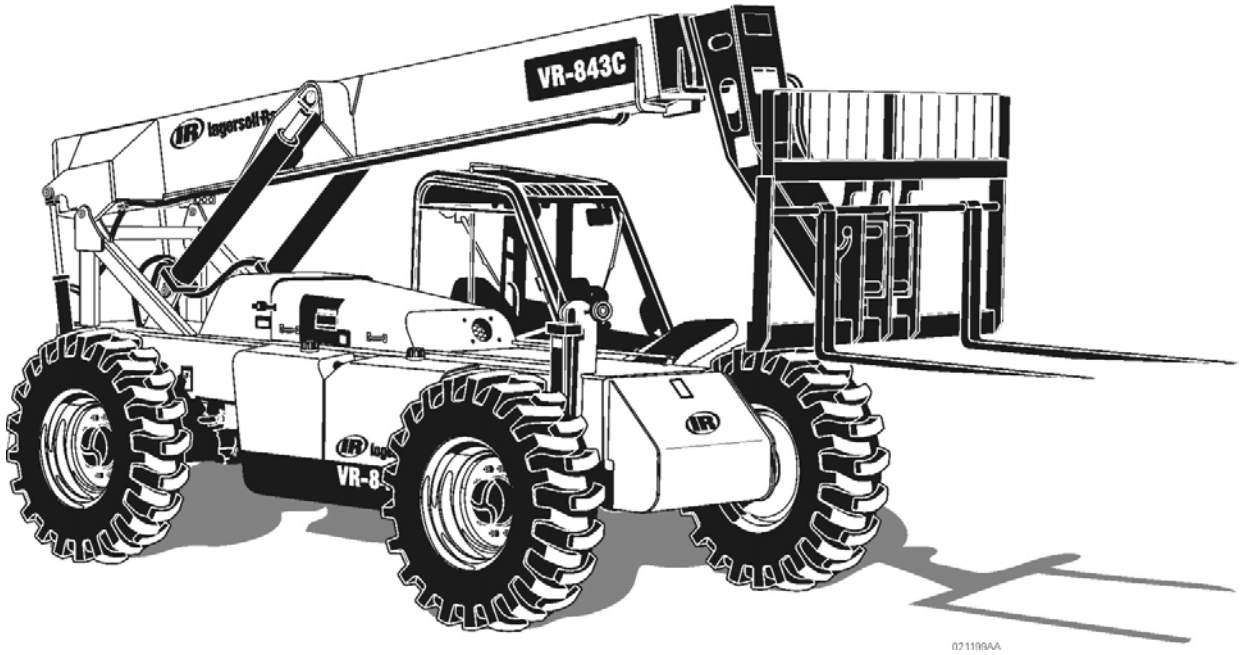
OPERATION AND MAINTENANCE MANUAL for VR-843C Variable Reach Material Handler

Effective with Serial Number 175806



CPN 13858303

February 17, 2006

Read and understand this manual before operating or servicing equipment

CALIFORNIA
Proposition 65 Warning
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

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Genuine Parts

For Genuine Ingersoll Rand Parts, Service and Nearest Distributor
http://www.road-development.irco.com

800-227-0573 (US and Canada)
717-532-9181 (Latin America - Ingersoll Rand)
49-5151-209-0 (Europe)
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Genuine Ingersoll Rand Protective Lubricants

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INTRODUCTION

GENERAL

Congratulations! You have just acquired an Ingersoll Rand Variable Reach Telescopic Material Handler, an application-designed product built with your needs in mind.

The VR-843C is powered by a direct injected 4 cylinder diesel engine. The turbocharged 110 hp (82 kW) at 2500 rpm engine is standard on the VR-843C machine. A three-speed, power-shift transmission with torque converter is directly mounted to the engine flywheel. Hydraulic brakes on all four wheels are used to stop the handler. The service brakes are a hydraulically operated power brake to oil immersed discs in both axles. The parking brake is a spring applied, hydraulically released, multi-disc brake that is mounted inside the rear axle. The parking brake is controlled by a toggle switch on the operator's control panel and will apply when the engine is shut down. The hydraulic pump is a closed circuit system with load sensing to the hydraulic functions.

STEERING

This Telescopic Material Handler has three modes of steering:

Front Wheel Only (2 wheel) Steering is normally used only when traveling on roads.

Crab Steering (all wheels turn in same direction) is used to move away from buildings or to escape from wheel ruts.

Coordinated Steering (rear wheels turn opposite of front wheels) provides the greatest maneuverability and is used most of the time.

OPTIONAL EQUIPMENT

The VR-843C can be ordered or equipped with options that permit auxiliary functions. Examples of these options are various buckets, back rests and fork configurations. The information for the operation of these options must be available, read, and understood by the operator. The control levers for these auxiliary functions are normally found on the left side of the control console or on the joystick handle.

SAFE OPERATION

Safe operation depends on reliable equipment and the use of proper operating procedures. Performing the checks and service described in this manual will help keep your Telescopic Material Handler in good condition. These recommended operation procedures will help you avoid unsafe practices.

Safety notes have been included throughout this manual to help you avoid injury and prevent damage to the equipment. These notes are not intended to cover all eventualities since it is impossible to anticipate and evaluate all possible methods of operation. Therefore, you are the only person who can guarantee safe operation and maintenance.

It is important that any procedure not specifically recommended in this manual be thoroughly evaluated from the standpoint of safety before it is implemented.

⚠ WARNING

Severe Personal Injury

Some illustrations in this manual may show guards or cover panels removed for purposes of clarity.

Always replace guards and cover panels before operating the machine.

NOTE

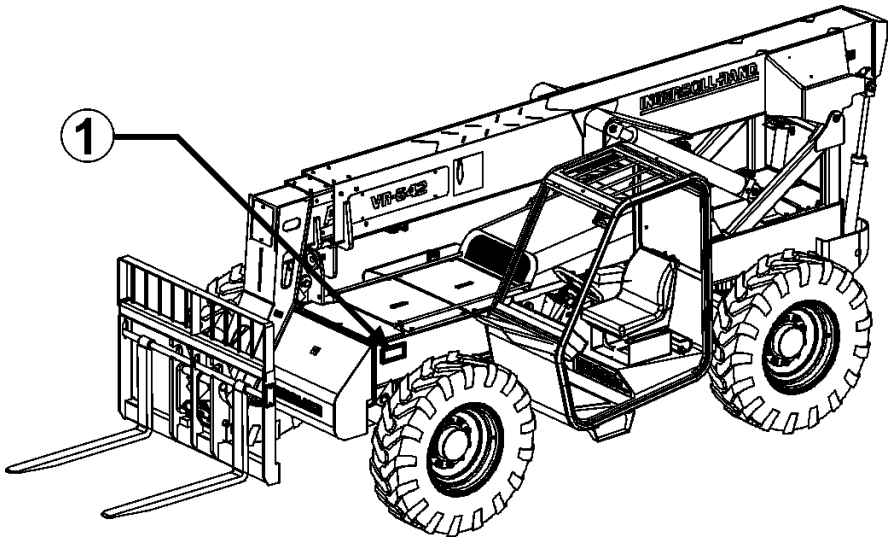
Some illustrations in this manual may show units with optional equipment installed. This optional equipment may be purchased from your local Ingersoll Rand Road Distributor.

Some illustrations in this manual may be of prototype models. Production models may vary in some detail.

Continuing improvement and advancement of product design may cause changes to your Telescopic Material Handler that may not be included in this publication. Each publication is reviewed and revised as required to update and include these changes in later editions. Ingersoll Rand reserves the right to modify or make changes within a specific model group without notice and without incurring any liability to retrofit units previously shipped from the factory. Contact your Ingersoll Rand Equipment Distributor for non-routine maintenance that is not covered in this publication.

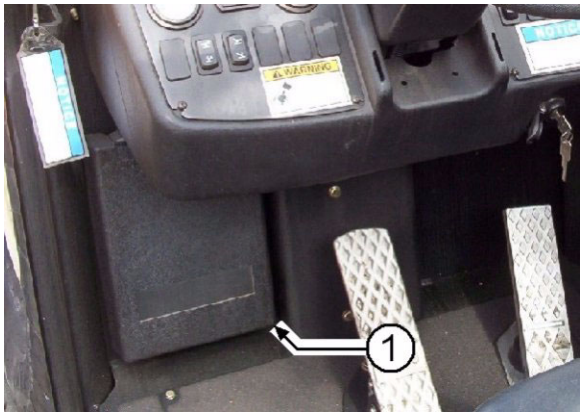
Record the Machine Serial Number, which is found on the Machine Serial Number Plate on the left side of the machine. Refer to 1, Figure 1.

Figure 1



Check to ensure that both the Parts Manual and the Operation and Maintenance Manual are with the machine. The manual case (1, Figure 2) is located under the left side of the control console. ALWAYS RETURN THE OPERATION AND MAINTENANCE MANUAL TO THE MANUAL POUCH WHEN YOU ARE FINISHED USING IT.

Figure 2



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SECTION 1 - SAFETY

BE AWARE OF SAFETY INFORMATION

This is the Safety Alert Symbol. When you see this symbol in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices.

UNDERSTAND SIGNAL WORDS

A signal word - DANGER, WARNING, or CAUTION - is used with the safety-alert symbol. DANGER identifies the most serious hazard.

DANGER, WARNING, or CAUTION safety labels are located near specific hazards.

NOTICE labels are for general information.

DANGER

RED BACKGROUND

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

WARNING

ORANGE BACKGROUND

WARNING indicates a potentially hazardous situation which if not avoided, could result in death or serious injury.

CAUTION

YELLOW BACKGROUND

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

YELLOW BACKGROUND

CAUTION used without the Safety Alert Symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE

BLUE BACKGROUND

NOTICE is used to notify people of installation, operation, or maintenance information which is important but not hazard related.

OVERVIEW

Before you operate, maintain, or in any other way use this telescopic material handler:

READ and STUDY both this Manual and the **Variable Reach Material Handler Safety Manual for Operators and Mechanics.** Know how to safely use the telescopic material handler's controls and what you must do for safe maintenance.

ALWAYS wear or use the proper safety items required for your personal protection.

READ and UNDERSTAND the information about NAMEPLATE and RATED CAPACITY CHART in this section of the manual.

MAKE SURE that a trained and qualified person will be operating the telescopic material handler. A qualified person experienced in the operation of this machine MUST guide a new operator through several driving and load-handling operations before the new operator attempts to operate the machine alone.

If you have any questions about the safe use or maintenance of this telescopic material handler, ask your supervisor or contact any Ingersoll Rand distributor. NEVER GUESS ALWAYS CHECK!

PRE-START INSPECTION

INSPECT your telescopic material handler daily. Ensure that the routine maintenance and lubrication are being dutifully performed. Have any malfunctioning, broken, or missing parts corrected or replaced before use. DO NOT operate a damaged or poorly maintained handler. You risk lives when operating faulty equipment, INCLUDING YOUR OWN.

VERIFY that all instruction and safety labels are in place and readable. These are as important as any other equipment on the machine.

CLEAN any foreign material from the steps and operators platform to reduce the danger of slipping.

NEVER fill the fuel tank with the engine running, while near an open flame, or when smoking. ALWAYS wipe up any spilled fuel.

CHECK for WARNING tags placed on the telescopic material handler. DO NOT operate the machine until repairs have been made and the WARNING tags are removed by authorized personnel.

ALWAYS know the capability and limitations of your equipment, speed, gradeability, steering, and braking.

BE AWARE of the dimensions of your telescopic material handler height and width as well as your transporter dimensions and weight.

WATCH for overhanging obstructions such as wires or tree limbs.

CHECK for any conditions that could be dangerous--holes, banks, underground culverts, manhole covers, water meter pits, curb and/or street boxes.

OPERATOR PROTECTION EQUIPMENT

The cab incorporates a ROPS (rollover protective structure) with overhead guard. When used in conjunction with seat belts, the cab is intended to lessen the possibility of death or serious injury in the event of a machine rollover or from falling objects. The ROPS with overhead guard must not be considered a substitute for good judgment and care when operating the telescopic material handler.

CHECK the seat belt regularly for wear or damage. Inspect belt hardware and fabric. Replace if hardware is damaged or if strap is nicked, frayed or loose stiching is found. Seat belt assemblies should be replaced every three (3) years regardless of appearance. Seat belt strength degrades over time due to exposure to weather, UV (ultraviolet radiation), and exposure to dirt. Check that mounting hardware is tight.

ALWAYS fasten the seat belt. The seat belt provides a means to help the operator keep the head and torso substantially within the confines of the Telescopic Material Handler frame if a tip over occurs. This restraint system is intended to reduce the risk of the head and torso being trapped between the machine and the ground, but cannot protect the operator against all possible injury in a tip over.

STARTING

READ and FOLLOW ALL instruction decals.

Seat belts and other OSHA-required safety equipment MUST be worn when operating the telescopic material handler.

BEFORE you start the telescopic material handler, ENSURE that the direction control lever is in Neutral (N).

BEFORE you start the telescopic material handler, ENSURE that no one is standing between the wheels and the frame.

START the engine from the operators position only.

Jump-starting the engine is NOT RECOMMENDED. If you do jump-start, use EXTREME CAUTION. Prior to jump-starting, ENSURE:

- Direction control lever is in Neutral (N).
- A TRAINED OPERATOR is at the controls when the engine starts
- The parking brake is ON.

DO NOT use ether or other starting fluids for cold-weather starting. Use of unmetered starting fluids can cause severe engine damage. If the telescopic material handler will not start in cold weather, the machine must be moved to a warmer area for starting. An ether start option is also available.

CHECK the operation of all the telescopic material handlers systems, including transmission, brakes, and boom operation, before beginning work.

OPERATING

ALWAYS make sure that no person or obstruction is in your line of travel BEFORE starting the telescopic material handler in motion.

NEVER climb onto or off the telescopic material handler while it is in motion.

REMAIN seated, with seat belt securely fastened, when operating the machine.

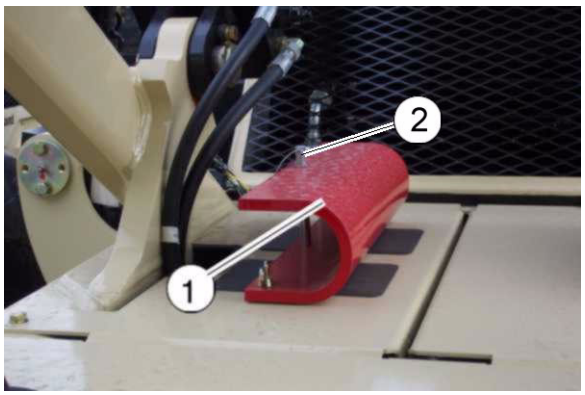
USE extreme caution and be observant when working in close quarters or congested areas.

OPERATE ONLY from the seated position. NEVER carry passengers.

BOOM SAFETY STOP

The Variable Reach Telescopic Material Handler is equipped with a boom stop (1, Figure 1-1) to be used whenever work is to be performed under a raised boom. It is to be placed over one of the boom cylinders and the boom lowered onto the stop. The stop is stowed behind the hood on the deckplate. The stop is equipped with a lock pin (2).

Figure 1-1



⚠ WARNING

Severe Personal Injury

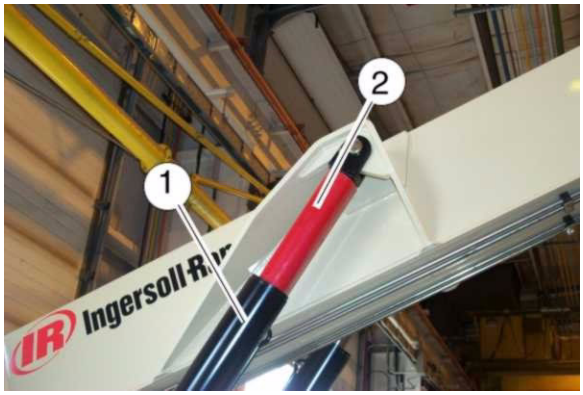
Never perform maintenance or service operations under the boom while in the raised position without blocking the boom from falling using the boom stop.

Failure to adhere to this warning could result in serious personal injury including death.

NOTICE

Use care not to damage lift cylinder rod. Rod damage may cause seal damage.

Figure 1-2



Install the boom stop (2, Figure 1-2) as follows:

1. Remove the boom stop from the frame.
2. Raise the boom high enough to allow the boom stop (2, Figure 1-2) to be placed over the boom cylinder (1) rod.
3. Shut down engine.
4. Install boom stop and safety pin.
5. Start engine.
6. Slowly lower the boom until it contacts the boom stop.

⚠ DANGER

Hazardous voltage.

Will cause severe injury or death.

Keep boom away from power lines.

Coming in contact with electric power lines can cause severe injuries or death by electrocution.

Before operating the material handler in an area with power lines, you should:

- **Notify the utility company to have the power disconnected, or**
- **Keep all parts of the machine 3.05 m (10 ft.) from the source of power.**
- **Be aware of any federal, state or local safety codes/regulations affecting the job location.**

If the machine comes in contact with electric power lines:

- **Stay in the cab.**
- **Warn other workers to stay away and to not touch the machine.**
- **If contact can be broken, drive the machine away from the danger zone.**
- **If contact can not be broken, stay in the cab until told that power is off.**

KNOW the area in which you are working. Familiarize yourself with work site obstructions and any other potential hazards in the area.

KNOW and USE the hand signals required for particular jobs and know who has the responsibility for signaling.

DO NOT work in the vicinity of overhanging banks, or on grades that could cause the telescopic material handler to slide or roll over.

AVOID excessively steep slopes or unstable surfaces. If you must drive on a slope, keep the load low and proceed with extreme caution. DO NOT drive across excessively steep slopes under any circumstances.

AVOID turning on an incline, if at all possible. If it is necessary, use extreme caution and make the turn wide and SLOW.

KEEP your seat belt fastened at all times when operating the telescopic material handler. If the machine should tip over:

- DO NOT JUMP; stay on the machine.
- HOLD firmly to the steering wheel.
- BRACE your feet.
- LEAN FORWARD and away from the impact.

ALWAYS look in all directions BEFORE changing your direction of travel.

DO NOT use your telescopic material handler to lift people; it is not designed for such use.

TRAVEL SLOWLY WHEN TURNING. Variable Reach Telescopic Material Handlers can tip over even at very slow speeds. The combination of speed and the sharpness of a turn can cause a tip-over. A machine is less stable when the forks are elevated, with or without a load. A tip-over can occur with an empty machine; in fact, it will actually tip over more easily when empty than when loaded with the load lowered. Rearward tilt of the carriage and load, off-center loads, and uneven or soft ground will aggravate these conditions.

KEEP a safe distance from the edge of docks, ramps, platforms, and other similar working surfaces.

KEEP a safe distance from the edges of excavations so that ground does not suddenly collapse and tip over the telescopic material handler. Be careful when operating on slopes when the ground is soft or muddy so that the handler does not suddenly slide and tip over.

Coordinated steering provides the greatest maneuverability and is the mode of steering most often used. It is recommended the machine be stopped before steering mode is changed. All steering modes can be selected while stopped, but the wheels should be straightened before moving to make sure they are properly aligned.

KEEP yourself and others away from the lift mechanism. NEVER permit anyone under or on the forks.

NEVER put head, arms, hands, or legs through the boom mechanism nor near the forks or carriage. This rule applies not only to the operator, but also a helper. A helper must not be near the load or lift mechanism when the operator is attempting to handle a load. The lift mechanism has moving parts with close clearances that can cause serious injury.

DO NOT move the direction control lever to the opposite position (FWD to REV or REV to FWD) when the Variable Reach Telescopic Material Handler is moving.

WATCH for pedestrians at all times. Do not drive up to anyone standing in front of an object. Use extra care at crossroads, doorways, and other locations where pedestrians can step into the path of travel of the machine. Slow down when approaching blind intersections or turns and sound the horn. The horn can alert pedestrians that there is a vehicle in the area and to be alert to possible danger.

AVOID bumps, holes, soft ground, slick spots, and loose materials that can cause the telescopic material handler to swerve or tip. If such areas cannot be avoided, go slowly. Always make sure you pick the smoothest route for your machine.

NEVER indulge in stunt driving or horseplay

ALWAYS operate the telescopic material handler at a speed that will permit it to be brought to a stop in a safe manner.

DO NOT tow or push the telescopic material handler, except as explained under “TOWING” in Section 4 - OPERATING INSTRUCTIONS of this manual.

DO NOT run the engine in a closed building for an extended length of time. EXHAUST FUMES CAN KILL.

⚠ WARNING

Serious Personal Injury.

Only attachments which have been fully tested for stablity and have had Rated Capacity Charts established per ASME B56.6 by Ingersoll Rand company are approved for use on Telescopic Material Handlers. The use of non-approved attachments may cause machine instability and tipover, which may result in severe injury or death to operators or bystanders.

Approved attachments are only those supplied by Ingersoll Rand which are accompanied by applicable Rated Capacity Charts for the specific attachment and machine model.

LOAD HANDLING

MAKE SURE you understand the Rated Capacity Chart(s) and the operation of the boom before a load is lifted.

ENSURE that you are using the proper Rated Capacity Chart for the boom attachment fitted to the telescopic material handler at the moment.

HANDLE only loads within the rated capacity as shown on the Rated Capacity Chart(s). This rated capacity represents the maximum load that can be lifted for the boom extensions when the telescopic material handler is on a hard, level surface. However, such factors as weak floors, uneven terrain, soft ground, special load-handling attachments, or loads having a high center of gravity can mean that the safe working load is less than the rated capacity. When such conditions exist, the operator must reduce the load so that the telescopic material handler will remain stable.

USE the frame leveling function to compensate for uneven terrain when operating on a side slope. Use the level indicator to make sure the Variable Reach Telescopic Material Handler is level before raising the boom. DO NOT use the frame leveling function when the load is raised.

DO NOT attempt to use the Variable Reach Telescopic Material Handler as an end loader. The machine is designed for lifting loads, NOT for digging or excavating.

INSPECT the load to be lifted. Lift the load and lower the load only on stable level ground. If a load must be handled several times, put stacking blocks under the load. Handle only stable loads. A load can have unstable items that can easily shift and fall on someone. DO NOT handle a load if any part of it is likely to fall. If a suspended load must be lifted, DO NOT permit it to swing freely; use a tether to control its movement.

DO NOT leave the machine unattended with a suspended load.

MAKE SURE that the floor or surface can hold the weight of the telescopic material handler and the load.

MAKE SURE that the surface or structure onto which you are placing the load is capable of supporting the load safely.

REMEMBER that although the telescopic material handler provides a degree of operator protection from falling objects and a rollover, other personnel in the area have no such protection. Keep all persons out of the area where they could be injured by a falling load or a tilting telescopic material handler.

STOPPING

ALWAYS park the machine on solid, level ground. If this is not possible, always park the machine at a right angle to the slope, set the parking brake, and chock the wheels.

AVOID leaving the operator's platform with the engine running. ALWAYS move the direction control lever to "Neutral" (N), apply the parking brake, turn the ignition switch to OFF, and lock all lockable compartments.

USE proper flags, barriers, and warning devices, especially when parking in areas of traffic.

MAINTENANCE

AVOID, whenever possible, servicing, cleaning, or examining the telescopic material handler with the engine running.

AVOID, whenever possible, servicing or providing maintenance to the telescopic material handler unless the wheels are adequately chocked.

NEVER fill the fuel tank with the engine running, while near an open flame, or when smoking. ALWAYS wipe up any spilled fuel.

AVOID removing the pressurized radiator cap until the engines cooling system has cooled.

USE care when removing hydraulic tank breather cap. Hydraulic tank is pressurized. Hot oil can cause severe burns.

DO NOT alter the engine governor settings from those indicated in the engine manual and the engine option plate.

ALWAYS replace damaged or lost decals. Refer to the Parts Manual for the proper location and part number of all decals.

ALWAYS disconnect the battery cables and ground wire to frame before working on the electrical system or when welding on the telescopic material handler. Serious damage to the electronic engine control module (ECM) will occur if battery cables are connected.

BE SURE the battery area is well-ventilated (clear of fumes) should it become necessary to connect a jump battery or battery charger. Fumes from the battery can ignite by a spark and explode.

IF battery charging is required, be sure the battery charger is Off when making the connections.

BE SURE the correct battery polarity is observed (negative to negative and positive [+] to positive [+]) when connecting to a battery charger or jumper cable.

TRANSPORTING AND HAULING

DO NOT attempt to load the Variable Reach Telescopic Material Handler onto the transporter without knowledge and experience with the operation of the telescopic material handler.

ALWAYS use a ramp when loading the Variable Reach Telescopic Material Handler onto the transporter. Be sure ramps are of adequate strength, low angle, and proper height.

USE proper chock blocks in front and rear of the wheels of the transporter when loading the Variable Reach Telescopic Material Handler.

BE SURE to approach the transporter loading ramps squarely to make sure the telescopic material handler does not drop off the side of the ramp.

KEEP the transporter deck clean of clay, oil, ice, frost, or any other material that can become slippery.

USE proper chock blocks in front and rear of the Variable Reach Telescopic Material Handler wheels.

SHUT the engine OFF, apply the parking brake, and lock all lockable compartments.

ALWAYS know the overall height of the telescopic material handler and hauling vehicle. Observe height and weight regulations and overhead objects to be sure you can safely pass beneath them.

When roading your Variable Reach Telescopic Material Handler on a public access, obey all traffic regulations and be sure that the proper clearance flags, lights, and warning signs, including the Slow Moving Vehicle emblem, are properly displayed. Know your approximate stopping distance at any given speed. Never turn corners at excessive speeds. Look in all directions before reversing your direction of travel.

A loose telescopic material handler can shift or fall while being transported.

Tie down the machine securely before moving the hauling vehicle or transporter.

1. Position the telescopic material handler on the transporter or hauling vehicle centered from side to side and apply the parking brake.
2. With adequate chains or cables and blocks, secure the machine to the deck of the hauling vehicle or transporter to meet ICC or local regulations.

LOAD CAPACITY CHARTS

⚠ WARNING

DO NOT add to or modify the Variable Reach Telescopic Material Handler. Any change to the machine or its equipment can change the lifting capacity. The machine must be rated as equipped and the nameplate must show the new capacity rating.

Failure to adhere to the warning could result in serious personal injury including death.

⚠ WARNING

Only attachments which have been fully tested for stability and have had Rated Capacity Charts established per ASME B56.6 by Ingersoll-Rand Company are approved for use on the Variable Reach Telescopic Material Handler. The use of non-approved attachments may cause machine instability and tipover, which may result in severe injury or death of operators or bystanders.

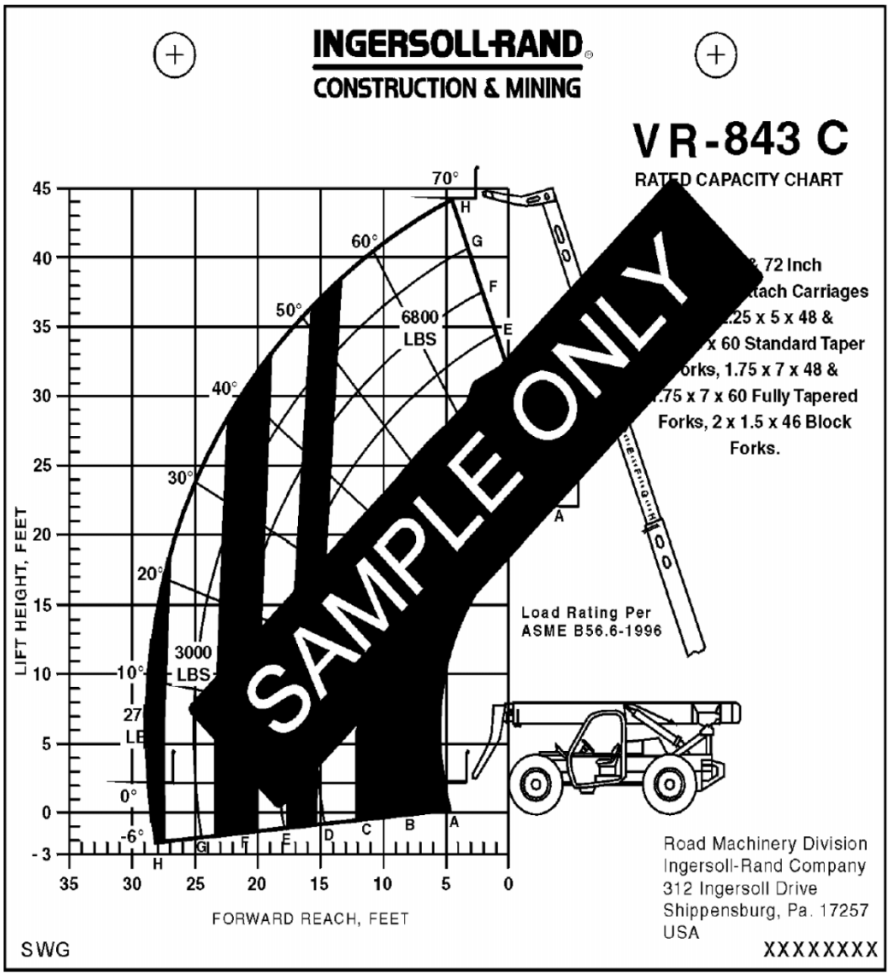
Approved attachments are only those supplied by Ingersoll-Rand which are accompanied by applicable Rated Capacity Charts for the specific attachment and machine model.

Use of non approved attachments may cause machine instability and tip over, which may result in serious injury or death to operator or bystanders.

The capacity of the Variable Reach Telescopic Material Handler changes as the boom is raised or extended and with the type of boom attachment being used. The Rated Capacity Charts can be found on the right side of the control panel. The charts show the capacity of the machine at different load positions and with different attachments. When loads are being moved, the operator must refer to the Load Capacity Charts. The rated capacity of the machine is also determined by the location of the center of gravity of the load. The Load Capacity Chart defines the load capacity only when the machine is on a level and stable surface. The following graphic shows a sample Load Capacity Chart.

Do not use this chart to determine the lifting capacity of your machine. Refer to the actual charts located on the control panel of your machine.

Figure 1-3



The weight of the load must be known by the operator before the load is lifted to make sure that the load is within the capacity of the telescopic material handler as shown on the Load Capacity Charts. When the load is lifted, the load is always raised with the boom retracted. Raise the boom to the required angle so that it can be extended to the point where the load will be stacked. See the boom angle on the boom angle indicator and find that angle on the Rated Capacity Chart. Find the letter on the Rated Capacity Chart that shows the extension of the boom permitted for the weight of the load being lifted. The point where the lines cross for the required boom extension and the boom angle is the maximum lifting capacity for those conditions.

⚠ WARNING

Always raise the boom with the boom retracted. Raise the boom to the angle where the boom can be extended to the point where the load will be stacked or lifted. Then extend the boom to stack or lift the load. When the load is raised, the load center can move away from the Variable Reach Telescopic Material Handler.

⚠ WARNING

If the load is larger than the "standard" 1219 mm (48 inch) cube or if the weight of the load isn not evenly distributed, the weight of the load must be less than the capacity shown on the Load Capacity Charts.

Failure to adhere to this warning could result in serious personal injury including death.

⚠ WARNING

Raise the boom only when the Telescopic Material Handler is on a stable surface. If the surface breaks or the tires sink into the surface, the Variable Reach Telescopic Material handler can tip over.

⚠ WARNING

Your Telescopic Material Handler may be equipped with several different Rated Capacity Charts to accommodate different boom attachments. Make sure that the Rated Capacity Chart you are using corresponds to the boom attachment fitted to the machine at the moment.

Failure to adhere to this Warning could result in serious personal injury including death.

ANGLE INDICATOR

The vertical red angle indicator pointer located on the left front of the outer boom (1, Figure 1-4) is designed to align with white angle values located on the boom as the boom is raised when the machine is located on level ground. This is the boom angle shown on the Rated Capacity Charts by lines marked in degrees extending away from the machine. Curved lines on the Rated Capacity Charts show the position of the load center at various angles as the boom is extended. These lines are lettered A thru G, corresponding A to G letters (2) installed along the operators side of the mid section boom, become visible as the boom is extended. Do not extend beyond the rated load center letter.

Figure 1-4

HAZARDOUS SUBSTANCE PRECAUTION

The following substances are contained in this machine and may be hazardous to health if exposed to or used incorrectly.

Table 1:

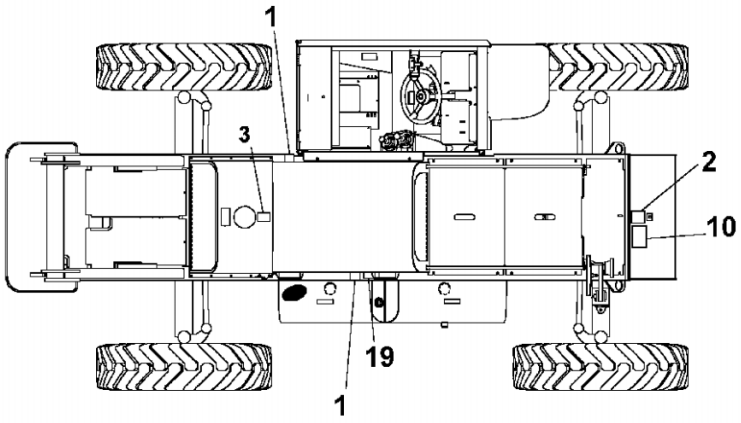
SUBSTANCE	PRECAUTION
Antifreeze	Avoid injestion, skin contact, and breathing fumes.
Hydraulic Oil	Avoid injestion, skin contact, and breathing fumes.
Engine Lubricating Oil	Avoid injestion, skin contact, and breathing fumes.
Preventative Grease	Avoid injestion, skin contact, and breathing fumes.
Rust Preventative	Avoid injestion, skin contact, and breathing fumes.
Engine Fuel	Avoid injestion, skin contact, and breathing fumes.
Battery Fluid	Avoid injestion, skin contact, and breathing fumes.
SAE Gear Oil	Avoid injestion, skin contact, and breathing fumes.

The following substances may be produced during the operation of this machine and may be hazardous to your health.

SUBSTANCE	PRECAUTION
Engine Exhaust Fumes	Avoid breathing.
Engine Exhaust Fumes	Avoid buildup of fumes in confined spaces.
Electric Motor Dust (Brushes/Insulation)	Avoid breathing during maintenance.
Break Lining Dust *	Avoid breathing during maintenance.

* Only on machines with dry axle brakes.

SAFETY DECALS (SHEET 1 of 2)



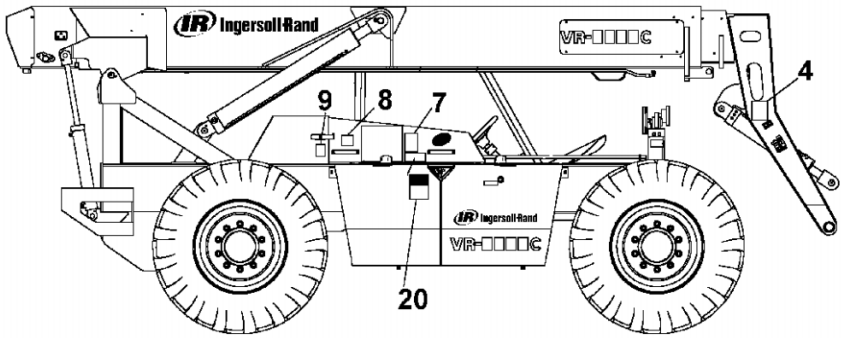


Table 2: Decal Reference Numbers

REF NO.	DESCRIPTION	QTY.	LOCATION
1	WARNING: Moving Machine	2	Top of Frame
2	WARNING: Crush Area	1	Counter Weight Box
3	WARNING: Pressure Hazard	1	Rear Engine Cover
4	WARNING: Carriage	2	Upright Carriage
7	WARNING: Rollover Tire Inflation	1	Front Engine Cover
8	WARNING: Improper Operation	2	Front Engine Cover
9	WARNING: Rotating Fan	2	Rear Engine Cover
10	WARNING: Falling Load	2	Counter Weight Box
19	NOTICE: Unmetered Ether	1	Top of Frame
20	WARNING: Runover	1	Fuel Tank

SAFETY DECALS (SHEET 2 of 2)

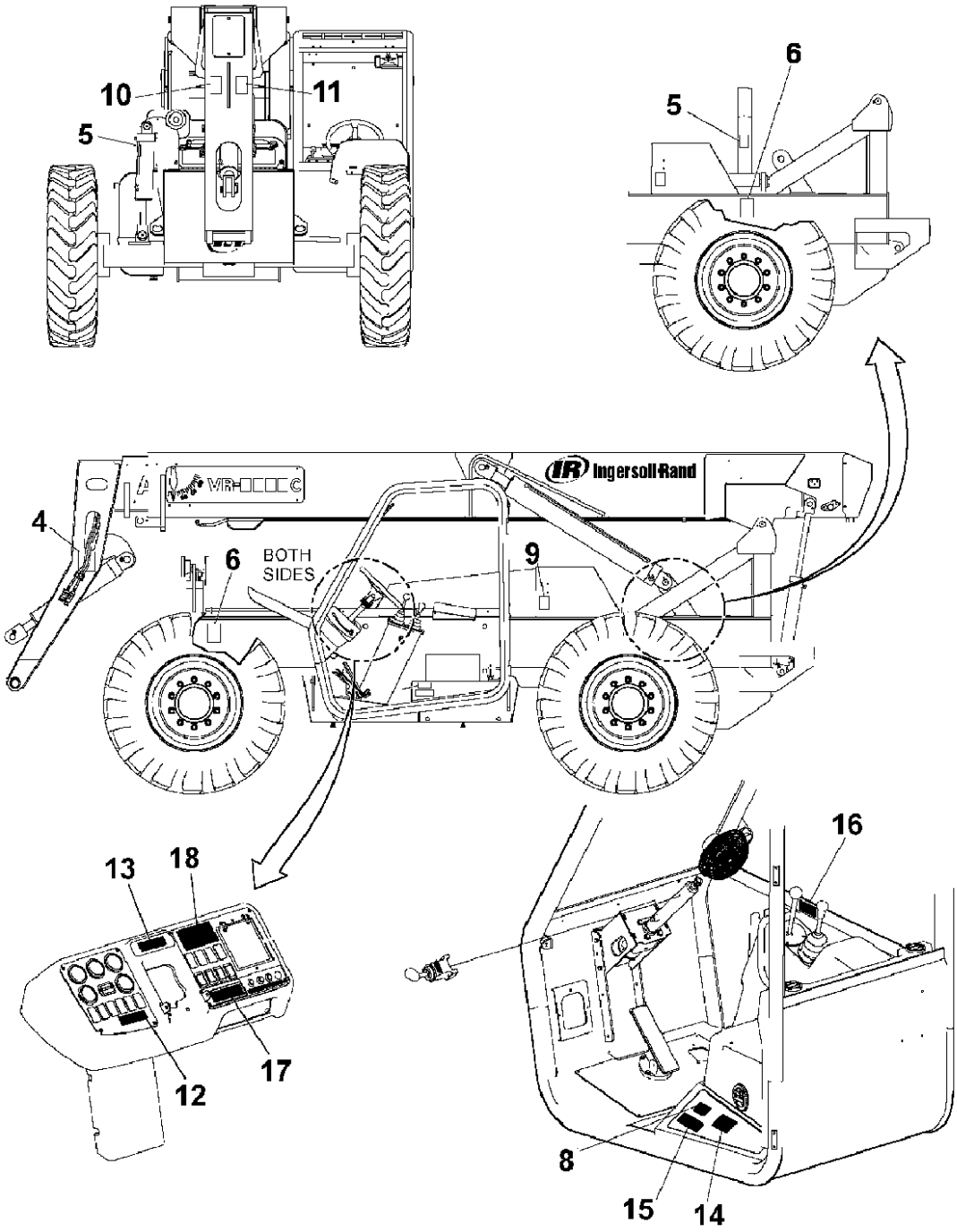


Table 3: Decal Reference Numbers

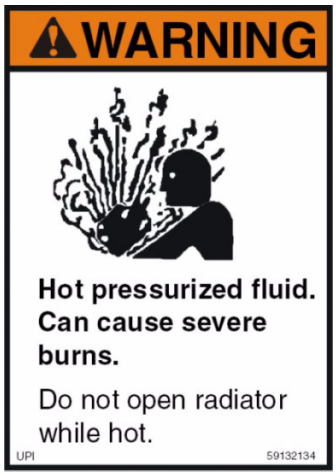
REF NO.	DESCRIPTION	QTY.	LOCATION
4	WARNING: Carriage	2	Upright Carriage
5	WARNING: Block Axle Frame	2	Frame Level Cylinder
6	WARNING: Crush Area	5	Behind Each Wheel
8	WARNING: Improper Operation	2	Front Engine Cover
10	WARNING: Falling Load	2	Counter Weight Box
11	WARNING: Fall from Forks	1	Upright Carriage
12	WARNING: Rollover	2	Operator's Console
13	DANGER: Electrical Hazard	1	Operator's Console
14	WARNING: No Riders	1	Operator's Cab
15	NOTICE: OSHA	1	Operator's Cab
16	WARNING: Frame Level	1	Operator's Cab
17	NOTICE: Parking Brake Test	1	Operator's Console
18	WARNING: Unpinned Attachment	1	Operator's Console

SAFETY RELATED DECALS

1. WARNING: Moving Machine

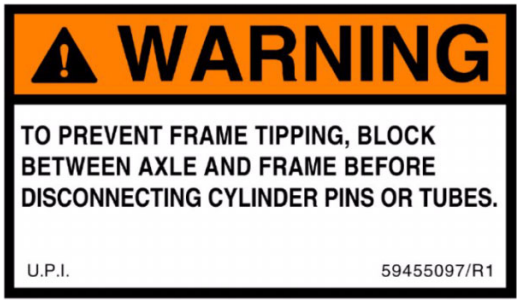
2. WARNING: Crush Area

3. WARNING: Pressure Hazard



4. WARNING: Carriage

5. WARNING: Block Axle Frame



6. WARNING: Crush Area

7. WARNING: Rollover Tire Inflation

8. WARNING: Improper Operation

9. WARNING: Rotating Fan

10. WARNING: Falling Load

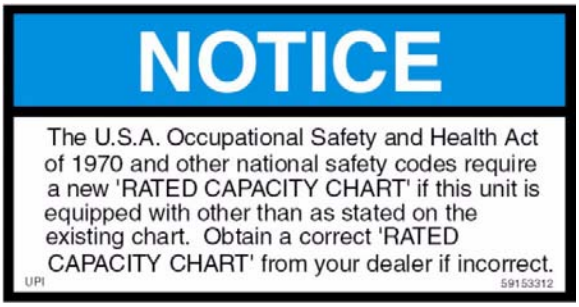
11. WARNING: Fall from Forks

12. WARNING: Rollover

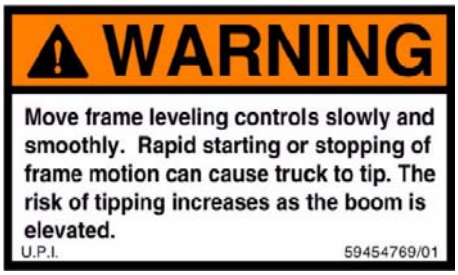
13. DANGER: Electrical Hazard

14. WARNING: No Riders

15. NOTICE: OSHA



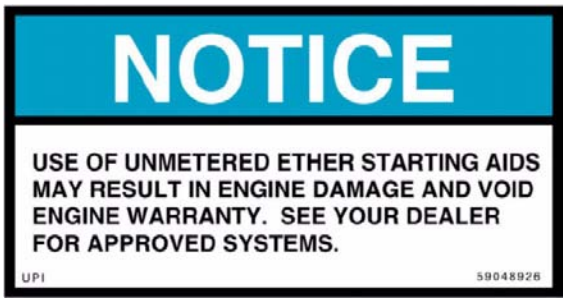
16. WARNING: Frame Level



17. NOTICE: Parking Brake Test

18. WARNING: Unpinned Attachment

19. NOTICE: Unmetered Ether



20. WARNING: Runover

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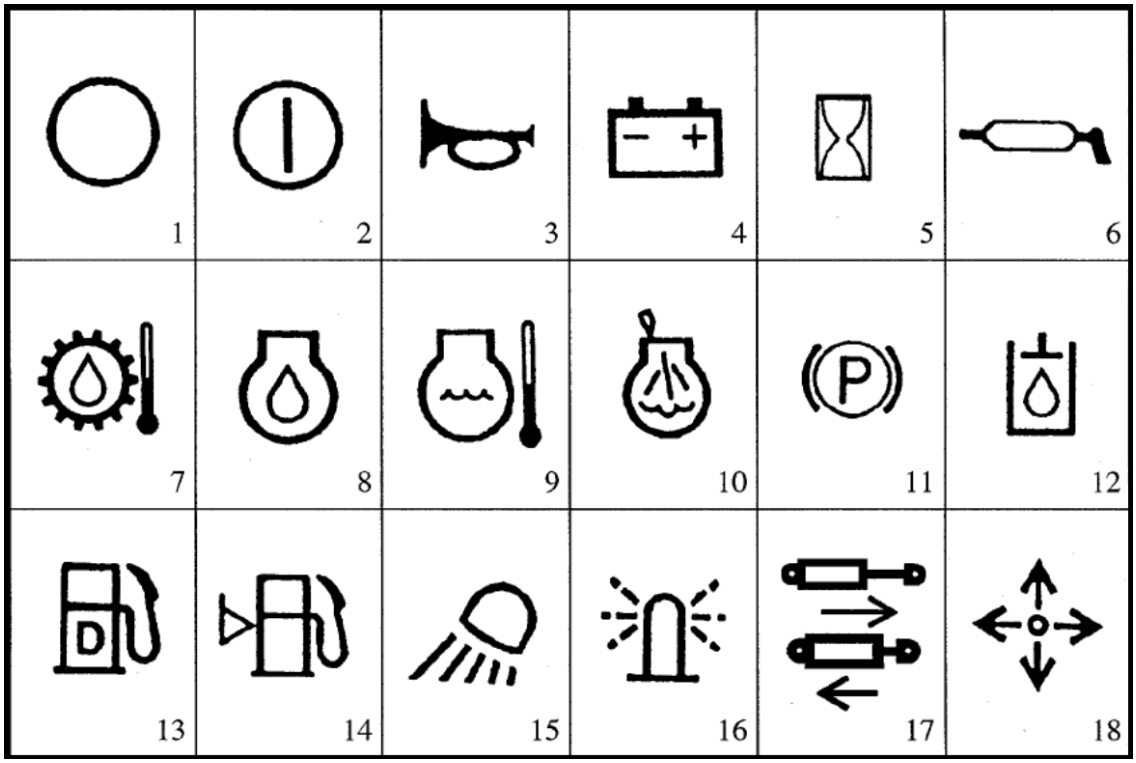
See your authorized Ingersoll Rand Distributor for details

SECTION 2 - SYMBOL IDENTIFICATION/METRIC CONVERSION

INTERNATIONAL MACHINE SYMBOLS

This section contains symbols that may be used on the VR-843C Variable Reach Material Handler. The following explains the meaning of international symbols that may appear on your machine.



1. On/Start
2. Off/Stop
3. Horn
4. Battery Condition
5. Hourmeter
6. Grease
7. Transmission Oil Temperature
8. Engine Oil
9. Coolant Temperature
10. Ether Inject (Cold Start)
11. Parking Brake
12. Hydraulic Oil
13. Fuel (Diesel)
14. Fuel Level
15. Work Lights
16. Flashing Beacon
17. Remote Cylinder Extent and Retract
18. Control Lever - Multidirectional

INTERNATIONAL HIGHWAY SYMBOLS

The following symbols may also appear in a yellow square instead of in a red triangle.

 ROAD BENDS	 DANGEROUS BEND	 DOUBLE BEND	 DANGEROUS DESCENT	 STEEP ASCENT	 CARRAGEWAY NARROWS
 CARRAGEWAY NARROWS	 "END OF PRIORITY" SIGN	 ONCOMING TRAFFIC HAS PRIORITY	 PRIORITY OVER ONCOMING TRAFFIC	 SWING BRIDGE	 ROAD LEADS ONTO QUAY OR RIVERBANK
 UNEVEN ROAD	 RIDGE	 DIP	 SLIPPERY ROAD	 LOOSE GRAVEL	 NO ENTRY FOR POWER DRIVEN VEHICLE
 NO ENTRY FOR VEHICLES EXCEEDING WIDTH	 NO ENTRY FOR VEHICLES EXCEEDING LENGTH	 FALLING ROCKS	 PEDESTRIAN CROSSING	 ROAD WORKS	 LIGHT SIGNALS
 TWO-WAY TRAFFIC	 OTHER DANGERS	 LEVEL CROSSING	 LEVEL CROSSING	 NO ENTRY	 CLOSED TO ALL VEHICLES IN BOTH DIRECTIONS
 INTERSECTION USER MUST GIVE WAY	 INTERSECTION USER MUST GIVE WAY	 INTERSECTION USER MUST GIVE WAY	 "GIVE WAY" SIGN	 "STOP SIGN" NEW	 "STOP SIGN" OLD
 "PRIORITY ROAD" SIGN	 NO ENTRY FOR VEHICLES EXCEEDING WEIGHT	 NO ENTRY FOR VEHICLE AXLE WEIGHT EXCEEDING	 NO U-TURN	 NO TURN DIRECTION SHOWN	 NO ENTRY FOR POWER DRIVEN VEHICLE

METRIC CONVERSION

TO CONVERT	INTO	MULTIPLY BY
bars	pounds per sq. in.	14.5
bars	kilopascals	100
Celsius	Fahrenheit	(°C X 9/5) + 32
centimeters	inches	0.3937
centimeters	millimeters	10
circumference	radians	6.283
cubic centimeters	cubic inches	0.06102
degrees (angle)	radians	0.1745
degrees per second	revolutions per minute	0.1667
Fahrenheit	Celsius	(°F - 32) x 5/9
feet	meters	0.3048
feet per minute	meters per minute	0.3048
gallons	liters	3.785
Hertz	vibrations per minute	60
horsepower	kilowatts	0.7457
inches	centimeters	2.54
inches	millimeters	25.4
kilograms	pounds	2.205
kilograms-meter	pounds-foot	7.233
kilopascals	pounds per sq. in.	0.145
kilopascals	bars	0.01
kilowatts	horsepower	1.341
liters	gallons (U.S. liquid)	0.2642
liters	pints (U.S. liquid)	2.113
liters	quarts (U.S. liquid)	1.057

TO CONVERT	INTO	MULTIPLY BY
meters	feet	3.281
meters	inches	39.37
meters per minute	feet per second	0.05468
miles per hour	kilometers per hour	1.609
millimeters	inches	0.03937
Newtons	pounds	4.448
Newtons-meter	pounds-foot	0.737
pints (liquid)	liters	0.4732
pounds	kilograms	0.4536
pounds	Newtons	0.225
pounds-foot	kilograms-meter	0.138
pounds-foot	Newtons-meter	1.356
pounds per square inch	bars	0.06895
pounds per square inch	kilopascals	6.895
quarts (liquid)	liters	0.9463
radians	degrees	57.30
radians per second	revolutions per minute	9.549
revolutions per minute	degrees per second	6.0
revolutions per minute	radians per second	0.1047
tons (short)	tons (metric)	0.9078
vibrations per minute	Hertz	0.0167

SECTION 3 - OPERATING CONTROLS AND INSTRUMENTS

The following individual controls and instruments are used on the VR-843C Telescopic Material Handler.

NOTE

Gauge readings are given as a guide only. Engine and machine conditions may cause gauge readings to vary.

Figure 3-1

FUEL GAUGE

The Fuel Gauge (1, Figure 3-1) indicates the amount of fuel in the fuel tank. The tank should be filled with #2 filtered diesel fuel when the indicator needle moves below a 1/4 tank.

BATTERY GAUGE (VOLTMETER)

With the ignition key in the ON position, the Battery Gauge (2, Figure 3-1) indicates the condition of the battery. The gauge should register between 13.5 and 14.5 volts. If the gauge is not within this range, shut down the machine and have maintenance personnel correct the problem.

ENGINE OIL PRESSURE GAUGE

The Oil Pressure Gauge (3, Figure 3-1) indicates engine oil pressure from 0 to 690 kPa (0 to 100 psi). At normal operating speed, the oil pressure should be between 276-414 kPa (40-60 psi). At idle speed, the pressure should be between 172-207 kPa (25-30 psi). If gauge reads outside these ranges, shut down the engine correct the problem.

TRANSMISSION OIL TEMPERATURE GAUGE

This Gauge (4, Figure 3-1) displays the Transmission Oil Temperature from 40 to 140° C (100 to 280° F). Normal operating temperature is between 82.2 and 93.3° C (180 and 200° F). If reading is not within this range, shut down the machine and determine the cause.

HOURMETER

The Hourmeter (5, Figure 3-1) indicates the operating hours for the engine. Maintenance recommendations are based on the engine operating hours.

WATER TEMPERATURE GAUGE

The Water Temperature Gauge (6, Figure 3-1) displays the engine coolant temperature. The gauge registers from 38-138° C (100-280° F). Normal operating temperature is between 60 and 100°C (140 and 212°F). If the coolant temperature is not within this range, shut down the machine and correct the problem.

AUXILIARY FUNCTION SWITCH (OPTION)

This switch (7, Figure 3-1) is used to control an optional Auxiliary Function. These could include carriage swing, scrap grapple bucket control and side tilt for the 1067 mm (42 in.), 1219 mm (48 in.), 1524 mm (60 in.) and 1829 mm (72 in.) forks. This switch (37, Figure 3-6) is located on the optional single joystick. Information regarding this optional equipment is available from your Ingersoll Rand distributor.

LEFT AND RIGHT STABILIZER SWITCHES

The Stabilizer Switches (8 and 9, Figure 3-1) are nonlatching, rocker type switches that control the right and left stabilizers. Pressing and holding the upper portion of the switches causes the stabilizers to raise while pressing and holding the lower portion of the switches will lower the stabilizers.

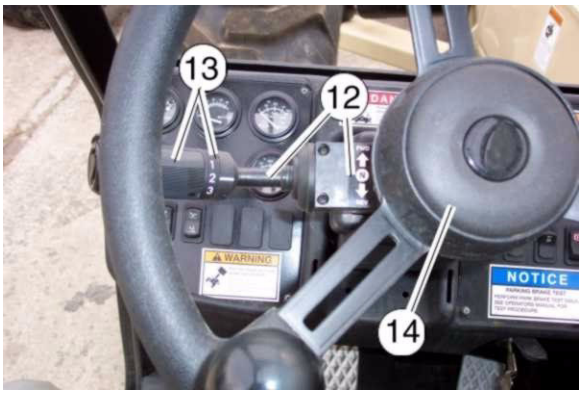
ETHER SWITCH (OPTION)

The Ether Switch (10, Figure 3-1) controls the optional cold start system. Press and hold this switch while cranking the engine. When smoke appears from the exhaust, release the button so that a measured amount of starting fluid is injected into the manifold. If the weather is very cold, a second injection may be required.

SPARES

These slots (11, Figure 3-1) are spares and are not used currently.

Figure 3-2



DIRECTION CONTROL LEVER

CAUTION

Equipment Damage.

DO NOT move the direction control lever to the opposite position (FWD to REV or REV to FWD) when the Telescopic Material Handler is moving.

The Direction Control Lever (12, Figure 3-2) is used to select the machine travel direction. The lever has three positions: "Forward" (FWD), "Neutral" (N), and "Reverse" (REV). Move the lever to the desired direction position.

NOTE

The lever must be in the "Neutral" (N) position before the engine can be started.

TRANSMISSION RANGE SELECTOR

The Transmission Range Selector (13, Figure 3-2) is located on the Direction Control Lever. The transmission has three speeds in either direction. The selector can be rotated to any setting while the machine is in motion.

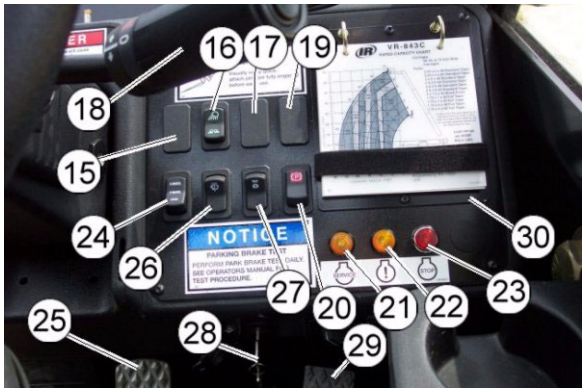
NOTE

Downshifting at any speed greater than 3.2 km/h (2 mph) will cause an abrupt change in the speed of the machine.

HORN BUTTON

The Horn Button (14, Figure 3-2) activates the horn. The horn is used to alert personnel to the approach of the telescopic handler or to a change of direction.

Figure 3-3



WORK LIGHT SWITCH (OPTION)

The Work Light Switch (15, Figure 3-3) controls the optional work lights. The switch is a three position, latching type, rocker switch. When the upper portion of the switch is pressed, the forward facing work lights turn on. When the lower portion of the switch is pressed, both the forward and rear facing work lights turn on. With the switch in the center position, the work lights are turned off.

BOOM LIGHT SWITCH

The Boom Light Switch (16, Figure 3-3) controls the optional light at the end of the boom.

SPARE

Slot (17, Figure 3-3) is a spare and are not used currently.

TURN SIGNAL CONTROL LEVER (OPTION)

The Turn Signal Control Lever (18, Figure 3-3) is used to activate the optional turn signals. Pull downward on the lever to activate the right turn flasher and push upward to activate left turn flasher. Rotate the lever knob to the hazard warning light symbol ⚠ to activate the four-way flashers.

BEACON SWITCH

The Beacon Switch (19, Figure 3-3) controls the optional beacon.

PARK BRAKE SWITCH

The Parking Brake Switch (20, Figure 3-3) controls the spring applied, hydraulically released parking brake. Apply the parking brake by pressing the switch at the end marked (Ⓟ) when the engine is running. When the brake is On, the parking brake red warning light (switch) will be illuminated with the key on. If Park Brake light does not go off when the pushbutton is pressed to release the park brake, call for service.

SERVICE ENGINE LIGHT

Service Engine Light (21, Figure 3-3) (yellow) turns on when the key is turned to the ON position prior to starting and when the engine has reached the predetermined number of operating hours where service is required. Refer to Section 5 - Maintenance Instructions.

CHECK ENGINE LIGHT

Check Engine Light (22, Figure 3-3) (yellow) turns on when the key is turned to the ON position prior to starting and when there is a malfunction that is not service related or will not cause damage to the engine. Contact service personnel to have problem corrected.

STOP ENGINE LIGHT

The Stop Engine Light (23, Figure 3-3) (red) turns on when the key is turned to the ON position prior to starting and when there is a problem with the engine which will cause damage to the engine. Turn off the engine immediately and contact service personnel.

STEERING MODE SELECTOR SWITCH

The Steering Selector Switch (24, Figure 3-3) is used to select the steering mode. There are three modes to choose from: coordinated (four wheel), front wheel (2 wheel) and crab.

Coordinated steering is the mode most often used. This mode allows all four wheels to steer the Telescopic Material Handler and permits the operator to make smaller radius turns.

In front wheel mode, only the front wheels steer the machine.

Crab steering mode permits the wheels to turn parallel to each other. This allows the machine to travel along a line that is diagonal to the forward-and-reverse axis of the machine. Crab steering is used to move away from buildings and to escape from wheel ruts.

It is recommended the machine be stopped before steering mode is changed. All steering modes can be selected while stopped, but the wheels should be straightened before moving to make sure they are properly aligned.

BRAKE PEDAL

The Brake Pedal (25, Figure 3-3) is operated by the operator’s left foot and applies the service brakes to stop the machine. The transmission remains engaged.

WINDSHIELD WASHER

The Windshield Washer Switch (26, Figure 3-3) activates the pump for the windshield washer. Press and hold the switch to activate.

PARK BRAKE TEST SWITCH

The Park Bake Test Switch (27, Figure 3-3) is used to test the operation of the Park Brake. Refer to "Park Brake Test Procedure" in Section 4.

KEY SWITCH

The Key Switch (28, Figure 3-3) activates the electrical system when it is turned in the clockwise direction to the ON position. Turning the switch past the ON position, against a spring, to the START position engages the starter motor. Release the key as soon as the engine starts. The spring will return the key to the ON position. A mechanical lockout prevents the key from being turned to the START position without first being turned to the OFF position.

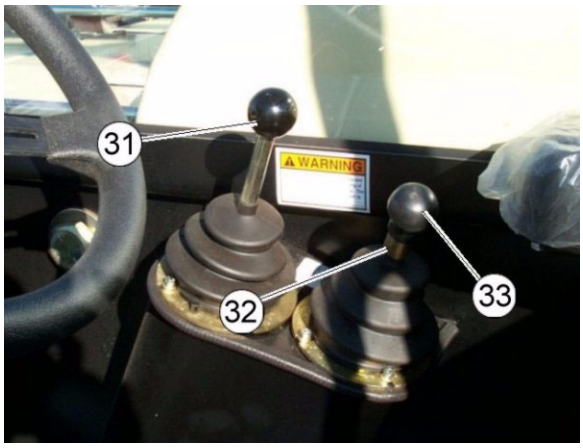
ACCELERATOR PEDAL

The Accelerator Pedal (29, Figure 3-3) is operated by the operator’s right foot and controls the engine speed.

FUSE PANEL

The fuse block is located inside the control panel housing behind panel (30, Figure 3-3).

Figure 3-4



BOOM CONTROL JOYSTICK

The Boom Control Joystick (31, Figure 3-4) controls the boom operation. Move the joystick forward to lower the boom. Move the joystick backward to raise the boom. Move the joystick to the right to extend the boom. Move the joystick to the left to retract the boom.

LEVEL AND FORK CONTROL JOYSTICK

⚠ WARNING

Serious Personal Injury.

Do not use the frame leveling function when the load is raised. Move the frame leveling controls slowly and smoothly. Rapid starting and stopping of frame motion can cause the telescopic handler to tip. The risk of tipping increases as the boom is raised and extended.

Failure to adhere to this warning could result in serious personal injury including death.

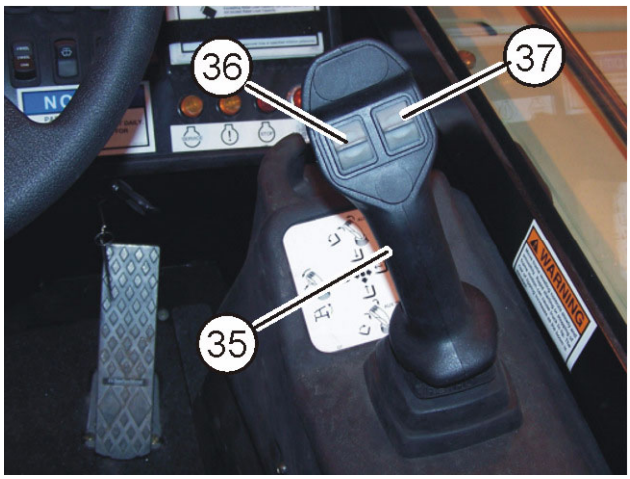
The Level and Fork Control Joystick (32, Figure 3-4) is a dual function controller that permits the operator to level the chassis when the machine is on sloping surfaces up to 18 percent and also controls the tilt of the forks at the end of the boom. To operate the frame level feature, press and hold the button (33, Figure 3-4) in the end of the joy stick while moving the joystick control (32, Figure 3-4) to the left to tilt (lower) the left side of the frame or to the right to tilt (lower) the right side of the frame. Frame level allows the chassis and boom to remain level if the machine is on sloping surface.

Figure 3-5

LEVEL INDICATOR

The Level Indicator (34, Figure 3-5) is located directly ahead of the operator on the upper crossmember of the overhead guard. The frame of the Telescopic Material Handler is level when the ball is centered in the indicator.

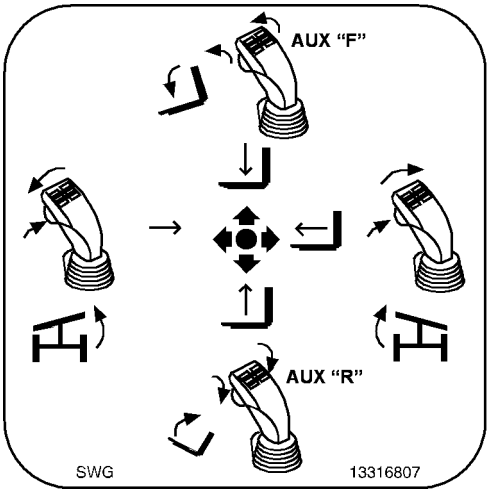
Figure 3-6



SINGLE JOYSTICK CONTROL - OPTION

The Single Joystick Control (35, Figure 3-6) is a multi-functional control which allows the operator to control boom operation (extend or retract and up or down), frame and boom leveling, fork tilt, and auxiliary functions such as fork side tilt or swing fork. The decal shown (Figure 3-7) is located in front of the control and illustrates all single control joystick functions.

Figure 3-7



Move the single joystick control (35, Figure 3-6) forward to lower the boom, and backward to raise the boom. Move the single joystick control to the right to extend the boom and to the left to retract the boom.

Fork tilt is controlled by switch (36, Figure 3-6). Press and hold the upper portion of the switch to tilt the forks down. Press and hold the lower portion the switch tilt the forks up. You do not need to move the joystick control.

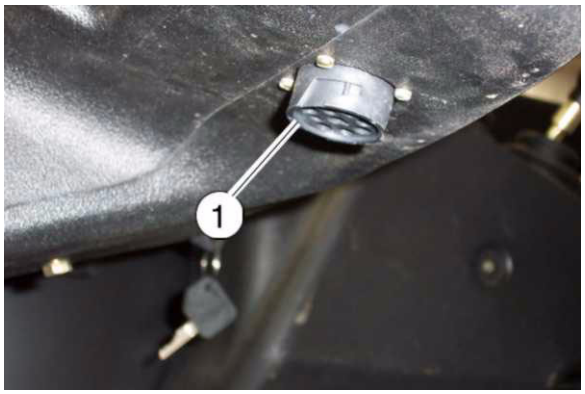
Auxiliary functions, if available, are controlled by pressing and holding switch (37, Figure 3-6). Press and hold the upper portion of the switch to operate an out or left direction function. Press and hold the lower portion of the switch to operate an in or right direction function You do not need to move the joystick control. If auxiliary functions are not available, switch (37) is not connected.

The frame level feature is activated by pressing and holding pushbutton (on the bottom of the control) while moving the single joystick control to the left to tilt (lower) the left side of the frame or to the right to tilt (lower) the right side of the frame. Frame level allows the chassis and boom to remain level if the machine is on sloping surface. The single joystick control must be moved back to the neutral (center) position to start the frame level function.

ENGINE DIAGNOSTIC PORT

The engine diagnostic port (1, Figure 3-8) is located under the left side of the control panel. The diagnostic port is used to connect a computer with the engine diagnostic software to the machine.

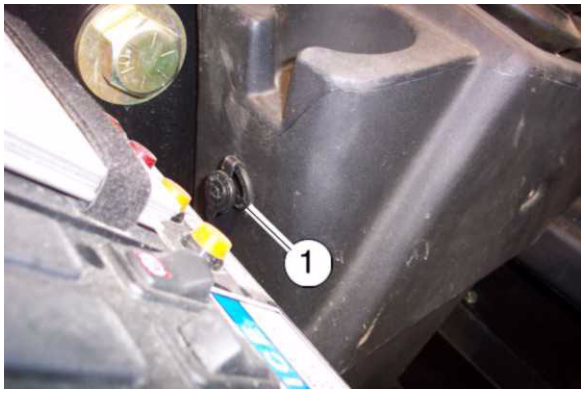
Figure 3-8



12 VOLT POWER PORT

A convenient 12 volt power port (1, Figure 3-9) is located in front of the joystick control console.

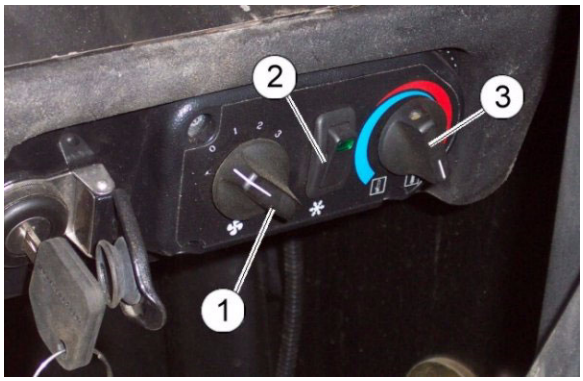
Figure 3-9



HEATER AND AIR CONDITIONER CONTROLS - OPTION

The optional heater and air conditioner controls are located on the right side control panel. Fan switch (1, Figure 3-10) is a rotary switch that controls the fan for both heating and cooling. Air conditioner switch (2) is a rocker type switch that turns the air conditioning unit on and off. When the air conditioner is operating, a green indicator light on the switch is illuminated. Rotary switch (3) controls the air temperature. Turn the switch clockwise for warmer air and counterclockwise for cooler air.

Figure 3-10



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852-2527-0183 (Asia)

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SECTION 4 - OPERATING INSTRUCTIONS

⚠ WARNING

Serious Personal Injury

Improper operation of the Telescopic Material Handler can be hazardous.

Before you start, use or in any other way operate the Telescopic Material Handler, read and understand SECTION 1 - SAFETY PRECAUTIONS AND GUIDELINES. Make sure that you also read and understand the FORKLIFT SAFETY MANUAL FOR OPERATORS AND MECHANICS.

Failure to understand and follow the instructions in these two manuals can cause serious injury or death.

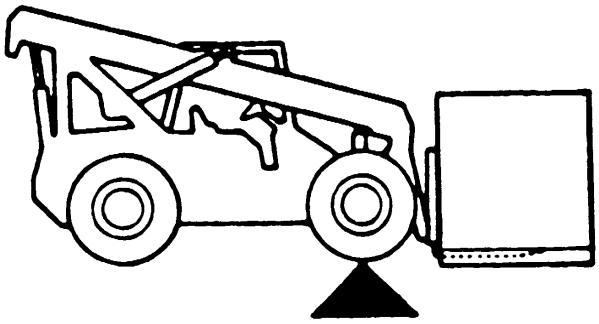
GENERAL

The Telescopic Material Handler is designed to pick up and move materials. The machine has forks or another attachment on the front of the boom to engage the load. The boom lifts the load so that it can be moved and stacked or placed.

In order to understand how the Telescopic Material Handler can pick up a load, you must first know a few basics.

The operation of a Telescopic Material Handler is based on the principle of two weights balanced on opposite sides of a pivot (fulcrum). Refer to Figure 4-1.

Figure 4-1



For this principle to work with a Telescopic Material Handler, the load on the forks must be balanced by the weight of the machine. The location of the center of gravity of both the machine and the load is also a factor.

This basic principle is used for picking up a load. The ability of the Telescopic Material Handler to handle a load is discussed in terms of center of gravity and both forward and side stability.

STABILITY AND CENTER OF GRAVITY

The center of gravity (CG) of an object is the single point about which an object is balanced in all directions. Every object has a CG. Refer to Figure 4-2. When the Telescopic Material Handler picks up a load, the machine and the load have a combined CG. The stability of the machine is determined by the location of its CG; or, if the machine is loaded, by the combined CG. Refer to Figure 4-3.

Figure 4-2

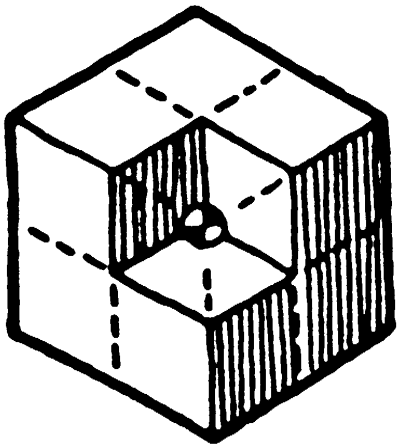
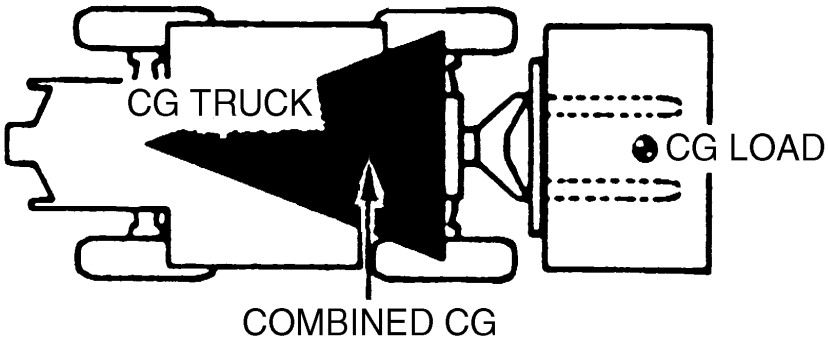
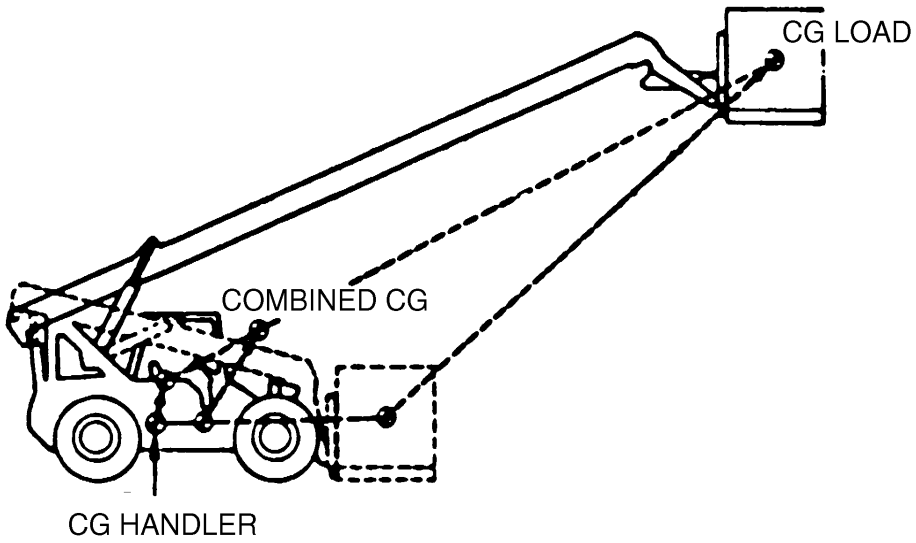


Figure 4-3



The Telescopic Material Handler has moving parts and, therefore, the machine CG and the combined CG move. They move forward and backward as the boom is extended and retracted. They also move forward and backward as the forks are tilted forward and backward and up and down as the boom moves up and down. Refer to Figure 4-4.

Figure 4-4



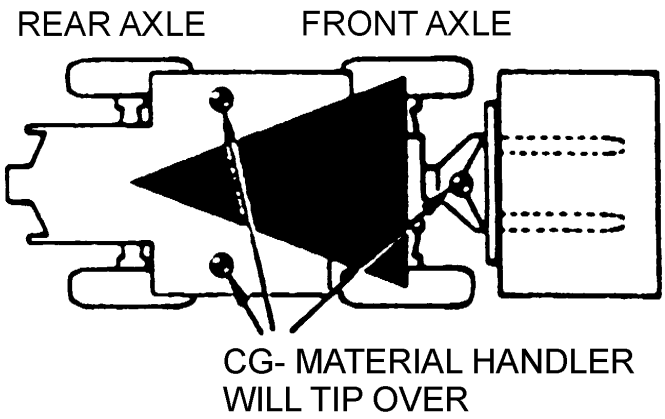
The combined center of gravity and, therefore, the stability of the loaded Telescopic Material Handler are affected by a number of factors:

- Size, weight, shape, and position of the load;
- Height to which the load is raised;
- Boom extension;
- Amount of forward and backward tilt;
- Tire pressure;
- Surface conditions where the machine is operating;
- Dynamic forces created when the machine is moving.

These dynamic forces are caused by factors such as acceleration, braking, turning, and operating on uneven surfaces or on an incline. These factors must also be considered when traveling with an unloaded Telescopic Material Handler, because AN UNLOADED MACHINE WILL TIP OVER TO THE SIDE EASIER than a loaded machine with its load in the lowered position.

In order for the Telescopic Material Handler to be stable (not tip over forward nor to the side), the combined CG must stay within the area represented by a triangle drawn between the front wheels and the pivot of the rear axle. Refer to Figure 4-5.

Figure 4-5



If the combined CG moves forward of the front axle, the machine will tip forward. If the combined CG moves outside of the line on either side of the stability base, the machine will tip to the side.

INSPECTION BEFORE OPERATION

Inspect the Telescopic Material Handler for the following items before use and every eight hours or daily. Unless otherwise specified below, detailed procedures for these checks are described in SECTION 5 - MAINTENANCE INSTRUCTIONS.

⚠ WARNING

Serious Personal Injury

Unexpected machine motion or moving parts can cut or crush.

Do not stand between tire and frame unless the engine is stopped, the key is removed from the key switch, the parking brake is ON, and the tires are blocked.

Failure to adhere to this warning could result in serious personal injury including death.

⚠ WARNING

Serious Personal Injury

Fuel is flammable. May cause severe injury or death.

Shut down the engine, extinguish all open flames, and do not smoke while filling the tank.

Always wipe up any spilled fuel. Failure to adhere to this warning could result in serious personal injury including death.

1. Check fuel level gauge (1, Figure 4-6). Fill fuel tank (1, Figure 4-7) if necessary. Be sure the tank is full at the end of the shift to prevent condensation.

Figure 4-6

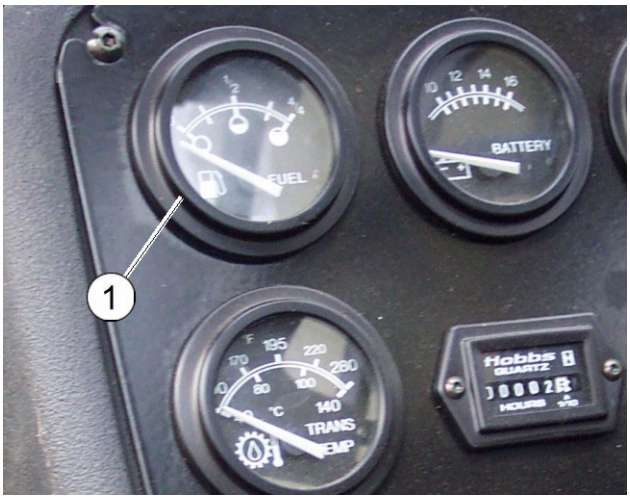
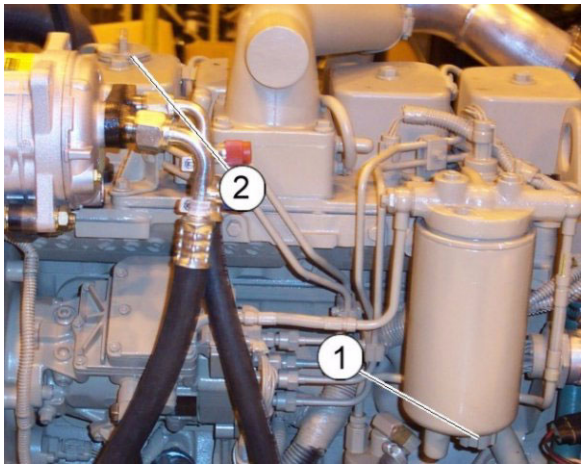


Figure 4-7

2. Drain water from the fuel/water separator by opening drain (1, Figure 4-8) until clear fuel is visible.

Figure 4-8

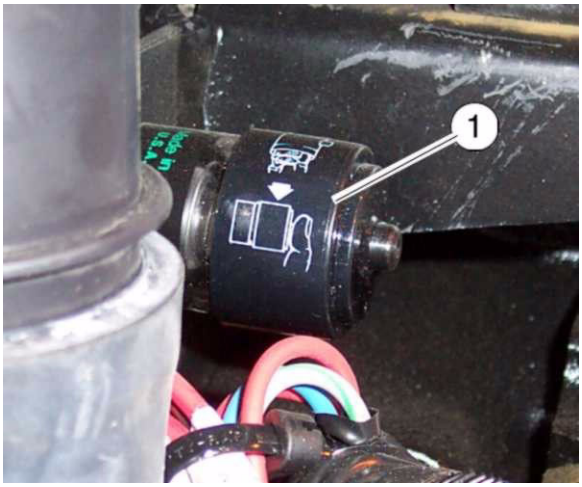


3. Check engine oil level on dip stick (1, Figure 4-9) and add oil as required at fill point (2, Figure 4-8). Refer to machine lube chart for oil type.

Figure 4-9

4. Check the air cleaner restriction indicator (1, Figure 4-10). Maintenance of the air cleaner is due when the red band shows on the restriction indicator. After servicing, press the indicator to reset it.

Figure 4-10



5. Check hydraulic tank sight gauge (1, Figure 4-11) and add fresh clean hydraulic oil at (2) as required. Refer to Section 8 for hydraulic oil specifications.

Figure 4-11

⚠ WARNING

Serious Personal Injury

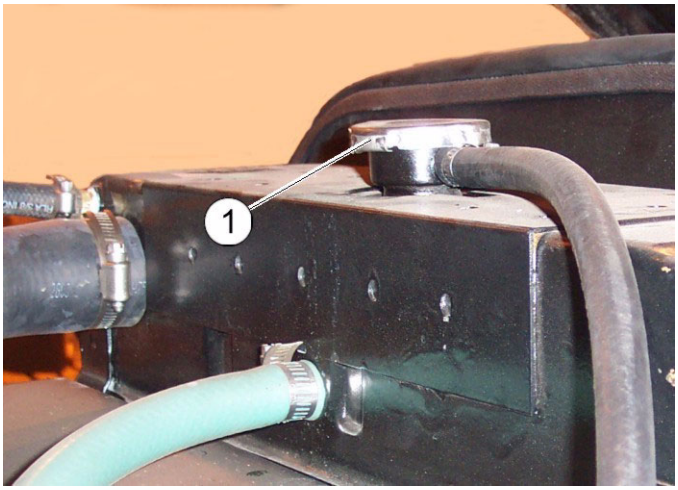
Injury can occur when removing the radiator cap. Steam or fluid escaping from the radiator can burn. Inhibitor contains alkali. Avoid contact with skin and eyes.

Always shutdown the engine and allow it to cool down before removing the radiator cap. Remove the cap slowly to relieve pressure. Avoid contact with steam or escaping fluid. Always wipe up any spilled fuel.

Failure to adhere to this warning could result in serious personal injury including death.

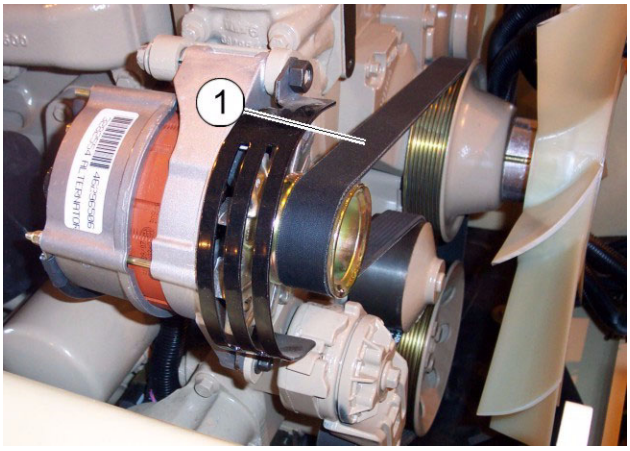
6. Check coolant level by removing radiator cap (1, Figure 4-12). The coolant level should be within 38 mm (1.5 in.) of the bottom of the cap when the cap is installed. If coolant level is low, add coolant to the correct level.

Figure 4-12



7. Check condition of the drive belt (1, Figure 4-13). Replace belt if cracked or worn.

Figure 4-13



8. Check for leaks from the engine, transmission, hydraulic system, brake system, and fuel system.

9. Check condition of wheels and tires.

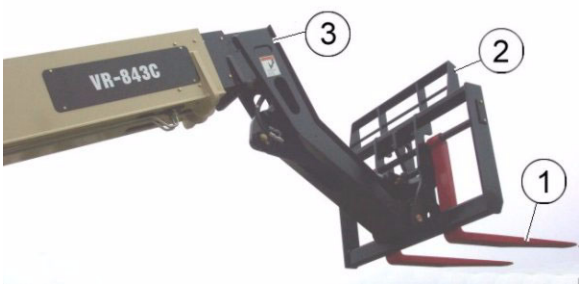
10. Check for correct pressure as noted on the tire pressure inflation chart.

11. Check operator restraint system (seat, belt, seat mounts, and floor plates). Check that mounting hardware is tight.

12. Condition of rollover protective structure (ROPS) cab.

13. Check condition of forks (1, Figure 4-14), carriage (2) and boom (3).

Figure 4-14



⚠ WARNING

Serious Personal Injury

Improper operation can be hazardous.

Report damage or faulty operation immediately. Do not operate damaged or defective Telescopic Material Handler. A Telescopic Material Handler will only do its job when it is in proper working order. If repairs are required, install a tag in the operator's area stating "DO NOT OPERATE" and remove the key from the key switch.

Failure to adhere to this warning could result in serious personal injury including death.

STARTING PROCEDURES

⚠ WARNING

Serious Personal Injury

Unexpected machine motion or moving parts can cut or crush.

Make sure that all personnel are away from the Telescopic Material Handler before the engine is started. Make sure that no one is standing between the wheels and the frame.

Failure to adhere to this warning could result in serious personal injury including death.

Make sure that the area around the Telescopic Material Handler is clear before starting the engine or making any operational checks. Be careful when making the checks. If the machine is stationary during a check, apply the parking brake and put the directional control lever in "Neutral". Proceed carefully.

⚠ WARNING

Serious Personal Injury

Seat belt and other OSHA-required safety equipment MUST be worn while operating the Telescopic Material Handler. Failure to use all safety equipment could result in serious injury or death.

If the Telescopic Material Handler starts to tip overtip over:

- **Do not jump -- Stay on the machine.**
- **Hold the steering wheel firmly.**
- **Brace feet.**
- **Lean forward and away from impact.**

Failure to adhere to this warning could result in serious personal injury including death.

Do not start or operate the Telescopic Material Handler, including any of its functions or attachments, from any place other than the operator's seat.

1. Sit in the operator's seat (1, Figure 4-15). Fasten seat belt (2), adjust seat position using lever (3) and adjust seat suspension with knob (4).

Figure 4-15

2. Make sure the parking brake is applied. Press Park Brake Switch (20, Figure 4-16).

Figure 4-16

3. Put the direction control lever (12, Figure 4-17) in the "Neutral" (N) position.

Figure 4-17

CAUTION

Equipment Damage

Starter may overheat if operated longer than 30 seconds.

If the engine fails to start, allow the starter to cool two (2) to three (3) minutes before trying again.

Starting fluids can severely damage the engine and void the engine warranty.

Do not use ether or other starting fluids or starting aids that have not been approved.

NOTE

This machine uses an electronic engine. Turn the ignition key to the On position and wait approximately two seconds before attempting to start the engine.

4. Turn the key (28, Figure 4-18) to ON, wait two seconds, then turn the key to START to engage the starter. When the engine starts, release the key to the ON position.

Figure 4-18

NOTE

If the engine does not start after four attempts, contact authorized service personnel.

PRE-OPERATION CHECKS

With the engine running, inspect the Telescopic Material Handler for the following items before use and every eight hours or daily. Unless otherwise specified below, detailed procedures for these checks are described in SECTION 5 - MAINTENANCE INSTRUCTIONS of this manual.

1. Check the operation of the horn, gauges, and indicator lights as described in SECTION 3 - OPERATING CONTROLS AND INSTRUMENTS.

2. Use Boom Control Lever (31, Figure 4-19) or (35, Figure 4-20) to slowly raise, lower, extend, and retract the boom several times without a load. Make sure that the boom moves smoothly in accordance with control inputs.

Figure 4-19

Figure 4-20

3. Check the operation of the powershift transmission.
4. Check the operation of the steering system.
5. Check the operation of the service brakes.
6. Check operation of the parking brake using the following procedure.

PARK BRAKE TEST PROCEDURE

The Park Brake Test Procedure must be performed every 10 hours or daily.

⚠ WARNING

Serious Personal Injury

Prior to performing this test, make sure the area within 15 m (50 feet) in front of and behind the machine is clear of persons and objects.

Be sure there is no load on the machine.

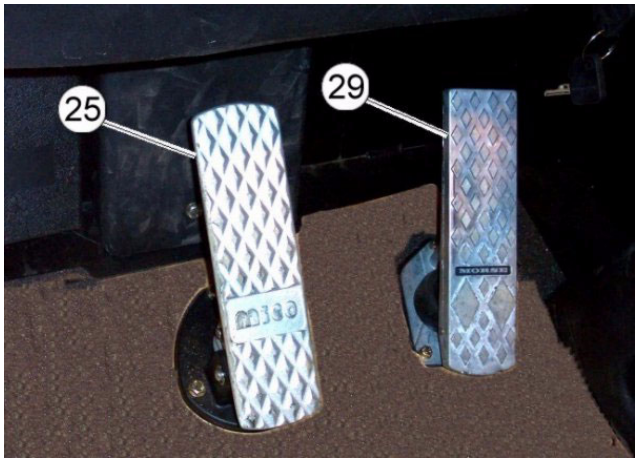
Failure to adhere to this warning could result in serious personal injury including death.

1. Be sure Park Brake Switch (20, Figure 4-21) is in the On position. The red indicator light on switch is illuminated.

Figure 4-21

2. Depress service brake pedal (25, Figure 4-22).

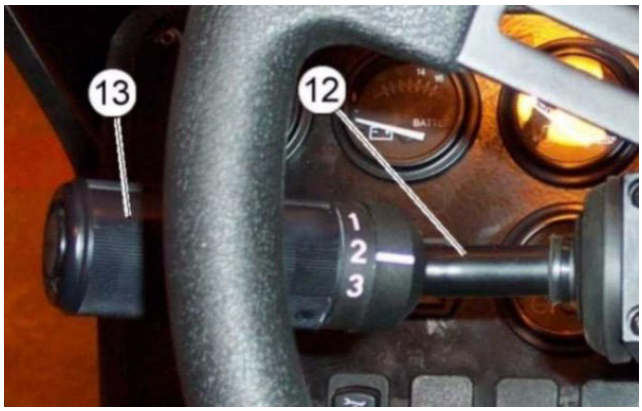
Figure 4-22



3. Press Park Brake Test switch (27, Figure 4-21).

4. Rotate transmission range selector (13, Figure 4-23) to "2" (2nd gear) position.

Figure 4-23



5. Lift and move the direction control lever (12, Figure 4-23) to the FWD (forward) position.

6. Depress the throttle pedal (29, Figure 4-22) completely to the floor.

7. Slowly remove pressure from service brake pedal (25, Figure 4-22).

8. If the machine does not move, the park brake performance is acceptable. If the machine moves forward, remove the machine from service and have the park brake serviced.

BASIC OPERATING PROCEDURES

⚠ WARNING

Serious Personal Injury

Improper operation can be hazardous.

There are a number of operations that, if not performed carefully, can cause the Telescopic Material Handler to tip. If you have not read SECTION 1 - SAFETY PRECAUTIONS AND GUIDELINES of this manual, do so NOW. If you have not read the VARIABLE REACH MATERIAL HANDLER SAFETY MANUAL FOR OPERATORS AND MECHANICS, do so NOW. As you study the following information about how to properly operate a Telescopic Material Handler, remember the WARNINGS.

Failure to adhere to this warning could result in serious personal injury including death.

Many new operators make the mistake of thinking that driving a Telescopic Material Handler is the same as driving an automobile. The procedures are not the same. It is true that some operating procedures are as simple and obvious as driving the family automobile (e.g., Look where you are going, start and stop smoothly, etc.). However, a Telescopic Material Handler is a special machine designed to do a much different job from an automobile. Because of the areas in which a machine operates, and its other operating characteristics (for example: coordinated or crab steering, and frame leveling), every operator must receive special training.

THE VR-843C TELESCOPIC MATERIAL HANDLER IS INTENDED FOR USE BY AUTHORIZED AND TRAINED OPERATORS ONLY. This statement means that the operator MUST be trained to drive the machine and must thoroughly understand the procedures for operation.

OSHA regulations require that a trained and qualified person operate the Telescopic Material Handler. A trained and qualified person experienced in the operation of this machine MUST guide a new operator through driving and load-handling operations until the new operator is trained and qualified to meet OSHA guidelines.

OPERATE THE TELESCOPIC MATERIAL HANDLER ONLY IN AREAS THAT HAVE BEEN APPROVED FOR ITS OPERATION.

Certain areas contain hazardous flammable gases, liquid, dust, fibers, or other materials. Machines that are operated in these areas must have special approval. These areas are designated to show the type of approval required for operation in the area. A Telescopic Material Handler is not normally operated in these restricted areas. If it must be operated in a restricted area, it must have some modifications and special approval. Contact your Ingersoll Rand distributor if this requirement is necessary.

⚠ DANGER

Serious Personal Injury or death

Electrocution Hazard. Boom contact with power lines will result in serious injury or death.

Do not operate a Telescopic Material Handler over or near electric power lines.

Failure to adhere to this warning could result in serious personal injury including death.

The Telescopic Material Handler is not insulated. Do not operate any part of the machine within 3.05 m (10 ft.) of an electric power line.

⚠ WARNING

Serious Personal Injury

This Telescopic Material Handler is designed and intended for handling materials. A Telescopic Material Handler is not designed to lift people.

Do not use a Telescopic Material Handler to lift people.

Failure to adhere to this warning could result in serious personal injury including death.

DO NOT CARRY RIDERS. A Telescopic Material Handler is built for only one person—the operator. It is dangerous for anyone to ride on the forks or anywhere else on the machine.

If a Telescopic Material Handler must be moved with an elevator or crane, make sure the lifting device has the capacity to lift the machine. The weight of your machine can be found on its nameplate.

Drive carefully, observe traffic rules, and be in full control of the Telescopic Material Handler at all times. Be completely familiar with all the driving and load-handling techniques contained in this manual **and** the **Variable Reach Material Handler Safety Manual for Operators and Mechanics**.

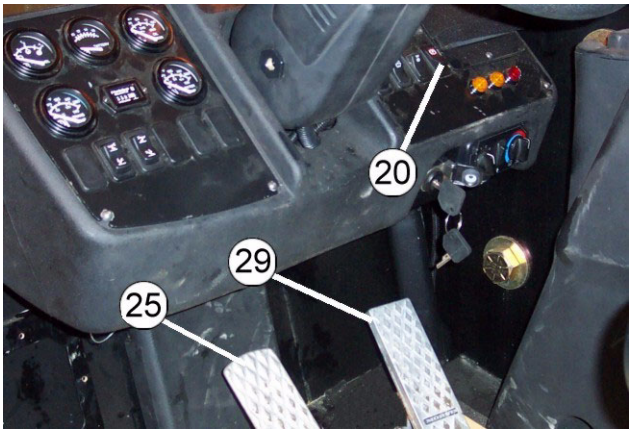
The VR-843C Telescopic Material Handler has a three speed transmission. The transmission range selector switch (13, Figure 4-24) is located in the end of the direction control lever (12). The three speed ranges are (HIGH [3], INTERMEDIATE [2], and LOW [1]). The direction control lever has three positions: "Forward" (FWD), "Neutral" (N), and "Reverse" (REV).

Figure 4-24

Lift the direction control lever and move the lever to either the "Forward" (FWD) or Reverse" (REV) position, as desired. Release the lever.

Check the area around the Telescopic Material Handler. Apply the service brakes (25, Figure 4-25) and release the parking brake by placing the park brake switch (20, Figure 4-25) in the release position. The indicator light will turn off. To move the unit, release the brake and push down on the accelerator pedal (29, Figure 4-25). A loaded or unloaded handler can usually begin to move with the transmission range selector in the "2" position. Start in the "1" position when the handler is on a grade or in mud. After the unit is moving, rotate the transmission range selector to increase speed or select a lower range.

Figure 4-25



CAUTION

Equipment Damage

DO NOT move the direction control lever to the opposite position (FWD to REV or REV to FWD) when the Telescopic Material Handler is moving.

Do not use ether or other starting fluids or starting aids that have not been approved.

To change directions, first stop the machine with the brake pedal (25, Figure 4-25). Select the speed range (13, Figure 4-24), then move the direction control lever (12, Figure 4-24) to the opposite direction. Look in the direction of travel. Release the brake and accelerate by pushing on the accelerator pedal (25, Figure 4-25).

STEERING AND TURNING

⚠ WARNING

Serious Personal Injury

TRAVEL SLOWLY WHEN TURNING. Telescopic material handlers can tip over even at very slow speeds.

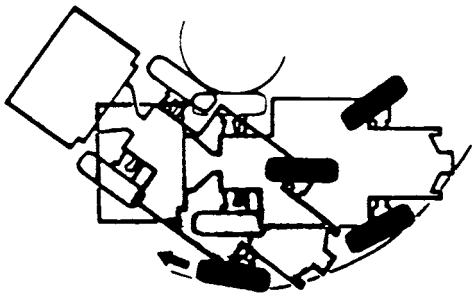
Failure to adhere to this warning could result in serious personal injury including death.

NOTICE

Telescopic material handlers can tip over even at very slow speeds. The combination of speed and the sharpness of a turn can cause the machine to tip over. A machine is less stable when the forks are elevated, with or without a load. Most operators can understand the need to be careful when handling loads, but some operators do not realize that a tip-over can occur with an empty machine because similar dynamic forces are present. In fact, the machine will actually tip over more easily when empty than when loaded with the load lowered. Rearward tilt of the carriage and load, off-center loads, and uneven or soft ground will aggravate these conditions.

Telescopic material handlers are designed to work in a relatively small space. Because of their design, they can turn more sharply than some other vehicles. An operator must be aware of tail swing and always check to make sure the tail swing area is clear before turning. Refer to Figure 4-26. Failure to observe the tail swing area when making a turn can cause serious injury or death.

Figure 4-26



⚠ WARNING

Serious Personal Injury

Keep a safe distance from the edge of docks, ramps, platforms, and other similar working surfaces. Watch the tail swing. Remember that when traveling in the forward direction and the steering wheel is turned to move the Telescopic Material Handler away from the edge of the dock, the rear can swing toward the edge. This action can cause the machine to fall off the dock.

Keep a safe distance from the edges of excavations so that the ground does not suddenly collapse and tip over the Telescopic Material Handler. Be careful when operating on slopes when the ground is soft or muddy so that the machine does not suddenly slide and tip over.

Failure to adhere to this warning could result in serious personal injury including death.

⚠ WARNING

Serious Personal Injury

If the Telescopic Material Handler starts to tip over:

- **DO NOT JUMP; stay on the machine.**
- **HOLD firmly to the steering wheel.**
- **BRACE your feet.**
- **LEAN FORWARD and away from the impact.**

Failure to adhere to this warning could result in serious personal injury including death.

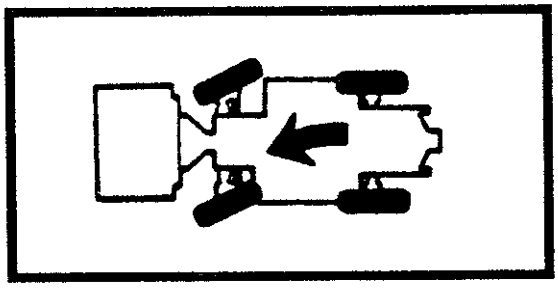
When possible, keep both hands on the steering wheel. During most loading or unloading operations, the operator steers with the left hand. The right hand is used to operate the control levers.

The VR-843C machine has three modes of steering that are selectable using 3 position steering selector switch (24, Figure 4-27).

Figure 4-27

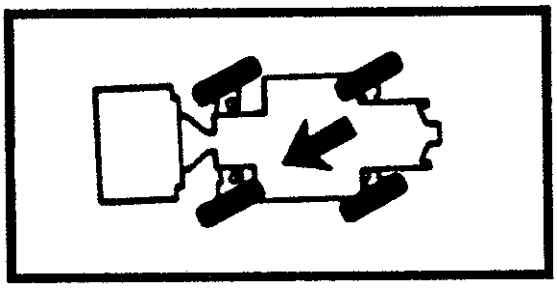
1. **Front Wheel Only (2 wheel)** (steering mode selector is in the center position). This mode is normally used only when traveling on roads. Refer to Figure 4-28.

Figure 4-28



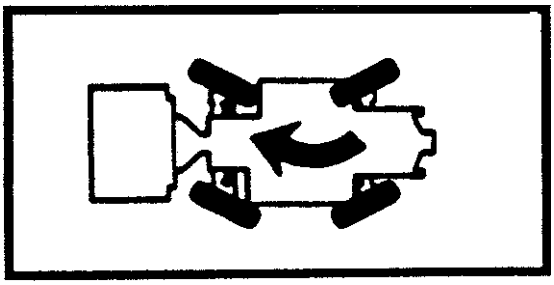
2. **Crab** (all wheels track in the same direction; upper portion of the steering mode selector switch depressed). Crab steering is used to move away from buildings or escape from wheel ruts. Refer to Figure 4-29.

Figure 4-29



3. **Coordinated (4 wheel)** (rear wheels turn the opposite of the front wheels; lower portion of steering mode selector switch depressed). Coordinated steering provides the greatest maneuverability and is the mode of steering most often used. Refer to Figure 4-30.

Figure 4-30



CAUTION

Equipment Damage

The machine must be completely stopped before the steering mode is changed. Also, the wheels must be aligned for straight travel before another mode is selected.

HANDLING AND MOVING LOADS

⚠ WARNING

Serious Personal Injury

Improper operation cab be hazardous.

If you have not read SECTION 1 - SAFETY PRECAUTIONS AND GUIDELINES, do so NOW. If you have not read the Safety Manual for Operators and Mechanics, do so NOW. As you study the following information regarding the proper handling and moving of loads, remember the warnings.

Failure to adhere to this warning could result in serious personal injury including death.

⚠ WARNING

Serious Personal Injury

Only attachments which have been fully tested for stablity and have had Rated Capacity Charts established per ASME B56.6 by Ingersoll Rand company are approved for use on Telescopic Material Handlers. The use of non-approved attachments may cause machine instability and tipover, which may result in severe injury or death to operators or bystanders.

Approved attachments are only those supplied by Ingersoll Rand which are accompanied by applicable Rated Capacity Charts for the specific attachment and machine model.

Failure to adhere to this warning could result in serious personal injury including death.

1. Handle only loads within the rated capacity as shown on the Rated Capacity Chart(s) mounted on the Telescopic Material Handler. MAKE SURE THE RATED CAPACITY CHART YOU ARE USING CORRESPONDS TO THE BOOM ATTACHMENT FITTED TO THE MACHINE. This rated capacity represents the maximum load that can be lifted for the boom extensions when the machine is on a hard, level surface. However, such factors as weak floors, uneven terrain, soft ground, special load-handling attachments, or loads having a high center of gravity can mean that the safe working load is less than the rated capacity. When such conditions exist, the operator must reduce the load so that the Telescopic Material Handler will remain stable.

⚠ WARNING

Serious Personal Injury

Do not use the frame leveling function when the load is raised. Level the frame before the load is lifted. If the Telescopic Material Handler is equipped with a tilt carriage, level the frame before using the tilt carriage adjustment.

Move the frame leveling controls (32 & 33, Figure 4-31 or 35, Figure 4-32) slowly and smoothly. Rapid starting and stopping of frame motion can cause the Telescopic Material Handler to tip. The risk of tipping increases as the boom is raised and extended.

Failure to adhere to this warning could result in serious personal injury including death.

Figure 4-31

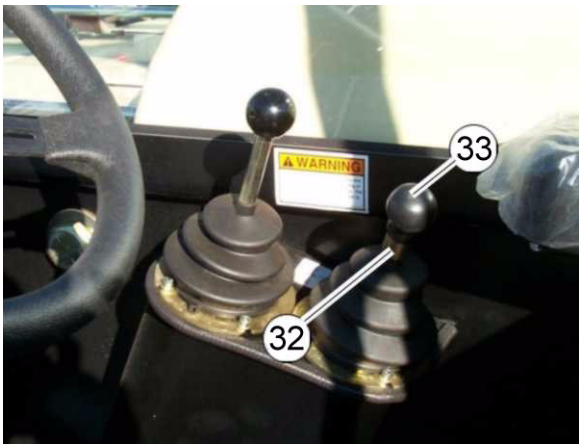


Figure 4-32

2. Inspect the load to be lifted. DO NOT raise the boom unless the frame is level. Lift the load and lower the load only on stable level ground. If a load must be handled several times, put stacking blocks under the loads.

3. Handle only stable loads. A load can have unstable items that can easily shift and fall on someone. DO NOT handle a load if ANY part of it is likely to fall.

4. If a suspended load must be lifted, DO NOT permit it to swing freely. Use a tether to control its movement. Start and stop the machine slowly and make turns carefully.

5. Position each load the same distance from the center of the carriage. This action will help center the load on the carriage. Set the forks as far apart as possible for maximum support of the load. Center the weight of the load between the forks. Otherwise, the load can fall from the forks when you turn a corner or hit a bump. An off-center load will increase the possibility of the Telescopic Material Handler tipping over to the side. Make sure that the floor or surface can hold the weight of the Telescopic Material Handler and the load. The weight of your machine can be found on the machine's nameplate.

LIFTING, LOWERING, AND TILTING

The boom extension, lift, and tilt functions are controlled by the boom control levers (32 and 33, Figure 4-31) or (35, Figure 4-32) if machine has the single lever control option.

The speed of the hydraulic functions is controlled by the position of the control levers and the speed of the engine. The farther the hand lever is moved from the "Neutral" (N) position, the faster the speed of the hydraulic function.

DO NOT lift or hit anything that can fall on the operator or another person. The Telescopic Material Handler is equipped with a ROPS and load backrest extension to give reasonable protection to the operator from falling objects, but cannot protect against every possible impact. Do not hit objects such as stacked material so that it can become dislodged and fall. The operator must be careful when working near stacks or objects that can fall.

⚠ WARNING

Serious Personal Injury

Keep yourself and others away from the lift mechanism. Never permit anyone under or on the forks. Never put head, arms, hands, or legs through the boom mechanism nor near the forks or carriage. This rule applies not only to the operator, but also a helper. A helper must not be near the load or lift mechanism when the operator is attempting to handle a load. The lift mechanism has moving parts with close clearances that can cause serious injury or death.

Make sure the operation of the boom and the Rated Capacity Chart are understood before a load is lifted.

Failure to adhere to this warning could result in serious personal injury including death.

1. Avoid fast starts. Sudden movement can cause the Telescopic Material Handler to tip or cause the loss of the load from the forks. People can be hurt or killed and material can be damaged. Approach the load carefully. Make sure the machine is perpendicular to the load. Raise the forks to the height to engage the load.

2. Move forward slowly until the forks are in position under the load. When lifting a load, the forks must support at least two-thirds (2/3) of the length of the load. Refer to Figure 4-33 Make sure that the load is centered between the forks, and that the forks are centered on the carriage. The center of gravity must be as close to the load backrest and the center of the carriage as possible. Make sure the forks do not extend past the load so the loads or equipment that are behind the load being lifted are not damaged. Refer to Figure 4-34.

Figure 4-33

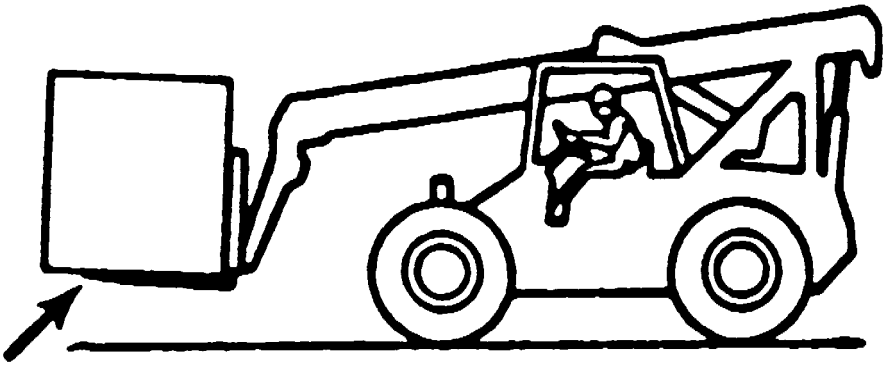
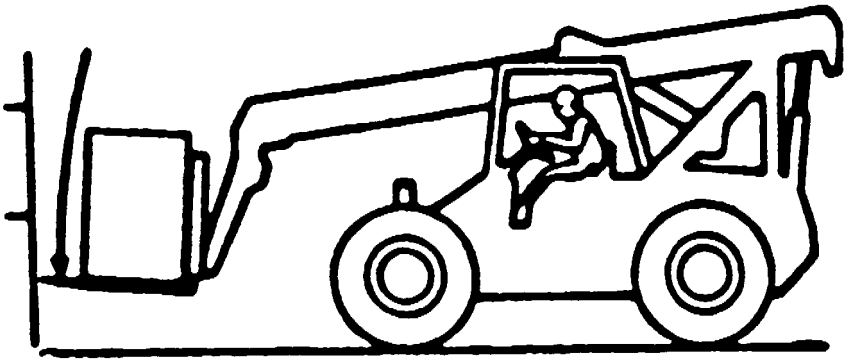


Figure 4-34



If the forks are longer than the load, move the forks under the load so that the tips of the forks do not extend beyond the load. Lift the load from the surface. Move backward a few inches, then lower the load onto the surface and inch forward to engage the load against the carriage. Tilt the forks backward just far enough to lift the load from the surface. When the boom is raised from the surface level, the tips of the forks move in an arc.

Make sure there is enough clearance so that the forks or the load do not hit loads or equipment that are behind the load being lifted.

⚠ WARNING

Serious Personal Injury

The forks on this Telescopic Material Handler have a range of tilt. Do not tilt the forks to cause a loss of the load.

Failure to adhere to this warning could result in serious personal injury including death.

3. Always use a helper if you cannot clearly see the point where the load will be stacked. Move the Telescopic Material Handler into position and make sure the area is clear. Lower the load onto the stack or the surface. Tilt the forks to the horizontal position to disengage the load. Move the machine carefully away from the load to disengage the forks.

⚠ WARNING

Serious Personal Injury

Be careful when placing a load at a high elevation. When the lift height increases, your depth perception decreases and the area you can see clearly decreases. Placing a load at a high elevation may require a helper to guide you.

Failure to adhere to this warning could result in serious personal injury including death.

4. When stacking a load at a high elevation, make sure that everyone is away from the area where the load can tip or fall. Move the machine as close to the load point as possible with the load lowered. Apply the Park Brake and place the Direction Control in Neutral. Use the frame leveling function as necessary before the load is raised.

   Slowly and carefully raise the load. Keep the forks tilted backward a small amount so that load cannot slide from the forks. Never tilt the forks forward unless the load is over the stack point and ready to be disengaged.

   If there is any indication, during the lift movement, the load or the machine are not stable, STOP immediately. Retract the boom and lower the load and decrease the size of the load. Move the machine to a more stable and level position. Make sure the machine has the capacity to lift the load.

⚠ WARNING

Serious Personal Injury

The Telescopic Material Handler becomes less stable as the load is lifted higher.

Failure to adhere to this warning could result in serious personal injury including death.

5. When the load being lifted approaches the stack height, slow to a minimum lift speed. Lift the load a small amount above the stack height.

⚠ WARNING

Serious Personal Injury

Do not extend the lift cylinder to the end of its stroke at a high lift speed. The sudden stop can cause the load to fall or the machine to tip.

Make sure the stack point can safely hold the load. Failure to adhere to this warning could result in serious personal injury including death.

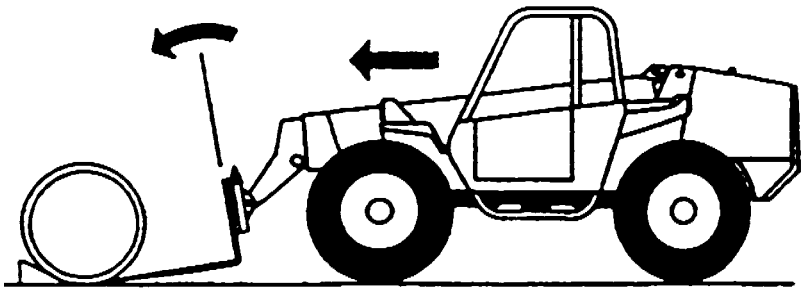
6. When the load is above the stack point, carefully move the load over the stack point. Gently lower the load until the weight is removed from the forks. Do not make a downward force on the stack with the forks or boom when lowering the load. Do not drag the forks on the surface under the load. Tilt the forks so that they are approximately level and parallel to the load surface so that they can be easily disengaged from the load.

Check that floor, support beams, scaffolding, and load surface can support the load before you completely disengage from the load. If there is a problem with the stack point, lift the load, tilt the load backward a small amount, retract the boom, and lower the load to the ground.

After the load is correctly stacked, move the machine slowly backward to disengage the forks. Retract the boom and lower the forks to a traveling height before moving the machine away from the area.

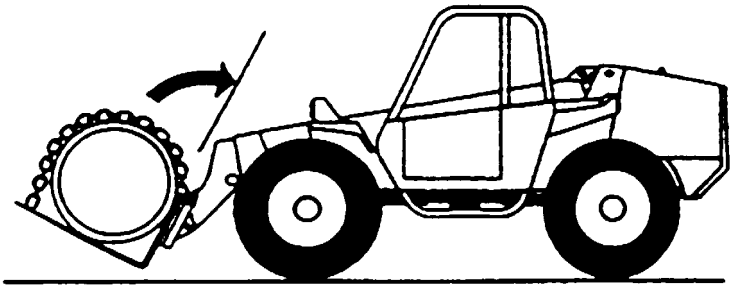
When lifting round objects, use a block behind the object. Tilt the carriage forward so that the forks can slide along the floor under the object to be lifted. Refer to Figure 4-35.

Figure 4-35



Tilt the carriage fully backward to help keep the load on the forks. Refer to Figure 4-36. Use additional caution when carrying drums, reels, cylinders, and other round objects. Use a tether if necessary to control the load. Watch the clearances when the loads are very long, high or wide.

Figure 4-36



NOTE

Not every load can be lifted using only the forks of the Telescopic Material Handler. Some loads require a special attachment.

TRAVELING

When traveling with the load lowered, keep the load against the carriage and the forks tilted backward. This position will help keep the load on the forks and give better forward and side stability.

Travel with the lift mechanism raised only enough to clear the ground or obstacles. When the carriage or load is in an elevated position, the stability of the machine is reduced. A Telescopic Material Handler without a load can be more likely to tip sideways, especially in a turn, than one with a load carried in the lowered position.

⚠ WARNING

Serious Personal Injury

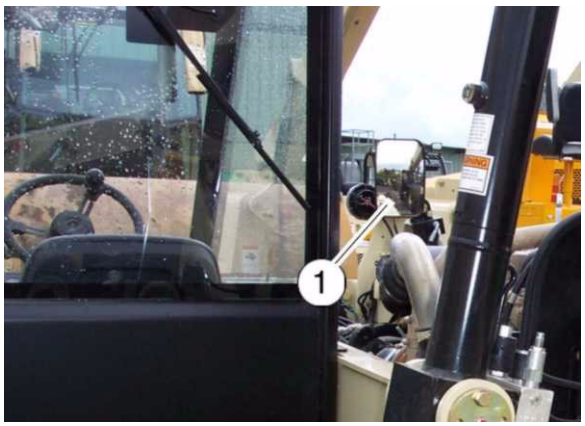
When the boom is in the lowered position, the area on the right side of the material handler is difficult to observe. The Telescopic Material Handler has a mirror (1, Figure 4-37) for viewing the area where the boom can cause interference with the operator's view. This mirror is an aid to the operator, but is NOT a driving mirror and must not be used as a driving mirror when operating in Reverse. ALWAYS look in the direction of travel to avoid personal injury or property damage.

Failure to adhere to this warning could result in serious personal injury including death.

For better visibility with large loads, travel with the load trailing, but always keep a proper lookout in the direction of travel. If the Telescopic Material Handler must travel in a direction where there is an obstruction to visibility, another person may be required for a lookout.

When traveling up or down a grade with a loaded Telescopic Material Handler, the load should be kept upgrade to maintain control. When operating an unloaded machine on a steep grade, the rear end must be kept upgrade.

Figure 4-37



Watch for pedestrians at all times. Do not drive up to anyone standing in front of an object. Use extra care at crossroads, doorways, and other locations where pedestrians can step into the path of travel of the machine. Slow down when approaching blind intersections or turns and sound the horn. The horn can alert pedestrians that there is a vehicle in the area and to be alert to possible danger.

Whenever the machine is moving, keep arms, legs, etc. inside the operator's compartment. Arms and legs outside the machine can be injured when passing obstructions.

Do not pass another vehicle traveling in the same direction at intersections, blind spots, or at other dangerous locations.

Avoid bumps, holes, soft ground, slick spots, and loose materials that can cause the Telescopic Material Handler to swerve or tip. If such areas cannot be avoided, go slowly. Always make sure you pick the smoothest route for your Telescopic Material Handler.

Do not indulge in stunt driving or horseplay.

Stay away from the edge of the road. Keep the wheels of the Telescopic Material Handler—particularly the steering wheels—on the roadway. If the wheels are allowed to run off the edge of the travel surface onto soft ground, the machine can tip over.

Under all travel conditions, operate the machine at a speed that will permit it to be brought to a stop in a safe manner.

Check the condition of the driving surface of all docks. Make sure the dock floor will hold the weight of the Telescopic Material Handler and the load.

Make sure the dock ramp is secured, in good condition, and of the correct capacity.

ATTACHMENTS

⚠ WARNING

Serious Personal Injury

Only attachments which have been fully tested for stability and have had Rated Capacity Charts established per ASME B56.6 by Ingersoll Rand Company are approved for use on Telescopic Material Handlers. The use of non-approved attachments may cause machine instability and tip-over, which may result in severe injury or death to operators or bystanders.

Approved attachments are only those supplied by Ingersoll Rand which are accompanied by applicable Rated Capacity Charts for the specific attachment and machine model.

Failure to adhere to this warning could result in serious personal injury including death.

If an attachment or special equipment is installed on the Telescopic Material Handler, make sure that the operating instructions are available and understood before operating the attachment.

PARKING

Never leave the Telescopic Material Handler in a condition from which it can cause damage or injury. When parking the machine, perform the following procedures:

1. Stop the machine and apply the parking brake.

⚠ WARNING

Serious Personal Injury

Do not leave the machine unattended with a suspended load.

Failure to adhere to this warning could result in serious personal injury including death.

2. Fully lower the boom and forks. Tilt the carriage forward until the tips of the forks touch the ground.

3. If the engine has been working hard, let the engine idle for a few minutes before it is stopped. This procedure is very important when operating a turbocharged engine. Turn the key switch to OFF to stop the engine.

4. Remove the ignition key. Lock the cab doors.

TOWING

If the machine has power:

NOTICE

The Telescopic Material Handler cannot be towed from one job site to another. This procedure is only for use when the machine must be removed from mud or other places where it cannot move under its own power.

1. The engine of the machine must operate. The steering and brakes cannot be operated if the engine is not running. Be sure to release the park brake before attempting to tow the machine.

2. Use extra care if the traction conditions are bad or the machine is on a grade. Bad traction conditions can cause the machine or the towing vehicle to slide. Grades can require additional distance to stop the machine.

3. Make sure that the tow chain has the capacity to do the job; the weight of your Telescopic Material Handler can be found on the machine nameplate. Carefully fasten the tow chain around the axle of the machine. Make sure that the tow chain is fastened so that the chain will not cause damage to the machine or the towing vehicle.

4. An operator must be on the Telescopic Material Handler to operate the steering and brakes while it is being towed.

If the machine has no power:

⚠ WARNING

Serious Personal Injury

Machine runaway condition could occur.

Always chock the wheels of the disabled machine or hitch to towing vehicle to prevent accidental movement while preparing the machine for towing. This is especially important if the failure occurs on an incline.

Failure to adhere to this warning could result in serious personal injury including death.

To tow the machine a maximum of 300 meters (984 feet):

1. Shutdown the engine.
2. Chock the wheels.

CAUTION

Do not attempt to tow the machine with the transmission engaged.

Towing with the transmission will result in damage to the transmission.

3. Disconnect the drive shafts from each axle.
4. Attach each drive shaft to the frame using straps or chains to support the shafts and prevent them from dragging when the machine is moved.

NOTE

The park brake is located on the rear axle.

5. Attach the machine to the tow vehicle using a tow bar.

⚠ WARNING

Serious Personal Injury

Service brakes will not operate if engine is not running.

Machine can move after park brake is released. Be sure the machine is securely attached to the tow vehicle before removing chocks from wheels. Be sure chain is fastened to the axle in a way that no damage will occur to the axle or machine.

Failure to adhere to this warning could result in serious personal injury including death.

6. Release the park brake as follows:

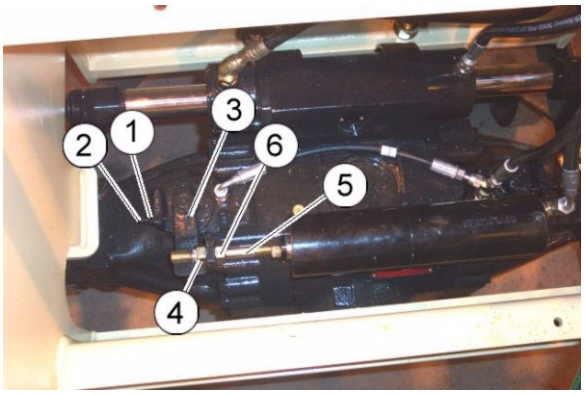
   a. Loosen lock nut (1, Figure 4-38).

   b. Turn set screw (2, Figure 4-38) until it contacts parking brake arm (3).

   c. Remove cylinder rod nut (4, Figure 4-38).

   d. Loosen set-screw (2, Figure 4-38) to allow the park brake arm to swing free of the cylinder rod (5) and release the park brake.

Figure 4-38



7. Remove the chocks from wheels and tow the machine.

8. Be sure to engage the park brake after the machine has been moved to the desired location. To engage the park brake (refer to Figure 4-38):

   a. Position arm (3, Figure 4-38) onto cylinder rod (5).

   b. Tighten set-screw (2, Figure 4-38) enough to allow nut (4) to be installed onto rod (5).

   c. Tighten nut (4, Figure 4-38) until park brake arm (3) is tight against rod lock nut (6).

   d. Back out set-screw (2, Figure 4-38) and tighten lock nut (1).

9. Reconnect the drive shafts.

STABILIZERS

Stabilizers (1, Figure 4-39) are available as optional equipment on the VR-843C Material Handler. The stabilizers should be used whenever you are picking up or placing a load with the boom raised.

Figure 4-39

CAUTION

Stabilizers are used to stabilize the machine when lifting and placing a load only. They are not outriggers and are not designed to lift the machine.

Always raise the stabilizers completely before driving the machine. Failure to have the stabilizers in the upright position may result in damage to the machine.

To Operate Stabilizers:

1. Move the machine to the area where the load is to be picked or placed.

⚠ WARNING

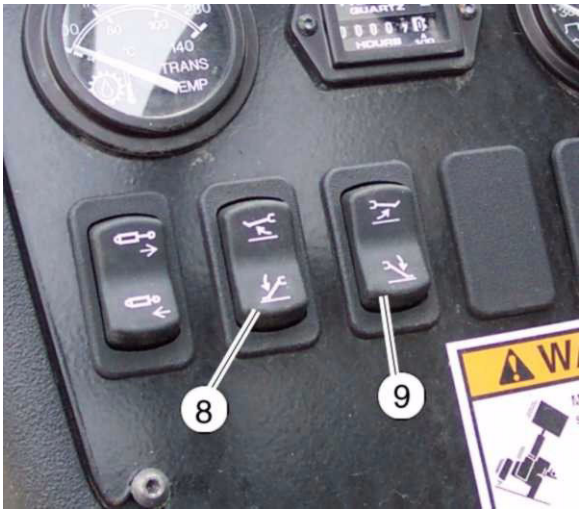
Serious Personal Injury

Stabilizers can crush. Be sure no one is near the stabilizers when they are lowered.

Failure to adhere to this warning could result in serious personal injury including death.

2. Check to be sure no personnel are near the stabilizers. Then, press and hold Left Stabilizer switch (8, Figure 4-40) to lower the left stabilizer. Press and hold Right Stabilizer switch (9, Figure 4-40) to lower the right stabilizer.

Figure 4-40



3. Raise the boom and pick up or place the load as required.

4. Lower the boom and raise the stabilizers to the full upright position.

TRANSPORTATION

⚠ WARNING

Serious Personal Injury

A loose Telescopic Material Handler can shift or fall while being transported.

Tie down the machine securely before moving the hauling vehicle or transporter.

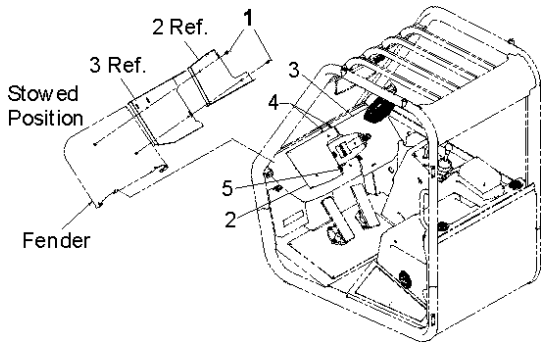
Failure to adhere to this warning could result in serious personal injury including death.

Telescopic material handlers are not designed for use on public roads and must be transported to job sites on a trailer or flatbed truck. Ensure that the trailer or flatbed truck has enough capacity to carry the machine; the weight of your machine can be found on the nameplate. Also verify the ramps can hold the machine and the ramps and trailer surfaces are clean so that the machine cannot slide. Use blocks and tiedowns to ensure the machine cannot fall from the trailer. For further details, see "TRANSPORTING AND HAULING" in **SECTION 1 - SAFETY PRECAUTIONS AND GUIDELINES.**

VANDAL PROTECTION COVER - OPTION

The vandal protection cover (Figure 4-41) is used to prevent unauthorized persons from accessing the control console. Install the cover over the console panel and secure using a padlock. When not in use, the cover is stowed on the front fender.

Figure 4-41



1. Remove wing nuts (1, Figure 4-41) and vandal cover plates (2 and 3) from their stowed position on the fender.

2. Install right hand vandal cover plate (3, Figure 4-41) over the locating pins (4) and lock plate (5).

3. Install left hand vandal cover plate (2, Figure 4-41) over the locating pins (4) and lock plate (5).

4. Secure cover plates with pad locks through lock plates (4, Figure 4-41).

OPTIONS

The following options affect the load capacity and CG of the VR-843C. When using an attachment, make sure to review and apply the correct Load Chart for the attachment. See LOAD CAPACITY CHARTS on Page 1-11 for additional details.

⚠ WARNING

Serious Personal Injury

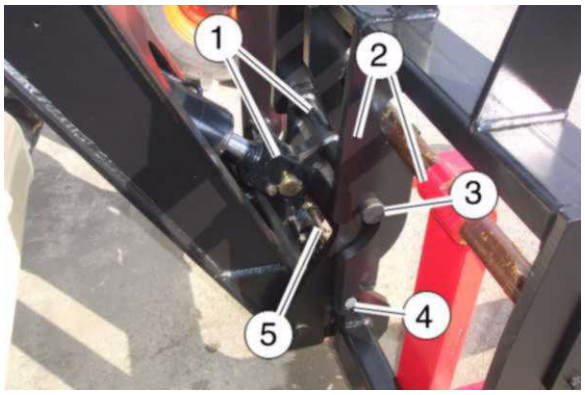
Your Telescopic Material Handler may be equipped with several different Rated Capacity Charts to accommodate different boom attachments. Make sure that the Rated Capacity Chart you are using corresponds to the boom attachment fitted to the machine at the moment.

Failure to adhere to this warning could result in serious personal injury including death.

QUICK ATTACHMENT APRON

The Quick Attachment Apron (1, Figure 4-42) is a one piece adaptor that bolts to the boom to allow quick, toolless mounting and dismounting of the various boom (2) options. The attachment is positioned onto apron pins (3), the boom raised allowing the apron mounted locking pins (4) to be extended into the attachment by handle (5).

Figure 4-42



To install attachments:

1. Insure the attachment locking pin control handle (3, Figure 4-42) is in the raised position with the locking pins (4) retracted.
2. Position the attachment on level ground.
3. Locate the boom such that the apron mounted lift pins (3, Figure 4-42) can be raised to engage the attachment (2) and lift it clear of the ground.
4. Raise the boom allowing the attachment to swing into position aligning the holes in the attachment with the locking pins (4, Figure 4-42).
5. Shut down the engine.
6. Lower handle (5, Figure 4-42) extending the pins (4) into attachment (2).

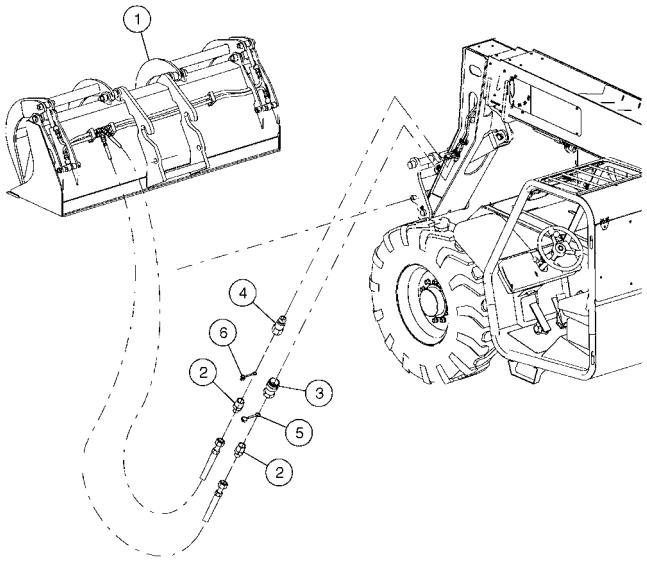
To remove attachments:

1. Position the boom so the attachment (2, Figure 4-42) is resting on level ground.
2. Shut down engine.
3. Raise handle (5, Figure 4-42) retracting pins (4) from attachment (2).
4. Start engine.
5. Lower boom to clear attachment and back machine to clear attachment.

SCRAP GRAPPLE BUCKET -- OPTION

The Scrap Grapple Bucket mounts and connects as shown in Figure 4-43. The figure is keyed to the table below.

Figure 4-43

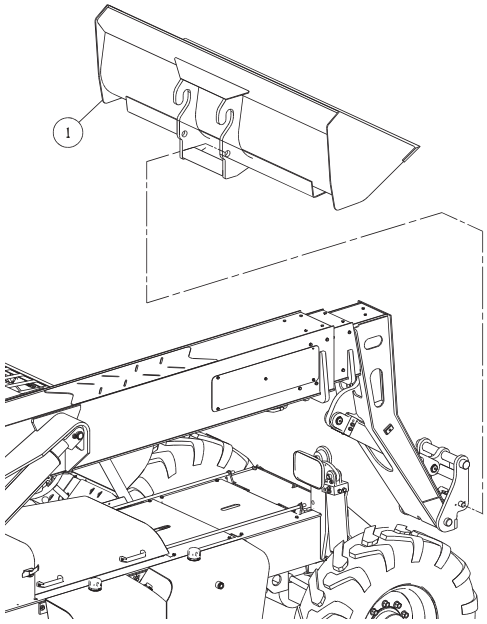


ITEM	DESCRIPTION
1	Scrap Grapple Bucket
2	Adapter
3	Coupler
4	Quick Disconnect Nipple
5	Quick Connect Couple Dust Cap
6	Quick Connect Nipple Dust Cap

BUCKET LOADER INSTALLATION — OPTION

The Bucket Loader (1, Figure 4-44) mounts as shown in Figure 4-44.

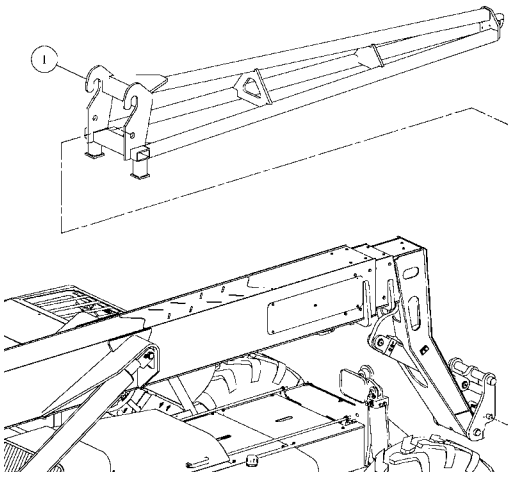
Figure 4-44



TRUSS BOOM INSTALLATION — OPTION

The Truss Boom (1, Figure 4-45) mounts as shown in Figure 4-45.

Figure 4-45



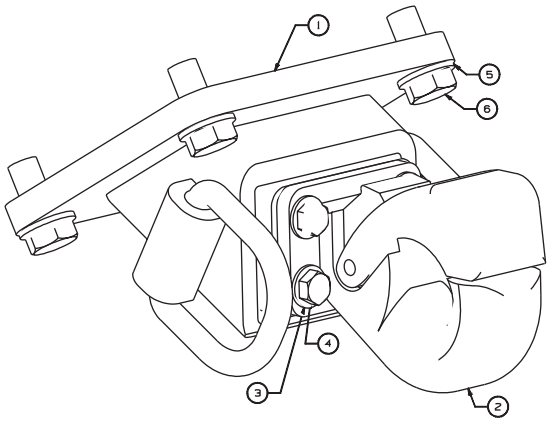
PINTLE HOOK INSTALLATION — OPTION

The Pintle Hook (1, Figure 4-46) mounts and connects to a tapped plate located at the rear of the VR-843C as shown in Figure 4-46.

NOTE

Apply Loctite 271 (Red) for all pintle hook fasteners. Torque the 3/4 in. H.H.C.S. to 610 N-m (450 lb.-ft.) Torque the 1/2 in. H.H.C.S. to 176 N-m (130 lb.-ft.).

Figure 4-46



ITEM	DESCRIPTION
1	Pintle Hook Plate
2	Pintle Hook
3	Washer
4	H.H.C.S.
5	Washer
6	H.H.C.S.

DRY WALL HANDLER INSTALLATION — OPTION

Refer to Figure 4-47 for the following procedure:

1. Slide forks toward the center of the carriage.

2. With the carriage vertical, lower the carriage so that the forks are on the ground. There should be no load on the load arm.

3. Unbolt the cover plate over the load arm on the opposite side of the carriage from the end where installing the DH (Drywall Handler) assembly. Slide the load arm out of the carriage allowing enough room to slide the DH assembly over the load arm.

4. Slide the load arm back into the carriage slot and reattach the cover plate. Repeat Step 3 for the opposite side.

5. To deploy the DH assemblies, rotate the DH assembly forward and slide the DH assembly towards the end plate of the carriage.

6. To engage the load arm float stop, hold the stop so that it goes into the slot in the end plate while hooking the DH assembly slot over the carriage end plate (RHS — view shown in Figure 4-47)

7. To allow the load arm to float:

   - Rotate the float stop towards the front of the carriage while hooking the DH assembly slot over the carriage end plate.

   - Turn in the lower wing screw. If aligned properly, the wing screw will engage the catch plate and the float stop (when in use).

8. To place the fork on top of the DH assembly:

   - Rotate or tilt the carriage as far forward as the tilt cylinder will allow.

   - Lift the tip of the fork if necessary and slide the fork outward until it rests above the DH assembly.

9. To stow the DH assemblies:

   - Rotate or tilt the carriage as far forward as the tilt cylinder will allow.

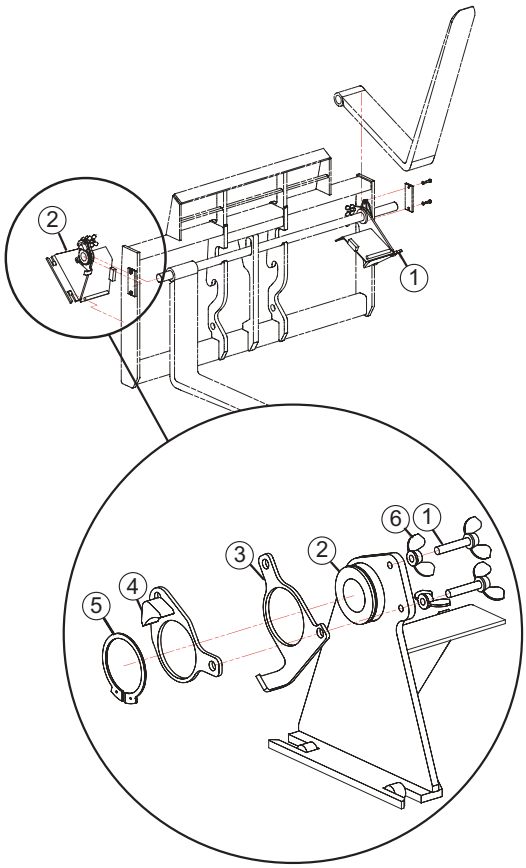
   - Lift the tip of the fork if necessary and slide the fork in toward the center of the carriage. Loosen the lower wing screw so that it disengages the catch plate and the float stop (when in use).

   - Rotate the DH assembly forward to disengage slot from the carriage end plate. Slide the DH assembly towards the center of the carriage so that it can be rotated behind the carriage. Slide the DH assembly towards the end plate so that the slot hooks over the carriage end plate.

10. To allow the load arm to float:

- Rotate the float stop towards the front of the carriage end plate. Turn in the upper wing screw. If aligned properly, the wing screw will engage the catch plate and the float stop (when in use).
- If installed properly, the catch plate should prevent the DH assembly from sliding off of the carriage end plate when the carriage is tilted backwards.

Figure 4-47

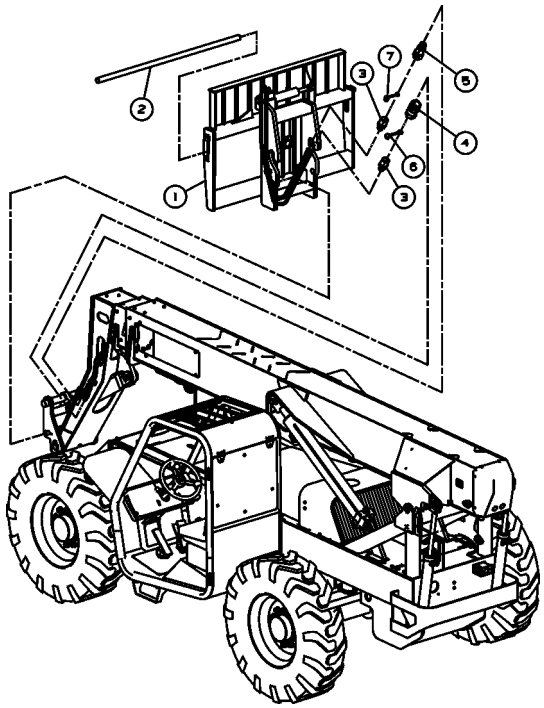


ITEM	DESCRIPTION
1	Wing Screw M12 x 1.75 x 60 mm (Qty 4) *NOTE: Apply Never Seize before installing.*
2	Left Hand Fork Rest (Right Hand Similar)
3	Left Hand Plate Catch (Right Hand Similar)
4	Left Hand Float Stop (Right HandSimilar)
5	Retaining Ring
6	Wing Nut (Qty 2) M12 x 1.75 x 60 mm

SIDE TILT CARRIAGE — OPTION

The Side Tilt Carriage allows carriage to tilt to either side. The carriage mounts and connects as shown in Figure 4-48.

Figure 4-48

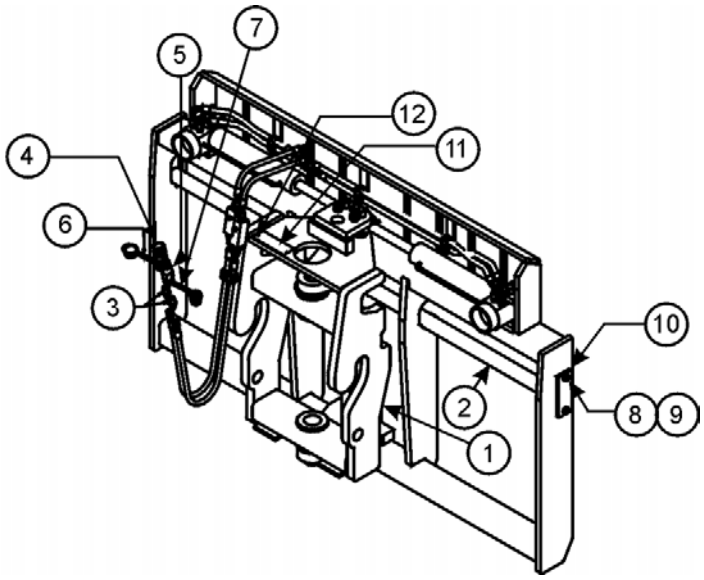


ITEM	DESCRIPTION
1	S/T QA Carriage (1219 mm [48 in.], 1524 mm [60 in.], or 1829 mm [72 in.])
2	Not Used with VR series
3	Adapter (Qty 2)
4	Coupler (Quick Disconnect)
5	Nipple (Quick Disconnect)
6	Dust Cap (used with item 4)
7	Dust Cap (used with item 5)

SWING CARRIAGE -- OPTION

The Swing Carriage allows carriage to swivel to either side. The carriage mounts and connects as shown in Figure 4-49.

Figure 4-49



ITEM	DESCRIPTION
1	Swing Carriage Assembly
2	Load Arm
3	Adapter
4	Coupler (Quick Disconnect)
5	Nipple (Quick Disconnect)
6	Dust Cap (used with item 4)
7	Dust Cap (used with item 5)
8	Hex Head Cap Screw
9	Lockwasher
10	Plate
11	Load Chart / VR Attachment Chart
12	Metal Tack

SECTION 5 - MAINTENANCE INSTRUCTIONS

⚠ WARNING

Serious Personal Injury

Unexpected machine motion or moving parts can cut or crush. Apply the parking brake and shut down the engine before working on the machine.

Failure to adhere to this warning could result in serious personal injury including death.

⚠ WARNING

Serious Personal Injury

Improper maintenance can be hazardous. Read and understand Section 1, SAFETY before you perform any maintenance, service or repairs.

Failure to adhere to this warning could result in serious personal injury including death.

GENERAL MAINTENANCE INFORMATION

To prevent minor irregularities from developing into serious conditions, several other services or checks are recommended for the same intervals as the periodic lubrication. The purpose of these services or checks is to ensure the uninterrupted and safe operation of the unit by revealing the need for adjustment caused by normal wear.

Prior to conducting any maintenance work, ensure that the following instructions are observed:

1. The machine should be parked on firm level ground.
2. Ensure engine is shut down and allowed to cool.
3. Disconnect battery and cover exposed terminals before working on the machine's electrical system.
4. Stop engine and allow hydraulic oil pressures to fall before working on the hydraulic hose installations.
5. The tires are chocked to prevent machine movement.

6. Thoroughly wash all fittings, caps, plugs, etc. with nonflammable, nontoxic cleaning solution before servicing, to prevent dirt from entering while performing the service.

Handling Fluids and Oil, Fuel Filters

1. When draining fluids, ensure that adequate sealable containers are available and that every care is taken to prevent spillage.

2. Always ensure waste fluids are disposed of in an environmentally safe manner.

3. Always ensure that used filters are stored in secure containers and disposed of in an environmentally safe manner.

MAINTENANCE SCHEDULE

The maintenance chart in this section shows those items that require regular service and the interval at which service should be performed. A regular service program should be geared to the items listed under each interval. These intervals are based on average operating conditions. In the event of extremely severe, dusty or wet operating condition, more frequent maintenance than specified may be necessary.

Table 5-1 : Maintenance Schedule

Function	Specification	Page
INITIAL MAINTENANCE		
Powershift Transmission Oil Filter		Page 5-5
Wheel Nut Tightness	599 N-m (442 lb.-ft.)	Page 5-6
Tighten Loose Bolted Connections		Page 5-6
10 HOUR OR DAILY MAINTENANCE		
Check Engine Oil Level		Page 5-7
Check Coolant Level, Radiator, and Hoses		Page 5-8
Check Transmission Fluid Level		Page 5-9
Check Air Cleaner Connections and Ducts for Leaks		Page 5-10
Check Air Cleaner Restriction		Page 5-10
Cleaning and Replacing the Air Cleaner Element		Page 5-11
Air Cleaner Vacuator Valve		Page 5-14
Check Hydraulic Oil Level		Page 5-15
Fuel/Water Separator		Page 5-15
Fill Fuel Tank		Page 5-16
Check Park Brake		Page 5-17
Check Tire Pressure and Condition		Page 5-18
Check Seat Belt and Mounting Hardware		Page 5-19

Function	Specification	Page
50 HOUR OR WEEKLY MAINTENANCE		
Grease Chain Sheave Bearings	MPG-EP 2 grease	Page 5-19
Check Lug Nut Torque	599 N-m (442 lb.-ft.)	Page 5-21
Check Oil Level in Axle Differential Planetary Wheel Ends		Page 5-22
Check Oil Level in Axle Differentials		Page 5-23
Grease Axle Pivot Bearings	MPG-EP 2 grease	Page 5-24
Grease Axle King Pins	MPG-EP 2 grease	Page 5-24
Grease Fork Pins	MPG-EP 2 grease	Page 5-25
Grease Frame Level Pivot Bushings and Stabilizer Pivot Bushings	MPG-EP 2 grease	Page 5-25
Grease Boom Pivot and Boom Cylinders	MPG-EP 2 grease	Page 5-26
Clean Heater/A-C Filter		Page 5-26
250 HOUR OR QUARTERLY MAINTENANCE		
Change Engine Oil and Filter		Page 5-27
Change Fuel Filters		Page 5-29
Change In Line Filter		Page 5-29
Clean Hydraulic Tank Breather		Page 5-30
Torque Axle Mounting Bolts	597 N-m (440 lb.-ft.)	Page 5-30
Inspect Chains		Page 5-31
Check Boom Wear Pad Clearances		Page 5-33
Adjust Boom Chains and Hoses		Page 5-36
1000 HOUR OR ANNUAL MAINTENANCE		
Change Hydraulic Oil Filter		Page 5-39
Change Hydraulic Oil and Clean Suction Strainer		Page 5-40
Change Axle Differential Oil		Page 5-41
Change Axle Planetary Oil		Page 5-43
Engine Coolant		Page 5-44
Change Transmission Oil		Page 5-46
Change Transmission Oil Filter		Page 5-48

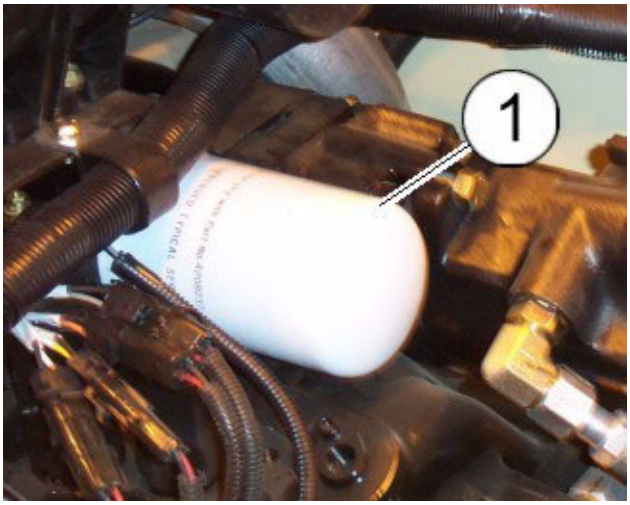
INITIAL MAINTENANCE SCHEDULE

Any new equipment requires an initial modification of the maintenance schedule to properly break in the various systems and component units. Perform the onetime initial break-in maintenance tasks below IN ADDITION TO the periodic maintenance tasks described in the following sections. After each initial break-in maintenance task has been performed, the regular service intervals should be followed.

Powershift Transmission Oil Filter

Change the transmission oil filter (1, Figure 5-1) after the first 50 hours of operation and again after the first 100 hours on a new or rebuilt transmission. For the procedure, refer to **1000 HOUR OR ANNUAL MAINTENANCE.**

Figure 5-1



Wheel Nut Tightness

Tighten the wheel nuts (1, Figure 5-2) every ten hours of operation and every ten hours of operation after any wheel has been removed and reinstalled. After the check has been made approximately eight or more times, it will be evident that they have seated and will not require further checks. For the procedures, refer to **50 HOUR OR WEEKLY MAINTENANCE.**

Figure 5-2

Tighten Loose Bolted Connections

If any fasteners are found to be loose during daily inspections, ensure that they are properly tightened. Refer to Section 9 - Torque Specifications for required torque against bolt sizes and grades.

Always replace self-locking nuts if they have been loosened.

10 HOUR OR DAILY ROUTINE MAINTENANCE

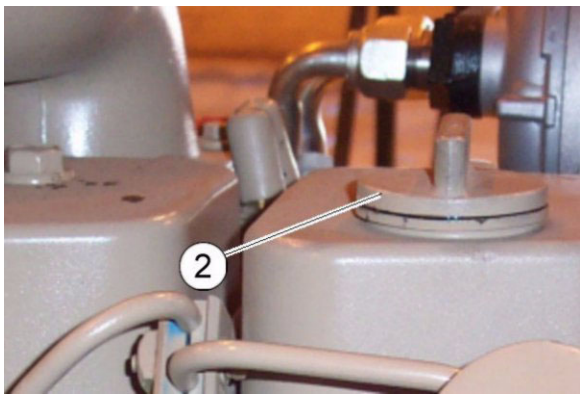
Check Engine Oil Level

1. Park the machine on a stable level surface and shut down the engine.
2. Release latch (1, Figure 5-3) and slide the engine cover (2) to the right.

Figure 5-3

3. Wait approximately 15 minutes after the engine has been shut off. Pull out dip stick (1, Figure 5-4) and wipe it off with a clean, dry, lint-free cloth; then, place the dip stick back in the hole until it stops.

Figure 5-4



4. Pull the dipstick (1, Figure 5-4) out again and check the oil level on the dipstick. The oil level must be between the Full mark and Low mark. If low, add oil through the fill area (2). Refer to Section 8 - Fuel and Lubricant Specifications.

Check Coolant Level, Radiator, and Hoses

⚠ WARNING

Serious Personal Injury

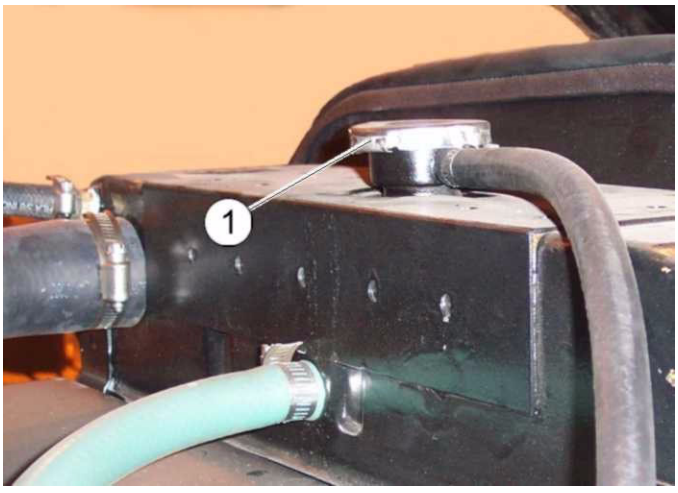
Injury can occur when removing the radiator cap. Steam or fluid escaping from the radiator can burn. Inhibitor contains alkali. Avoid contact with skin and eyes.

Always shut down the engine and allow it to cool down before removing the radiator cap. Remove the cap slowly to relieve pressure. Avoid contact with steam or escaping fluid.

Failure to adhere to this warning could result in serious personal injury including death.

1. Check coolant level by removing radiator cap (1, Figure 5-5). The coolant level should be within 38 mm (1.5 in.) of the bottom of the cap when the cap is installed. If coolant level is low, add coolant to the correct level.

Figure 5-5



2. Check radiator fins and clean as necessary using compressed air or water.

3. Check radiator hoses for leaks or damage.

Check Transmission Fluid Level

The transmission oil level must be checked daily and be maintained to the FULL mark on the dipstick. To check the transmission oil, the engine must be idling and the transmission must be at operating temperature.

⚠ WARNING

Serious Personal Injury

Unexpected machine motion or moving parts can cut or crush.

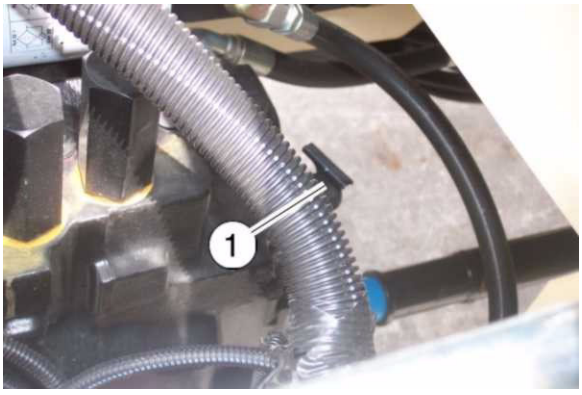
Before checking the transmission oil level:

- **Place the Direction Control Lever in Neutral.**
- **Apply the Park Brake.**

Failure to adhere to this warning could result in serious personal injury including death.

1. Position the machine on a firm level surface, place directional control lever in Neutral, and apply the park brake.
2. Start the engine and allow the transmission to reach normal operating temperature, between 82 – 93° C (180 – 240° F).
3. Release latch (1, Figure 5-3) and slide the engine cover (2) all the way to the right.
4. Pull out dipstick (1, Figure 5-6) and wipe with a clean, dry, lint-free cloth. Fully insert the dipstick back into the tube and then pull it out and check the oil level.

Figure 5-6



5. If transmission oil level is low, add recommended transmission oil through the dipstick tube to bring level to “FULL” mark on the dipstick. Refer to Section 8 - Fuel and Lubricant Specifications.

6. Place the dipstick in the tube; then close and latch the engine cover.

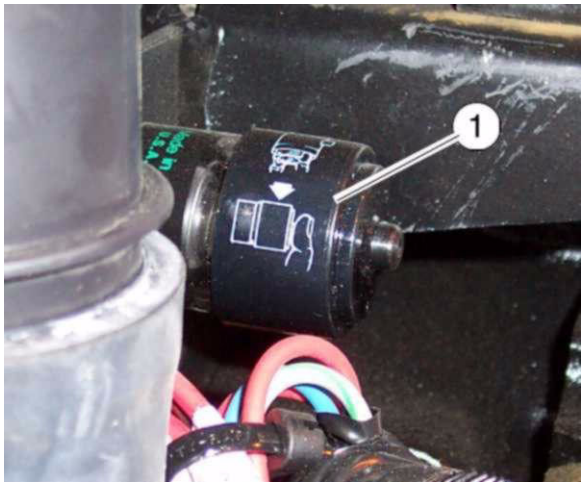
Check Air Cleaner Connections and Ducts for Leaks

Ensure that all connections between the air cleaner and engine are tight and sealed.

Check Air Cleaner Restriction

Maintenance of the air cleaner is due when the red band shows on the restriction indicator (1, Figure 5-7). After servicing, press the indicator to reset it.

Figure 5-7



CAUTION

Equipment Damage.

Raw, unfiltered air can cause engine damage.

Never service the air cleaner while the engine is running.

NOTE

Dust that gets past the air cleaner can often be detected by looking for dust streaks on the air transfer tubing or just inside the intake manifold inlet.

Cleaning and Replacing the Air Cleaner Element

The VR-843C Telescopic Material Handler uses a two-stage air filter system. This system consists of a primary filter element and a secondary safety element.

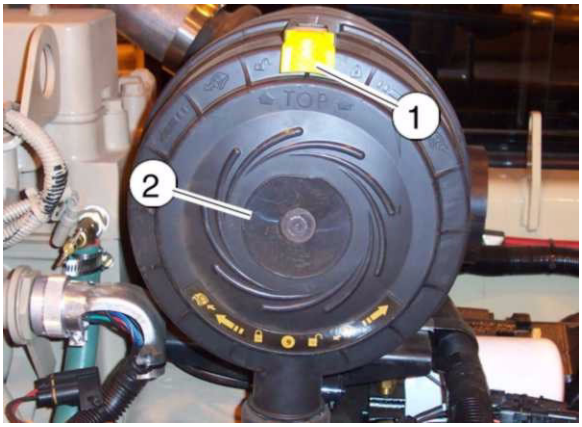
The primary element may be replaced or it may be cleaned. The safety element cannot be cleaned and must be replaced only.

NOTE

For maximum engine protection, replace the safety element after every third cleaning of the primary element or annually.

1. Pull outward on latch (1, Figure 5-8), then rotate dust cover (2) counterclockwise and pull outward to remove.

Figure 5-8

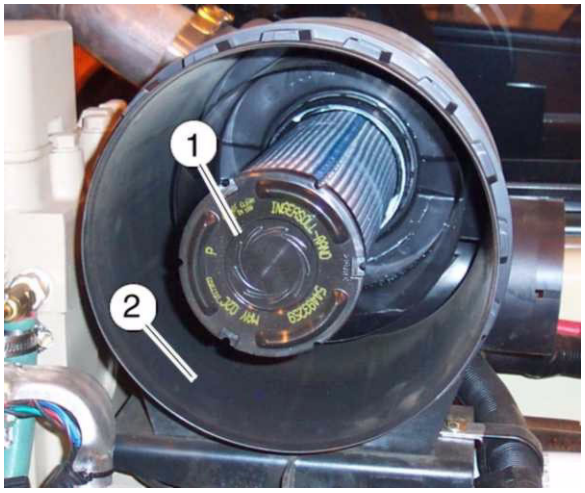


2. Remove the primary air cleaner element (1, Figure 5-9).

Figure 5-9

3. Remove safety element (1, Figure 5-10) and clean the inside of the housing (2) and dust cover (2, Figure 5-8) with a damp cloth.

Figure 5-10



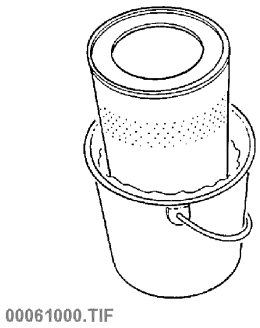
4. Clean the element as follows:

   - To dry clean the element (Figure 5-11), carefully direct compressed air, not to exceed 500 kPa (73 psi), at an angle to the inside surface of the element.

Figure 5-11

- To wet clean the element (Figure 5-12), use lukewarm water mixed with a commercially available detergent. After cleaning, the element must be thoroughly dried before using.

Figure 5-12



NOTE

The element should be replaced after it has been cleaned six times or annually, whichever comes first.

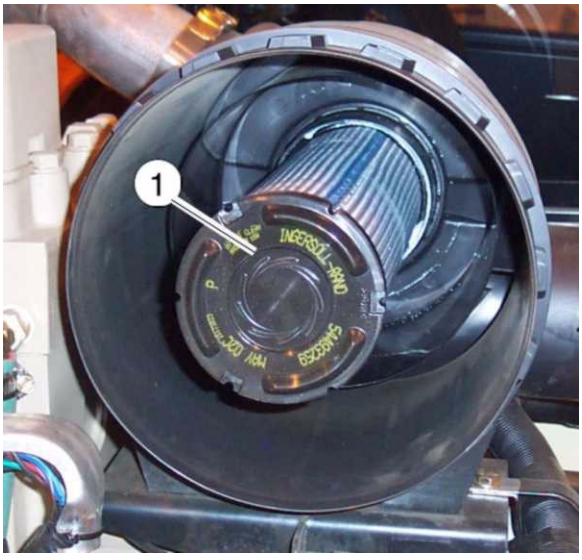
5. Examine the new or newly cleaned element (1, Figure 5-9), for torn or damaged pleats, bent end covers or liners, or damaged gaskets. Replace as necessary.

6. Replace the safety element if:

   - Examination reveals tears or perforations in the safety element.
   - The primary element has been replaced three times or element has been in service one year.

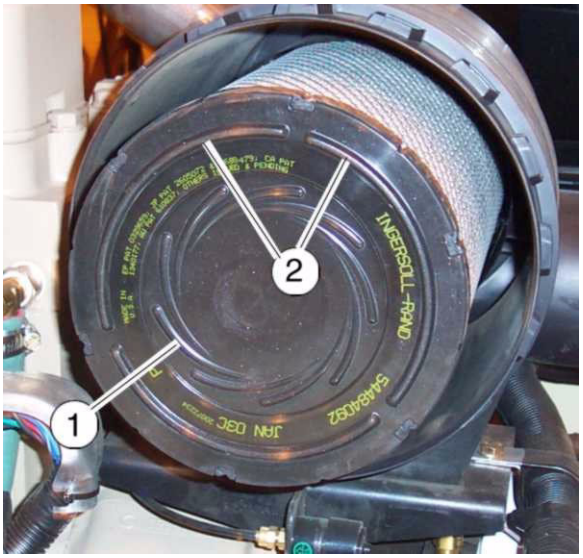
7. Install the safety element (1, Figure 5-13) into the housing.

Figure 5-13



8. Carefully install the cleaned or replacement primary element (1, Figure 5-14).

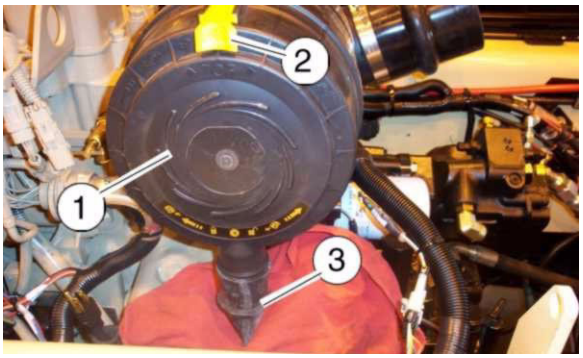
Figure 5-14



9. Apply a light coat of petroleum jelly to the raised ridge (2, Figure 5-14) on the face of the primary element (1).

10. Align the cover (1, Figure 5-15), rotate clockwise to align yellow tab (2) and push tab to lock cover.

Figure 5-15



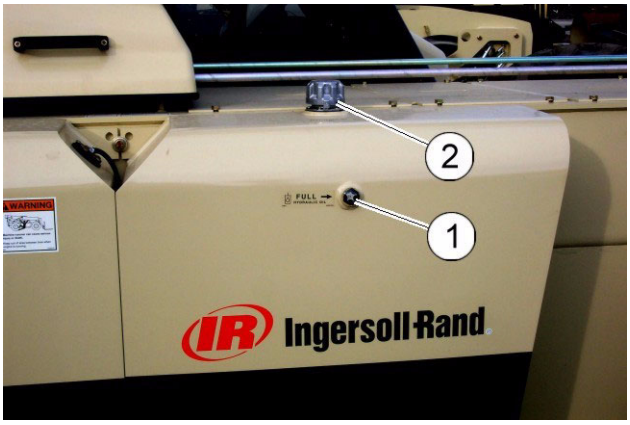
Air Cleaner Vacuator Valve

Check the air cleaner vacuator valve (3, Figure 5-15) to see that it is clean and that the rubber is not cracked.

Hydraulic Oil Level

Check the hydraulic tank sight gauge (1, Figure 5-15) and add fresh clean hydraulic oil at (2) as required. Refer to Section 8 - Fuel and Lubricant Specifications.

Figure 5-16



Fuel/Water Separator

⚠ WARNING

Serious Personal Injury

Fuel is flammable. May cause serious injury or death.

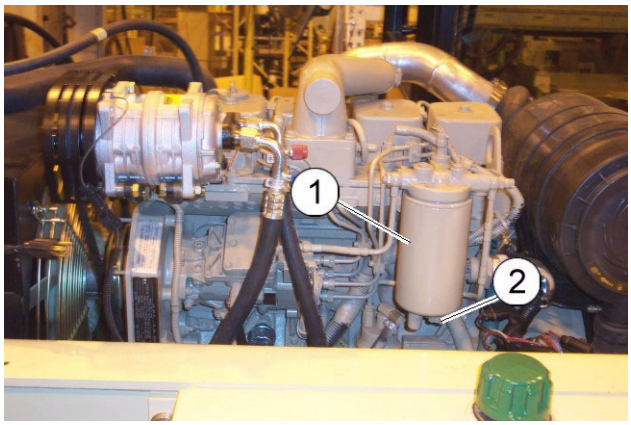
Shut down engine, extinguish all open flames, and do not smoke while draining fuel/water separator.

Always wipe up spilled fuel.

Failure to adhere to this warning could result in serious personal injury including death.

Drain water from fuel/water separator (1, Figure 5-17) as follows:

Figure 5-17



1. Open drain cock (2, Figure 5-17) and allow approximately one cup of fuel and any collected water and sediment to drain into a container.

2. Close the drain and dispose of the collected liquid in an environmentally safe manner.

Fill Fuel Tank

NOTICE

Do not allow fuel tank to become completely empty.

If tank is allowed to empty completely, the entire fuel system will require bleeding.

1. Check fuel gauge (1, Figure 5-18). Be sure fuel tank is full at the end of the shift to prevent condensation.

Figure 5-18

⚠ WARNING

Serious Personal Injury

Fuel is flammable. May cause serious injury or death.

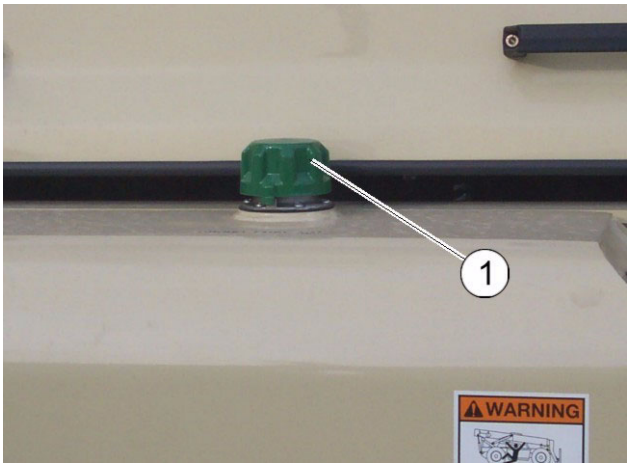
Shut down engine, extinguish all open flames, and do not smoke while draining fuel/water separator.

Always wipe up spilled fuel.

Failure to adhere to this warning could result in serious personal injury including death.

2. Add fuel at filler (1, Figure 5-19) as required. Refer to Section 8 - Fuel and Lubricant Specifications. Always fill tank at the end of the shift to prevent condensation from forming.

Figure 5-19



Check Park Brake

Check Park Brake operation every 10 hours or daily. See Park Brake Test Procedure in Section 4.

Check Tire Pressure and Condition

⚠ WARNING

Serious Personal Injury

Air pressure in tires can cause tire and wheel parts to explode and cause serious injury or death. Tires must be removed and air pressure added in a safety cage if the air pressure is less than 80 percent of the correct air pressure.

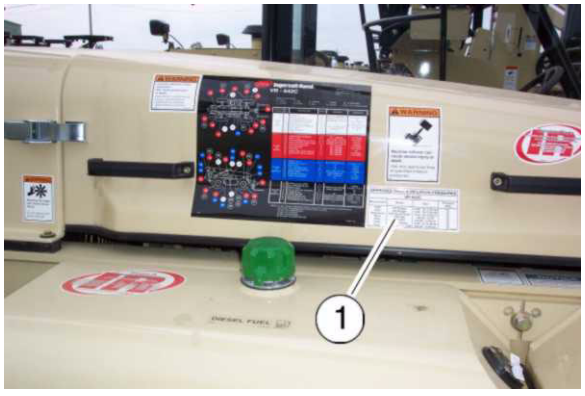
If a tire must be removed for repair, remove the air pressure from the tire before the wheel is removed from the Telescopic Material Handler.

When air pressure is added to tires, use equipment with a gauge or pressure regulator and a clip-on chuck. Make sure the hose is long enough so that the person adding air pressure can stand to the side and not in the path of the wheel parts in case of an explosion.

Failure to adhere to this warning could result in serious personal injury including death.

Tire air pressure that must be maintained is found on the tire inflation decal (1, Figure 5-20). Check the air pressure with a gauge when the tires are cold. If it is necessary to add air pressure to a tire that is warm, check one of the other tires and add air to the tire that has low air pressure so that the air pressures are equal. The air pressure of a warm tire must always be equal to or greater than the air pressure specified for cold tire.

Figure 5-20



Check the tires for damage. Check the tread and remove any objects that will cause damage. Check for bent or damaged rims. Check for loose or missing hardware. Remove any wire, strapping, or other material that may have wrapped around the axle.

Check Seat Belt and Mounting Hardware

CHECK the seat belt for wear or damage. Inspect belt hardware and fabric. Replace if hardware is damaged or if strap is nicked, frayed or loose stitching is found. Check that mounting hardware is tight.

Seat belt assemblies should be replaced every three years, regardless of appearance. Seat belt strength degrades over time and use due to exposure to weather, UV (ultraviolet radiation) and abrasives (dirt).

50 HOUR OR WEEKLY ROUTINE MAINTENANCE

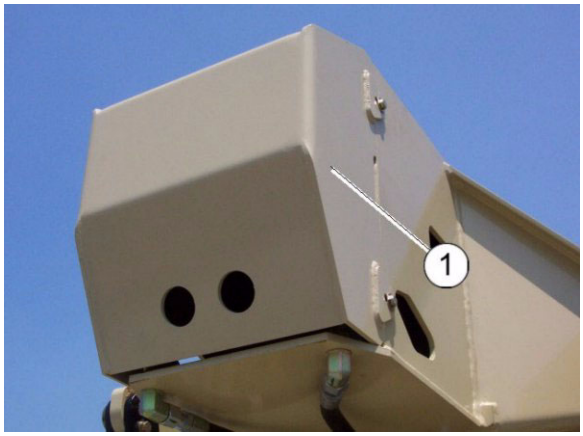
Grease Chain Sheave Bearings

There are two chain bearing sheaves that require lubrication at this interval. Refer to Section 8 - Fuel and Lubricant Specifications for type of grease which is to be used.

1. Completely retract the boom and place it in the lowered position.

2. Shut down the engine and apply the parking brake.

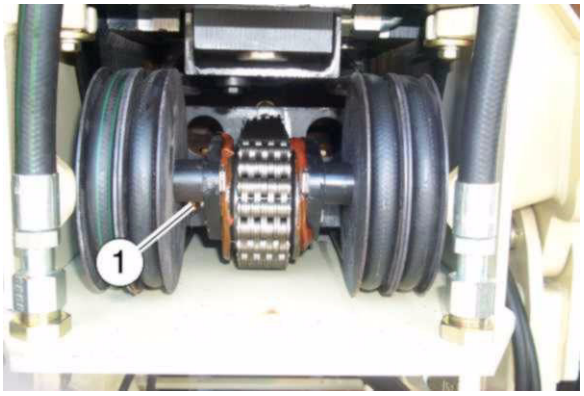
Figure 5-21



3. Remove boom cowl (1, Figure 5-21) to access retract chain bearing sheave grease fitting (1, Figure 5-22).

4. Apply four shots of MPG-EP 2 grease to the retract chain sheave fittings (1, Figure 5-22).

Figure 5-22



5. Replace boom cowl (1, Figure 5-21).

⚠ WARNING

Serious Personal Injury

Boom access covers are designed to protect personnel from serious injury and to prevent contamination of internal boom parts. Be sure the variable reach material handler power is shutdown before removing covers and working inside of the boom. Never place fingers or hands in boom access holes while the material handler is operating. Always replace covers after maintenance or service work is completed.

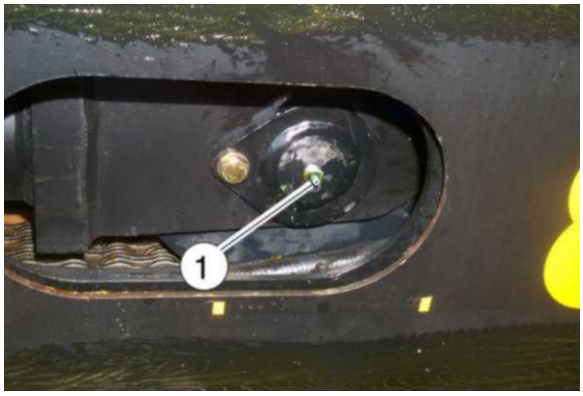
Failure to adhere to this warning could result in serious personal injury including death.

6. Remove access cover on boom (1, Figure 5-23) from the left side of the boom.

Figure 5-23

7. Apply four shots of MPG-EP2 grease to fitting (1, Figure 5-24) on the extend chain sheave bearing.

Figure 5-24



8. Install boom access cover.

Check Lug Nut Torque

Make sure the wheel nuts are tight. Tighten the wheel nuts to a torque of 599 N•m (442 lb.-ft.) using a cross pattern as shown in Figure 5-25. When the wheels are removed and installed again, check the nuts after eight hours of operation. When the nuts stay tight after an eight-hour check, the interval for checking with a torque wrench can be extended to 250 hours.

Figure 5-25

Check Oil Level in Axle Differential Planetary Wheel Ends

⚠ WARNING

Serious Personal Injury.

Hot oil or components can burn. Oil must be at normal operating temperature when draining. Avoid contact with hot oil or components

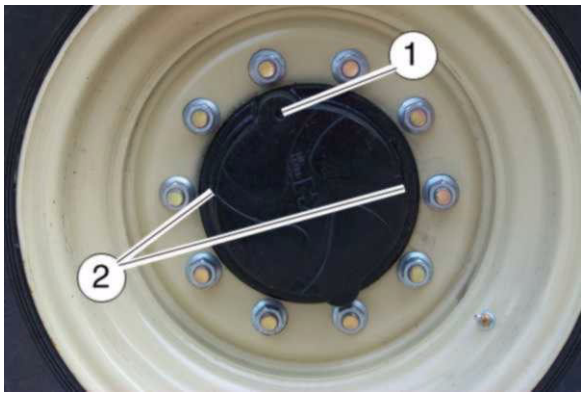
Do not allow oil to drain into ground. Dispose of properly.

Failure to adhere to this warning could result in serious personal injury.

Each axle is equipped with two independent planetary assemblies requiring gear oil lubricant. To check the level of this oil follow the steps listed below.

1. Park the machine on a firm level surface with planetary wheel end plug (1, Figure 5-26) positioned at the three or nine o'clock position (2). Shut down the machine, apply parking brake and allow it to sit for a minimum of two minutes.

Figure 5-26



2. Wipe the fill plug (1) clean and then remove.

3. Check oil level which should be to the bottom of the fill hole. If required add oil as needed. Refer to Section 8 for the correct lubricant.

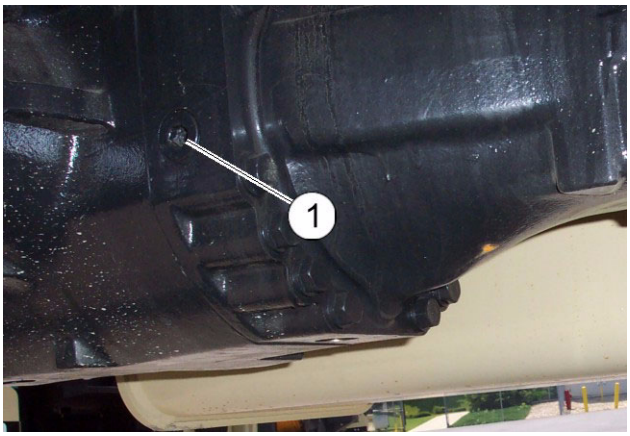
4. Replace plug and repeat step procedure for the remaining three wheel end planetary units.

Check Oil Level In Axle Differentials

Each axle assembly requires gear lubricant independent of the planetary assemblies. To check the level of this oil follow the steps listed below.

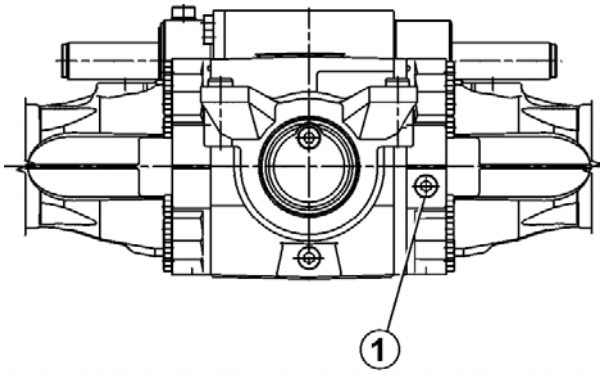
1. Park the machine on a firm level surface shut down the machine, apply parking brake and allow it to sit for a minimum of two minutes.

Figure 5-27



2. Wipe the fill plug (1, Figure 5-27/Figure 5-28), clean, and then remove.

Figure 5-28



3. Check oil level which should be to the bottom of the fill hole. If required, add oil as needed. Refer to Section 8 for the correct lubricant.

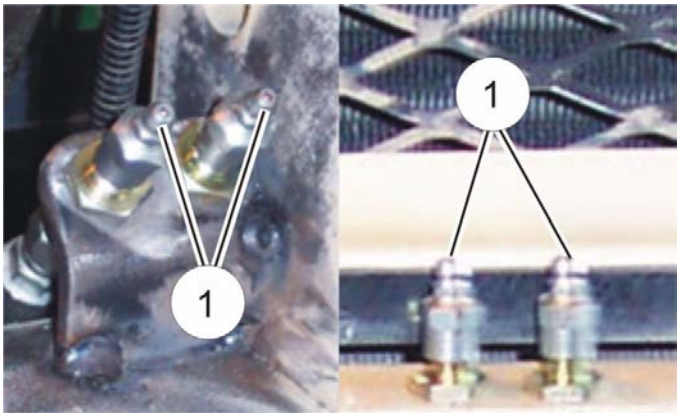
4. Replace plug and repeat step procedure for the remaining axle.

Grease Axle Pivot Bearings

Each axle is equipped with two integral pivot assemblies which attach the axle to the frame. Each of the four pivot assemblies requires independent lubrication. Remote grease fittings (1, Figure 5-29) are provided for pivot bearing lubrication.

To lubricate these assemblies, follow the steps below:

Figure 5-29

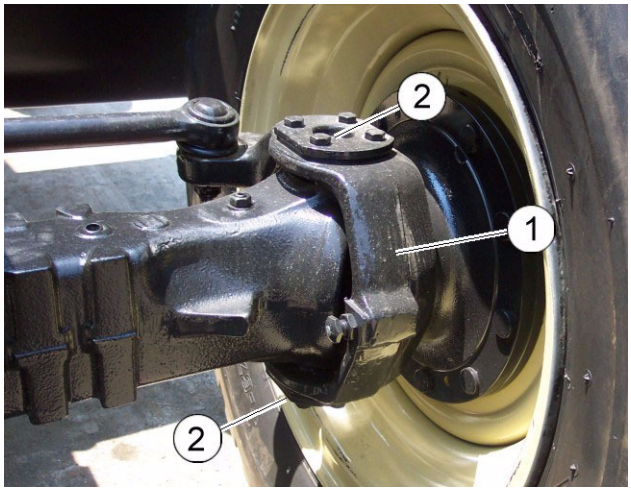


1. Wipe dirt and grease from each remote grease fitting (1, Figure 5-29).
2. Apply 4 shots of MPG-EP2 grease to each fitting (one on top, one on bottom).

Grease Axle King Pins

Each axle is equipped with two king pins (1, Figure 5-30). Each king pin is equipped with an upper and a lower grease fitting (2). Follow the steps below to lubricate the kin pins.

Figure 5-30



1. Wipe each fitting clean.
2. Apply four (4) shots of MPG-EP2 grease to each fitting (2, Figure 5-30).

Grease Fork Pins

Check the condition of the fork pins (1, Figure 5-31). If required, lubricate the fork pins with MPG-EP2 grease.

Figure 5-31

Grease Frame Level Pivot Bushings and Stabilizer Pivot Bushings

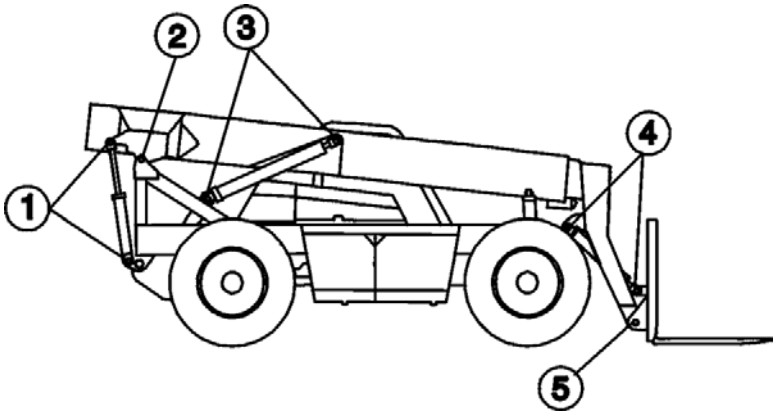
Apply MPG-EP2 grease to the grease fittings (1, Figure 5-32) at each end of the frame level cylinder.

Figure 5-32

Grease Boom Pivot and Boom Cylinders

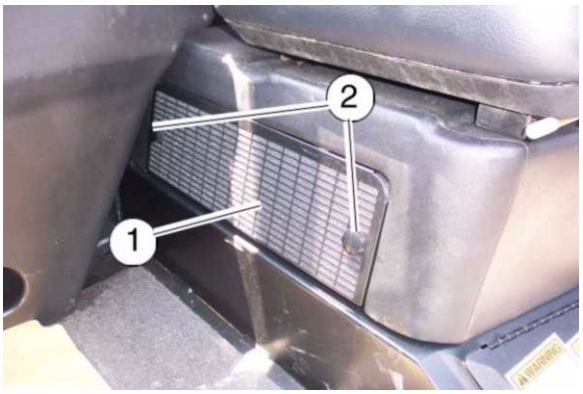
Apply MPG-EP2 grease to the lube points shown in Figure 5-33.

Figure 5-33



Clean Heater / A-C Filter

Figure 5-34



Filter element (1, Figure 5-34) should be removed and cleaned in soapy water on a regular basis. Dry and replace behind grid.

250 HOUR OR QUARTERLY ROUTINE MAINTENANCE

Change Engine Oil and Filter

⚠ WARNING

Serious Personal Injury.

Hot oil or components can burn. Oil must be at normal operating temperature when draining. Avoid contact with hot oil or components

Do not allow oil to drain into ground. Dispose of properly.

Failure to adhere to this warning could result in serious personal injury.

1. Park the machine on stable level surface, apply the park brake and shut off the engine.
2. Ensure that the engine oil is at normal operating temperature.

NOTE

At normal operating temperature, the engine water temperature gauge will register between 60 and 100° C (140 and 212° F).

3. Place a container with the capacity of at least 24 liters (25 quarts) under the drain point.
4. Remove drain plug (1, Figure 5-35). Dispose of used oil in an environmentally safe manner.

Figure 5-35

5. Clean the area around the head of the oil filter (1, Figure 5-36). Use a 90-95 mm filter wrench to remove the filter.

Figure 5-36

6. Clean the filter head seal area and be sure that no gasket material remains from the old filter.

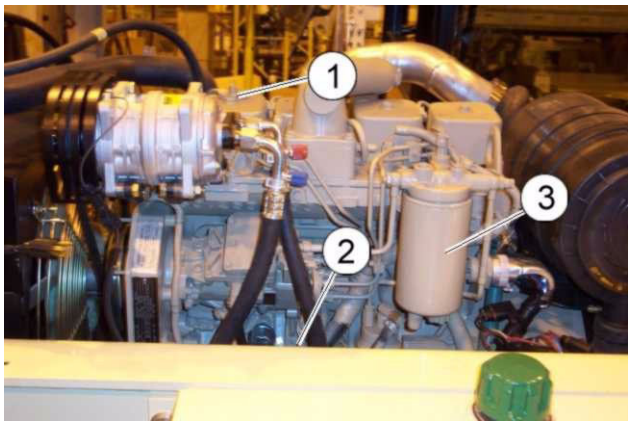
7. Apply a light coat of oil to the filter gasket sealing surface before installation. Refer to Section 8-Fuel and Lubrication Specifications for correct lube oil.

8. Install the filter following the manufacturer's recommendations. Be careful, mechanical overtightening may distort threads or damage the gasket.

9. Clean the drain plug (1, Figure 5-35) and install. Tighten to a torque of 81 N•m (60 lb.-ft.).

10. Fill the crankcase through the fill area (1, Figure 5-37) with engine oil to the full mark on the dipstick (2, Figure 5-37). Refer to Section 8 - Fuel and Lubrication Specifications for correct lube oil.

Figure 5-37



11. Start the engine. Check the engine oil pressure and for any leaks.

Change Fuel Filters

1. Clean area around head of fuel filter (3, Figure 5-37) and place a container under the filter to collect any escaping fuel.

2. Remove the filter using a 90-95 mm filter wrench. Discard used filter and fuel in accordance with local guidelines.

3. Be sure that seal area of filter head is completely clean.

4. Lubricate the O-ring seal on new filter with clean oil, and fill the filter with clean fuel.

5. Install the new filter and tighten as specified by the manufacturer.

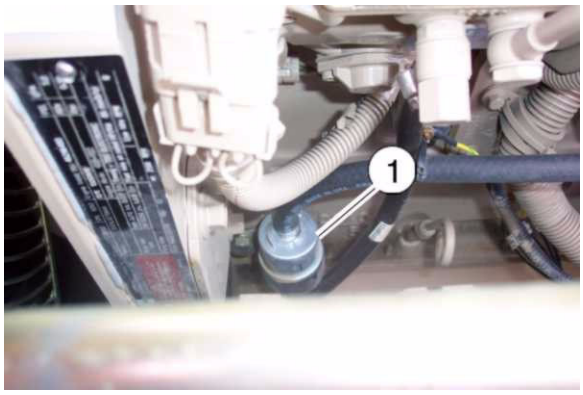
NOTE

If the fuel filter is changed using these instructions, manual bleeding of the fuel system should be unnecessary. If the fuel system requires bleeding, refer to the engine manufacturer's manual.

Change In Line Filter

The in-line filter (1, Figure 5-38) must also be changed at this interval.

Figure 5-38



1. Disconnect the fuel line from each side of the in-line filter (1, Figure 5-38). Discard the used filter in accordance with local guidelines.

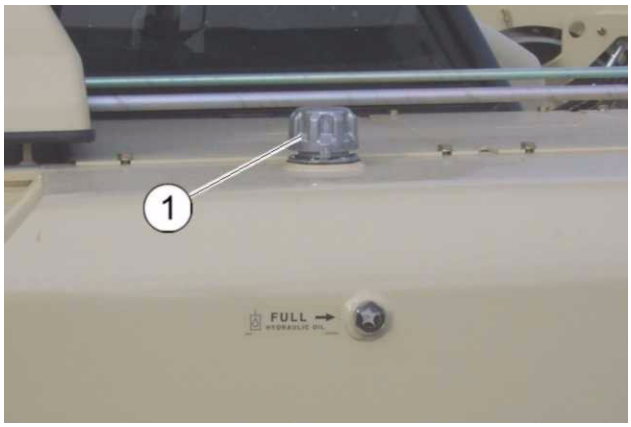
2. Install the new in-line filter by reconnecting it in the fuel line. Be sure filter is installed with flow direction arrow pointing toward the fuel pump.

3. Check for leaks.

Clean Hydraulic Tank Breather

1. Clean area around hydraulic breather (1, Figure 5-39). Do not allow dirt to enter the hydraulic tank.

Figure 5-39

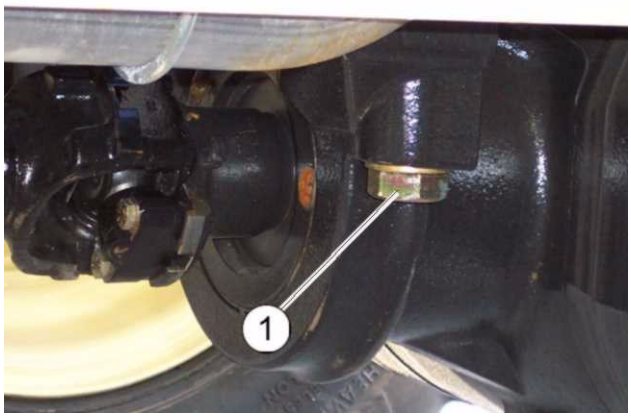


2. Remove the breather and clean with solvent. Blow dry with compressed air.
3. Place the cleaned breather on the tank.

Torque Axle Mounting Bolts

The axles are secured to the frame by an axle pivot assembly on each side of the axle. The pivot assemblies are bolted to the machine frame with axle mounting bolts (1, Figure 5-40).

Figure 5-40



1. Torque front axle mounting bolts to 895 N•m (660 lb.-ft.).
2. Repeat procedure for rear axle.

Inspect Chains

⚠ WARNING

Serious Personal Injury.

Lower the boom completely. Never allow anyone under the raised forks. Do not place any part of your body in or through the lift or extend mechanism unless all parts of the boom are completely lowered and the engine is shut down.

Before making any repairs, use blocks and chains on the boom sections and forks to ensure that they cannot move. Make sure the moveable parts are attached to non-moveable parts.

Failure to adhere to this warning could result in serious personal injury.

1. Fully retract and lower the boom. Apply the park brake and shut down the engine.
2. Remove boom cowl (1, Figure 5-41) and boom front cover (1, Figure 5-42).

Figure 5-41

Figure 5-42

3. Inspect the retract chain (1, Figure 5-43) inside the rear of the boom and the extend chain (1, Figure 5-44) inside the front of the boom.

Figure 5-43

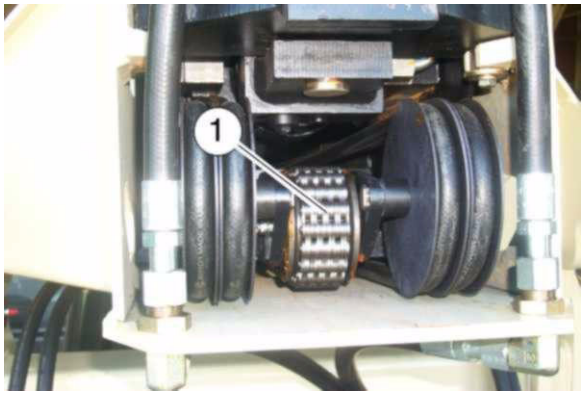
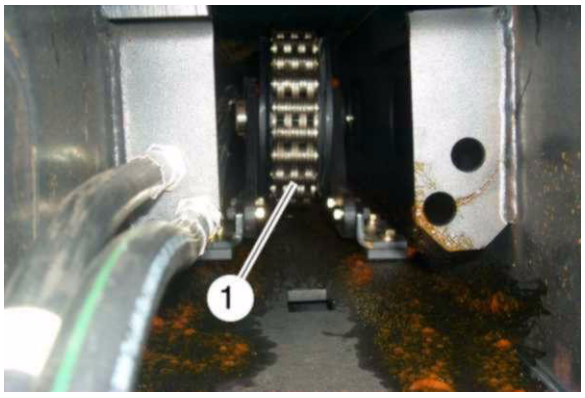


Figure 5-44



NOTE

The chains should appear well lubricated, with no signs of wear or rust.

4. If chain appears dry, rusty, or worn, the chains must be removed for a complete inspection and lubrication. Refer to service manual. When the chains are well lubricated, reinstall the cowl (1, Figure 5-41) and the front cover (1, Figure 5-42).

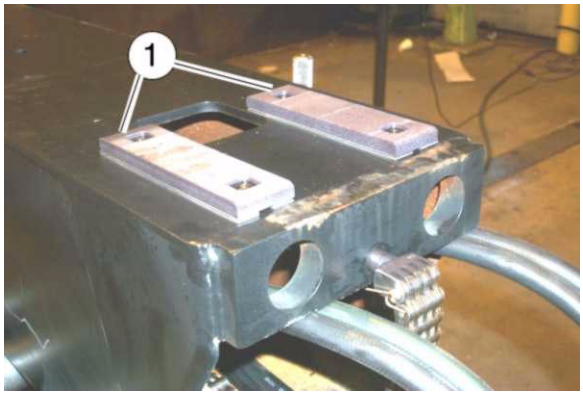
Check Boom Wear Pad Clearances

Wear pads (1, Figure 5-45) support the boom components as the boom is extended and retracted. The wear pads must maintain clearance between the contact surface of the pad and the adjacent sliding surface. This clearance ranges between 0.79 – 1.58 mm (0.031 – 0.062 in.) TOTAL for both sides of the boom. When clearances exceed this amount shims need to be added or the pads replaced.

The wear pads are chamfered on the corner of the wear surface. This is to be used as a wear indicator. When the chamfer is no longer visible the pads must be replaced. Additional wear will allow interference with inserts in the pads.

Lubrication of these pads require application of grease on the boom surfaces which come in contact with the pads.

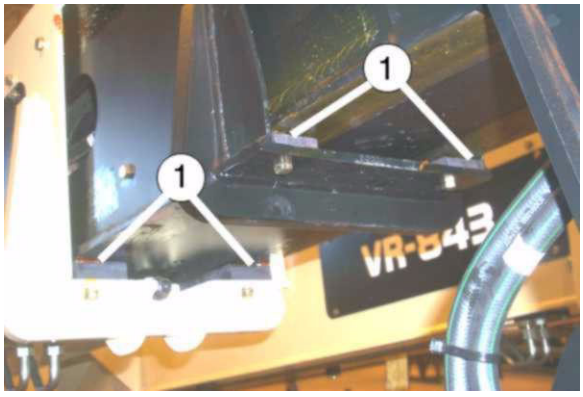
Figure 5-45



To check the pad to contact surface clearances perform the following steps.

1. Extend the boom and place the forks on a level surface.
2. Shutdown the engine and apply the parking brake.
3. Measure the clearance between the bottom surfaces of the boom and wear pads at each section. Refer to 1, Figure 5-46. Clearance should range between 0.79 – 1.58 mm (0.031 - .062 in.). When clearances exceed this amount shims need to be added or the pads replaced.

Figure 5-46



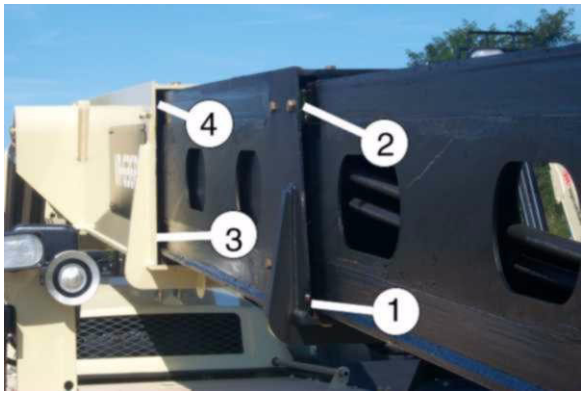
4. Start the machine and raise the boom so that the forks are not touching the ground and no upward force is being applied to the boom.

5. Shut down the engine and apply the parking brake.

6. Measure the clearance between each side wear pad and the adjacent boom section as follows:

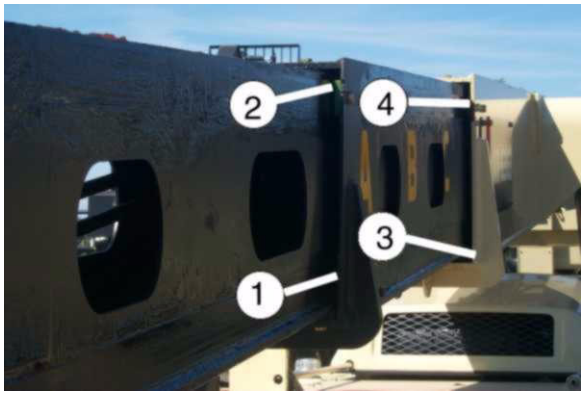
   a. Measure the clearance between the side of the boom and the lower wear shoe (1, Figure 5-47).

Figure 5-47



   b. Without moving the boom measure the clearance between the side of the boom and the lower wear shoe (1, Figure 5-48). Clearance should range between 0.79 – 1.58 mm (0.031 – 0.062 in.). When clearances exceed this amount, shims need to be added or the pads replaced.

Figure 5-48



   c. Repeat above steps for pad locations 2, 3, & 4.

⚠ WARNING

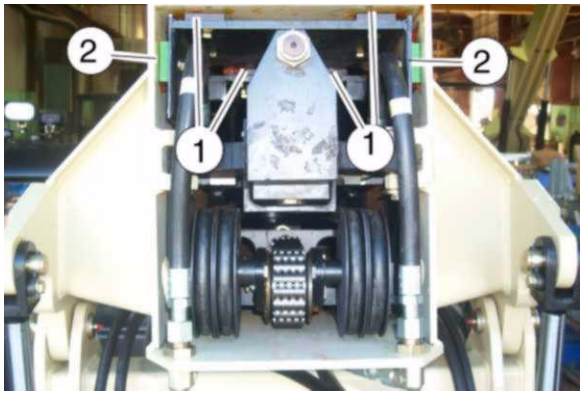
Severe Personal Injury.

Boom access covers are designed to protect personnel from serious injury and to prevent contamination of internal boom parts. Be sure the telescopic material handler power is shut down before removing covers and working inside of the boom. Never place fingers or hands in boom access holes while the material handler is operating. Always replace covers after work is completed.

Failure to adhere to this warning could result in serious personal injury.

7. Remove boom cowl (1, Figure 5-41) so that rear of the boom sections are visible. Start the engine and retract the boom far enough to see the upper and side wear pads (1 & 2, Figure 5-49) on each boom.

Figure 5-49



8. Lower the boom until the forks are resting on the ground and an upward force is being applied to the boom sections. Shut down the engine and apply the parking brake.

9. Measure the wear shoe clearance at the top of each boom section (1, Figure 5-49).

   Clearance should range between 0.79 – 1.58 mm (0.031 – 0.062 in.). When clearances exceed this amount shims need to be added or the pads replaced.

10. Start the machine and raise the boom high enough to lift the forks off of the ground. Shut down the engine and apply the parking brake.

11. Measure the side wear shoe clearances at (2, Figure 5-49). The TOTAL clearance should range between 0.79 – 1.58 mm (0.031 – 0.062 in.). When the TOTAL of the clearances exceed this amount shims need to be added or the pads replaced.

Adjust Boom Chains and Hoses

Extend and retract boom chains are to be checked and adjusted, if necessary, at the 250 hour maintenance interval. Adjustment is required when the chains are making noise as banging on the interior boom parts or the gap identified below is less than the minimum acceptable amount. Proper adjustment of the chains at this interval minimizes the risk of chain failure which could cause extensive damage to other boom components and require extensive labor hours to repair.

The following procedure should be followed to insure correct chain adjustment.

1. Park the machine on level ground, fully retract the boom, lower the boom, set barking brake and shut off engine.

2. Measure the gap (1, Figure 5-50). The minimum acceptable gap is 19 mm (0.75 in.). If the gap is the minimum or more, no adjustment is required.

Figure 5-50

If the measured gap (1, Figure 5-50) is less than 19 mm (0.75 in.), adjust the chains as follows:

1. Start the engine, raise the boom to clear the ground, and extend the boom approximately 300 mm (12 in.).

2. Shut down the engine.

3. Loosen the boom retract adjustment nut (1, Figure 5-51 & Figure 5-52). The length required to have an acceptable gap is plus 3 mm (0.125 in.).

Figure 5-51

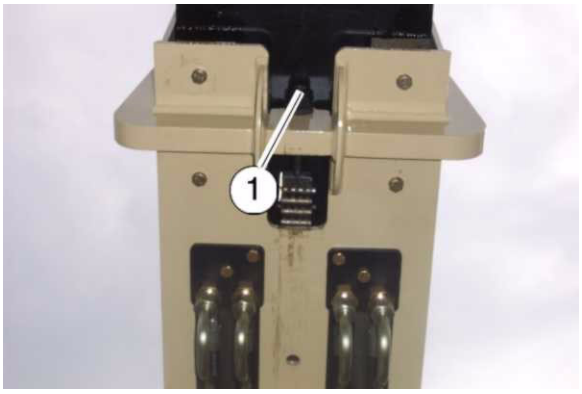
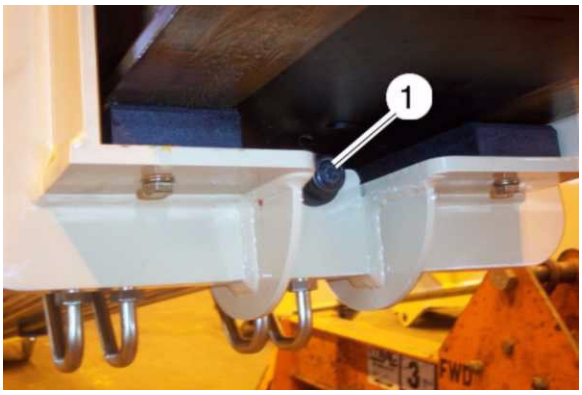


Figure 5-52



4. Start the engine and fully retract the boom.

5. Stop the engine.

6. Tighten the extend chain nut (1, Figure 5-53) until the gap (1, Figure 5-50) is a minimum of 19 mm (0.75 in.).

Figure 5-53

7. Loosen the extend chain nut (1, Figure 5-53) slightly to level the extend chain anchor and remove any twist in the chain. Nut must be fully engaged.

8. Torque the boom retract adjustment nut (1, Figure 5-51 & Figure 5-52) to 54 N•m (40 lb-ft.).

9. Loosen the retract chain nut (1, Figure 5-51 & Figure 5-52) slightly to level the extend chain anchor and remove any twist in the chain. Nut must be fully engaged.

10. Start the engine, extend and retract the boom several times.

11. Stop the engine and measure the gap. If it is not within range, repeat procedure.

12. Install the rear boom cover.

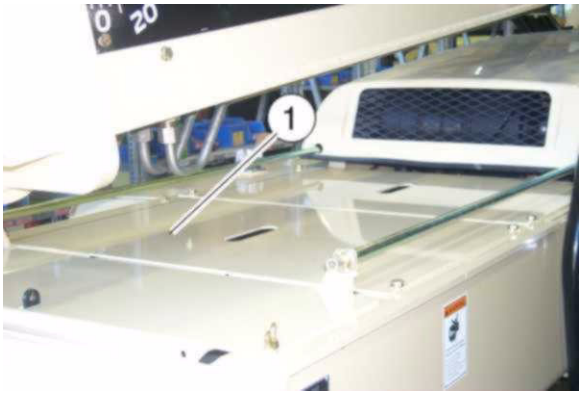
1000 HOUR OR ANNUAL ROUTINE MAINTENANCE

Change Hydraulic Oil Filter

1. Park the machine on a firm level surface, apply the park brake, and shut down the engine.

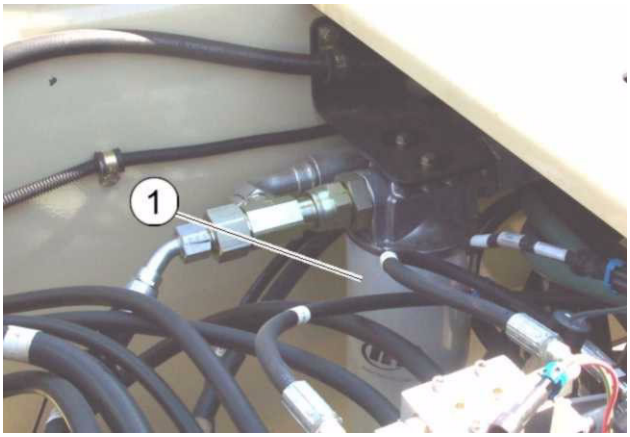
2. Remove deck plate (1, Figure 5-54).

Figure 5-54



3. Remove and discard the old hydraulic oil filter (1, Figure 5-55). Be sure all traces of the old filter gasket are removed from the filter head. Discard old filter in accordance with local procedures.

Figure 5-55



4. Apply a light coating of clean oil to the gasket on the new filter.

5. Install the new filter and turn until the gasket contacts the filter head. Tighten an additional 1/2 to 3/4 turn by hand to compress the gasket.

Change Hydraulic Oil and Clean Suction Strainer

NOTICE

Dirt in the hydraulic system will lead to premature component failure.

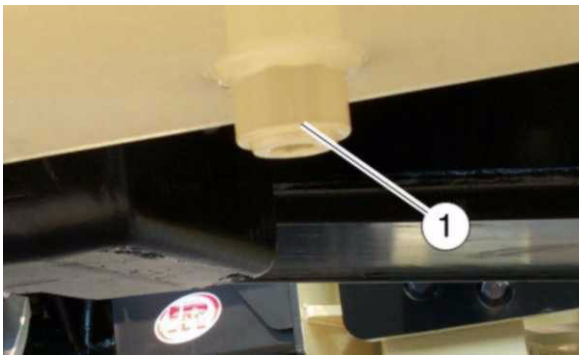
A clean, contaminant-free system is extremely important to the machine's proper function.

Take extra care when working around or on the hydraulic system to ensure its complete cleanliness.

1. Completely retract the boom and place it in the lowered the position, so that as much hydraulic oil as possible is returned to the hydraulic tank. Shut down the engine and apply the park brake.

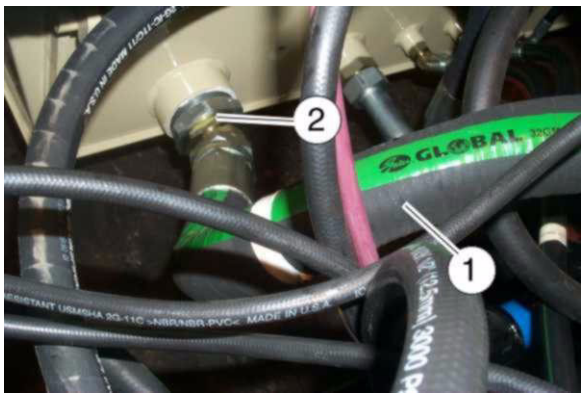
2. Remove hydraulic tank drain plug (1, Figure 5-56) and drain the hydraulic oil into a container capable of holding approximately 190 liters (50 gallons). Dispose of used oil in accordance with local regulations.

Figure 5-56



3. Disconnect hydraulic hose (1, Figure 5-57) and remove hydraulic suction strainer (2) by unthreading it from the tank.

Figure 5-57



4. Clean the strainer in a solvent, using a stiff, fiber brush. If impurities cannot be removed, replace with a new strainer.

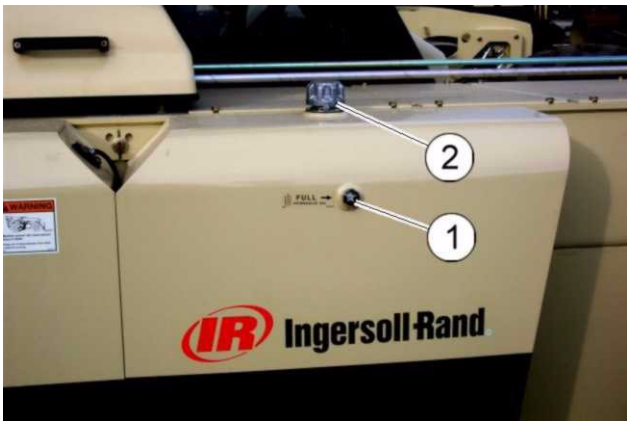
NOTICE

A partially plugged strainer will lead to cavitation, contamination, and a sluggish operating machine.

Ensure the strainer is cleaned or replaced.

5. Air-dry the suction strainer from the inside out.
6. Install drain plug (1, Figure 5-56) back into tank.
7. Apply pipe sealant to the new or cleaned strainer (2, Figure 5-57) and screw it back into the manifold pipe inside the tank.
8. Remove the breather (2, Figure 5-58) and fill the tank with clean hydraulic oil from unopened containers. When adding oil, be sure to filter it through a 10 micron filter. Refer to Section 8 - Fuel and Lubrication Instructions for oil details.

Figure 5-58



9. Install the breather.
10. Run engine and work hydraulic functions. Add additional oil as required.

Change Axle Differential Oil

Each axle assembly requires gear lubricant independent of the planetary assemblies. To change this oil, follow the steps listed below:

⚠ WARNING

Hot oil or components can burn.

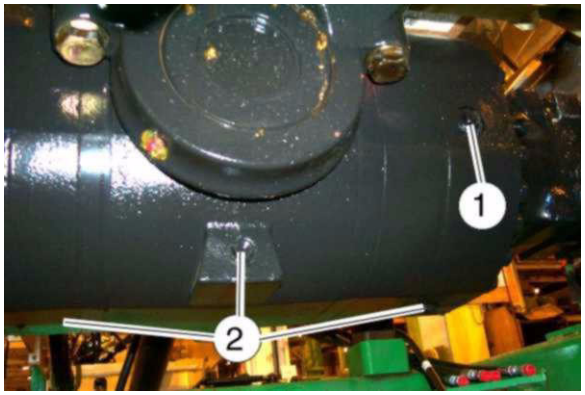
Oil must be at normal operating temperature when draining.

Avoid contact with hot oil or components.

Do not allow oil to drain into the ground.

1. Ensure that the axle differential oil is at operating temperature.
2. Park the machine on a firm level surface apply parking brake, shut down the machine, and allow it to sit for two minutes.
3. Clean the areas around the three (3) drain plugs (2, Figure 5-59) and level/fill plug (1).

Figure 5-59



4. Place a drain pan capable of holding approximately 9.5 liters (10 quarts) under the axle drain plugs (2, Figure 5-59).
5. Remove the level/fill plug (1, Figure 5-59).
6. Remove all three (3) drain plugs (2, Figure 5-59) and drain the oil from the differential. Dispose of used oil in accordance with local regulations.
7. Wipe off the magnetic drain plugs (3) with a clean rag and install it in the axle.
8. Slowly fill the axle with 6.6 liters (7 quarts) of gear oil until oil begins to overflow from the level/fill hole (1, Figure 5-58 & Figure 5-59). Refer to Section 8 - Fuel and Lubrication Instructions for oil details.
9. Clean and replace the level fill plug.
10. Repeat procedure for the second axle.

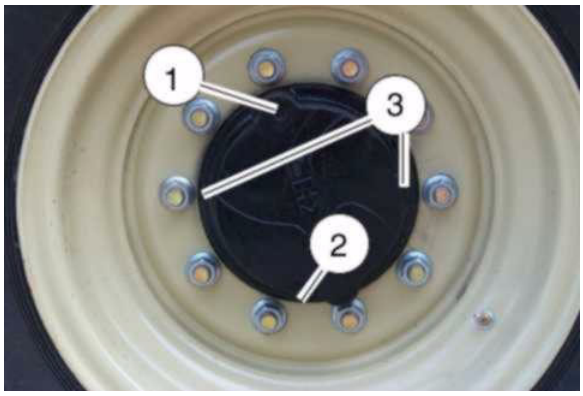
Change Axle Planetary Oil

Each axle assembly requires planetary gear lubricant independent of the differential assemblies. To change this oil, follow the steps listed below:

1. Ensure that the axle planetary oil is at operating temperature.

2. Park the machine on a firm level surface with the level/fill/drain plug (1, Figure 5-60) at the (2) 6 o'clock position. Shut down the machine, apply parking brake and allow it to sit for a minimum of two minutes.

Figure 5-60



3. Clean the area around the (1) plug located at (2).

4. Remove the plug and drain the oil from the axle planetary. Dispose of used oil in accordance with local regulations.

5. Wipe off the magnetic drain plug with a clean rag and install it in the planetary.

6. Reposition the plug to the 3 o'clock or 9 o'clock position (3, Figure 5-60).

7. Slowly fill the planetary with 0.95 liters (1 quart) of gear oil until oil begins to overflow from the level/fill hole (1, Figure 5-60). Refer to Section 8 - Fuel and Lubrication Instructions for oil details.

8. Clean the level/fill plug (1) and install it in the planetary.

9. Repeat procedure for the remaining three planetaries.

Engine Coolant

⚠ WARNING

Severe Personal Injury.

Injury can occur when removing the radiator cap.

Steam or fluid escaping from the radiator can burn. Inhibitor contains alkali, avoid contact with skin and eyes.

Always shut down the engine and allow to cool down before removing the radiator cap. Remove cap slowly to relieve pressure. Avoid contact with steam or escaping fluid.

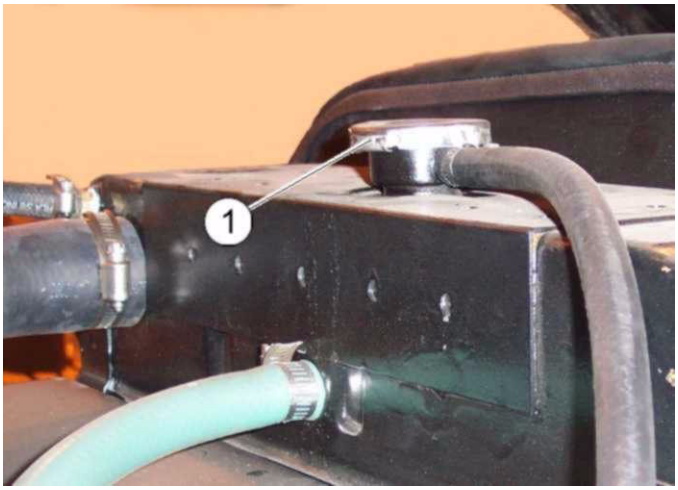
Failure to adhere to this warning could result in serious personal injury.

The coolant system should be drained and flushed out at least once a year, preferably twice a year. Any effective, commercial flushing agent may be used. Unless the coolant has a corrosion preventive in it, rust and scale will eventually clog up the system.

NOTE

Remove the radiator cap (1, Figure 5-61*) when draining the system to ensure proper draining.*

Figure 5-61



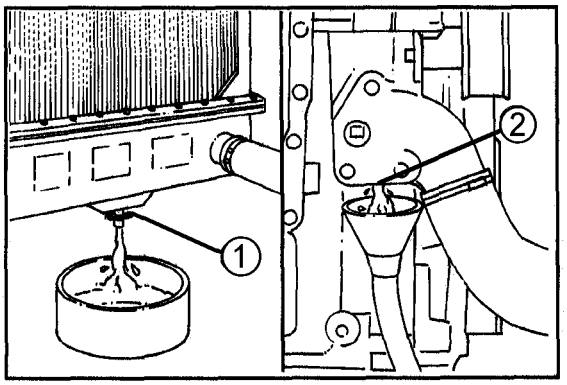
1. Open the radiator cap (1, Figure 5-61) to ensure proper draining.

2. Place a container capable of holding 24 liters (25 quarts) under the radiator petcock (1, Figure 5-62). Open the petcock and allow radiator and coolant bottle to drain.

Figure 5-62

3. Place a container under the engine block coolant drain plug (2, Figure 5-63) located on the bottom of the engine water inlet hose connection point. Remove the plug and drain coolant from the engine.

Figure 5-63



4. Check for damaged hoses and loose or damaged hose clamps. Replace as required. Check radiator for leaks, damage and buildup of dirt. Clean and repair as required.

5. Following the manufacturer's instructions, flush the system using a good grade commercial radiator cleaning agent.

6. After cleaning and flushing operations are completed, close the petcock (Figure 5-62 & 1, Figure 5-63) replace and tighten the engine block drain plug (2, Figure 5-63).

NOTICE

To prevent air locks, the system must be filled properly. Air must be vented from coolant passages during the fill operation.

NOTE

A mixture of ethylene glycol antifreeze and water is recommended to refill the radiator. Refer to the engine manual for the manufacturers's recommendation for proper ratio of antifreeze to water mixture. The addition of a separate lubricant and corrosion inhibitor will guard against internal corrosion and freezing.

7. Replace the radiator cap, start the engine and check for leaks.

Change Transmission Oil

1. Run the machine until the transmission oil temperature reaches operating temperature. Normal operating temperature is between 82 and 93° C (180 and 200° F) as registered on the Transmission Oil Temperature Gauge.

2. Locate the machine on a smooth level surface. Apply the parking brake and shut down the engine.

3. Place a container with a capacity of at least 13 liters (14 quarts) under the transmission drain point (1, Figure 5-64).

Figure 5-64

⚠ WARNING

Hot oil or components can burn.

Oil must be at normal operating temperature when draining.

Avoid contact with hot oil or components.

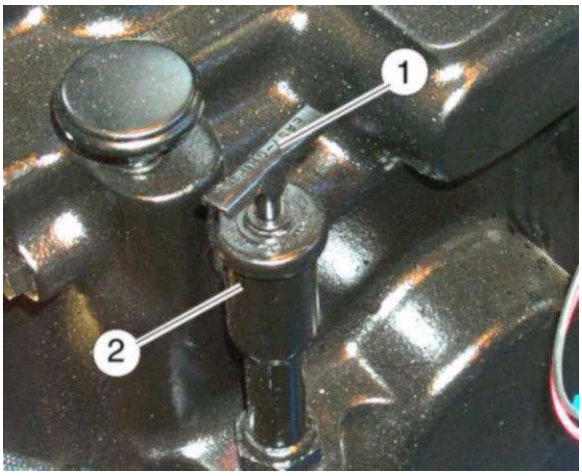
Do not allow oil to drain into the ground. Dispose of properly.

4. Remove the drain plug (1, Figure 5-64) and drain the transmission.
5. Remove deck cover (1, Figure 5-65).

Figure 5-65

6. Fill the transmission with 13 liters (14 quarts) of fresh clean transmission oil through the dipstick tube (2, Figure 5-66). Refer to Section 8 - Fuel and Lubrication Specifications.

Figure 5-66



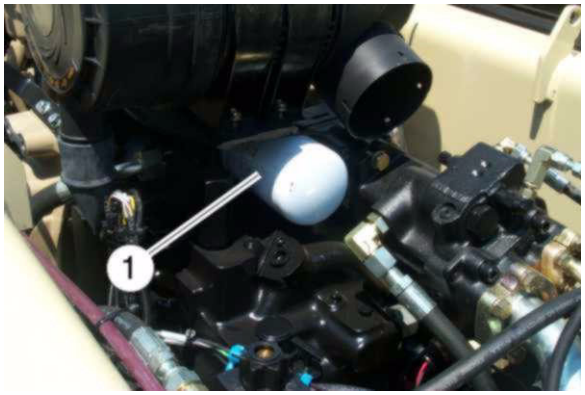
7. Replace the dipstick (1, Figure 5-66).

8. Run the engine until the transmission oil is at operating temperature. With the engine running and the Direction Control Lever in Neutral, pull out the dipstick (1, Figure 5-66) and check the transmission oil level. Add as required.

Change Transmission Oil Filter

1. Clean the area around the transmission filter (1, Figure 5-67).

Figure 5-67



2. Remove the used filter and discard in accordance with local guidelines.

3. Apply a light coating of oil to the filter gasket and install it on the transmission. Hand tighten the filter until it touches the base then tighten an additional 1/2 to 3/4 turn.

4. Install deck plate (1, Figure 5-65).

LONG TERM STORAGE

Whenever the machine will be stored for an extended period of time (up to six months), the following preparations must be made:

1. Ensure that all protective covers are in place and are secure.

2. Change all fluids which may have deteriorated with use. Be sure coolant is in good condition. If it was not added when coolant was last changed, add a corrosion inhibitor and lubricant.

3. Ensure that fuel tank is full and add a fuel stabilizer to the fuel.

4. Apply MPG-EP 2 grease to all wear pad contact surfaces on the boom to prevent rust.

5. Ensure that storage site is not subject to flooding or other natural hazards.

SECTION 6 - TROUBLESHOOTING

⚠ WARNING

When carrying out trouble shooting procedures, it is important to strictly observe the safety precautions and guidelines in Section 1 of this manual.

Improper operation and maintenance is the most frequent cause of machinery failures and problems. In the event of a failure, it is recommended to read through this manual.

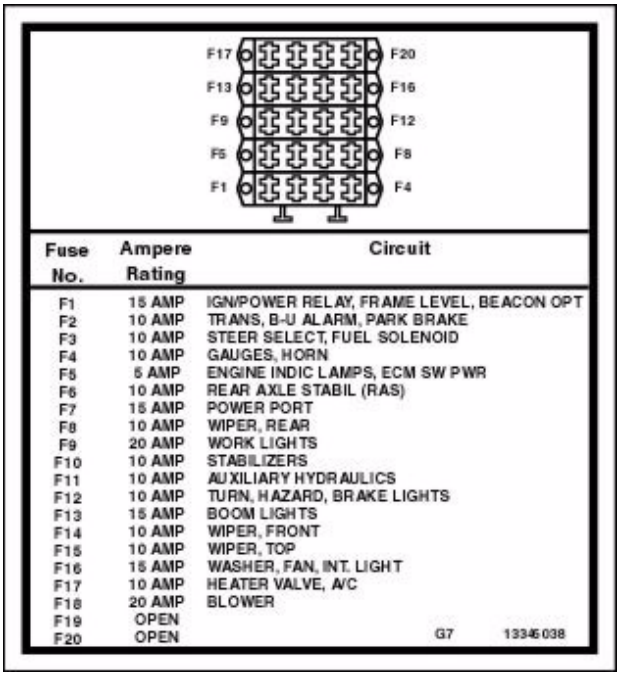
If you are unable to determine the cause of the problem or are unable to find a solution when following the troubleshooting chart below, contact your local Ingersoll Rand service office.

The troubleshooting chart is limited to machine control operational problems which will guide the operator to rectifying the cause of the failure.

FUSES AND RELAYS

Figure 6-1 displays the Fuse Chart decal which is located on the back of cover plate (1, Figure 6-2). All the fuses in the Variable Reach Material Handler are located on this fuse panel. Each fuse controls an electrical section of the machine.

Figure 6-1



Fuse No.	Ampere Rating	Circuit
F1	15 AMP	IGN/POWER RELAY, FRAME LEVEL, BEACON OPT
F2	10 AMP	TRANS, B-U ALARM, PARK BRAKE
F3	10 AMP	STEER SELECT, FUEL SOLENOID
F4	10 AMP	GAUGES, HORN
F5	5 AMP	ENGINE INDIC LAMPS, ECM SW PWR
F6	10 AMP	REAR AXLE STABIL (RAS)
F7	15 AMP	POWER PORT
F8	10 AMP	WIPER, REAR
F9	20 AMP	WORK LIGHTS
F10	10 AMP	STABILIZERS
F11	10 AMP	AUXILIARY HYDRAULICS
F12	10 AMP	TURN, HAZARD, BRAKE LIGHTS
F13	15 AMP	BOOM LIGHTS
F14	10 AMP	WIPER, FRONT
F15	10 AMP	WIPER, TOP
F16	15 AMP	WASHER, FAN, INT. LIGHT
F17	10 AMP	HEATER VALVE, A/C
F18	20 AMP	BLOWER
F19	OPEN	
F20	OPEN	

G7 1334038

Figure 6-2

Additional fuses are listed in Table 6-1. The additional fuses are located on the chassis harness located next to the frame.

Table 6-1

F21	7.5 AMP	ENGINE ECM BATTERY +
F22	7.5 AMP	ENGINE ECM BATTERY +
F23	7.5 AMP	ENGINE ECM BATTERY +
F24	10 AMP	ENGINE ECM (FUEL PUMP)
F25	10 AMP	ENGINE ECM (FUEL PUMP)

Relays are also included on this machine. They are identified in Table 6-2.

Table 6-2

RELAY CHART	
RELAY NO.	**FUNCTION**
CR1	POWER RELAY
CR2	BRAKE TEST (ALT DROOP)
CR3	BRAKE TEST (NEUTRAL)
CR4	BRAKE TEST (LATCHING)
CR5	BRAKE TEST (REVERSE LOCKOUT)
CR6	(STARTER)
CR7	BRAKE TEST (PRESS SWITCH)

ENGINE WILL NOT START

Starter does not rotate

• Fuse F1 defective	• Check console fuse and replace
• Battery discharged	• Check battery, charge if necessary
• Battery cable connections loose or disconnected	• Clean and tighten terminal connections
• In-line fuse to starter blown	• Call for service to correct fault
• Starter relay fault	• Call for service to correct fault
• Ignition Switch defective	• Call for service to correct fault
• Starter solenoid or starter defective	• Call for service to correct fault
• Ballast kill switch defective	• Call for service to correct fault
• Park Brake not switched on	• Turn on Park Brake
• Transmission shifter lever NOT in NEUTRAL	• Place shifter in NEUTRAL

Starter does rotate

• Empty Fuel Tank	• Fill fuel tank
• Clogged Fuel Filter	• Call for service to clean/replace
• Fuel solenoid at fuel pump defective	• Call for service to test/replace
	• Check fuel solenoid with test lamp
• Defective wiring	• Call for service to correct fault

DIFFICULT STARTING & POOR/IRREGULAR PERFORMANCE

• Low battery power	• Check battery
• Batteries discharged	• Charge battery, if necessary
• Battery cable connections loose or corroded	• Clean and tighten terminal connections, cover with acid-free grease
• Using too high a viscosity oil in low ambient temps.	• Use appropriate oil grade for the ambient temperature conditions
• Fuel line blockage due to wax separation in winter	• Change fuel filters, and bleed fuel system, check for fuel line leaks and loose connection. Always use winter grade fuel in winter
• Incorrect valve clearances	• Call for service to adjust
• Loose or badly adjusted throttle cable	• Adjust or replace control cable
• Defective fuel injectors	• Call for specialist service
• Defective turbocharger	• Call for specialist service
• Blocked air cleaner element	• Clean or replace element

ENGINE MAKING EXCESSIVE FUMES

• Engine oil level too high	• Drain engine oil to correct level on the dip stick
• Blocked air cleaner element	• Clean or replace element
• Low compression due to poor condition of the valve or incorrect valve clearance	• Call for specialist service

ENGINE OVERHEATS - STOP ENGINE IMMEDIATELY

• Excessive dirt on cooling system	• Clean the radiator/cooling fins
• Engine belt broken	• Call for service to correct fault
• Defective injector nozzle	• Call for service to correct fault
• Incorrect fuel pump calibration	• Call for service to correct fault
• Blocked cooling air flow	• Clear blockage

LOW ENGINE OIL PRESSURE

• Low engine oil level	• Fill oil level to dipstick mark
• Defective oil pressure switch	• Check with test lamp.
• Leaks from lubrication system	• Stop engine and check for leaks, and tighten any loose fittings on the system oil lines

VOLTMETER INDICATES LOW OR NEGATIVE VOLTAGE

• Speed of alternator too low	• Check belt tensions, change belt if required
• Battery discharged or dead	• Check battery, charge if necessary.
• Not charging due to defective alternator or regulator	• Call for service to correct fault

ELECTRICAL CIRCUIT MALFUNCTIONS

IGNITION, RELAY, LIGHTS RELAY, FRAME LEVEL, ETHER (OPT), BEACON (OPT)

- Fuse F1 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

TRANS, BACKUP ALARM, PARK BRAKE

- Fuse F2 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

STEER SELECTION, FUEL SOLENOID

- Fuse F3 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

GAUGES, HORN

- Fuse F4 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

ENGINE INDICATOR LAMPS, ECM SWITCH POWER

- Fuse F5 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

REAR AXLE STABILIZER (RAS)

- Fuse F6 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

POWER PORT

- Fuse F7 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

WIPER (REAR)

- Fuse F8 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

WORK LIGHTS

- Fuse F9 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

STABILIZERS

- Fuse F10 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

AUXILIARY HYDRAULICS

- Fuse F11 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

TURN, HAZARD, BRAKE LIGHTS

- Fuse F12 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

BOOM LIGHTS

- Fuse F13 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

WIPER (FRONT)

- Fuse F14 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

WIPER (TOP)

- Fuse F15 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

WASHER, FAN, INTERIOR LIGHT

- Fuse F16 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

HEATER VALVE, AIR CONDITIONING

- Fuse F17 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

BLOWER

- Fuse F18 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

OPEN

- Fuse F19

OPEN

- Fuse F20

ENGINE ECM (BATTERY +)

- Fuse F21 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

ENGINE ECM (BATTERY +)

- Fuse F22 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

ENGINE ECM (BATTERY +)

- Fuse F23 defective
- Check console fuse and replace
- Defective wiring/parts
- Call for service to correct fault

ENGINE ECM (FUEL PUMP)

- Fuse F24 defective
- Defective wiring/parts
- Check console fuse and replace
- Call for service to correct fault

ENGINE ECM (FUEL PUMP)

- Fuse F25 defective
- Defective wiring/parts
- Check console fuse and replace
- Call for service to correct fault

NOTE

Fuses F21 to F25 (Engine ECM) are located on the chassis harness next to the engine.

BALLAST / IGNITION KILL SWITCH

The Variable Reach Material Handler is equipped with a weighted ballast box (1, Figure 6-3) mounted to the front of the main frame.

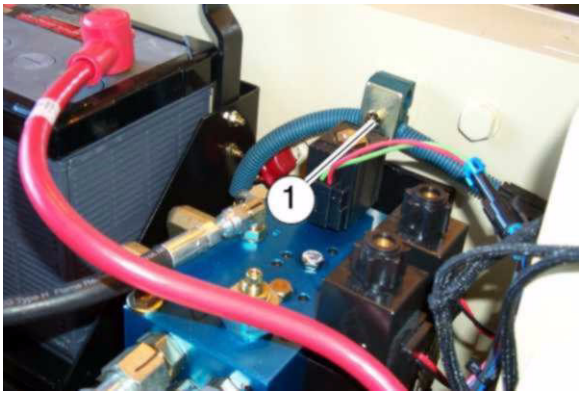
Figure 6-3

Figure 6-4

Ignition Kill Switch (Ballast Removal)

To ensure the machine is not operated without the weight of the ballast box or the optional stabilizers (Figure 6-4) an engine ignition kill switch (1, Figure 6-5) is mounted behind the ballast box . A switch actuator protrudes through the front vertical frame of the handler and is in contact with the ballast box when attached to the frame. Removal of the ballast box without replacement or the addition of the stabilizer assembly allows this actuator to be fully extended thus eliminating power to the machine's starting circuit.

Figure 6-5

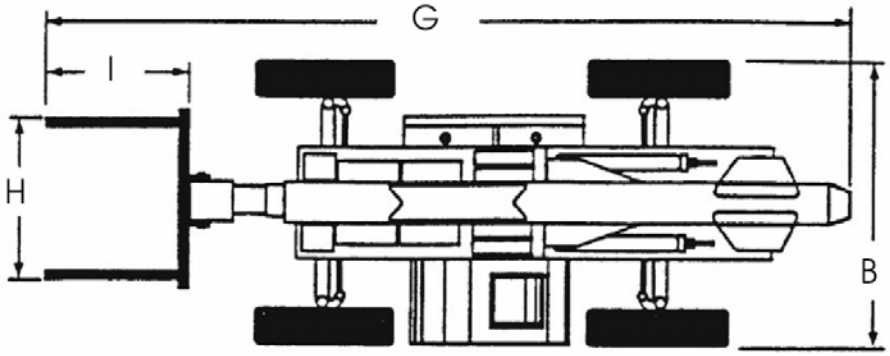


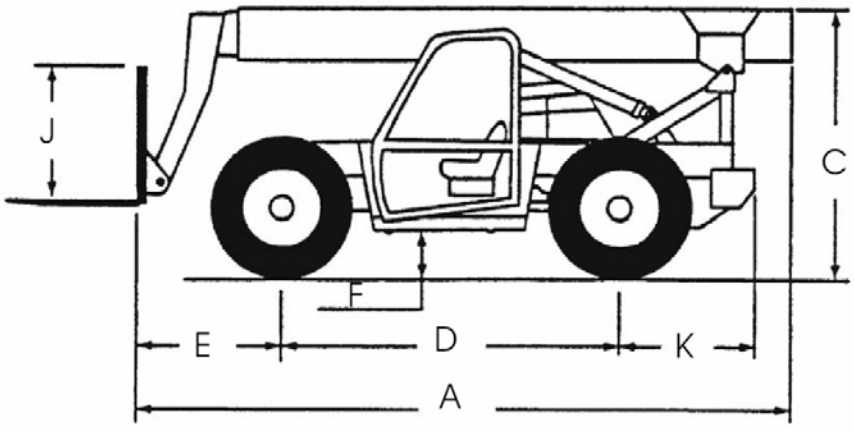
SECTION 7 - TECHNICAL SPECIFICATIONS

GENERAL IDENTIFICATION

Name of machine	VR-843C
Type of machine	Vertical Reach Material Handler
Serial number and product range	Effective with Serial Number 175806
Name and address of manufacturer	Ingersoll Rand Construction Technologies Road Development 312 Ingersoll Drive Shippensburg, Pennsylvania 17257

MACHINE DIMENSIONS





VR-843C DESCRIPTION		DESIGNATION	DIMENSION	
			mm	in.
Overall Length (less forks)		A	6400	252.0
Overall Width		B	2590	102.0
Overall Height		C	2413	95.0
Wheelbase Reach		D	3251	128.0
Drive Axle to Carriage Front		E	1430	56.3
Ground Clearance		F	406	16.0
Overall Length (w/forks)		G	7670	302.0
Carriage Width	Maximum: Minimum:	H H	1490 290	58.5 9.0
Carriage Length		I	1220	48.0
Carriage Height		J	1210	47.8
Drive Axle to Rear		K	1240	49.0

MACHINE WEIGHTS AND FIGURES

Tread Width	mm (in.)	2210 (87.0)
Frame Leveling	> 70° 10° each side	
	< 70° 4° each side	
Shipping Weight	kg (lbs.)	12,542 (27,650)
Turning Radius:		
Inside	mm (in.)	2184 (86.0)
Outside	mm (in.)	3726 (146.7)
Steering Wheel Turns:		
Stop to Stop	6.25 turns	
Travel Speeds:		
Range 1	km/h (mph)	1 - 7 (0 - 4)
Range 2	km/h (mph)	8 - 13 (5 - 8)
Range 3	km/h (mph)	14 - 32 (9 - 20)

VR-843C MACHINE STANDARD EQUIPMENT

ENGINE:

Standard	Cummins 4BT3.9 “Elite” Diesel	
Cylinders	4	
Capacity	cm^3 (cu. in.)	3917 (239)
Power @ 2500 RPM	kW (HP)	82 (110)
Torque @ 1500 RPM	N-m (lb.-ft.)	397 (293)

TRANSMISSION:

Type	Powershift with Soft Shift
Range	3 speeds forward and reverse
Make	Ingersoll Rand

DRIVE AXLES:

Front & Back	All Wheel Drive
Type	Planetary Steering
Make	Ingersoll Rand

BRAKES:

Service	Internal wet disk
Parking Brake	Internal - SAHR

TIRES:

Front	13.00 x 24 14PR/G2
Rear	13.00 x 24 14PR/G2
Ballast	Not Required

ELECTRICAL:

Negative Ground	12 volts
Alternator	62 Amps
Battery	900 Amps
Backup Alarm	107 DBM

STEERING:

3 modes	2-wheel, 4-wheel, or Crab

HYDRAULIC SYSTEM:

Pump, Variable displacement piston	129 Lpm @ 241 bar 34 gpm @ 3500 psi

GAUGES:

Oil Pressure	Water Temperature
Fuel Level	Voltmeter
Transmission Oil Temperature	Hourmeter

INDICATORS/ACCESSORIES:

Air Cleaner Restriction

Boom Angle Indicator

Frame Level Indicator

Backup Alarm

Engine Coolant Heater

Horn & Seat Belt

Lockable Engine Hood

Lockable Fuel Cap

Lockable Hydraulic Cap

Park Brake Light

Rear Axle Stabilization Indicator

Rear Wiper / Washer Stabilizers

Engine Service, Check, and Stop/Indicator Lights

SECTION 8 - FUEL AND LUBRICANT INSTRUCTIONS

GENERAL INFORMATION

Lubrication is an essential part of preventive maintenance, affecting to a great extent the useful life of the unit. Periodic lubrication of the moving parts reduces to a minimum the possibility of mechanical failures.

Different lubricants are needed and some components in the unit require more frequent lubricant than others. Therefore, it is important that the instructions regarding types of frequency of the application be explicitly followed.

The Lubrication Chart that follows in this section shows those items requiring regular service and the interval at which they should be performed. Details concerning fuel, oil and other lubricants follow the lubrication chart. A regular service program should be geared to the items listed under each interval. These intervals are based on average operating conditions. In the event of extremely severe, dusty or wet operating conditions, more frequent lubrication than specified may be necessary.

Specific recommendations of brand and grade of lubricants are not made here due to regional availability, operating conditions, and the continual development of improved products. Where questions arise, refer to the component manufacturer's manual and a reliable supplier.

All oil levels are to be checked with the machine parked on a level surface and while the oil is cold, unless otherwise specified.

On plug type check points, the oil levels are to be at the bottom edge of the check port.

All grease fittings are SAE STANDARD unless otherwise indicated. Grease non-sealed fittings until grease is seen extruding from the fitting. Twenty-eight grams (one ounce) of EP-MPG equals one pump on a standard 0.45 kg (one pound) grease gun.

Over lubrication on non-sealed fittings will not harm the fittings or components, but under lubrication will definitely lead to a shorter lifetime.

Unless otherwise indicated, items not equipped with grease fittings (linkages, pins, levers, etc.) should be lubricated with oil once a week. Motor oil, applied sparingly, will provide the necessary lubrication and help prevent the formation of rust. An anti-seeze compound may be used if rust has not formed. Otherwise, the component must be cleaned first.

Grease fittings that are worn and will not hold the grease gun, or those that have a stuck check ball, must be replaced.

To prevent minor irregularities from developing into serious conditions several other services or checks are recommended for the same intervals as the periodic lubrication.

1. Thoroughly wash all fittings, caps, plugs, etc. with non-flammable, non-toxic cleaning solution before servicing, to prevent dirt from entering while performing the service.

2. Lubricants must be at operating temperature when draining.

3. During regular lubrication service, visually check the entire unit in regard to capscrews, nuts and pins being properly secured.

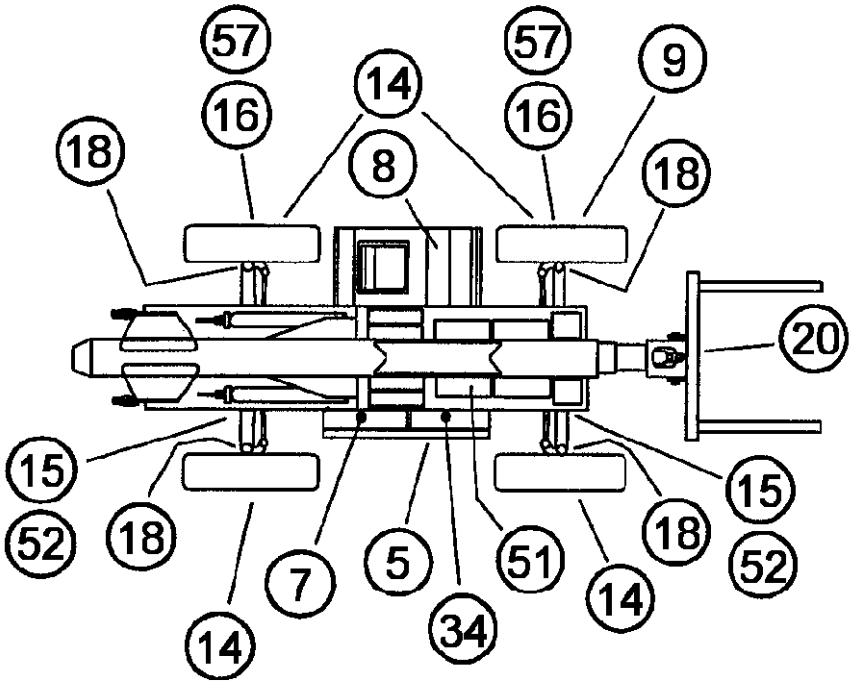
4. Spot check several capscrews and nuts for proper torque. If any are found loose, a more thorough investigation must be made.

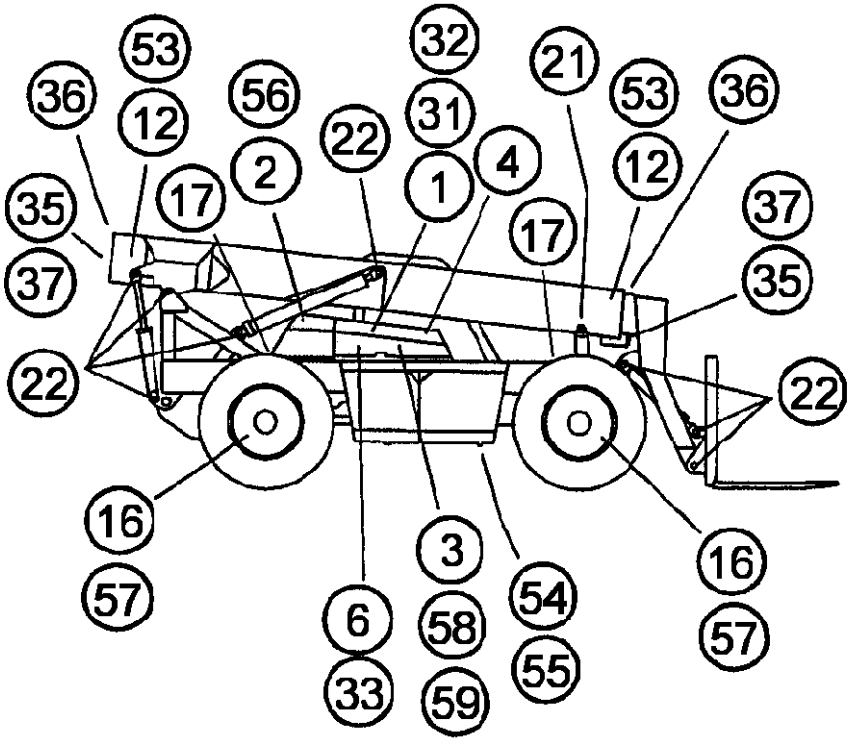
5. If a defect is detected which requires special maintenance service, stop the machine operation until the defect has been corrected. If necessary, contact the local Ingersoll-Rand distributor for assistance.

6. This symbol  represents an area where lubrication is required.

Periodic lubrication requirements are listed in the following Lubrication Chart. These requirements include lubricant checks and greasing designated areas of the machine.

LUBRICATION CHART





SERVICE FUNCTIONS:

S - CHECK T - TORQUE CL - CLEAN D - DRAIN
C - CHANGE G - GREASE AR - AS REQUIRED
F - FILL A - ADD FTLH - FILL TO LEVEL HOLE/MARK

SERVICE INTERVAL	REF. NO	DESCRIPTION	SERVICE	PART NO. OR LUBRICANT	COMMENTS
10 HRS. OR DAILY	1	ENGINE OIL	S, A	*	FULL ON DIPSTICK
	2	ENGINE COOLANT	S, A	WATER/ANTI-FREEZE	AR
	3	TRANSMISSION OIL LEVEL	S, A	**	FULL ON DIPSTICK
	4	AIR CLEANER INDICATOR	S		AR 1 PLACE
	5	HYDRAULIC OIL LEVEL	S, A	**	FILL TO SIGHT GAUGE
	6	FUEL/WATER SEPARATOR	D	COLLECTED WATER	AR 1 PLACE
	7	FUEL TANK	S, A	#2 DIESEL FUEL	AR
	8	PARKING BRAKE	S	SEE SECTION 3	
	9	TIRES	S, A	PRESSURE / CONDITION	SEE INFLATION DECAL
50 HRS. OR WEEKLY	12	CHAIN SHEAVE BEARINGS	G	EP-2 GREASE	2 FITTINGS
	14	WHEEL LUGS	S, T	619 N-M/442 LB.-FT.	40 PLACES
	15	AXLE DIFFERENTIAL OIL LEVEL	S, A	***	2 PLUGS
	16	AXLE PLANETARY WHEEL ENDS	S, A	***	4 PLUGS
	17	AXLE PIVOT BEARINGS	G	EP-2 GREASE	4 FITTINGS
	18	AXLE KING PINS	G	EP-2 GREASE	8 FITTINGS
	20	FORK PINS	G	EP-2 GREASE	AR
	21	FRAME LEVEL PIVOT BUSHINGS	G	EP-2 GREASE	2 FITTINGS
	22	BOOM PIVOT AND CYLINDERS	G	EP-2 GREASE	13 FITTINGS
250 HRS. OR QUATERLY	31	ENGINE OIL TURBO	D, F	*	11 L (11.6 QUARTS)
	32	ENGINE OIL FILTER	C	SEE PARTS MANUAL	1 REQUIRED
	33	FUEL FILTER	C	SEE PARTS MANUAL	1 REQUIRED
	34	HYD. TANK BREATHER	C		1 REQUIRED
	35	BOOM CHAINS	S	CHAIN LUBRICANT	AR
	36	BOOM WEAR PADS	G	EP-2 GREASE	30 PADS
	37	CHAIN AND BOOM HOSE	T	SEE SECTION 5	ADJUST

SERVICE INTERVAL	REF. NO	DESCRIPTION	SERVICE	PART NO. OR LUBRICANT	COMMENTS
1000 HRS. OR ANNUALLY	51	HYD. TANK BREATHER	C	SEE PARTS MANUAL	1 REQUIRED
	52	AXLE DIFFERENTIAL OIL	D, F	***	31 L (32.8 QUARTS)
	53	BOOM CHAINS	S	CHAIN LUBRICANT	AR
	54	HYD. OIL SUCTION STRAINER	CL, A		(3)
	55	HYDRAULIC OIL	C	**	FILL TO SIGHT GAUGE
	56	ENGINE COOLANT	D, F	WATER/ANTI-FREEZE	18.9 L (20 QUARTS)
	57	AXLE PLANETARY	D, F	***	0.9 L (1 QUART)
	58	TRANSMISSION OIL (1)	D, F	**	11.3 L (12 QUARTS)
	59	TRANSMISSION OIL FILTER (1)	C	SEE PARTS MANUAL	1 REQUIRED

*** IR Multi-Purpose Premium Engine Oil**
**** IR Premium Multi-Purpose ATF**
***** IR Premium Limited-Slip Component Lubricant**

NOTES:
1. Change transmission oil and filter after first 50 hours.
2. Without Chlorine Additive
3. See Parts Manual for Part Number

FLUID CAPACITIES

The following fluid capacities are provided for servicing personnel who must perform machine maintenance in remote locations where complete shop facilities and resources are not available. These capacities will give the servicing personnel an approximation of the fluid capacities of the components to be serviced. Always ensure that the specified method of checking for accurate fluid levels is used.

Table 8-1

FLUID/OIL	USEABLE CAPACITY
Diesel Fuel (#2 ASTMD-975-60T)	132 Liter (35 Gallon)
Engine Oil (SAE 15W40)	11 Liter (11.6 Quart) - Turbocharged
Transmission Oil (Multipurpose ATF)	12.9 Liter (13.6 Quart)
Engine Coolant (50% Water/50% Glycol)	18.9 Liter (20 Quart)
Hydraulic Oil (Mobil DTE 13M, Multipurpose ATF)	151 Liter (40 Gallon)
Drive Axle, Total	8.51 Liter (9.0 Quart)
Drive Axle, Center Section (Mobilube 80W-90 EP)	6.62 Liter (7.0 Quart)
Drive Axle, Wheel End (per side) (SAE 80W-90 EP)	0.95 Liter (1 Quart)

HYDRAULIC OIL REQUIREMENTS AND SPECIFICATIONS

The quality of the hydraulic oil is important to the satisfactory performance of any hydraulic system. The oil serves as the power transmission medium, system coolant, and lubricant. Selection of the proper oil is essential to ensure proper system performance and life. For the specifications and requirements that hydraulic oil used in this machine should meet, refer to information below.

Table 8-2

Viscosity :	60 SUS minimum at operating temperature 7500 SUS maximum at starting temperature 150 TO 225 SUS AT 38° C (100° F) (generally) 44 TO 48 SUS AT 99° C (210° F) (generally)
Viscosity Index :	90 minimum
Aniline Point :	-175 minimum
API gravity :	28 minimum Paraffinic oils: 28 OR MORE Mixed base: 24 TO 28 Napthanic or asphaltic base: 24 or less
Recommended Additives :	Rust and oxidation inhibitors Foam depressant
Desirable Characteristics :	Stability of physical and chemical characteristics High demulsibility (low emulsibility) for separation of water, air, and contaminants Resistance to the formation of gums, sludges, acids, tars, and varnishes High lubricity and film strength

The following are only a few examples of the commercial brand oils meeting specifications for use at temperatures above -12° C (10° F).

International Harvester Tran	
Auto. Trans. Fluid	Type F
Mobil Oil Company	Mobil DTE 15M
Sun Oil Company	Sun Oil 2105

For temperatures below -12° C (10° F), the following examples meet specifications.

Auto Transmission Fluid	Type F
Mobil Oil Company	Mobil DTE 13
Shell Oil Company	Tellus T-27

LUBRICATING OIL/GREASE SPECIFICATIONS (EXCEPT ENGINE)

Extreme Pressure Multipurpose Lubricant

This gear lubricant is compounded to achieve high load carrying capacity and meet the requirements of either API-GL-5 or MIL-L-2105C. Unless otherwise specified, SAE-90 viscosity oil may be used for year-round service. Low temperature usage is restricted as follows:

SAE VISCOSITY NO.	MIN. AMBIENT TEMP °C (°F)
75W	-40°C (-40°F)
80W	-26°C (-15°F)
85W	-12°C (+10°F)
90	-7°C (+20°F)
140	+4°C (+40°F)
250	+10°C (+50°F)

Extreme Pressure Multi-Purpose Grease

This is a lithium soap base grease with a high load carrying capacity. The following properties are recommended:

Timken OK Load	18 kg (40 lb.) Minimum
Dropping Point	177° C (350° F) Minimum
Oil Viscosity	75 SUS Minimum at 99° C (210° F)
Water Resistance	Excellent

Under normal operating conditions, the following consistency grades are recommended:

NLGI No. 0 for temperatures below -18° C (0° F).

NLGI No. 1 or No. 2 for ambient temperatures -18° C to 38° C (0 - 100° F).

NLGI No. 2 or No. 3 for temperatures over 38° C (100° F).

ENGINE LUBE OIL SPECIFICATIONS

NOTE

For latest applicable engine lubricating oil specifications, contact engine manufacturer, engine distributor or your Ingersoll Rand distributor.

CUMMINS FUEL OIL SPECIFICATIONS

Cummins diesel engines have been developed to take advantage of the high energy content and generally lower cost of No. 2 Diesel Fuels. Experience has shown that a Cummins diesel engine will also operate satisfactorily on No. 1 fuels or other fuels within the specifications shown in Table 8-3.

Table 8-3

Viscosity (ASTM D-445)	1.3 to 5.8 mm per second at 40° C (1.3 to 5.8 centistokes per second at 104° F)
Cetane Number (ASTM D-613)	40 minimum except in cold weather or in service with prolonged idle, a higher cetane number is desirable.
Sulfur Content (ASTM D-129 or 1552)	Not to exceed 1 percent by weight.
Water and Sediment (ASTM D-1796)	Not to exceed 0.1 percent by volume.
Carbon Residue (Ramsbottom, ASTM-D-524 or Conradson, ASTM D-189)	Not to exceed 0.25 percent by weight on 10 percent volume residue.
Flash Point (ASTM D-93)	At least 52° C (125° F) or legal temperature if higher than 52° C (125° F).
Density (ASTM D-287)	-1 to 6° C (30 to 42° F) API gravity at 16° C (60° F) (0.816 to 0.876 Sp. Gr.).
Cloud Point (ASTM D-97)	6° C (10° F) below lowest ambient temperature at which the fuel is expected to operate.
Active Sulfur	Copper strip corrosion not to exceed No. 2 rating after 3 hours at 49° C (122° F).
Ash (ASTM D-482)	Not to exceed 0.02 percent by weight.
Distillation (ASTM D-86)	The distillation curve must be smooth and continuous. At least 90 percent of the fuel must evaporate at less than 360° C (680° F). All of the fuel must evaporate at less than 385° C (725° F).

HAZARDOUS SUBSTANCE PRECAUTION

HAZARDOUS SUBSTANCE PRECAUTION

The following information is provided to assist the owners and operators of Ingersoll Rand Road Machinery Equipment. Further information may be obtained by contacting your Ingersoll Rand Road Machinery Equipment Distributor.

Table 8-4

The following substances may be produced during the operation of this machine and may be hazardous to health.	
SUBSTANCE	**PRECAUTION**
Engine Exhaust Fumes	Avoid breathing.
Engine Exhaust Fumes	Avoid buildup of fumes in confined spaces.
Electric Motor Dust (Brushes/Insulation)	Avoid breathing during maintenance.
Brake Lining Dust *	Avoid breathing during maintenance.

The following substances are used in the manufacturing of this machine and may be hazardous to health if used incorrectly.	
SUBSTANCE	**PRECAUTION**
Antifreeze (Water-cooled engine)	Avoid ingestion, skin contact and breathing fumes.
Hydraulic Oil	Avoid ingestion, skin contact and breathing fumes.
Engine Lubricating Oil	Avoid ingestion, skin contact and breathing fumes.
Preservative Grease	Avoid ingestion, skin contact and breathing fumes.
Rust Preventative	Avoid ingestion, skin contact and breathing fumes.
Engine Fuel	Avoid ingestion, skin contact and breathing fumes.
Battery	Avoid ingestion, skin contact and breathing fumes.
SAE Gear Oil	Avoid ingestion, skin contact and breathing fumes.

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800-227-0573 (US and Canada)
717-532-9181 (Latin America - Ingersoll Rand)
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SECTION 9 - TORQUE SPECIFICATIONS

ISO METRIC TORQUE CHART

Use the following Recommended Torque Chart for bolts and nuts of ISO Metric strength Class 8.8 or 10.9. If other torques are required, they will be indicated in the text.

NOTE

Torque values are based on dry zinc-plated capscrews. Value will be approximately 30% less if lubricated bolts are used.

BOLT SIZE (MM)	TORQUE	
	GRADE 8.8 N-m (POUNDS-FOOT)	GRADE 10.9 N-m (POUNDS-FOOT)
6	11 (8)	15 (11)
8	28 (20)	37 (27)
10	53 (39)	72 (53)
12	92 (68)	126 (93)
14	145 (107)	201 (148)
16	212 (156)	312 (230)
20	415 (306)	609 (449)
24	717 (529)	1054 (777)
30	1424 (1050)	2094 (1544)
36	2488 (1835)	3656 (2696)

SAE TORQUE CHART

Use the following Recommended Torque Chart for bolts and nuts of SAE Grade 5 or better quality. If other torques are required, they will be indicated in the text.

NOTE

Torque values are based on plain, unplated hardware, degreased, dried, clamping steel to steel.

BOLT SIZE	CLAMP LOAD		TORQUE	
	kg	lbs.	N•m	lb.-ft
1/4 - 20 1/4 - 28	916 1052	2020 2320	11 14	96 lb.-in. 120 lb.-in.
5/16 - 18 5/16 - 24	1515 1678	3340 3700	23 26	17 19
3/8 - 16 3/8 - 24	2241 2540	4940 5600	41 47	30 35
7/16 - 14 7/16 - 20	3084 3425	6800 7550	68 75	50 55
1/2 - 13 1/2 - 20	4105 4853	9050 10700	102 122	75 90
9/16 - 12 9/16 - 18	5262 5874	11600 12950	149 163	110 120
5/8 - 11 5/8 - 18	6532 7688	14400 16950	203 240	150 180
3/4 - 10 3/4 - 16	9661.5 10795.5	21300 23800	353 407	260 300
7/8 - 9 7/8 - 14	12247 13517	27000 29800	542 597	400 440
1 - 8 1 - 12	16102.5 17599	35500 38800	786 868	580 640
1 1/8 - 7 1 1/8 - 12	19187 21546	42300 47500	1085 1193	800 880
1 1/4 - 7 1 1/4 - 12	24403 27034	53800 59600	1519 1681	1120 1240
1 3/8 - 6 1 3/8 - 12	29075 33112	64100 73000	1460 1680	1980 2278
1 1/2 - 6 1 1/2 - 12	35380 39780	78000 87700	1940 2200	2631 2983

USE OF LOCTITE

All thread fasteners will be Loctited except the following:

1. Wheel nuts
2. Nylon insert nuts
3. Whizlock bolts and nuts
4. Fasteners less than ¼ inch diameter
5. If instructed not to apply Loctite

Type of Loctite to be used:

1. No. 242 for 5/16 diameter and below
2. No. 271 for greater than 5/16 diameter
3. No. 242 for aluminum

All Loctited fasteners will be degreased and dried. When accelerated Loctite cure times are required, Loctite primer must be used.

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SECTION 10 - SCHEMATICS

GENERAL INFORMATION

Hydraulic and electrical schematics are included here for the convenience of the owner/ operator. Additional full-size copies of the schematics are available by contacting the Ingersoll Rand Road Development Division. See your authorized Ingersoll Rand dealer for assistance, if required.

For ultimate machine life and maximum performance, we recommend the use of genuine Ingersoll Rand brand parts.

The electrical and hydraulic schematics included herein that are applicable to the VR-843C Vertical Reach Material Handlers are outlined below.

Electrical Schematics

- Electrical Schematic for the VR-843C Vertical Reach Material Handler, Drawing No. 13443197, pages 10-3 to 10-5.

Hydraulic Schematics

- Hydraulic Schematic for the VR-843C Vertical Reach Material Handler, Drawing No. 18006643, page 10-6.

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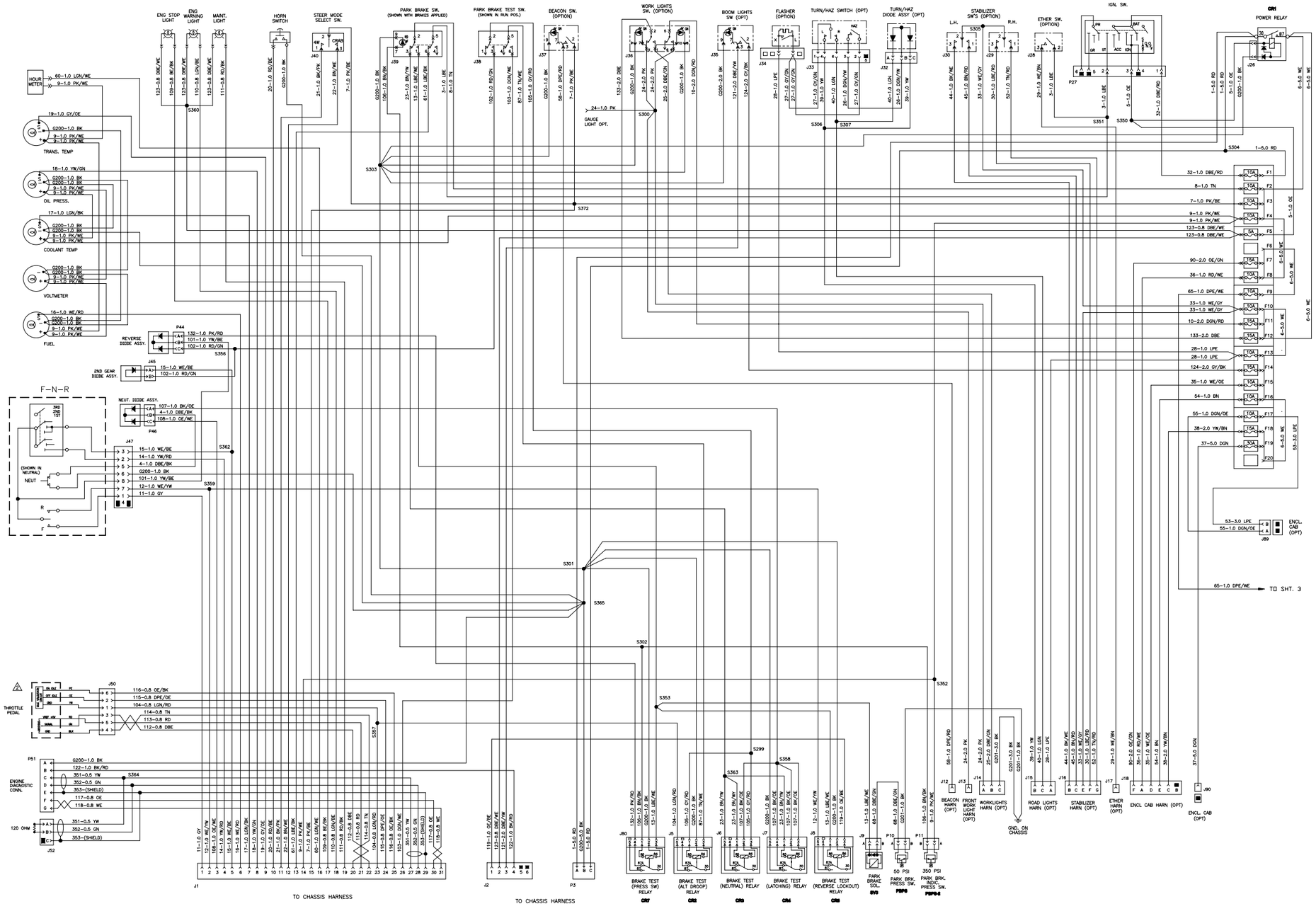
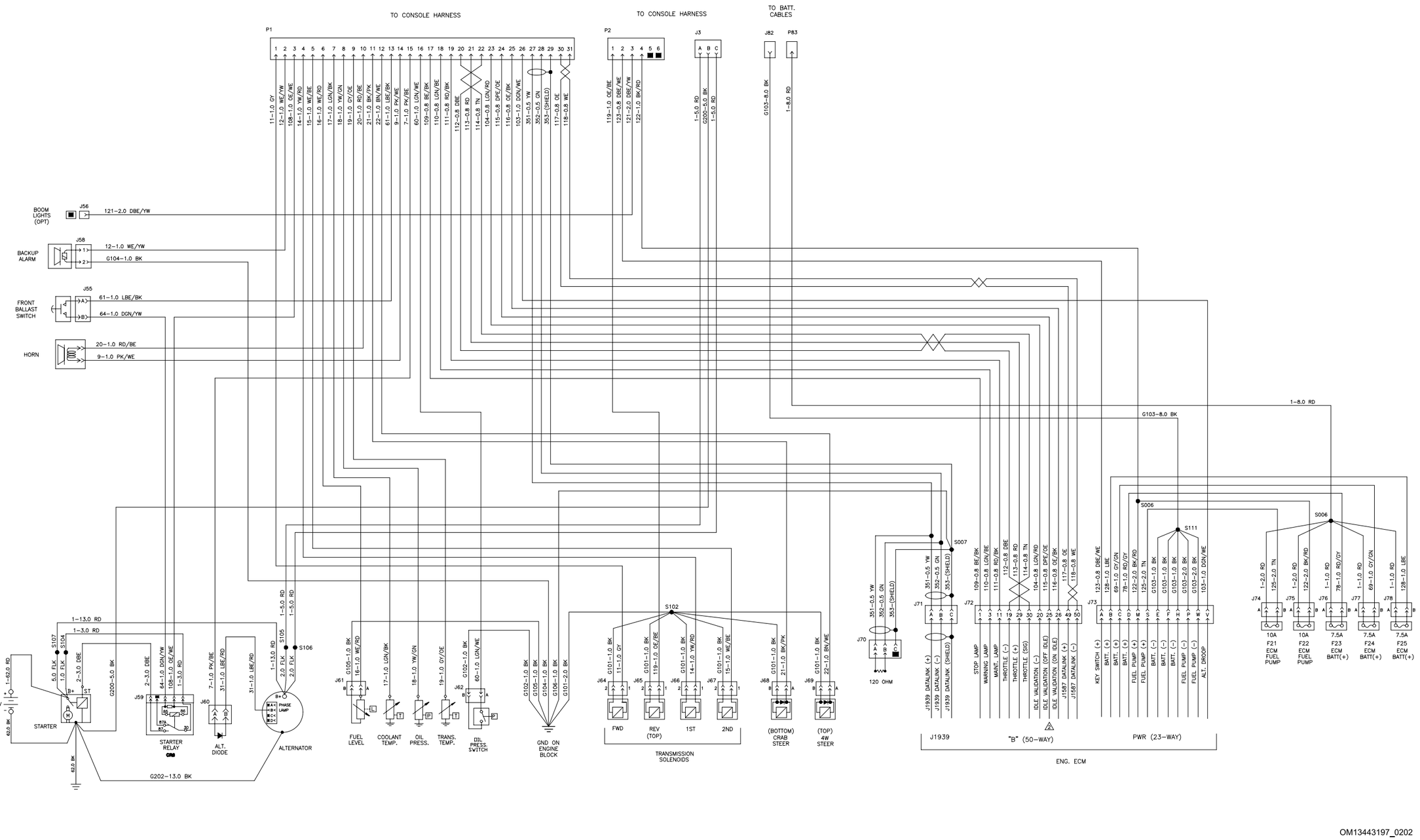
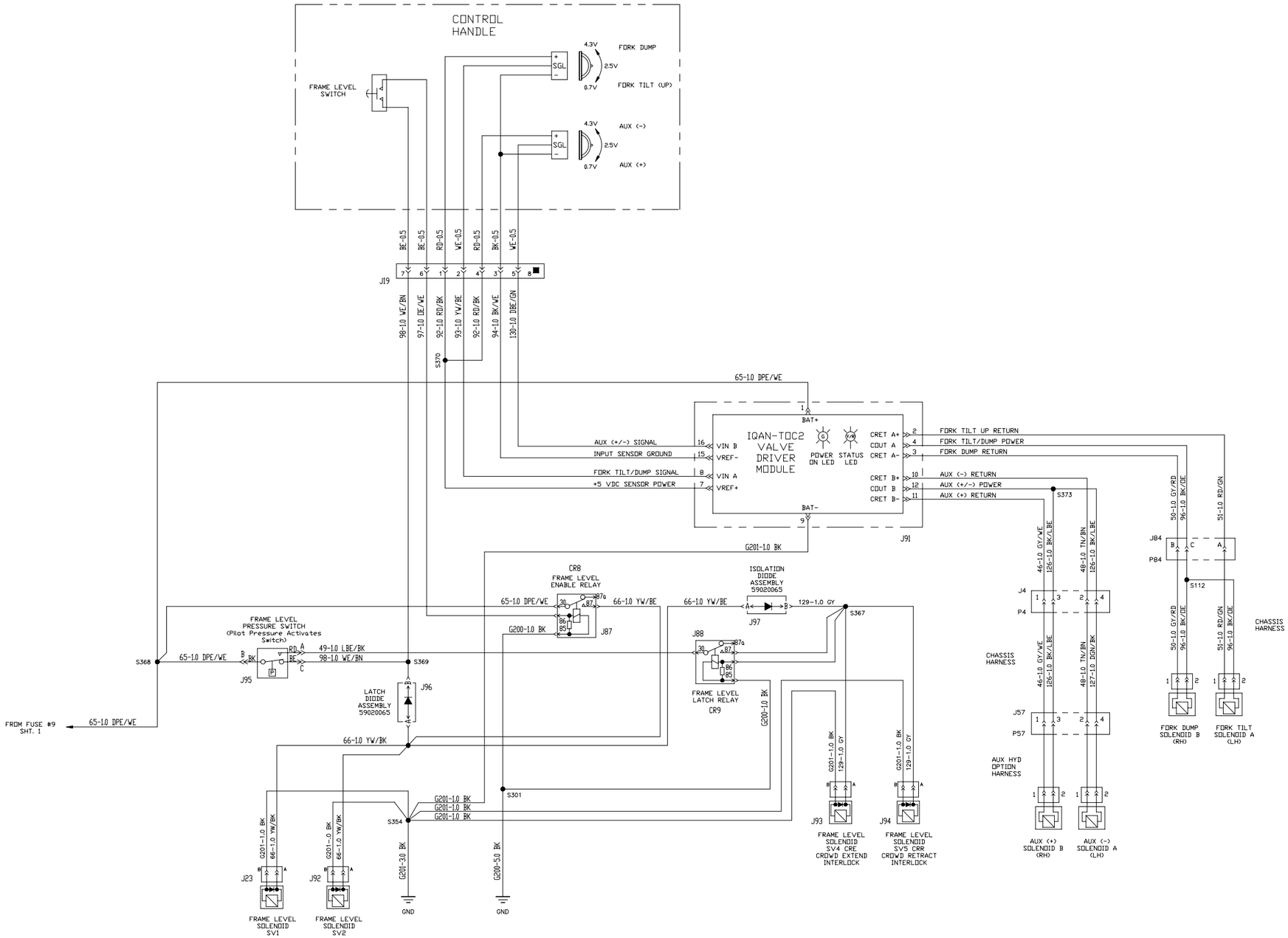
Electrical Schematic for VR-843C Vertical Reach Material Handler (13443197 Sheet 1 of 3)



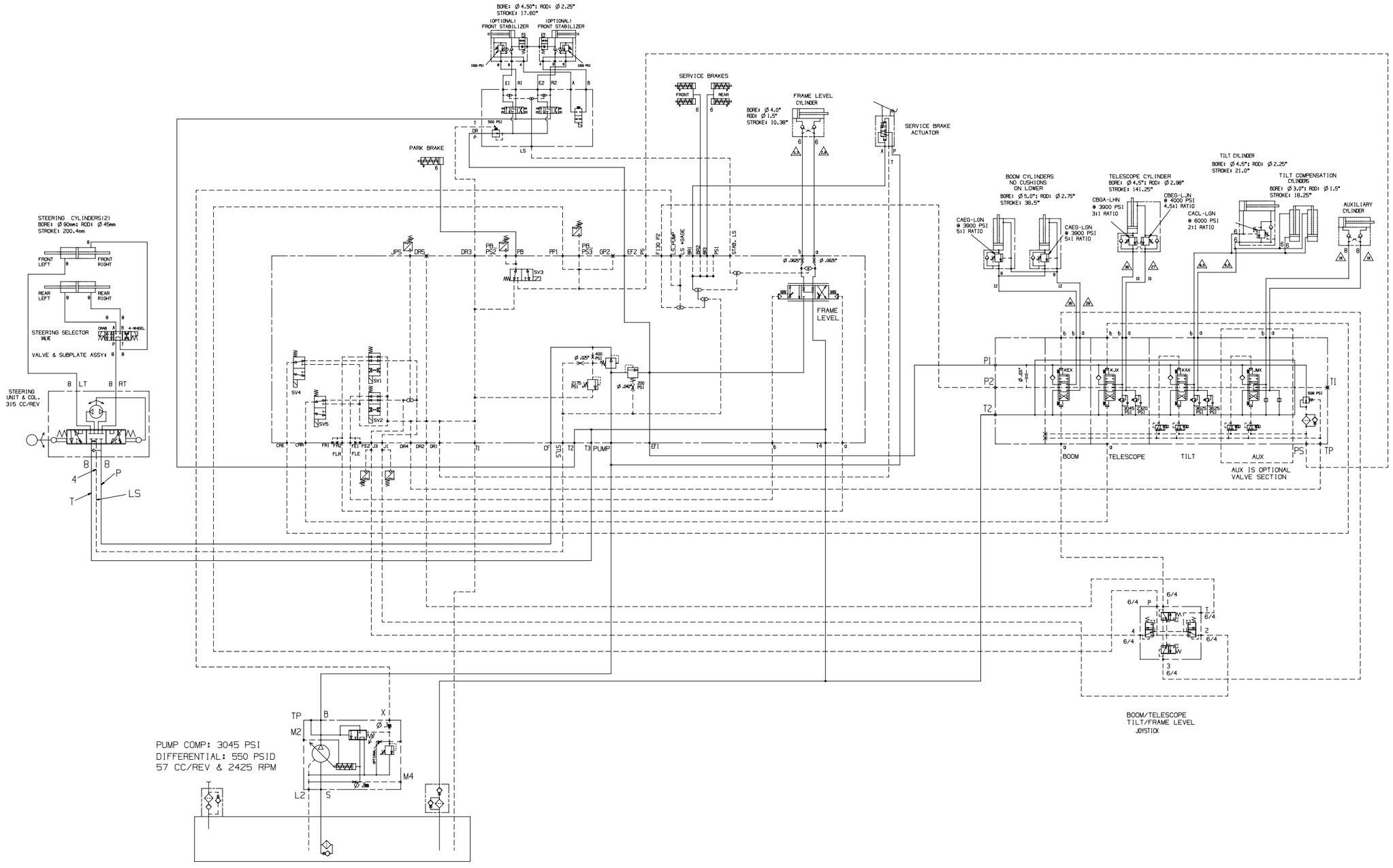
Electrical Schematic for VR-843C Vertical Reach Material Handler (13443197 Sheet 2 of 3)



Electrical Schematic for VR-843C Vertical Reach Material Handler (13443197 Sheet 3 of 3)



Hydraulic Schematic VR-843C Vertical Reach Material Handler (18006643)



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SECTION 11 - RECOMMENDED SPARE PARTS

VR-843C RECOMMENDED SPARE PARTS

This section of the manual identifies the spare parts that the owner/operator is encouraged to keep on hand in support of the service schedule for the VR-843C Vertical Reach Material Handler. The owner/operator can expect to use these spare parts over the course of normal use to keep his machine performing optimally if service is kept current in accordance with the recommended service intervals in Section 5's Maintenance Schedule and the Lubrication Chart of Section 8. More or less of these spare parts may actually be used depending on how your machine is equipped, how frequently your machine is used, and how well it is cared for. The recommended spare parts are tabulated below, grouped by major assemblies and the service interval (operating hours).

Table 11-1: Spare Parts for VR-843C Vertical Reach Material Handler

Service Interval (Hours)			Component Description	CPN
0 - 1000	1000 - 3000	3000 +		
Air Cleaner				
		1	Air Cleaner	54524418
1	1	1	Air Cleaner Primary Filter Element	54484092
1	1	1	Air Cleaner Secondary Filter Element	54493259
Axle and Wheels				
		1	Front Drive Shaft Assembly	54568522
		1	Rear Drive Shaft Assembly	54479878
		1	Frame Level Cylinder	13224969
		1	Frame Level Cylinder Locknut	59644465
		1	Rim (Standard)	59182097
		1	Tire (Standard)	59158345
		1	Air Valve (Foamless Wheel & Tire Assemblies)	59254447
		20	Wheel Nut	59163758

Service Interval (Hours)			Component Description	CPN
0 - 1000	1000 - 3000	3000 +		
Boom and Carriage				
	4		Bearing	50268127
	2		Anchor	59455154
		1	Tilt Compensation Cylinder	59221895
	4		Cylinder Pivot Pin	13232244
		1	Lift Cylinder	59221721
		1	Fork Tilt Cylinder	59221770
	2		Anchor Pin	59001891
		2	Anchor Chain	59101170
	1		Chain Anchor Rod	59101048
	1		Chain Extension	59157339
	2		Anchor Chain Pin	59456962
		1	Base Ring	59462895
		1	Pin	59454801
		1	Crowd Cylinder	59282715
	2		Wear Pad	13156799
		1	Bushing	59455204
		1	Bracket Guide Plate	59116459
	1		Anchor Guide	59116467
	2		Chain Sheave Guard	59135087
		1	Chain Sheave	59169953

Service Interval (Hours)			Component Description	CPN
0 - 1000	1000 - 3000	3000 +		
Outer Boom Section				
	2		Wear Pad	13156799
	2		Wear Pad	13156781
	2		Shim Plate	59269134
	6		Wear Pad	59182196
		2	Block	59451641
		2	Bearing	13232277
	1		Boom Cowling	13351135
Intermediate Boom Section				
		2	Hose Sheeve	13334552
		2	Block	59157099
	2		Shim Plate	59100941
	2		Wear Pad	13156799
		2	Wear Pad	13243639
	2		Wear Pad	59182196
		1	Finger	13183074
	2		Shim Plate	59135194
	4		Shim Plate	59136804
Inner Boom Section				
	2		Wear Pad	13156799
		2	Spacer Plate	59116491
	2		Shim Plate	59100941
	2		Shim Plate	59135194
	2		Shim Plate	59136804

Service Interval (Hours)			Component Description	CPN
0 - 1000	1000 - 3000	3000 +		
			Quick-Attach Carriage	
	1		Cylinder Pivot Pin	13232251
		1	48 in. Load Arm	58793209
		1	60 in. Load Arm	58793191
		1	72 in. Load Arm	58793183
		2	Plate	59451815
	2		Pin	59101758
	1		Apron Handle	13199393
		1	Quick-Attach Apron	13187364
		1	Rubber Stop Pin	13195862
		1	12 Ft. Truss Boom	59199513
			Electrical	
1	1	1	Power Relay with Diodes	13316831
1	1	1	Relay	59436899
		1	Battery	59436931
		1	Battery Hold Down	59181875
	1		Horn	13111422
	1		Switch	59112011
	1		Backup Alarm	13273354
	1		Fuse, 10 A	59325712
	1		Fuse, 15 A	59483339
	1		Fuse, 20 A	59398016
		1	Diode Assembly	59149146

Service Interval (Hours)			Component Description	CPN
0 - 1000	1000 - 3000	3000 +		
Engine				
1	1	1	Engine Oil Filter	13284716
1	1	1	Fuel Filter	13284708
1	1	1	Inline Fuel Filter	58827932
	1		Fan Belt	13284732
		1	Starter	13284724
		1	Alternator	54726948
		1	Transmission Temperature Sender	59302554
	1		Engine Oil Pressure Sender	58878000
	1		Suction Fan	59023747
	1		Engine Coolant Temperature Sender	59816322
		1	Engine Oil Pressure Switch	59124578
		1	Muffler	58933623
		2	Exhaust Clamp	59179218
		1	Tail Pipe	13195912
1	1	1	Radiator Cap	13281571
		1	Upper Radiator Hose	13267067
		1	Lower Radiator Hose	13307863
Frame				
		1	Cable	59436741
	1		Fuel Level Sender	59129528
	1		Fuel Cap	59182428
	1		Magnetic Plug	59144428
		1	Hydraulic Tank	13258470
	1		Hydraulic Tank Cap	59182410
		1	Fuel Tank	13258355

Service Interval (Hours)			Component Description	CPN
0 - 1000	1000 - 3000	3000 +		
			Hydraulics	
		1	Hydraulic Pump	54535646
1	1	1	Hydraulic Filter	13173802
		1	Steering Unit	13267596
		1	Brake Valve	59113480
		1	Steering Selector Valve	13163274
	1		Pressure Switch	13259189
	2		Pressure Reducer	13284633
		1	Fuel Tank	13258355
			Stabilizer	
		1	Stabilizer Cylinder	59221812
		1	Stabilizer Valve	13173331
	2		Bearing	58951674
	2		Anchor	59455154
			Instrument Panel	
	1		Ignition Switch	13316849
1	1	1	Ignition Switch Key	58917261
	1		Ignition Switch Cover	58892902
		1	Cable	59436741
	1		Fuel Level Gauge	59046920
		1	Voltmeter	59044297
	1		Oil Pressure Gauge	59046904
		1	Transmission Temperature Gauge	59113761
		1	Water Temperature Gauge	59132324
	1		Hourmeter	59165001
		1	Brake Test Switch	54666102
		1	Parking Brake Switch	54666094
	1		Indicator Light	59816447

Service Interval (Hours)			Component Description	CPN
0 - 1000	1000 - 3000	3000 +		
Operator Compartment				
	1		Horn Button	59159558
		1	Spinner Kit	59199141
	1		Transmission Shifter	59113696
		1	Level Gauge	59181545
		1	Heater Valve	13200027
Open Cab				
	1		Rear Wiper Arm	59072694
	1		Wiper Blade	59194514
	1		Wiper Motor Kit	59194548
Enclosed Cab				
		1	Front Window	13174081
		1	Sliding Window	59154641
	1		Rear Wiper Arm	59072694
	1		Wiper Blade	59194514
	1		Wiper Motor Kit	59194548
		1	Level Gauge	59181545
		1	Armrest	54473004
		1	Defrost Fan	59154757
		1	Door Seal	59072702
		1	Door Strap	59142851
		1	Outside Door Latch	59142661
		1	Inside Latch Handle	59154955
	1		Door Key	59155598

Service Interval (Hours)			Component Description	CPN
0 - 1000	1000 - 3000	3000 +		
Kits				
	1		VR-843C Decal Kit	13341581
		1	Frame Level Cylinder Seal Kit	13248505
		1	Tilt Compensation Cylinder Seal Kit	13421896
		1	Lift Cylinder Seal Kit	13268271
		1	Fork Tilt Cylinder Seal Kit	13281431
		1	Crowd Cylinder Seal Kit	13284104
	1		Hydraulic Pump Seal Kit	59154310
	1		Brake Valve Seal Kit	59154617
		1	Stabilizer Cylinder Seal Kit	13284120
Optional Equipment				
Wheel and Tire Assemblies				
		1	Foam Filled Tire	54503016
72 in. Swing Carriage				
		2	Hydraulic Cylinder	13170147
		2	Counterbalance Valve	58874751
		1	Seal Kit	54728886
		1	Bearing	50275395
		1	Flow Control Valve	13170188
		2	Cover Plate	59583450
Load Bucket				
		1	Load Bucket	59149484
Tapered Forks				
		1	48 in. Tapered Fork	59272583
		1	60 in. Tapered Fork	59272591

Service Interval (Hours)			Component Description	CPN
0 - 1000	1000 - 3000	3000 +		
			Scrap Grapple Bucket	
		1	Cylinder	59110932
		1	Seal Kit	59231282
			Block Heater	
		1	Block Heater	59118521
			Worklights	
	2		Work Lamp	58837949
	2		Work Lamp Light Bulb	58875543
		3	Cable Seal	59854877
			Stop/Turn Signal	
		1	Brake Light Switch	59157792
			Single Function Auxiliary Hydraulics	
		2	Sheave	13334552
		1	Lift/Crowd Valve	13315387
		1	Lift/Crowd Valve	13315361

RECOMMENDED LUBRICANTS

This section of the manual contains a list of the recommended Ingersoll Rand lubricants for the VR-843C Vertical Reach Material Handler.

Table 11-2: Recommended Lubricants

	1 Qt.	1 Gal.	5 Gal.	55 Gal.
IR All-Season Premium Hydraulic Oil	N/A	N/A	59045179	59045187
IR Multi-Purpose Premium Engine Oil	59022343	59023507	57022327	59022335
IR Premium Limited-Slip Component Lubricant	13248455	13248463	59022418	59022426
IR Premium Multi-Purpose ATF	13248471	13248489	59023572	59023580
IR Synthetic Component Lubricant	13248430	13248448	58977597	59022459
IR Synthetic Plus Component Lubricant	13248414	13248422	59046177	59046165

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MATERIAL HANDLER WARRANTY

Ingersoll-Rand Company ("IR") warrants to its and its affiliates' authorized distributors, who in turn warrant to the initial user only, that each new Ingersoll-Rand material handler sold by the distributor will be free from proven defects in material and workmanship for the following period:

- VR Series and RT-700G and H Series limited to **1 year** or **1,000 hours** of operation, from date of entry into service, or **twenty-four** (24) months from the date of delivery from the factory to the distributor, whichever occurs first.

- RT-700J Series limited to **3 years** or **3,000 hours** of operation from date of entry into service, or **forty-eight** (48) months from date of delivery from the factory to the distributor, whichever occurs first

During the warranty period, the authorized distributor shall repair or replace, at IR's option, any part that is found upon inspection to be defective in material or workmanship. Such part will be repaired or replaced without charge for parts and labor to the initial user by the authorized distributor. The initial user shall provide the authorized distributor with prompt notification of the defect and allow reasonable time for repair or replacement. IR may require failed parts to be returned to the factory. Transportation of the product to the authorized distributor is the responsibility of the user. The remedies provided in this warranty are exclusive.

This warranty does not apply to failures occurring as a result of abuse, misuse, negligent repairs, corrosion, erosion and normal wear and tear, alterations or modifications made to the product without the express written consent of IR, or failure to follow the recommended operating practices and maintenance procedures as provided in the product's operating and maintenance publications. This warranty does not cover replacement of scheduled service items such as oil, filters, and wear items. This warranty does not apply to engines (including engine electrical components) and tires or other accessories and equipment furnished by IR, but manufactured by others. The initial user shall rely solely on the warranty, if any, of the respective manufacturers thereof.

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