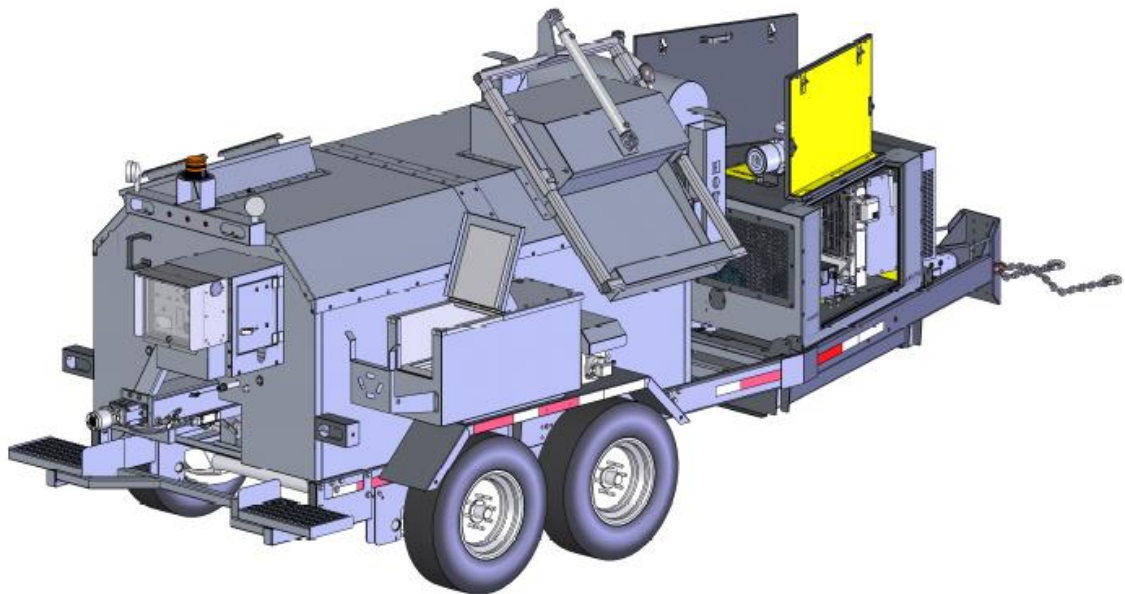




ASPHALT MASTIC PATCHER

OPERATIONS/MAINTENANCE/PARTS MANUAL

Diesel Burner Systems



ASPHALT MAINTENANCE EQUIPMENT
651-674-4491 / STEPPMFG.COM

Fill in the appropriate fields that apply to this machine.

Machine S/N: _____

Engine S/N: _____

Warranty

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

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

No warranty is extended to cover:

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

The following items are covered solely by their manufactures warranty:

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

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

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

Disclaimer of further warranty:

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

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

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

Please see Warranty section for more details.

Stepp Manufacturing Co., Inc.
12325 River Road
North Branch, MN 55056
P: 651-674-4491 F: 651-674-4221
www.steppmfg.com

INTRODUCTION

SMP Stepp Mastic Patcher

Thank you for selecting *Stepp* highway maintenance equipment. We are confident you will be satisfied with the *Stepp Mastic Patcher*. *Stepp Manufacturing* is backed by over 83 years of experience in the design and manufacture of highway maintenance equipment. This experience along with our innovative design and unique features make the *Stepp Mastic Patcher* the fastest and most efficient kettle available.

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

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

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

When ordering parts or making any inquiry about the *Stepp Mastic Patcher*, be sure to include the vin number found on the data plate attached to the frame.

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IMPORTANT NOTICE!

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

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

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

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

Before Starting or Operating this Machine

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

General Safety

- Stepp Manufacturing Co Inc assumes no liability for an accident or injury incurred through the improper use of this machine.
- Read this manual in its entirety before operating this machine.
- Obey all CAUTIONS and WARNINGS signs on this machine.

WARNINGS

- ◆ This equipment contains mechanical and heating components that may cause serious injury or death if not handled or maintained properly. All personnel must be properly trained in the operation and maintenance of this equipment.
- ◆ Wear personal protective clothing when operating. This includes gloves, safety glasses and or shield (especially when loading and unloading) Keep hands, feet and clothing away from moving parts.
- ◆ Before refueling, shut off the burners and allow all flames in the burner and pilot light to extinguish. Shut off the engine.
- ◆ Check fuel lines, fuel line connections, and all other components for leaks. If any leaks are found, they must be repaired before using the unit.
- ◆ Know the temperature required for the material being used, and do not exceed this temperature. Avoid overheating, as this may cause equipment damage, personal injury, and/or death.
- ◆ Never load a tank with heated oil when moisture is present in the tank. Depending on the temperature of the hot oil, the moisture may instantly boil causing hot oil to foam up and out of the tank causing severe burns.
- ◆ DO NOT heat transfer oil to a temperature of more than 600°F.
- ◆ DO NOT overfill the heat transfer oil in the reservoir. The expansion of oil while it heats up can cause overflow. With the machine on level ground, check the oil each day before starting the burner. Add oil to the top mark on the dipstick if required (at 70°F). Use only recommended heat transfer oil.

CAUTIONS

- ◆ Know the materials being used and know the proper handling, heating, application, clean-up, and storage procedures. Not all materials are compatible with each other. Many materials have a very limited shelf life. Most materials require special handling procedures to prevent personal injury and/or equipment damage. Contact your material supplier and/or manufacturer for proper handling instructions. Equipment malfunction or damage due to improper handling or use of the materials is not covered by warranty.
- ◆ Do not exceed the maximum heating temperature or storage time as recommended by the material manufacturer. Consult with the material manufacturer for recommendations.
- ◆ The burner on your Stepp SMP is designed to be in operation only while the unit is parked or at slow speeds in the construction site. When transporting the machine the burner shall be shut off. Operating the burner when transporting the machine is a violation of The Code of Federal Regulations, CFR Title 49, Part 392, Subpart G, 392.67 and may cause damage to the burner and/or machine.

NOTES

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

Notify your supervisor or the manufacturer if any questions arise concerning the operation of this equipment.

Specification	
Capacity	470 gallons
Heat Transfer Oil Required	58 gallons at 70°F
Tank Construction	Double boiler type
Loading Chute Size	32"x10"
Maximum heat input	480,000 BTUs
Burner and temperature control	Diesel-forced air thermostatic control
Engine Kubota	D1105 24.5 HP Tier 4 Compliant
Drive Mechanism	Hydraulic Planetary Gear Box
Mixer	Horizontal shaft with 6-1/4" AR replaceable paddles
Dry Weight	Approximately 4,900 lbs.
Loaded Weight	Approximately 11950 lbs.
Diesel Tank Capacity	Main Tank 26 Gallons Secondary 20 Gallons
Hydraulic Tank Capacity	12 Gallons
Axle Capacity	Dual 7000 lbs.
Tires	235/80R16, Load Range E

DESCRIPTION

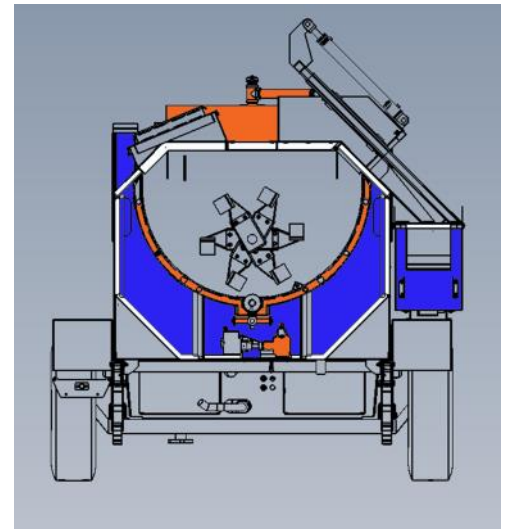
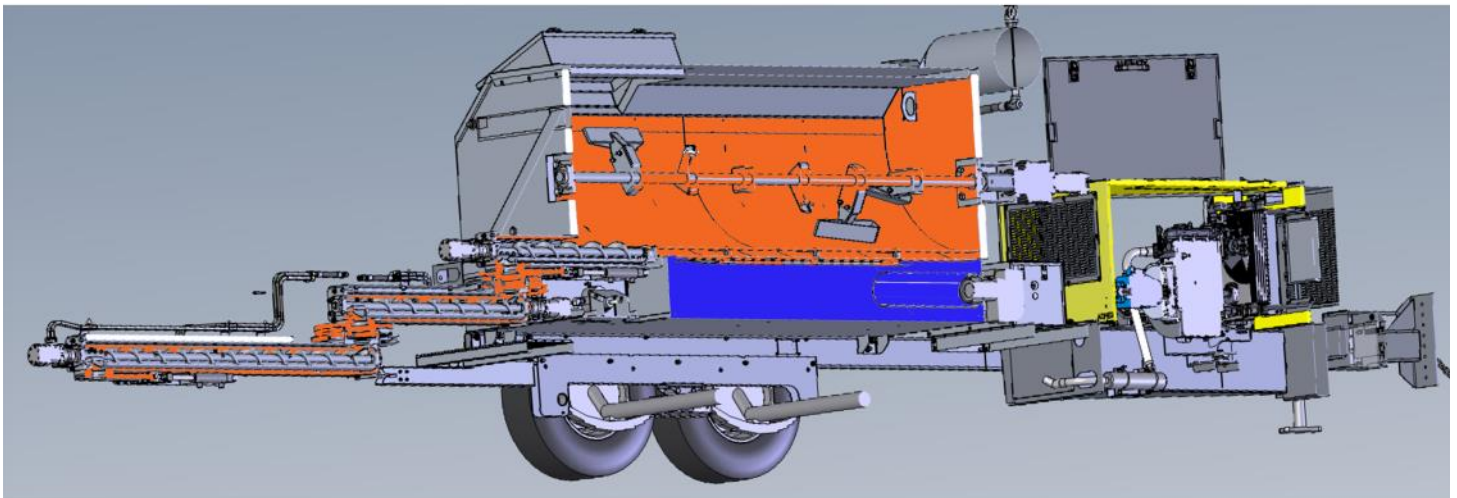
DESCRIPTION

The Stepp SMP is designed to melt and apply mastic compounds to fill cracks and potholes in the roadway surface.

The SMP uses a tank surrounded by an oil jacket filled with heat transfer oil. The heat transfer oil is heated by a diesel fired burner and is circulated in the oil jacket by a pump. The temperature of the product and the heat transfer oil is automatically maintained by electronic temperature controls.

The heated mastic is applied to the crack or pothole by an oil jacketed discharge auger with hydraulic discharge gate. The optional placement auger allows for direct placement in the repair area.

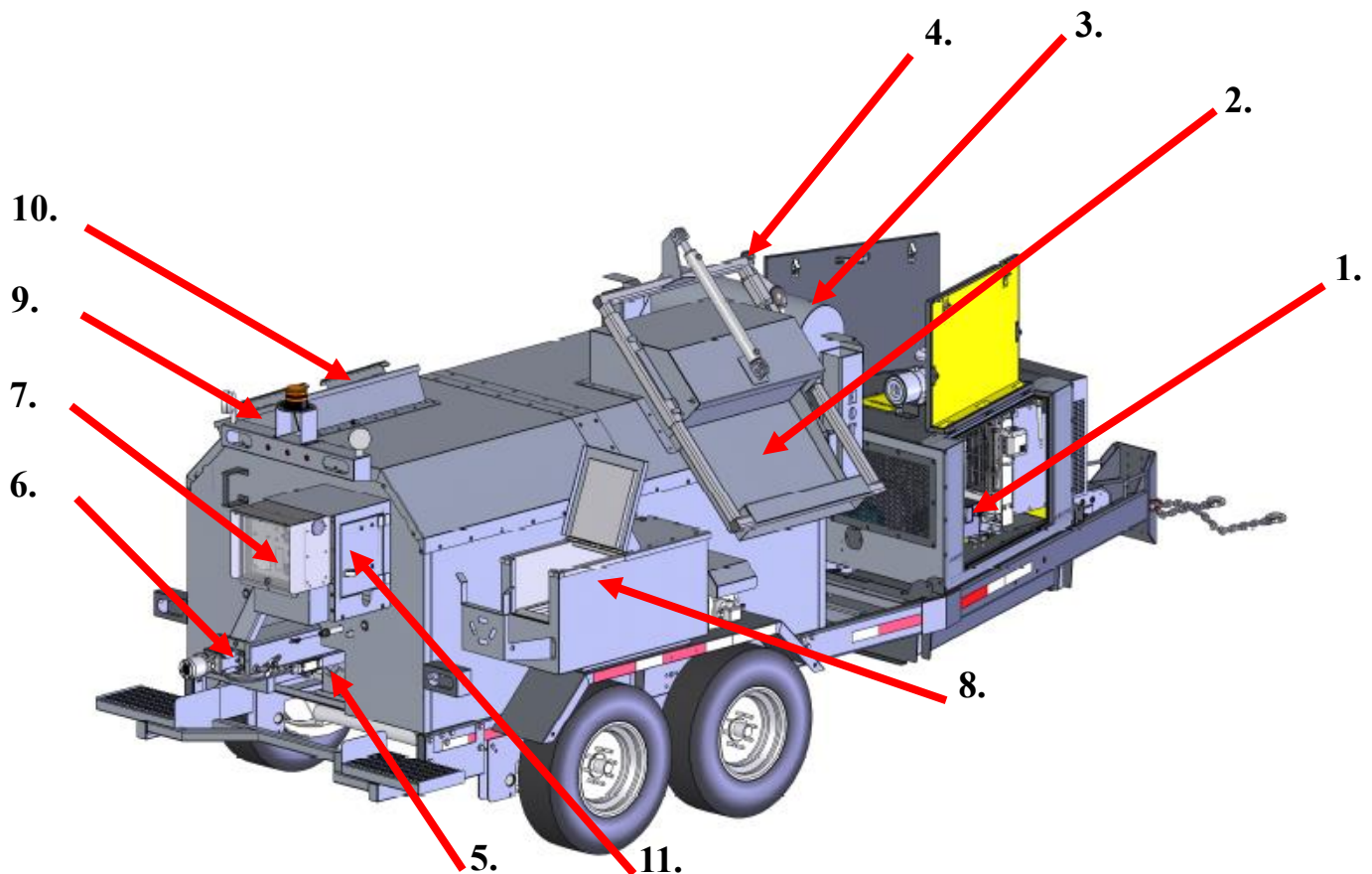
Power is supplied by a diesel engine. It also drives a hydraulic load sensing pump that powers the heat transfer oil circulation pump, agitator, and placement augers.



DESCRIPTION

Component Location

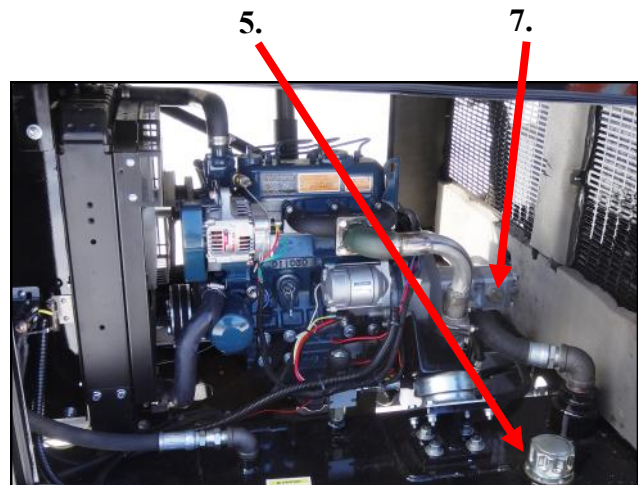
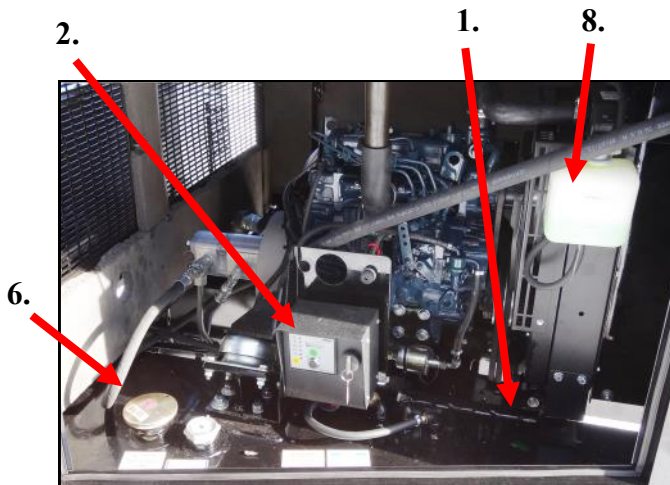
1. Deep Sea Engine Controls
2. Dozer Loading Chute — Provides a "splash free" way of loading product into a hot tank.
3. Expansion Tank — Provides room for the heat transfer oil to expand and allows the oil to cool. This creates a "cold seal" effect allowing safer operation at elevated oil temperatures.
4. Hot Oil Dip Stick / Fill Cap — Provides a way to check and fill the heat transfer oil tank.
5. Hot Oil Pump — Drives the heat transfer oil circulation pump.
6. Auger Delivery System— Delivers the material to the roadway.
7. Burner and Mixer Controls— Material temperature controllers and controllers for mixer operation and auger operation.
8. Tool Heater
9. Optional Strobe Lights, Work Lights and Camera System
10. Inspection Hatch
11. Tether Storage



DESCRIPTION

Component Location

1. 12V Alternator — Provides electrical power.
2. Engine Control Panel — Provides a means of controlling engine functions.
3. Engine Fuel Filter — Provides clean fuel to engine. (not shown)
4. Hydraulic Filter — Removes contaminants from the hydraulic system. (not shown)
5. Hydraulic Reservoir — Provides a 15 gallon capacity for the hydraulic system.
6. Fuel Tank and Gauge — Stores 46 gallons of diesel fuel to operate the burner and the engine.
7. Hydraulic Pump — Provides hydraulic power to the heat transfer oil circulation pump, auger, and the product pump.
8. Radiator Reservoir— Used to fill the radiator.



DESCRIPTION

Component Location

1. Automatic Temperature Controls for Product Temp— Controls material temperature.
2. Volt Meter
3. Automatic Temperature Oil Temperature thermostat— controls heat transfer oil temperature.
4. Timer for Tool Heater
5. Oil Pump Switch— Turns on heat transfer pump.
6. Tank Mixer— controls the rotation of the mixer.
7. Tether Controller— Used on standard base unit.
8. Tether Controller— Used on Units with optional Double Knuckle Placing Auger.



DESCRIPTION

Heating System

Burner System:

The heating system is designed to burn diesel fuel and efficiently heat the transfer oil. The heating system is equipped with constant ignition (flame-out protection) and automatic controls to monitor the temperature of the heat transfer oil and the product temperature.

WARNING: Know and understand your products safe pouring temperature.

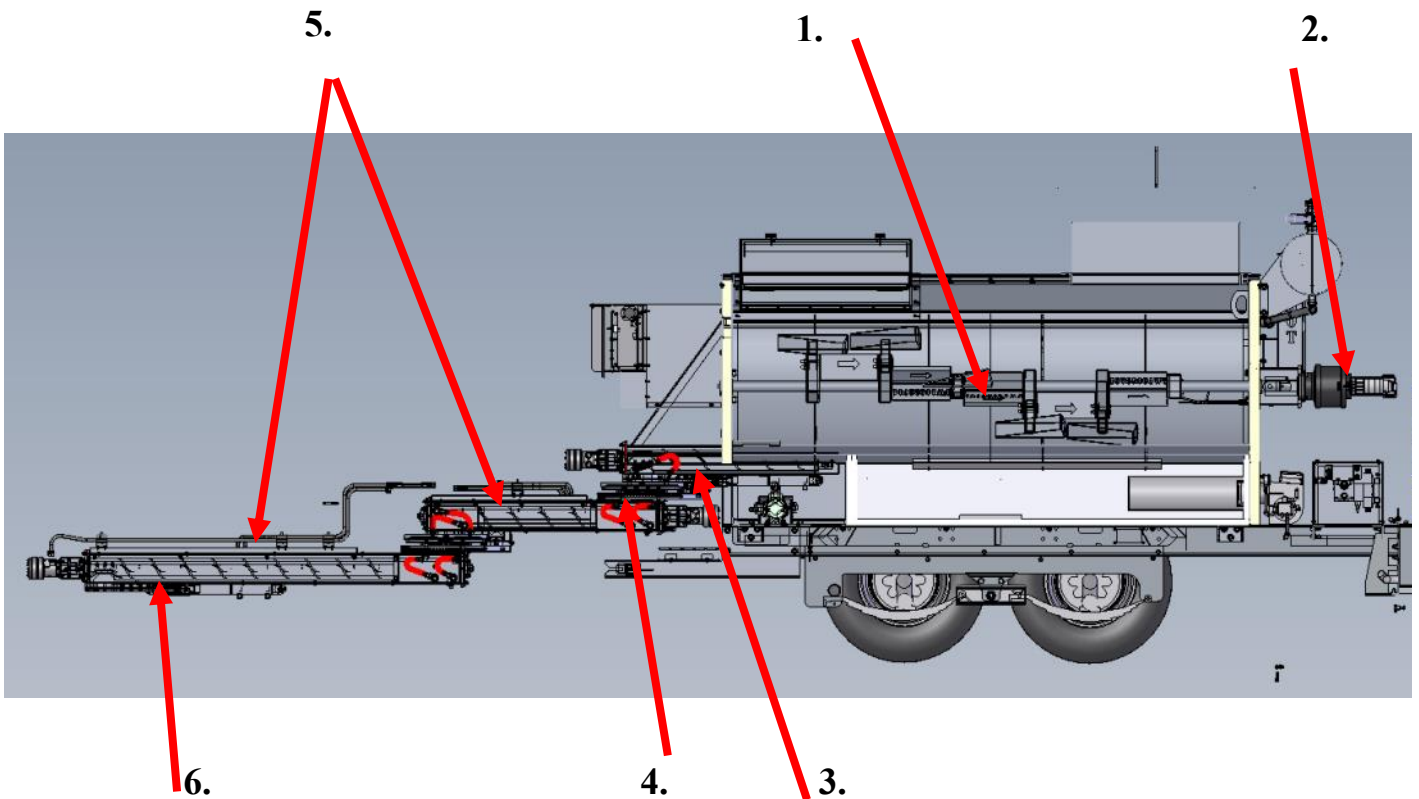
Agitator:

This unit is equipped with a hydraulically operated agitator with forward / reverse control. Operating the agitator during the heating cycle will decrease the amount of time and energy necessary to bring the product up to working temperature. The agitator should be turned on as soon as the material melts sufficiently enough to allow the agitator to rotate usually around 275°F. Constant agitation is required to maintain the proper rock/oil ratios.

DESCRIPTION

Discharge and Placement Augers

1. Mixer Agitator
2. Gearbox and Hydraulic Motor for Mixer
3. Hopper Auger
4. Hopper Valve/Chute
5. Double Knuckle Placing Augers
6. Placing Auger Valve/Chute



DESCRIPTION

Misc.

Overnight Heater (optional):

This feature will maintain the product from 150° to 200° F., saving startup time. The system consists of two heating elements submerged in the heat transfer oil.

The heaters require 110V, 15 amp service each. The extension cords used must be the outdoor heavy duty type, grounded, and each rated for 1500 watt service.

CAUTION: *Make sure to plug each heater into separate circuits or it may cause the breaker to trip on your outlet.*

Digital Engine Management Controls:

The engine controls consist of a starter / glow plug button, an unloader switch to relieve the hydraulic pressure for starting purposes (the deep sea control will also stop the engine in case of low oil pressure or high coolant temperatures), and indicator lights for oil pressure, coolant temperature, hour meter and volt meter. Optional equipment includes engine gauges.

OPERATIONS

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

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

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

Pre-Trip Inspection

1. Check engine fluid levels & grease machine.
2. Check tire pressure.
3. Inspect unit for any physical damage.
4. Check that discharge gate is operating properly.
5. Truck hook-up and lights .

Transporting

Trailer Hook-up

1. Connect trailer to towing vehicle
 - a. Assure hitch is engaged properly.
 - b. Attach safety chains to towing vehicle.
 - c. Connect electrical plug to towing vehicle.
 - d. Connect breakaway cable to towing vehicle.
 - e. Check operation of lights and brakes.
2. Secure trailer for transport
 - a. Shut OFF the engine and burners.
 - b. Shut OFF all fuel valves.
 - c. Be sure the product temperature is not above the recommended operating temperature.
 - d. Securely latch the inspection cover.

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

Note: DO NOT attempt to operate the machine without using these and all other instructions.

Note: Refer to the manufacturer's instruction manual for more specifications on fuel requirements.

Preparing the Machine for Start Up

1. Fill the engine fuel tank with diesel fuel.
2. Check the oil level in the engine crankcase. Refer to the manufacturer's instruction manual for the engine.
3. Check the hydraulic fluid level while at a temperature of 70°F. Add fluid if necessary.
4. With the machine on level surface, check the heat transfer oil level while at a temperature of 70°F. The oil should be at the full mark on the dipstick. DO NOT overfill or spillage may occur when the oil is heated and expands.
5. Make sure discharge gate is in the closed position.
6. Place the mixer control switch in the neutral position.
7. Make sure all toggle switches are turned "OFF" and all temperature control dials are set to their minimum settings.
8. Grease both front and rear mixer bearings weekly.

WARNING: The safe operation of this machine is the operator's responsibility.

Use extreme care when operating this machine; safety is the result of being careful and paying attention to details. Remember the diesel flame is approximately 2,200°F. Some exposed parts of the machine reach 500°F, the material 400°F, and the hydraulic fluid 200°F.

Always put on protective clothing, gloves, hard-soled shoes, and safety glasses or a face shield. Be sure that all joints and fittings are tight and leak proof. Immediately replace any hose, which shows any signs of wear, fraying, or splitting. Tighten all bolts, nuts, and screws every 100 hours.

Loading: Dozer loading chute.

It is very important that the operator know the operating temperature and flash point of the product being used. This information is available from the product manufacturer. Be sure the thermostat is set at the recommended temperature.

Prior to adding product to the tank, ensure the compatibility of the product in the tank to that being loaded. If products are not compatible the tank must be thoroughly drained and cleaned before switching products.

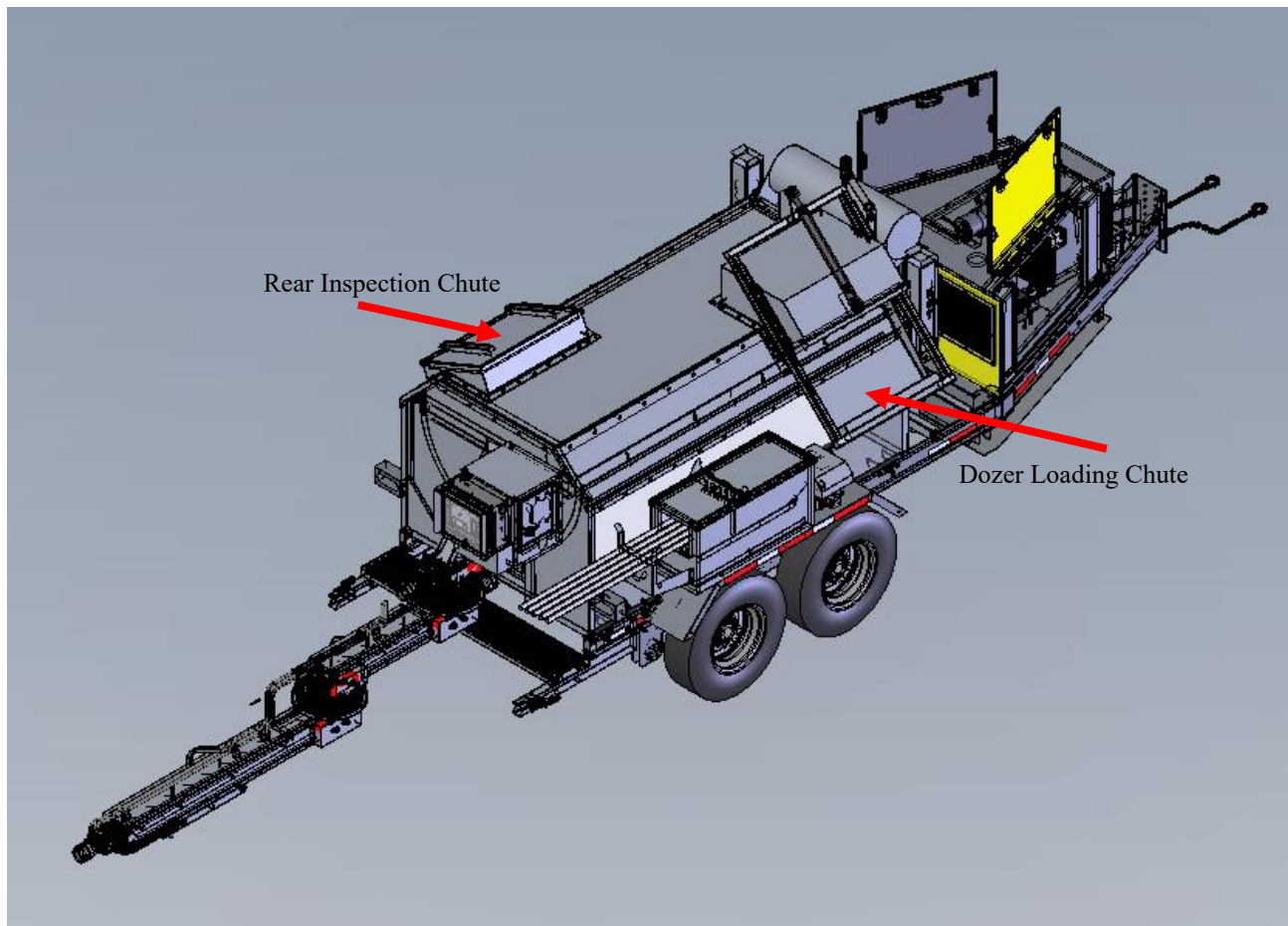
Loading When Hot:

WARNING Make sure that all operators and tools are clear of the loading chute before activating it.

Operate the switch located on the engine cabinet to open loading chute. Open loading chute and place block(s) of product on the loading platform, activate the switch to load the blocks hydraulically into the hopper. Open chute by activating the switch to open and repeat until product is at the desired level.

Loading When Cold:

You may also load blocks into the rear of the unit when the unit is cold. This will allow you to get more blocks into the kettle for your initial heat up. We do recommend that you do not use the rear loading chute when hot.



OPERATIONS

Engine

Engine Starting:

NOTE: *Be sure all pre-start checks are complete prior to starting engine.*

1. Fill fuel tank.
2. Check Engine Oil level
3. Turn key switch to the ON (right) position.
4. Hold yellow glow plug button down for 30-60 seconds.
5. Press green start button to start engine.
6. If engine does not start on first try, turn key switch OFF and start the starting sequence over.



OPERATIONS

Burner and Tool Heater

Burner & Auger Operations:

1. Turn the main power switch to the ON position.
2. Turn the Oil Pump switch on to start circulating heat transfer oil throughout the kettle and discharge auger(s).

CAUTION: Do not operate the oil pump if the oil temperature is over 200°F. Doing so may cause thermal shock and damage to the pump and personal injury may occur.

3. Set product thermostat to the product manufacturers recommended temperature. Thermostat will display the set point and the actual temperature of the product.
4. Set heating oil thermostat 50-100° above the asphalt product manufacturers recommended temperature. Thermostat will display the set point and the actual temperature of the product. Maximum Heating Oil Temperature is 550° F
5. Once product temp reaches a minimum of 300° turn on the agitator to the "Forward" position.
6. When the product is flowing freely and temperatures are stabilized, the product is ready to apply to the road surface. Proceed to "Application Operations".



Tool Heater

1. Open door on tool heater and insert tools.
2. Turn the tool heater timer to desired time.

CAUTION: Tools will heat up very quickly make sure that you have proper personal safety equipment on before operating. **EXTREME CAUTION!!** should be used when operating the tool heater.

WARNING: Tool heater has direct flame contact with tools. Tools that have excessive amounts of material may catch fire and cause damage. Keep flammable or combustible materials clear of tool heater box.

OPERATIONS

Standard Application Operations:

Application Operations with Hopper Auger only.

1. Turn Auger switch to the on position to start the auger. Make sure that you are ready to apply material to the road surface or into your cart. .
2. Select the switch to open the hopper chute. You will be able to see the chute gate indicator to the open or close position.
3. When you have the desired amount you may close the gate and push the auger button to stop the auger. We recommend that you do not leave the auger turning for a long period of time when the gate is closed.
4. No other cleanout required to shut the unit down.
5. Monitor the level in the tank and add product as necessary.



CAUTION: Do not engage augers until the product is at a minimum of 300°F.

Application Operations with Optional Double Knuckle Auger.

Note that the Double knuckle auger is heated with the kettles heat transfer oil. You will need to make sure that the augers are hot before trying to operate them.

1. Turn on the transfer pump. This should have been turned on when the burner turned on. Oil temp is over 200°F **DO NOT TURN ON** Circulating pump. Thermal heat expansion could occur and damage the pump. Allow the kettle to cool below 200° before turning on circulating pump.
2. Make sure your product is up to application temperature. Minimum of 300° material temperature required to operate the discharge augers. Failure to have material up to operating temperature could cause damage to the augers.
3. On the left hand side of the controller turn the red power button on. to the open or close position. This is the chute on the end of the third auger.

Note: Below the power button is the charging port. Make sure to utilize the cap when not charging to prevent dirt build up and causing damage to the charging port. Indicator light will be green when fully charged and when enable is activated. Red light will be on when charging.



4. On the right lower side of the controller press and hold the orange enable button until green light turns on. This is a 3-4 second hold to activate. **The controller will go into sleep mode after 3 minutes of no use.** To wake controller up, press the enable button to reactivate. This is to conserve on battery life. You are now ready to operate the discharge augers.

Note: Controller batteries can run for approximately 40hr without a charge. We highly recommend charging the batteries at the end of each shift to ensure full day operations. If batteries are dead or low you can operate the controller with the supplied charging cord. The controller will charge while using the controller with the charge cable installed.



Note: Take special precautions not to drive over, drag or melt the charging when cable is attached. If batteries die while in use. You will need to attach charging cord and shut the engine off and turn the controller power off to reset the controller to resume operation.

DISPENCING MATERIAL

5. Unlock augers from the travel cradles position.
6. Use the left and right joysticks to swing auger to desired location to dispense.

Note: Initial material that is discharged may be thick and hard to spread until you get hot material from the tank purged through the augers.



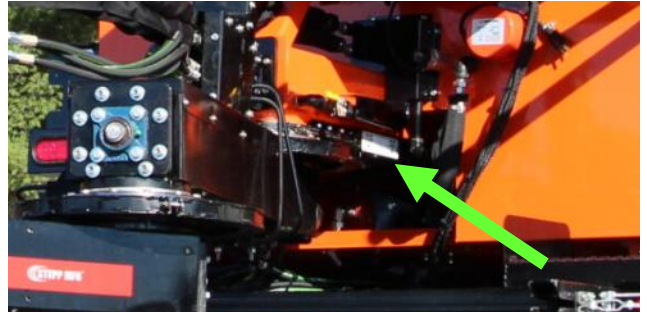
7. Turn the auger switch to forward and verify that all three augers are turning. Once verified that all three auger turn you can turn the augers to the off (center) position. Make sure that you are ready to apply material to the road surface or into your cart.



OPERATIONS

Application

9. Open hopper gate with the switch to allow material to enter the discharge augers. You can physically see the hoppers knife gate shift towards the kettle in the open position on the right side directly under the hoppers auger.
10. Open the auger gate switch to open the gate valve on the end of the placing augers. Material will start to drip out once open.
11. Turn on auger to start the flow of material. Be ready to shut the auger gate off once desired amount exits the placing auger. Shut off the augers also when not dispensing. It is ok to leave material in the auger until you reach the next patch. You should turn the augers off between patches to minimize wear inside the auger trough and prevent the rock getting separated toward the discharge gate valve.



Standard Shutdown Procedures:

CLEANOUT Double Knuckle Augers.

1. Select the discharge/cleanout button.
2. Close the Hopper Gate.
3. Open the auger Gate
4. Turn the auger switch to forward. Note that the hopper auger will not turn on, only the 2 on the double knuckle augers. Allow the material to empty. If material is left inside of augers you can reheat them the next day but you may have a longer heat up time to completely melt the material in the augers.
5. Turn both thermostats to their lowest setting.
6. Turn OFF the burner power switch.
7. Place the agitator switch to the OFF/ Neutral position.
8. Securely latch all covers.
9. Turn key to OFF position to shutdown the engine



OPERATIONS

Helpful Hints

1. It is recommended that the product level be drawn down to $\frac{1}{4}$ capacity or less prior to shutdown if the machine is not going to be used for two days or more. This will decrease the startup time next time the machine is used. However, if the equipment will be used the next day leave the unit $\frac{1}{2}$ full or more, then plug in the optional overnight heaters (if available). This will help retain heat for a faster startup the following day.
2. Overnight heating elements normally should not be used for more than 48 hours at a time. Check your product manufacturers specifications for recommended "pot" life.
3. DO NOT heat or reheat any product for a length of time more than that recommended by the product manufacturer. The result of excessive heating time is the material hardening and possibly becoming difficult or impossible to remove from the machine.

OPERATIONS

Optional Equipment

Optional Air Compressor:

100 CFM rotary screw compressor, direct coupled to the Kubota engine.

1. Start the engine (refer to engine start).
2. Set throttle to adjust the desired air flow using the supplied pressure gauge.
3. Connect the air hose to the quick connector and open the supply valve.

MAINTENANCE

SMP MAINTENANCE SCHEDULE

ITEM	OPERATION TO PERFORM	HOURS	AS NEEDED	DAILY	EVERY 3MO	EVERY 12 MO	EVERY 24MO
ENGINE	Refer to the engine manufacturers manual insert.						
OIL	Check engine oil level, add oil as needed.			X			
OIL	Change engine oil and filter.	100					
COOLANT	Check coolant level.			X			
COOLANT	Flush cooling system and replace coolant.						X
RADIATOR	Clean radiator fins of dirt and dust with garden hose.		X				
AIR FILTER	Clean air filter.		X				
AIR FILTER	Replace air filter.	100				X	
FUEL FILTER	Replace fuel filter.					X	
FAN BELT	Check condition and tension.			X			
HYDRAULICS							
HYD. OIL	Check hydraulic oil level, add oil as necessary.			X			
HYD. OIL	Change hydraulic oil.						X
FILTER	Change hydraulic filter.	200				X	
STRAINER	Clean strainer screen.					X	
DRIVE LINE							
ALT. BELTS	Check condition and tension of 12V alternator belts.			X			

SMP MAINTENANCE SCHEDULE

ITEM	OPERATION TO PERFORM	HOURS	AS NEEDED	DAILY	EVERY 3MO	EVERY 12 MO	EVERY 24MO
BURNER							
ELECTRODES	Check electrodes for wear and proper adjustment.					X	
NOZZLE	Replace fuel nozzle with same size and style.					X	
FILTER	Replace burner fuel filter.	400				X	
F-HEAD	Check condition of F-head on burner.					X	
HOT PUMP							
CLEARANCE	Check and adjust end clearances of heat transfer oil pump.						X
PACKING	Adjust shaft seal packing of heat transfer oil pump.		X				
COUPLING	Check pump to hydraulic motor coupling for proper alignment and excess wear.					X	
HEAT TRANSFER OIL							
OIL	Check heat transfer oil level.			X			
OIL	Change heat transfer oil.	1000					X
PRODUCT TANK							
TANK	Clean and inspect interior for leaks or damage.					X	
PACKING	Adjust packing seal on auger shaft.		X				
COUPLING	Check auger to hydraulic motor coupling for proper alignment and excess wear.					X	
BEARINGS	Check auger bearing mounts for looseness and excessive wear.					X	

SMP MAINTENANCE SCHEDULE

[illegible]

SMP MAINTENANCE RECORD

[illegible]

All maintenance items must be performed according to the maintenance schedules and documented for warranty coverage to be effective.

SMP MAINTENANCE RECORD

[illegible]

All maintenance items must be performed according to the maintenance schedules and documented for warranty coverage to be effective.

Oil & Filter Change:

1. Run engine until operating temperature is reached, then shut OFF engine.
2. Place drain pan under oil drain hose.
3. Open oil drain valve and drain oil from the engine.
4. Close the oil drain valve.
5. Place drain pan under engine oil filter and remove filter.
6. Coat gasket of new oil filter with engine oil and install, hand tighten only.
7. Add 5 quarts SAE 10 W 40 oil.
8. Run engine and check for leaks.
9. Return used oil to a recycling center.

Air Cleaner Service:

1. Remove wing nut in center of air cleaner.
2. Remove filter.
3. Clean element following instructions on air cleaner housing. Element may be cleaned up to six times before replacement.
4. Reinstall element in housing and tighten wing nut.

Fuel Filter Change:

1. Position drain pan under fuel filter.
2. Remove fuel filter.
3. Fill new filter with clean diesel fuel.
4. Lubricate gasket with fuel and install filter, hand tighten.
5. Loosen the air vent plug on the injection pump where the fuel line is attached.
6. Pump the lever on the fuel pump until no air bubbles are present, tighten air vent plug.

Cooling System Service:

1. Allow engine to cool to ambient temperature.
2. Open radiator petcock and drain coolant into a suitable container.
3. Open petcock on left side of engine block and drain into a suitable container.
4. Open radiator cap and remove lower radiator hose.
5. Flush clean water through radiator until the water comes out clear.
6. Remove the thermostat then flush clean water through the engine block until the water comes out clear.
7. Install new thermostat and gasket.
8. Install radiator hose and close all petcocks.
9. Refill system with fresh anti-freeze in a 50/50 mix.
10. Run engine and check for leaks, then recheck coolant level after engine has cooled.

Filter Change:

1. Position drain pan under filter.
2. Remove oil filter.
3. Lubricate gasket of new filter with hydraulic oil.
4. Install new filter, hand tighten.
5. Start unit and check for leaks.
6. Shutdown unit then check hydraulic oil level.

Hydraulic Oil Change:

1. Position drain pan under the hydraulic reservoir (reservoir capacity exceeds 15 gallons, be sure drain pans have adequate capacity).
2. Remove drain plug from bottom of reservoir and drain oil.
3. Return used oil to a recycling center.
4. Replace drain plug using pipe sealer on threads.
5. Fill reservoir with hydraulic oil to about 3 to 4 inches from the top of the tank (approx. 15 gallons).

Strainer Screen Service:

1. Position drain pan under the hydraulic reservoir (reservoir capacity exceeds 15 gallons, be sure drain pans have adequate capacity).
2. Remove drain plug from bottom of reservoir to drain oil.
3. Replace drain plug using pipe sealer on threads.
4. Remove hose clamps and 1¼" suction hose from nipple on hydraulic reservoir tank.
5. Unscrew king nipple from street-el.
6. Unscrew strainer from tank and clean in solvent.
7. Apply pipe sealer to threads and reinstall strainer and king nipple.
8. Attach 1¼" suction hose to king nipple and tighten clamps.
9. Refill hydraulic reservoir with hydraulic oil.
10. Check for leaks.

Level Check:

1. Remove oil fill cap on top of expansion tank.
2. Cold oil level should be at the lower notch and the hot level at the upper notch in the dipstick. The cold level may also be checked by removing the cold oil level plug located to the lower left of the control panel on the rear of the machine.
3. Allow unit to cool, then add heat transfer oil as necessary. Use heat transfer oil with a minimum flash point of 550° F. C.O.C. (ISO 68)
4. Replace oil fill cap.

Oil Change:

1. Allow unit to cool to ambient temperature.
2. Approximate oil capacities 58 gallons. Have suitable containers ready to contain oil.
3. Remove the drain plug from lower rear of unit and drain oil into drain pan(s).

NOTE: *If optional overnight heater is installed, remove to allow the oil to drain.*

4. Replace drain plug and return oil to a recycling center.
5. Remove oil fill cap and add oil to the cold fill mark on the dipstick, or until oil flows from the cold oil level plug on the rear of the machine. Use heat transfer oil with a minimum flash point of 550° F. C.O.C. (ISO 68)
6. Heat unit to normal operating temperature and verify oil is half full in the expansion tank.

Packing Adjustment, Hot Oil Pump:

NOTE: *The packing gland requires a small amount of leakage (one drop every couple minutes) for lubrication, if leakage becomes excessive, adjust only enough to stop the excessive leakage.*

1. Stop engine.
2. Tighten two nuts on adjusting plate equally to control leakage (DO NOT over tighten).
3. Start machine and check amount of leakage.
4. Readjust as necessary.

WARNING: *The proper heat transfer oil level is critical to the safe operation of this equipment. The most accurate way to check the oil level is when the unit is at operating temperature, however, extreme caution must be used since the dipstick and the oil are very hot and will cause severe burns. Wear leather gloves, eye and face protection, and other appropriate safety gear when checking the oil level.*

WARNING: *It is important that the oil level (when hot) be approximately half full in the expansion tank. Allow the unit to cool before adding oil. DO NOT allow any water or moisture to be introduced into the system.*

NOTE: *The heat transfer oil will expand approximately 10 to 15% when heated from 60°F to 400°F. Make allowance for this when adding oil to a cold system.*

NOTE: *The unit is shipped with Amsoil IHNT Heat Transfer Oil. Use this or an equivalent heat transfer oil.*

Fuel Filter Replacement:

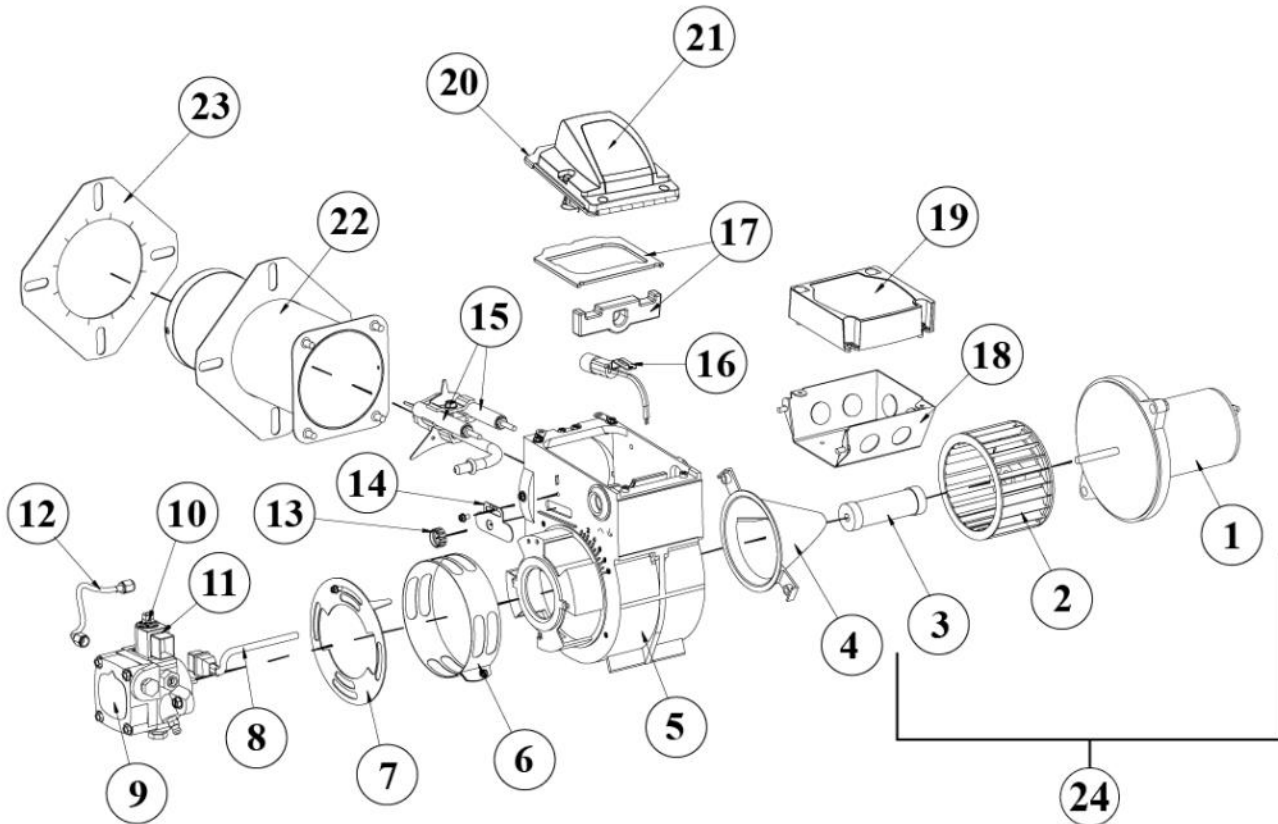
1. Close fuel shutoff valve located at the fuel tank.
2. Remove the nut securing the canister to the fuel filter body.
3. Remove the canister and the filter element.
4. Replace the element with a new one.
5. Reinstall the canister and turn on the fuel valve.
6. Attach a clear hose to the fuel pump bleeder screw on the burner and direct the hose into a suitable container.
7. Start engine, set thermostats, then turn on the burner power switch. This will allow the fuel pump in the burner to run so the fuel system can be bled of air.
8. Loosen the bleeder screw and observe the flow of fuel through the clear hose, when all air is purged from the system close the bleeder screw.
9. Check entire fuel system for leaks.
10. Set the thermostats to the desired level and the burner will ignite.

Combustion Chamber Inspection:

1. Allow unit to cool to ambient temperature.
2. Remove four nuts and washers securing burner and cover.
3. Inspect heat transfer tubes for any signs of leaks, cracks, or deformation.
4. Inspect insulation support clips for damage.
6. Inspect end diffuser plate for cracking or warping.
7. Inspect liner for cracks, excessive deformation, or other signs of deterioration.
8. Inspect entire combustion chamber area for any other signs of leakage, damage or fatigue.
9. Reinstall burner if no damage is found.

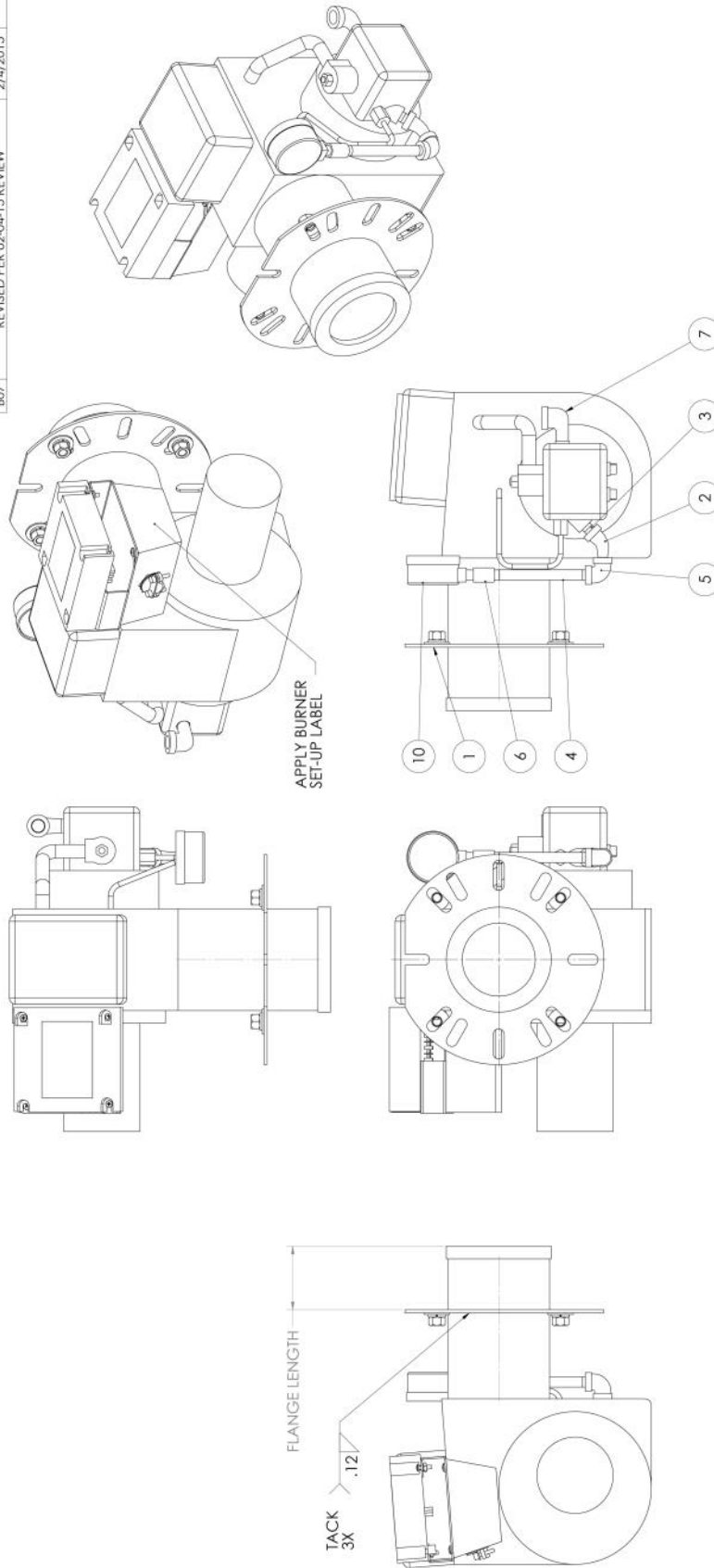
NOTE: *If any damage is found it must be repaired before returning the unit to service. Contact Stepp Mfg. (651) 674-4491 for replacement parts.*

REPLACEMENT PARTS



ITEM	QTY	DESCRIPTION	PART#
1	1	Motor, blower	509092
2	1	Blower Fan Wheel	509069
3	1	Coupling, pump to motor.....	509086
4	1	Air Tube	509066
5	1	Burner Housing	P10015946
6	1	Air Band	Call
7	1	Air Shutter	Call
8	1	Cord Set.....	P10015940
9	1	Pump.....	509109
10	1	Valve Stem	P10015922
11	1	12 Volt Coil	P10015920
12	1	8" Copper Tubing	P10015921
13	1	Escutcheon Plate Spline Nut.....	Call
14	1	Escutcheon Plate.....	Call
15	1	Electrode and Fuel Line assembly	509112
	1	Electrode only.....	509089
16	1	Cad Cell	A10008216
17	1	Igniter Gasket Kit	P10015548
18	1	4x4 Wiring Box kit.....	Call
19	1	Primary Control	A10008216
20	1	Igniter Assembly With Base Plate	509087
21	1	Igniter Only	N/A
22	1	Air Tube Assembly	509070
23	1	Flange Mounting Gasket	509111
	1	Flange with Gasket.....	509071
24	1	Motor Kit with Blower Wheel and Coupling	509092
25	1	Complete Burner Assembly of SMP-400	A10008105-003

REV.	DESCRIPTION	DATE	APPR.
B03	CHANGED GAUGE FITTINGS	9/25/2013	
B06	REVISED AND REDRAWN	1/9/2015	
B07	REVISED PER 02-04-15 REVIEW	2/4/2015	



NOTE: USE BURNER SET-UP SHEET A10008105-005
TEST AFTER ASSEMBLY

ITEM NO.	-005/QTY.	PartNo	Description-1	Description-2
10	1	P10012560	PRESSURE GAUGE	0-200 PSI
9	1	P10005132	F - 12 FUEL RETURN HEAD	BECKETT MODEL ADC DIESEL BURNER
8	1	P10005125	1.50 GPH BURNER NOZZLE	DIESEL BECKETT MODEL ADC BURNER
7	1	P10001539-002	ELL - ST - 90°	1/4 NPT
6	1	P10001520-001	COUPLING - FULL STANDARD	1/8"
5	1	P10001465-001	ELBOW - BLK 90°	1/8"
4	1	P10001298-007	PIPE NIPPLE - SCH.40	1/8 x 4
3	1	P10001298-001	PIPE NIPPLE - SCH.40	1/8 x CLOSE
2	1	P10001048-001	ELBOW - ST - 45°	1/8 NPT
1	1	A10008215	BURNER BASE UNIT ASSY CPC	BURNER BASE UNIT ASSY

FOR PARTS AND COMPONENTS, CONTACT STEPP MFG. CO. INC. AT 1-800-451-1234 OR VISIT OUR WEBSITE AT WWW.STEPPMFG.COM STEPP MFG. CO. INC. 1000 STEPP DRIVE MILWAUKEE, WI 53214-1000 TEL: 414-224-4447 FAX: 414-224-4448	STEPP MFG. CO. INC. 1000 STEPP DRIVE MILWAUKEE, WI 53214-1000 TEL: 414-224-4447 FAX: 414-224-4448
ROUTINGS ASSEMBLY, QC SCALE: 1:2 WEIGHT: 23.56 DO NOT SCALE DRAWING	STEPP MFG. CO. INC. 1000 STEPP DRIVE MILWAUKEE, WI 53214-1000 TEL: 414-224-4447 FAX: 414-224-4448 BURNER ASSY QTY: 75 & 125 PART NO: A10008105-005 REV: B07 SHEET 1 OF 2

NOTE: USE PURCHASED VINYL CONTROL PANEL LABEL P10021356

NOTE: USE WIRING SCHEMATIC S10021362 PAGE 1 FOR WIRING

REVISIONS

REV.	DESCRIPTION	DATE
B03	ADDED TOOL HEATER COVER	2/25/2020
B04	CHANGED VOLTMETER	7/21/2020
B05	CONTROL PANEL & LABEL UPDATED	5/4/2021

NOTE: USE WIRING SCHEMATIC S10021362 PAGE 1 FOR WIRING

NOTE: USE PURCHASED VINYL CONTROL PANEL LABEL P10021356

NOTE: USE WIRING SCHEMATIC S10021362 PAGE 1 FOR WIRING

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ITEM NO.	QTY.	PartNo	Description-1	Description-2
40	19	P10021976	DEUTSCH SOCKET 1062-20-0122	16 TO 22 GA FOR SIZE 20
39	1	P10021973	DEUTSCH NUT 2411-002-1805	FOR SIZE 20
38	1	P10021972	DEUTSCH LOCKWASHER 2414-002-1886	FOR SIZE 20
37	1	P10021970	DEUTSCH HDP24-18-21SN	FLANGE CONNECTOR 21 FEMALE PINS
36	1	P10021967	SWITCH LATCHING RELAY BISTABLE	6-24V DC
35	1	P10021924	DEUTSCH-HDP20-RECPC-23-S-IL	
34	1	P10021911	VOLTMETER - 4.5-30VDC	
33	1	P10021910-001	LED - PANEL MNT AMBER	6" WIRE LEADS
32	1	P10021910	LED - PANEL MNT RED	6" WIRE LEADS
31	2	P10021856	DEUTSCH-SEAL PLUG-20	
30	1	P10021594	TIMER SPRING WOUND 15 MINUTE	TIMER SPRING WOUND 15 MINUTE
29	1	P10021356	LABEL - CONTROL PANEL MASTIC	MASTIC WITH AB & STROBE CUTOUT
28	2	P10020471	CABLE TIE MOUNT	ADHESIVE BACKED
27	1	P10019814	DEUTSCH-LOCK WASHER-24	
26	1	P10019813	DEUTSCH-PANEL NUT-24	
25	15	P10013723	DEUTSCH-SKT-# 16-16/20AWG	
24	8	P10012089	WATLOW EZ PID TEMP CONTROLLER	
23	2	P10003540	SWITCH 20 AMP ON-OFF DPST	12 VOLT
22	1	P10002877	SWITCH ON-OFF-ON 15 AMP	15 AMPS, 4 TERMINALS
21	1	P10002558	CONNECTOR STRAIN RELIEF 3/4	3 TERMINAL
20	1	P10002557	CONNECTOR STRAIN RELIEF 1/2	WITH LOCKING NUT
19	1	P10002553	CPC CON-4 PIN FL REC STD	USE MALE PINS
18	1	P10002032	GROUNDING BAR	8 SCREW
17	1	P10002031	BREAKER	20 AMP AUTO RESET
16	1	P10002030	RELAY HIGH CAPACITY	40A NC 20A 12V
15	1	P10002009	PLUG, NYLON	1/2 DIA X .125
14	2	P10001625-006	HEX NUT MACHINE SCREW	1/4-20NC
13	4	P10001619-100	PAN CROSS HD MACH SCREW	#6-32X0.375
12	2	P10001619-097	PAN CROSS HD MACH SCREW	#6-32X0.75
11	2	P10001619-014	PAN CROSS HD MACH SCREW	#8-32 X 5/8
10	10	P10001619-013	PAN CROSS HD MACH SCREW	#8-32 X 1/2
9	2	P10001619-012	PAN CROSS HD MACH SCREW	#8-32X0.375X0.375-N
8	4	P10001600-001	NUT HEX	1/4-20NC
7	2	P10000187	TERMINAL STRIP	8 X 30 AMP
6	4	P10000179	BREAKER	20 AMP
5	1	M10001342	FRONT CONTROL PANEL MASTIC	MASTIC WITH AB & STROBE CUTOUT
4	1	M10013006	INNER PANEL STPH	STPH CONTROL BOX
3	1	M10011831	AB PANEL COVER	COVER PLATE
2	1	M10001051-042	BOTTOM COVER PLATE	D29P-D21P-CON7-CON5-CPC4
ITEM NO.	DEFAULT/QTY.	PartNo	Description-1	Description-2

NOTE: USE PURCHASED VINYL CONTROL PANEL LABEL P10021356

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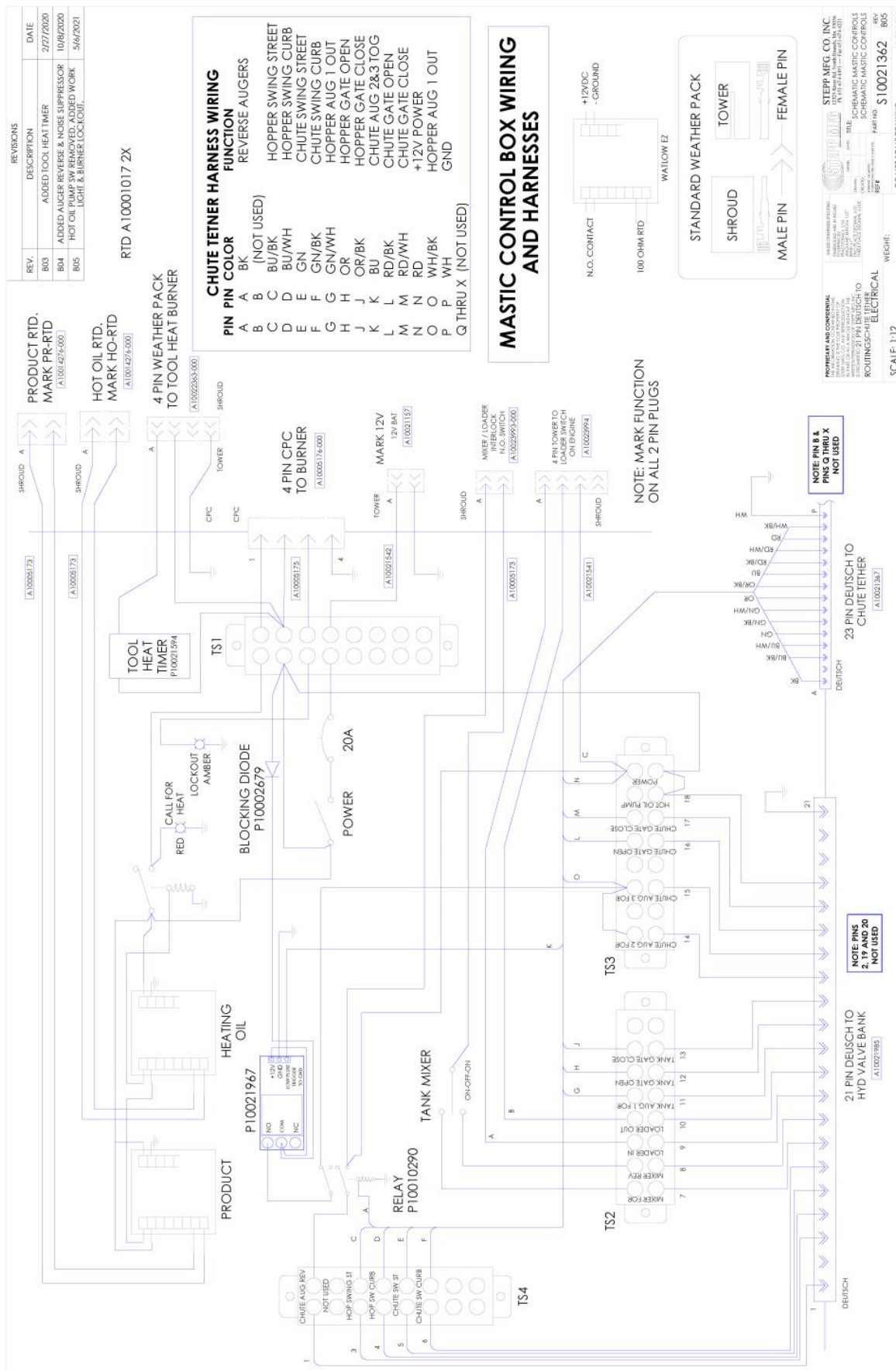
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REPLACEMENT PARTS

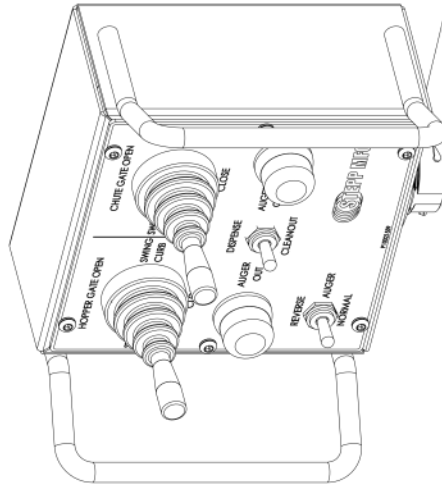
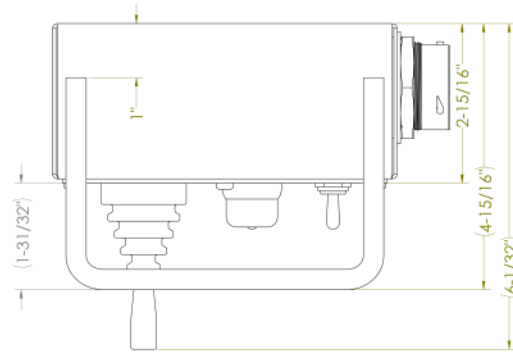
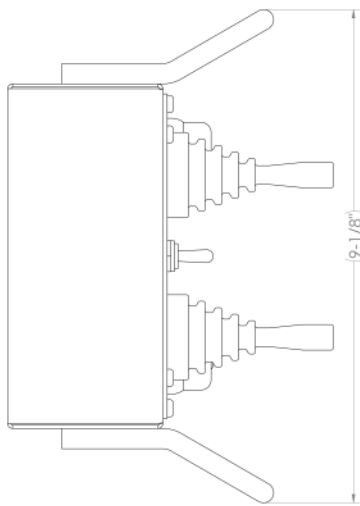
Tether Control Base Unit

[illegible]

REPLACEMENT PARTS Legacy tether Control For Double Knuckle Placing

SEE PAGE 2 FOR EXPLODED VIEW

REVISIONS		
REV.	DESCRIPTION	DATE
B01	RELEASED FOR PROTOTYPE	12/19/2019
B02	ADDED AUGER REVERSE SWITCH	5/4/2021



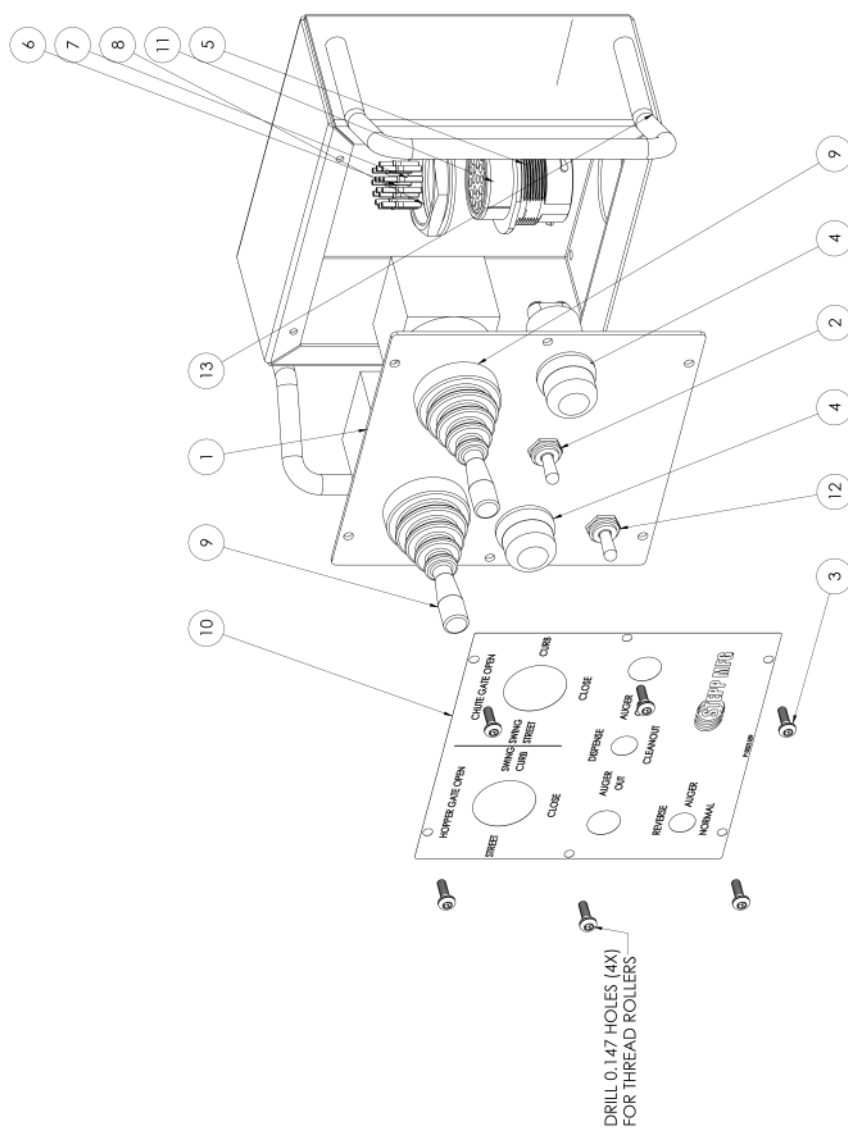
NOTE: SEE S10021362 PAGE 2
FOR INTERNAL WIRING

ITEM NO.	QTY.	PartNo	Description-1	Description-2
13	1	W10021555	MASTIC TETHER BOX W/DM	
14	1	P10022684	SPST SWITCH OFF-MOM	
15	1	P10022684	DEUTSCH-LOCK 23.5-IL	
16	1	P10021559	DEUTSCH-LOCK TETHER BOX	
17	2	P10021552	JOYSTICK 4 POS 30MM	MASTIC TETHER BOX ASSY
18	1	P10019814	DEUTSCH-LOCK WASHER-24	JOYSTICK 4 POS 30MM
19	8	P10019813	DEUTSCH-LOCK PANEL NUT-24	
20	7	P10019813	DEUTSCH-SKT-#16-16/20AWG	
21	6	P10013723	DEUTSCH-SEAL PLUG-12/16	
22	5	P10012089	WORM GEAR 16MM W/BOOT	
23	8	P10003245	WORM GEAR 16MM W/BOOT	NORMALLY OPEN
24	3	P10003245	WORM GEAR 16MM W/BOOT	#8-32 UNF X 1/2
25	2	P10000180	SPST SWITCH ON-OFF	PLASTIC
26	1	M10021553	TETHER SWITCH PLATE	MASTIC TETHER BOX ASSY

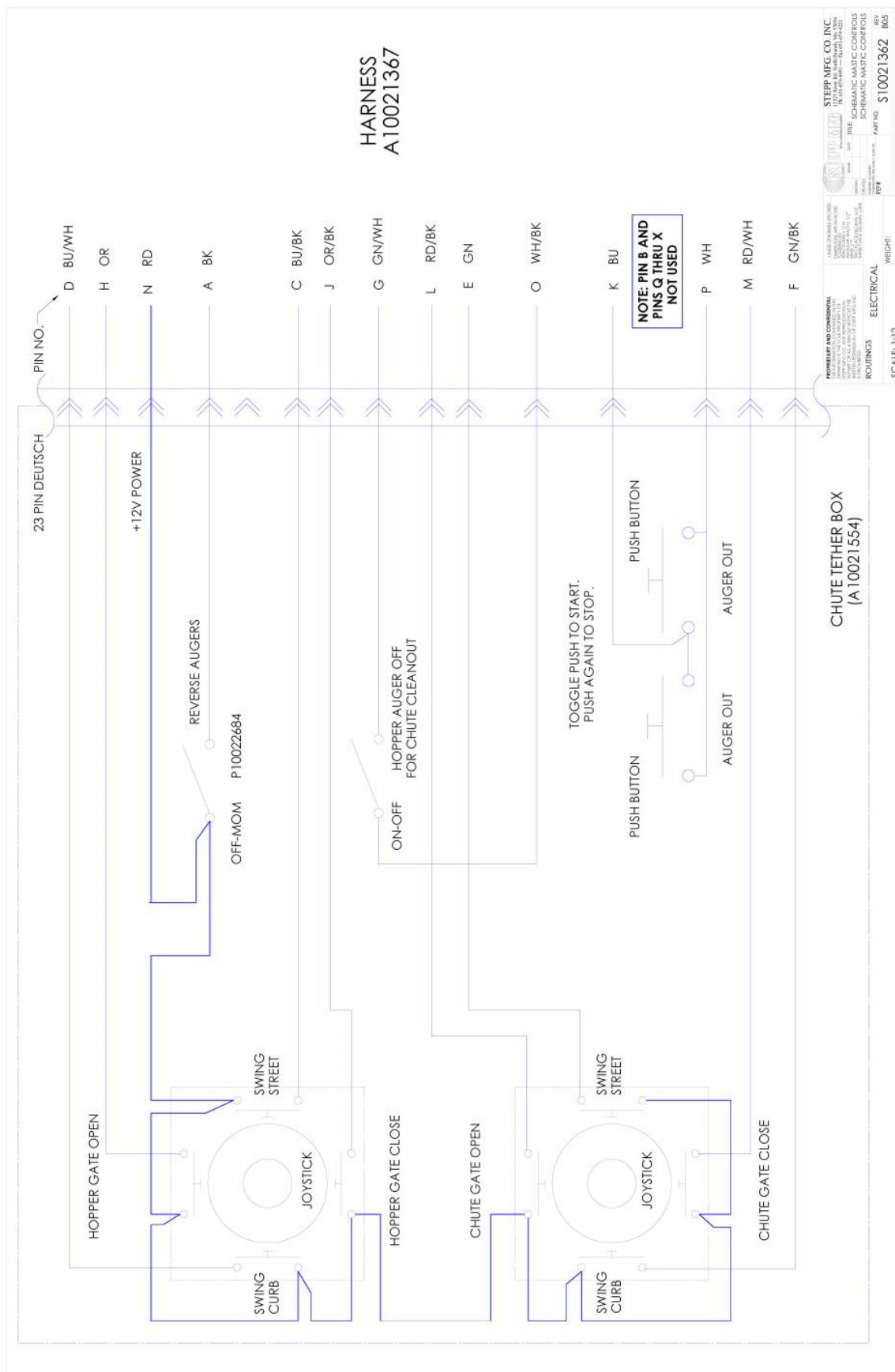
PARTS LIST AND COMMENTS SEE DRAWING FOR PARTS LIST PARTS LIST IS SUBJECT TO CHANGE WITHOUT NOTICE PARTS LIST IS SUBJECT TO CHANGE WITHOUT NOTICE		STEPP MFG. CO. INC. 1000 S. 10th St. - 1st Floor Ft. Collins, CO 80521		REV 10021554 B02+	SHEET 01 OF 2
		THIS DRAWING IS FOR THE MASTIC TETHER BOX ASSY			
PARTS LIST SEE DRAWING FOR PARTS LIST PARTS LIST IS SUBJECT TO CHANGE WITHOUT NOTICE	DATE: 10/1/2011 DRAWN BY: J. J. J. J. CHECKED BY: J. J. J. J. APPROVED BY: J. J. J. J. 1000 S. 10th St. - 1st Floor Ft. Collins, CO 80521	PART NO. A 10021554 B02+	DO NOT SCALE DRAWING		
ELECTRICAL ROUTINGS	WEIGHT: 9.48	SCALE: 1:1			

REPLACEMENT PARTS

Legacy Tether Control For Double Knuckle Placing Augers



SECRETARY AND CONFIDENTIAL INFORMATION IS NOT TO BE DISCLOSED TO THE PUBLIC UNLESS AUTHORIZED BY A WRITTEN ORDER FROM THE SECRETARY OF DEFENSE (DD FORM 129, 1-75)		PLEASE CONTINUE ON PREVIOUS PAGE IF THIS IS THE LAST PAGE OF THE DRAWING, CHECK ONE OF THE FOLLOWING:	NAME	DATE	TITLE	STEP MFG. CO. INC. 10000 W. 10TH AVE. MINNETONKA, MN 55342								
		THIS DRAWING IS THE PROPERTY OF STEPHAIR AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS WITHOUT PERMISSION IN WRITING FROM STEPHAIR	DESIGN	DRAWN	CHECKED	APPROVED	PART NO.	REV.	PART NO.	REV.				
			M-1000-1-2-12 (2008)		M-1000-1-2-12 (2008)		MASTIC TETHER BOX ASSY		MASTIC TETHER BOX ASSY		A10021554		802+ 802+ 2 OF 3	
			ELECTRICAL ROUTINGS		ELECTRICAL ROUTINGS		DO NOT SCALE DRAWING		WEIGHT: 9.38		SCALE: 1:1			

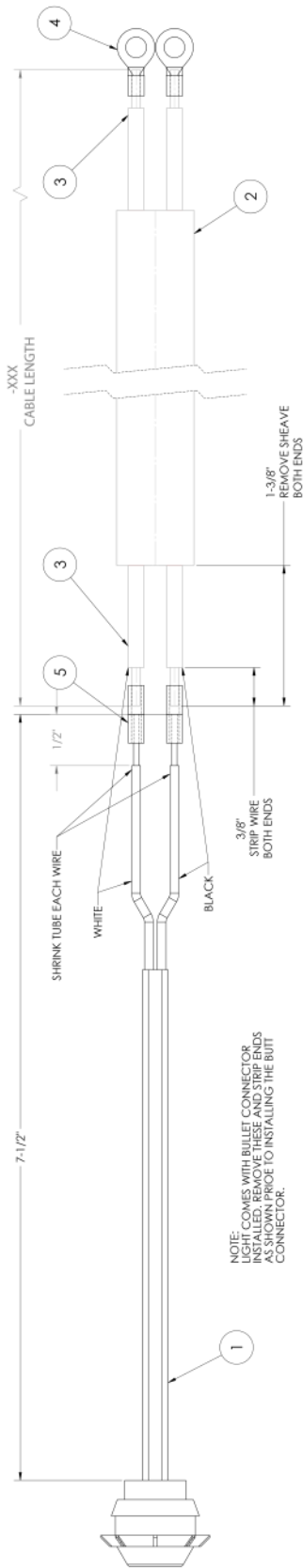


Part No.	Length
A10008368-000	UNDOCUMENTED
A10008368-052	52"
A10008368-096	96"
A10008368-180	180"

REV.	DESCRIPTION	DATE
002	UPDATED PER MARKUPS	8/20/2010
003	ADDED DIMENSIONS	7/13/2014
004	ADDED ASSEMBLY INFORMATION	7/13/2014

SEE PART NO. ON CHART FOR CABLE LENGTH

-000 REQUIRES DOCUMENTATION RETURNED TO ENGINEERING FOR LENGTH AND WHERE USED.



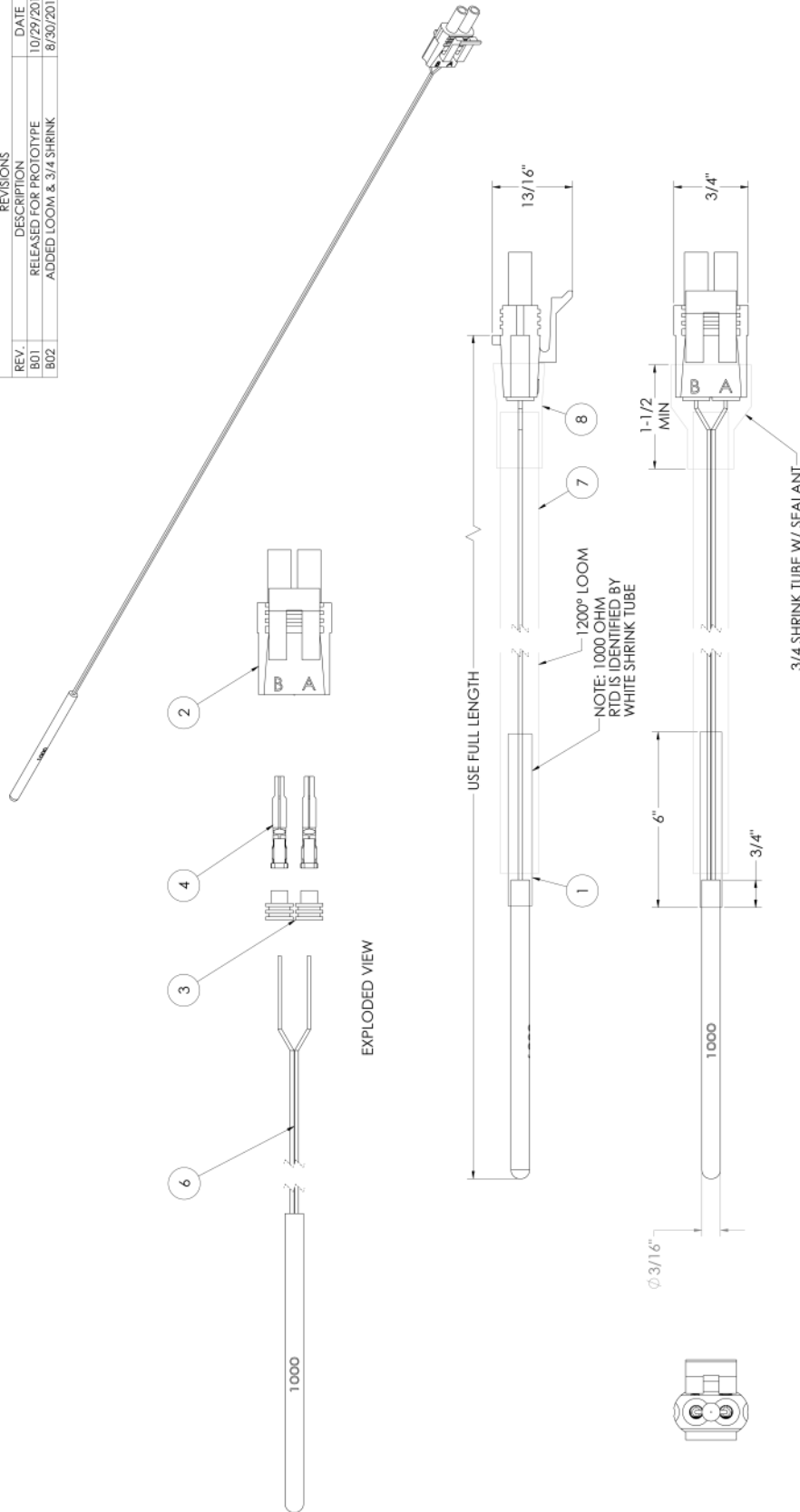
ITEM NO.	AS DRAWN/QTY.	PartNo	Description-1	Description-2
5	2	P10002861	16-14 GA BUTT CONNECTOR	NON-INSULATED
4	2	P10007273	TERMINAL - RING 14-16 AWG. #10	NON-INSULATED
3	1	P10001019	SHRINK TUBE 1/4	STOCK
2	1	P10005145	WIRE - 18/2 CABLE GRAY	
1	1	P10007246	3/4 INCH MINI COMBINATION AMBER	CLEARANCE LIGHT

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ROUTINGS	1700	WIGHT: 0.02
SCALE: 1:1	DO NOT SCALE DRAWING	SHEET 1 OF 1

REPLACEMENT PARTS

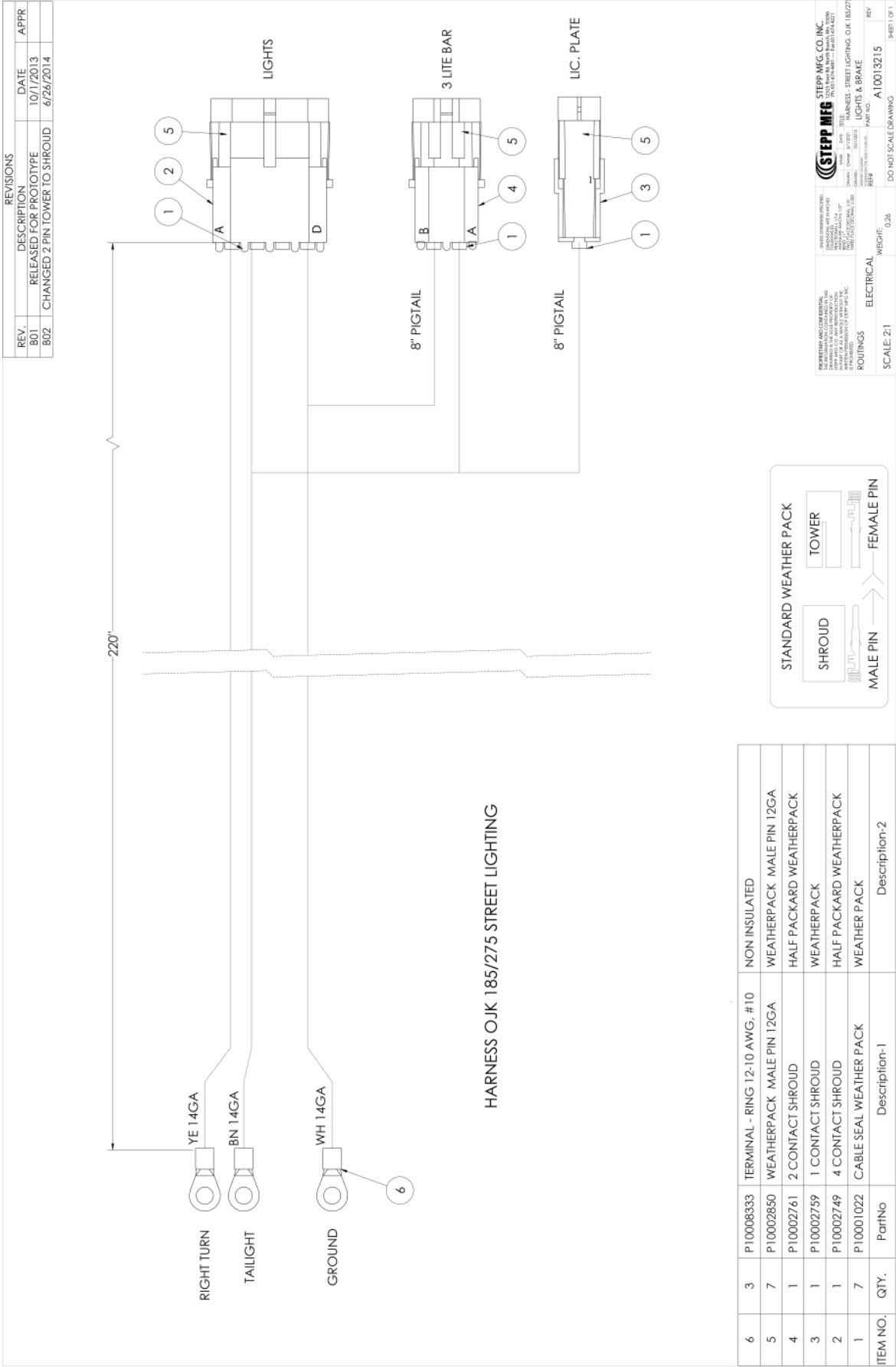
Temp Sensor

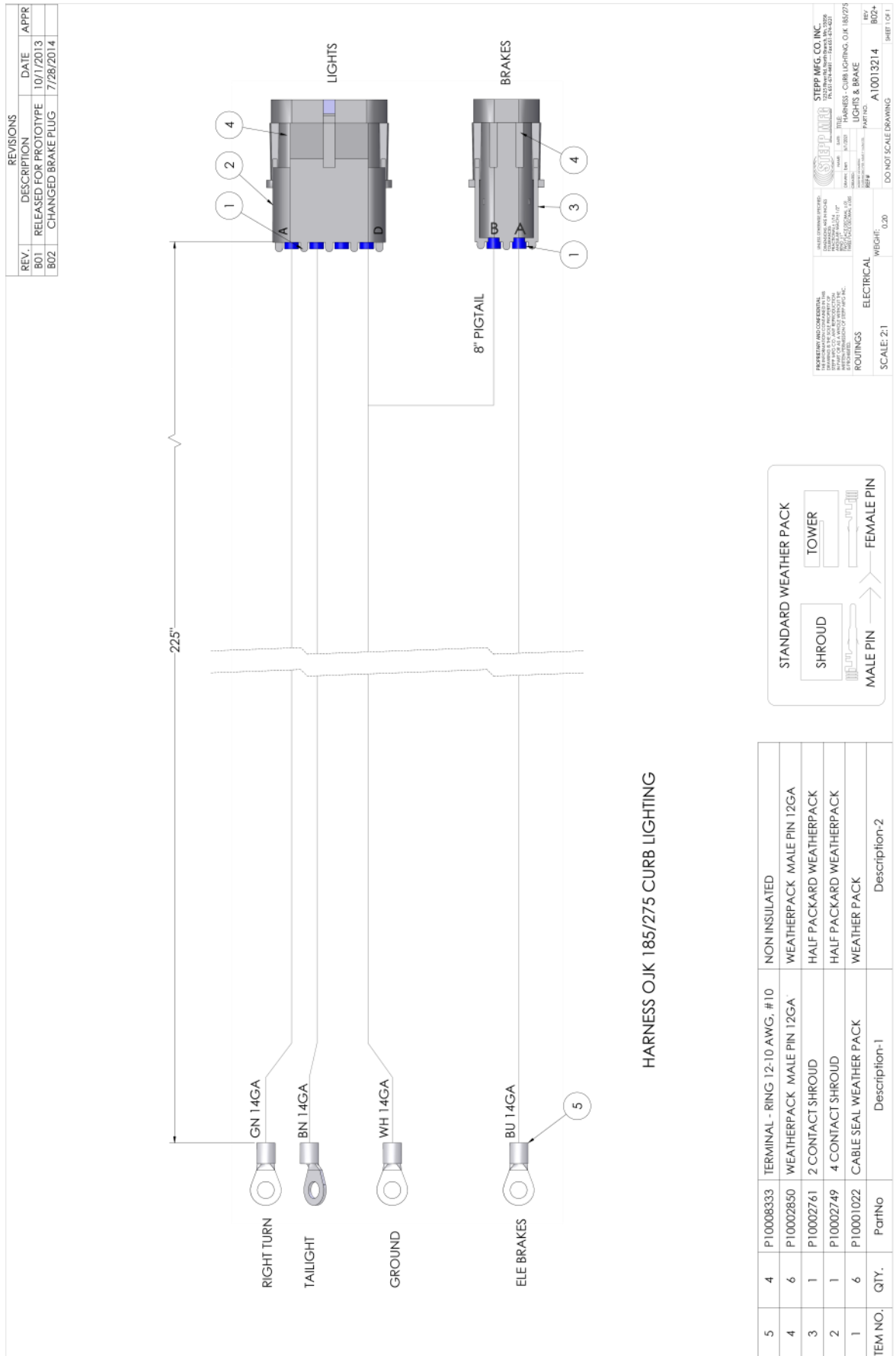
REVISIONS		
REV.	DESCRIPTION	DATE
B01	RELEASED FOR PROTOTYPE	10/29/2012
B02	ADDED LOOM & 3/4 SHRINK	8/30/2014



8	1	P10014543	SHRINK TUBE W / SEALANT 3/4	SHRINK TUBE W / SEALANT 3/4
7	1	P10014539	LOOM 1/4" HIGH TEMP 1200°	LOOM 1/4" HIGH TEMP 1200°
6	1	P10011442	RTD 1000 OHM	RTD SENSOR 1000 OHM
5	1	P10001738	SEALANT	RTV162 SILICONE 1OZ
4	2	P10001023	WEATHER PACK-SOCKET-FEMALE	12 GA
3	2	P10001022	CABLE SEAL WEATHER PACK	WEATHER PACK
2	1	P10001021	CONNECTOR 2 PIN TOWER	HALF PACKARD WEATHERPACK
1	1	P10001019	SHRINK TUBE 1/4	STOCK
ITEM NO.	QTY.	PartNo	Description-1	Description-2

PREPARED BY: INCOMPRESSIBLE DRAWN BY: INCOMPRESSIBLE CHECKED BY: INCOMPRESSIBLE DATE: 10/27/2010 WORKS RELEASED BY: INCOMPRESSIBLE		STEPP MFG. CO. INC.  1000 OHLM WALLOW RTD WFLUG 1000 OHLM WFLUG 1000 OHLM TEL: 401-281-8801 FAX: 401-281-4212	
PART NO. A10011441		REV B04	
SHEET 1 OF 1		SCALE: 2:1	
WEIGHT: 0.05		DO NOT SCALE DRAWING	
1700		ROUNDS	
DIMENSIONS IN PARENTHESES ARE NOT TO SCALE ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED		REF# 526077	

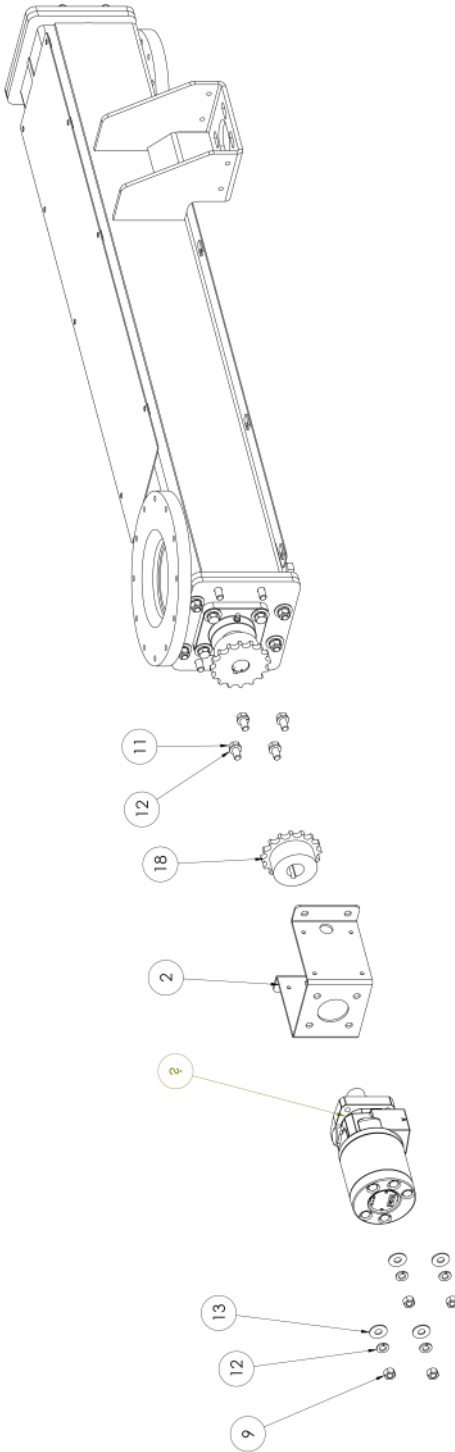




REPLACEMENT PARTS

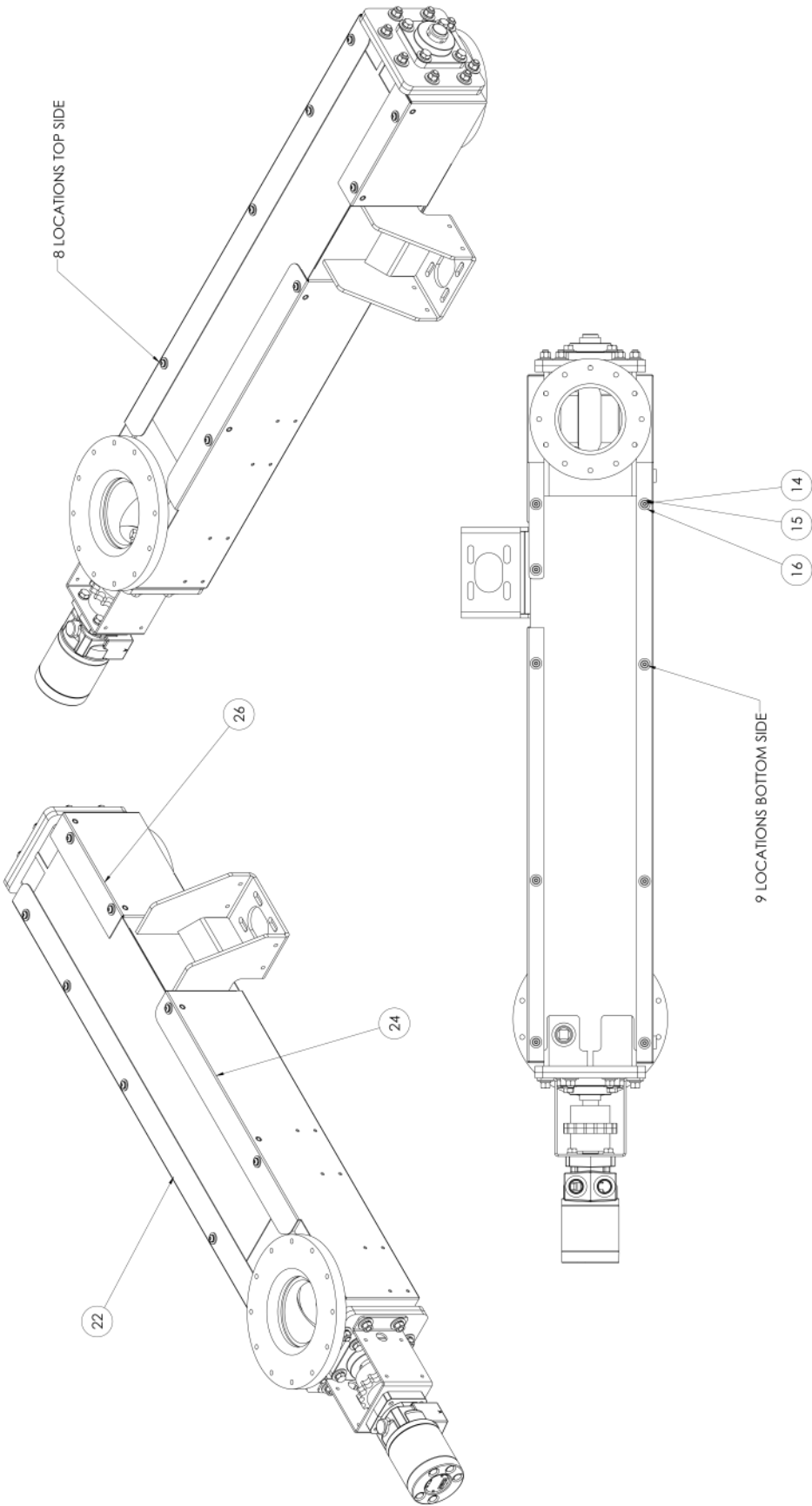
Placing Auger Middle Section

INSTALL MOTOR MOUNT, CHAIN HUB, CHAIN, AND HYD MOTOR.



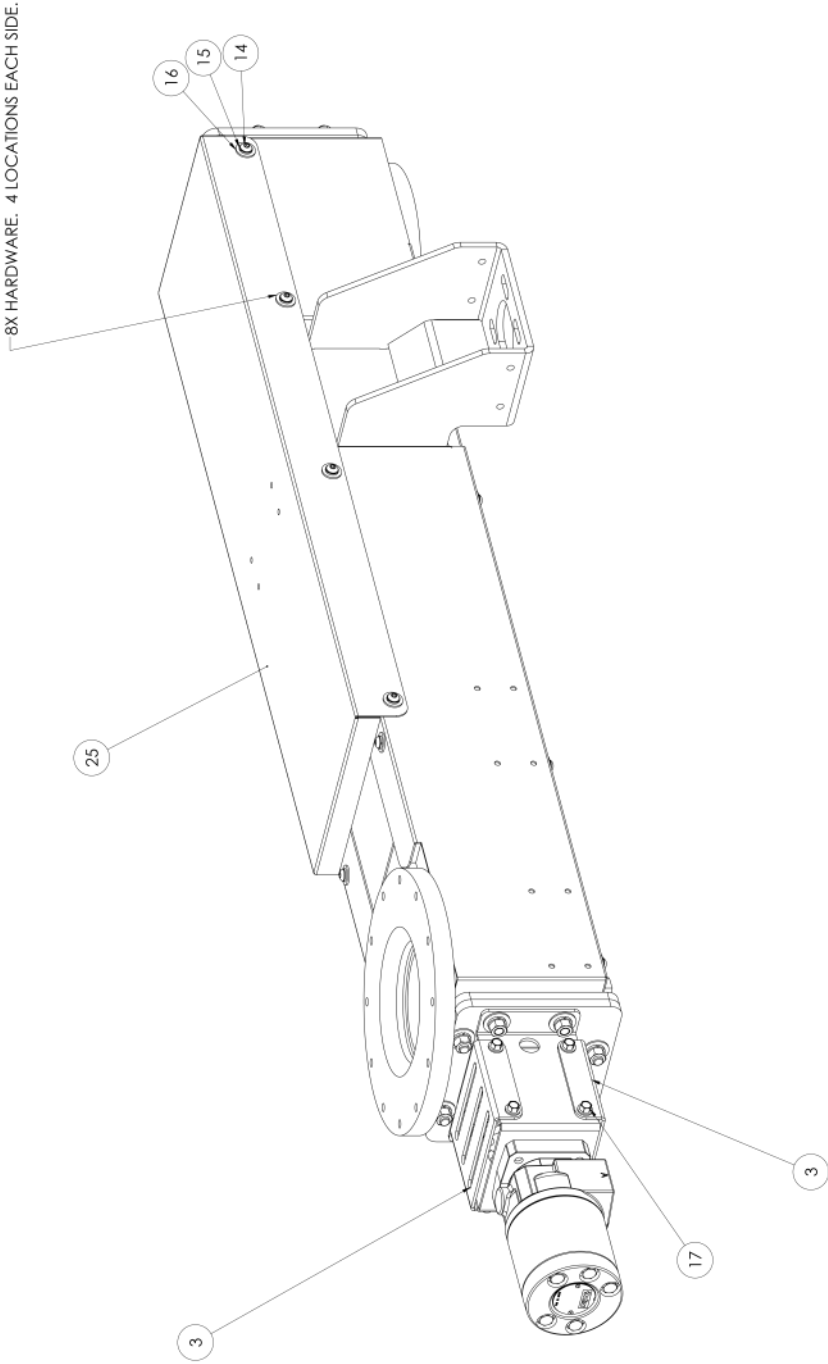
STEPPI MFG. CO. INC. 1000 STEPPING DRIVE PO BOX 1000 MILWAUKEE, WI 53210-1000 TEL: 414.441.1000 FAX: 414.441.1001 WWW.STEPPINGMFG.COM		STEPPI MFG. CO. INC. 1000 STEPPING DRIVE PO BOX 1000 MILWAUKEE, WI 53210-1000 TEL: 414.441.1000 FAX: 414.441.1001 WWW.STEPPINGMFG.COM	
PART NAME: AUGER MIDDLE SECTION		PART NAME: AUGER MIDDLE SECTION	
PART NO: A10020873		PART NO: A10020873	
REV: B03+		REV: B03+	
WEIGHT: 333.81		WEIGHT: 333.81	
SCALE: 1:3		SCALE: 1:3	
DO NOT SCALE DRAWING		DO NOT SCALE DRAWING	
SHEET 2 OF 2		SHEET 2 OF 2	

INSTALL SIDE INSULATION TINS.



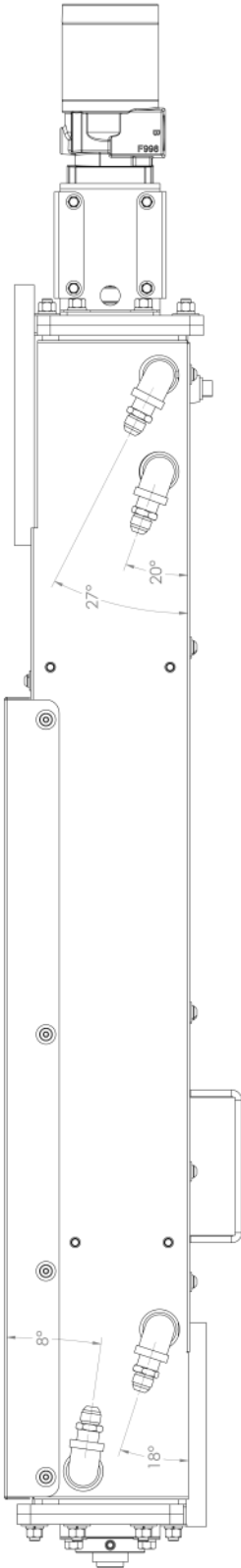
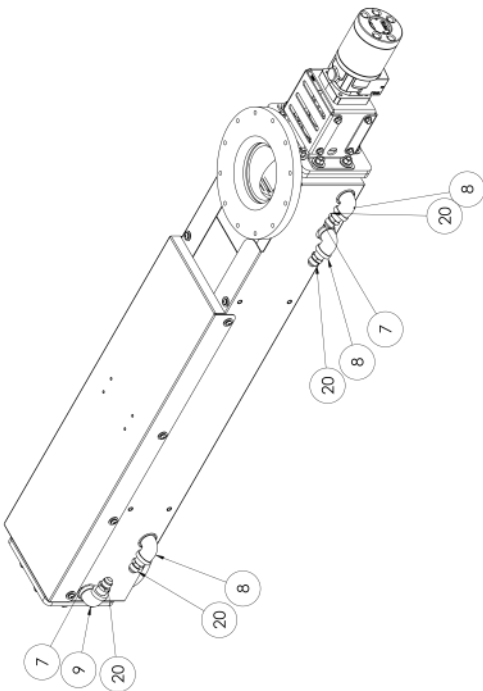
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FRACTIONS SHALL BE IN 16THS OF AN INCH DECIMALS SHALL BE TO 3 PLACES HOLE LOCATIONS SHALL BE TO 0.005 INCHES HOLE LOCATIONS SHALL BE TO 0.005 INCHES		STEP-TEC MFG. CO. INC. 1000 W. 10TH AVE. PO BOX 1000 MUSKOGEE, AL 36555	
ROUTINGS		STEP-TEC MFG. CO. INC. 1000 W. 10TH AVE. PO BOX 1000 MUSKOGEE, AL 36555	
SCALE: 1:3		DO NOT SCALE DRAWING	
WEIGHT: 353.81		REV: 803+	
PART NO: A10020873		SHEET 4 OF 4	

ADD TOP INSULATION TIN AND CHAIN HUB GUARDS.



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ROUTINGS	WEIGHT: 333.81	DO NOT SCALE DRAWING	SCALE: 1:2	SHEET 5 OF 4

INSTALL PLUMBING. USE LOCTITE 5770.



STEP-TECH INDUSTRIES, INC. 10000 W. 100th Ave., Suite 100 Denver, CO 80231 TEL: 303.440.1111 FAX: 303.440.1112 WWW.STEPPING.COM		STEP-TECH INDUSTRIES, INC. 10000 W. 100th Ave., Suite 100 Denver, CO 80231 TEL: 303.440.1111 FAX: 303.440.1112 WWW.STEPPING.COM	
REVISIONS		REVISIONS	
REV	DESCRIPTION	REV	DESCRIPTION
001	INITIAL DESIGN	001	INITIAL DESIGN
002	REVISION	002	REVISION
003	REVISION	003	REVISION
004	REVISION	004	REVISION
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100	REVISION	100	REVISION

SCALE: 1:2

DO NOT SCALE DRAWING

WEIGHT: 333.81

803*

A10020873

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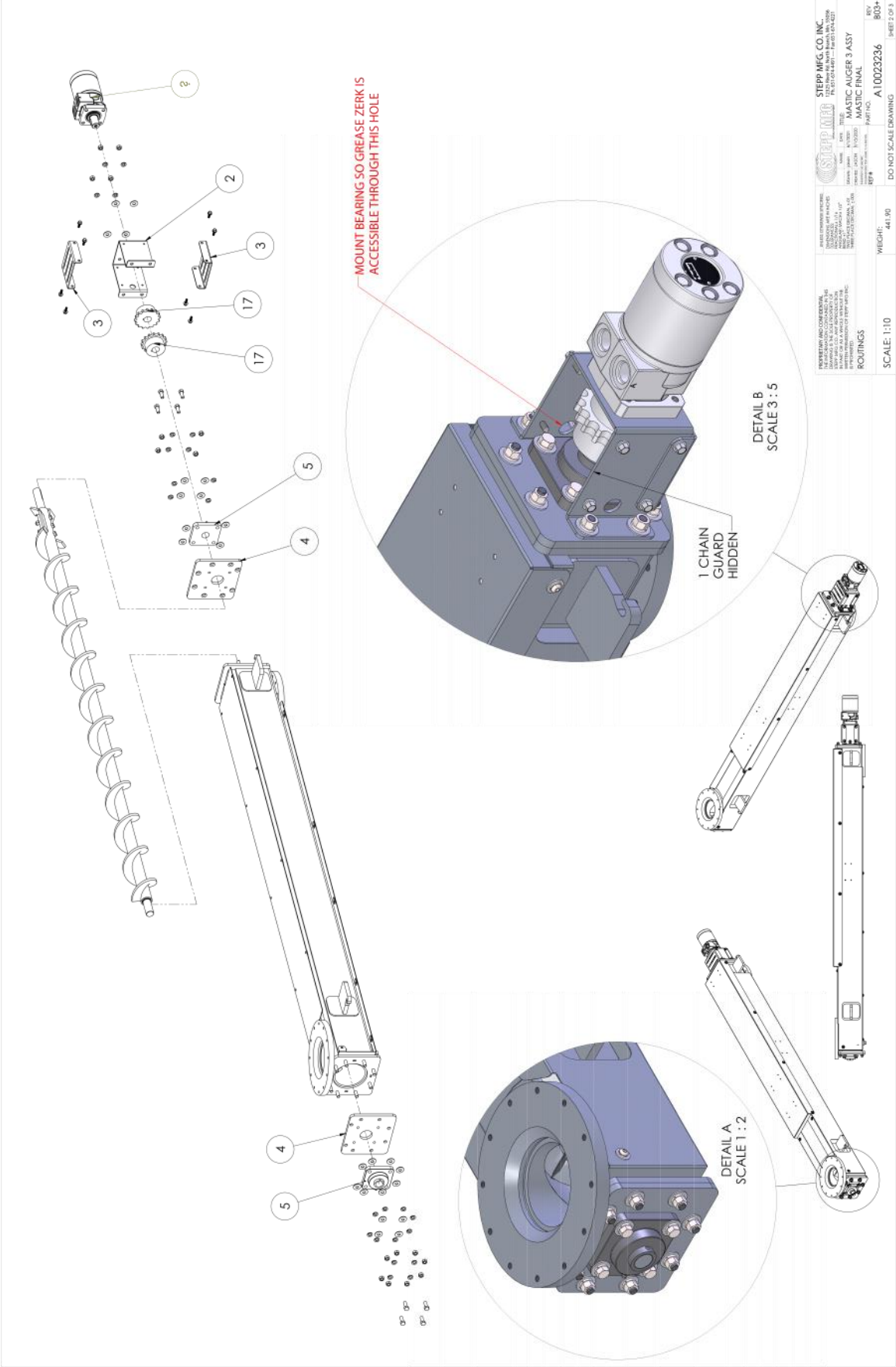
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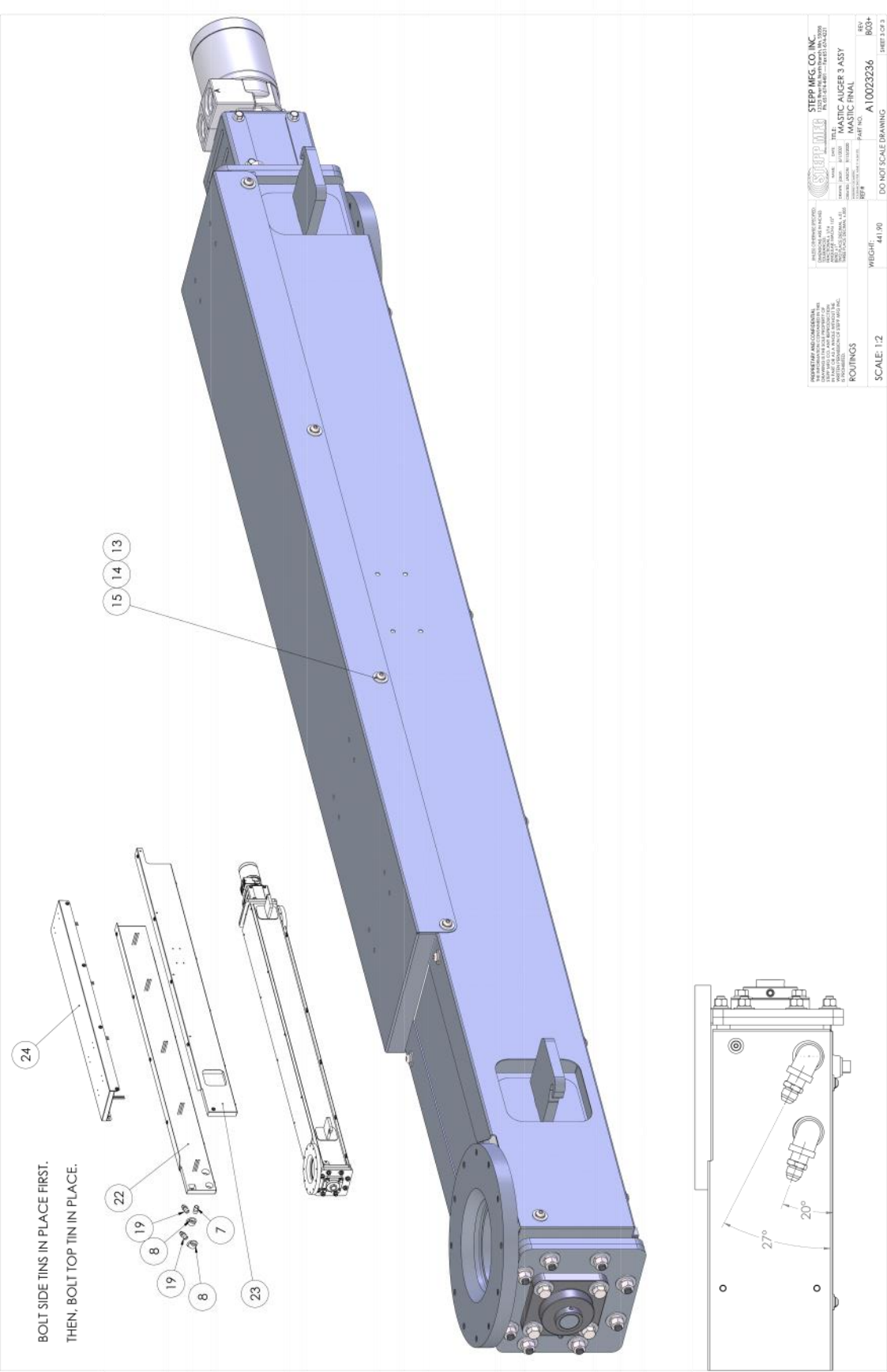
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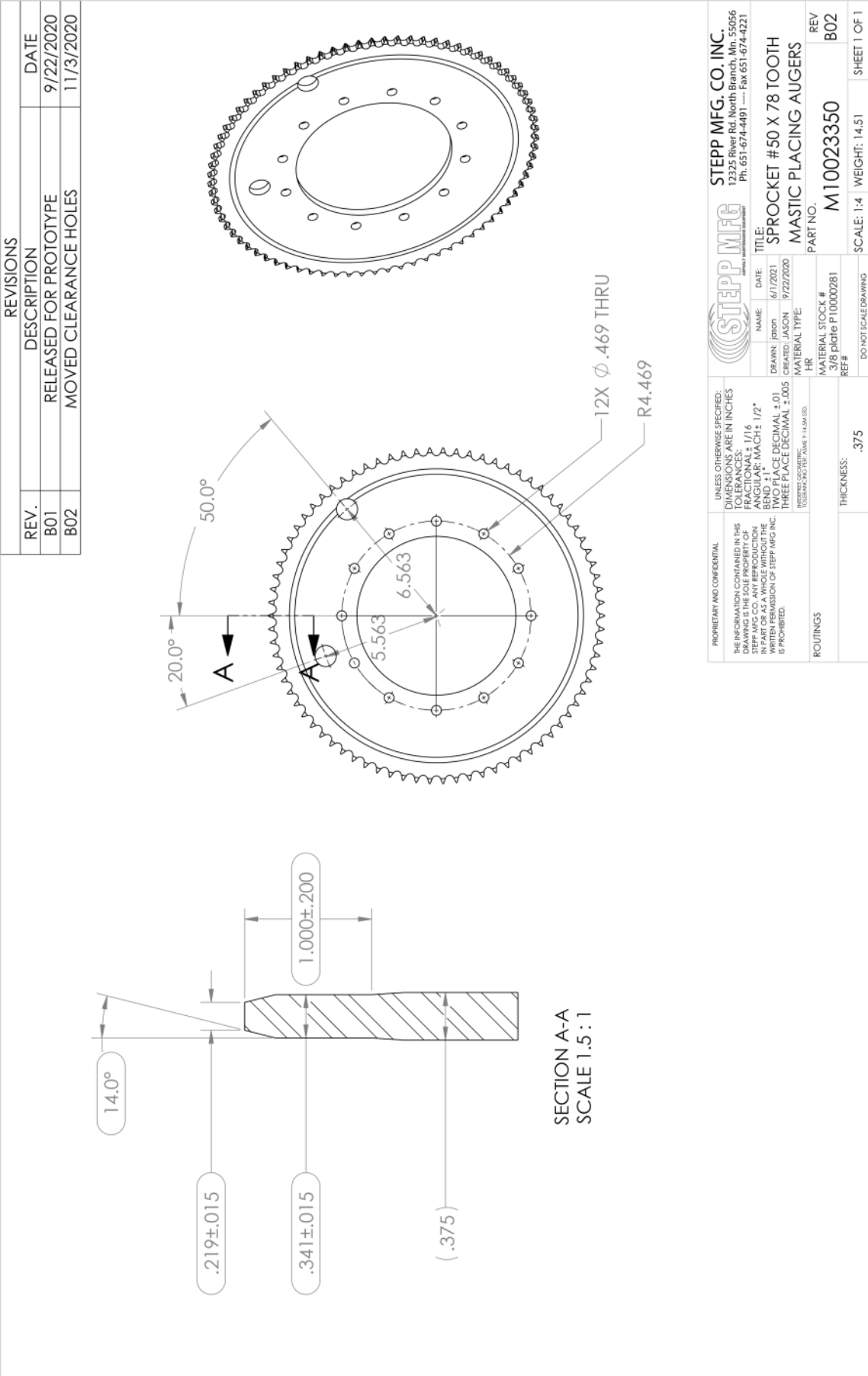
REPLACEMENT PARTS

Placing Auger Tail Section

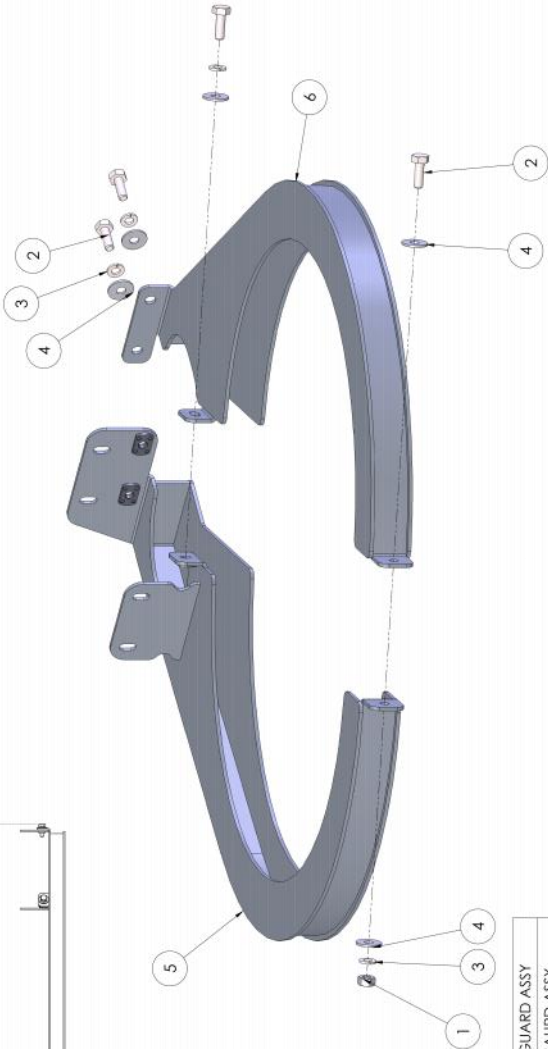
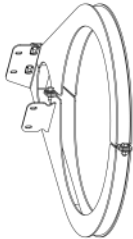
ITEM NO.	QTY.	PartNo	Description-1	Description-2
24	1	W10023359	INSULATION TIN STREET WLDM	MASTIC AUGER 3
23	1	W10023358	INSULATION TIN STREET	MASTIC AUGER 3
22	1	W10023357	INSULATION TIN WLDM CURB	MASTIC AUGER 3
21	1	W10023237	MASTIC-AUGER 3 WLDM	MASTIC-AUGER 3 ASSY
20	1	P10015370	HYD MOTOR	14 CU. IN. MOTOR
19	2	P10007825-011	ADAPTER STRAIGHT	ADPT-S-08MJICx08MNPT
18	1	P10006438	ROLLER CHAIN ONLY	5016
17	2	P10004956-002	5016 1 BORE	5016 1 BORE
16	8	P10001666-013	SCREW-THRD ROLLING	1/4-20UNC X 1/2
15	28	P10001633-004	WASHER	FLAT 1/4 SS
14	28	P10001632-004	WASHER	LOCK 1/4 SS
13	28	P10001630-026	SOCK. BUT. HD CAP SCREW SS	3/8-16 X .750
12	24	P10001609-006	WASHER	FLAT 3/8
11	24	P10001608-006	WASHER	LOCK 3/8
10	8	P10001603-001	BOLT	HEX - 3/8-16 X 1
9	16	P10001600-003	NUT HEX	3/8-16NC
8	2	P10001465-004	ELBOW - BLK 90°	1/2"
7	1	P10001301-002	PIPE NIPPLE - SCH.40	1/2 x 1/2
6	1	P10001068-004	PIPE FLUG - BLACK	1/2"
5	2	P10000088	BEARING	FLANGE 1"
4	2	M10022977	END BEARING MOUNT	MASTIC AUGER TUBE WLDM
3	2	M10020875	CHAIN HUB GUARD	MASTIC
2	1	M10020874	HYD MOTOR STAND OFF	MASTIC AUGER 3 ASSY
1	1	A10023245	AUGER ASSY	MASTIC AUGER 3 ASSY





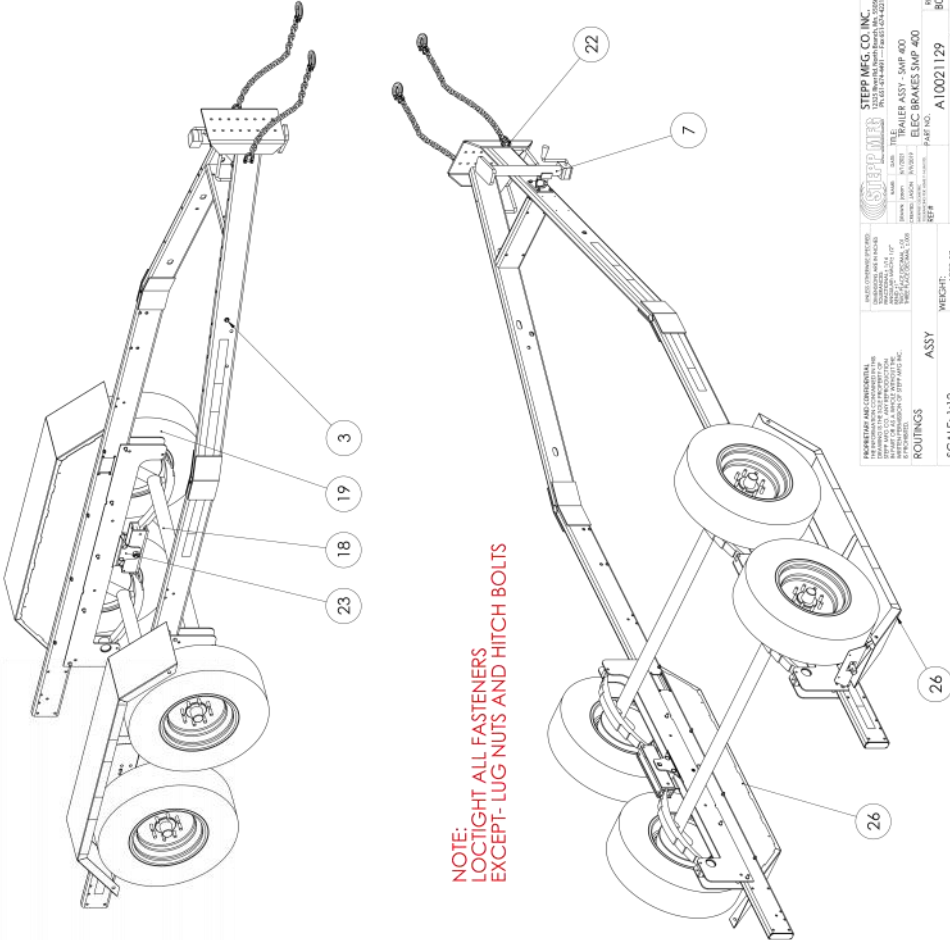
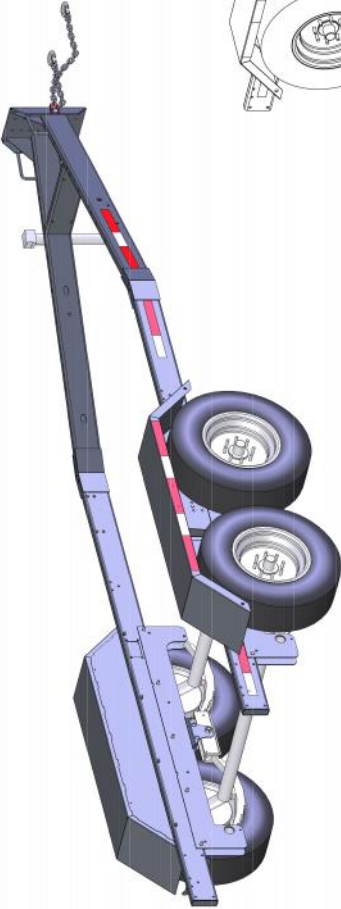


REVISIONS		
REV.	DESCRIPTION	DATE
B01	RELEASED FOR PROTOTYPE	9/22/2020
B02	DFMA UPDATES	12/28/2020



ITEM NO.	QTY.	PartNo	Description-1	Description-2
6	1	W10023348	MASTIC CHAIN GUARD C W/LDM	MASTIC CHAIN GUARD ASSY
5	1	W10023347	MASTIC CHAIN GUARD S W/LDM	MASTIC CHAIN GAURD ASSY
4	5	P10001609-004	WASHER	FLAT 1/4
3	4	P10001608-004	WASHER	LOCK 1/4
2	4	P10001601-001	BOLT	HEX - 1/4-20 X 3/4
1	1	P10001600-001	NUT HEX	1/4-20NC

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ROUTINGS		TITLE MASTIC CHAIN GUARD ASSY	
SCALE: 1:4		PART NO. A10023349	
WEIGHT: 10.07		REV B02	
DO NOT SCALE DRAWING		SHEET 1 OF 1	



NOTE:
LOCTIGHT ALL FASTENERS
EXCEPT- LUG NUTS AND HITCH BOLTS

ITEM NO.	QTY.	PartNo	Description-1	Description-2
26	2	W10007245	TANDEM FENDER WELDMENT	6 & 7K LB SUSPENSION
23	1	W10021130	FRAME W/DM SPM 400	SNP FRAME ASSY
24	1	W10003234	SWIVEL W/DM	JACKSTAND SWIVEL ASSY
23	2	W10003060	7000 AXLE MOUNT W/DM	7000 LB SUSPENSION
22	2	P10008370	SHACKLE	FOR SAFETY CHAIN
21	8	P10005051	GRIPPERT 1/4-20NC	.391 DRILL (25/64)
20	15	P10005045	GRIPPERT 3/8"	17/32" HOLE
19	4	P10004912	TIRE & WHEEL 235/80R-16 E	3520 LB 8 BOLT WHITE
18	2	P10004628	AXLE 760 DUE	7000# DROP ELE BRAKES
17	2	P10004626	SAFETY CHAIN WITH HOOK	GRADE 70 CHAIN X 36"
16	1	P10002811	7000 LB EQUALIZER BRACKET	SLIP SPRING EQUALIZER KIT
15	1	P10002742	REFLECTIVE TAPE, 2" WIDE	UNIT = 1 FOOT
14	1	P10002608	LOCITITE 262	PERMANENT
13	10	P10001655-111	BOLT GR8	BOLT - 1/2-13 X 3 1/2
12	10	P10001608-008	WASHER	LOCK 1/2
11	12	P10001608-006	WASHER	LOCK 3/8
10	8	P10001603-006	BOLT	HEX - 3/8-16 X 3
9	4	P10001603-001	BOLT	HEX - 3/8-16 X 1
8	8	P10001603-003	NUT HEX	3/8-16NC
7	1	P10001273	SCREW/JACK 5000#	LONG SIDEWIND B=29.5
6	2	A10013217	W/TH- ELE BRAKES, TANDEM AXLE	ELECTRIC BRAKES
5	1	A10013215	HARNES - STREET LIGHTING, OJK 185/275	LIGHTS & BRAKE
4	1	A10013214	HARNES - CURB LIGHTING, OJK 185/275	LIGHTS & BRAKE
3	2	A10008368-052	3/4 MINI MARKER HARNES	52" LENGTH
2	1	A10007532	LICENSE PLATE LOCATION - SRM	SRM TO RECYCLER
1	2	A10005558	6" BRAKE PIGTAIL	SPH TRAILER ASSY

REVISIONS

REV.	DESCRIPTION	DATE
B02	UPDATE VIEWS	2/18/2020
B03	ECR20019 FENDER ASSYS REPLACE W/DMs	4/11/2020
B04	MOUNTING HOLES MOVED/FENDERS CHANGED	12/22/2020

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STEPP MFG CO. INC.

1000 STEPP DRIVE
MILWAUKEE, WI 53211
TEL: 414-224-1100
WWW.STEPPMFG.COM

TRAILER ASSY - SNP 400

ELEC BRAKES SNP 400

ROUTINGS

REF	DESCRIPTION	PART NO.
A10021129	TRAILER ASSY - SNP 400	

SCALE: 1:12

ASSY

WEIGHT: 1381.37

DO NOT SCALE DRAWING

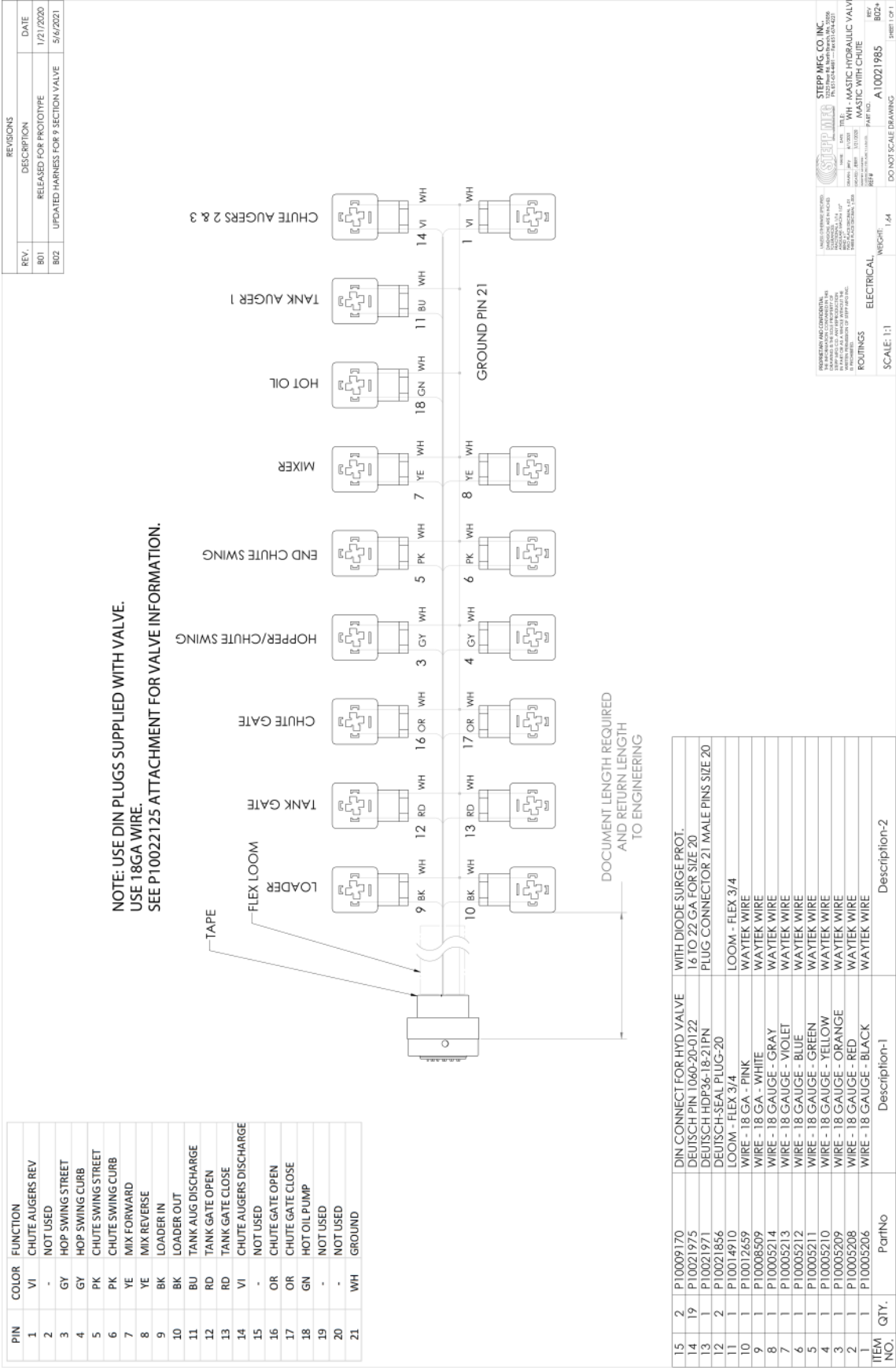
REV: B04

SHEET 1 OF 2

70

REPLACEMENT PARTS

HYDRAULIC VALVE

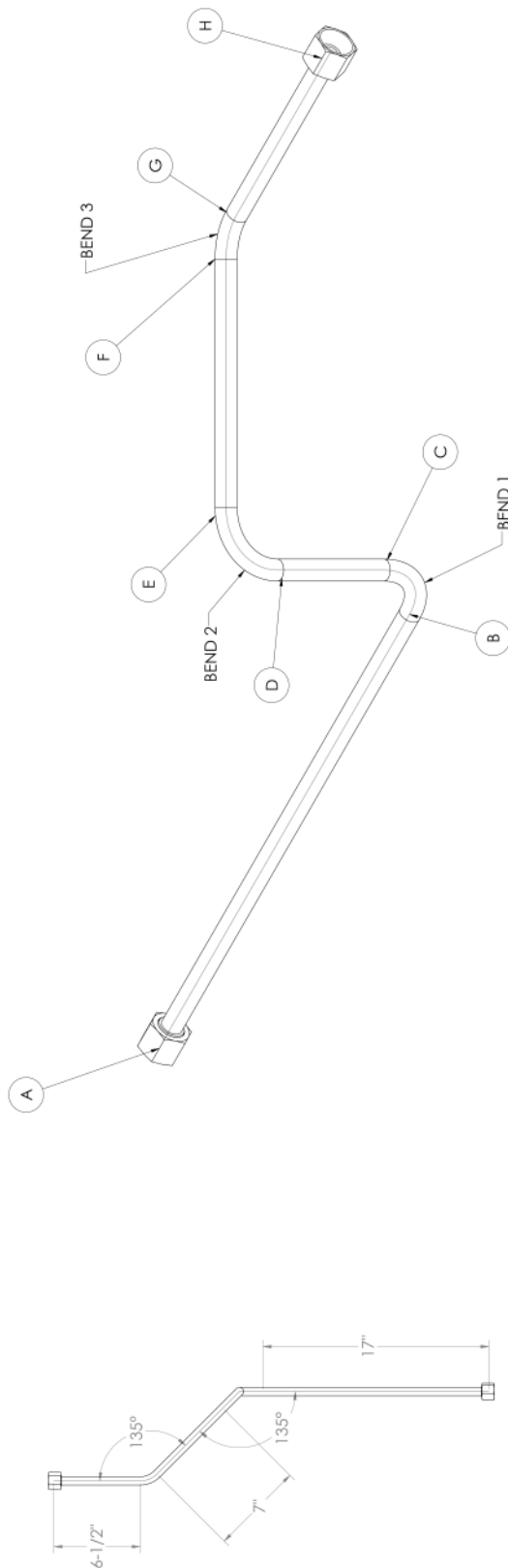


ITEM NO.	QTY.	PartNo	Description-1	Description-2
15	1	W10023677	MASTIC TOOL HEATER TANK W/DM	MASTIC TOOL HEATER ASSY
14	1	W10023676	TOOL HEATER TOP COVER W/DM	MASTIC TOOL HEATER ASSY
13	1	W10023634	HANDLE SUPPORT W/DM	MASTIC TOOL HEATER ASSY
12	1	W10023298	TOOL SUPPORT GRATE W/DM	MASTIC TOOL HEATER ASSY
11	3	P10005045	GRIPSERT 3/8"	17/32" HOLE
10	2	P10001609-006	WASHER	FLAT 3/8
9	18	P10001608-006	WASHER	LOCK 3/8
8	4	P10001608-004	WASHER	LOCK 1/4
7	18	P10001603-001	BOLT	HEX - 3/8-16 X 1
6	4	P10001601-001	BOLT	HEX - 1/4-20 X 3/4
5	1	M10023843	TOP MOUNTING BRACKET	MASTIC TOOL HEATER ASSY
4	2	M10023637	TANK MOUNT	MASTIC TOOL HEATER ASSY
3	2	M10023635	DRIP PAN	MASTIC TOOL HEATER ASSY
2	1	M10004131-003	BURNER COVER NARROW	MASTIC TOOL HEATER ASSY
1	1	A10008105-010	BURNER ASSY	BOLT ON COVER NARROW
				SPH - TACK TANK

REPLACEMENT PARTS

Hydraulic line

REVISIONS		
REV.	DESCRIPTION	DATE
B01	RELEASED FOR PROTOTYPE	2/9/2021



BEND DIMENSIONS		
A	0	
B	17	START OF BEND 1
C	19-15/32"	
D	23-15/32"	START OF BEND 2
E	26-1/4"	
F	33-1/4"	START OF BEND 3
G	34-5/8"	
H	41-1/8"	CUT LENGTH

[illegible]

3	2	P 10007851-001	HYD. TUBE SLEEVE # 10	5/8 HYD TUBE - (049 WALL)
2	2	P 10007852-001	HYD-TUBE FACE SEAL NUT # 10	5/8 HYD TUBE - (049 WALL)
1	1	P 10000451	HYD TUBE	AUGER 3 GATE - A
ITEM NO.	QTY.	PartNo	Description-1	Description-2



REV.		DESCRIPTION		DATE
B01		RELEASED FOR PROTOTYPE		2/8/2021
B02		CHANGED COVER		4/8/2021
B03		UPDATED FROM FIRST BUILD		4/20/2021

ITEM NO.	QTY.	PartNo	Description-1	Description-2
57	2	W10029980	MASTIC COVER W/DM	MASTIC TANK
56	2	W10023612	MASTIC STACK W/DM	MASTIC HOPPER ASSY
55	1	W10023385	MASTIC HOPPER W/DM	MASTIC HOPPER ASSY
54	1	W10008880	8" FLUE LINER	8" FLUE - FOR 24" LINER
53	1	P10015370	HYD MOTOR	14 CU IN. MOTOR
52	1	P10011741	VALVE 3/4" 2-PORT LOCKABLE	BALL VALVE
51	1	P10007825-023	ADAPTER STRAIGHT	ADPT-S-16MJC16MNPT
50	2	P10007825-011	ADAPTER STRAIGHT	ADPT-S-08MJC08MNPT
49	1	P10006438	ROLLER CHAIN ONLY	5016
48	1	P10005045	GRIPSET 3/8"	17/32" HOLE
47	6	P10004956-002	5016 CHAIN COUPLING	5016 1 BORE
46	2	P10004956-002	1.00 PILLOW BLOCK	BEARING
45	1	P10003036	SCREW-THRD ROLLING	1/4-20UNC X 1/2
44	8	P1001666-013	WASHER SS	FLAT 1/4
43	72	P1001633-004	WASHER SS	LOCK 1/4
42	72	P1001632-004	WASHER SS	LOCK 1/4
41	72	P1001630-016	SOCK, BUT, HD CAP SCREW SS	1/4-20 X .750
40	6	P1001624-014	LOCK NUT	HEX 3/4-16NC
39	6	P1001624-014	LOCK NUT	HEX 3/4-16NC
38	2	P1001624-008	LOCK NUT	HEX 1/4-20NC
37	4	P1001609-010	WASHER	FLAT 3/4
36	8	P1001609-008	WASHER	FLAT 3/4
35	20	P1001609-006	WASHER	FLAT 3/8
34	4	P1001608-006	WASHER	LOCK 3/8
33	42	P1001608-006	WASHER	LOCK 3/8
32	4	P1001607-002	BOLT	HEX - 3/4-10 X 2
31	4	P1001605-003	BOLT	HEX - 1/2-13 X 1 1/2
30	24	P1001603-000	BOLT	HEX - 3/8-16 X 3/4
29	6	P1001603-001	BOLT	HEX - 3/8-16 X 1
28	2	P1001601-001	BOLT	HEX - 1/4-20 X 3/4
27	4	P1001600-005	NUT HEX	1/2-13NC
26	24	P1001600-003	NUT HEX	3/8-16NC
25	2	P1001539-006	ELL - ST - 90°	1.0 NPT
24	1	P1001539-005	ELL - ST - 90°	3/4 NPT
23	1	P1001539-004	PIPE NIPPLE - SCH.40	1/2 NPT
22	1	P1001302-001	PIPE NIPPLE - SCH.40	3/4 X CLOSE
21	1	P1001302-001	PIPE NIPPLE - SCH.40	1/2 X CLOSE
20	1	P1000458	FIBERGLASS INSULATION 2' x 1 1/2' LB	3/2 X CLOSE
19	1	P1000452	FIBERGLASS INSULATION 2' x 1 1/2' LB	SE FIBERGLASS INSULATION
18	1	M1002975	COVER TIE TRIM	FLANGE 1"
17	1	M1002975	END BEARING MOUNT	MASTIC COVER
16	1	M1002975	CHAIN HUB GUARD	MASTIC AUGER TUBE W/DM
15	2	M10020875	HYD MOTOR STAND OFF	MASTIC
14	1	M10020874	BURNER ENCLOSURE ASSY	MASTIC AUGER
13	1	A10024004	MASTIC TETHER CABINET ASSY	MASTIC SMP
12	1	A10023803	MASTIC EXPANSION TANK ASSY	MASTIC CONTROL BOX ASSY
11	1	A10023723	MASTIC HOT OIL PUMP ASSY	MASTIC HOPPER ASSY
10	1	A10023618	MASTIC AGITATOR ASSY	MASTIC TOP LEVEL
9	1	A10023568	2" BEARING MODIFIED	MASTIC HOPPER ASSY
8	1	A10023235	DRIVE ASSEMBLY	MASTIC AUGER 1 ASSY
7	2	A10023040	CONTROL BOX ASSY MASTIC	MASTIC AUGER 1 ASSY
6	1	A10022532	GRAB HANDLE AND FASTENERS	MASTIC HOPPER ASSY
5	2	A10021355	BURNER ASSY	CONTROL BOX ASSY MASTIC
4	2	A10013643	SENSOR TUBE ASSY 3/8 X 16	OPTION
3	2	A10008105-013	SENSOR TUBE ASSY 3/8 X 16	PHO-3.0 & 2.0
2	2	A10001010	SENSOR TUBE ASSY 3/8 X 16	PHO-3.0 & 2.0
1	2	A1000058-004	SENSOR TUBE ASSY 3/8 X 16	000 OIL ALLOW
				QUI 185/275

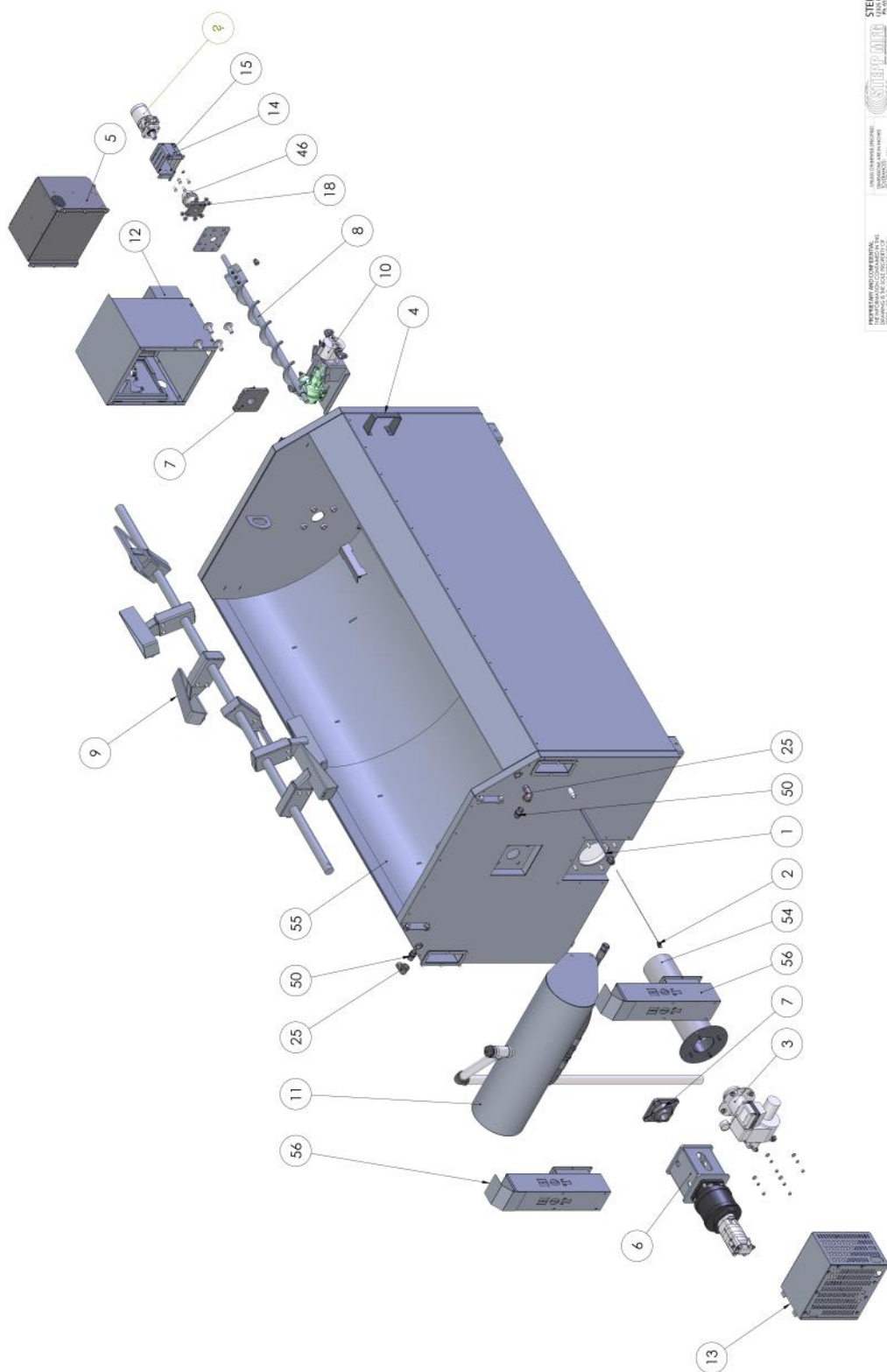
STEPP MFG CO. INC.
1700 E. Highway 100, Suite 100
Mesa, AZ 85205
TEL: 480.961.1000
WWW.STEPPMFG.COM

MASTIC HOPPER ASSY
MASTIC FINAL
PART NO. A10023588
REV. B03

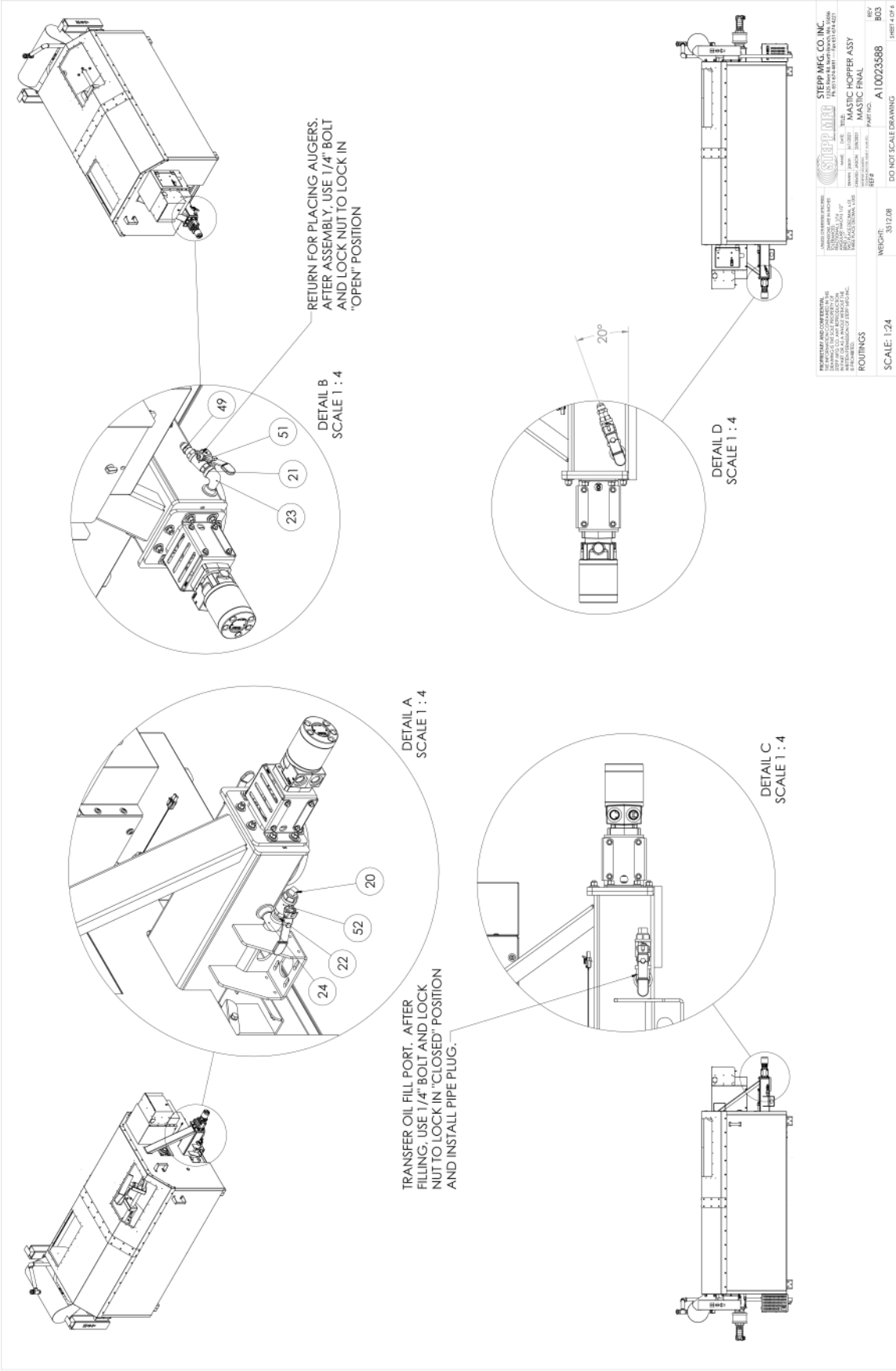
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SCALE: 1:30
DO NOT SCALE DRAWING
SHEET 1 OF 4

REPLACEMENT PARTS

Hopper Assembly

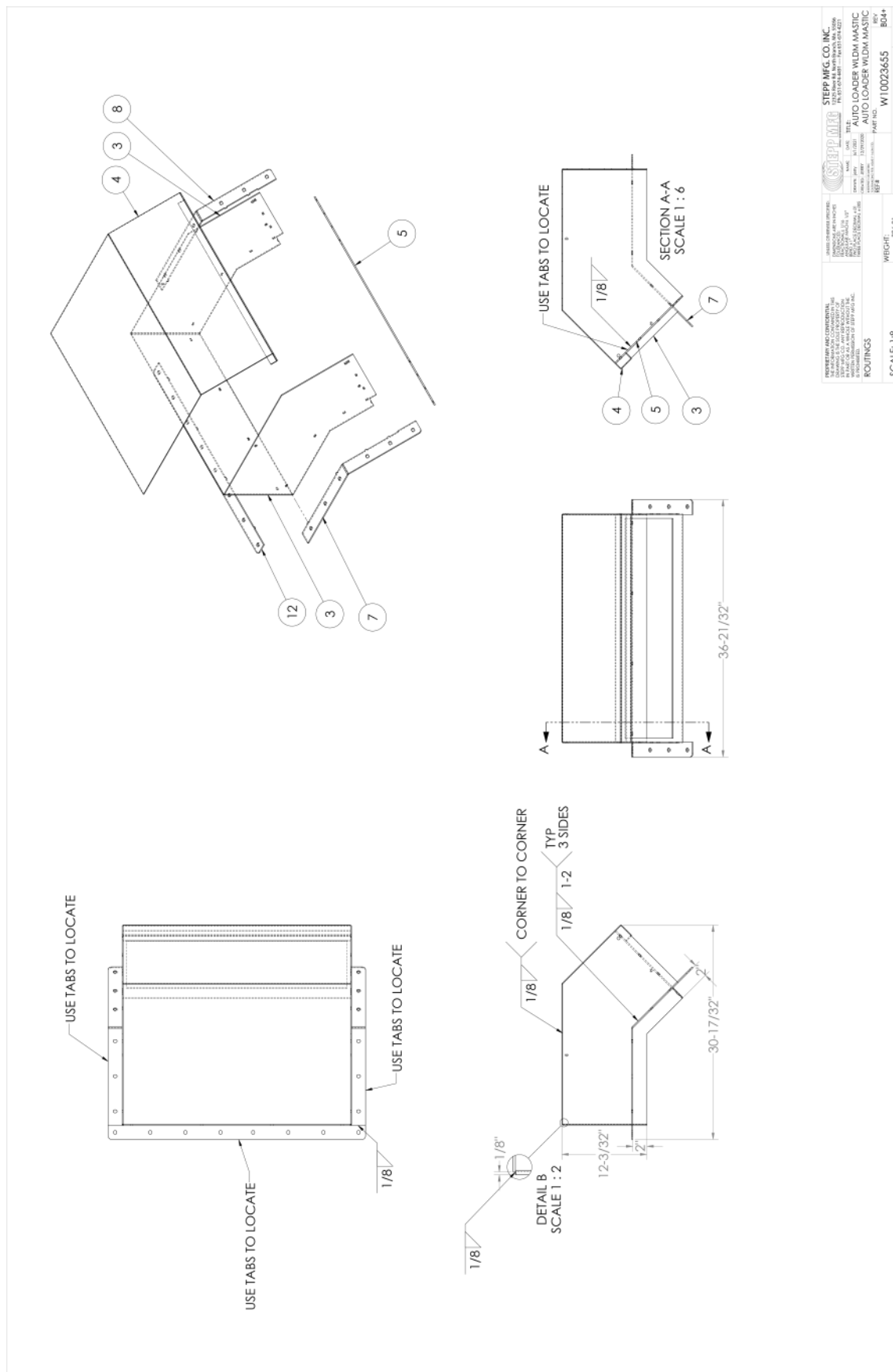


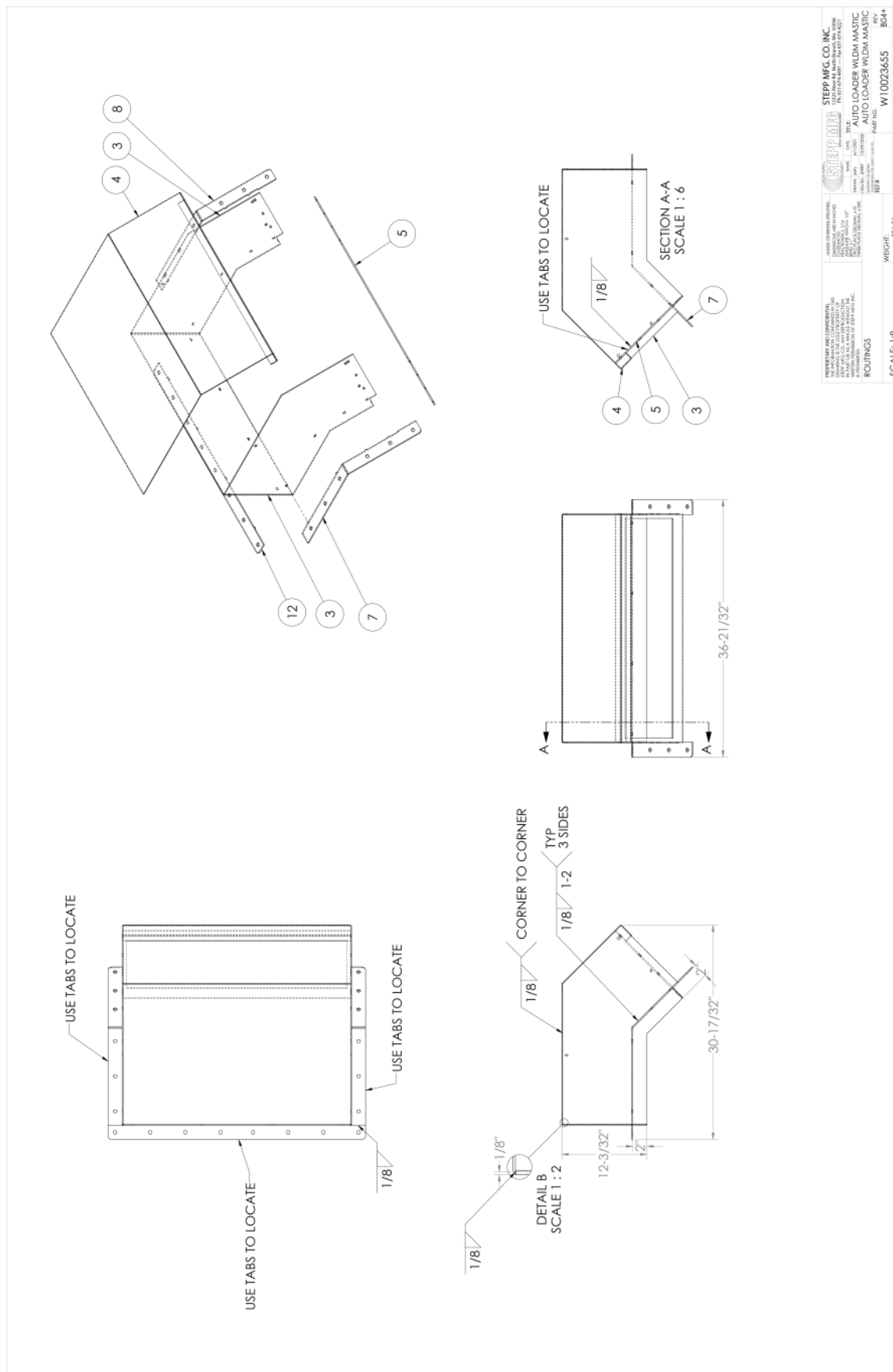
 STEEPP MFG. CO. INC. 1000 W. 10TH AVE. SUITE 100 DENVER, CO 80202 TEL: 303.733.4400 FAX: 303.733.4217 WWW.STEEPP.COM	ROUTINGS 1. DRILL 1/8" DIA. HOLE 2. DRILL 1/4" DIA. HOLE 3. DRILL 1/2" DIA. HOLE 4. DRILL 3/4" DIA. HOLE 5. DRILL 1" DIA. HOLE 6. DRILL 1 1/4" DIA. HOLE 7. DRILL 1 1/2" DIA. HOLE 8. DRILL 1 3/4" DIA. HOLE 9. DRILL 2" DIA. HOLE 10. DRILL 2 1/4" DIA. HOLE 11. DRILL 2 1/2" DIA. HOLE 12. DRILL 2 3/4" DIA. HOLE 13. DRILL 3" DIA. HOLE 14. DRILL 3 1/4" DIA. HOLE 15. DRILL 3 1/2" DIA. HOLE 16. DRILL 3 3/4" DIA. HOLE 17. DRILL 4" DIA. HOLE 18. DRILL 4 1/4" DIA. HOLE 19. DRILL 4 1/2" DIA. HOLE 20. DRILL 4 3/4" DIA. HOLE 21. DRILL 5" DIA. HOLE 22. DRILL 5 1/4" DIA. HOLE 23. DRILL 5 1/2" DIA. HOLE 24. DRILL 5 3/4" DIA. HOLE 25. DRILL 6" DIA. HOLE 26. DRILL 6 1/4" DIA. HOLE 27. DRILL 6 1/2" DIA. HOLE 28. DRILL 6 3/4" DIA. HOLE 29. DRILL 7" DIA. HOLE 30. DRILL 7 1/4" DIA. HOLE 31. DRILL 7 1/2" DIA. HOLE 32. DRILL 7 3/4" DIA. HOLE 33. DRILL 8" DIA. HOLE 34. DRILL 8 1/4" DIA. HOLE 35. 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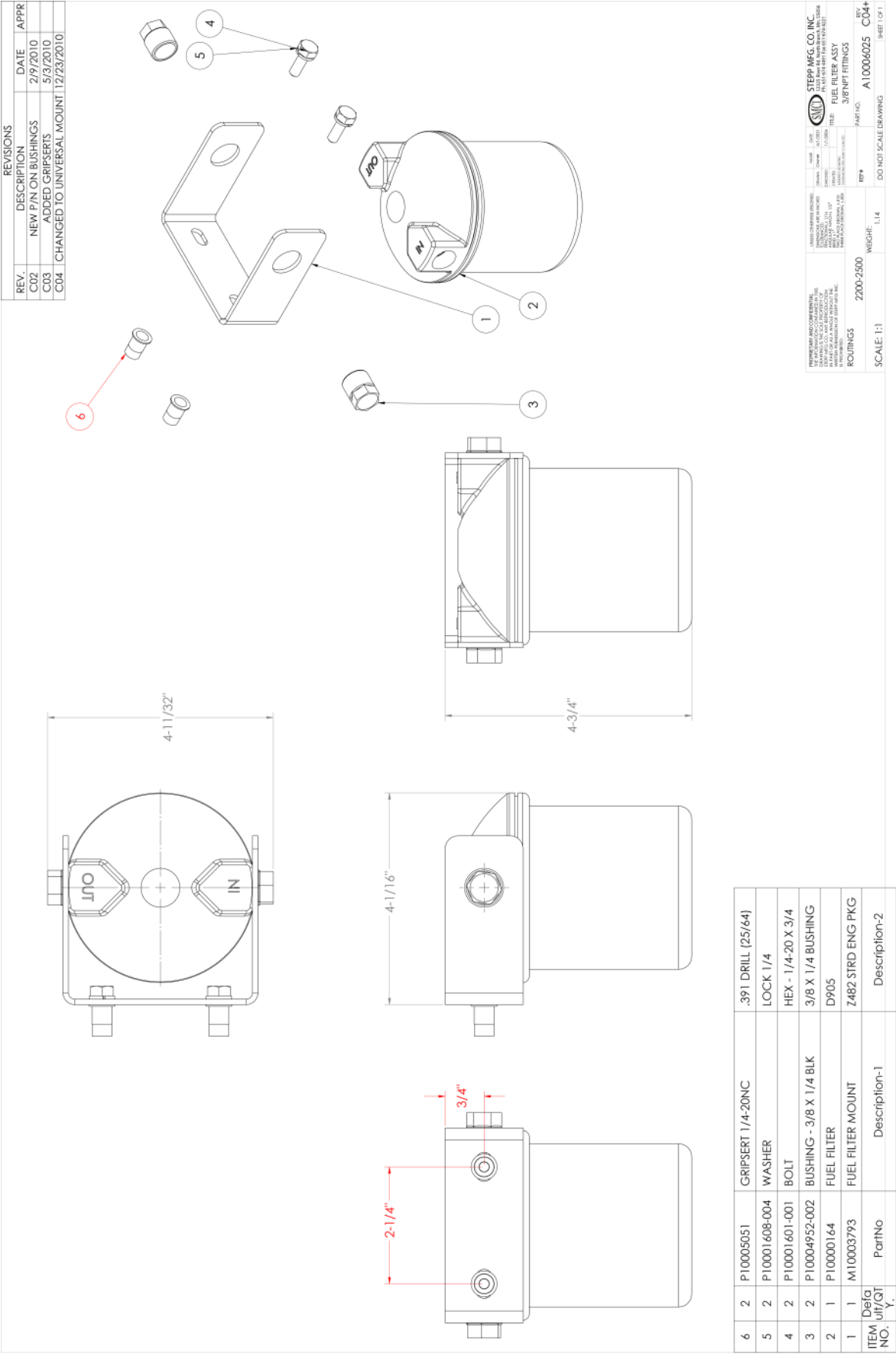


Loading Chute

85







Hydraulic Hose

REVISIONS			
REV.	DESCRIPTION	DATE	APPR
A01	ECP1910 REMOVED DISCHARGE DOOR FROM MACHINE ASSY	6/14/2019	



NOTE: HOSE ASSEMBLIES WITH LENGTH -000 NEED TO HAVE THE \ LENGTHS VERIFIED AND DOCUMENTED.

[illegible]

Design Table for: A10005162

DESCRIPTION	SPRP@PartNo
Default	A10005162
-000	TBD-WIRE LENGTH A10005162-000
-092	92" WIRE LENGTH A10005162-092
-096	96" WIRE LENGTH A10005162-096
-108	108" WIRE LENGTH A10005162-108
-120	120" WIRE LENGTH A10005162-120
-130	130" WIRE LENGTH A10005162-130
-144	144" WIRE LENGTH A10005162-144
-150	150" WIRE LENGTH A10005162-150
-200	200" WIRE LENGTH A10005162-200

7 Way Trailer Connector

Outside

Inside

WIRE COLORS

WH - GROUND - 1
BU - ELECT. BRAKES - 2
BN - TAIL LIGHTS - 3
BK - POWER - 4
YE - LEFT TURN - 5
GN - RIGHT TURN - 6
RD - BACKUP - CENTER

NOTE:
PART NUMBER A10005162-000
REQUIRES THE LENGTH TO BE
DETERMINED AT ASSEMBLY AND
RECORDED TO GET THIS HARNESS LENGTH
ADDED FOR FUTURE USE.

SEE DESIGN TABLE FOR LENGTH

STRIP JACKET 8"

VIEW OF INSIDE CONNECTOR

REVISIONS	
REV.	DESCRIPTION
C08	REVISED RINGS
C09	ADDED CONFIGURATION .096
C10	ADDED CONFIGURATION .130

REV.	DATE
C08	2/6/2014
C09	9/22/2017
C10	9/19/2018

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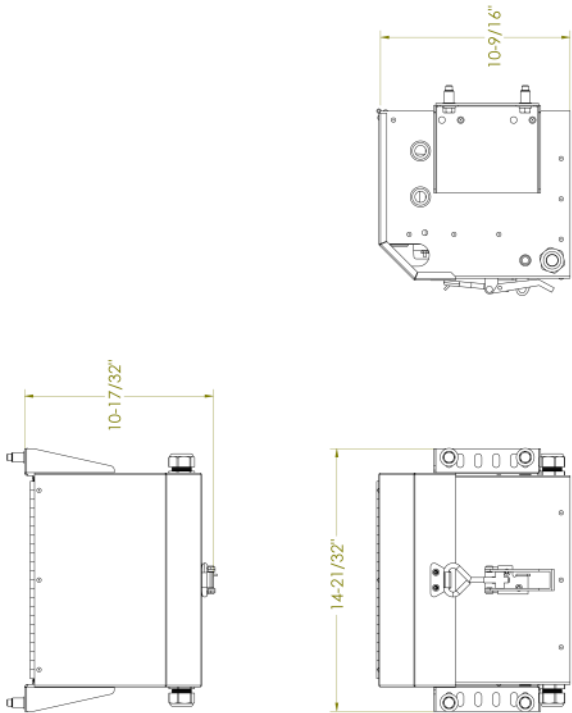
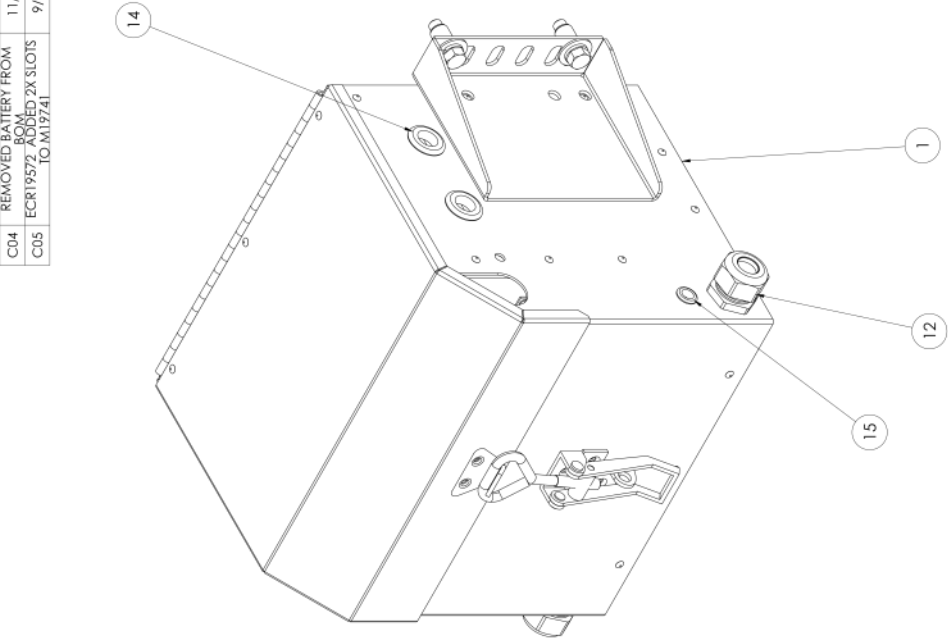
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REVISIONS		
REV.	DESCRIPTION	DATE
C03	ADDED WIRE HARNESS	8/1/2016
C04	REMOVED BATTERY FROM BOX	11/10/2017
C05	ECR19572 ADDED 2X SLOTS TO M19741	9/13/2019



ITEM NO.	QTY.	PartNo	Description-1	Description-2
19	2	P10001619-096	PAN CROSS HD MACH SCREW	
18	1	P10019269	BATTERY TERMINAL ID	#4-40 X 1/4 BOLT ON BATTERY BOX
17	2	P10001619-015	PAN CROSS HD MACH SCREW	#8-32 X 3/4
16	4	P10005045	GRIPSERT 3/8"	17/32" HOLE
15	2	P10004461	GROMMET	5/16" ID - 5/8" O.D.
14	5	P10002730	RUBBER GROMMET	5/8 ID X 1/16 X 1-1/8 OD
13	2	P10002560	LOCKING NUT 3/4	PLASTIC
12	2	P10002558	CONNECTOR STRAIN RELIEF 3/4	WITH LOCKING NUT
11	1	P10002031	BREAKER	20 AMP AUTO RESET
10	2	P10001625-003	HEX NUT MACHINE SCREW	#8-32NC
9	2	P10001625-001	HEX NUT MACHINE SCREW	#4-40NC
8	4	P10001609-006	WASHER	FLAT 3/8
7	4	P10001608-006	WASHER	LOCK 3/8
6	2	P10001608-002	WASHER	LOCK #8
5	2	P10001608-001	WASHER	LOCK #6
4	4	P10001603-002	BOLT	HEX - 3/8-16 X 1 1/4
3	1	P10000187	TERMINAL STRIP	8 X 30 AMP
2	1	A10005156	WH - BAT BOX	BATTERY BOX
1	1	A10003290	BATTERY BOX ASSY	POP RIVET STYLE
ITEM NO.			Description-1	Description-2

PREPARED AND CONFIRMED BY: STEPP MFG. CO. INC.		DATE: 11/10/2017		REV: C05	
CHECKED BY: STEPP MFG. CO. INC.		DATE: 11/10/2017		REV: C05	
DRAWN BY: STEPP MFG. CO. INC.		DATE: 11/10/2017		REV: C05	
PART NO: A10005104-006		PART NAME: INTERNAL BATTERY BOX ASSY		REV: C05	
WEIGHT: 2500-2500		SCALE: 1:3		DO NOT SCALE DRAWING	
ROUTINGS		NO BREAKAWAY / NO CABLE		SHEET 1 OF 2	

REVISIONS			DATE	
REV.	DESCRIPTION			
B03	UPDATED EXHAUST SYSTEM		7/10/2019	
B04	ECR19467 UPDATE AFTER BUILD		7/22/2019	
B05	ECR19736 BOM UPDATES		1/9/2020	

ITEM NO.	-Q04/-QTY.	PartNo	Description-1	Description-2
1	1	A1002644	FILTER, SINGLE HYD W/ADAPT	
2	1	A10007867-006	HOSE ASSY - 3/4" HYD HIGH	
3	1	A10007867-022	HOSE ASSY - 3/4" HYD HIGH	
4	1	A10007867-050	HOSE ASSY - 3/4" HYD HIGH	
5	1	A10007867-070	HOSE ASSY - 3/4" HYD HIGH	
6	1	A10007881-030	HOSE - FUEL 1/4" X 30"	
7	1	A10007883-030	HOSE - FUEL X 3/16" HOSE	
8	1	A10007894-000	HOSE - SUCTION - 1-1/4"	
9	1	A10008281-001	AIR CLEANER HOSE ASSY	
10	1	A10011481	ENGINE CABINET OJK DAC	
11	1	A10011670	RADIATOR SUPPORT 1105 ASSY	
12	2	A10012161-060	BAT CABLE ASSY	
13	1	A10017596-023	HOSE - HYD. HIGH - 1/2" X 23"	
14	1	A10020859	EXHAUST ASSEMBLY	
15	1	M10003959	AIR CLEANER MOUNT	
16	1	M10011476	FRONT ENG MT CHANNEL	
17	1	M10011586	COVER PLATE	
18	2	M10011590	OIL FILL ACCESS COVER	
19	2	M10011596	OIL COOLER MT DAC	
20	1	M10011634	ENGINE CONTROL MOUNT DAC	
21	1	P10000150	FUEL GAGE	
22	1	P10000155	BALL VALVE	
23	1	P10000203	5/16" HOSE BARB	
24	1	P10001114	HYD CAP AND SCREEN	
25	1	P10001124	HYDRAULIC SUCTION STRAINER	
26	1	P10001292	HYDRAULIC OIL	
27	2	P10001304-001	PIPE NIPPLE - SCH 40	
28	2	P10001465-002	ELBOW - BLK 90°	
29	1	P10001465-007	ELBOW - BLK 90°	
30	1	P10001520-007	COUPLING - FULL STANDARD	
31	1	P10001539-002	ELL - ST - 90°	
32	4	P10001600-002	NUT HEX	
33	2	P10001600-003	NUT HEX	
34	12	P10001600-005	NUT HEX	
35	8	P10001601-001	BOLT	
36	4	P10001602-004	BOLT	
37	4	P10001603-001	BOLT	
38	2	P10001603-002	BOLT	
39	4	P10001603-001	BOLT	
40	4	P10001603-003	BOLT	
41	10	P10001608-005	WASHER	
42	6	P10001608-006	WASHER	
43	16	P10001608-007	WASHER	
44	19	P10001608-008	WASHER	
45	6	P10001609-005	WASHER	
46	24	P10001609-006	WASHER	
47	17	P10001609-008	WASHER	
48	30	P10001630-016	SOCK. BUT. HD CAP SCREW SS	
49	20	P10001631-001	NUT HEX SS	
50	44	P10001632-004	WASHER SS	
51	59	P10001633-004	WASHER SS	
52	6	P10001640-002	BOLT SS	
53	16	P10001664-020	HEX HEAD CAP SCREW	
54	3	P10001664-033	HEX HEAD CAP SCREW	
55	1	P10001666-007	SCREW-THRD ROLLING	
56	3	P10001666-011	SCREW-THRD ROLLING	
57	1	P10002030	RELAY HIGH CAPACITY	
58	2	P10003637-001	POP RIVET CLOSED END	

ITEM NO.	-Q04/-QTY.	PartNo	Description-1	Description-2
59	1	P10004952-007	BUSHING - 3/4" X 1/2" BLK	
60	2	P10005041	EDGE TRIM	
61	4	P10005158	WIRE CLAMP 5/8	
62	1	P10005672-005	CROSS BLACK SCH 40	
63	4	P10005843	GRIPSEIT 1/2-13UNC	
64	1	P10006278-002	PIPE CAP SCH. 40	
65	1	P10007825-012	ADPT-S-08MJIC X 12MNPT	
66	1	P10007825-018	ADAPTER STRAIGHT	
67	1	P10007826-003	ADAPTER ELBOW	
68	1	P10007827-011	ADAPTER STRAIGHT	
69	1	P10007830-001	ADAPTER ELBOW	
70	3	P10007830-016	ADAPTER ELBOW	
71	1	P10007830-021	ADAPTER ELBOW	
72	1	P10007845-002	3/16" HOSE BARB	
73	1	P10008293	V1505 OIL COOLER 4-24 GPM	
74	1	P10008295	15W40 ENGINE OIL	
75	1	P10009199	EATON 420 PUMP 3.00 CID	
76	1	P10009328	KUBOTA DRAIN VALVE	
77	1	P10009890	D1105 ENGINE	
78	1	P10009927-004	DEEP SEA CONTROL STD W/ENCLOSURE	
79	3	P10013033	MOTOR MOUNT ISOLATOR OJK	
80	2	P10015354-012	ADAPTER ELBOW, 45	
81	1	P10018519-001	DRIVE HUB SPLINE SHAFT B MT	
82	1	P10018520-001	BELL HOUSING 4-BOLT B MOUNT	
83	1	P10019284	FUEL CAP W/ CHAIN	
84	2	P10021158-005	ADPT-S-B-12MJIC X 12MJIC	
85	1	W10011448	DAC TANK W/DM	
86	2	W10011489	FOOT BRACKET W/DM	
87	1	W10011601	RADIATOR COVER W/DM	
88	1	W10011671	REAR MT W/DM 1105 OJK	
89	1	W10011675-002	ACCESS PANEL W/DM 1105 ENG	
90	1	W10017052	W/DM, MOTOR MNT	

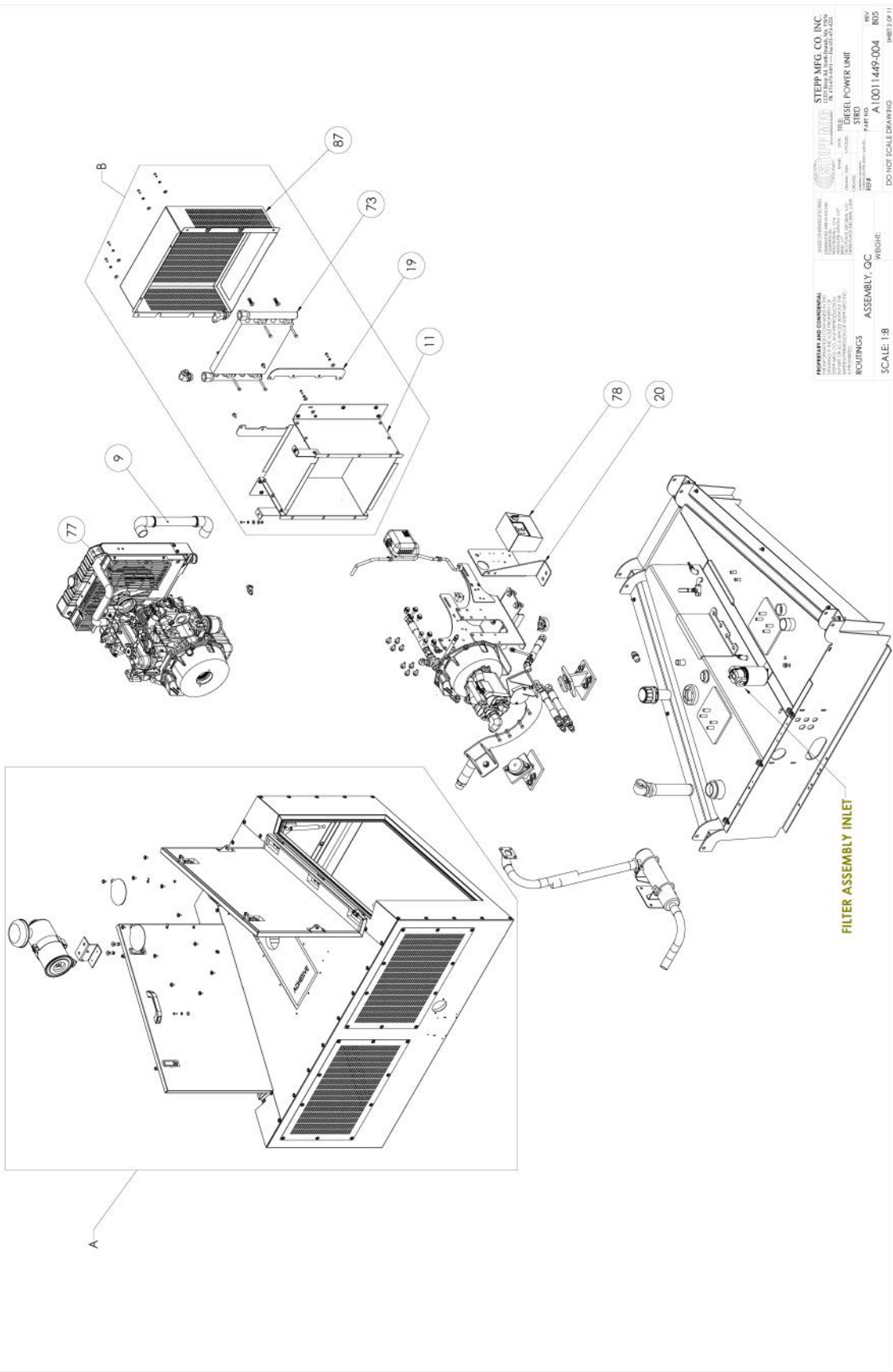
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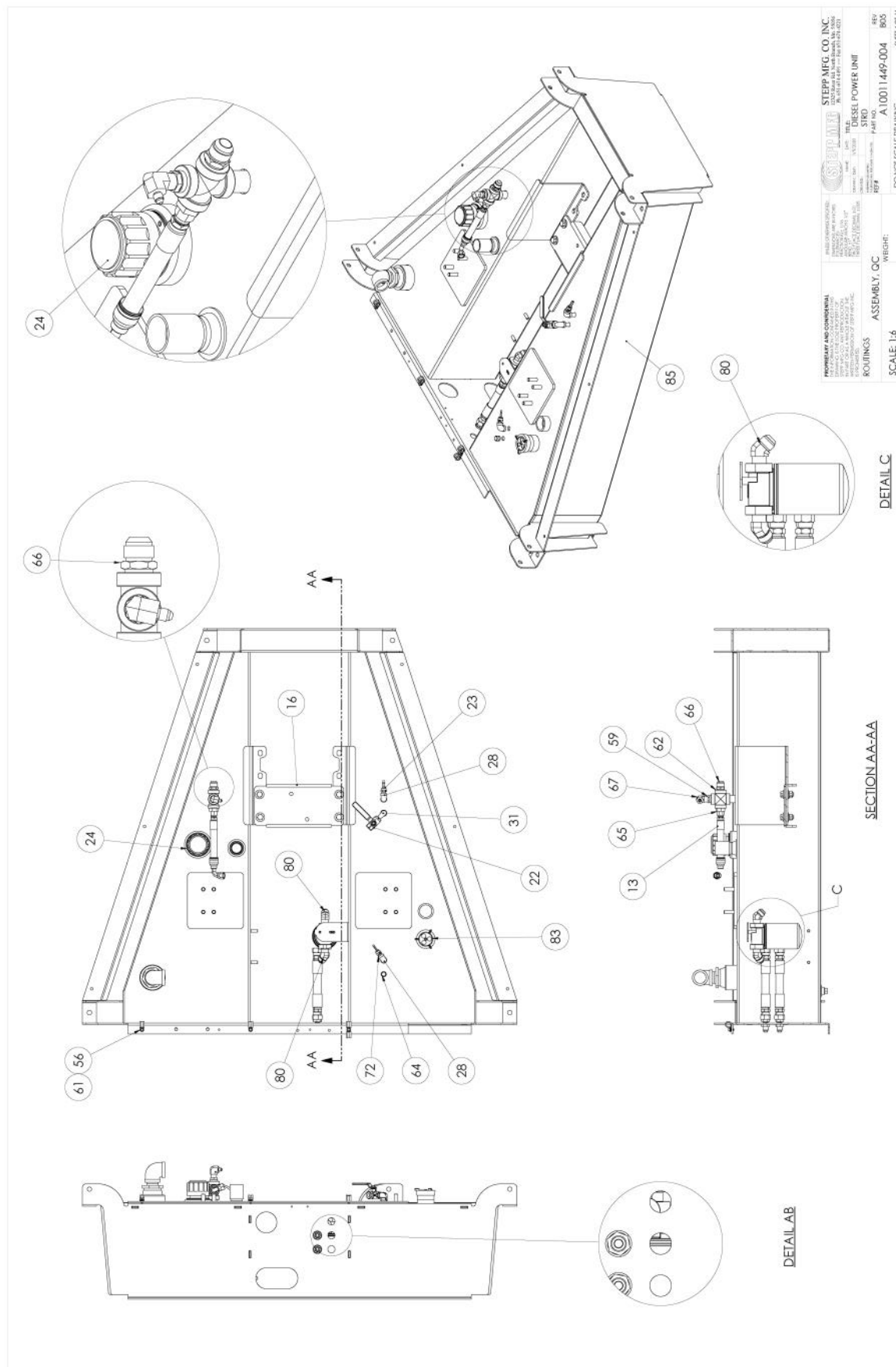
STEPP MFG CO. INC.
10011449-004
DIESEL POWER UNIT
A10011449-004
R05
R05

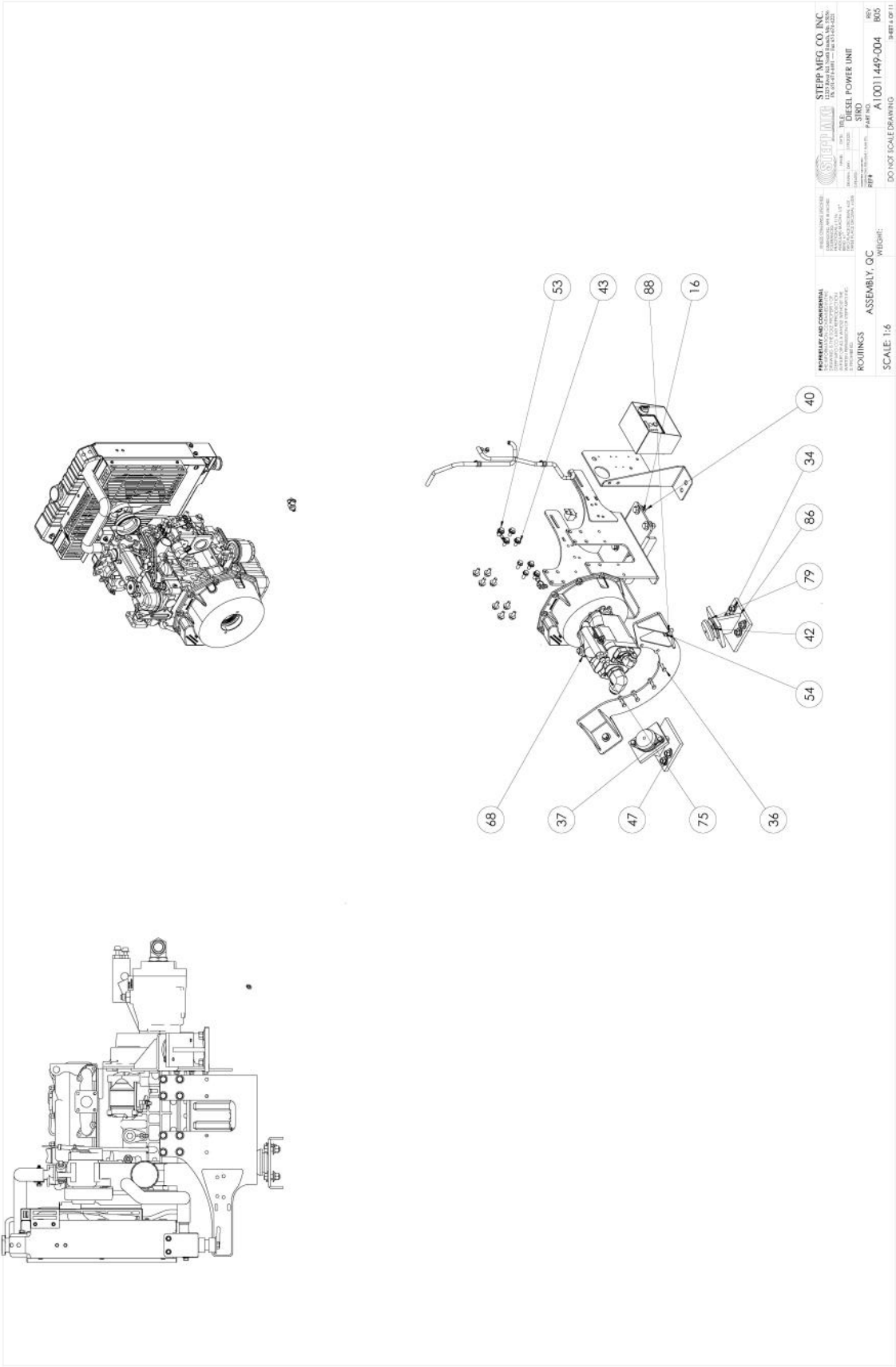
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SCALE: 1:32
DO NOT SCALE DRAWING
SHEET 0011

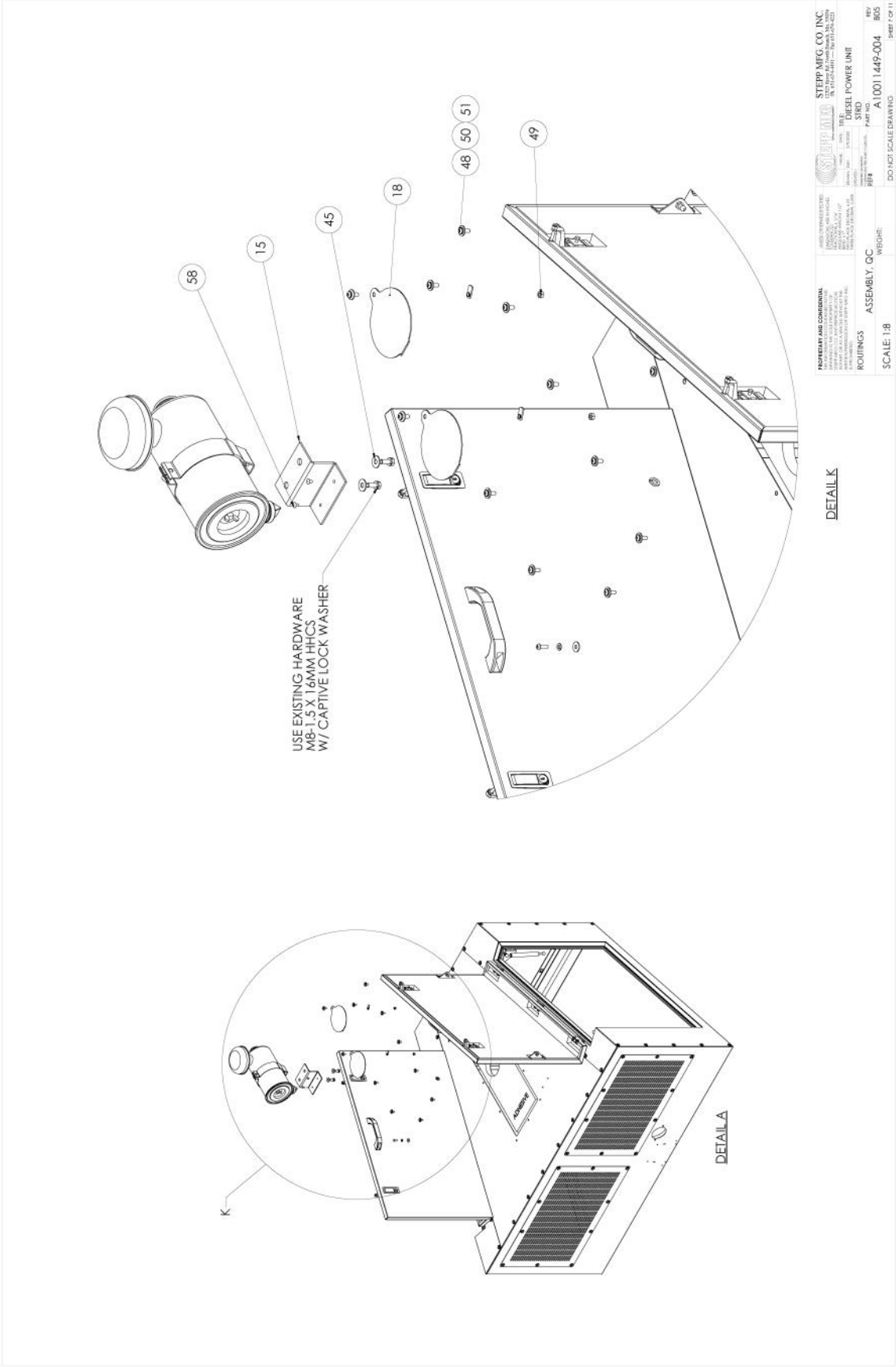
REPLACEMENT PARTS

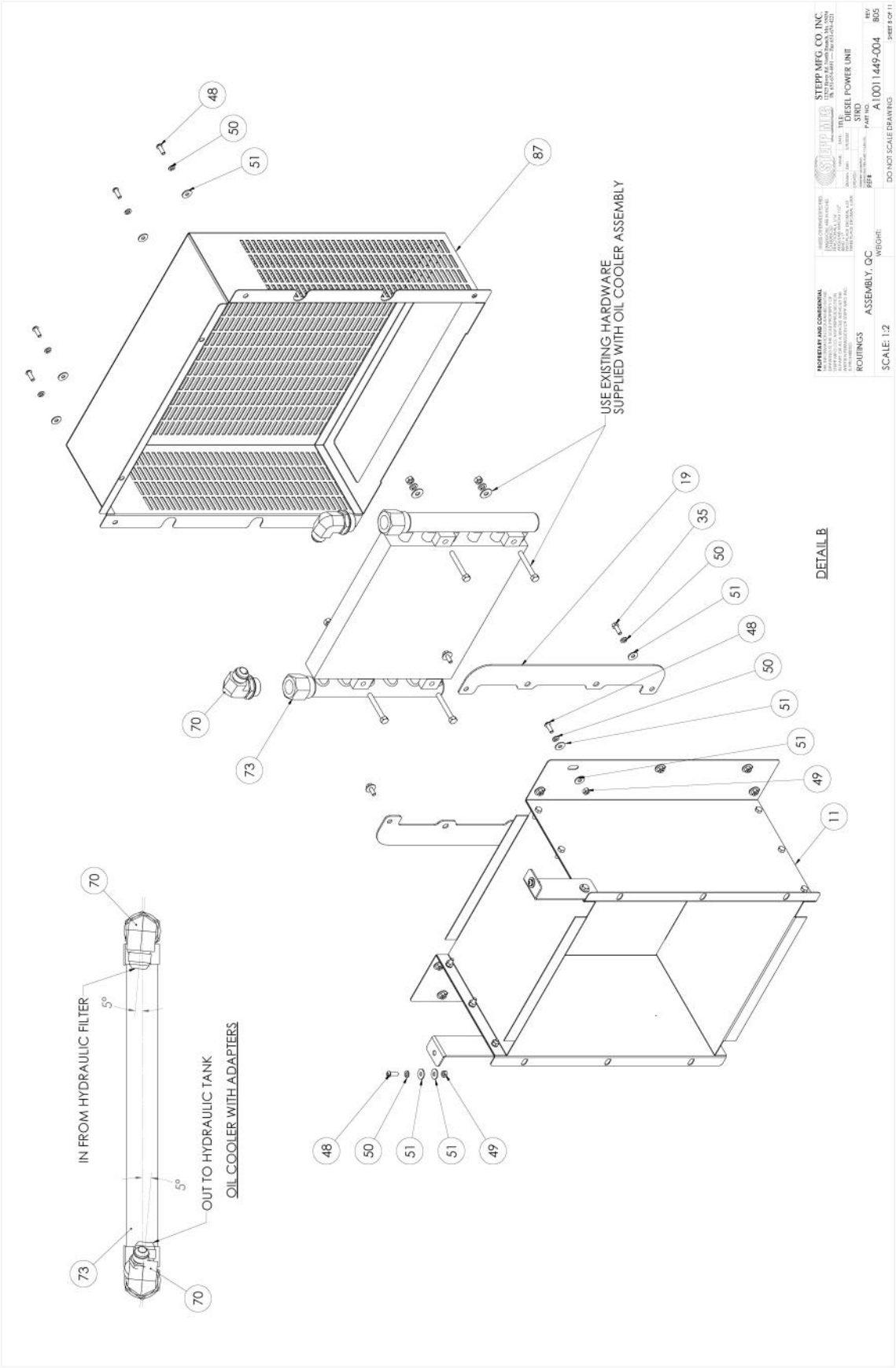
Engine

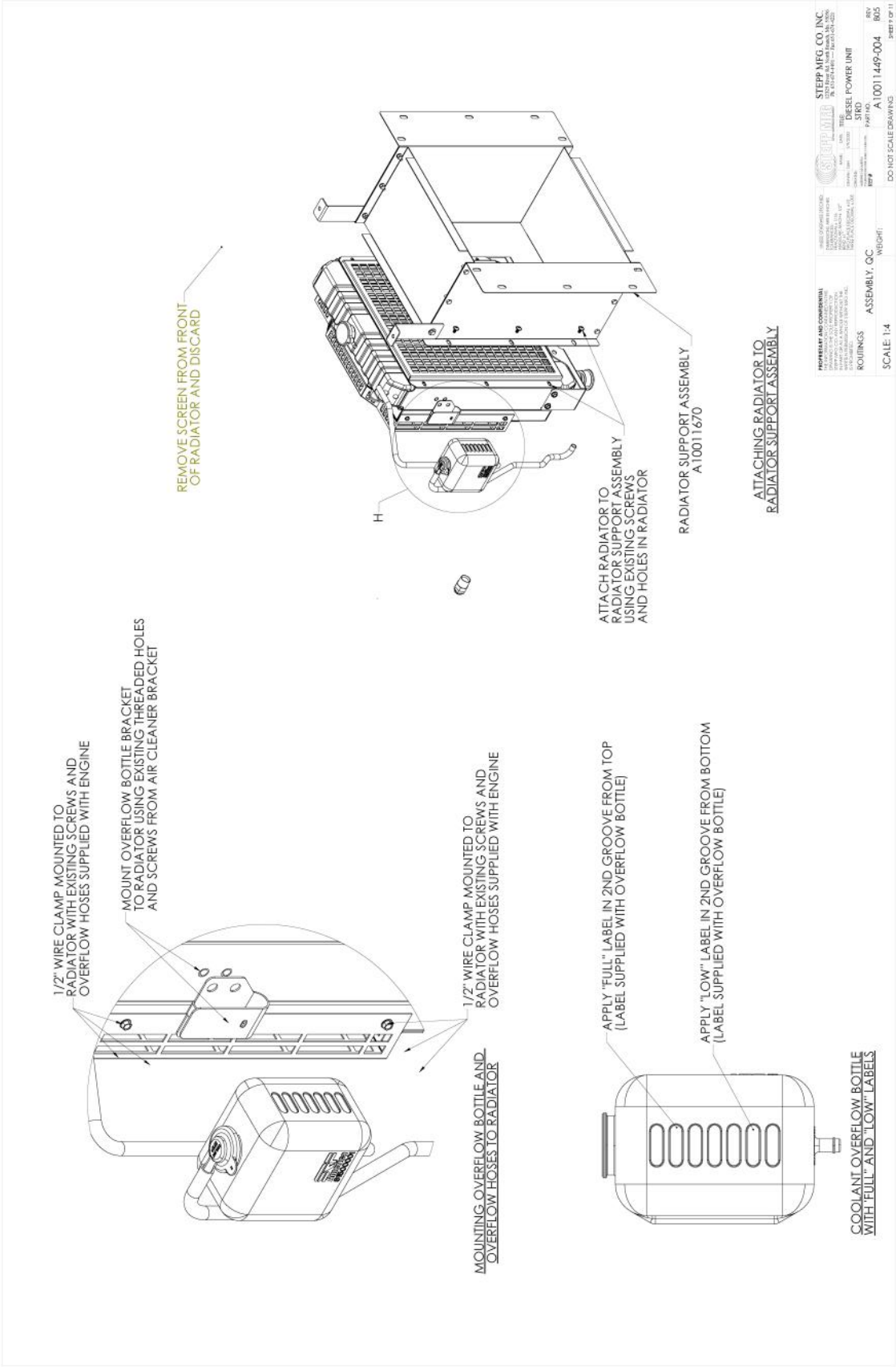












NHTSA Reporting Safety Defects

If you believe that your vehicle has a defect in which 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 STEPP MANUFACTURING CO., INC..

If 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, NHTSA cannot become involved in individual problems between you, your dealer, or STEPP MANUFACTURING CO., INC..

To Contact NHTSA, you may either call the Auto Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153); go to <http://www.safercar.gov>; or Write to: NHTSA, US Department of Transportation, 1200 New Jersey Ave., S.E., Washington DC 20590. You can also obtain information about your motor vehicle safety from <http://www.safercar.gov>.



Consumer Warranty Guide



Introduction

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

Warranty Procedures Through A Dealer

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

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

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

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

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

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

Engine Warranty Claims

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

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

Equipment Owner Responsibilities

As the equipment owner, you are responsible for:

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



General Warranty Statement

Stepp Manufacturing's One (1) Year Limited Warranty

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

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

No warranty is extended to cover:

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

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

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

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

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

Disclaimer of further warranty:

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

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

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



Twelve (12) Month Pro-Rata Limited Warranty
Heated Asphalt Hose and Heating Elements
Effective for Equipment Delivered After 5/1/2012

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

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

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

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

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

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

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

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

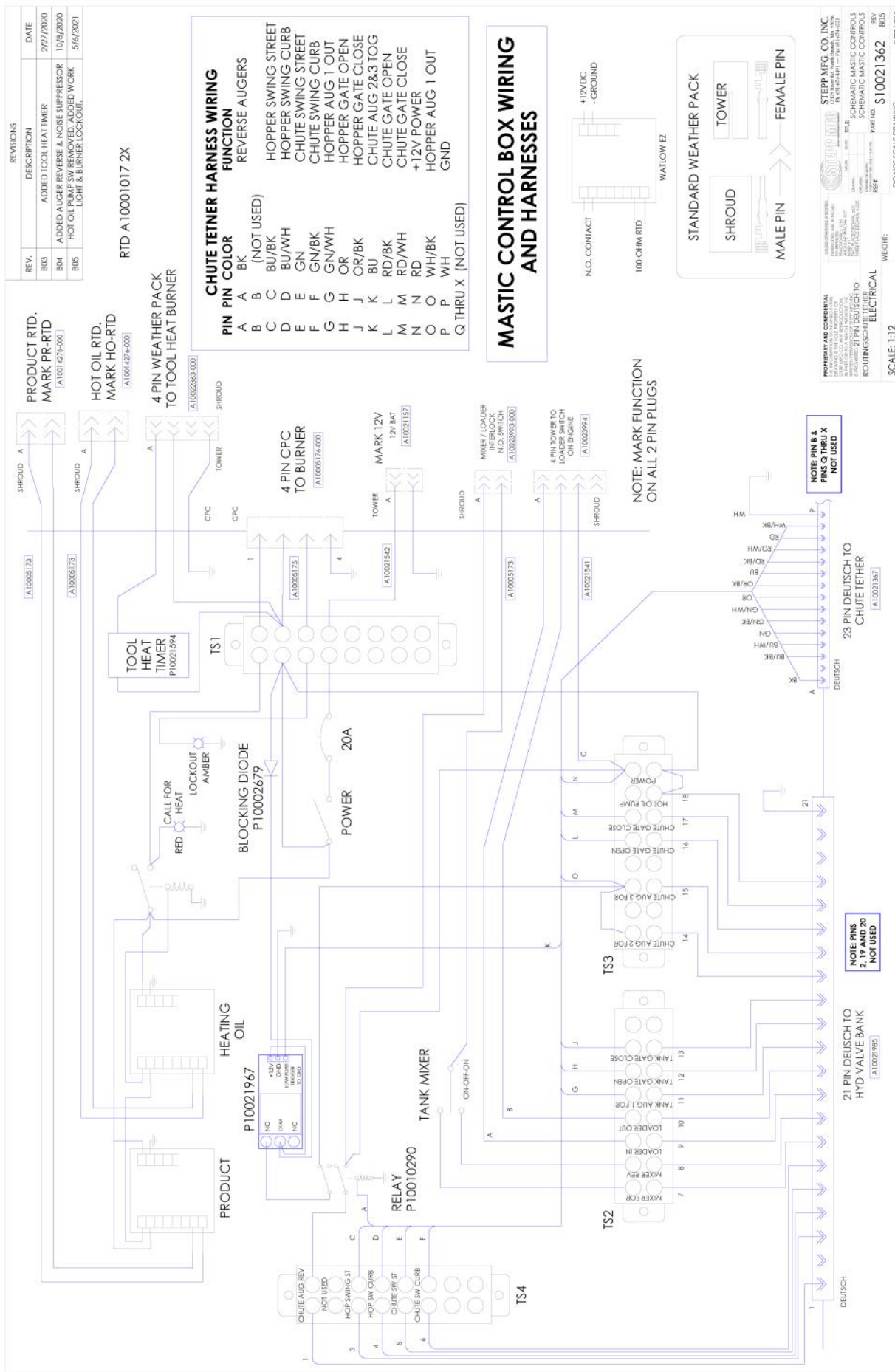
Heating Element		
Failure Date	Warranty's Responsibility	Customer's Responsibility
0-3 Months 0-90 Days	100%	0%
3-4 Months 91-121 Days	60%	40%
4-5 Months 122-152 Days	40%	60%
5-6 Months 153-180 Days	20%	80%
After 6 Months	0%	100%



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

Equipment Owner		Warranty to be Performed by	
Customer Name		Company Name	
Street Address		Address	
City/State/Zip		City/State/Zip	
Equipment Model #		Contact Name	
Equipment VIN		Contact Phone #	
Hour Meter Read			
Purchase Date		Date of Malfunction	
Dealer Purchased Form		Date of Repair	
Warranty Authorization		Signature for Authorization	
Date of Malfunction		X	
Date of Repair			
Symptoms / Diagnostics / Action			
Symptoms	Diagnostics	Action	
<i>Describe the symptoms in detail, be as specific as possible. Ex: Burner ignites and runs for 35 seconds, then goes out.</i>	<i>Describe issues found, be as specific as possible. Ex: Part failed due to loose connection, resulting in misalignment and premature wear.</i>	<i>Describe action taken, be as specific as possible. Ex: Removed damaged section of wire harness, soldered new leads in place, and insulated splices w/ heat shrink tubing.</i>	
Parts and Labor			
Labor Time to Correct Problem (reimbursed at \$55/hour)		Parts Used to Correct Problem	
Labor Time (in hours)	Repair Made	Part Number	Description Qty
Parts Return			
All parts returned must be tagged with the warranty authorization number and a copy of this claim. Retain all parts until credit is received from the factory. When requested, return the parts, along with this claim, to: Stepp Manufacturing Co., Inc. Attn: Warranty Department 12325 River Road North Branch MN 55056 *Note: If defective parts are not returned within 10 days, or this warranty claim does not accompany the returned parts, the claim will be denied.			
Office Use Only			
Date Claim/Parts Received?		Is this a warrantable claim?	Yes No
Claim Reviewed By:		Original Invoice # for Parts	
Date of Review:			
Warranty Totals			

SCHEMATICS



PROPERTY AND COMMERCIAL INFORMATION

STEPP MFG. CO. INC.
11111 STEPP DRIVE
WILSON, NC 27157-1491
TEL: 704.241.1111 FAX: 704.241.1111

REVISIONS

REV.	DESCRIPTION	DATE
B05	SCHEMATIC MASTICH CONTROLS	10/8/2020
B06	SCHEMATIC MASTICH CONTROLS	5/4/2021

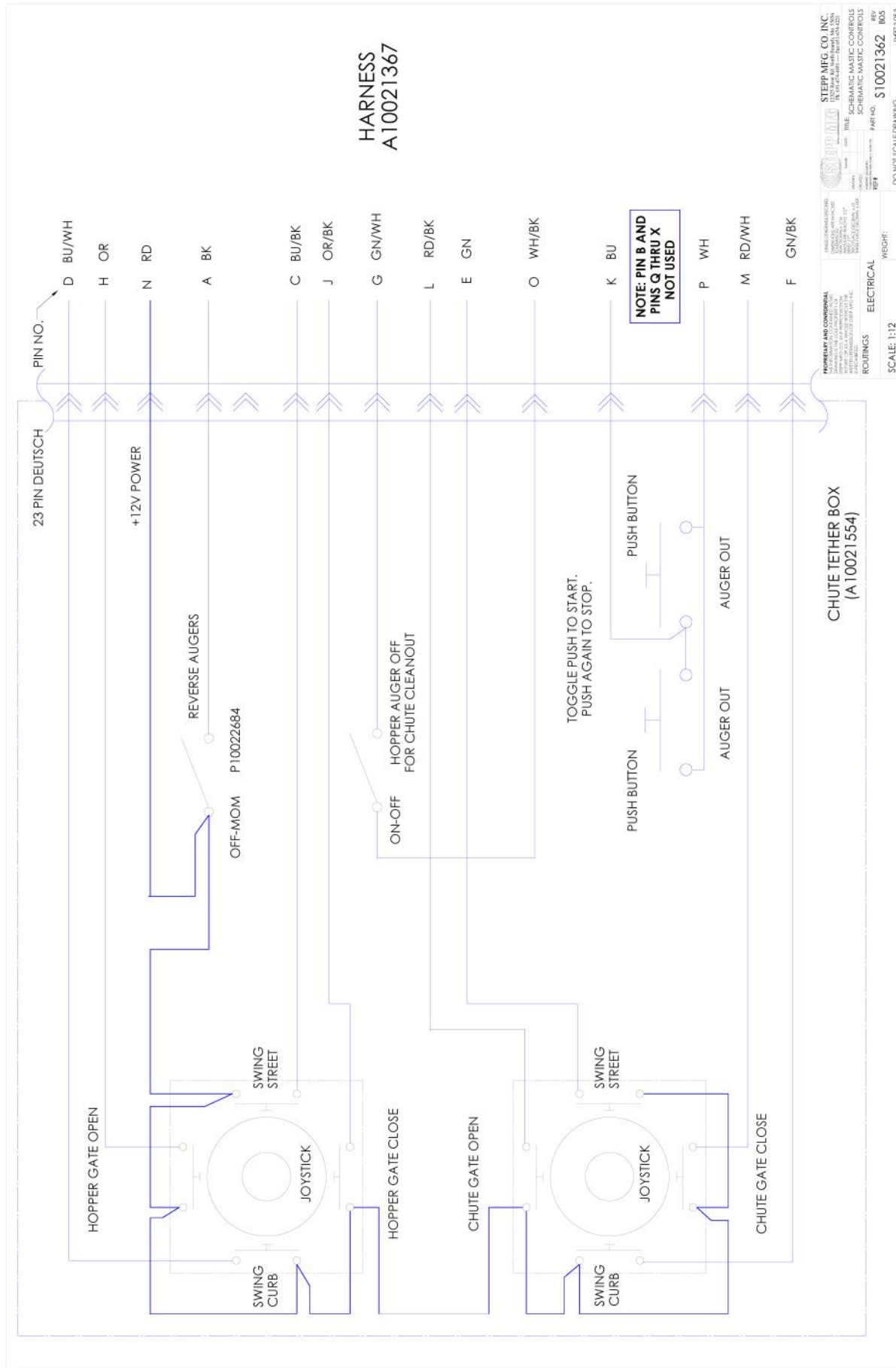
WIRING

WIRING: 1:12

SCALE: 1:12

DO NOT SCALE DRAWING

SHEET 1 OF 2



HEAT TRANSFER OIL MSDS



SAFETY DATA SHEET

Heat Transfer Oil

According to Appendix D, OSHA Hazard Communication Standard 29 CFR §1910.1200 and WHMIS 2015, in compliance with the Hazardous Product Act (HPA, as amended) and the requirements of the Hazardous Product Regulations (HPR).

1. Identification

Product identifier

Product name Heat Transfer Oil

Product number INHT

Recommended use of the chemical and restrictions on use

Application Lubricant.

Uses advised against Avoid the formation of mists.

Details of the supplier of the safety data sheet

Supplier AMSOIL INC.
Bordner, Ladner, Gervais
Scotia Plaza, 40 King St W
Toronto, ON, Canada M5H 3Y4
+1 416.367.6547

Manufacturer SEVERUS INC.
1101 Susquehanna Ave.
Superior, WI 54880, USA.
T: +1-7 15-395-0946

Emergency telephone number

Emergency telephone CHEMTREC: Within USA and Canada: 1-800-424-9300
Outside the USA and Canada: +1 703-741-5970
(collect calls accepted) 24/7

2. Hazard(s) identification

Classification of the substance or mixture

OSHA/WHMIS Regulatory Status This Product is not Hazardous under the OSHA Hazard Communication Standard and according to the hazard criteria of the Hazardous Product Regulations.

Physical hazards Not Classified

Health hazards Not Classified

Environmental hazards Not Classified

Label elements

Hazard statements NC Not Classified

Other hazards

This product does not contain any substances classified as PBT or vPvB.

3. Composition/information on ingredients

Mixtures

Heat Transfer Oil

Composition comments No classified ingredients, or those having occupational exposure limits, present above the levels of disclosure.

4. First-aid measures

Description of first aid measures

General information	Get medical attention if any discomfort continues. Show this Safety Data Sheet to the medical personnel.
Inhalation	Move affected person to fresh air and keep warm and at rest in a position comfortable for breathing. Maintain an open airway. Loosen tight clothing such as collar, tie or belt.
Ingestion	Rinse mouth thoroughly with water. Give a few small glasses of water or milk to drink. Stop if the affected person feels sick as vomiting may be dangerous. Do not induce vomiting unless under the direction of medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Never give anything by mouth to an unconscious person. Maintain an open airway. Loosen tight clothing such as collar, tie or belt.
Skin Contact	Wash skin thoroughly with soap and water.
Eye contact	Rinse immediately with plenty of water. Remove any contact lenses and open eyelids wide apart. Continue to rinse for at least 10 minutes.
Protection of first aiders	First aid personnel should wear appropriate protective equipment during any rescue.

Most important symptoms and effects, both acute and delayed

General information	See Section 11 for additional information on health hazards. The severity of the symptoms described will vary dependent on the concentration and the length of exposure.
Inhalation	Prolonged inhalation of high concentrations may damage respiratory system.
Ingestion	Gastrointestinal symptoms, including upset stomach. Fumes from the stomach contents may be inhaled, resulting in the same symptoms as inhalation.
Skin contact	Prolonged contact may cause dryness of the skin.
Eye contact	May cause temporary eye irritation.

Indication of immediate medical attention and special treatment needed

Notes for the doctor	Treat symptomatically.
Specific treatments	No special treatment required.

5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media	Extinguish with alcohol-resistant foam, carbon dioxide, dry powder or water fog. Use fire-extinguishing media suitable for the surrounding fire.
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.

Special hazards arising from the substance or mixture

Specific hazards	Containers can burst violently or explode when heated, due to excessive pressure build-up. Contains Hydrocarbons. The product is immiscible with water and will spread on the water surface.
Hazardous combustion products	Thermal decomposition or combustion products may include the following substances: Harmful gases or vapors.

Advice for firefighters

Heat Transfer Oil

Protective actions during firefighting	Avoid breathing fire gases or vapors. Evacuate area. Cool containers exposed to heat with water spray and remove them from the fire area if it can be done without risk. Cool containers exposed to flames with water until well after the fire is out. If a leak or spill has not ignited, use water spray to disperse vapors and protect men stopping the leak.
Special protective equipment for firefighters	Wear positive-pressure self-contained breathing apparatus (SCBA) and appropriate protective clothing. Standard Firefighter's clothing including helmets, protective boots and gloves, that provides a basic level of protection during chemical incidents is defined by the Canada Occupational Health and Safety Regulations, by provincial guidelines on occupational health and safety or by NFPA standards if applicable.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Personal precautions	No action shall be taken without appropriate training or involving any personal risk. Keep unnecessary and unprotected personnel away from the spillage. Wear protective clothing as described in Section 8 of this safety data sheet. Follow precautions for safe handling described in this safety data sheet. Wash thoroughly after dealing with a spillage. Use protective equipment appropriate for surrounding materials.
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Environmental precautions

Environmental precautions	Avoid discharge to the aquatic environment.
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Methods and material for containment and cleaning up

Methods for cleaning up	Wear protective clothing as described in Section 8 of this safety data sheet. Clear up spills immediately and dispose of waste safely. Reuse or recycle products wherever possible. Absorb the spillage with an inert, dry material and place it in a suitable waste disposal container. Flush contaminated area with plenty of water. Wash thoroughly after dealing with a spillage. Dispose of contents/container in accordance with national regulations.
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Reference to other sections	For personal protection, see Section 8. For waste disposal, see Section 13.
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7. Handling and storage

Precautions for safe handling

Usage precautions	Read and follow manufacturer's recommendations. Wear protective clothing as described in Section 8 of this safety data sheet. Keep away from food, drink and animal feeding stuffs. Handle all packages and containers carefully to minimize spills. Keep container tightly sealed when not in use. Avoid the formation of mists. Avoid contact with used product. Do not reuse empty containers.
--------------------------	---

Advice on general occupational hygiene	Wash promptly if skin becomes contaminated. Take off contaminated clothing and wash before reuse. Wash contaminated clothing before reuse. Do not eat, drink or smoke when using this product. Wash at the end of each work shift and before eating, smoking and using the toilet. Change work clothing daily before leaving workplace.
---	---

Conditions for safe storage, including any incompatibilities

Storage precautions	Store away from incompatible materials (see Section 10). Keep container tightly closed, in a cool, well ventilated place. Protect containers from damage.
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Storage class	Chemical storage.
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Specific end uses(s)

Specific end use(s)	The identified uses for this product are detailed in Section 1.
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8. Exposure controls/Personal protection

Control parameters

Heat Transfer Oil

Occupational exposure limits

Comments The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit. At this time, the other constituents have no known exposure limits.

Under conditions which may generate mists, the following exposure limits are recommended:

Long-term exposure limit (8-hour TWA): 5 mg/m³

Short-term exposure limit (15-minute): 10 mg/m³

Exposure controls

Appropriate engineering controls	Provide adequate ventilation. Good general ventilation should be adequate to control worker exposure to airborne contaminants.
Eye/face protection	Eyewear complying with an approved standard should be worn if a risk assessment indicates eye contact is possible. Personal protective equipment for eye and face protection should comply with OSHA 1910.133 and/or the Canadian regulation on health and safety at work, SOR/86-304, Part XII (12.6), and any relevant provincial regulation relating to health and safety at work. The following protection should be worn: Chemical splash goggles.
Hand protection	Chemical-resistant, impervious gloves complying with an approved standard should be worn if a risk assessment indicates skin contact is possible. The most suitable glove should be chosen in consultation with the glove supplier/manufacturer, who can provide information about the breakthrough time of the glove material. To protect hands from chemicals, gloves should comply with OSHA 1910.138 and/or the Canadian regulation on health and safety at work, SOR/86-304, Part XII (12.9), and be demonstrated to be impervious to the chemical and resist degradation. Considering the data specified by the glove manufacturer, check during use that the gloves are retaining their protective properties and change them as soon as any deterioration is detected. Frequent changes are recommended.
Other skin and body protection	Appropriate footwear and additional protective clothing complying with an approved standard should be worn if a risk assessment indicates skin contamination is possible.
Hygiene measures	Provide eyewash station and safety shower. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reuse. Clean equipment and the work area every day. Good personal hygiene procedures should be implemented. Wash at the end of each work shift and before eating, smoking and using the toilet. When using do not eat, drink or smoke.
Respiratory protection	Respiratory protection complying with an approved standard should be worn if a risk assessment indicates inhalation of contaminants is possible. Provide adequate ventilation. Large Spillages: If ventilation is inadequate, suitable respiratory protection must be worn.
Environmental exposure controls	Not regarded as dangerous for the environment.

9. Physical and chemical properties

Information on basic physical and chemical properties

Appearance	Liquid.
Color	Amber.
Odor	Mild petroleum.
Odor threshold	Not available.
pH	Not available.
Melting point	Not available.
Initial boiling point and range	Not available.

Heat Transfer Oil

Flash point	212°C Cleveland open cup. [ASTM D 92]
Evaporation rate	Not available.
Upper/lower flammability or explosive limits	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	0.8639
Solubility(ies)	Not known.
Partition coefficient	Not available.
Auto-ignition temperature	Not available.
Decomposition Temperature	Not available.
Viscosity	36.2 cSt @ 40°C 6.1 cSt @ 100°C [ASTM D 445]
Explosive properties	Not considered to be explosive.
Oxidizing properties	Does not meet the criteria for classification as oxidizing.
Fire point	238°C Cleveland open cup. [ASTM D 92]
Pour point	-21°C [ASTM D 97]

10. Stability and reactivity

Reactivity	See the other subsections of this section for further details.
Stability	Stable at normal ambient temperatures and when used as recommended. Stable under the prescribed storage conditions.
Possibility of hazardous reactions	No potentially hazardous reactions known.
Conditions to avoid	There are no known conditions that are likely to result in a hazardous situation.
Materials to avoid	No specific material or group of materials is likely to react with the product to produce a hazardous situation.
Hazardous decomposition products	Does not decompose when used and stored as recommended. Thermal decomposition or combustion products may include the following substances: Harmful gases or vapors.

11. Toxicological information

Information on toxicological effects

Toxicological effects	Not regarded as a health hazard under current legislation.
<u>Acute toxicity - oral</u>	
Notes (oral LD ₅₀)	Based on available data the classification criteria are not met.
<u>Acute toxicity - dermal</u>	
Notes (dermal LD ₅₀)	Based on available data the classification criteria are not met.

Heat Transfer Oil

Acute toxicity - inhalation

Notes (inhalation LC₅₀) Based on available data the classification criteria are not met.

Skin corrosion/irritation

Animal data Based on available data the classification criteria are not met.

Serious eye damage/irritation

Serious eye damage/irritation Based on available data the classification criteria are not met.

Respiratory sensitization

Respiratory sensitization Based on available data the classification criteria are not met.

Skin sensitization

Skin sensitization Based on available data the classification criteria are not met.

Germ cell mutagenicity

Genotoxicity - in vitro Based on available data the classification criteria are not met.

Carcinogenicity

Carcinogenicity Based on available data the classification criteria are not met.

IARC carcinogenicity

None of the ingredients are listed or exempt.

Reproductive toxicity

Reproductive toxicity - fertility Based on available data the classification criteria are not met.

Reproductive toxicity - development

Based on available data the classification criteria are not met.

Specific target organ toxicity - single exposure

STOT - single exposure Not classified as a specific target organ toxicant after a single exposure.

Specific target organ toxicity - repeated exposure

STOT - repeated exposure Not classified as a specific target organ toxicant after repeated exposure.

Aspiration hazard

Aspiration hazard Based on available data the classification criteria are not met.

General information

No specific health hazards known. The severity of the symptoms described will vary dependent on the concentration and the length of exposure.

Inhalation

Prolonged inhalation of high concentrations may damage respiratory system.

Ingestion

Gastrointestinal symptoms, including upset stomach. Fumes from the stomach contents may be inhaled, resulting in the same symptoms as inhalation.

Skin Contact

Prolonged contact may cause dryness of the skin.

Eye contact

May cause temporary eye irritation.

Route of exposure

Ingestion Inhalation Skin and/or eye contact

Target Organs

No specific target organs known.

Medical considerations

Skin disorders and allergies.

12. Ecological information

Ecotoxicity

Not regarded as dangerous for the environment. However, large or frequent spills may have hazardous effects on the environment.

Heat Transfer Oil

Toxicity Based on available data the classification criteria are not met.

Persistence and degradability

Persistence and degradability The degradability of the product is not known.

Bioaccumulative potential

Bio-Accumulative Potential No data available on bioaccumulation.

Partition coefficient Not available.

Mobility in soil

Mobility No data available.

Other adverse effects

Other adverse effects None known.

13. Disposal considerations

Waste treatment methods

General information The generation of waste should be minimized or avoided wherever possible. Reuse or recycle products wherever possible. This material and its container must be disposed of in a safe way. Disposal of this product, process solutions, residues and by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any local authority requirements.

Disposal methods Dispose of surplus products and those that cannot be recycled via a licensed waste disposal contractor. Waste packaging should be collected for reuse or recycling. Incineration or landfill should only be considered when recycling is not feasible. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of the local water authority.

14. Transport information

General The product is not covered by international regulations on the transport of dangerous goods (IMDG, IATA, DOT, TDG).

UN Number

UN No. (International) Not applicable.

UN proper shipping name

Proper shipping name (International) Not applicable.

Transport hazard class(es)

Transport labels

No transport warning sign required.

Packing group

Packing group (International) Not applicable.

Environmental hazards

Environmentally Hazardous Substance

No.

Special precautions for user

Not applicable.

Heat Transfer Oil

DOT TIH Zone Not applicable.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable.

15. Regulatory information

Regulatory References OSHA Hazard Communication Standard 29 CFR §1910.1200 Hazardous Products Regulation (SOR/2015-17) Transportation of Dangerous Goods Regulations -SOR/2015-100.

US Federal Regulations

SARA Section 302 Extremely Hazardous Substances Tier II Threshold Planning Quantities

None of the ingredients are listed or exempt.

CERCLA/Superfund, Hazardous Substances/Reportable Quantities (EPA)

None of the ingredients are listed or exempt.

SARA Extremely Hazardous Substances EPCRA Reportable Quantities

None of the ingredients are listed or exempt.

SARA 313 Emission Reporting

None of the ingredients are listed or exempt.

CAA Accidental Release Prevention

None of the ingredients are listed or exempt.

SARA (311/312) Hazard Categories

None of the ingredients are listed or exempt.

OSHA Highly Hazardous Chemicals

None of the ingredients are listed or exempt.

US State Regulations

California Proposition 65 Carcinogens and Reproductive Toxins

None of the ingredients are listed or exempt.

California Air Toxics "Hot Spots" (A-I)

None of the ingredients are listed or exempt.

California Air Toxics "Hot Spots" (A-II)

None of the ingredients are listed or exempt.

California Directors List of Hazardous Substances

None of the ingredients are listed or exempt.

Massachusetts "Right To Know" List

None of the ingredients are listed or exempt.

Rhode Island "Right To Know" List

None of the ingredients are listed or exempt.

Minnesota "Right To Know" List

None of the ingredients are listed or exempt.

New Jersey "Right To Know" List

None of the ingredients are listed or exempt.

Heat Transfer Oil

Pennsylvania "Right To Know" List

None of the ingredients are listed or exempt.

Inventories

Canada - DSL/NDSL

All the ingredients are listed or exempt.

US - TSCA

All the ingredients are listed or exempt.

US - TSCA 12(b) Export Notification

None of the ingredients are listed or exempt.

16. Other information

Abbreviations and acronyms used in the safety data sheet

C.A.S. = Chemical Abstracts Service; E.C. No = European Commission number; GHS = Globally Harmonised System; OSHA = Occupational Safety and Health Administration; WHMIS = Workplace Hazardous Materials Information System; DOT = Department of Transport; TDG = Transport of Dangerous Goods Regulations; IMDG = International Maritime Dangerous Goods; IATA = International Air Transport Association; SARA = Superfund Amendments and Reauthorization Act; CERCLA = Comprehensive Environmental; EPCRA = Emergency Planning and Community Right-to-Know Act; TSCA = Toxic Substances Control Act; LD/LC/EC = Lethal Dose, Lethal Concentration/Effect Concentration for 50% of population; NOEC = No Overall Effect Concentration; NOEL = No Overall Effect Level; REACH = Registration, Evaluation, Authorisation & Restriction of Chemicals; STOT-RE = Single Target Organ Toxicity - Repeat Exposure; STOT-SE = Specific Target Organ Toxicity - Single Exposure; PBT = Persistent, Bioaccumulative, Toxic; vPvB = Very Persistent, Very Bioaccumulative.

Key literature references and sources for data

Source: European Chemicals Agency, <http://echa.europa.eu/>

Training advice

Read and follow manufacturer's recommendations. Only trained personnel should use this material.

Revision comments

This is the first issue.

Revision date

4/14/2019

SDS No.

8602

This information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Such information is, to the best of the company's knowledge and belief, accurate and reliable as of the date indicated. However, no warranty, guarantee or representation is made to its accuracy, reliability or completeness. It is the user's responsibility to satisfy himself as to the suitability of such information for his own particular use.

HYDRAULIC OIL MSDS

MATERIAL SAFETY DATA SHEET

SECTION 1	PRODUCT AND COMPANY IDENTIFICATION
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PRODUCT

Product Name: UNIVIS N 32
Product Description: Base Oil and Additives
Product Code: 8259
Intended Use: Hydraulic fluid

COMPANY IDENTIFICATION

Supplier: Canada Imperial Oil Limited, An Affiliate of Exxon Mobil Corporation
P.O. Box 4029, Station A
Calgary, ALBERTA. T2P 3M9 Canada

24 Hour Health Emergency 519-339-2145
Transportation Emergency Phone 519-339-2145
Supplier General Contact 1-800-567-3776

SECTION 2	COMPOSITION / INFORMATION ON INGREDIENTS
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Reportable Hazardous Substance(s) or Complex Substance(s)

Name	CAS#	Concentration*
HYDROTREATED LIGHT NAPHTHENIC DISTILLATE (PETROLEUM)	64742-53-6	20 - 30%

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

SECTION 3	HAZARDS IDENTIFICATION
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This material is not considered to be hazardous according to regulatory guidelines (see (M)SDS Section 15).

POTENTIAL HEALTH EFFECTS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

NFPA Hazard ID: Health: 0 Flammability: 1 Reactivity: 0
HMIS Hazard ID: Health: 0 Flammability: 1 Reactivity: 0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4	FIRST AID MEASURES
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INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5	FIRE FIGHTING MEASURES
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EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO₂) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Pressurized mists may form a flammable mixture.

Hazardous Combustion Products: Smoke, Fume, Sulfur oxides, Aldehydes, Oxides of carbon, Incomplete combustion products

FLAMMABILITY PROPERTIES

Flash Point [Method]: 165C (329F) [ASTM D-93]

Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0

Auto ignition Temperature: N/D

SECTION 6	ACCIDENTAL RELEASE MEASURES
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NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. U.S. regulations require reporting releases of this material to the environment which exceed the reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7	HANDLING AND STORAGE
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HANDLING

Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is a static accumulator.

STORAGE

Do not store in open or unlabeled containers.

SECTION 8	EXPOSURE CONTROLS / PERSONAL PROTECTION
------------------	--

Exposure limits/standards for materials that can be formed when handling this product: When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL, 5 mg/m³ - OSHA PEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Work conditions can greatly effect glove durability; inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9	PHYSICAL AND CHEMICAL PROPERTIES
-----------	----------------------------------

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid
Color: Yellow
Odor: Characteristic
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 C): 0.87
Flash Point [Method]: 165C (329F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Auto ignition Temperature: N/D
Boiling Point / Range: 229C (444F) - 512C (954F)
Vapor Density (Air = 1): N/D
Vapor Pressure: [N/D at 40 °C] | < 1 kPa (7.5 mm Hg) at 38C
Evaporation Rate (n-butyl acetate = 1): < 0.1
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 32 cSt (32 mm²/sec) at 40 C
Oxidizing Properties: See Sections 3, 15, 16.

OTHER INFORMATION**Freezing Point:** N/D**Melting Point:** N/A**Pour Point:** -48°C (-54°F)**DMSO Extract (mineral oil only), IP-346:** < 3 %wt.

SECTION 10	STABILITY AND REACTIVITY
-------------------	---------------------------------

STABILITY: Material is stable under normal conditions.**CONDITIONS TO AVOID:** Excessive heat. High energy sources of ignition.**MATERIALS TO AVOID:** Strong oxidizers**HAZARDOUS DECOMPOSITION PRODUCTS:** Material does not decompose at ambient temperatures.**HAZARDOUS POLYMERIZATION:** Will not occur.

SECTION 11	TOXICOLOGICAL INFORMATION
-------------------	----------------------------------

ACUTE TOXICITY

<u>Route of Exposure</u>	<u>Conclusion / Remarks</u>
Inhalation	
Toxicity (Rat): LC50 > 5000 mg/m ³	Minimally Toxic. Based on assessment of the components.
Irritation: No end point data.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
Ingestion	
Toxicity (Rat): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on assessment of the components.
Eye	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.

CHRONIC/OTHER EFFECTS**Contains:**

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitizing in test animals.

Additional information is available by request.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = NTP CARC

3 = IARC 1

5 = IARC 2B

2 = NTP SUS

4 = IARC 2A

6 = OSHA CARC

SECTION 12	ECOLOGICAL INFORMATION
-------------------	-------------------------------

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bio accumulate, however metabolism or physical properties may reduce the bio concentration or limit bioavailability.

SECTION 13	DISPOSAL CONSIDERATIONS
-------------------	--------------------------------

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrositivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

Empty Container Warning PRECAUTIONARY LABEL TEXT: Empty containers may retain residue and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

SECTION 14	TRANSPORT INFORMATION
-------------------	------------------------------

LAND (DOT) : Not Regulated for Land Transport

LAND (TDG) : Not Regulated for Land Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15	REGULATORY INFORMATION
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OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this material is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.

NATIONAL CHEMICAL INVENTORY LISTING: DSL, TSCA

EPCRA: This material contains no extremely hazardous substances.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: Delayed Health.

SARA (313) TOXIC RELEASE INVENTORY: This material contains no chemicals subject to the supplier notification requirements of the SARA 313 Toxic Release Program.

The Following Ingredients are Cited on the Lists Below:*

Chemical Name	CAS Number	List Citations
HYDROTREATED LIGHT NAPHTHENIC DISTILLATE (PETROLEUM)	64742-53-6	13, 17, 18
PHOSPHORODITHOIC ACID, O,O-DI C1-14-ALKYL ESTERS, ZINC SALTS (2:1) (ZDDP)	68649-42-3	15

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

* EPA recently added new chemical substances to its TSCA Section 4 test rules. Please contact the supplier to confirm whether the ingredients in this product currently appear on a TSCA 4 or TSCA 12b list.

SECTION 16**OTHER INFORMATION**

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

No revision information is available.

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Internal Use Only

MHC: 0, 0, 0, 0, 0, 0

PPEC: A

DGN: 5007202 (1012936)

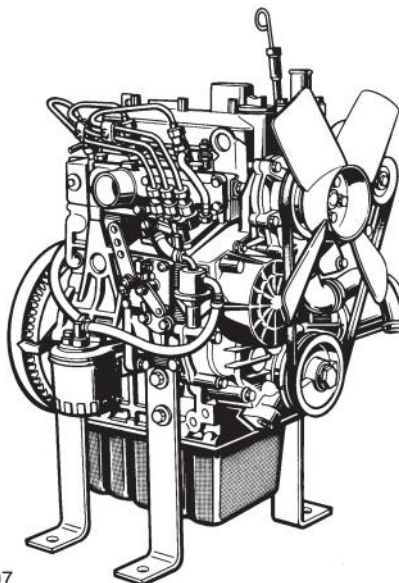
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OPERATOR'S MANUAL

ENGLISH

KUBOTA MOTORE DIESEL

MODELS D905-E·D1105-TE·V1305-E
D1005-E·V1205-E·V1505-E
D1105-E·V1205-TE·V1505-TE



D-2107

16622-8916-8

READ AND SAVE THIS BOOK

Kubota

California Proposition 65

▲ WARNING ▲

Engine exhaust, some of its constituents, certain vehicle components and fluids, contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

FOREWORD

You are now the proud owner of a KUBOTA Engine. This engine is a product of KUBOTA quality engineering and manufacturing. It is made of fine materials and under a rigid quality control system. It will give you long, satisfactory service. To obtain the best use of your engine, please read this manual carefully. It will help you become familiar with the operation of the engine and contains many helpful hints about engine maintenance. It is KUBOTA's policy to utilize as quickly as possible every advance in our research. The immediate use of new techniques in the manufacture of products may cause some small parts of this manual to be outdated. KUBOTA distributors and dealers will have the most up-to-date information. Please do not hesitate to consult with them.



SAFETY FIRST

This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully. It is essential that you read the instructions and safety regulations before you attempt to assemble or use this unit.



DANGER : Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING : Indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.



CAUTION : Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.

IMPORTANT : Indicates that equipment or property damage could result if instructions are not followed.

NOTE : Gives helpful information.

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SAFE OPERATION

ENGLISH

Careful operation is your best assurance against an accident. Read and understand this section carefully before operating the engine. All operators, no matter how much experience they may have, should read this and other related manuals before operating the engine or any equipment attached to it. It is the owner's obligation to provide all operators with this information and instruct them on safe operation.

Be sure to observe the following for safe operation.

OBSERVE SAFETY INSTRUCTIONS

- Read and understand carefully this "OPERATOR'S MANUAL" and "LABELS ON THE ENGINE" before attempting to start and operate the engine.
- Learn how to operate and work safely. Know your equipment and its limitations. Always keep the engine in good condition.
- Before allowing other people to use your engine, explain how to operate and have them read this manual before operation.
- DO NOT modify the engine. UNAUTHORIZED MODIFICATIONS to the engine may impair the function and/or safety and affect engine life. If the engine does not perform properly, consult your local Kubota Engine Distributor first.



1AAACAAAP008B

WEAR SAFE CLOTHING AND PERSONAL PROTECTIVE EQUIPMENT (PPE)

- DO NOT wear loose, torn or bulky clothing around the machine that may catch on working controls and projections or into fans, pulleys and other moving parts causing personal injury.
- Use additional safety items-PPE, e.g. hard hat, safety protection, safety goggles, gloves, etc., as appropriate or required.
- DO NOT operate the machine or any equipment attached to it while under the influence of alcohol, medication, or other drugs, or while fatigued.
- DO NOT wear radio or music headphones while operating the engine.



1AEAAAAAP0130

CHECK BEFORE STARTING & OPERATING THE ENGINE

- Be sure to inspect the engine before operation. Do not operate the engine if there is something wrong with it. Repair it immediately.
- Ensure all guards and shields are in place before operating the engine. Replace any that are damaged or missing.
- Check to see that you and others are a safe distance from the engine before starting.
- Always keep the engine at least 3 feet (1 meter) away from buildings and other facilities.
- DO NOT allow children or livestock to approach the machine while the engine is running.
- DO NOT start the engine by shorting across starter terminals. The machine may start in gear and move. Do not bypass or defeat any safety devices.



1BAABADAP0010

KEEP THE ENGINE AND SURROUNDINGS CLEAN

- Be sure to stop the engine before cleaning.
- Keep the engine clean and free of accumulated dirt, grease and trash to avoid a fire. Store flammable fluids in proper containers and cabinets away from sparks and heat.
- Check for and repair leaks immediately.
- DO NOT stop the engine without idling; Allow the engine to cool down, first. Keep the engine idling for about 5 minutes before stopping unless there is a safety problem that requires immediate shut down.



1AEAAAAAP0120

SAFE HANDLING OF FUEL AND LUBRICANTS -KEEP AWAY FROM FIRE

- Always stop the engine before refueling and/or lubricating.
- DO NOT smoke or allow flames or sparks in your work area. Fuel is extremely flammable and explosive under certain conditions.
- Refuel at a well ventilated and open place. When fuel and/or lubricants are spilled, refuel after letting the engine cool down.
- DO NOT mix gasoline or alcohol with diesel fuel. The mixture can cause a fire or severe engine damage.
- Do not use unapproved containers e.g. buckets, bottles, jars. Use approved fuel storage containers and dispensers.



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EXHAUST GASES & FIRE PREVENTION

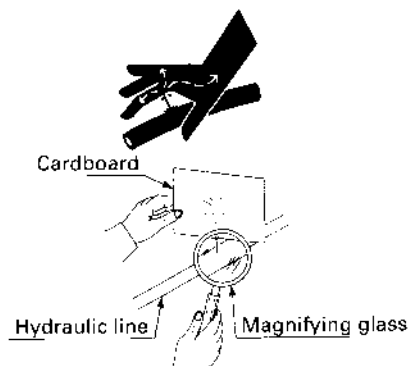
- Engine exhaust fumes can be very harmful if allowed to accumulate. Be sure to run the engine in a well ventilated location and where there are no people or livestock near the engine.
- The exhaust gas from the muffler is very hot. To prevent a fire, do not expose dry grass, mowed grass, oil or any other combustible materials to exhaust gas. Keep the engine and muffler clean at all times.
- To avoid a fire, be alert for leaks of flammable substances from hoses and lines. Be sure to check for leaks from hoses or pipes, such as fuel and hydraulic fluid by following the maintenance check list.
- To avoid a fire, do not short across power cables and wires. Check to see that all power cables and wirings are in good condition. Keep all electrical connections clean. Bare wire or frayed insulation can cause a dangerous electrical shock and personal injury.



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ESCAPING FLUID

- Relieve all pressure in the air, the oil and the cooling systems before disconnecting any lines, fittings or related items.
- Be cautious of possible pressure relief when disconnecting any device from a pressurized system that utilizes pressure. DO NOT check for pressure leaks with your hand. High pressure oil or fuel can cause personal injury.
- Escaping fluid under pressure has sufficient force to penetrate skin causing serious personal injury.
- Fluid escaping from pinholes may be invisible. Use a piece of cardboard or wood to search for suspected leaks; do not use hands and body. Use safety goggles or other eye protection when checking for leaks.
- If injured by escaping fluid, see a medical doctor immediately. This fluid can produce gangrene or severe allergic reaction.



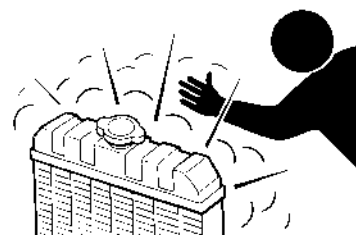
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CAUTIONS AGAINST BURNS & BATTERY EXPLOSION

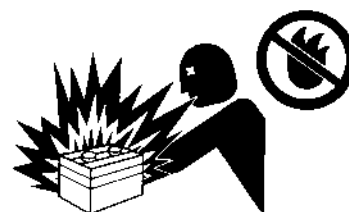
- To avoid burns, be cautious of hot components, e.g. muffler, muffler cover, radiator, hoses, engine body, coolants, engine oil, etc. during operation and after the engine has been shut off.
- DO NOT remove the radiator cap while the engine is running or immediately after stopping. Otherwise hot water will spout out from the radiator. Wait until the radiator is completely cool to the touch before removing the cap. Wear safety goggles.
- Be sure to close the coolant drain valve, secure the pressure cap, and fasten the pipe band before operating. If these parts are taken off, or loosened, it will result in serious personal injury.
- The battery presents an explosive hazard. When the battery is being charged, hydrogen and oxygen gases are extremely explosive.
- DO NOT use or charge the battery if its fluid level is below the LOWER mark.
Otherwise, the component parts may deteriorate earlier than expected, which may shorten the service life or cause an explosion. Immediately, add distilled water until the fluid level is between the UPPER and LOWER marks.
- Keep sparks and open flames away from the battery, especially during charging. DO NOT strike a match near the battery.
- DO NOT check the battery charge by placing a metal object across the terminals. Use a voltmeter or hydrometer.
- DO NOT charge a frozen battery. There is a risk of explosion. When frozen, warm the battery up to at least 16°C (61°F).



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KEEP HANDS AND BODY AWAY FROM ROTATING PARTS

- Be sure to stop the engine before checking or adjusting the belt tension and cooling fan.
- Keep your hands and body away from rotating parts, such as the cooling fan, V-belt, fan drive pulley or flywheel. Contact with rotating parts can cause severe personal injury.
- DO NOT run the engine without safety guards. Install safety guards securely before operation.



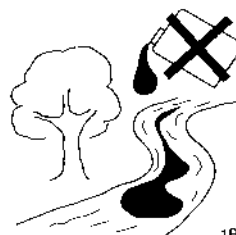
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ANTI-FREEZE & DISPOSAL OF FLUIDS

- Anti-freeze contains poison. Wear rubber gloves to avoid personal injury. In case of contact with skin, wash it off immediately.
- DO NOT mix different types of Anti-freeze. The mixture can produce a chemical reaction causing harmful substances. Use approved or genuine KUBOTA Anti-freeze.
- Be mindful of the environment and the ecology. Before draining any fluids, determine the correct way to dispose of them. Observe the relevant environmental protection regulations when disposing of oil, fuel, coolant, brake fluid, filters and batteries.
- When draining fluids from the engine, place a suitable container underneath the engine body.
- DO NOT pour waste onto the ground, down a drain, or into any water source. Dispose of waste fluids according to environmental regulations.



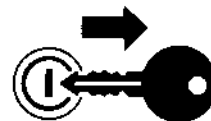
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CONDUCTING SAFETY CHECKS & MAINTENANCE

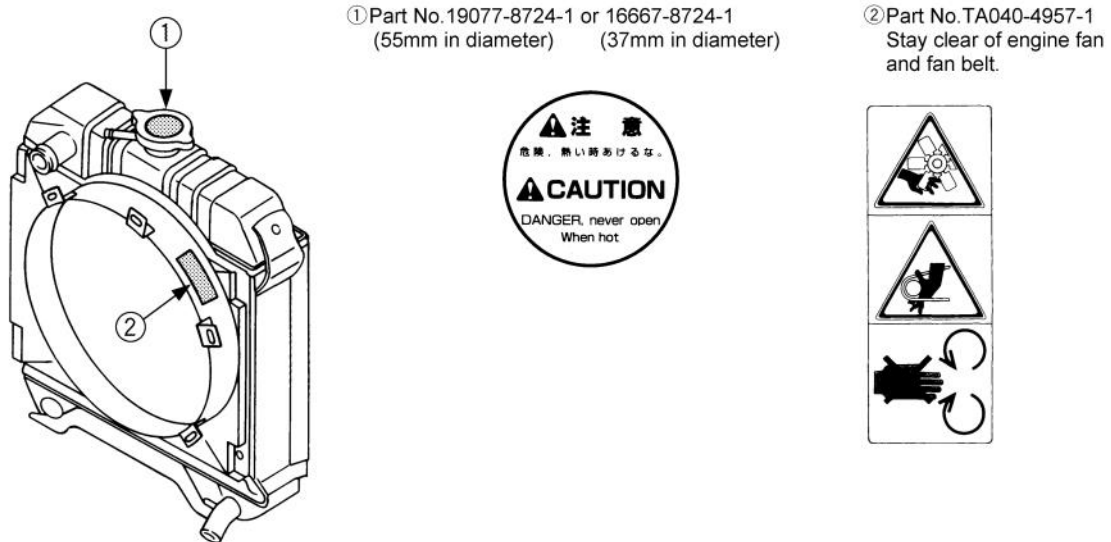
- When inspecting the engine or servicing, place the engine on a large flat surface. DO NOT work on anything that is supported ONLY by lift jacks or a hoist. Always use blocks or the correct stands to support the engine before servicing.
- Disconnect the battery from the engine before conducting service. Put a "DO NOT OPERATE!" tag on the key switch to avoid accidental starting.
- To avoid sparks from an accidental short circuit always disconnect the battery's ground cable (-) first and reconnect it last.
- Be sure to stop the engine and remove the key when conducting daily and periodic maintenance, service and cleaning.
- Check or conduct maintenance after the engine, coolant, muffler, or muffler cover have cooled off completely.



1BJABAAAP0200

- Always use the appropriate tools and fixtures. Verify that they are in good condition before performing any service work. Make sure you understand how to use them before service.
- Use **ONLY** correct engine barring techniques for manually rotating the engine. **DO NOT** attempt to rotate the engine by pulling or prying on the cooling fan and V-belt. This practice can cause serious personal injury or premature damage to the cooling fan and belt.
- Replace fuel pipes and lubricant pipes with their hose clamps every 2 years or earlier whether they are damaged or not. They are made of rubber and age gradually.
- When servicing is performed together by two or more persons, take care to perform all work safely.
- Keep a first aid kit and fire extinguisher handy at all times.

WARNING AND CAUTION LABELS



CARE OF WARNING AND CAUTION LABELS

1. Keep warning and caution labels clean and free from obstructing material.
2. Clean warning and caution labels with soap and water, dry with a soft cloth.
3. Replace damaged or missing warning and caution labels with new labels from your local KUBOTA dealer.
4. If a component with warning and caution label(s) affixed is replaced with a new part, make sure the new label(s) is (are) attached in the same location(s) as the replaced component.
5. Mount new warning and caution labels by applying to a clean dry surface and pressing any bubbles to the outside edge.

SERVICING OF THE ENGINE

ENGLISH

Your dealer is interested in your new engine and has the desire to help you get the most value from it. After reading this manual thoroughly, you will find that you can do some of the regular maintenance yourself.

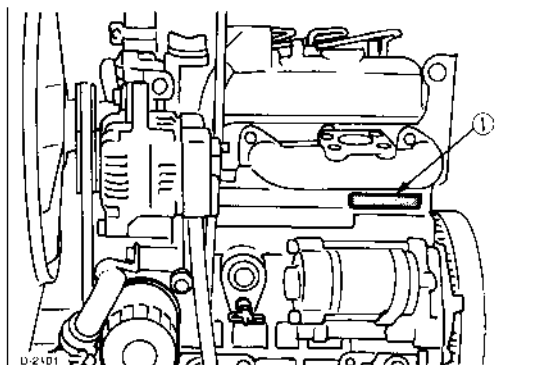
However, when in need of parts or major service, be sure to see your KUBOTA dealer.

For service, contact the KUBOTA Dealership from which you purchased your engine or your local KUBOTA dealer.

When in need of parts, be prepared to give your dealer the engine serial number.

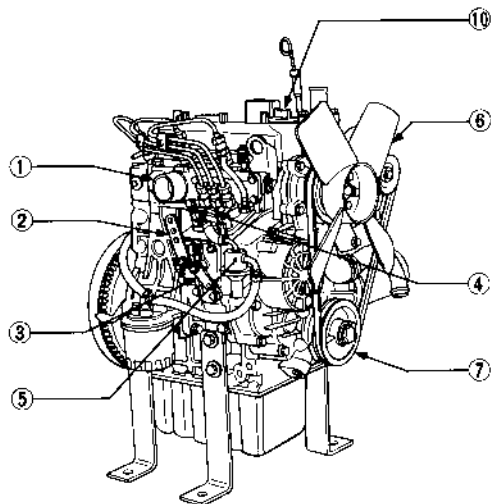
Locate the serial number now and record them in the space provided.

	Type	Serial No.
Engine		
Date of Purchase		
Name of Dealer		
(To be filled in by purchaser)		



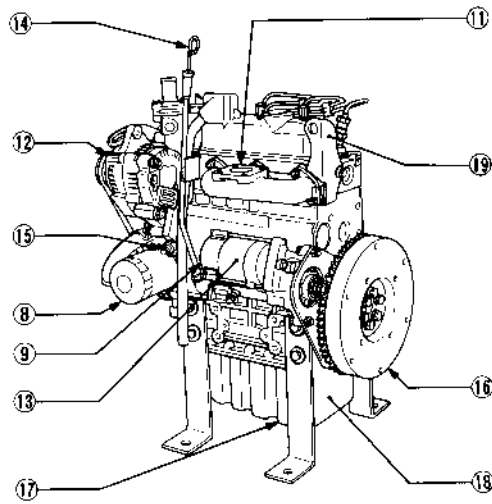
(1) Engine serial number

NAMES OF PARTS



□ 2106

- (1) Intake manifold
- (2) Speed control lever
- (3) Engine stop lever
- (4) Injection pump
- (5) Fuel feed pump
- (6) Cooling fan
- (7) Fan drive pulley
- (8) Oil filter cartridge
- (9) Water drain cock



□ 2105

- (10) Oil filler plug
- (11) Exhaust manifold
- (12) Alternator
- (13) Starter
- (14) Oil level gauge
- (15) Oil pressure switch
- (16) Flywheel
- (17) Oil drain plug
- (18) Oil pan
- (19) Engine hook

PRE-OPERATION CHECK

BREAK-IN

During the engine break-in period, observe the following by all means:

1. Change engine oil and oil filter cartridge after the first 50 hours of operation (See "ENGINE OIL" in "PERIODIC SERVICE" Section).
2. When ambient temperature is low, operate the machine after the engine has been completely warmed up.

DAILY CHECK

To prevent trouble from occurring, it is important to know the conditions of the engine well. Check it before starting.



CAUTION

To avoid personal injury:

- Be sure to install shields and safeguards attached to the engine when operating.
- Stop the engine at a flat and wide space when checking.
- Keep dust or fuel away from the battery, wiring, muffler and engine to prevent a fire. Check and clear them before operating everyday. Pay attention to the heat of the exhaust pipe or exhaust gas so that it can not ignite trash.

Item		Ref. page
1. Parts which had trouble in previous operation		-
2. By walking around the machine	(1) Oil or water leaks	14 to 19
	(2) Engine oil level and contamination	14, 15
	(3) Amount of fuel	11
	(4) Amount of coolant	16 to 19
	(5) Dust in air cleaner dust cup	20, 21
	(6) Damaged parts and loosened bolts and nuts	-
3. By inserting the key into the starter switch	(1) Proper functions of meters and pilot lamps; no stains on these parts	-
	(2) Proper functions of glow lamp timer	-
4. By starting the engine	(1) Color of exhaust fumes	7
	(2) Unusual engine noise	7

OPERATING THE ENGINE

STARTING THE ENGINE (NORMAL)



CAUTION

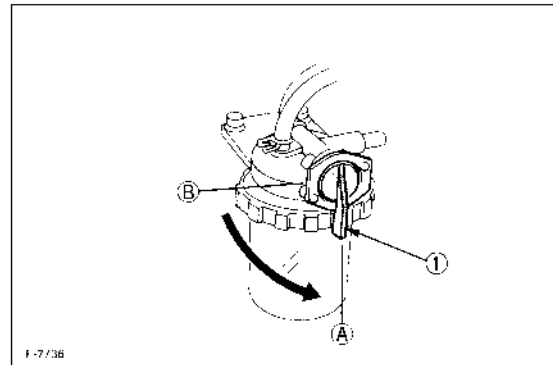
To avoid personal injury:

- Do not allow children to approach the machine while the engine is running.
- Be sure to install the machine on which the engine is installed, on a flat place.
- Do not run the engine on gradients.
- Do not run the engine in an enclosed area. Exhaust gas can cause air pollution and exhaust gas poisoning.
- Keep your hands away from rotating parts (such as fan, pulley, belt, flywheel etc.) during operation.
- Do not operate the machine while under the influence of alcohol or drugs.
- Do not wear loose, torn or bulky clothing around the machine. It may catch on moving parts or controls, leading to the risk of accident. Use additional safety items, e.g. hard hat, safety boots or shoes, eye and hearing protection, gloves, etc., as appropriate or required.
- Do not wear radio or music headphones while operating engine.
- Check to see if it is safe around the engine before starting.
- Reinstall safeguards and shields securely and clear all maintenance tools when starting the engine after maintenance.

IMPORTANT :

- Do not use ether or any starting fluid for starting the engine, or a severe damage will occur.
- When starting the engine after a long storage (of more than 3 months), first set the stop lever to the "STOP" position and then activate the starter for about 10 seconds to allow oil to reach every engine part.

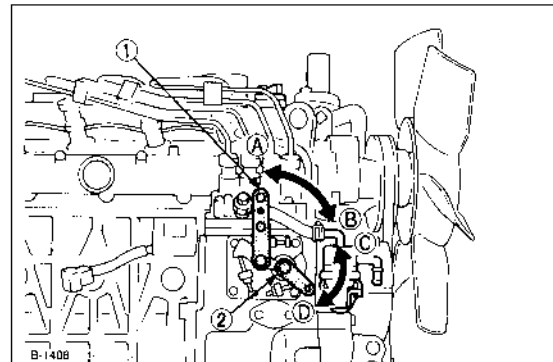
1. Set the fuel lever to "ON".



(1) Fuel lever

(A) "ON"
(B) "OFF"

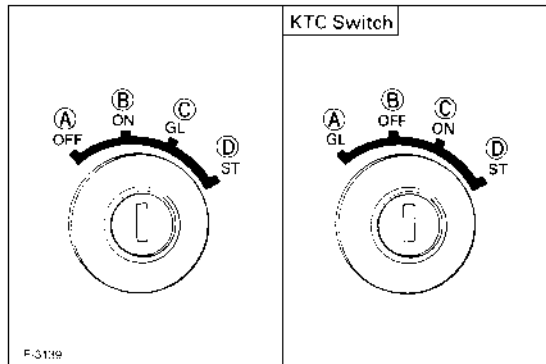
2. Place the engine stop lever in the "START" position.
3. Place the speed control lever at more than half "OPERATION".



(1) Speed control lever
(2) Engine stop lever

(A) "IDLING"
(B) "OPERATION"
(C) "START"
(D) "STOP"

4. Insert the key into the key switch and turn it "ON".



(A) "SWITCHED OFF"
(B) "OPERATION"
(C) "PREHEATING"
(D) "STARTING"

(A) "PREHEATING"
(B) "SWITCHED OFF"
(C) "OPERATION"
(D) "STARTING"

5. Turn the starter switch to the "PREHEATING" position to allow the glow lamp to redden.
6. Turn the key to the "STARTING" position and the engine should start. Release the key immediately when the engine starts.
7. Check to see that the oil pressure lamp and charge lamp are off. If the lamps are still on, immediately stop the engine, and determine the cause.
(See "CHECKS DURING OPERATION" in OPERATING THE ENGINE Section)

NOTE :

- If the oil pressure lamp should be still on, immediately stop the engine and check;
 - if there is enough engine oil.
 - if the engine oil has dirt in it.
 - if the wiring is faulty.

8. Warm up the engine at medium speed without load.

IMPORTANT :

- If the glow lamp should redden too quickly or too slowly, immediately ask your KUBOTA dealer to check and repair it.
- If the engine does not catch or start at 10 seconds after the starter switch is set at "STARTING", wait for another 30 seconds and then begin the engine starting sequence again. Do not allow the starter motor to run continuously for more than 20 seconds.

COLD WEATHER STARTING

If the ambient temperature is below -5°C (23°F)* and the engine is very cold, start it in the following manner: Take steps (1) through (4) left.

5. Turn the key to the "PREHEATING (GLOW)" position and keep it there for a certain period mentioned below.

IMPORTANT :

- Shown below are the standard preheating times for various temperatures. This operation, however, is not required, when the engine is warmed up.

Ambient temperature	Preheating time	
	Ordinary heat type	With glow lamp timer
Above 10°C (50°F)	NO NEED	See NOTE:
10°C (50°F) to -5°C (23°F)	Approx. 5 seconds	
*Below -5°C (23°F)	Approx. 10 seconds	
Limit of continuous use	20 seconds	

NOTE :

- In case of installing standard glow lamp, glow lamp goes off after about 6 seconds, when the starter switch key is turned to preheating position. However if necessary, keep the starter switch key at preheating position for longer time, according to the left recommendation.

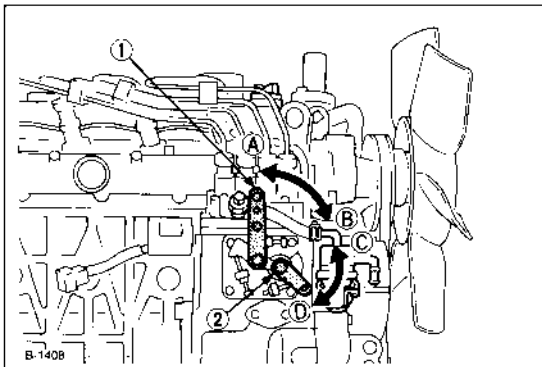
6. Turn the key to the "ST (STARTING)" position and the engine should start.
(If the engine fails to start after 10 seconds, turn off the key for 5 to 30 seconds. Then repeat steps (5) and (6).)

IMPORTANT :

- Do not allow the starter motor to run continuously for more than 20 seconds.
- Be sure to warm up the engine, not only in winter, but also in warmer seasons. An insufficiently warmed-up engine can shorten its service life.
- When there is a fear of temperature dropping below -15°C (5°F), detach the battery from the machine, and keep it indoors in a safe area to be reinstalled just before the next operation.

STOPPING THE ENGINE

1. Return the speed control lever to low idle, and run the engine under idling conditions.
2. Set the engine stop lever to the "STOP" position.
3. With the starter switch placed at the "OFF" position, remove the key. (Be sure to return the engine stop lever to the "START" position to be ready for the next start.)



(1) Speed control lever
(2) Engine stop lever

(A) "IDLING"
(B) "OPERATION"
(C) "START"
(D) "STOP"

IMPORTANT :

- If equipped with a turbo-charger, allow the engine to idle for 5 minutes before shutting it off after a full load operation. Failure to do so may lead to turbo-charger trouble.

CHECKS DURING OPERATION

While running, make the following checks to see that all parts are working correctly.

■ Radiator cooling water (Coolant)



WARNING

To avoid personal injury:

- Do not remove radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop position, to relieve any pressure, before removing cap completely.

If the water temperature warning lamp lights up or overflow of steam or water from the overflow pipe does not stop, stop loading and let the engine "COOL DOWN" by idling for at least 5 min. Allow the engine to cool down gradually, stop the engine and proceed to the next inspection and maintenance work according to "RADIATOR" section.

Check item

1. Check to see if there is any coolant leak;
2. Check to see if there is any obstacle around the cooling air inlet or outlet;
3. Check to see if there is any dirt or dust between radiator fins and tube;
4. Check to see if the fan belt is too loose;
5. Check to see if radiator water pipe is clogged; and
6. Check to see if anti-freeze is mixed to a 50/50% mix of water and anti-freeze.

■ Oil pressure lamp

The lamp lights up to warn the operator that the engine oil pressure has dropped below the prescribed level. If this should happen during operation or should not go off even after the engine is accelerated more than 1000rpm, immediately stop the engine and check the following:

1. Engine oil level (See "ENGINE OIL" in MAINTENANCE Section).

■ Fuel

**CAUTION**

To avoid personal injury:

- Fluid escaping from pinholes may be invisible. Do not use hands to search for suspected leaks; Use a piece of cardboard or wood, instead. If injured by escaping fluid, see a medical doctor at once. This fluid can produce gangrene or a severe allergic reaction.
- Check any leaks from fuel pipes or fuel injection pipes. Use eye protection when checking for leaks.

Be careful not to empty the fuel tank. Otherwise air may enter the fuel system, requiring fuel system bleeding. (See "FUEL" in MAINTENANCE Section.)

■ Color of exhaust

While the engine is run within the rated output range:

- The color of exhaust remains colorless.
- If the output slightly exceeds the rated level, exhaust may become a little colored with the output level kept constant.
- If the engine is run continuously with dark exhaust emission, it may lead to trouble with the engine.

■ Immediately stop the engine if;

- The engine suddenly slows down or accelerates.
- Unusual noises suddenly appear.
- Exhaust fumes suddenly become very dark.
- The oil pressure lamp or the water temperature alarm lamp lights up.

REVERSED ENGINE REVOLUTION AND REMEDIES**CAUTION**

To avoid personal injury:

- Reversed engine operation can make the machine reverse and run it backwards. It may lead to serious trouble.
- Reversed engine operation may make exhaust gas gush out into the intake side and ignite the air cleaner; It could catch fire.

Reversed engine revolution must be stopped immediately since engine oil circulation is cut quickly, leading to serious trouble.

■ How to tell when the engine starts running backwards

1. Lubricating oil pressure drops sharply. Oil pressure warning light, if used, will light.
2. Since the intake and exhaust sides are reversed, the sound of the engine changes, and exhaust gas will come out of the air cleaner.
3. A louder knocking sound will be heard when the engine starts running backwards.

■ Remedies

1. Immediately set the engine stop lever to the "STOP" position to stop the engine.
2. After stopping the engine, check the air cleaner, intake rubber tube and other parts and replace parts as needed.

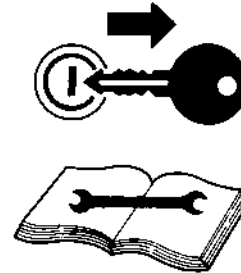
MAINTENANCE



CAUTION

To avoid personal injury:

- Be sure to conduct daily checks, periodic maintenance, refueling or cleaning on a level surface with the engine shut off and remove the key.
- Before allowing other people to use your engine, explain how to operate, and have them read this manual before operation.
- When cleaning any parts, do not use gasoline but use regular cleanser.
- Always use proper tools, that are in good condition. Make sure you understand how to use them, before performing any service work.
- When installing, be sure to tighten all bolts lest they should be loose. Tighten the bolts by the specified torque.
- Do not put any tools on the battery, or battery terminals may short out. Severe burns or fire could result. Detach the battery from the engine before maintenance.
- Do not touch muffler or exhaust pipes while they are hot; Severe burns could result.



B-1509



B-1497

SERVICE INTERVALS

Observe the following for service and maintenance.

Interval	Item	Ref. Page		
Every 50 hours	Check of fuel pipes and clamp bands	13		@
See NOTE:	Change of engine oil	15	⊙	
Every 100 hours	Cleaning of air cleaner element	20	*1	@
	Cleaning of fuel filter	13		
	Check of fan belt tightness	23		
Every 200 hours	Check of radiator hoses and clamp bands	18		
	Replacement of oil filter cartridge	16	⊙	
	Check of intake air line	-		@
Every 400 hours	Replacement of fuel filter cartridge	14		@
Every 500 hours	Removal of sediment in fuel tank	-		
	Cleaning of water jacket (radiator interior)	17 to 18		
	Replacement of fan belt	23		
Every year	Replacement of air cleaner element	20	*2	@
	Check of damage in electric wiring and loose connections	-		
Every 800 hours	Check of valve clearance	25		
Every 1500 hours	Check of fuel injection nozzle injection pressure	-	*3	@
Every 3000 hours	Check of turbo charger	-	*3	@
	Check of injection pump	-	*3	@
	Check of fuel injection timer	-	*3	@
Every two years	Change of radiator coolant (L.L.C.)	18		
	Replacement of radiator hoses and clamp bands	18		
	Replacement of fuel pipes and clamp bands	13	*3	@
	Replacement of intake air line	-	*4	@

IMPORTANT :

- The jobs indicated by ⊙ must be done after the first 50 hours of operation.
- *1 Air cleaner should be cleaned more often in dusty conditions than in normal conditions.
- *2 After 6 times of cleaning.
- *3 Consult your local KUBOTA Dealer for this service.
- *4 Replace only if necessary.
- The items listed above (@ marked) are registered as emission related critical parts by KUBOTA in the U.S. EPA nonroad emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction.
Please see the Warranty Statement in detail.

NOTE :

- Changing interval of engine oil depends on the conditions below.

Models	Oil pan depth	
	Above 125 mm (4.9 in.)	*below 101 mm (4.0 in.)
All models	200 Hrs	150 Hrs
Initial	50 Hrs	

* 101mm oil pan depth is optional.

** Standard replacement interval

- API service classification: above CD grade
- Ambient temperature: below 35°C (95°F)

NOTE :**Lubricating oil**

With the emission control now in effect, the CF-4 and CG-4 lubricating oils have been developed for use of a low-sulfur fuel on on-road vehicle engines. When an off-road vehicle engine runs on a high-sulfur fuel, it is advisable to employ the CF, CD or CE lubricating oil with a high total base number. If the CF-4 or CG-4 lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals.

- **Lubricating oil recommended when a low-sulfur or high-sulfur fuel is employed.**

○ : Recommendable × : Not recommendable

lubricating oil class	Fuel		Remarks
	Low sulfur	High sulfur	
CF	○	○	TBN ≥ 10
CF-4	○	×	
CG-4	○	×	

PERIODIC SERVICE

ENGLISH

FUEL

Fuel is flammable and can be dangerous. You should handle fuel with care.



CAUTION

To avoid personal injury:

- Do not mix gasoline or alcohol with diesel fuel. This mixture can cause an explosion.
- Be careful not to spill fuel during refueling. If fuel should spill, wipe it off at once, or it may cause a fire.
- Do not fail to stop the engine before refueling. Keep the engine away from the fire.
- Be sure to stop the engine while refueling or bleeding and when cleaning or changing fuel filter or fuel pipes. Do not smoke when working around the battery or when refueling.
- Check the above fuel systems at a well ventilated and wide place.
- When fuel and lubricant are spilled, refuel after letting the engine cool off.
- Always keep spilled fuel and lubricant away from engine.

Fuel level check and refueling

1. Check to see that the fuel level is above the lower limit of the fuel level gauge.
2. If the fuel is too low, add fuel to the upper limit. Do not overfill.

No.2-D is a distillate fuel oil of lower volatility for engines in industrial and heavy mobile service.

(SAE J313 JUN87)

Grade of Diesel Fuel Oil According to ASTM D975.

Flash Point, °C (°F)	Water and Sediment, volume %	Carbon Residue on, 10 percent Residuum, %	Ash, weight %
Min	Max	Max	Max
52 (125)	0.05	0.35	0.01

Distillation Tempera- tures, °C(°F) 90% Point		Viscosity Kinematic cSt or mm ² /s at 40°C		Viscosity Saybolt, SUS at 100°F		Sul- fur weight %	Cop- per Strip Corro- sion	Cetane Num- ber
Min	Max	Min	Max	Min	Max	Max	Max	Min
282 (540)	338 (640)	1.9	4.1	32.6	40.1	0.50	No. 3	40

The cetane number is required not to be less than 45.

IMPORTANT :

- Be sure to use a strainer when filling the fuel tank, or dirt or sand in the fuel may cause trouble in the fuel injection pump.
- For fuel, always use diesel fuel. You are required not to use alternative fuel, because its quality is unknown or it may be inferior in quality. Kerosene, which is very low in cetane rating, adversely affects the engine. Diesel fuel differs in grades depending on the temperature.
- Be careful not to let the fuel tank become empty, or air can enter the fuel system, necessitating bleeding before next engine start.

■ Air bleeding the fuel system



CAUTION

To avoid personal injury:

- Do not bleed a hot engine as this could cause fuel to spill onto a hot exhaust manifold creating a danger of fire.

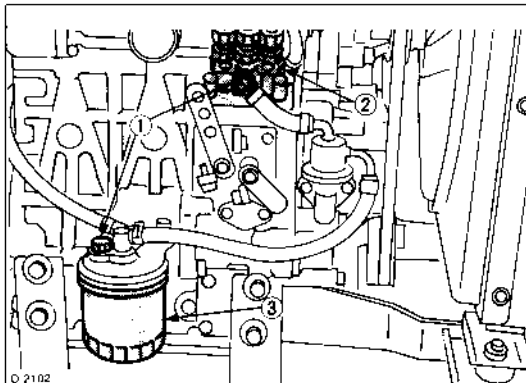
Air bleeding of the fuel system is required if:

- after the fuel filter and pipes have been detached and refitted;
- after the fuel tank has become empty; or
- before the engine is to be used after a long storage.

[PROCEDURE Ⓐ] (gravity feed fuel tanks only)

1. Fill the fuel tank to the fullest extent. Open the fuel filter lever.
2. Loosen air vent plug of the fuel filter a few turns.
3. Screw back the plug when bubbles do not come up any more.
4. Open the air vent plug on top of the fuel injection pump.
5. Retighten the plug when bubbles do not come up any more.

[GRAVITY FEED SYSTEM]



- (1) Air vent plug
(2) Injection pump
(3) Fuel filter

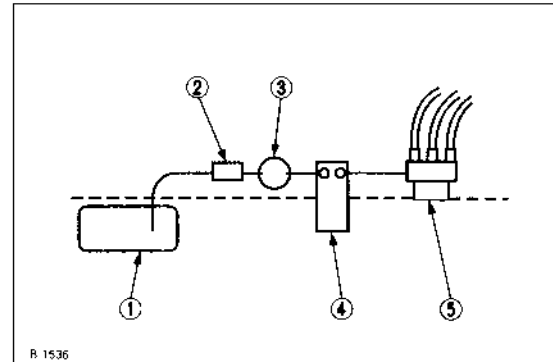
[PROCEDURE Ⓑ] (fuel tanks lower than injection pump)

1. For fuel tanks that are lower than the injection pump. The fuel system must be pressurized by the fuel system electric fuel pump.
2. If an electric fuel pump is not used, you must manually actuate the pump by lever to bleed.
3. The primary fuel filter (3) must be on the pressure side of the pump if the fuel tank is lower than the injection pump.
4. To bleed follow (2) through (5) above.
(PROCEDURE Ⓐ)

IMPORTANT :

- Tighten air vent plug of the fuel injection pump except when bleeding, or it may stop the engine suddenly.

[TANK BELOW INJECTION PUMP SYSTEM]



- (1) Fuel tank below injection pump
(2) Pre-filter
(3) Electric or Mechanical pump
(4) Main Filter
(5) Injection pump

■ Check of fuel pipes and clamp bands



CAUTION

To avoid personal injury:

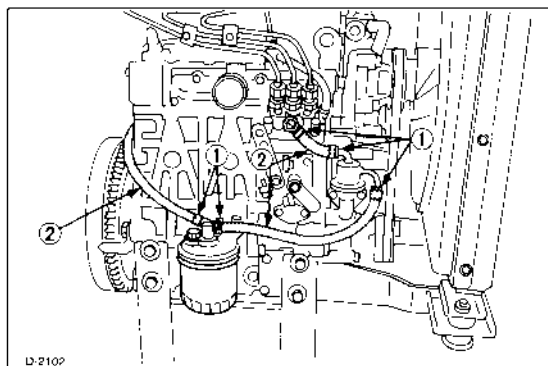
- Check or replace the fuel pipes after stopping the engine. Broken fuel pipes can cause fires.

Check the fuel pipes every 50 hours of operation. When if;

1. If the clamp band is loose, apply oil to the screw of the band, and tighten the band securely.
2. If the fuel pipes, made of rubber, become worn out, replace them and the clamp bands every two years.
3. If the fuel pipes and clamp bands are found worn or damaged before two years'time, replace or repair them at once.
4. After replacement of the pipes and bands, air-bleed the fuel system.

IMPORTANT :

- When the fuel pipes are not installed, plug them at both ends with clean cloth or paper to prevent dirt from entering. Dirt in the pipes can cause fuel injection pump malfunction.

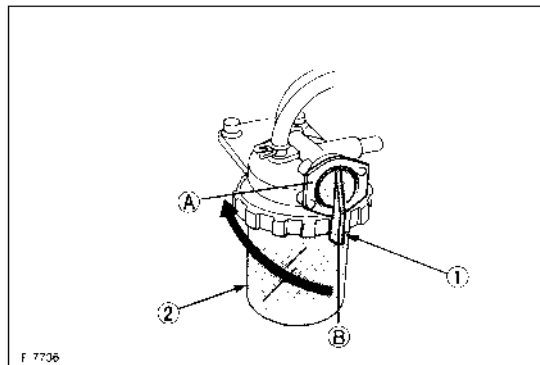


(1) Clamp band
(2) Fuel pipe

■ Cleaning of fuel filter

Every 100 hours of operation, clean the fuel filter in a clean place to prevent dust intrusion.

1. Close the fuel filter lever.



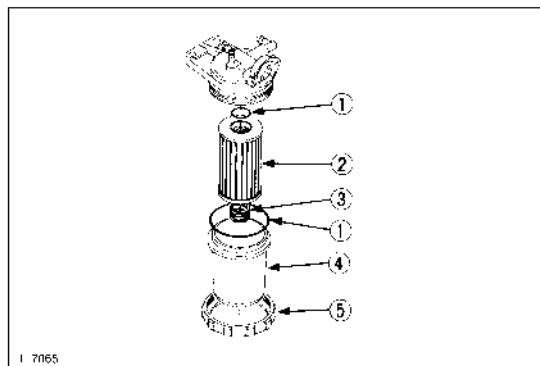
(1) Fuel filter lever
(2) Fuel filter pot

(A) "OFF"
(B) "ON"

2. Remove the top cap, and rinse the inside with diesel fuel.
3. Take out the element, and rinse it with diesel fuel.
4. After cleaning, reinstall the fuel filter, keeping out of dust and dirt.
5. Air-bleed the injection pump.

IMPORTANT :

- Entrance of dust and dirt can cause a malfunction of the fuel injection pump and the injection nozzle. Wash the fuel filter cup periodically.



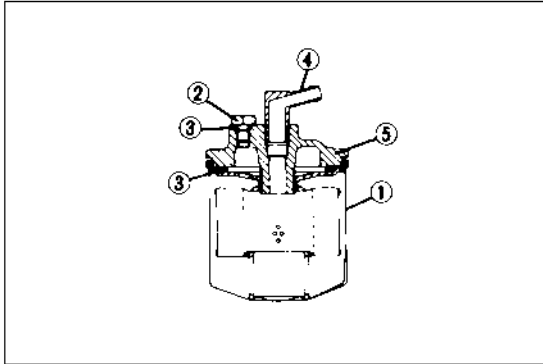
(1) O ring
(2) Filter element
(3) Spring
(4) Filter bowl
(5) Screw ring

■ Replacement of fuel filter cartridge

1. Replace the fuel filter cartridge with a new one every 400 operating hours.
2. Apply fuel oil thinly over the gasket and tighten the cartridge into position by hand-tightening only.
3. Finally, vent the air.

IMPORTANT :

- Replace the fuel filter cartridge periodically to prevent wear of the fuel injection pump plunger or the injection nozzle, due to dirt in the fuel.



- (1) Fuel filter cartridge
(2) Air vent plug
(3) O ring
(4) Pipe joint
(5) Cover

ENGINE OIL



CAUTION

To avoid personal injury:

- Be sure to stop the engine before checking and changing the engine oil and the oil filter cartridge.
- Do not touch muffler or exhaust pipes while they are hot; Severe burns could result. Always stop the engine and allow it to cool before conducting inspections, maintenance, or for a cleaning procedure.

- Contact with engine oil can damage your skin.

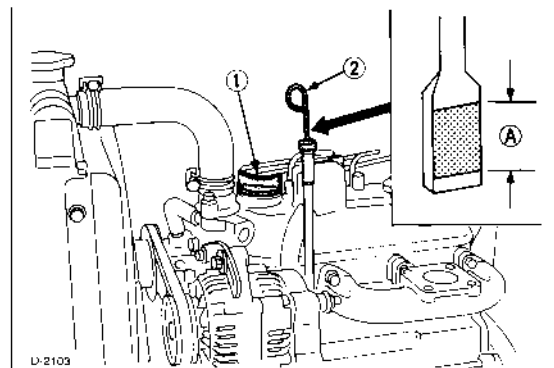
Put on gloves when using engine oil. If you come in contact with engine oil, wash it off immediately.

NOTE :

- Be sure to inspect the engine, locating it on a level place. If placed on gradients accurately, oil quantity may not be measured.

■ Checking oil level and adding engine oil

1. Check the engine oil level before starting or more than 5 minutes after stopping the engine.
2. Remove the oil level gauge, wipe it clean and reinstall it.
3. Take the oil level gauge out again, and check the oil level.



- (1) Oil filter plug
(2) Oil level gauge

[Lower end of oil level gauge]
(A) Engine oil level within this range is proper.

4. If the oil level is too low, remove the oil filler plug, and add new oil to the prescribed level.
5. After adding oil, wait more than 5 minutes and check the oil level again. It takes some time for the oil to drain down to the oil pan.

Engine oil quantity

Models	Quantity
D905-E, D1005-E, D1105-E, D1105-TE	5.1 L (1.35 U.S.gals.)
V1205-E, V1305-E, V1505-E	6.0 L (1.59 U.S.gals.)
V1205-TE, V1505-TE	6.7 L (1.77 U.S.gals.)

Oil quantities shown are for standard oil pans.

IMPORTANT :

- Engine oil should be MIL-L-2104C or have properties of API classification CD grades or higher. Change the type of engine oil according to the ambient temperature.

above 25°C (77°F)	SAE30 or SAE10W-30 SAE15W-40
-10°C to 25°C (14 to 77°F)	SAE10W-30 or SAE15W-40
below -10°C (14°F)	SAE10W-30

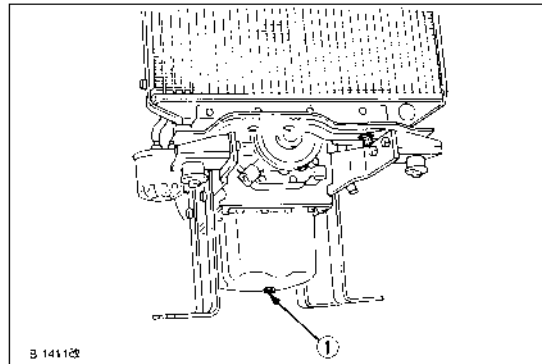
- When using oil of different brands from the previous one, be sure to drain all the previous oil before adding the new engine oil.

Change of engine oil**CAUTION**

To avoid personal injury:

- Be sure to stop the engine before draining engine oil.
- When draining engine oil, place some container underneath the engine and dispose it according to local regulations.
- Do not drain oil after running the engine. Allow engine to cool down sufficiently.

1. Change oil after the initial 50 hours of operation and every 200 hours thereafter.
2. Remove the drain plug at the bottom of the engine, and drain all the old oil. Drain oil will drain easier when the oil is warm.



(1) Oil drain plug

3. Add new engine oil up to the upper limit of the oil level gauge.

■ Replacement of oil filter cartridge

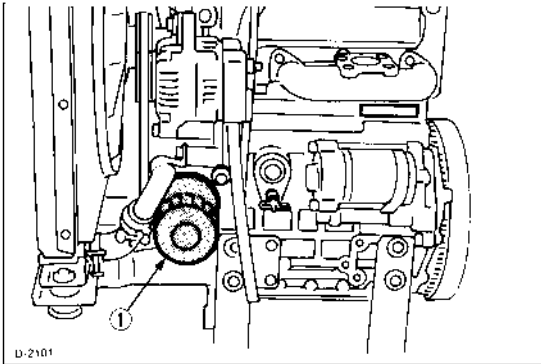


CAUTION

To avoid personal injury:

- Be sure to stop the engine before changing the oil filter cartridge.
- Allow engine to cool down sufficiently, oil can be hot and cause burns.

1. Replace the oil filter cartridge after the initial 50 hours of operation and every 200 hours thereafter.
2. Remove the old oil filter cartridge with a filter wrench.
3. Apply a film of oil to the gasket for the new cartridge.
4. Screw in the cartridge by hand. When the gasket contacts the seal surface, tighten the cartridge enough by hand. Because, if you tighten the cartridge with a wrench, it will be tightened too much.



(1) Oil filter cartridge
Remove with a filter wrench
(Tighten with your hand)

5. After the new cartridge has been replaced, the engine oil level normally decreases a little. Thus, run the engine for a while and check for oil leaks through the seal before checking the engine oil level. Add oil if necessary.

NOTE :

- Wipe off any oil sticking to the machine completely.

RADIATOR

Coolant will last for one day's work if filled all the way up before operation. Make it a rule to check the coolant level before every operation.



WARNING

To avoid personal injury:

- Do not stop the engine suddenly, stop it after about 5 minutes of unloaded idling.
- Work only after letting the engine and radiator cool off completely (more than 30 minutes after it has been stopped).
- Do not remove the radiator cap while coolant is hot. When cool to the touch, rotate cap to the first stop to allow excess pressure to escape. Then remove cap completely. If overheats should occur, steam may gush out from the radiator or reserve tank; Severe burns could result.

Change of radiator coolant (L.L.C.)

1. To drain coolant, always open both drain cocks and simultaneously open the radiator cap as well. With the radiator cap kept closed, a complete drain of water is impossible.
2. Remove the overflow pipe of the radiator pressure cap to drain the reserve tank.
3. Prescribed coolant volume (U.S.gallons)

Models	Quantity
D905-E, D1005-E, D1105-E, D1105-TE	3.1 L (0.82 U.S.gals.)
V1205-E, V1305-E, V1505-E	4.0 L (1.06 U.S.gals.)
V1205-TE, V1505-TE	5.0 L (1.32 U.S.gals.)

NOTE :

- Coolant quantities shown are for standard radiators.
4. An improperly tightened radiator cap or a gap between the cap and the seat quickens loss of coolant.
 5. Coolant (Anti-freeze)

Season	Coolant
All seasons	Pure water and anti-freeze (See "Anti-freeze" in "RADIATOR" section.)

Remedies for quick decrease of coolant

1. Check any dust and dirt between the radiator fins and tube. If any, remove them from the fins and the tube.
2. Check the tightness of the fan belt. If loose, tighten it securely.
3. Check the internal blockage in the radiator hose. If scale forms in the hose, clean with the scale inhibitor or its equivalent.

Replacement of radiator hoses and clamp bands**CAUTION**

To avoid personal injury:

- Be sure to check radiator hoses and hose clamps periodically. If radiator hose is damaged or coolant leaks, overheats or severe burns could occur.

Check to see if radiator hoses are properly fixed every 200 hours of operation or 6 months, whichever comes first.

1. If hose clamps are loose or water leaks, tighten hose clamp securely.
2. Replace hoses and tighten hose clamps securely, if radiator hoses are swollen, hardened or cracked.

Replace hoses and hose clamp every 2 years, or earlier, if checked and found that hoses are swollen, hardened or cracked.

Precaution at overheating

Take the following actions in the event the coolant temperature is nearly or more than the boiling point, what is called "Overheating". Take these actions if the engine's alarm buzzer sounds or the alarm lamp lights up.

1. Stop the engine operation in a safe place and keep the engine unloaded idling.
2. Do not stop the engine suddenly. Stop it after about 5 minutes of unloaded idling.
3. If the engine stalls within about 5 minutes of running under no load, immediately leave and keep yourself away from the machine. Do not open the hood and any other part.
4. Keep yourself and others well away from the engine for further 10 minutes or while the steam blown out.
5. Checking that there gets no danger such as burn, get rid of the causes of overheating according to the manual, see "TROUBLESHOOTING" section. And then, start again the engine.

Cleaning radiator core(outside)

If dust is between the fin and tube, wash it away with running water.

IMPORTANT :

- Do not clean radiator with firm tools such as spatulas or screwdrivers. They may damage specified fin or tube. It can cause coolant leaks or decrease coolings performance.

■Anti-freeze

**CAUTION**

To avoid personal injury:

- When using anti-freeze, put on some protection such as rubber gloves (Anti-freeze contains poison.).
- If should drink anti-freeze, throw up at once and take medical attention.
- When anti-freeze comes in contact with the skin or clothing, wash it off immediately.
- Do not mix different types of anti-freeze. The mixture can produce chemical reaction causing harmful substances.
- Anti-freeze is extremely flammable and explosive under certain conditions. Keep fire and children away from anti-freeze.
- When draining fluids from the engine, place some container underneath the engine body.
- Do not pour waste onto the grounds, down a drain, or into any water source.
- Also, observe the relevant environmental protection regulations when disposing of anti-freeze.

Always use a 50/50 mix of long-life coolant and clean soft water in KUBOTA engines.

Contact KUBOTA concerning coolant for extreme conditions.

1. Long-life coolant (hereafter LLC) comes in several types. Use ethylene glycol (EG) type for this engine.
2. Before employing LLC-mixed cooling water, flush the radiator with fresh water. Repeat this procedure 2 or 3 times to clean up the radiator and engine block from inside.
3. Mixing the LLC
Premix 50% LLC with 50% clean soft water. When mixing, stir it up well, and then fill into the radiator.
4. The procedure for the mixing of water and anti-freeze differs according to the make of the anti-freeze. Refer to SAE J1034 standard, more specifically also to SAE J814c.

Vol % Anti-freeze	Freezing Point		Boiling Point *	
	°C	°F	°C	°F
50	-37	-34	108	226

*At 1.013×10^5 Pa (760 mmHg) pressure (atmospheric). A higher boiling point is obtained by using a radiator pressure cap which permits the development of pressure within the cooling system.

5. Adding the LLC
 - (1) Add only water if the coolant level reduces in the cooling system by evaporation.
 - (2) If there is a coolant leak, add the LLC of the same manufacturer and type in the same coolant percentage.

*Never add any long-life coolant of different manufacturer. (Different brands may have different additive components, and the engine may fail to perform as specified.)
6. When the LLC is mixed, do not employ any radiator cleaning agent. The LLC contains anti-corrosive agent. If mixed with the cleaning agent, sludge may build up, adversely affecting the engine parts.
7. Kubota's genuine long-life coolant has a service life of 2 years. Be sure to change the coolant every 2 years.

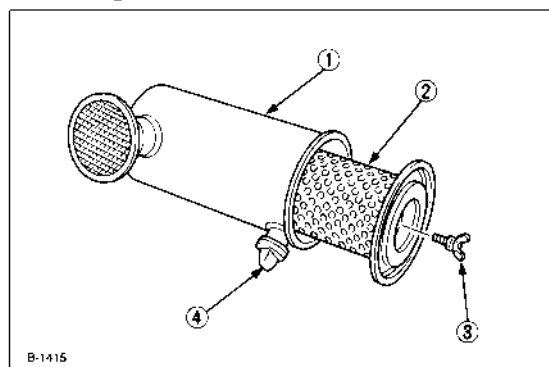
NOTE :

- The above data represent industry standards that necessitate a minimum glycol content in the concentrated anti-freeze.

AIR CLEANER

Since the air cleaner employed on this engine is a dry type, never apply oil to it.

1. Open the evacuator valve once a week under ordinary conditions - or daily when used in a dusty place. This will get rid of large particles of dust and dirt.
2. Wipe the inside air cleaner clean with cloth if it is dirty or wet.
3. Avoid touching the element except when cleaning.
4. When dry dust adheres to the element, blow compressed air from the inside turning the element. Pressure of compressed air must be under 205kPa (2.1kgf/cm², 30psi).
5. When carbon or oil adheres to the element, soak the element in detergent for 15 minutes, then wash it several times in water, rinse with clean water and dry it naturally.
6. After the element is fully dried, inspect the inside of the element with a light, and check if it is damaged or not. (referring to the instructions on the label attached to the element.)
7. Replace the element every year or every 6 cleanings.



- (1) Air cleaner body
(2) Element
(3) Wing bolt
(4) Evacuator valve

IMPORTANT :

- Make sure the wing bolt for the element is tight enough. If it is loose, dust and dirt may be sucked in, wearing down the cylinder liner and piston ring earlier, and thereby resulting in poor power output.
- Do not overservice the air cleaner element. Overservicing may cause dirt to enter the engine causing premature wear. Use the dust indicator as a guide on when to service.

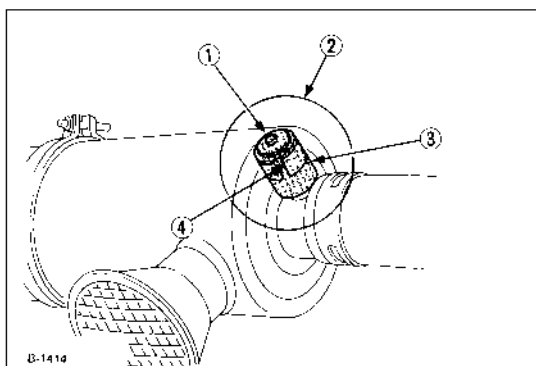
■ Evacuator valve

Open the evacuator valve once a week under ordinary conditions - or daily when used in a dusty place - to get rid of large particles of dust and dirt.

■ Dust indicator (optional)

If the red signal on the dust indicator attached to the air cleaner is visible, the air cleaner has reached the service level.

Clean the element immediately, and reset the signal with the "RESET" button.



- (1) "RESET" button
(2) Dust indicator
(3) Service level
(4) Signal

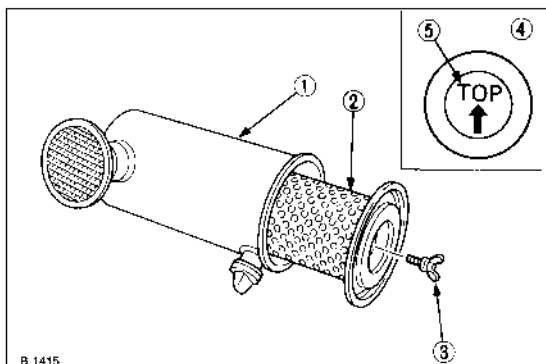
■ For the air cleaner with a dust cup (optional)

Remove and clean out the dust cup before it becomes half full with dust; usually once a week, or even every day if the working surroundings are dusty.

Install the air cleaner dust cup with "TOP" indicated on the rear of the cup in the up position. (However, it may be installed in either direction when the cover is placed at the lower part.)

IMPORTANT :

- If the dust cup is mounted incorrectly, dust or dirt does not collect in the cup, and direct attachments of the dust to the element will cause its lifetime to shorten to a great extent.



- (1) Air cleaner body
(2) Element
(3) Wing bolt
(4) Dust cup
(5) "TOP" mark

ELECTRIC WIRING**CAUTION**

To avoid personal injury:

Shorting of electric cable or wiring may cause a fire.

- Check to see if electric cables and wiring are swollen, hardened or cracked.
- Keep dust and water away from all power connections.

Loose wiring terminal parts, make bad connections. Be sure to repair them before starting the engine.

Damaged wiring reduces the capacity of electrical parts. Change or repair damaged wiring immediately.

FAN BELT**■ Adjusting fan belt tension****CAUTION**

To avoid personal injury:

- Be sure to stop the engine and remove the key before checking the belt tension.
- Be sure to reinstall the detached safety shield after maintenance or checking.

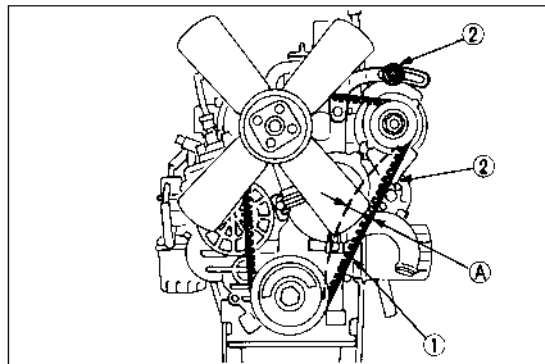
Proper fan belt tension

A deflection of between 7 to 9 mm (0.28 to 0.35 in.) when the belt is pressed in the middle of the span.

1. Stop the engine and remove the key.
2. Apply moderate thumb pressure to belt between pulleys.
3. If tension is incorrect, loosen the alternator mounting bolts and, using a lever placed between the alternator and the engine block, pull the alternator out until the deflection of the belt falls within acceptable limits.
4. Replace fan belt if it is damaged.

IMPORTANT :

- If belt is loosen or damaged and the fan is damaged, it could result in overheats or insufficient charging. Correct or replace belt.



- (1) Fan belt
(2) Bolt and nut

(A) 7 to 9 mm (0.28 to 0.35 in.)
(under load of 10kgf (22.1 lbs))

CARRIAGE AND STORAGE

CARRIAGE



CAUTION

To avoid personal injury:

- Fix the engine securely not to fall during operation.
- Do not stand near or under the engine while carrying it.
- The engine is heavy. In handling it, be very alert not to get your hands and body caught in.

1. Use carrier such as crane when carrying the engine, or hurt your waist and yourself. Support the engine securely with rope not to fall while carrying it.
2. When lifting the engine, put the hook securely to metal fittings attached to the engine. Use strong hook and fittings enough to hang the engine.

STORAGE



CAUTION

To avoid personal injury:

- Do not clean the machine with engine running.
- To avoid the danger of exhaust fume poisoning, do not operate the engine in a closed building without proper ventilation.
- When storing the engine just after running, let the engine cool off.

Before storing the engine for more than a few months, remove any dirt on the machine, and:

1. Drain the coolant in the radiator. Open the cock at the bottom of the radiator, and remove the pressure cap to drain water completely. Leave the cock open. Hang a note written "No water" on the pressure cap. Since water may freeze when the temperature drops below 0°C (32°F), it is very important that no water is left in the machine.
2. Remove dirty engine oil, fill with new oil and run the engine for about 5 minutes to let the oil penetrate to all the parts.
3. Check all the bolts and nuts, and tighten if necessary.
4. Remove the battery from the engine, adjust the electrolyte level, and recharge it. Store the battery in a dry and dark place.
5. When the engine is not used for a long period of time, run it for about 5 minutes under no load every 2-3 months to keep it free from rust. If the engine is stored without any running, moisture in the air may condense into dew over the sliding parts of the engine, resulting in rust there.
6. If you forget to run the engine for longer than 5-6 months, apply enough engine oil to the valve guide and valve stem seal and make sure the valve works smoothly before starting the engine.
7. Store the engine in a flat place and remove the key from engine.
8. Do not store the engine in a place where has flammable materials such as dry grass or straw.
9. When covering the engine for storage, let engine and muffler cool off completely.
10. Operate the engine after checking and repairing damaged wirings or pipes, and clearing flammable materials carried by mouse.

TROUBLESHOOTING

If the engine does not function properly, use the following chart to identify and correct the cause.

■ When it is difficult to start the engine

Cause	Countermeasures
Fuel is thick and doesn't flow	* Check the fuel tank and fuel filter. Remove water, dirt and other impurities. * As all fuel will be filtered by the filter, if there should be water or other foreign matters on the filter, clean the filter with kerosene.
Air or water mixed in fuel system	* If air is in the fuel filter or injection lines, the fuel pump will not work properly. To attain proper fuel injection pressure, check carefully for loosened fuel line coupling, loose cap nut, etc. * Loosen joint bolt stop fuel filter and a vent screws of fuel injection pump to eliminate all the air in the fuel system.
Thick carbon deposits on orifice of injection nozzle.	* This is caused when water or dirt is mixed in the fuel. Clean the nozzle injection piece, being careful not to damage the orifice. * Check to see if nozzle is working properly or not. If not, install a new nozzle.
Engine oil becomes thick in cold weather and engine cranks slow.	* Change grade of oil according to the weather (temperature).

■ When output is insufficient

Cause	Countermeasures
Carbon stuck around orifice of nozzle piece	* Clean orifice and needle valve, being very careful not to damage the nozzle orifice. * Check nozzle to see if good. If not, replace with new parts.
Fuel is insufficient	* Check fuel system.
Overheating of moving parts	* Check lubricating oil system. * Check to see if lubricating oil filter is working properly. * Filter element deposited with impurities would cause poor lubrication. Change element.
Air cleaner is dirty	* Clean the element every 100 hours of operation.
Injection pump wear	* Do not use poor quality fuel as it will cause wear of the pump. Only use No. 2-D diesel fuel.

NOTE :

- If the cause of trouble can not be found, contact your KUBOTA dealer.

■ When engine suddenly stops

Cause	Countermeasures
Lack of fuel	* Check the fuel tank and refill the fuel, if necessary. * Also check the fuel system for air or leaks.
Bad nozzle	* If necessary, replace with a new nozzle.
Moving parts are overheated due to shortage of lubrication oil or improper lubrication	* Check amount of engine oil with oil level gauge. * Check lubricating oil system. * At every 2 times of oil change, oil filter cartridge should be replaced.

■ When color of exhaust is especially bad

Cause	Countermeasures
Fuel is of extremely poor quality	* Select good quality fuel. Use No. 2-D diesel fuel only.
Nozzle is bad.	* If necessary, replace with new nozzle.

■ When engine must be stopped immediately

Cause	Countermeasures
Color of exhaust suddenly turns dark.	* Check the fuel injection system, especially the fuel injection nozzle.
Bearing parts are overheated.	* Check the lubricating system.
Oil lamp lights up during operation.	* Check the lubricating system. * Check the function of the relieve valve in the lubricating system. * Check pressure switch. * Check filter base gasket.

■ When engine overheats

Cause	Countermeasures
Engine oil insufficient	* Check oil level. Replenish oil as required.
Fan belt broken or elongated	* Change belt or adjust belt tension.
Coolant insufficient	* Replenish coolant.
Excessive concentration of antifreeze	* Add water only or change to coolant with the specified mixing ratio.
Radiator net or radiator fin clogged with dust	* Clean net or fin carefully.
Inside of radiator or coolant flow route clogged	* Clean or replace radiator and parts.
Fan or radiator or radiator cap defective	* Replace defective part.
Thermostat defective	* Check thermostat and replace if necessary.
Temperature gauge or sensor defective	* Check temperature with thermometer and replace if necessary.
Overload running	* Reduce load.
Head gasket defective or water leakage	* Replace parts.
Unsuitable fuel used	* Use the specified fuel.

SPECIFICATIONS

ENGLISH

Model		D905-E		D1005-E		D1105-E		D1105-TE	
Type		Vertical, water-cooled, 4-cycle diesel engine							
Number of cylinders		3							
Bore and stroke mm (in.)		72 × 73.6 (2.83 × 2.90)		76 × 73.6 (2.99 × 2.90)		78 × 78.4 (3.07 × 3.09)			
Total displacement cm ³ (cu.in.)		898 (54.80)		1001 (61.08)		1123 (68.53)			
Combustion chamber		Spherical Type (E-TVCS)							
SAE NET Intermittent	kW / min ⁻¹ (rpm)	14.9 / 3000 (20.0 / 3000)	17.5 / 3600 (23.5 / 3600)	16.6 / 3000 (22.6 / 3000)	18.4 / 3600 (26.0 / 3600)	18.7 / 3000 (25.0 / 3000)	23.5 / 3000 (31.5 / 3000)		
H.P. (SAEJ1349)	(HP / min ⁻¹ (rpm))								
SAE NET Continuous	kW / min ⁻¹ (rpm)	12.7 / 3000 (17.0 / 3000)	15.3 / 3600 (20.5 / 3600)	14.2 / 3000 (19.0 / 3000)	16.8 / 3600 (22.5 / 3600)	16.4 / 3000 (22.0 / 3000)	20.4 / 3000 (27.4 / 3000)		
H.P. (SAEJ1349)	(HP / min ⁻¹ (rpm))								
Maximum bare speed	min ⁻¹ (rpm)	3200	3800	3200	3800	3200			
Minimum bare idling speed	min ⁻¹ (rpm)	850~950							
Order of firing		1-2-3							
Direction of rotation		Counter-clockwise (viewed from flywheel side)							
Injection pump		Bosch MD Type Mini Pump							
Injection pressure		13.73 MPa (140 kgf/cm ² , 1991 psi)							
Injection timing (Before T.D.C.)		18°	21°	18°	21°	18°			
Compression ratio		23 : 1		24 : 1					
Fuel		Diesel Fuel No.2-D (ASTM D975)							
Lubricant (API classification)		above CD grade							
Dimensions (length × width × height)	mm (in.)	497.8 × 396 × 608.7 (19.60 × 15.59 × 23.96)					497.8 × 437.7 × 628.8 (19.60 × 17.23 × 24.76)		
Dry weight	kg (lbs.)	93 (205.0)					97 (213.8)		
Starting system		Cell starter (with glow plug)							
Starting motor		12 V, 1.0 kW							
Charging generator		12 V, 360 W							
Recommended battery capacity		12 V, 65 AH, equivalent							

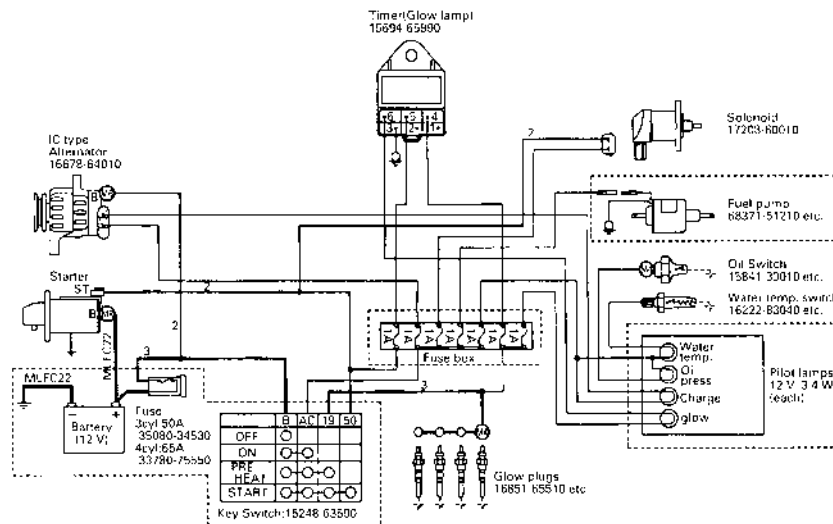
NOTE :

- Specifications are subject to change without notice.

V1205-E		V1205-TE		V1305-E		V1505-E		V1505-TE	
Vertical, water-cooled, 4-cycle diesel engine									
4									
72 × 73.6 (2.83 × 2.90)				76 × 73.6 (2.99 × 2.90)		78 × 78.4 (3.07 × 3.09)			
1198 (73.11)				1335 (81.47)		1498 (91.41)			
Spherical Type (E-TVCS)									
20.1 / 3000 (27.0 / 3000)	23.5 / 3600 (31.5 / 3600)	25.4 / 3000 (34.0 / 3000)	29.8 / 3600 (40.0 / 3600)	22.4 / 3000 (30.0 / 3000)	25.7 / 3600 (34.5 / 3600)	25.0 / 3000 (33.5 / 3000)	31.3 / 3000 (42.0 / 3000)		
17.2 / 3000 (23.0 / 3000)	20.1 / 3600 (27.0 / 3600)	21.3 / 3000 (29.0 / 3000)	25.7 / 3600 (34.5 / 3600)	19.0 / 3000 (25.5 / 3000)	22.4 / 3600 (30.0 / 3600)	21.6 / 3000 (29.0 / 3000)	27.2 / 3000 (36.5 / 3000)		
3200	3800	3200	3800	3200	3800	3200			
800~900									
1-3-4-2									
Counter-clockwise (viewed from flywheel side)									
Bosch MD Type Mini Pump									
13.73 MPa (140 kgf/cm ² , 1991 psi)									
19°	22°	19°	22°	18°	21°	18°			
23 : 1		22.5 : 1		24 : 1			23.5 : 1		
Diesel Fuel No.2-D (ASTM D975)									
above CD grade									
583.8 × 396 × 613.7 (22.98 × 15.59 × 24.16)		591.3 × 439.2 × 613.7 (23.28 × 17.29 × 24.16)		583.8 × 396 × 613.7 (22.98 × 15.59 × 24.16)		591.3 × 396 × 613.7 (23.28 × 15.59 × 24.16)		591.3 × 439.2 × 613.7 (23.18 × 17.29 × 24.16)	
110 (242.5)		114 (251.3)		110 (242.5)			114 (251.3)		
Cell starter (with glow plug)									
12 V, 1.2 kW									
12 V, 360 W									
12 V, 70 AH, equivalent									

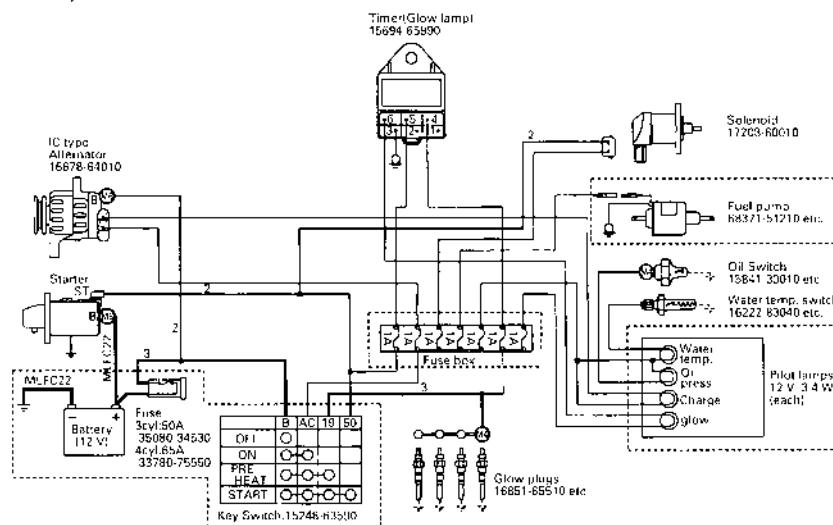
WIRING DIAGRAMS

EU standard
(Energize to run)



- ★ The parts boxed in are reference, NOT equipped for standard engine spec.
- ★ Non marked wire dia. is 0.8~1.25 mm².

KEA/SAE standard
(Energize to run)



- ★ The parts boxed in are reference, NOT equipped for standard engine spec.
- ★ Non marked wire dia. is 0.8~1.25 mm².

