

Buhler Versatile

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02/2008

OPERATOR'S MANUAL



TO THE OWNER:

This manual contains information concerning the operation, adjustment, and maintenance of Buhler Versatile 4WD tractors. You have purchased a dependable machine, but only by proper care and operation can you expect to receive the performance and long service built into this tractor. **HAVE ALL OPERATORS READ THIS MANUAL CAREFULLY AND KEEP IT AVAILABLE FOR READY REFERENCE.**

The tractor was designed to pull agricultural equipment in agricultural applications at field speeds of 7.2 KPH (4.5 MPH) or greater. Proper ballasting to provide equal traction to front and rear axles under moderate to heavy load will improve tractor performance and life. Using the tractor in industrial only applications (ie. road building) will not be covered by warranty.

Your Buhler Versatile dealer will instruct you in the general operation of your tractor. Your dealer's staff of factory-trained service technicians will be glad to answer any questions that may arise regarding the operation of your tractor.

For engine maintenance not covered in this manual, follow the instructions provided in the Cummins Engine Operator's manual. Before putting the tractor in service, become familiar with the procedures outlined in both manuals.

The warranty coverage that is extended to your Buhler Versatile 4WD tractor is explained in the Warranty and Limitation of Liability form. Your dealer will provide you with a copy of the warranty and retain a copy which you have signed. After you read the warranty, ask your dealer to explain any points that you may not understand.

Do not modify, alter, or permit anyone else to modify or alter this tractor or any of its components, or any tractor function, without first consulting an authorized Buhler Versatile dealer. If you have any questions regarding tractor modifications, contact Buhler Versatile Inc., 1260 Clarence Ave. Winnipeg MB, R3T 1T2.

Your safety, and the safety of those around you depends upon the care and good judgement you use while operating this equipment. Read the safety precautions carefully.

For a complete list of the delivery service checks performed by your dealer, refer to the Delivery Report in this manual. The first copy is your record of the service performed and the second copy, which is to be removed from the manual, is your dealer's record. **MAKE SURE THAT YOU AND THE DEALER SIGN BOTH COPIES.**

After you have operated the tractor for 50 hours, have your dealer perform the factory recommended 50-hour service. Return this manual with your tractor to the dealer so the "First 50-Hour Service" checklist can be filled out. You will be responsible for the cost of lubricants, fluids, filters and other items replaced as part of normal maintenance. Prior to taking the tractor to your selling dealer for service, it is recommended that you contact them to determine any other charges for which you may be responsible.

All data given in this book is subject to production model variations. Dimensions and weights are approximations only, and the illustrations do not necessarily show tractors in standard condition. For exact information about any particular tractor, please consult your Buhler Versatile dealer.



CAUTION: THIS SYMBOL IS USED THROUGHOUT THIS BOOK WHENEVER PERSONAL SAFETY IS INVOLVED. TAKE TIME TO READ AND FOLLOW THE INSTRUCTIONS. BE CAREFUL!

CAUTION: PICTURES IN THIS MANUAL MAY SHOW PROTECTIVE SHIELDING OPEN OR REMOVED TO BETTER ILLUSTRATE A PARTICULAR FEATURE OR ADJUSTMENT.

BE CERTAIN, HOWEVER, TO CLOSE OR REPLACE ALL SHIELDING BEFORE OPERATING THE MACHINE.

IMPROVEMENTS

Buhler Versatile Inc. is continually striving to improve its products. We reserve the right to make improvements or changes when it becomes practical and possible to do so, without incurring any obligation to make changes or additions to the equipment sold previously.

CALIFORNIA EMISSION CONTROL WARRANTY STATEMENT

Your Warranty Rights and Obligations

The California Air Resources Board and Buhler Versatile are pleased to explain the emission control system warranty on your engine. In California, new 1996 and later heavy-duty off-road engines from 175 to 750 HP must be designed, built, and equipped to meet the State's stringent anti-smog standards. Buhler Versatile must warrant the emission control system on your engine for the periods of time listed below, provided there has been no abuse, neglect, or improper maintenance of your engine.

Your emission control system includes parts such as the fuel injection system and the air induction system.

Manufacturer's Warranty Coverage:

The 1996 and later heavy-duty off-road engines are warranted from the original date of delivery for five years or 3,000 hours of operation, whichever occurs first. If any emission-related part on your engine is defective, the part will be repaired or replaced by Buhler Versatile.

Owner's Warranty Responsibilities:

- As the heavy-duty off-road engine owner, you are responsible for the performance of the required maintenance listed in your owner's manual. Buhler Versatile recommends that you retain all receipts covering maintenance on your heavy-duty off-road engine, but Buhler Versatile cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.
- As the heavy-duty off-road engine owner, you should, however, be aware that Buhler Versatile may deny you warranty coverage if your heavy-duty off-road engine or a part has failed due to abuse, neglect, improper maintenance, or unapproved modifications.
- Your engine is designed to operate on commercially available diesel fuel only. Use of any other fuel may result in your engine no longer operating in compliance with California's emissions requirements.
- You are responsible for initiating the warranty process. The ARB suggests that you present your heavy-duty off-road engine to a Buhler Versatile dealer as soon as a problem exists. The warranty repairs should be completed by the dealer as expeditiously as possible.

If you have questions regarding your warranty rights and responsibilities, you should contact the Buhler Versatile Warranty Department.

- Prior to the expiration of the warranty, you must give notice of any failure of an emission control warranted part. Such notice must be given to Buhler Versatile or an authorized dealer, and you must deliver the engine to the repair location.
- You, the owner, are responsible for incidental costs incurred by yourself or your employees as a result of a warrantable failure. Examples of such costs are communication expenses, meals and lodging.
- The owner is responsible for any business costs or losses, any "downtime" expenses and any "cargo" damage which result from the failure of a warranted part. Buhler Versatile is not responsible for other incidental or consequential damages, including but not limited to fines, theft, vandalism or collisions.

Parts covered:

This emission control system warranty applies to the following 675TA/V emission control parts.

- Fuel Injection Pump
- Fuel Injectors
- Turbocharger
- Intake Manifold
- Charge Air Cooler
- Exhaust Manifold

Any replacement part, equivalent in performance and durability, may be used in the performance of any maintenance or repairs and must be provided without charge to the owner. The use of these parts does not reduce the warranty obligations of Buhler Versatile. However, Buhler Versatile recommends the use of new, genuine Buhler Versatile service parts or Buhler Versatile approved rebuilt parts and assemblies. Buhler Versatile also recommends that the engine be serviced by a Buhler Versatile authorized dealer.

Buhler Versatile Responsibilities

Warranty work will be provided at no charge to the owner at any authorized dealer, using new genuine Buhler Versatile service parts or Buhler Versatile approved rebuilt parts or assemblies.

The owner will not be charged for diagnostic labor which leads to the determination that a warranted part is defective, if the diagnostic work was performed at a warranty station.

Buhler Versatile is liable for damages to other engine components caused by the failure under warranty of any warranted part.

Warranty Limitations

Buhler Versatile is not responsible for failures resulting from abuse or neglect by owner or operator.

Buhler Versatile warrants to the ultimate purchaser and each subsequent purchaser that the engine is designed, built, and equipped so as to conform with all applicable regulations adopted by the Air Resources Board, and that it is free from defects in materials and workmanship which cause the failure of a warranted part.

Any warranted part which is not scheduled for replacement as required maintenance, or which is scheduled only for regular inspection to the effect of "repair or replace as necessary" is warranted for the warranty period.

Any warranted part which is scheduled for replacement as required maintenance is warranted for the period of time prior to the first scheduled replacement point for that part.

Buhler Versatile is liable for damages to other engine components caused by the failure under warranty of any warranted part.

FEDERAL EMISSIONS WARRANTY

(California owner's emissions warranty is covered elsewhere)

Buhler Versatile warrants that your new 2001 and later heavy-duty off-road diesel engine was designed, built, and equipped to conform to applicable U.S. Environmental Protection Agency regulations for a period of use of five years or 3,000 hours of operation, whichever occurs first.

The new model year, class of diesel engine, and emission application determination for your engine are identified on the emission control information label affixed to the top of your engine's rocker arm cover. The warranty period begins on the date the new equipment is sold to the first retail purchaser.

Any emission control system parts which are proven defective during normal use will be repaired or replaced during the warranty period. The warranty repairs and service will be performed by any authorized Buhler Versatile dealer at the dealer's place of business, with no charge for parts or labor (including diagnosis).

As the engine owner, you are responsible to perform all the required maintenance listed in your owner's manual. Buhler Versatile will not deny an emission warranty claim solely because you have no record of maintenance; however, a claim may be denied if your failure to perform maintenance resulted in the failure of a warranted part. Receipts covering regular maintenance should be retained in the event of questions and these receipts should be passed on to each subsequent owner of the engine.

It is recommended replacement parts used for maintenance or repairs be Buhler Versatile Service Parts to maintain the quality originally designed into your emission certified engine. The use of non-Buhler Versatile parts does not invalidate the warranty on other components unless the use of such parts causes damage to warranted parts.

Buhler Versatile wishes to assure the emission control systems warranty is being properly administered. If you believe you have not received the service entitled to under this warranty, you should contact the Buhler Versatile Service Department.

Service Department
Buhler Versatile Inc.
1260 Clarence Avenue
Winnipeg , MB R3T 1T2
(204) 661-8711

Please note that the Emission Warranty does not cover:

1. Systems and parts that were not first installed on the new equipment or engine as original equipment by Buhler Versatile.
2. Part malfunctions caused by abuse, misuse, improper adjustment, modification, alteration, tampering, disconnection, improper or inadequate maintenance, or use of non-recommended fuels and lubricating oils.
3. Accident caused damage, acts of nature, or other events beyond Buhler Versatile's control.
4. Replacement of expendable items made in connection with scheduled maintenance.
5. Parts requiring replacement, inspection or adjustment maintenance intervals for reasons other than being defective.
6. Parts which are not Buhler Versatile Service Parts.
7. Loss of time, inconvenience, loss of use of equipment/engine or commercial loss.
8. Equipment with altered or disconnected hourmeter where the hours cannot be determined.
9. Equipment normally operated outside the United States.
10. Non-defective parts replaced by other than Buhler Versatile dealers.

Coverage

This emission control system warranty applies to the following 675TA/V emission control parts.

Fuel Injection Pump
Fuel Injectors
Turbocharger
Intake Manifold
Charge Air Cooler
Exhaust Manifold
Boost Pressure Tubing

CONTENTS

SAFETY	0-4
SECTION 1 - GENERAL INFORMATION	1-1
SECTION 2 - OPERATION	2-1
SECTION 3 - LUBRICATION AND MAINTENANCE	3-1
SECTION 4 - TROUBLESHOOTING	4-1
SECTION 5 - SPECIFICATIONS	5-1
INDEX	5-31
DELIVERY REPORT	after Index

PRECAUTIONARY STATEMENTS

PERSONAL SAFETY

Throughout this manual and on machine decals, you will find precautionary statements (“CAUTION”, “WARNING”, and “DANGER”) followed by specific instructions. These precautions are intended for the personal safety of you and those working with you. Please take the time to read them.



CAUTION: THE WORD “CAUTION” IS USED WHERE A SAFE BEHAVIORAL PRACTICE ACCORDING TO OPERATING AND MAINTENANCE INSTRUCTIONS AND COMMON SAFETY PRACTICES WILL PROTECT THE OPERATOR AND OTHERS FROM ACCIDENT INVOLVEMENT.



WARNING: THE WORD “WARNING” DENOTES A POTENTIAL OR HIDDEN HAZARD WHICH HAS A POTENTIAL FOR SERIOUS INJURY. IT IS USED TO WARN OPERATORS AND OTHERS TO EXERCISE EVERY APPROPRIATE MEANS TO AVOID A SURPRISE INVOLVEMENT WITH MACHINERY.



DANGER: THE WORD “DANGER” DENOTES A FORBIDDEN PRACTICE IN CONNECTION WITH A SERIOUS HAZARD.

FAILURE TO FOLLOW THE “CAUTION”, “WARNING”, AND “DANGER” INSTRUCTIONS MAY RESULT IN SERIOUS BODILY INJURY OR DEATH.

MACHINE SAFETY

Additional precautionary statements (“ATTENTION” and “IMPORTANT”) are followed by specific instructions. These statements are intended for machine safety.

ATTENTION: The word “ATTENTION” is used to warn the operator of potential machine damage if a certain procedure is not followed.

IMPORTANT: The word “IMPORTANT” is used to inform the reader of something he needs to know to prevent minor machine damage if a certain procedure is not followed.

SAFETY

PRECAUTIONARY STATEMENTS

National Safety Council statistics indicate many people die or suffer serious injury each year as a result of farm accidents.

Don't become a statistic or victim.

Carefully review the procedures given in this manual with all operators **ANNUALLY**. It is important that all operators be familiar with, **AND FOLLOW**, safety precautions.

Operating instructions must be given to everyone using the tractor before operation and at least once yearly thereafter in compliance with OSHA Regulation 1928.57 (United States).

A careful operator is the best operator. Most accidents can be avoided by observing certain precautions. To help prevent accidents, read and take the following precautions before operating the tractor. Equipment should be operated only by those who are responsible and instructed to do so.

THE TRACTOR

1. Read the Operator's Manual carefully before using the tractor. Lack of operating knowledge can lead to accidents.
2. Only allow properly trained and qualified persons to operate the tractor.
3. Do not permit anyone but the operator to ride on the tractor. There is no safe place for extra riders.
4. Replace all missing, illegible or damaged safety decals.
5. Keep safety decals free of dirt or grime.
6. Do not modify, alter, or permit anyone else to modify or alter the tractor or any of its components or any tractor function without first consulting an authorized Buhler Versatile dealer.
7. Install all shields before starting or operating the tractor.
8. Never jump from the tractor. There is a danger of catching clothing on protruding parts.

DRIVING THE TRACTOR

1. Always sit in the driver's seat while starting or driving the tractor.
2. When driving on public roads, have consideration for other road users. Pull to the side of the road so that any following traffic may pass.
3. Dim the tractor lights when meeting a vehicle at night. Make sure the lights are adjusted to prevent blinding the driver of an oncoming vehicle.
4. Reduce engine speed before turning or applying the brakes.
5. Any towed vehicle whose total weight exceeds that of the towing tractor must be equipped with brakes for safe operation.
6. Never apply the differential lock when turning. When engaged, the differential lock will increase the effort required to turn the tractor and increase the turning radius.
7. Always check overhead clearance, especially when transporting the tractor. Watch where you are going, especially at row ends, on roads, and around trees and low overhanging obstacles.

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8. Use extreme caution when operating on steep slopes.
 9. To avoid overturns, drive the tractor with care and at speeds compatible with safety, especially when operating over rough ground, when crossing ditches or slopes and when turning corners.
 10. Keep the tractor in the same gear when going down hill as would be used when going uphill. Do not coast or freewheel down hills.
 11. When descending steep grades, select a sufficiently low gear to maintain control with minimum braking.
 12. Drive the tractor slowly on hillsides and curves to eliminate the danger of tipping. Avoid slopes which are too steep for safe operation. Avoid sharp uphill turns.
 13. When driving out of a ditch, gully or up a steep hillside, engage the clutch slowly. Avoid sharp uphill turns.
 14. Use caution when driving near the edge of a ditch or gully. It may cave in, causing the tractor to roll over.
 15. Use extreme caution when operating the tractor on single wheels. The danger of tipping increases. Do not travel at high speeds.
 16. Before transporting the tractor and implement on public roadways, check with authorities for local regulations.
 17. Use the wide transport marker lights to clearly indicate the full width of the tractor with those tire options.
 18. Equip towed implements with slow-moving vehicle (SMV) signs when traveling on public roads.
 19. Install additional lights on implement rear to safeguard against rear-end collisions. Daybreak and dusk are particularly dangerous. Buhler Versatile tractors have seven-pin trailer connectors to facilitate installation of extra lighting.
 20. Be aware of the transport width of towed implements. Install additional lights to the sides of wide implements to alert passing traffic. Keep clear of the approaching lane.
 21. Use hazard warning flashers as required by law when transporting or driving the tractor on public roads. Use extremity lighting kit when required or deemed necessary.
 22. Use extreme caution when pulling heavy loads at road speeds. Avoid hard application of the tractor brakes at high speed.

OPERATING THE TRACTOR

1. Apply the parking brake, place the PTO control in the "OFF" position, the lift control in the down position, the remote control valve levers in the neutral position and the transmission lever in neutral before starting the tractor.
2. Do not start the engine or operate controls while standing beside the tractor. Always sit in the tractor seat when starting the engine or operating the controls.
3. Do not bypass the transmission neutral start switch. Consult your authorized dealer if your neutral start controls malfunction. Use jumper cables only in the recommended manner. Improper use can result in a tractor runaway.
4. Avoid accidental contact with the gear shift lever while the engine is running. Unexpected tractor movement can result from such contact.
5. Do not get off the tractor while it is in motion.
6. Shut off the engine and PTO and apply the parking brake before getting off the tractor.
7. Do not park the tractor on a steep incline.

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8. Do not operate the tractor engine in an enclosed building without adequate ventilation. Exhaust fumes can cause death.
 9. The cab air filter is designed to remove dust from the air but will not exclude chemical vapor. Follow the chemical manufacturer's directions regarding protection from dangerous chemicals.
 10. Always wear a protective mask when working with toxic spray chemicals. Follow the directions on the chemical container.
 11. If the power steering or engine ceases to operate, stop the tractor immediately as the tractor will be more difficult to control.
 12. Stop the engine and relieve pressure before connecting or disconnecting hydraulic, steering, water, or fuel lines.
 13. Pull only from the swinging drawbar. Use only a drawbar pin that locks in place. Pulling from the tractor rear axle or any point above the axle may cause the tractor to overturn.
 14. Be sure hydraulic couplers are properly mounted and will disconnect safely in case of accidental detachment of the implement.
 15. Do not leave equipment in the raised position when the vehicle is stopped or unattended.
 16. Ensure any attached equipment or accessories are correctly installed, are approved for use with the tractor, do not overload the tractor and are operated and maintained in accordance with the instructions issued by the equipment or accessory manufacturer.
 17. Remember that your tractor, if abused or incorrectly used, can be dangerous and become a hazard both to the operator and to bystanders. Do not overload or operate with attached equipment which is unsafe, not designed for the particular task, or is poorly maintained.
 18. The cab is designed to provide the minimum noise level at the operator's ears and, in fact, meets or exceeds applicable standards in this respect.

However, noise (sound pressure level) in the workplace can exceed 86dB(A) when the cab windows are open. Therefore, it is recommended that the operators wear suitable ear protectors when operating in high noise level conditions.

19. Always keep sleeves, jackets or other clothing relatively tight and belted. Loose clothing may catch in moving parts and result in personal injury or death.
20. Use steps and handholds when mounting and dismounting the tractor or for servicing components too high to reach from the ground.
21. Lock the seat in position and buckle your safety belt before operating the tractor.
22. Do not operate the tractor when you are tired, sick, or impaired in any way.
23. Never operate the tractor in confined areas, or when visibility next to the tractor is reduced. Injury to bystanders or damage to the tractor or equipment may result.
24. When hitching drawn equipment to the drawbar, only allow an assistant between the tractor and implement if the tractor is off, in neutral and the brakes are engaged.
25. Do not leave implements with the hydraulic cylinders fully extended or retracted where the heat from the sun can cause the hydraulic fluid to expand. Hydraulic pressure can rupture the hoses, releasing high pressure oil causing personal injury.
26. Be careful when turning with an implement. Lift it from the ground if possible during turns. Side thrust caused by the implement could damage the tire and implement.
27. Use transport locks, lower the implement to the ground and securely block the frame before servicing the implement. Relieve pressure from the hydraulic system and shut off the tractor.

OPERATING THE PTO

1. When operating PTO-driven equipment, shut off the engine and wait until the PTO stops before getting off the tractor and disconnecting the equipment.
 2. Do not wear loose clothing when operating the power take-off or when near rotating equipment.
 3. When operating stationary PTO-driven equipment, always apply the tractor parking brake and block the rear wheels front and back. Engage the articulation lock.
 4. To avoid injury, do not clean, adjust, unclog or service PTO driven equipment when the tractor engine is running.
 5. Make sure all PTO shields are in position at all times.
 6. Be sure the articulation lock is engaged, the park brake is set and the gearshift lever is in neutral when using the PTO in stationary applications. Do not leave the tractor unattended. If you must leave the tractor for any reason, stop the tractor and remove the key.
 7. Take special care in hook-up of implements to the PTO.
4. To prevent fire or explosion, keep open flames away from the battery or cold-weather starting aids. To prevent sparks which could cause explosion, use jumper cables according to instructions.
 5. Do not attempt to service the air conditioning system. It is possible to suffer severe frost bite or injury from escaping refrigerant. Special equipment and instruments are required to service the air conditioning system which uses R134A refrigerant. See your authorized Buhler Versatile dealer for service.
 6. Stop the engine before performing any service on the tractor.
 7. Escaping diesel/hydraulic fluid under pressure can penetrate the skin causing serious injury.
 - DO NOT use your hand to check for leaks. Use a piece of cardboard or paper to search for leaks.
 - Stop the engine and relieve pressure before connecting or disconnecting lines.
 - Tighten all connections before starting the engine or pressurizing lines.
 - If fluid is injected into the skin, obtain medical attention immediately or gangrene may result.

SERVICING THE TRACTOR

Most accidents can be avoided by observing certain precautions. To help prevent accidents, read and take the following precautions before servicing the tractor.

1. The cooling system operates under pressure which is controlled by the radiator cap. It is dangerous to remove the cap while the system is hot. Always turn the cap slowly to the first stop and allow the pressure to escape before removing the cap entirely. Wear gloves when removing the cap.
2. Do not smoke while refueling the tractor. Keep any type of open flame away.
3. Keep the tractor and equipment, particularly brakes and steering, maintained in a reliable and satisfactory condition to ensure your safety and comply with legal requirements.
8. Do not modify, alter or permit anyone else to modify or alter the tractor or any of its components or any tractor function without first consulting an authorized Buhler Versatile dealer.
9. The fuel oil in the injection system is under high pressure and can penetrate the skin. Unqualified persons should not remove or attempt to adjust a pump, injector, nozzle or any other part of the fuel injection system. Failure to follow these instructions can result in serious injury.
10. Continuous long-term contact with used engine oil may cause skin cancer. Avoid prolonged contact with used engine oil. Wash skin promptly with soap and water.

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11. **Tractor wheels are very heavy. Handle with care and ensure, when stored, they cannot fall and cause injury.**
 12. **Dispose of all drained fluids and removed filters properly. Follow local laws governing disposal of used engine oil.**
 13. **Never oil, grease or adjust the tractor while it is running. Do not leave the engine running while the tractor or drawn equipment is being adjusted, repaired or cleaned.**
 14. **Be sure all connections are tight and lines and hoses are undamaged. Before disconnecting hydraulic lines, relieve all pressure. Do not overfill the hydraulic tank.**
 15. **Do not smoke and avoid open flames if servicing any batteries.**
 16. **Starting fluid is highly flammable. Do not use near fire, sparks, or open flames.**
 17. **Remove mud, crop residue, chains and tools from steps and operator's platform. They may interfere with pedal operation or entry/exit from the tractor.**
 18. **Never operate with a damaged tire. The tire may explode.**
 19. **Tighten all connections before starting the engine or pressurizing lines.**

DIESEL FUEL

1. **Under no circumstances should gasoline, alcohol or blended fuels be added to diesel fuel. These combinations can create an increased fire or explosive hazard. In a closed container, such as a fuel tank, these blends are more explosive than pure gasoline. Do not use these blends.**
2. **Do not smoke while refueling the tractor or when standing near fuel. Keep any type of open flame away.**
3. **Never remove the fuel cap or refuel with the engine running. Allow the tractor to cool off before fueling.**
4. **Use the proper fuel transfer hose and nozzle. Make sure the nozzle and hose are grounded to dissipate static electric charges.**
5. **When refueling, make sure the nozzle is in contact with the filler neck of the tractor fuel tank before fuel starts to flow and during the entire time fuel is flowing.**
6. **Maintain control of the fuel filler pipe nozzle when filling the tank.**
7. **Do not fill the fuel tank to capacity. Allow room for expansion.**
8. **Wipe up spilled fuel immediately.**
9. **Always tighten the fuel tank cap securely.**
10. **If the original fuel tank cap is lost, replace it with a genuine replacement cap. A non-approved cap may not be safe.**
11. **Keep equipment clean and properly maintained.**
12. **Do not drive equipment near open fires.**
13. **Never use fuel for cleaning purposes.**
14. **Arrange fuel purchases so that summer grade fuels are not held over and used in the winter.**
15. **Ground fuel storage tanks to prevent static buildup.**

SAFETY CAB

Your tractor is equipped with a safety cab which must be maintained in a serviceable condition. Be careful when driving through doorways or working in confined spaces with low headroom.

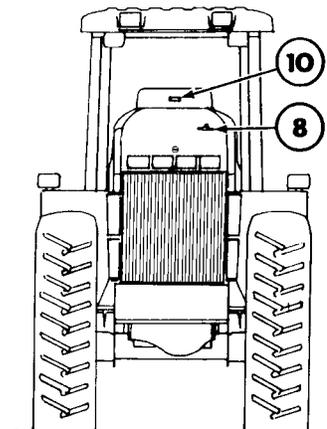
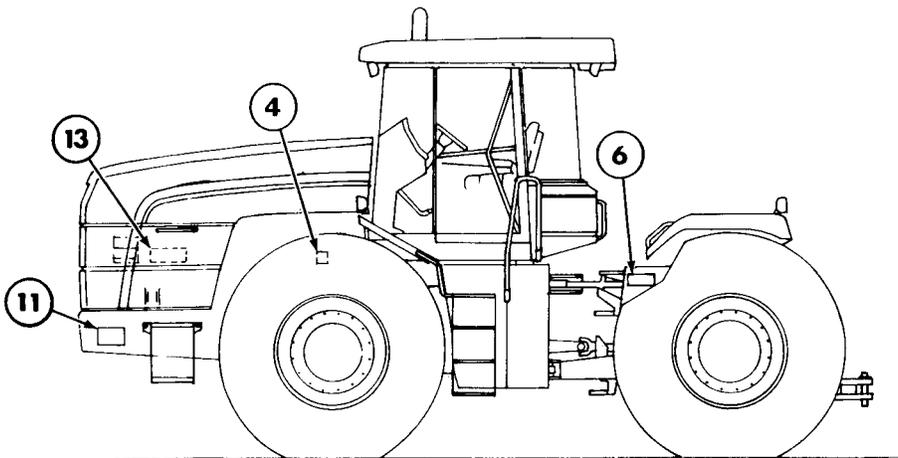
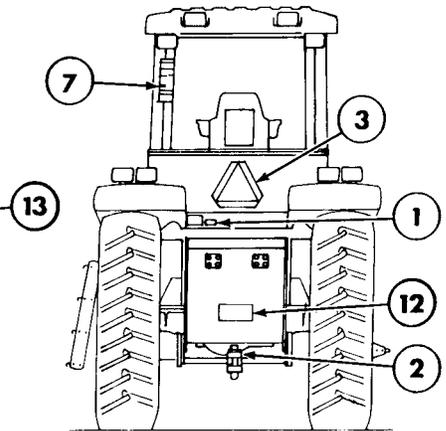
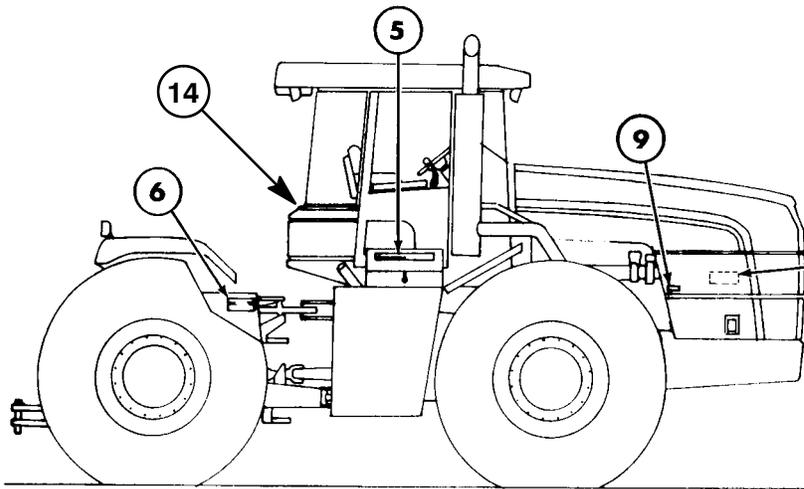
1. Do not modify, drill, weld, or alter the safety cab in any way. Doing so could render you liable to legal prosecution in some countries.
2. Never attempt to straighten or weld any part of the main frame or retaining brackets which have suffered damage. By doing so you may weaken the structure and endanger your safety. Replace all damaged parts.
3. Never attach chains or ropes to the cab or main frame for pulling purposes.
4. Never take unnecessary risks even though your safety cab affords you the maximum protection possible.
5. Do not carry harmful chemicals in the cab. Chemicals may rupture the container, and the fumes may poison the operator.
6. The tractor cab is not designed to provide a “sprayer safe” environment for the operator. When applying chemicals from a spray unit, do not rely on the cab filter elements to provide protection to the operator from the airborne chemicals.

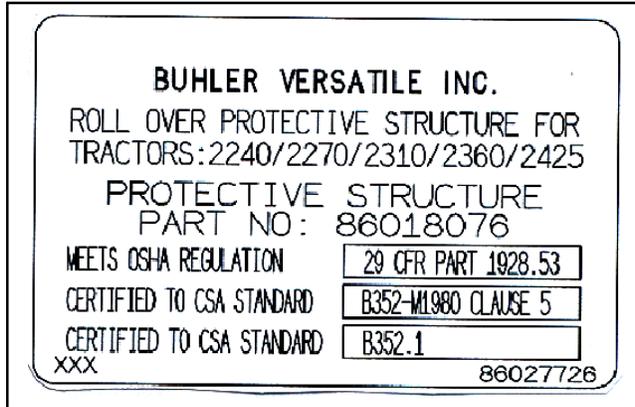
SAFETY DECALS

The following decals were installed on the tractor in the areas indicated. They are intended for your safety and for those working with you. Please take this manual and walk around your tractor to note the content and location of these decals.

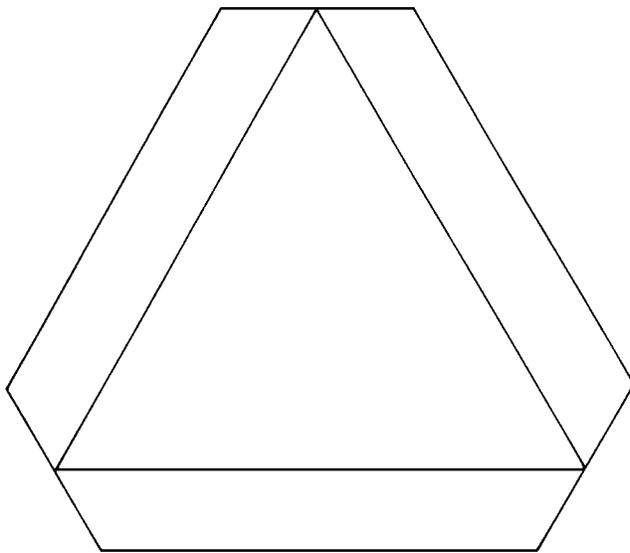
Review these decals and the operating instructions detailed in this manual with the machine operators.

Keep the decals legible. If they are not, obtain replacements from your authorized dealer.





1. ROPS Certificate - Located rear left of cab.



3. Slow-Moving Vehicle - Located rear center of tractor.

⚠ CAUTION

ATTACH IMPLEMENTS PROPERLY

- Attaching clevis type tongues

- Attaching single type tongues

- Pull only from drawbar or three point hitch.
- Use a safety chain when towing implement.

86000550-C

2. Implement Attaching - Located on the drawbar at the rear of the tractor.

⚠ WARNING

AVOID POSSIBLE INJURY OR DEATH

Do not start engine by shorting across starter terminals. Engine can start and machine can move when starting safety switch is by-passed.

Start engine only from operator's seat with transmission in neutral and the parking brake applied.

86000552-C

4. Jump Starting - Located on the left side of the tractor on the starter.

<p style="text-align: center;">⚠ CAUTION</p> <ul style="list-style-type: none"> • DO NOT CONNECT JUMPER CABLE TO NEGATIVE POST OF DISCHARGED BATTERY • DO NOT LEAN OVER BATTERIES WHILE MAKING CONNECTIONS • DO ENSURE POSITIVE AND NEGATIVE CLAMPS ARE NOT IN CONTACT • DO ENSURE VEHICLES ARE NOT IN CONTACT 	<p style="text-align: center; font-size: small;">BATTERY BOOSTING INSTRUCTIONS</p> <ul style="list-style-type: none"> • Apply parkbrake, set transmission in neutral and turn all electrical connections off • Connect one end of jumper cable to positive terminal of boosting battery and other end to positive terminal of discharged battery. • Connect one end of negative cable to negative post of battery and other end to tractor frame at least 300 mm (12") from discharged battery <p style="text-align: right; font-size: x-small;">86000551-D</p>
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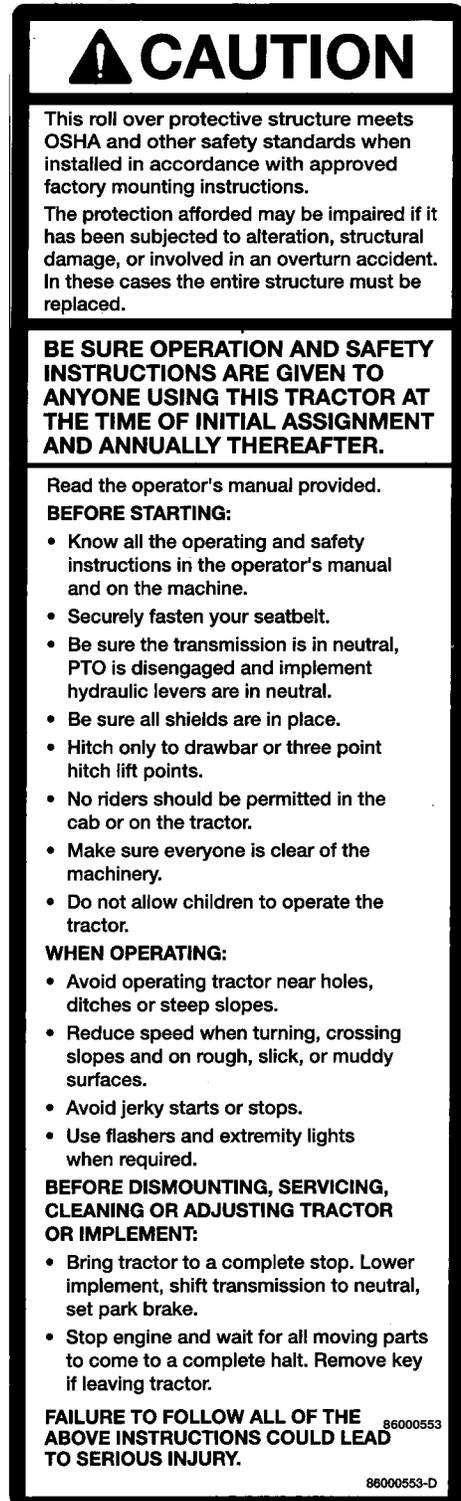
5. Battery Boosting - Located on the underside of the battery cover.



6. Pivoting Frames - Located on the right and left sides of the rear frame in the articulation area.



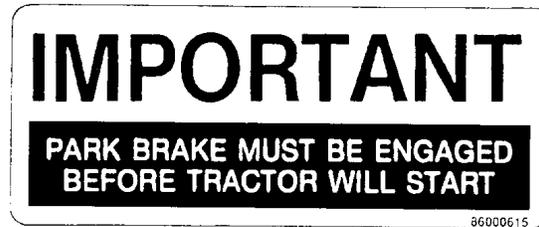
8. Radiator Cap Pressure - Located on the left side of the hood at the access hole for the radiator cap.



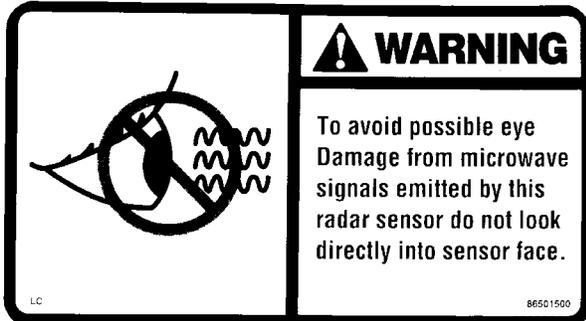
7. ROPS Caution - Located inside the cab on the rear left post.



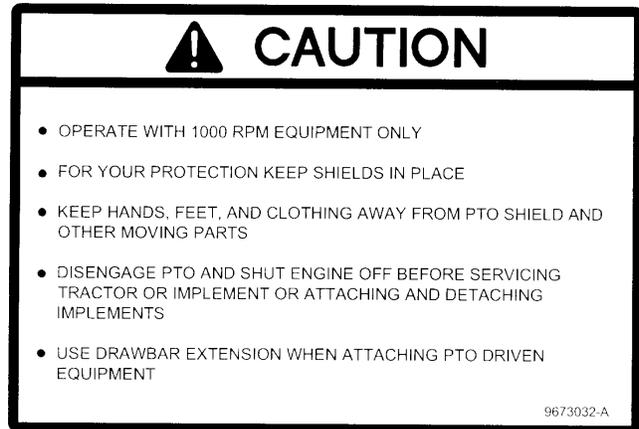
9. Hot Exhaust - Located on the right side engine hood.



10. Park Brake - Located in the front windshield in the center.



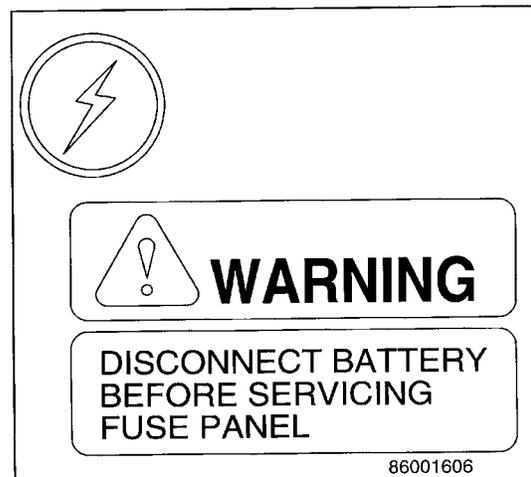
11. Ground Speed Radar - Located on the front left side of the tractor.



12. PTO Safety - Located on top of the PTO master shield.



13. Engine Cooling Fan - Located under the engine side shields.



14. Fuse and Relay Panel - Located on rear shelf of cab in panel compartment.

ADDITIONAL SAFETY ITEMS

ARTICULATION LOCK

1. Use the articulation lock, 1, during stationary applications, servicing, jacking or overhaul operations. Do not use when the tractor is operating.
2. Before engaging the lock, drive the tractor to a level surface, put the steering straight, engage the park brake, put the gearshift in neutral and stop the engine.
3. Remove the pin from the storage position on the swing frame right and put the pin through the hole on the swing frame left.

NOTE: It may be necessary to start the engine and articulate the frame slightly to be sure the articulation pin is positioned properly and completely seated through the frame pieces.

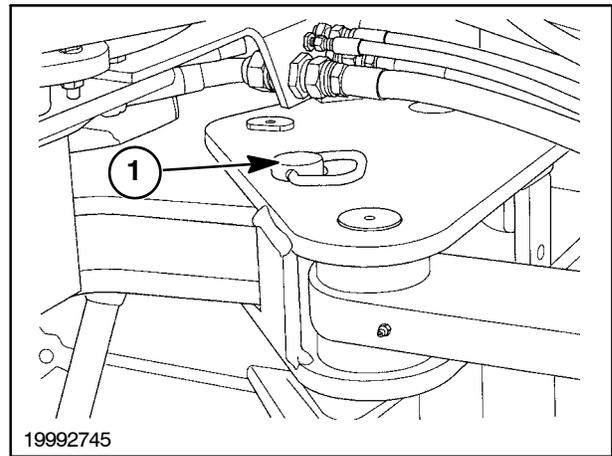


Figure 0- 1

ALTERNATE EXIT

1. The cab has an emergency exit located in the right rear of the cab. Pull the pin attaching the lever to the glass window. This will allow the window to open beyond the latch. If greater access is required, the silicone hinge/seal can be sliced to remove the window completely.

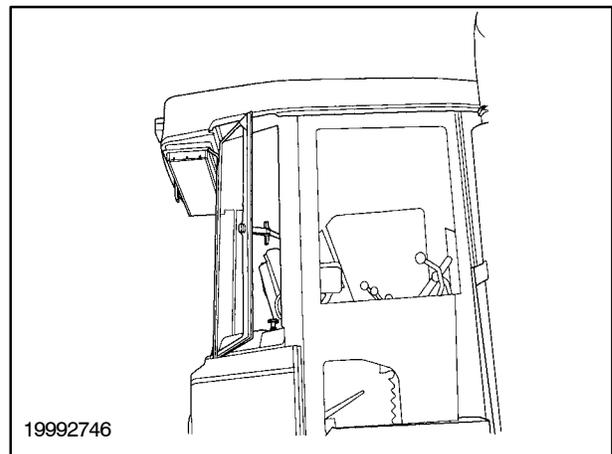


Figure 0- 2

SAFETY CAB

A safety cab incorporating a Roll Over Protective Structure (ROPS) and safety belt were standard equipment for the tractor at time of factory assembly. The safety belt, when used by the operator, maximizes the protection offered by the ROPS.



WARNING: ALWAYS USE YOUR SAFETY BELT WITH THE CAB/ROPS TO PREVENT BEING THROWN FROM THE TRACTOR IN THE EVENT OF A ROLLOVER. SAFETY BELTS SAVE LIVES WHEN THEY ARE USED.

Information regarding the safety cab/Roll Over Protective Structure and safety belt are available from your authorized Buhler Versatile dealer.

ROPS Maintenance and Inspection

After the first 50 hours of operation and every 1500 hours of operation (or yearly, whichever comes first):

1. Check the torque of the cab/ROPS mounting bolts, as detailed in the lubrication and maintenance section of this manual.
2. Check the operator's seat mounting bolts and the safety belt mounting bolts. Tighten the seat mounting bolts to 40 N·m (30 ft. lbs.). Replace any worn or damaged parts.

Damage to the Cab/ROPS

If the tractor has rolled over or the cab/ROPS has been damaged (such as striking an overhead object during transport), it must be replaced to provide the original protection.

After an accident, check for damage to the cab/ROPS, operator's seat, safety belt and safety belt mountings. Before you operate the tractor, replace all damaged parts.

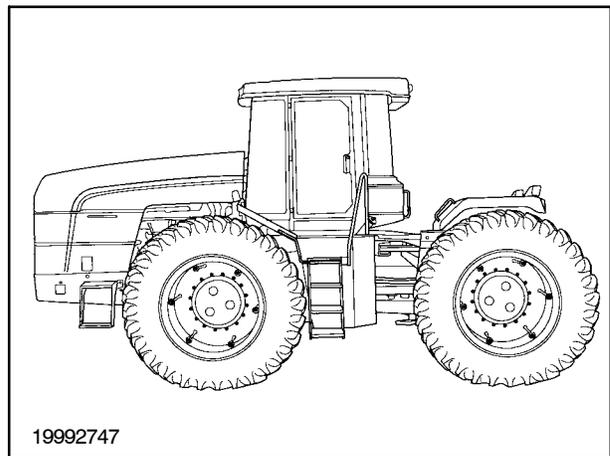


Figure 0-3

IMPORTANT: Do not try to weld or straighten the cab/ROPS.



WARNING: NEVER ATTACH CHAINS, ROPES OR CABLES TO THE CAB/ROPS FOR PULLING PURPOSES. ALWAYS PULL FROM THE TRACTOR DRAWBAR. BE CAREFUL WHEN DRIVING THROUGH DOOR OPENINGS OR UNDER LOW OVERHEAD OBJECTS. MAKE SURE THERE IS SUFFICIENT OVERHEAD CLEARANCE FOR THE CAB/ROPS.

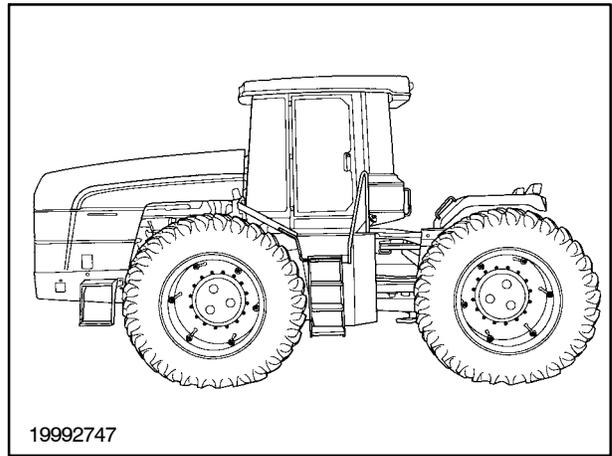


Figure 0- 4



WARNING: IF THE CAB/ROPS IS REMOVED OR REPLACED, MAKE CERTAIN THAT THE PROPER HARDWARE IS USED AND THE RECOMMENDED TORQUE VALUES ARE APPLIED TO THE ATTACHING BOLTS. SEE YOUR AUTHORIZED BUHLER VERSATILE DEALER.



SECTION 1

GENERAL INFORMATION

INTRODUCTION TO THIS MANUAL

This manual has been prepared to assist you in the correct procedure for breaking in, driving, operating, and maintaining your tractor.

The manual is divided into five sections as detailed in the "Contents" page. An index is provided at the back of the manual.

Read this manual carefully and keep it in the manual holder attached to the rear of the seat for future reference. If at any time you require advice concerning your tractor, do not hesitate to contact your authorized Buhler Versatile dealer. He has factory-trained personnel, genuine replacement parts, and the necessary equipment for your service requirements.

Your tractor has been designed and built to give maximum performance, economy and ease of operation under a wide variety of operating conditions. Prior to delivery, the tractor was carefully inspected, both at the factory and by your dealer, to ensure that it reaches you in optimum condition. To maintain this condition and ensure trouble-free operation, it is important that the routine services, as specified in this manual, are carried out at the recommended intervals.

All data given in this book is subject to production variations. Dimensions and weights are approximate only, and the illustrations do not necessarily show tractors in standard condition. For exact information about any particular tractor, please consult your authorized dealer.

The company policy is one of continuous improvement, and the right to change prices, specifications or equipment at any time without notice is reserved.

Section "0" of this manual lists the precautions to be observed to ensure your safety and the safety of others. Read the safety precautions carefully and follow the advice offered BEFORE operating the tractor.

OPERATOR'S MANUAL HOLDER

A manual holder, 1, is attached to the rear of the seat. Store the operator's manual and other tractor information in the holder.

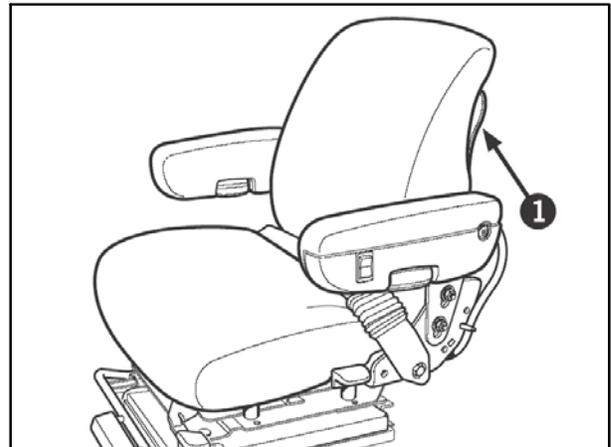


Figure 1-1

TRACTOR STATEMENT OF USE

Buhler Versatile has designed the 2290, 2335, 2360, 2375 and 2425 4WD articulated tractors to be used in customary **agricultural** applications. Using the tractor in an industrial only application (ie. road building) will not be covered by warranty.

The machine is constructed to use specific tire combinations along with additional ballast to properly distribute weight and power for the operation of agricultural equipment.

To obtain maximum performance and durability, the tractor must be operated and maintained in a manner as described in this manual. Failure to follow the information contained in this manual may lead to premature deterioration or personal injury.

You have made a substantial investment in this agricultural tractor and it demands proper operation and maintenance. **PLEASE FOLLOW YOUR OPERATOR'S MANUAL.**

Thank you for purchasing your Buhler Versatile tractor.

TRACTOR ORIENTATION

OVERALL DESCRIPTION

The Models 2290, 2335, 2360, 2375 and 2425 tractors are classified as 4-wheel drive articulating vehicles. The tractors consist of front and rear frame assemblies which steer by pivoting at the center articulation joint.

The front frame, 1, incorporates the engine, fuel tanks, transmission, front drive axle, and cab. The rear frame, 2, incorporates the rear drive axle and supports any implements that are operated by the tractor. This type of design allows for greater flexibility of weight distribution, depending upon operating conditions and type of implement. The operator can ballast the tractor to best suit the needs of the particular operation.

The construction of the tractor is a modular-type construction. This means that the major components are individual units which are supported within the front and rear frames. This makes for easier serviceability and longer life due to reduced structural stress on components.

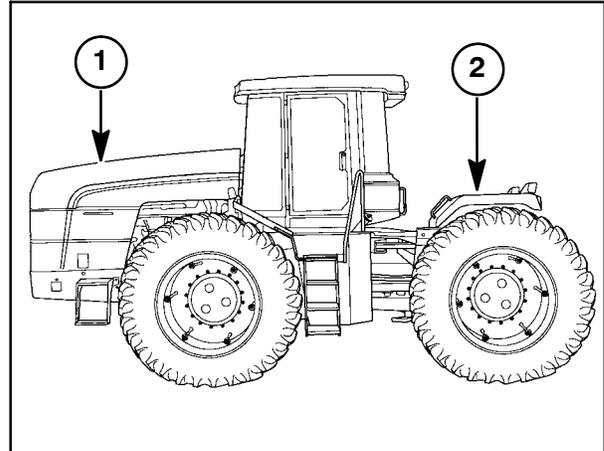


Figure 1-2

TRACTOR TERMINOLOGY

This manual uses the following terms to describe tractor function and directional relationships:

Front, 1 - The engine end of the tractor. This direction will also be referred to as "Forward Direction of Travel."

Right, 2 - The console side of the cab.

Back, 3 - The drawbar end of the tractor, which is used for pulling implements.

Left, 4 - The doorway side of the cab.

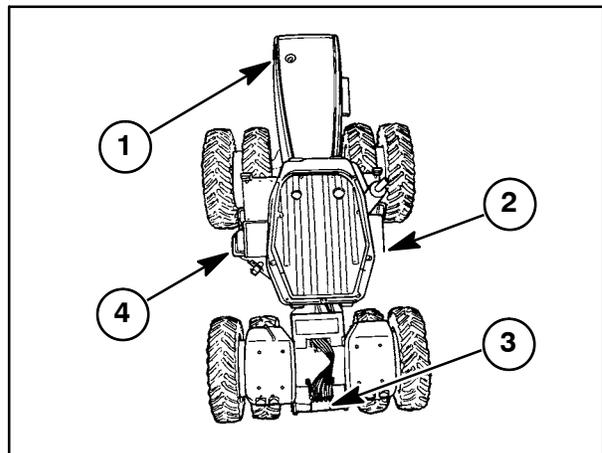


Figure 1-3

Articulation - The ability to steer by pivoting between front and rear frame sections.

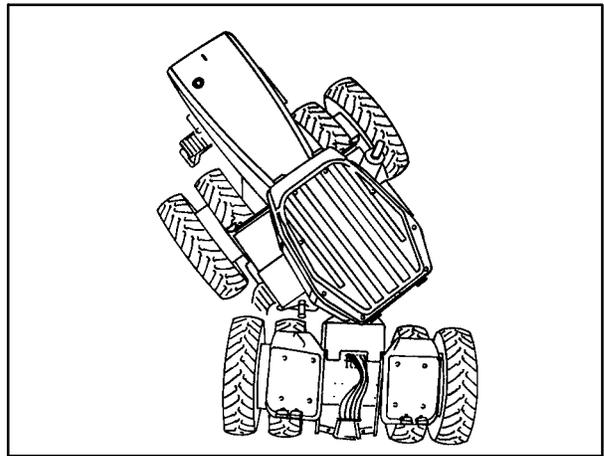


Figure 1-4

Oscillation - The ability of a vehicle to twist, allowing travel over uneven terrain.

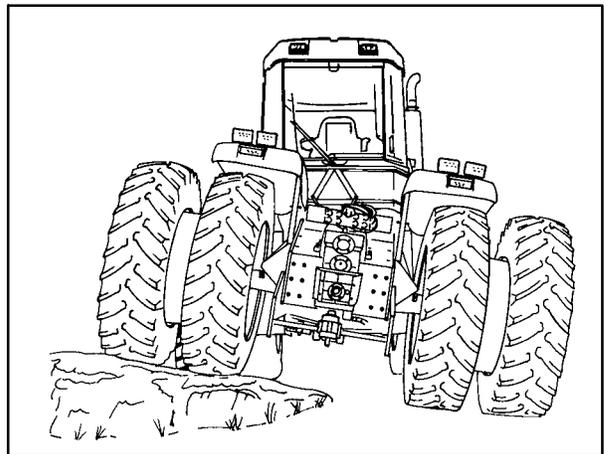


Figure 1-5

IDENTIFICATION NUMBERS

TRACTOR IDENTIFICATION DATA

The tractor and its major components are identified using serial numbers and/or manufacturing codes. The following provides the locations of the identification data.

NOTE: Tractor identification data must be supplied to the dealer when requesting parts or service.

Identification data is needed to aid in identifying the tractor if it is ever stolen.

VEHICLE IDENTIFICATION PLATE

The vehicle identification plate is located on the left rear corner, 1, of the cab.

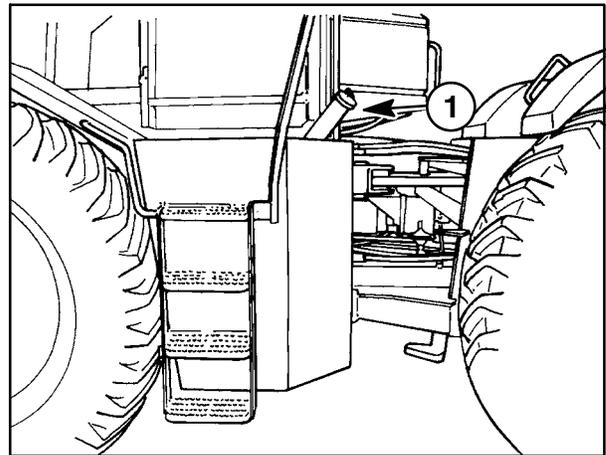


Figure 1-6

Record the identification data in the sample ID plate.

bühler		
TRACTOR NUMBER	MODEL	UNIT
<input style="width: 90%;" type="text"/>	<input style="width: 90%;" type="text"/>	<input style="width: 90%;" type="text"/>
ENGINE	TRANSMISSION	REAR AXLE
<input style="width: 90%;" type="text"/>	<input style="width: 90%;" type="text"/>	<input style="width: 90%;" type="text"/>
FRONT AXLE	HYDRAULIC PUMP	HYDRAULIC LIFT
<input style="width: 90%;" type="text"/>	<input style="width: 90%;" type="text"/>	<input style="width: 90%;" type="text"/>
<input style="width: 90%;" type="text"/>	FWD-FACTOR	SPECIAL ORDER
<input style="width: 90%;" type="text"/>	<input style="width: 90%;" type="text"/>	<input style="width: 90%;" type="text"/>
BUHLER VERSATILE INC.		
<input style="width: 15px; height: 10px;" type="checkbox"/> MADE IN CANADA		

TRACTOR IDENTIFICATION

The serial number is stamped on the front frame beside the left fuel tank, 1.

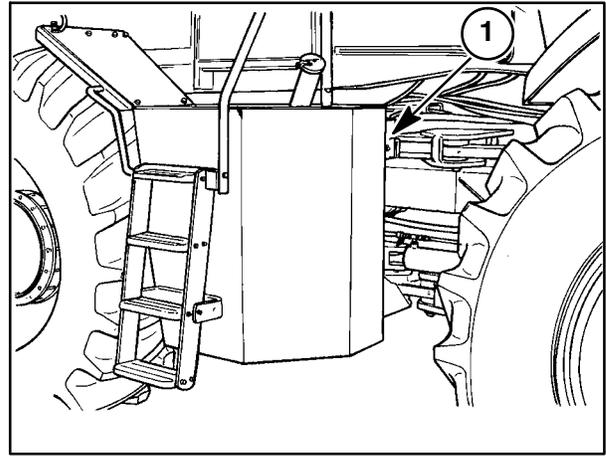


Figure 1-7

This serial number stamp is used in the event that the Tractor Identification Plate is removed or mutilated.

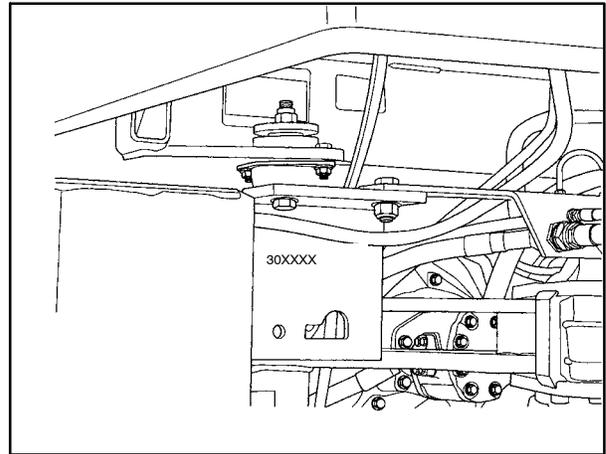


Figure 1-8

ENGINE IDENTIFICATION

The Cummins engine used in your Buhler Versatile 4WD tractor is serviced solely by the Cummins Engine Company through its authorized dealers and distributors. For service, warranty, and parts information, contact your Buhler Versatile dealer. Many Buhler Versatile dealers are authorized Cummins dealers. If your dealer is not, he will arrange for the engine service on your tractor by an authorized Cummins engine dealer or distributor.

For the 2290, 2335, 2375 tractor (Cummins QSM11 engine), the Engine Identification Plate, (1), is located on the left side of the engine block below the valve cover.

Please record this information on the lines provided.

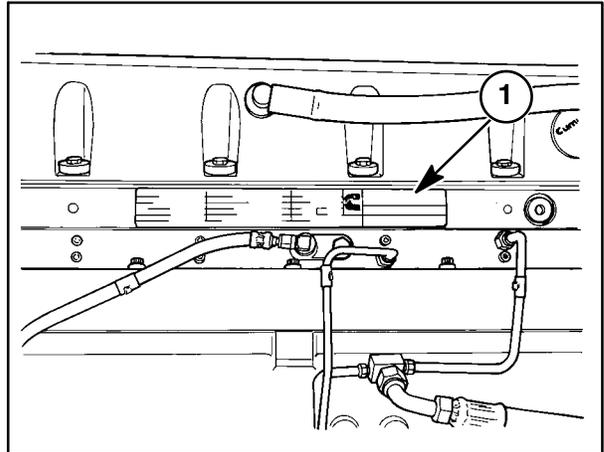


Figure 1-9

For the 2360 and 2425 tractors (Cummins N14 engine), the Engine Identification Plate, 1, is located on the left side of the engine ahead of the fuel injection pump.

Please record this information on the lines provided.

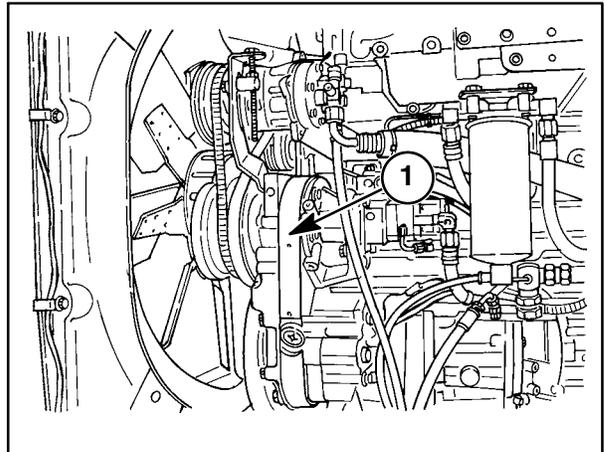


Figure 1-10

NOTE: It is very important to include the engine number, engine family, and engine CPL number (control parts listing) when contact is made with a Cummins dealer or distributor.

TRANSMISSION IDENTIFICATION

**Quad Shift III Transmission
(12x4 Synchronized)**

The serial number plate, 1, is on the right rear of the transmission case. This is a 6-digit alpha numeric number. Record this number on the line provided.

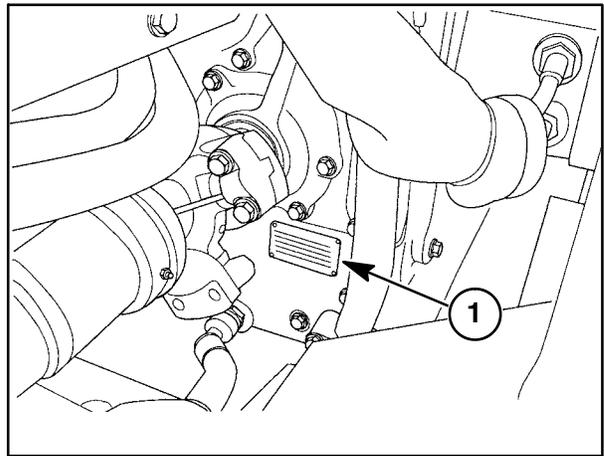


Figure 1-11

Powershift Transmission (12x2 Powershift)

The serial number plate, 1, is located on the left rear of the transmission housing.

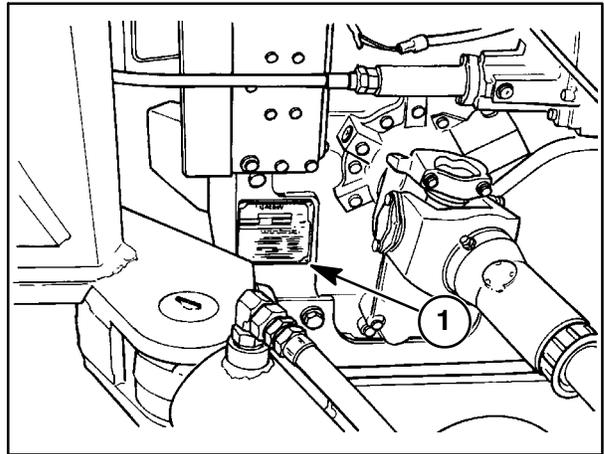


Figure 1-12

The serial number plate contains information that may be required for parts, service, or warranty. Record the identification data in the sample ID plate.



FRONT AND REAR AXLE IDENTIFICATION

On the underside (or topside) of the input shaft is the Differential Identification Plate, 1, containing Eaton differential model information. Record this information on the lines provided.

NOTE: Make a copy of the information recorded in the preceding paragraphs and keep in a safe location in the event your operator's manual is lost or destroyed.

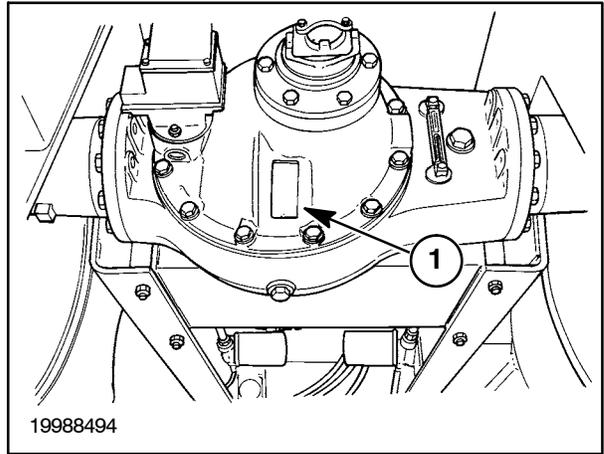


Figure 1-13

PROTECTIVE SHIELDING

ENGINE SIDE COVERS

The side covers, 1, protect the operator from heated and/or moving parts. Do not operate the tractor without the engine side covers in place and latched.

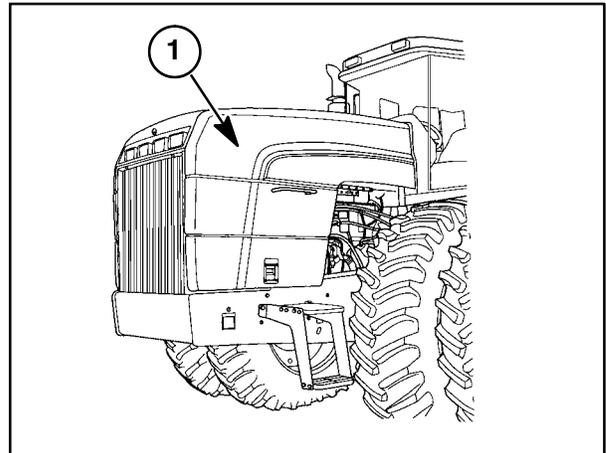


Figure 1-14

BATTERY COVER

The battery cover, 1, protects the batteries from damage and the electrical connections from accidental contact. The battery cover must always be in place and latched during operation.

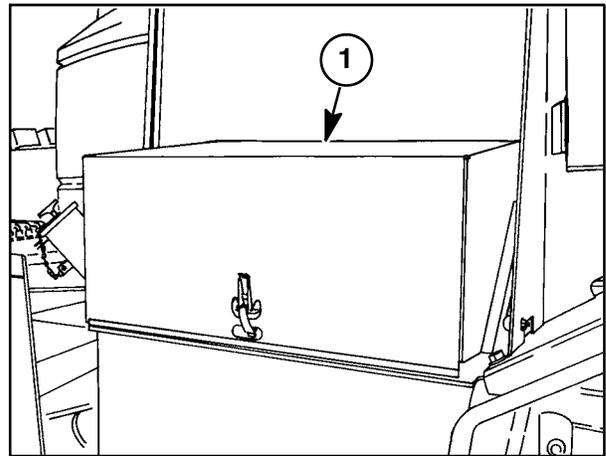


Figure 1-15

STARTER SOLENOID SHIELD

The shield, 1, covers the starter solenoid electrical connections to prevent accidental contact. The shield must be installed whenever the batteries are connected to the electrical system.



DANGER: NEVER ATTEMPT TO START THE TRACTOR BY BYPASSING THE WIRES TO THE STARTER MOTOR.

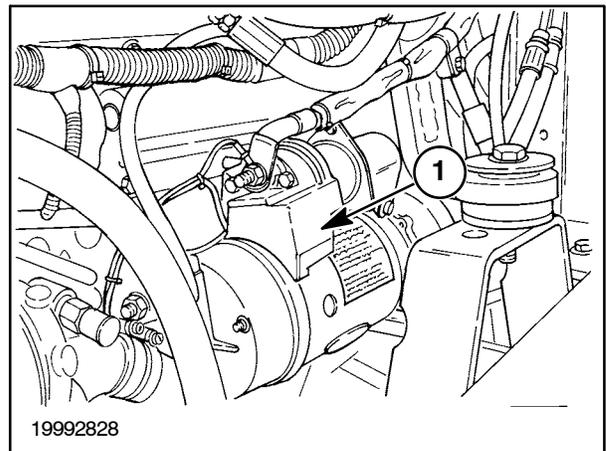


Figure 1-16

MASTER PTO SHIELD

The shield, 1, covers the PTO stub shaft, if so equipped. The shield does not pivot or lift up.



CAUTION: DO NOT REMOVE OR MODIFY THE PTO SHIELD.

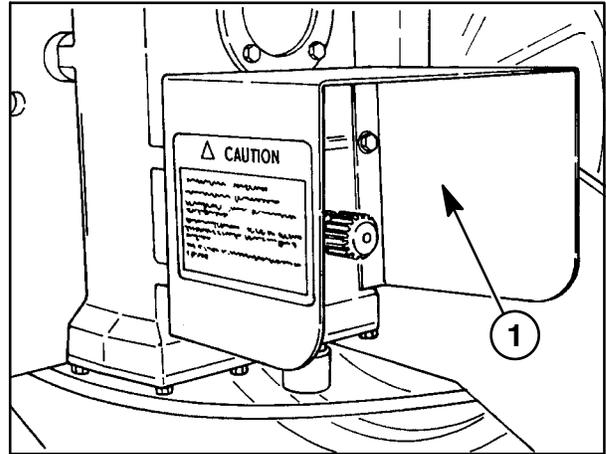


Figure 1-17

CENTER PTO ARTICULATION DRIVE SHAFT SHIELD

The shield, 1, covers the PTO drive shaft, if so equipped, as it passes through the articulation area.



CAUTION: DO NOT REMOVE OR MODIFY THE PTO SHIELD.

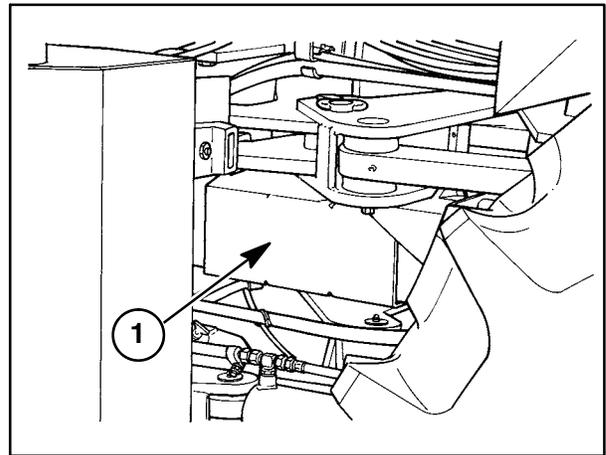


Figure 1-18



WARNING: INSTALL PROTECTIVE SHIELDS BEFORE STARTING OR OPERATING THE TRACTOR.

TIRE CONFIGURATIONS

The 2290, 2335, 2360, 2375 and 2425 tractors are designed to be used with specific tire configurations and should only be used with those tires approved for use on a specific model. The detailed charts on the following pages give all tire configurations by model that can be used on a particular model tractor.

IF A SPECIFIC TIRE SIZE IS NOT LISTED UNDER THE MODEL TRACTOR YOU OWN, DO NOT ATTEMPT TO INSTALL THAT SIZE OR CONFIGURATION OF TIRE.

ARTICULATION STOP SPACERS - QUICK REFERENCE CHART

	DRUM DUAL INNER	DRUM DUAL OUTER	BAND SPACER DUAL INNER	BAND SPACER DUAL OUTER	DRUM DUAL TRIPLE
24.5x32	N/A	N/A	NONE	NONE	N/A
30.5x32	N/A	N/A	NONE	38°	N/A
18.4x38	NONE	NONE	NONE	NONE	N/A
20.8x38	NONE	NONE	NONE	NONE	N/A
18.4x42	38°	38°	38°	38°	31°
20.8x42	38°	38°	38°	38°	31°
18.4x46	38°	38°	N/A	N/A	31°
700/65x38	38°	33°	N/A	N/A	N/A
710/70x38	38°	33°	N/A	N/A	N/A
750/65x38	38°	33°	N/A	N/A	N/A
850/60x38	31°	31°	N/A	N/A	N/A

SECTION 1 - GENERAL INFORMATION

2290

TIRE SIZE	CONFIGURATION	RIM STYLE	MAXIMUM ARTICULATION ANGLE (1)
24.5R32 RADIAL **	SINGLES	TIE ROD	42°
20.8R38 R1W RADIAL	SINGLES	DRUM	42°
20.8R42 R1W RADIAL	SINGLES	DRUM	38°
30.5x32 R1 10 PLY	SINGLES	TIE ROD	38°
30.5x32 R2 10 PLY	SINGLES	TIE ROD	38°
710/70R38 RADIAL **	SINGLES	DRUM	38°
710/70R38 R1W RADIAL	SINGLES	DRUM	38°
700/65x38 8 PLY	SINGLES	DRUM	38°
750/65R38 8 PLY	SINGLES	DRUM	38°
850/60R38 8 PLY	SINGLES	DRUM	31°
18.4x38 R1 6 PLY	DUALS	TIE ROD	42°
18.4x38 R2 6 PLY	DUALS	TIE ROD	42°
18.4R38 RADIAL *	DUALS	TIE ROD	42°
18.4x42 R1 8 PLY	DUALS	TIE ROD	42°
20.8x38 R1 8 PLY	DUALS	TIE ROD	42°
20.8x38 R2 8 PLY	DUALS	TIE ROD	42°
20.8R38 RADIAL *	DUALS	TIE ROD	42°
20.8R38 R1W RADIAL	DUALS	TIE ROD	42°
20.8x42 R1 10 PLY	DUALS	TIE ROD	38°
20.8R42 RADIAL **	DUALS	TIE ROD	38°
20.8x42 R2 RADIAL	DUALS	TIE ROD	38°
20.8R42 R1W RADIAL	DUALS	TIE ROD	38°
24.5x32 R1 10 PLY	DUALS	TIE ROD	42°
24.5R32 RADIAL *	DUALS	TIE ROD	42°
30.5x32 R2 10 PLY	DUALS	TIE ROD	33°
30.5R32 R1 RADIAL	DUALS	TIE ROD	33°
18.4R46 RADIAL ***	DUALS	DRUM	38°
20.8R38 R1W RADIAL	DUALS	DRUM	42°
20.8x42 R1 8 PLY	DUALS	DRUM	38°
20.8R42 RADIAL **	DUALS	DRUM	38°
20.8R42 R1W RADIAL	DUALS	DRUM	38°
20.8R42 R2 RADIAL	DUALS	DRUM	38°
700/65x38 8 PLY	DUALS	DRUM	33°
710/70R38 RADIAL **	DUALS	DRUM	33°
710/70R38 R1W RADIAL	DUALS	DRUM	33°
750/65R38 8 PLY	DUALS	DRUM	33°
18.4x38 R1 8 PLY	DUALS	DRUM (30") ROW CROP	42°
18.4R38 RADIAL *	DUALS	DRUM (30") ROW CROP	42°
18.4x42 R1 10 PLY	DUALS	DRUM (30") ROW CROP	38°
18.4R42 RADIAL **	DUALS	DRUM (30") ROW CROP	38°
18.4R46 RADIAL ***	DUALS	DRUM (30") ROW CROP	38°

Radial tires are identified according to rating by a star code - either one star (*), two stars (**), or three stars (***).

- (1) Any tractor that is equipped with a PTO option requires a 38° articulation block kit be installed on it. If the tire size of the tractor requires a 33° or 31° articulation kit, use those kits instead of the 38° kit for a PTO option.

SECTION 1 - GENERAL INFORMATION

2335

TIRE SIZE	CONFIGURATION	RIM STYLE	MAXIMUM ARTICULATION ANGLE (1)
24.5R32 RADIAL **	SINGLES	TIE ROD	42°
20.8R38 R1W RADIAL	SINGLES	DRUM	42°
20.8R42 R1W RADIAL	SINGLES	DRUM	38°
30.5x32 R1 10 PLY	SINGLES	TIE ROD	38°
30.5x32 R2 10 PLY	SINGLES	TIE ROD	38°
710/70R38 RADIAL **	SINGLES	DRUM	38°
710/70R38 R1W RADIAL	SINGLES	DRUM	38°
700/65x38 8 PLY	SINGLES	DRUM	38°
750/65R38 8 PLY	SINGLES	DRUM	38°
850/60R38 8 PLY	SINGLES	DRUM	31°
18.4x38 R1 6 PLY	DUALS	TIE ROD	42°
18.4x38 R2 6 PLY	DUALS	TIE ROD	42°
18.4R38 RADIAL *	DUALS	TIE ROD	42°
18.4x42 R1 8 PLY	DUALS	TIE ROD	42°
20.8x38 R1 8 PLY	DUALS	TIE ROD	42°
20.8x38 R2 8 PLY	DUALS	TIE ROD	42°
20.8R38 RADIAL *	DUALS	TIE ROD	42°
20.8R38 R1W RADIAL	DUALS	TIE ROD	42°
20.8x42 R1 10 PLY	DUALS	TIE ROD	38°
20.8R42 RADIAL **	DUALS	TIE ROD	38°
20.8x42 R2 RADIAL	DUALS	TIE ROD	38°
20.8R42 R1W RADIAL	DUALS	TIE ROD	38°
24.5x32 R1 10 PLY	DUALS	TIE ROD	42°
24.5R32 RADIAL *	DUALS	TIE ROD	42°
30.5x32 R2 10 PLY	DUALS	TIE ROD	33°
30.5R32 R1 RADIAL	DUALS	TIE ROD	33°
18.4R46 RADIAL ***	DUALS	DRUM	38°
20.8R38 R1W RADIAL	DUALS	DRUM	42°
20.8x42 R1 8 PLY	DUALS	DRUM	38°
20.8R42 RADIAL **	DUALS	DRUM	38°
20.8R42 R1W RADIAL	DUALS	DRUM	38°
20.8R42 R2 RADIAL	DUALS	DRUM	38°
700/65x38 8 PLY	DUALS	DRUM	33°
710/70R38 RADIAL **	DUALS	DRUM	33°
710/70R38 R1W RADIAL	DUALS	DRUM	33°
750/65R38 8 PLY	DUALS	DRUM	33°
18.4x38 R1 8 PLY	DUALS	DRUM (30") ROW CROP	42°
18.4R38 RADIAL *	DUALS	DRUM (30") ROW CROP	42°
18.4x42 R1 10 PLY	DUALS	DRUM (30") ROW CROP	38°
18.4R42 RADIAL **	DUALS	DRUM (30") ROW CROP	38°
18.4R46 RADIAL ***	DUALS	DRUM (30") ROW CROP	38°

Radial tires are identified according to rating by a star code - either one star (*), two stars (**), or three stars (***).

- (1) Any tractor that is equipped with a PTO option requires a 38° articulation block kit be installed on it. If the tire size of the tractor requires a 33° or 31° articulation kit, use those kits instead of the 38° kit for a PTO option.

SECTION 1 - GENERAL INFORMATION

2360

TIRE SIZE	CONFIGURATION	RIM STYLE	MAXIMUM ARTICULATION ANGLE (1)
24.5R32 RADIAL *	SINGLES	TIE ROD	42°
20.8R38 R1W RADIAL	SINGLES	DRUM	42°
20.8R42 R1W RADIAL	SINGLES	DRUM	38°
30.5x32 R2 10 PLY	SINGLES	TIE ROD	38°
710/70R38 RADIAL **	SINGLES	DRUM	38°
710/70R38 R1W RADIAL	SINGLES	DRUM	38°
700/65 x 38 8 PLY	SINGLES	DRUM	38°
750/65R38 8 PLY	SINGLES	DRUM	38°
850/60R38 8 PLY	SINGLES	DRUM	31°
20.8x38 R2 8 PLY	DUALS	TIE ROD	42°
20.8R38 R1W RADIAL	DUALS	TIE ROD	42°
20.8x42 R1 10 PLY	DUALS	TIE ROD	38°
20.8R42 RADIAL **	DUALS	TIE ROD	38°
20.8R42 R2 RADIAL	DUALS	TIE ROD	38°
20.8R42 R1W RADIAL	DUALS	TIE ROD	38°
24.5x32 R1 10 PLY	DUALS	TIE ROD	42°
24.5R32 RADIAL *	DUALS	TIE ROD	42°
30.5x32 R2 10 PLY	DUALS	TIE ROD	33°
30.5R32 R1 RADIAL	DUALS	TIE ROD	33°
18.4R46 RADIAL ***	DUALS	DRUM	38°
20.8R38 R1W RADIAL	DUALS	DRUM	42°
20.8x42 R1 8 PLY	DUALS	DRUM	38°
20.8R42 RADIAL **	DUALS	DRUM	38°
20.8R42 R2 RADIAL	DUALS	DRUM	38°
20.8R42 R1W RADIAL	DUALS	DRUM	38°
700/65x38 8 PLY	DUALS	DRUM	33°
710/70R38 RADIAL **	DUALS	DRUM	33°
750/65R38 8 PLY	DUALS	DRUM	33°
850/65R38 8 PLY	DUALS	DRUM	31°
18.4R46 RADIAL ***	DUALS	DRUM (30") ROW CROP	38°
18.4R46 R1 RADIAL	TRIPLES ⊗	DRUM	31°
20.8x42 R1 8 PLY	TRIPLES ⊗	DRUM	31°
20.8R42 RADIAL **	TRIPLES ⊗	DRUM	31°
20.8R42 R2 RADIAL	TRIPLES ⊗	DRUM	31°

Radial tires are identified according to rating by a star code - either one star (*), two stars (**), or three stars (***).

⊗ - Triple tires mounted on the 2360 only when the tractor is equipped with heavy-duty axles.

(1) Any tractor that is equipped with a PTO option requires a 38° articulation block kit be installed on it. If the tire size of the tractor requires a 33° or 31° articulation kit, use those kits instead of the 38° kit for a PTO option.

SECTION 1 - GENERAL INFORMATION

2375

TIRE SIZE	CONFIGURATION	RIM STYLE	MAXIMUM ARTICULATION ANGLE (1)
24.5R32 RADIAL *	SINGLES	TIE ROD	42°
20.8R38 R1W RADIAL	SINGLES	DRUM	42°
20.8R42 R1W RADIAL	SINGLES	DRUM	38°
30.5x32 R2 10 PLY	SINGLES	TIE ROD	38°
710/70R38 RADIAL **	SINGLES	DRUM	38°
710/70R38 R1W RADIAL	SINGLES	DRUM	38°
700/65 x 38 8 PLY	SINGLES	DRUM	38°
750/65R38 8 PLY	SINGLES	DRUM	38°
850/60R38 8 PLY	SINGLES	DRUM	31°
20.8x38 R2 8 PLY	DUALS	TIE ROD	42°
20.8R38 R1W RADIAL	DUALS	TIE ROD	42°
20.8x42 R1 10 PLY	DUALS	TIE ROD	38°
20.8R42 RADIAL **	DUALS	TIE ROD	38°
20.8R42 R2 RADIAL	DUALS	TIE ROD	38°
20.8R42 R1W RADIAL	DUALS	TIE ROD	38°
24.5x32 R1 10 PLY	DUALS	TIE ROD	42°
24.5R32 RADIAL *	DUALS	TIE ROD	42°
30.5x32 R2 10 PLY	DUALS	TIE ROD	33°
30.5R32 R1 RADIAL	DUALS	TIE ROD	33°
18.4R46 RADIAL ***	DUALS	DRUM	38°
20.8R38 R1W RADIAL	DUALS	DRUM	42°
20.8x42 R1 8 PLY	DUALS	DRUM	38°
20.8R42 RADIAL **	DUALS	DRUM	38°
20.8R42 R2 RADIAL	DUALS	DRUM	38°
20.8R42 R1W RADIAL	DUALS	DRUM	38°
700/65x38 8 PLY	DUALS	DRUM	33°
710/70R38 RADIAL **	DUALS	DRUM	33°
750/65R38 8 PLY	DUALS	DRUM	33°
850/65R38 8 PLY	DUALS	DRUM	31°
18.4R46 RADIAL ***	DUALS	DRUM (30") ROW CROP	38°
18.4R46 R1 RADIAL	TRIPLES ⊗	DRUM	31°
20.8x42 R1 8 PLY	TRIPLES ⊗	DRUM	31°
20.8R42 RADIAL **	TRIPLES ⊗	DRUM	31°
20.8R42 R2 RADIAL	TRIPLES ⊗	DRUM	31°

Radial tires are identified according to rating by a star code - either one star (*), two stars (**), or three stars (***).

⊗ - Triple tires mounted on the 2375 only when the tractor is equipped with heavy-duty axles.

(1) Any tractor that is equipped with a PTO option requires a 38° articulation block kit be installed on it. If the tire size of the tractor requires a 33° or 31° articulation kit, use those kits instead of the 38° kit for a PTO option.

SECTION 1 - GENERAL INFORMATION

2425

TIRE SIZE	CONFIGURATION	RIM STYLE	MAXIMUM ARTICULATION ANGLE (1)
20.8R38 R1W RADIAL	SINGLES	DRUM	42°
20.8R42 R1W RADIAL	SINGLES	DRUM	38°
30.5x32 R2 10 PLY	SINGLES	TIE ROD	38°
710/70R38 RADIAL **	SINGLES	DRUM	38°
710/70R38 R1W RADIAL	SINGLES	DRUM	38°
700/65x38 8 PLY	SINGLES	DRUM	38°
750/65R38 8 PLY	SINGLES	DRUM	38°
850/60R38 8 PLY	SINGLES	DRUM	31°
20.8x38 R2 8 PLY	DUALS	TIE ROD	42°
20.8R38 R1W RADIAL	DUALS	TIE ROD	42°
20.8x42 R1 10 PLY	DUALS	TIE ROD	38°
20.8R42 RADIAL **	DUALS	TIE ROD	38°
20.8R42 R2 RADIAL	DUALS	TIE ROD	38°
20.8R42 R1W RADIAL	DUALS	TIE ROD	38°
24.5x32 R1 10 PLY	DUALS	TIE ROD	42°
24.5R32 RADIAL *	DUALS	TIE ROD	42°
30.5x32 R2 10 PLY	DUALS	TIE ROD	33°
30.5R32 R1 RADIAL	DUALS	TIE ROD	33°
20.8R38 R1W RADIAL	DUALS	DRUM	42°
20.8x42 R1 10 PLY	DUALS	DRUM	38°
20.8R42 RADIAL **	DUALS	DRUM	38°
20.8R42 R2 RADIAL	DUALS	DRUM	38°
20.8R42 R1W RADIAL	DUALS	DRUM	38°
700/65x38 8 PLY	DUALS	DRUM	33°
710/70R38 RADIAL **	DUALS	DRUM	33°
750/65R38 8 PLY	DUALS	DRUM	33°
850/65R38 8 PLY	DUALS	DRUM	31°
18.4R46 RADIAL ***	DUALS	DRUM (30") ROW CROP	38°
18.4R46 R1 RADIAL	TRIPLES	DRUM	31°
20.8x42 R1 10 PLY	TRIPLES	DRUM	31°
20.8R42 RADIAL **	TRIPLES	DRUM	31°
20.8R42 R2 RADIAL	TRIPLES	DRUM	31°

Radial tires are identified according to rating by a star code - either one star (*), two stars (**), or three stars (***).

- (1) Any tractor that is equipped with a PTO option requires a 38° articulation block kit be installed on it. If the tire size of the tractor requires a 33° or 31° articulation kit, use those kits instead of the 38° kit for a PTO option.

EXTERNAL LIGHTING

Your tractor is equipped with lights to allow for nighttime and low light operation.

Front lighting consists of four worklamps, 1, above the grille, one worklamp, 2, on each front fender and two safety flashers, 3, at the top of the cab.

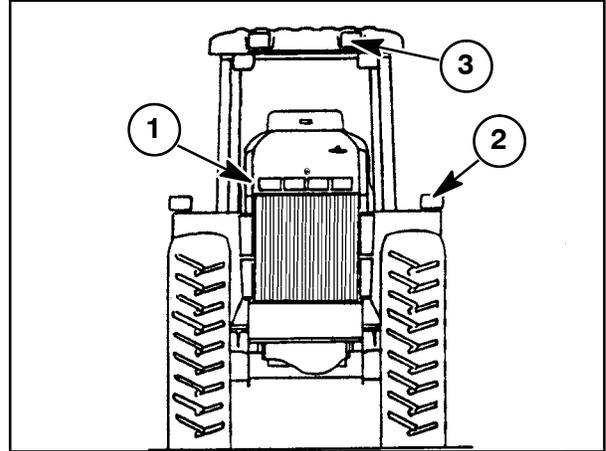


Figure 1-19

Rear lighting consists of two worklamps, 1, located on each rear fender. A combination brake, turn and taillight, 2, is located in the rear fenders and amber safety flashers, 3, are mounted on the cab as standard equipment.

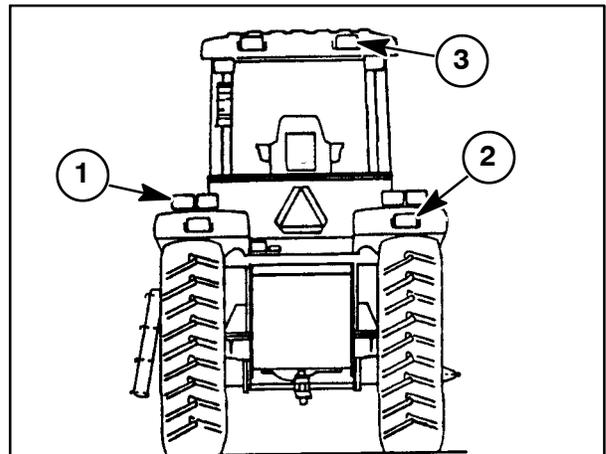


Figure 1-20

Wide transport marker lights are standard equipment on all tractors. These are adjustable to indicate the full width of the tires.

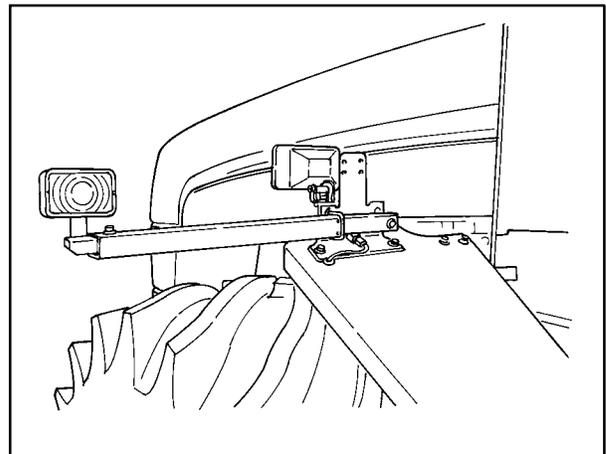


Figure 1-21

Optional high mount worklamps, 1, for mounting on top of the cab can be purchased from your local Buhler Versatile dealer.

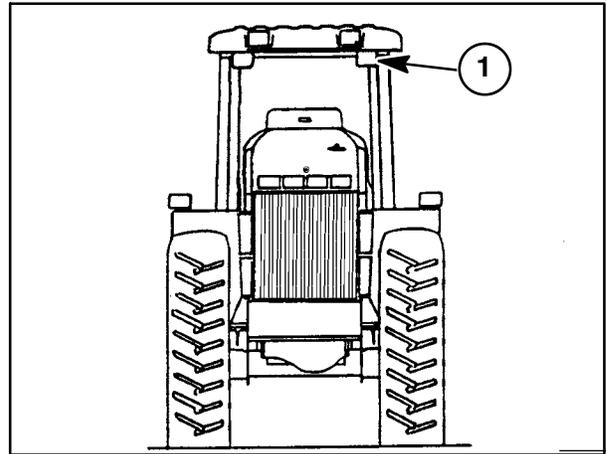


Figure 1-22

CONTROLS AND INSTRUMENTS - OVERVIEW OF LOCATION AND FUNCTION

The information on the following pages identifies, locates and briefly describes the function of the controls and instruments located in the cab.

The controls have been divided into the following six areas:

1. Forward operator controls
2. Foot and floor controls
3. Overhead controls
4. Right side console controls
5. Additional cab controls
6. Operator seat controls

IMPORTANT: The following information in this section provides a general overview of location of the controls, but does not provide detailed operational information. Thoroughly read Section 2 - "Operation" for details on how to use the controls and read the instruments before operating the tractor.



WARNING: DO NOT OPERATE THE TRACTOR UNTIL YOU ARE THOROUGHLY FAMILIAR WITH THE LOCATION AND OPERATION OF ALL CONTROLS.

FORWARD OPERATOR CONTROLS

- 1 Electronic monitor digit select switch
- 2 Instrument cluster
- 3 Engine oil pressure gauge
- 4 Electronic monitor
- 5 Engine water temperature gauge
- 6 Warning light bar
- 7 Electronic monitor acknowledge/reset button
- 8 Electronic monitor rotary select switch
- 9 Radio (if equipped)
- 10 Ignition switch
- 11 Steering wheel tilt control lever
- 12 Ether start button
- 13 Ashtray
- 14 Combination horn, turn signal and headlight dimmer switch lever
- 15 Front windshield wiper switch
- 16 Rear window wiper switch
- 17 Front and rear windshield washer switch
- 18 Rotary light switch

Steering wheel (removed in figure)

Steering wheel height control knob
(removed in figure)

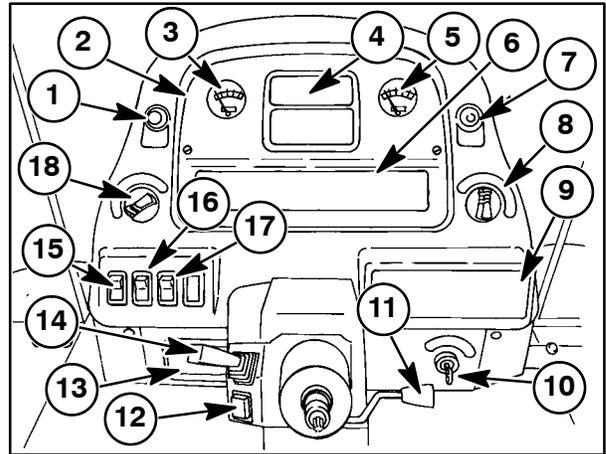


Figure 1-23

FOOT AND FLOOR CONTROLS

- 1 Clutch control pedal
- 2 Brake pedal
- 3 Decelerator pedal

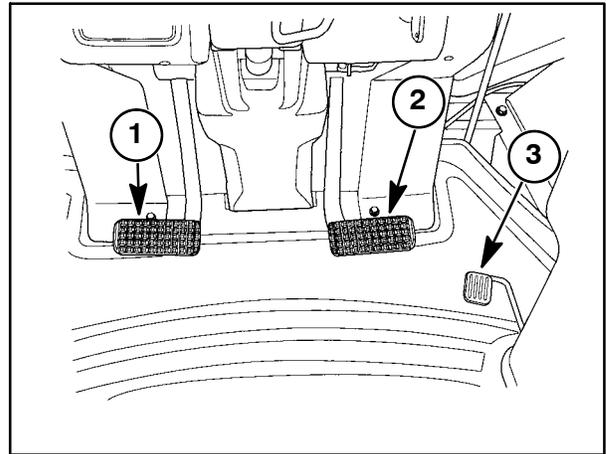


Figure 1-24

OVERHEAD CONTROLS

- 1 Air duct
- 2 Speaker (2)
- 3 Air conditioner on/off switch
- 4 Fan rotary select switch
- 5 Temperature control rotary select switch
- 6 Recirculation baffle rotary control
- 7 Recirculation vent (2)
- 8 Auxiliary three-pin connector
- 9 Rearview mirror

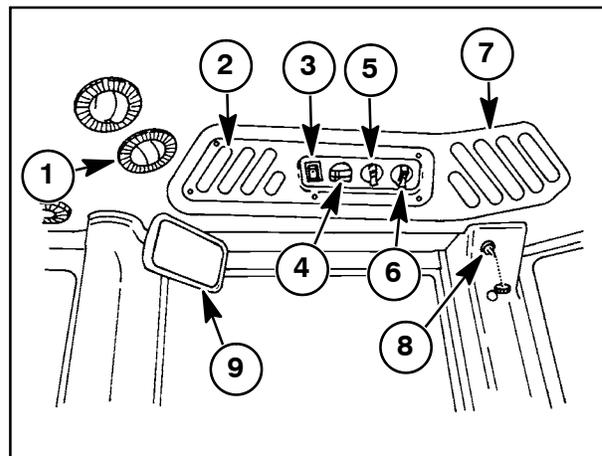


Figure 1-25

RIGHT SIDE CONSOLE CONTROLS

- 1 Transmission shift levers - 12x4 Quad Shift III*
- 2 Speed chart
- 3 Flow control knob - grey circuit only
- 4 Tractor Performance Monitor (if equipped)
- 5 Cup holder
- 6 Remote valve control levers
- 7 PTO switch (optional)
- 8 Differential lock switch (optional)
- 9 Three-point hitch switch (optional)
- 10 Throttle control lever
- 11 Flow control knobs - blue, tan, and green circuits
- 12 Cigarette lighter
- 13 Cruise control on/off switch
- 14 Cruise control +/- switch

* See the following pages for powershift transmission control lever.

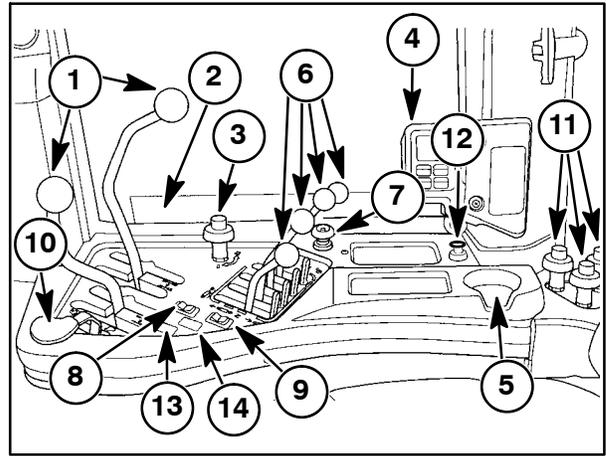


Figure 1-26

ADDITIONAL CAB CONTROLS

Fuel Gauge - Mounted on the right-hand front pillar of the cab.

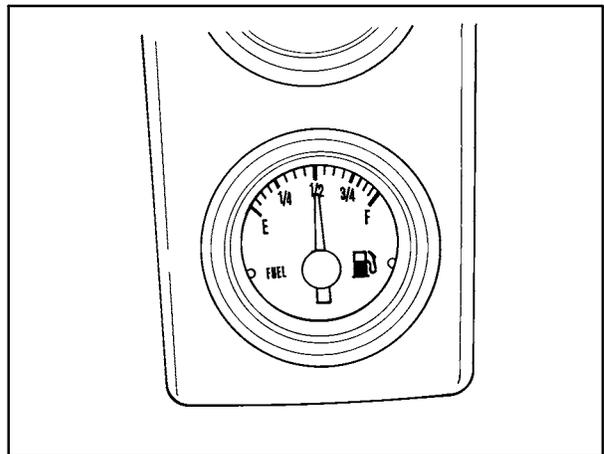


Figure 1-27

Liquid Crystal Display Readout - Powershift Tractors Only - Mounted above the fuel gauge.

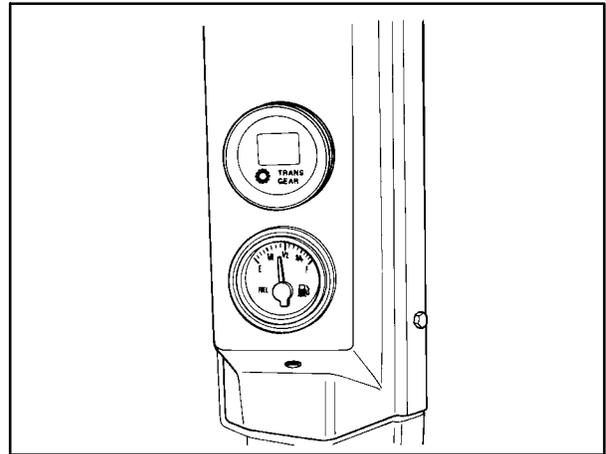


Figure 1-28

Electrical Control Panel - Directly behind the operator's seat, right-hand corner of the cab.

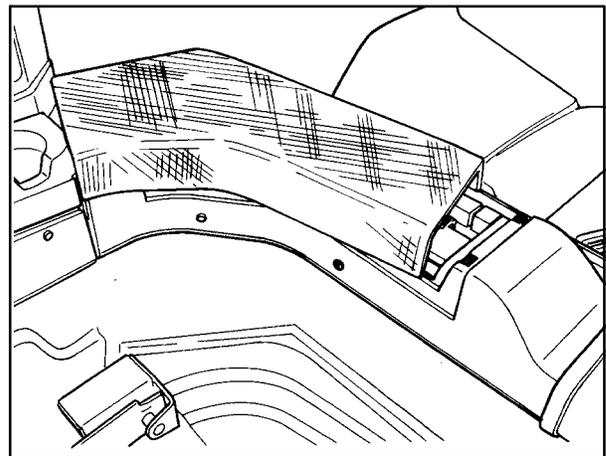


Figure 1-29

Dome Light and Coat Hook

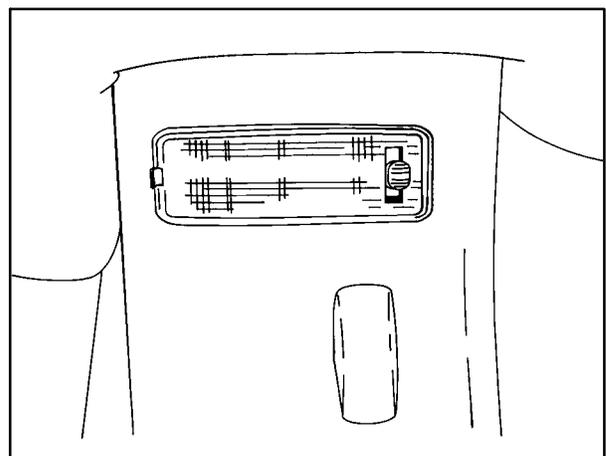


Figure 1-30

Console Light - The console light, 1, is mounted in the front right-hand cab post directly below the fuel gauge.

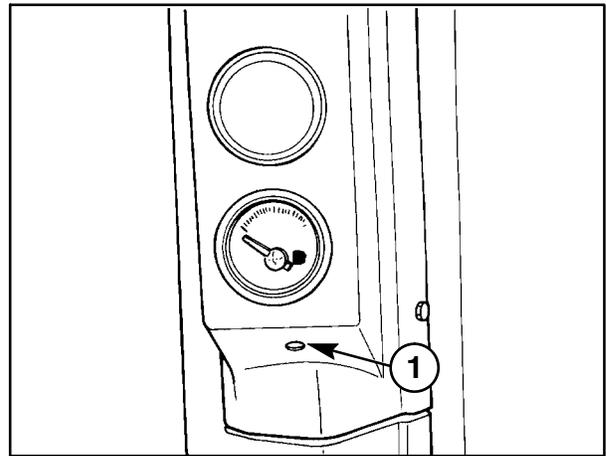


Figure 1-31

Powershift Transmission Control Lever, 1 - Powershift Transmissions Only

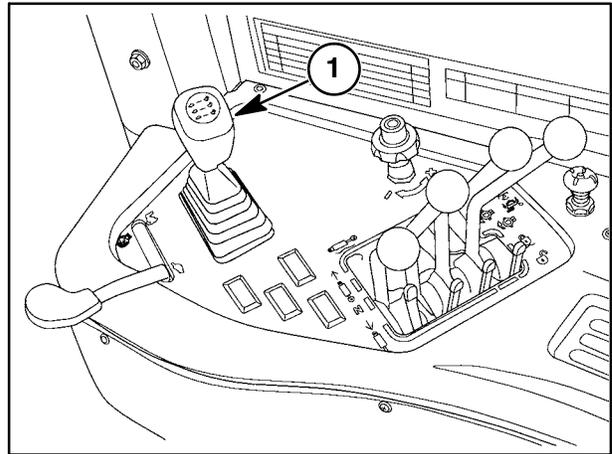


Figure 1-32

Three-Point Hitch Controls - Optional - Located on the right-hand console.

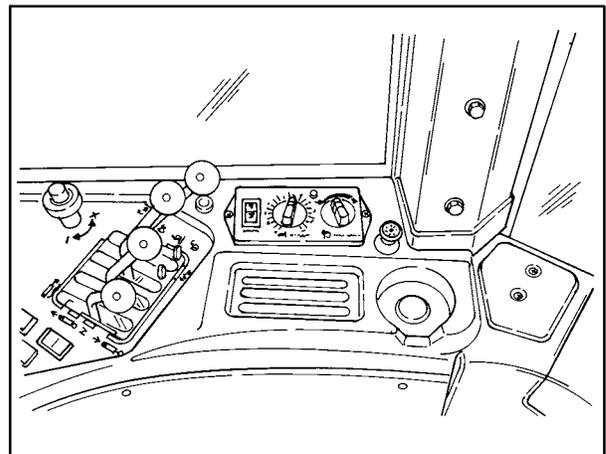


Figure 1-33

Trouble Light - Mounted in the lower left rear corner of the cab under the rear shelf.

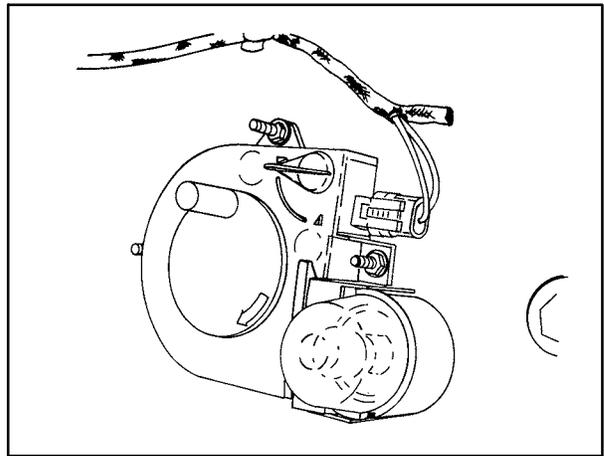


Figure 1-34

Side Window - Right-hand rear window of the cab. The only window that swings outward from the cab.

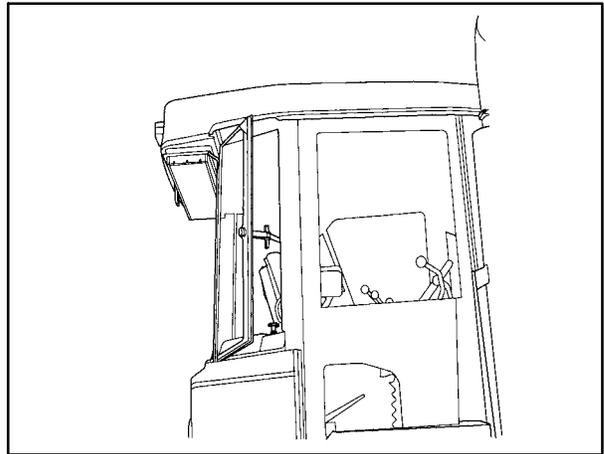


Figure 1-35

OPERATOR SEAT CONTROLS

The seat control levers shown in this figure are:

- 1 Right-hand armrest height adjustment
- 2 Left-hand armrest height adjustment
- 3 Seat belt buckle
- 4 Fore and aft adjustment
- 5 Seat belt retractor
- 6 Air ride position control switch

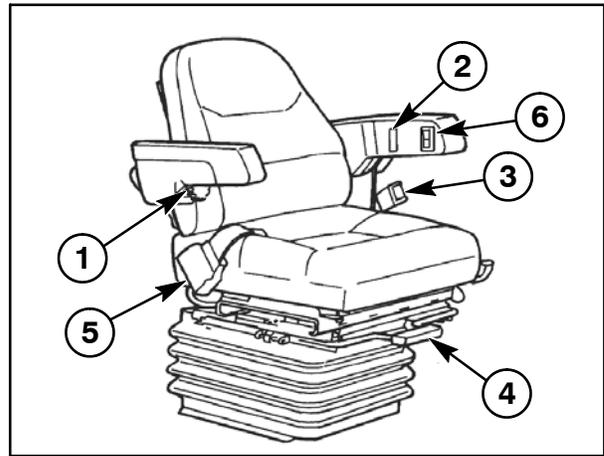


Figure 1-36

The seat control levers shown in this figure are:

- 1 Lumbar control knob
- 2 Backrest position control lever
- 3 Fore and aft isolation lever
- 4 Lateral isolation lever
- 5 Damping knob
- 6 Seat swivel control lever

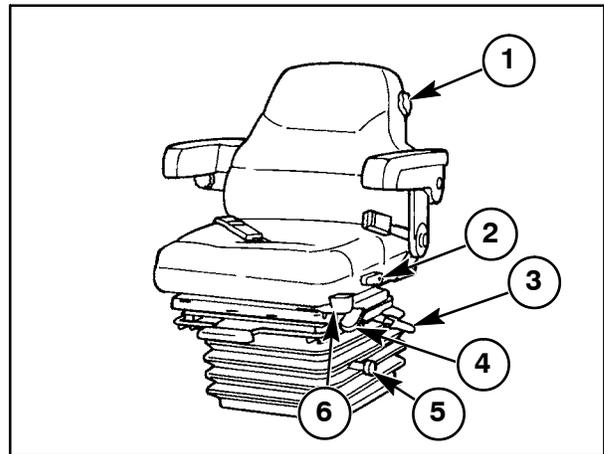


Figure 1-37

INSTALLATION OF CAB-MOUNTED ACCESSORIES

IMPLEMENT MONITOR BOXES, GAUGES, CB RADIO, AND CELLULAR PHONE

1. The cab has convenient mounting hardware, 1, located on the cab pillars to attach brackets for monitor boxes, radios, or phones to be placed near the operator.

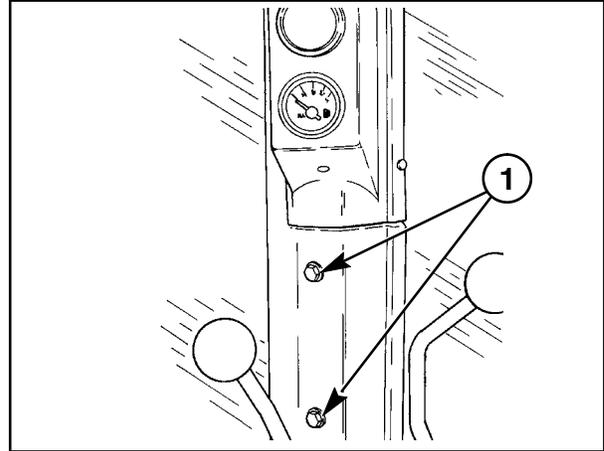


Figure 1-38

A bracket P/N 86029617, 1, can be purchased to aid in the installation of a monitor on the cab pillar.

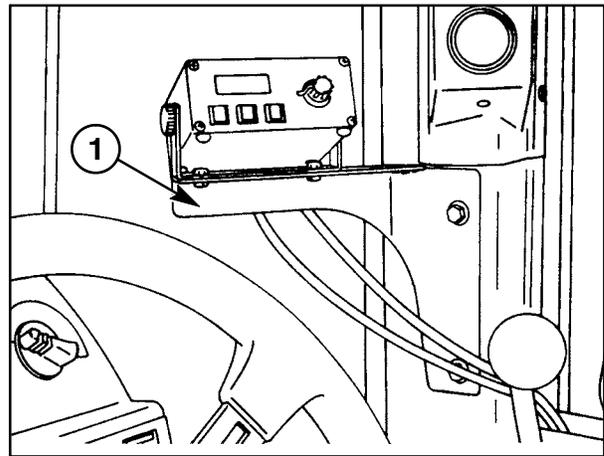


Figure 1-39

A bracket - monitor/powerbar P/N 86031182, 2, can be purchased to aid in the installation of a monitor and/or power bar on the cab pillar. This powerbar includes a harness, 1, for monitor power. The harness includes: 1 Cigarette Type Receptacle, 3, and 2 3-Pin Auxiliary Connectors, 4.

- 1 - Key Switch Power - 30 Amp
- 2 - Live Battery Power - 15 Amp
- 3 - Ground

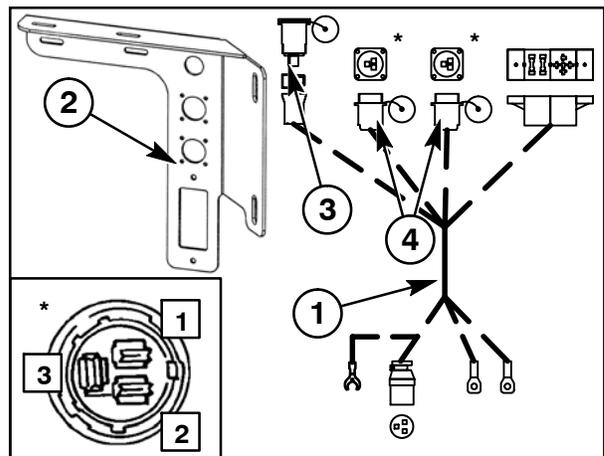


Figure 1-40

Some monitors require a true ground speed signal from a radar unit to be fed into them for proper operation.

Buhler Versatile 4WD tractors equipped with a Tractor Performance Monitor (TPM) option can provide this signal to the monitor by tapping into the existing wire harness on the tractor.

To tap into the existing signal wire on the tractor, use the following procedure:

- a. Remove the cover from the rear of the TPM module on the right-hand console. The cover, 1, is held in position with velcro.



Figure 1-41

- b. Pull out wire harness, 1, that is tucked into the rear of the TPM.
- c. The TPM is connected to the main cab wire harness with a green 8-pin connector. Locate the gray wire marked "CM-90" that is plugged into the connector.

Wire "CM-90" is a processed 5-volt signal that supplies the TPM with a 58.9 Hz/mph output from the Electronic Instrument Control System monitor

- d. Using a pigtail-type splice connector, tie into the "CM-90" wire with the wire leading into the implement monitor.

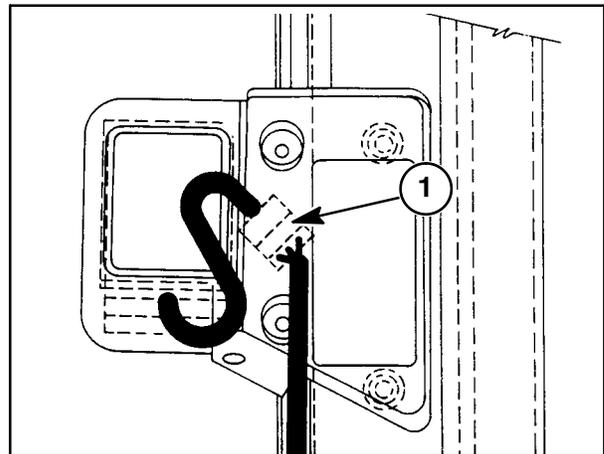


Figure 1-42

The monitor will now receive a signal from the radar unit at the front of the tractor.

- e. Route the signal wire along the right-hand console and out to the implement monitor.
- f. Reinstall the TPM wire harness and connect back into place and install the TPM backplate.

2. There are also four mounting bolt locations directly above the dash so that a "Heads Up" type monitor could also be located in front of the operator.

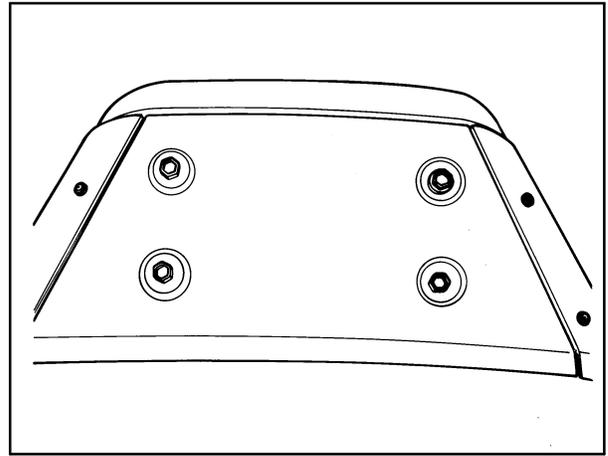


Figure 1-43

3. The cab has a three-pin auxiliary connector, 1, located at the top of the right rear cab pillar inside the cab.

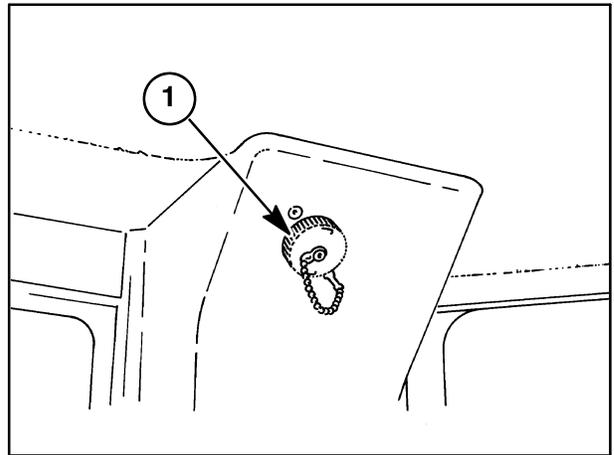


Figure 1-44

4. The three-pin auxiliary connector has three terminals inside of it. Pin, 1, is a switched 12-volt power source protected by a 20-amp fuse. Pin 2 is an unswitched (live) 12-volt power source protected by a 20-amp fuse. The third pin, 3, is a ground pin.

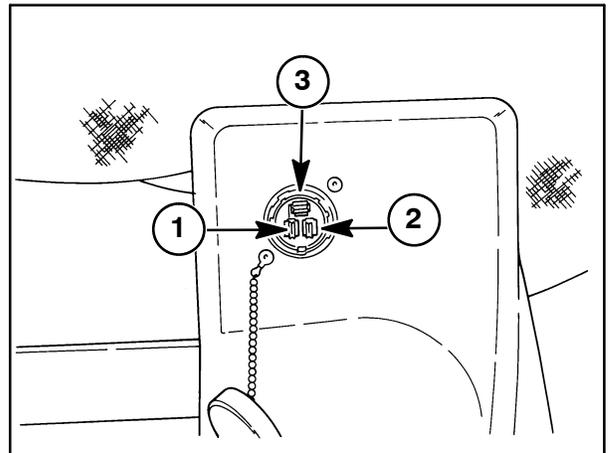


Figure 1-45

Buhler Versatile has a male connector, 1, that will plug into the three-pin auxiliary connector. It is available from your local Buhler Versatile dealer using part #86032122. This number will contain all parts necessary to install the male connector. Please contact your Buhler Versatile dealer for assistance in assembling the connector. A special tool is required to crimp the pins in the kit.

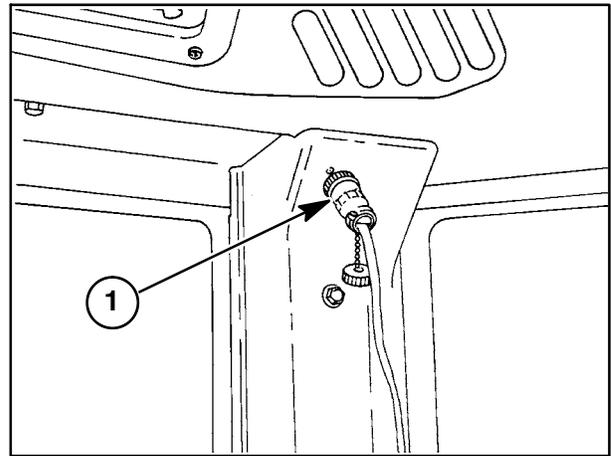


Figure 1-46

5. There is a secondary power source located on a four-pin bus bar behind the cowling that secures the fuel gauge. To access the four-pin bus bar, remove the four cap screws, 1, that secure the panel to the cab post.

NOTE: The power source pins are protected by a 10-amp and 3-amp fuse, respectively. The pins may not be suitable for use with an implement monitor (due to electrical load the monitor requires) and are intended for use with additional gauges installed by the operator. It is suggested that the 3-pin auxiliary connector be used to power the monitor.

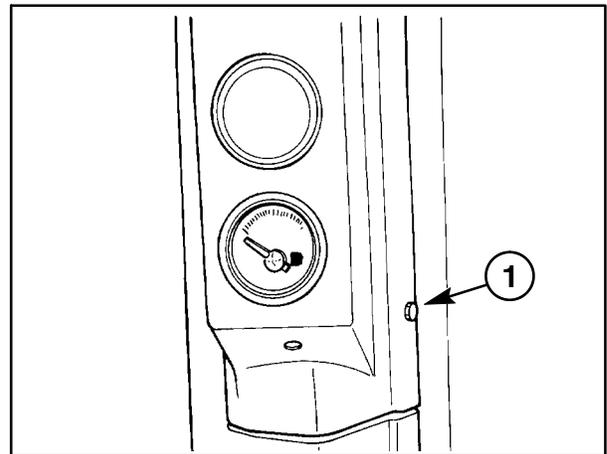


Figure 1-47

The bus bar pins are identified as follows:

Pin 1 is a switched 12-volt power source that is live when the ignition is in the "RUN" position (10-amp circuit protection).

Pin 2 is a switched 12-volt power source that is live when the rotary light switch is in the roadway or field use positions (3-amp circuit protection).

Pin 3 is a ground pin.

Pin 4 is a secondary source for external signals to access the external alarm control of the Electronic Instrument Control System.

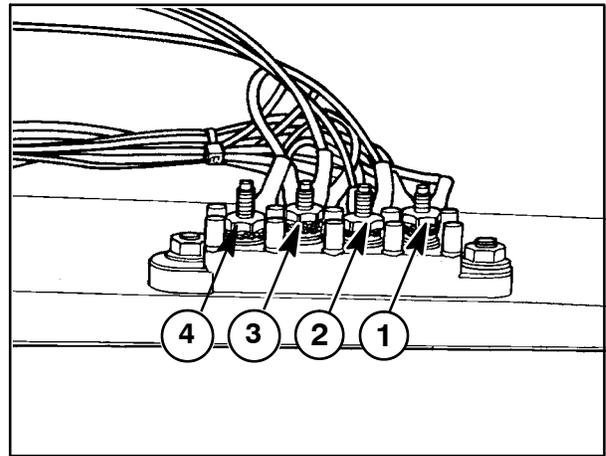


Figure 1-48

For more information on how to hook up the external alarm control, see the "Electronic Instrument Control System" section of this manual.

NOTE: The cowling that secures the bus bar and fuel gauge has circular scribe marks that can be cut out for installing additional gauges. The scribe marks are sized to standard size gauges.

6. To route umbilical cords to a monitor box, remove the cover plate, 1, on the underside of the right rear corner of the cab and route the cord into the cab.

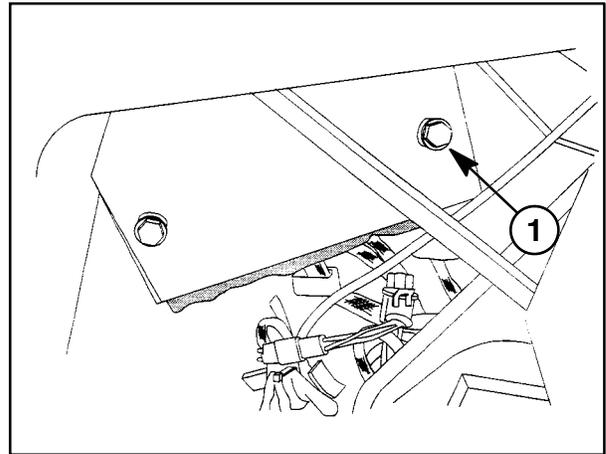


Figure 1-49

The rear shield, 1, in the back of the cab can be removed by loosening the two wing nuts, 2, and pulling the shield away from the rear wall of the cab. Once the shield is removed, the umbilical cord can be routed to the monitor box.

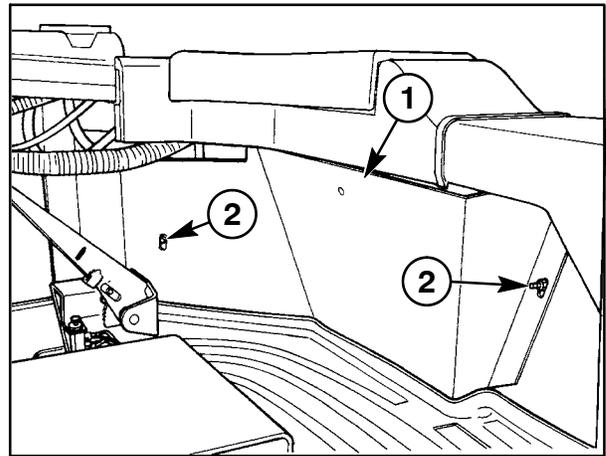


Figure 1-50

7. Antennas for CB radios and cellular phones can be installed in the roof cap, 1. These items should be of such quality that they are shielded to prevent interference with tractor controls and instruments. Consult the radio or phone manufacturer for proper antenna installation.

The roof cap has additional antenna mounts under the right-hand and left-hand rear corner of the roof panel. These mounts can be used by the operator for additional electrical devices that require an antenna be mounted on the tractor.

The roof cap also has two flat mounting locations on top for mounting rotary style beacons.

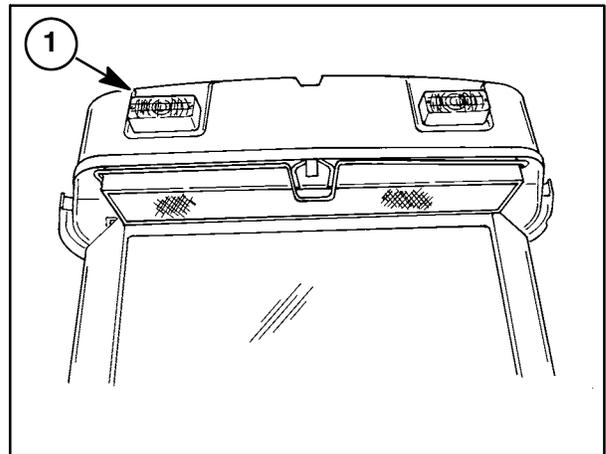


Figure 1-51

WELDING & BATTERY CHARGING

PRECAUTIONS: WELDING

To avoid damage to the electronic/electrical systems, always observe the following:

1. Always disconnect the ground cable from the batteries before carrying out arc welding on the tractor or on any implement attached to the tractor.
2. Position the welder ground cable clamp as close to the welding area as possible. Never weld on one frame member (i.e., front or rear frame) and have the ground strap of the welder on the other frame. Doing this can cause damage to the hoses, articulation bearings, and wire harnesses in the articulation joint area.
3. Never allow welding cables to lay on, near or across any electrical wiring or electronic component while welding is in progress.
4. On powershift transmission equipped units, remove the electrical connectors attached to the transmission electronic controller, even when the negative cable of the battery is disconnected, to provide additional protection to the transmission controller.
5. Always have an assistant standing by with a fire extinguisher to put out any fires that may start due to welding procedures.
6. Always completely clean the area to be welded so that it is free of any grease, fuel or oil before welding.

PRECAUTIONS: BATTERY CHARGING

1. Never make or break any of the charging circuit connections, including the connection at the batteries, when the engine is running.
2. Never short any of the charging components to ground.
3. Do not use a booster battery of higher than 12 volts nominal voltage.
4. Always observe correct polarity when installing the batteries or using a booster battery to jump start the engine. Follow the instructions in this manual when jump starting the tractor. Connect positive to positive and negative to negative.
5. Always disconnect the negative cable from the batteries when charging the batteries in the tractor with a battery charger.



WARNING: BATTERIES CONTAIN SULFURIC ACID. IN CASE OF CONTACT WITH SKIN, FLUSH THE AFFECTED AREA WITH WATER FOR FIVE MINUTES. SEEK MEDICAL ATTENTION IMMEDIATELY.

AVOID CONTACT WITH THE SKIN, EYES OR CLOTHING. WEAR EYE PROTECTION WHEN WORKING NEAR BATTERIES.

TOWING THE TRACTOR

IMPORTANT: The tractor should only be towed a short distance, such as out of a building. Do not tow down roadways or as a method of transport. Haul the tractor on a trailer or truck for transport.

Use a strong chain if towing the tractor is necessary. Tow the tractor BACKWARD from the drawbar or FORWARD from the axle. Use the tie-down slots in the front and rear frames to attach the chains to the tractor.

IMPORTANT: Do not tow the tractor by hooking to the engine cross brace.

1. Place the transmission in neutral and engage the park brake. Attach the chain to the tractor.
2. If possible start the engine and let the engine run so that full use can be made of the power steering. If the engine cannot be run, **engage the articulation lock.**

If the engine is not operational, and the transmission internal components are rotated by the axle drive shafts for a long period of time, possible transmission damage due to lack of lubrication may result.

IMPORTANT: When the engine is running, the clutch, transmission input shaft, and transmission output shafts will also be driven. Be sure that these components are functional prior to starting the engine.

3. Release the park brake and tow the tractor.
4. If a failure has occurred in the front axle, disconnect the drive shaft from the transmission to the front axle only. Do not disconnect the drive shaft between the transmission and the rear axle.



WARNING: IF BOTH DRIVE SHAFTS TO BOTH AXLES ARE DISCONNECTED AT THE SAME TIME THERE WILL BE NO BRAKES ON THE TRACTOR AND A POSSIBLE COLLISION MAY RESULT.

If the transmission has failed and it is necessary to disconnect the drive shafts between the transmission and both the front and rear axle, a solid towing bar must be hooked between the tractor drawbar and the towing vehicle. The towing vehicle must be of adequate size to stop the towed tractor.



CAUTION: DO NOT TOW THE TRACTOR FASTER THAN 8 KPH (5 MPH). ENGAGE THE ARTICULATION LOCK WHEN IT IS NOT POSSIBLE TO STEER THE TRACTOR (WITH THE ENGINE RUNNING).

WARNING: DO NOT USE CABLES OR ROPE TO TOW THE TRACTOR. IF THE CABLE OR ROPE BREAKS OR SLIPS, IT MAY WHIP WITH SUFFICIENT FORCE TO CAUSE SERIOUS INJURY. WHEN USING A CHAIN, ATTACH WITH THE HOOK OPEN SIDE FACING UP; IF IT SLIPS, IT WILL DROP DOWN INSTEAD OF FLYING UP AND CAUSING SERIOUS INJURY.

HAULING THE TRACTOR ON A TRANSPORTER

1. Haul the tractor with all four wheels on a flatbed trailer or truck.
2. Remove the outer duals or triples during hauling unless special permits allow for over-width hauling. Consult local authorities for information on over-width hauling.
3. Make an accurate measurement of the highest point on the tractor when it is on the flatbed of the truck. Consult local authorities regarding over height hauling based on the measurement taken.
4. Tie-down brackets are located on either side of the drawbar cage, 1, to allow a chain of adequate size to be routed through the brackets and hold down the rear end of the tractor.

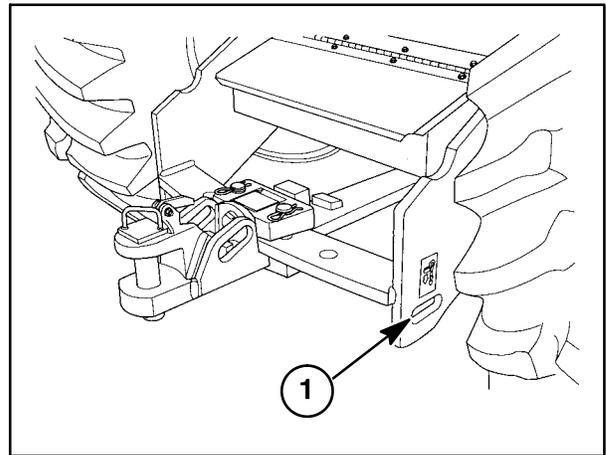


Figure 1-52

5. There are cutout slots, 1, on either side of the front frame of the tractor to allow a chain hook to fasten the front end of the tractor down.
6. Always install the articulation lock pin and set the park brake while transporting the vehicle.

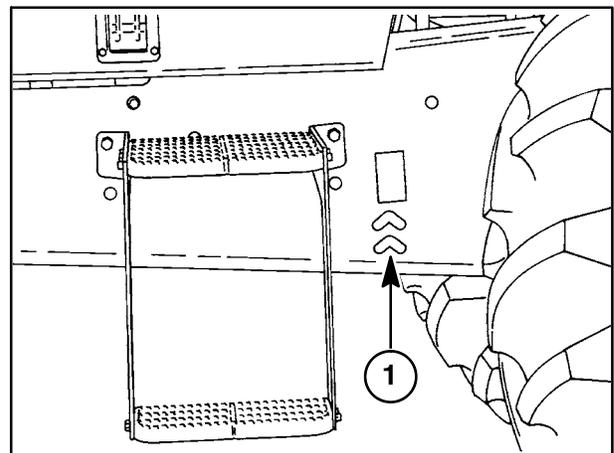


Figure 1-53

PRE-OPERATION CHECKS

Before operating the tractor, be sure you are thoroughly familiar with the location and operation of the controls.

Perform all daily lubrication and maintenance operations as outlined in Section 3.

After completing the daily maintenance operations, perform a walk around visual inspection of the tractor. Pay particular attention to the following items:

- Fan belt for cracks
- Engine area for accumulation of debris
- Hoses, lines, and fittings for leaks or damage.

- Tires for damage
- Hardware for looseness
- Driveline and hydraulic pump areas for leaks or debris accumulation
- Make sure the tractor is ballasted properly for the work to be performed (see “Ballasting” in Section 2)
- Check dual or triple wheel mounting bolt torque

Make any necessary repairs before using the tractor.

SECTION 2

OPERATION

INTRODUCTION

Read this section thoroughly. It details the location and operation of the various instruments, switches and controls on your tractor. Even if you operate other tractors, you should thoroughly read this section of the manual and be sure that you are familiar with the location and function of all the features of the tractor.

Do not start the engine or attempt to drive or operate the tractor until you are fully accustomed to all the controls. It is too late to learn after the tractor is moving. If in doubt about any aspect of operation of the tractor, consult your authorized dealer.

Pay particular attention to the break-in recommendations to ensure that your tractor will give the long and dependable service for which it was designed.

See Section 3 for lubrication and maintenance requirements. Tractor specifications are listed in Section 5.

PRECAUTIONARY STATEMENTS



CAUTION: DO NOT OPERATE THE TRACTOR IN A CLOSED BUILDING.

BEFORE STARTING THE ENGINE, BE SURE ALL OPERATING CONTROLS ARE IN NEUTRAL OR OFF AND THE PARK BRAKE IS ENGAGED.

OPERATE ALL CONTROLS ONLY FROM THE OPERATOR'S SEAT.

STOP THE ENGINE BEFORE SERVICING THE TRACTOR.

KEEP ALL SHIELDS IN PLACE.

STOP THE ENGINE BEFORE RAISING THE ENGINE SIDE SHIELDS.

USE HANDHOLDS AND STEPS WHEN MOUNTING AND DISMOUNTING THE TRACTOR.

USE THE ARTICULATION LOCK IN STATIONARY APPLICATIONS AND SERVICING. DO NOT USE WHEN THE TRACTOR IS MOVING.

ON HIGHWAYS, SIGNAL BEFORE STOPPING, TURNING, OR SLOWING THE TRACTOR.

USE PROPER SAFETY DEVICES TO WARN OF SLOW-MOVING VEHICLE WHEN DRIVING ON PUBLIC ROADS. CHECK WITH LOCAL AUTHORITIES CONCERNING HIGHWAY TRAVEL.

WIDE TRANSPORT MARKER LIGHTS ARE SUPPLIED WITH ALL TIRE OPTIONS. USE THEM.

CAB

ENTERING THE CAB

The cab has been designed for operator comfort and convenience. The roof and floor are insulated to reduce noise.



CAUTION: THE CAB IS NOT DESIGNED TO PROVIDE A “SPRAYER SAFE” ENVIRONMENT FOR THE OPERATOR. WHEN APPLYING CHEMICALS FROM A SPRAY UNIT, DO NOT RELY ON THE CAB FILTER ELEMENTS TO PROVIDE PROTECTION TO THE OPERATOR FROM AIRBORNE CHEMICALS.

Standard features include one door, tinted glass, hinged window, assist rails, a fresh air heater/defroster, air-conditioning, interior light, an air suspension seat, storage tray, cigar lighter, and ashtray.

The cab has an entry ladder, 1, and grab rails, 2, located on the left side of the tractor. Use these to gain entrance to the cab.

There is one door, 3, on the left side of the cab and is the only means of entering the cab.

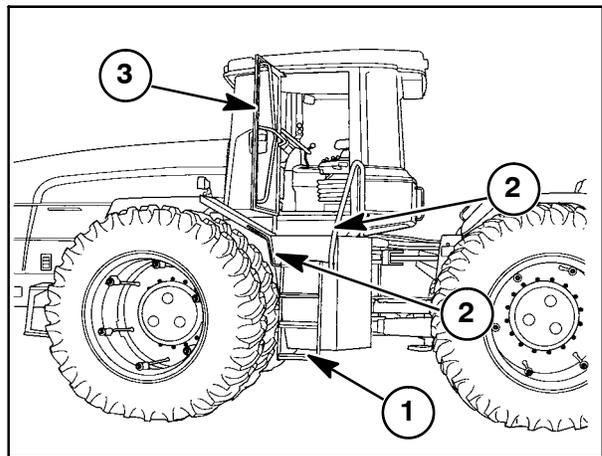


Figure 2-1

The door has a push-button latch, 1, located on the outside. To enter the cab, push the button and swing the door outward from the cab.

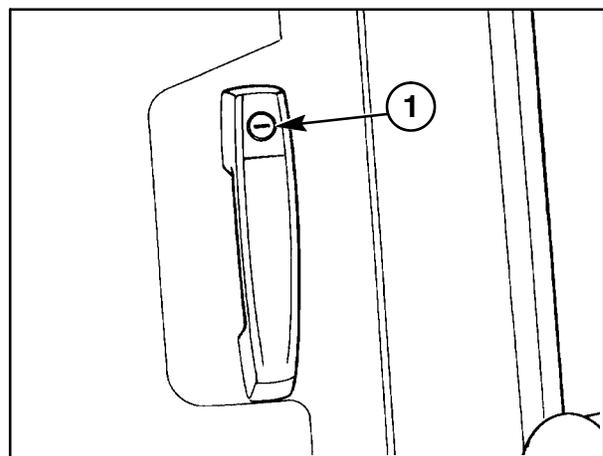


Figure 2-2

The push-button latch can be locked by using the ignition key. When the key slot in the push-button latch is in the horizontal position, the door is unlocked. When the slot is in the vertical position, the door is locked.

NOTE: Be careful not to lock the keys in the cab.

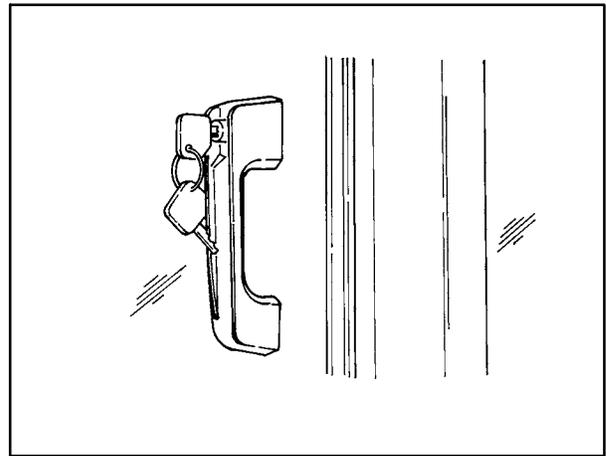


Figure 2-3

The latch on the inside of the door is a lever type. To open the door, pull forward on the lever. The inside latch will open the door even if the door is locked from the outside.

The door is front hinged and is retained in the fully opened position by a gas spring.

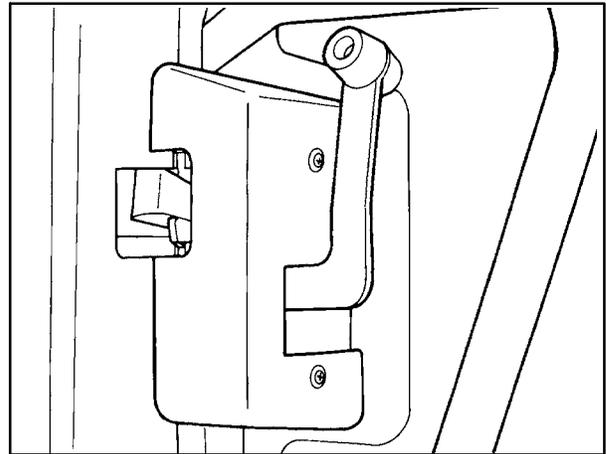


Figure 2-4

RIGHT REAR WINDOW

The right rear window, 1, can be opened to provide ventilation. The window can be locked open, closed, or positioned partially open.

To lock the window, pull the handle in and forward in an arc. The handle will fold, go over center and lock.

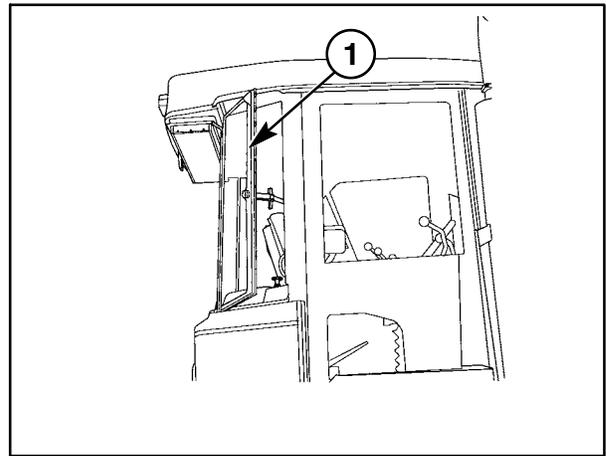


Figure 2-5

To open the window, pull the handle back and push out. The handle will unfold. There are four detents in the handle, which will hold the window in a partially open position. To lock in the full open position, continue rotating the handle outward until the handle stops. This is also an over center position, which will prevent the window from closing unless the latch is pulled.

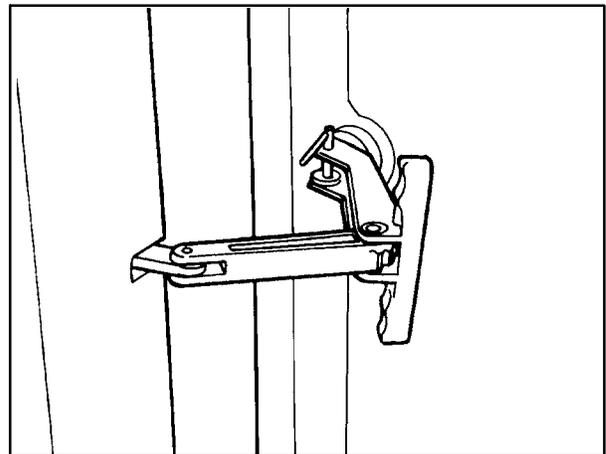


Figure 2-6

The right rear window serves as an emergency exit in the event that the cab door cannot be opened. Pull the latch pin to open the window wide enough for exit. If necessary, the window can be removed by slicing the silicon hinge.

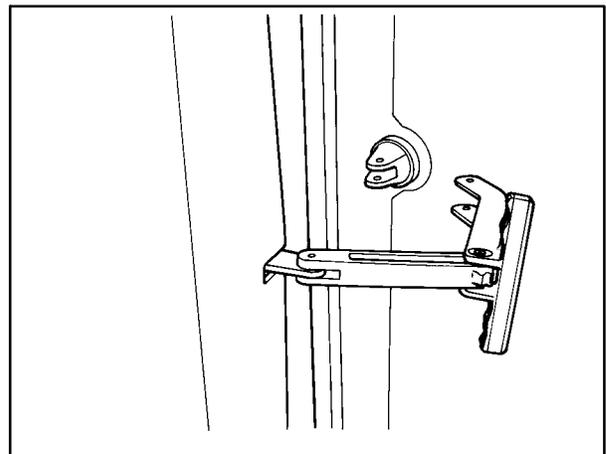


Figure 2-7

OPERATOR'S SEAT

The seat has an electronically controlled pneumatic suspension.

The seat is equipped with controls to permit adjustment for personal comfort.

NOTE: Before operating the tractor, it is important to adjust the seat, steering wheel, and controls to the most comfortable position.

SEAT BELT



WARNING: THIS TRACTOR IS EQUIPPED WITH A RETRACTABLE SEAT BELT. ALWAYS USE THE SEAT BELT.

The seat belt retracts when not in use. The belt automatically adjusts for the size of the individual in the seat.

To fasten the belt, pull the belt from the reel and push the tongue end, 1, into the buckle end, 2, until a click indicates it is properly engaged.

To release the belt, push the red release button, 3, on the buckle and remove the tongue from the buckle.

To clean the belt, sponge with clean, soapy water. Do not use solvents, bleach or dye on the belt as these chemicals will weaken the webbing. Replace the belt when it shows signs of fraying, damage or general wear.

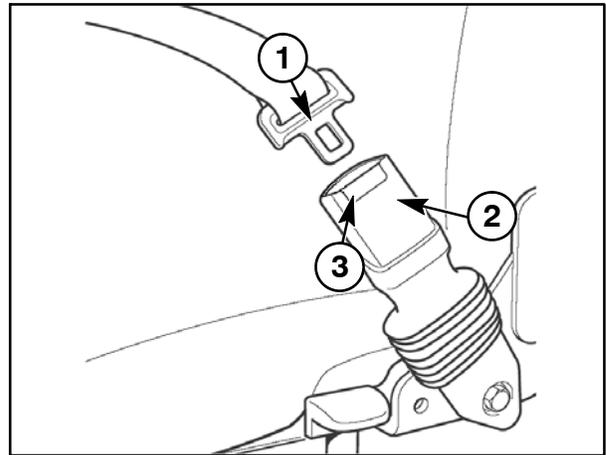


Figure 2-8

SEAT ADJUSTMENTS

NOTE: All adjustments should be made in the following order while sitting in the seat.

Adjust the seat using the following procedures:

NOTE: Turn the ignition switch to the “ACC” position to use the electric functions of the seat. DO NOT START THE ENGINE.



1. Height/Weight Adjustment

Raise - Depress the top of the switch. Release when the desired height is obtained.

Lower - Depress the bottom of the switch. Release when the desired height is achieved.



2. Backrest Angle Adjustment

Lift the lever and tilt the backrest to the desired position. Release the lever to lock the backrest in position.

NOTE: The backrest will tilt backward far enough to contact the rear window.



3. Fore/Aft Position Adjustment

Pull up on the lever and move the seat fore/aft through the 178 mm (7") adjustment range to the desired position. Release the lever to lock the seat into position.



4. Fore/Aft Float

Pull up on the lever to allow the seat to float fore and aft 51 mm (2"). Push down on the lever to lock the seat into position.



5. Lateral Float

Pull up on the lever to allow the seat to float laterally 51 mm (2"). Push down on the lever to lock the seat into position.

6. Storage tray

Pull out for access.

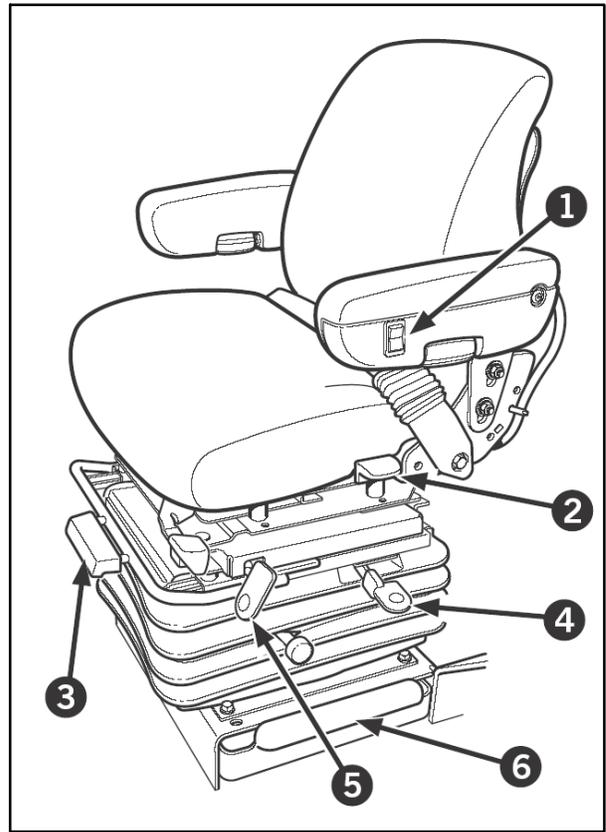


Figure 2-9

7. Dampener Adjustment

The firmness of the ride can be adjusted as follows:

Soft - Rotate the control knob clockwise to decrease the firmness of the seat bounce.

Firm - Rotate the control knob counterclockwise to increase the firmness of the seat bounce.

8. Swivel Adjustment

The seat can be adjusted to:

- Lock in the forward position.
- Lock in the position to the left of center.
- Lock in one of four positions to the right of center (increments of 7° for a total of 28° rotation)
- Provide a free swing position without locking in any position.

To adjust the seat swivel:

1. Move the swivel control lever partially to the rear.
2. Swing the seat to the desired position.
3. Release the lever to lock the seat into position.

NOTE: Moving the control lever fully rearward will provide the free swing position.

9. Lumbar Adjustment

Adjust as follows:

Increase support - Rotate the wheel down.

Decrease support - Rotate the wheel upwards.

10. Armrest Angle Adjustment

Rotate the roller on each armrest to adjust to the desired angle.

Both armrests can also be raised up to the full vertical position for easy access.

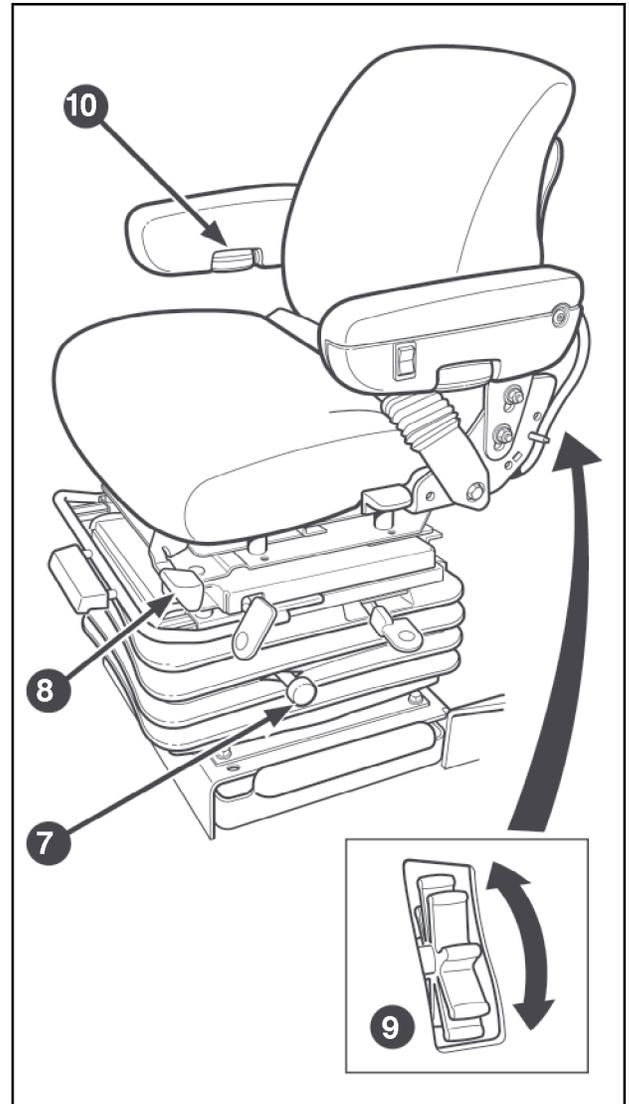


Figure 2-10

STEERING WHEEL AND COLUMN

The steering column may be tilted and telescoped to provide a comfortable operating position.

Steering Wheel Tilt Control

Pulling the tilt control lever, 1, allows the steering column, 2, to be tilted to a comfortable operator position. The steering wheel can be tilted upward to the top stop to allow easy entry and exit of the cab.

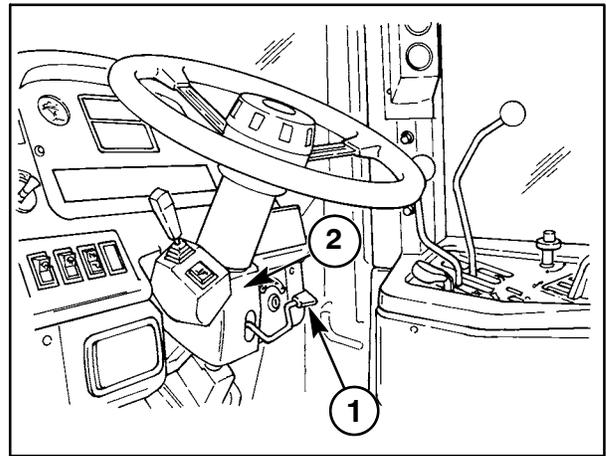


Figure 2-11

Steering Wheel Telescopic Adjustment

Rotating the center locking knob, 1, counterclockwise, will unlock the steering column so the steering wheel, 2, can be telescoped to a comfortable operating position. Tighten the column in place by rotating the locking knob, 1, clockwise.

IMPORTANT: Your tractor is equipped with hydrostatic power steering. Never hold the steering wheel against either of the articulation stops for more than 10 seconds or for more than a total of 10 seconds in any one minute. Failure to observe this precaution may result in damage to the steering system components.

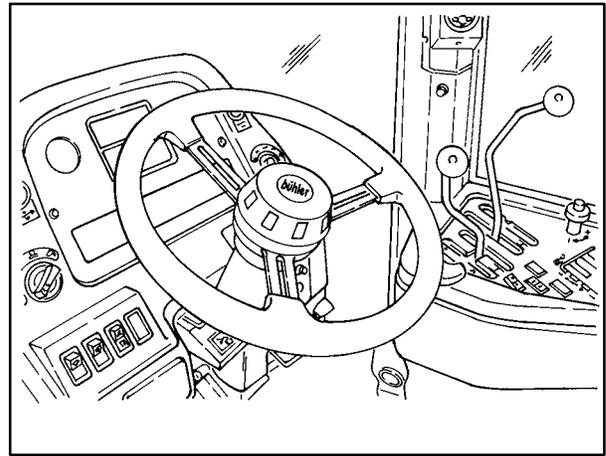


Figure 2-12

OPERATOR'S CONTROL CONSOLE

The following is a description of the switches and gauges located on the front operator's console. The electronic monitor and related controls will be covered in the next section.

- 1 Rotary light switch
- 2 Engine oil pressure gauge
- 3 Engine coolant temperature gauge
- 4 Warning light bar
- 5 Radio (if equipped)
- 6 Ignition switch
- 7 Ether start button
- 8 Ashtray
- 9 Combination horn, turn signal, and headlight dimmer switch lever
- 10 Front windshield wiper switch
- 11 Rear window wiper switch
- 12 Front and rear windshield washer switch

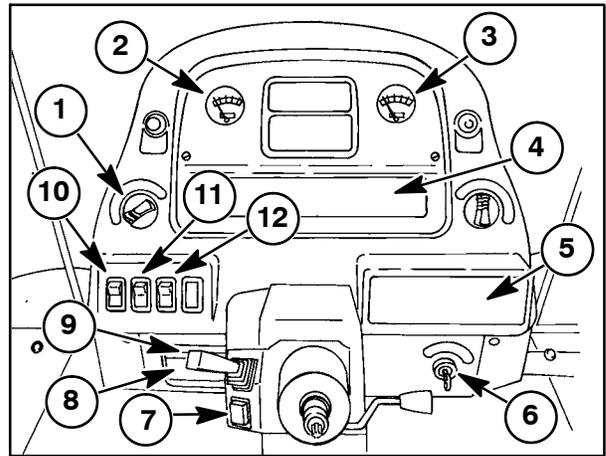


Figure 2-13

Ignition Switch

The ignition switch has four positions:

Stop, 1 - When the switch is in this position, the following cab functions will operate: rotary headlight switch, brake lights, dome light, cigar lighter, horn, turn signals, dimmer switch, pin 2 of the 3-pin auxiliary connector, trouble light, and fuel gauge. These items are live with the ignition switch in the stop position.

ACC, 2 - When the switch is in this position, the following cab functions are live in addition to the items listed in number one above: seat, front and rear windshield wiper switches, front and rear windshield washer switch, radio, fan rotary switch, and air-conditioner switch.

Run, 3 - When the switch is in this position, the following cab functions are live in addition to the items listed in number two above: pin 1 of 3-pin auxiliary connector, electronic monitor select switch, electronic monitor acknowledge switch, electronic monitor rotary select switch, warning light bar, PTO switch (if equipped), differential lock switch (if equipped), engine fuel solenoid, tractor performance monitor, and ether cold start button.

Engine Start, 4 - When the switch is turned and held in this position, the engine will crank and start as long as the safety start switch circuit is complete. The following items will turn off momentarily when the switch is turned to the start position, but will be live again when the key is released and returns to the run position: radio, air conditioner, and fan control switch.

The switch has a starter protection feature built-in. If the switch is rotated to the start position, and then released to the run position, it will be necessary to rotate the switch to the stop position in order to make another attempt at starting the tractor. This will prevent accidental engagement of the engine starting motor when the engine is already running.

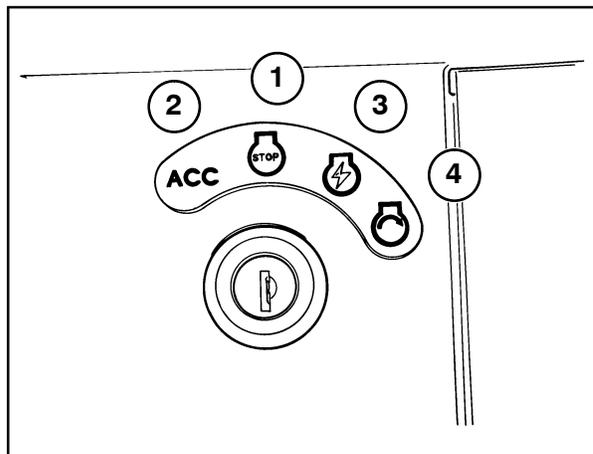


Figure 2-14

Ashtray and Cigarette Lighter

The ashtray can be tilted out for convenient use.

To clean the ashtray, pull it outward from the dash and empty.

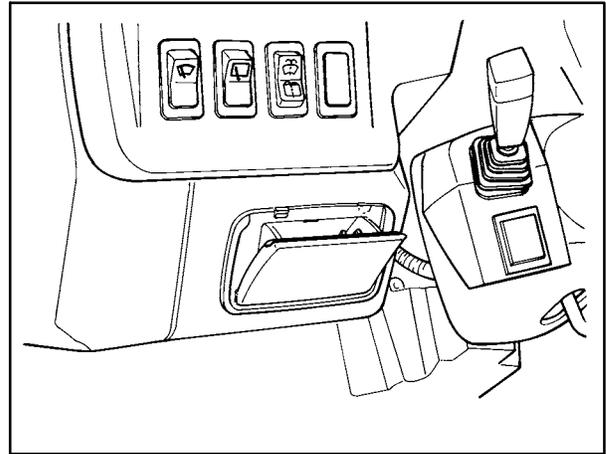


Figure 2-15

The cigarette lighter, 1, is located at the center of the right console. Push the lighter in to activate. It will automatically pop out when heated.

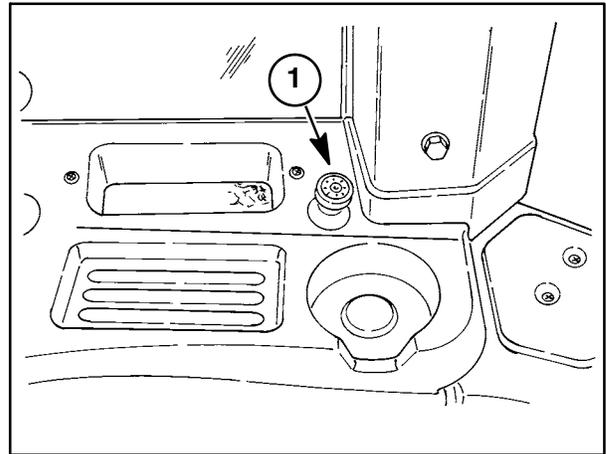


Figure 2-16

Ether Aid Button

The ether aid button, 1, is used to inject ether, a highly combustible substance, into the engine intake manifold. Ether will ignite in the engine at temperatures far below those needed to ignite diesel fuel. Use the ether to assist the engine starting in temperatures at or below 0°C (32°F).

Only depress the ether start button while the starter motor is cranking the engine. Depress the button again after 10 seconds if the engine does not start.

A temperature sensor, mounted on the side of the engine block, prevents ether from being injected into the engine if the engine block temperature is above 27°C (80°F). See "Engine Starting" later in this section.

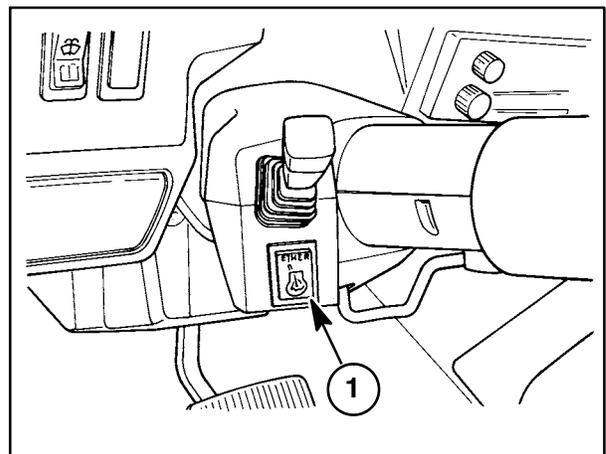


Figure 2-17

Combination Horn, Turn Signal, and Headlight Dimmer Switch Lever

The stalk-type multifunction switch, 1, operates the horn, turn signals, headlight flash and is used to select high or low beam.

Turn Signals - Move the stalk upward to indicate a right turn, or downward to indicate a left turn. The turn signal warning light on the warning light bar will flash when the signals are operated. The opposite warning light on the warning light bar will also light, but will remain steady. The turn signal must manually be returned to neutral after the turn is completed.

Headlights (High/Low Beams) - With the rotary select headlight switch in the roadway use position, the multifunction switch can be pulled toward the steering column to change the headlights from high to low beam and vice versa.

Headlight Flash - With the headlight rotary select switch in the off position, the multifunction switch can be pulled toward the steering column to flash the high or low beams of the grille-mounted headlights.

Horn - Press the button on the end of the multifunction switch to activate the horn.

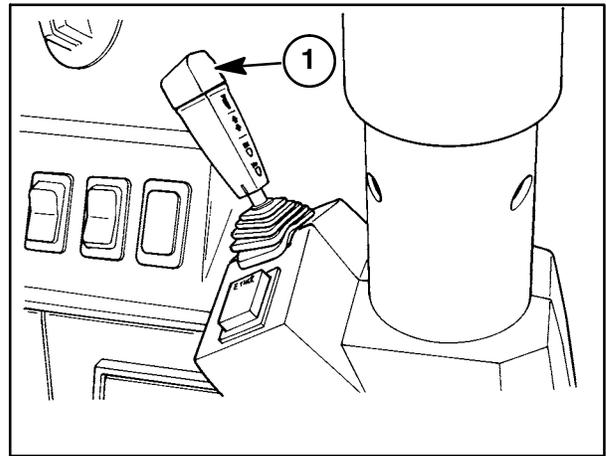


Figure 2-18

Front Windshield Wiper Switch

The front windshield wiper switch, 1, is a three-position switch. Position one (when the bottom of the switch is flush with the dash) is the off position. Position two (when the switch is in the center rocker position) is low speed. Position three (when the top of the switch is pressed flush with the dash) is high speed.

NOTE: When the front windshield wiper switch is turned off, the wiper arm will always stop on the right side of the windshield.

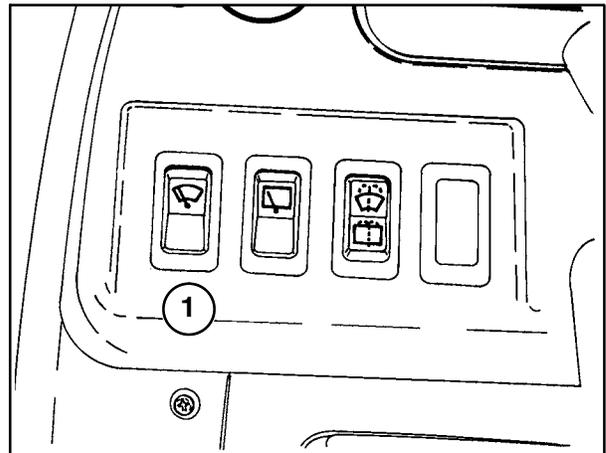


Figure 2-19

Rear Window Wiper Switch

The rear windshield wiper switch, 2, is a three-position switch. Position one (when the bottom of the switch is flush with the dash) is the off position. Position two (when the switch is in the center rocker position) is low speed. Position three (when the top of the switch is pressed flush with the dash) is high speed.

NOTE: When the rear windshield wiper switch is turned off, the wiper arm will always stop on the left side of the rear cab window.

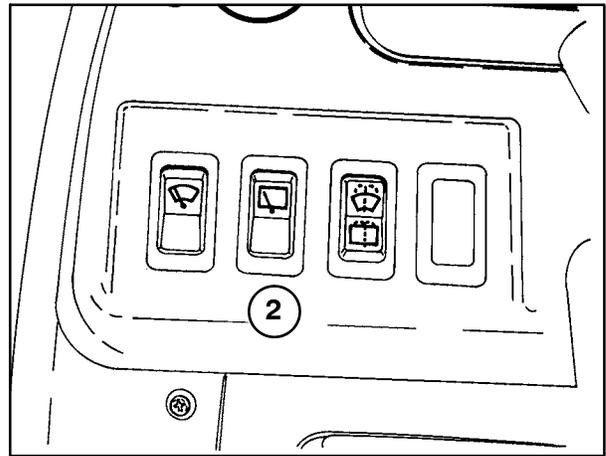


Figure 2-20

Front and Rear Windshield Washer Switch

The washer switch, 3, is a three position, momentary-type switch. Position one (when switch is in the center rocker position) is the off position. Position two (when the top of the switch is pressed flush with the dash) will provide washer fluid to wash the front windshield. Position three (when the bottom of the switch is flush with the dash) will provide washer fluid to wash the rear window.

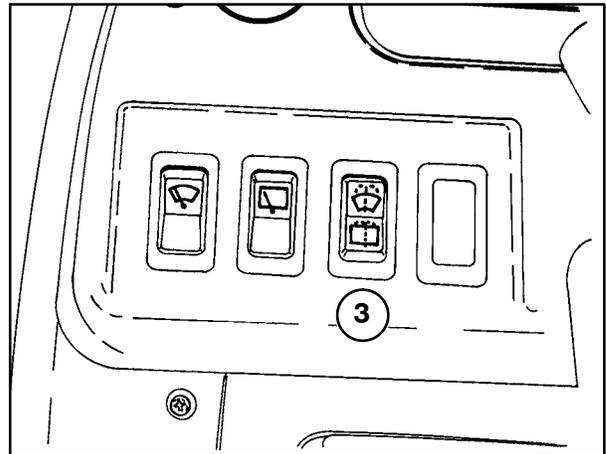


Figure 2-21

Engine Oil Pressure Gauge

The engine oil pressure gauge, 1, is a mechanical gauge that has a capillary tube to the engine to provide oil pressure for the gauge. The gauge has a 0 to 500 kPa (0 to 75 PSI) display on its face. The gauge is tied into the Electronic Instrument Control System to warn the operator that an unusual engine oil pressure reading is present during operation. For further information about the electronic dash module and how it relates to oil pressure, see “Electronic Instrument Control System” later in this section. The gauge also has red (warning) and green (normal operation) segments on the face of the gauge to indicate the operating range. The red (warning) segment, 2, stretches from 0 to 100 kPa (0 to 15 PSI) and indicates the engine is running at a lower than normal oil pressure. The green (normal operation) segment, 3, stretches from 100 to 500 kPa (15 to 75 PSI) and indicates the engine is running within normal oil pressure parameters.

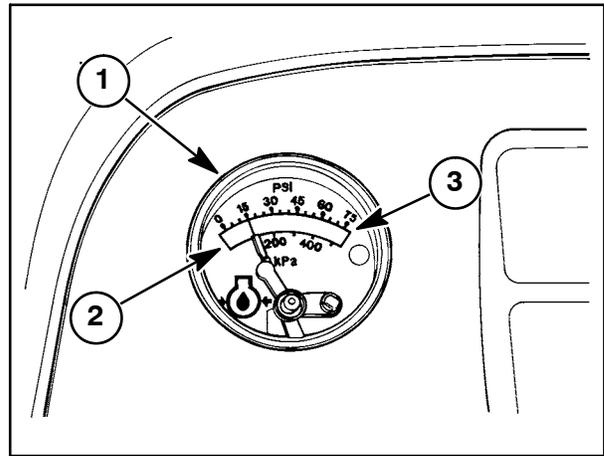


Figure 2-22

Engine Coolant Temperature Gauge

The engine coolant temperature gauge, 1, is a mechanical gauge that has a capillary tube to the engine to provide a coolant temperature reading for the gauge. The gauge is tied into the Electronic Instrument Control System to warn the operator that an unusual engine coolant temperature reading is present during operation. For further information about the electronic dash module and how it relates to engine coolant temperature, see the “Electronic Instrument Control System” portion of this section. The gauge is numberless with two indicator bands on it to display engine coolant temperature. The green zone, 2, (normal operating temperature) ranges from 54°C to 109°C (130°F to 228°F). The red band, 3, (warning operating temperature) ranges from 109°C to 121°C (228°F TO 250°F).

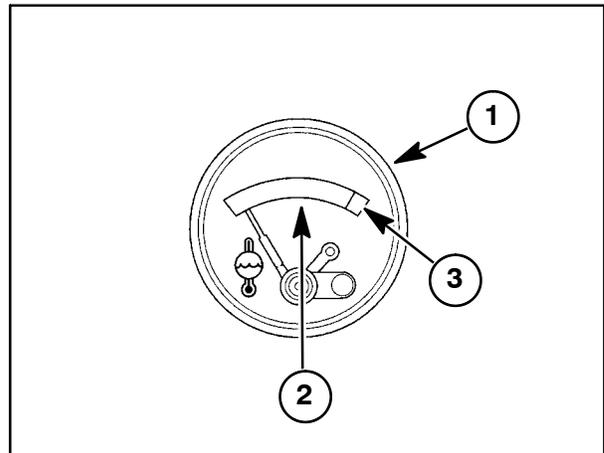


Figure 2-23

NOTE: On 2360 and 2425 tractors equipped with electronic engines, the engine coolant temperature gauge is not tied into the module. The system has its own temperature sending unit. See “Electronic Instrument Control System” portion if this manual for more information.

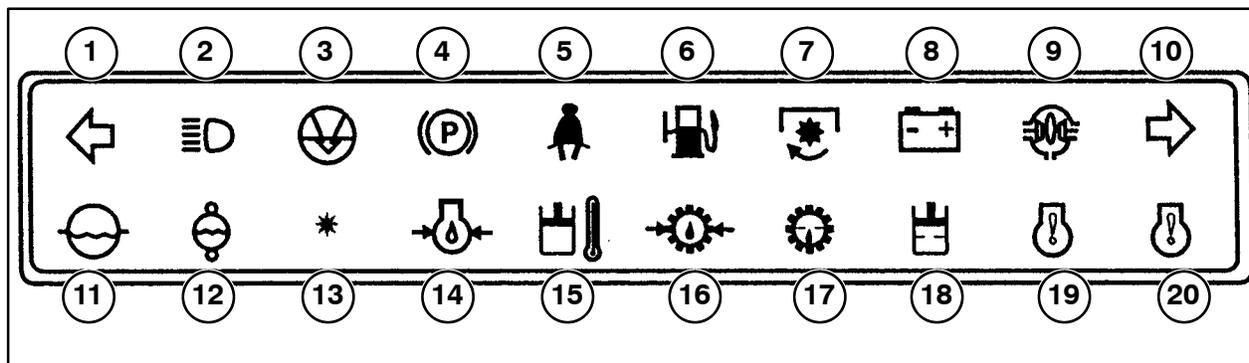


Figure 2-24

Warning Light Bar

The warning light bar provides visual indication of specific functions as follows:

- 1 Left Turn Signal and Flasher Indication Arrow - illuminates when the multifunction switch is placed in the left turn position (flashes), when the multifunction switch is placed in the right turn position (steady) and when the rotary light switch is in positions two or three (flashes).
- 2 High Beams - illuminates when the multifunction switch is pulled toward the steering column for headlight flash or high beam position.
- 3 Air Filter Restriction - illuminates when there is 635 mm (25") of H₂O vacuum being caused by a restriction in the engine air filter assembly.
- 4 Park Brake - illuminates when the park brake handle is pulled upward in the lock position and goes out when the park brake is in the downward (operate) position.
- 5 Safety Belt - illuminates when the ignition switch is turned to the "RUN" position and stays illuminated for five seconds to remind the operator to fasten the safety belt. The light will then go out and will not re-light until the ignition switch is turned off and then turned back to the run position.
- 6 Low Fuel Level - illuminates when the fuel in the tanks is at 1/12 or less capacity (1/12 equals 68.1 L or 18 US gals).
- 7 PTO Switch - illuminates when the PTO switch is placed in the "ON" position and power is supplied to the circuit supplying the PTO solenoid.
- 8 Alternator Output - illuminates when the alternator has stopped sending a charging output to the electrical system.
- 9 Front Differential Lock - illuminates when the differential lock switch is placed in the "ON" position. The light goes off when the differential lock switch is placed in the "OFF" position or when the brake is depressed.
- 10 Right Turn Signal and Flasher Indication Arrow - illuminates when the multifunction switch is placed in the right turn position (flashes), when the multifunction switch is placed in the left turn position (steady) and when the rotary light switch is in positions two or three (flashes).
- 11 Engine Coolant Level - illuminates when the engine coolant in the radiator has dropped 4.5 L (5.3 US qts.) below the acceptable fill level in the radiator.
- 12 Red Engine Coolant Temperature - illuminates when the engine coolant temperature reaches 109°C (228°F), indicating engine overheating requiring shutdown.
- 13 Not used.
- 14 Engine Oil Pressure - illuminates when the engine oil pressure reaches 100 kPa (15 PSI), indicating the engine oil pressure has reached a point unacceptable for proper engine lubrication.

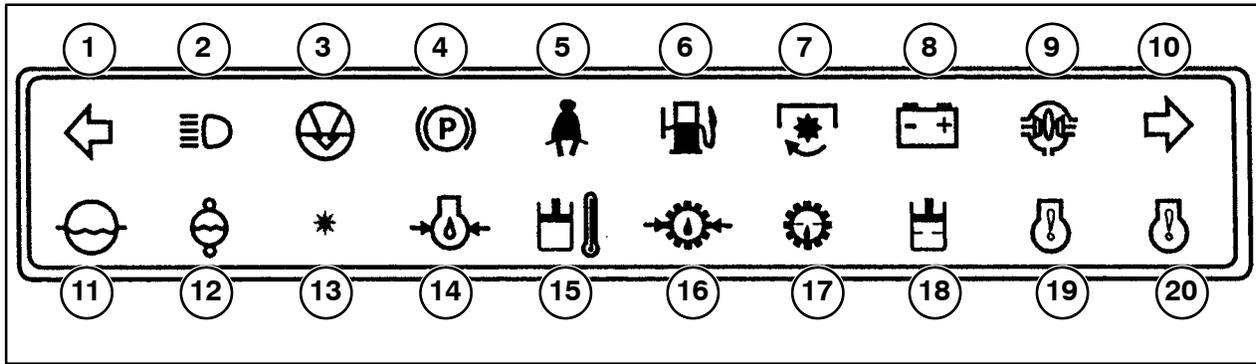


Figure 2-25

- 15 Hydraulic Oil Temperature - illuminates when the hydraulic oil temperature has reached 99°C (210°F), which is unacceptable for normal operation.
- 16 Transmission Lube Pressure - illuminates when the transmission oil pressure being supplied for transmission lubrication is below 20 kPa (3 PSI) and unacceptable for proper transmission lubrication.
- 17 Transmission Lube Filter - illuminates when the transmission lube filter has a pressure drop of 210 kPa (40 PSI) indicating a restricted filter. The filter is now in its bypass condition and is no longer filtering the oil returning to the transmission.
- 18 Hydraulic Lube Filter - illuminates when the hydraulic lube filter has a pressure drop of 210 kPa (40 PSI) indicating a restricted filter. The filter is now in its bypass condition and is no longer filtering the oil returning to the reservoir.
- 19 Yellow Engine Warning Light (electronic engines only) - illuminates when a non-critical fault occurs in the electronic engine control system. As soon as possible, contact your Buhler Versatile dealer.
- 20 Red Engine Warning Light (electronic engines only) - illuminates when a critical fault occurs in the electronic engine controls. Stop the tractor immediately and contact your Buhler Versatile dealer. This light will also come on when the system detects an engine overspeed condition. The red engine warning light when illuminated can be used to retrieve engine fault codes that have occurred.

RIGHT CONSOLE

On the right side of the cab is a console which contains controls for operation of the throttle, 1; transmission (Quad Shift III shown), 2; PTO, 3, (if equipped); differential lock, 4, (if equipped); cruise control, 5; remote control valves, 6; and flow control, 7.

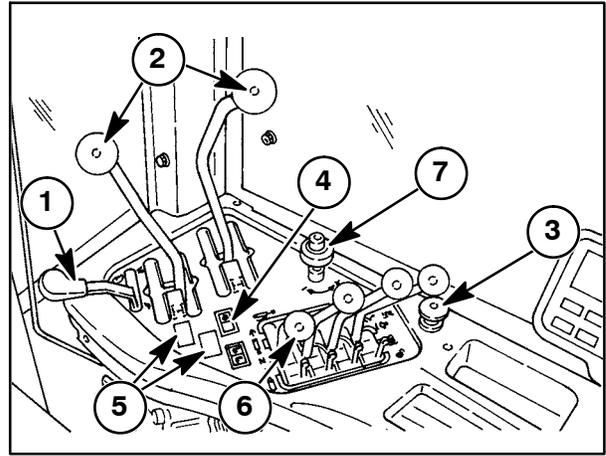


Figure 2-26

On tractors equipped with the powershift transmission, the right console is laid out exactly the same as the Quad Shift III equipped tractors with the exception of the shift lever, 1.

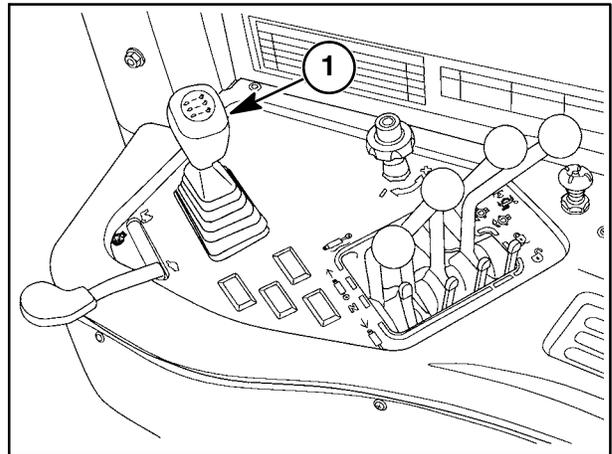


Figure 2-27

Convenience items on the right console include the cup holder, 1, and two storage trays, 2.

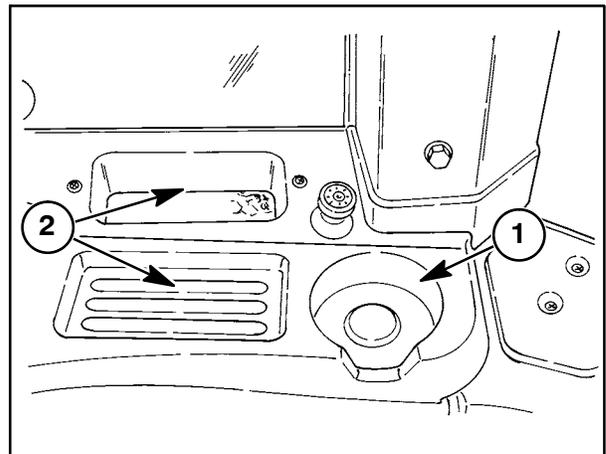


Figure 2-28

SECTION 2 - OPERATION

On 3-point hitch equipped tractors, the 3-point hitch control switches and dials are located on the rear portion of the right console.

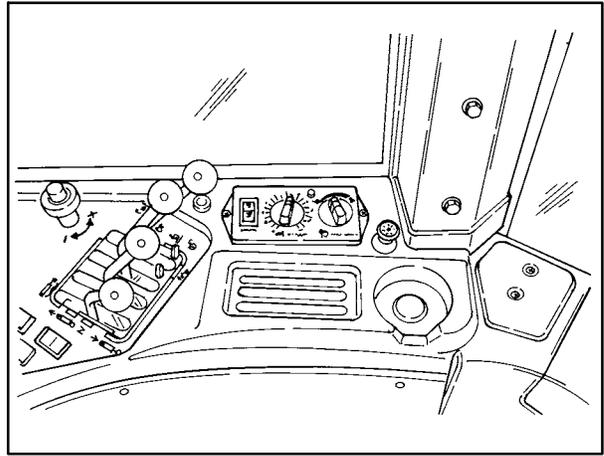


Figure 2-29

At the lower front corner is an adjustable heater/air-conditioning vent, 1, and the decelerator pedal, 2.

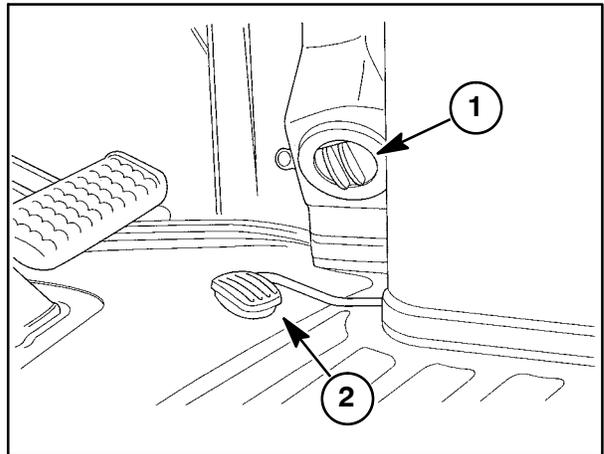


Figure 2-30

Above the front corner of the right console on the cab post is the fuel gauge, 1. If the tractor is equipped with the powershift transmission, a digital readout, 2, displaying transmission information is located above the fuel gauge.

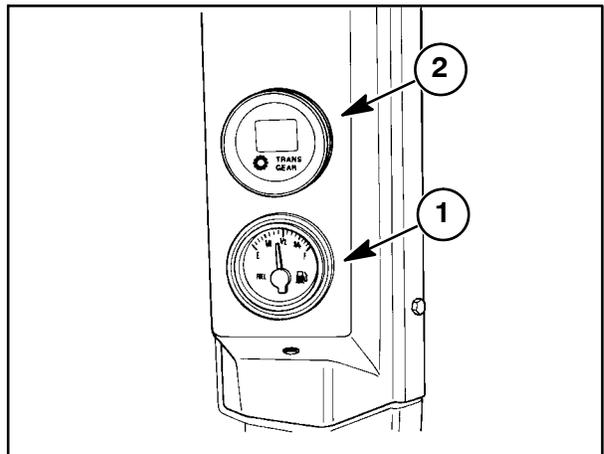


Figure 2-31

ARTICULATION LOCK

The articulation lock pin prevents the tractor frames from articulating when placed in the lock position. The pin has two positions in the frame:

When the pin is in the right side of the frame, 1, it is in the operate position.

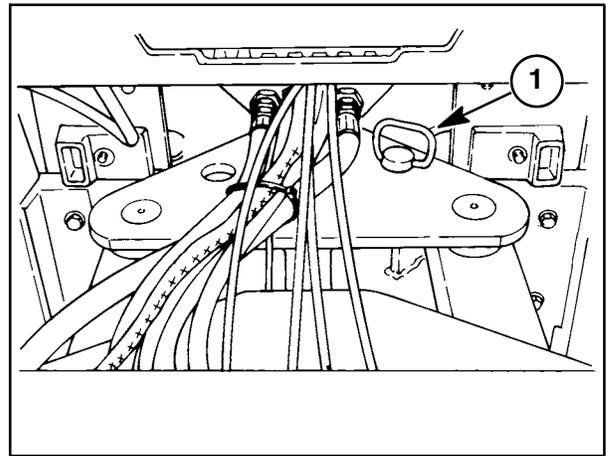


Figure 2-32

When the pin is in the left side of the frame, 2, it is in the lock position.

Use the articulation lock during stationary applications, servicing, jacking or overhaul operations. Do not use when the tractor is operating. To install the articulation lock, use the following procedure:

1. Before engaging the lock, drive the tractor to a level surface, put the steering straight, engage the park brake, put the gearshift in neutral, and stop the engine.
2. Remove the pin from the operate position on the right side of the frame and put the pin through the hole on the left side of the frame.

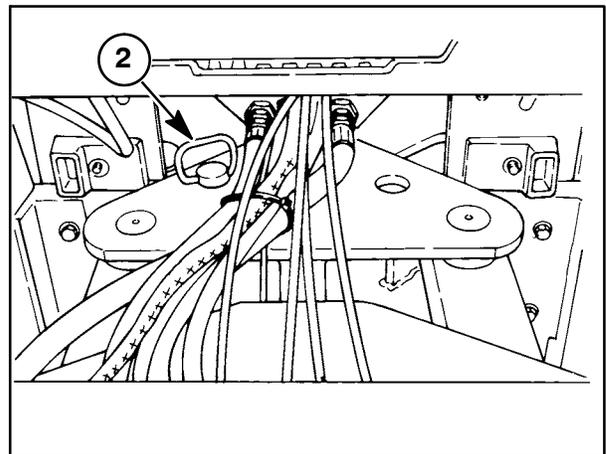


Figure 2-33

NOTE: It may be necessary to start the engine and articulate the frame slightly to be sure the articulation pin is positioned properly and completely seated through the frame pieces.

TRACTOR START-UP AND ENGINE OPERATION



WARNING: AVOID POSSIBLE INJURY OR DEATH FROM A MACHINE RUNAWAY.

DO NOT START THE ENGINE BY SHORTING ACROSS STARTER TERMINALS. THE ENGINE CAN START AND THE MACHINE CAN MOVE WHEN THE STARTING SAFETY SWITCH IS BYPASSED.



CAUTION: PREVENT INADVERTENT TRACTOR OR IMPLEMENT MOVEMENT.

BE SURE THE HYDRAULIC CONTROL LEVERS ARE IN NEUTRAL AND THE 3-POINT HITCH IS SET TO THE LOWEST POSITION PRIOR TO STARTING THE TRACTOR WHEN ATTACHED TO AN IMPLEMENT.

THE TRACTOR CAN MOVE AS SOON AS THE ENGINE IS STARTED BY TURNING THE STEERING WHEEL, EVEN WITH THE PARK BRAKE ENGAGED AND THE TRANSMISSION IN NEUTRAL. BE SURE ALL PERSONNEL ARE CLEAR OF THE TRACTOR BEFORE STARTING.

PRESTART INSPECTION

Do the following before starting the engine each day:

1. Check the engine oil level and adjust, if necessary.
2. Check the coolant level and adjust, if necessary.
3. Check and clean the radiator and grill for dirt and debris, if required.
4. Check the transmission and hydraulic oil tank levels and adjust, if necessary.
5. Inspect the condition of all belts, lights, switches, hoses, lines, fittings, seals, tires, nuts and bolts. Replace or tighten, if required.

6. Check the drawbar and 3-point hitch for wear, especially around metal-to-metal contact parts.

ENGINE STARTING

IMPORTANT: Protect the turbocharger during start-up by not opening the throttle or accelerating above 1000 RPM until the engine oil pressure gauge reads in the normal range. Avoid excessive engine speed during warm-up.

1. Fasten your seat belt.
2. Put the transmission in neutral.
3. On tractors equipped with a PTO, put the switch to the "OFF" position. A safety switch on PTO-equipped models permits engine starting only when the PTO is off.

4. Engage the park brake.

IMPORTANT: A safety switch in the park brake will not permit the tractor to start unless the park brake is engaged.

5. Check to be sure that the remote hydraulic levers are in the neutral position.
6. On tractors equipped with a 3-point hitch, make sure that the hitch controls are set to the lowest position.
7. Set the engine throttle to the lowest position.
8. Turn the ignition to "RUN" to activate the electrical accessories.

Observe the warning lamps to be sure they are functioning.

9. Turn the ignition to the "START" position to crank the engine, and release when the engine starts.

The switch has a starter protection feature built-in. If the switch is rotated to the start position, and then released to the run position, it will be necessary to rotate the switch to the stop position in order to make another attempt to start the tractor. This will prevent an accidental engagement of the engine starter motor when the engine is already running.

IMPORTANT: To prevent starter motor damage, never crank the engine for more than 30 seconds. If the engine does not start within 30 seconds, wait 2 minutes to cool the starter motor before reanking.

10. Once the engine has started, allow it to idle and warm up before adding a working load.

IMPORTANT: Pay attention to the warning light bar and electronic monitor for any indication of a problem. Stop the tractor immediately and investigate the problem.

Cold-Weather Starting



CAUTION: STARTING FLUID IS HIGHLY FLAMMABLE. DO NOT USE NEAR FIRE, SPARKS, OR FLAMES. BE SURE ALL OPERATORS READ THE CAUTIONARY INFORMATION ON CONTAINERS.

NOTE: A feature on the starting aid prevents starting fluid injection if the engine temperature is above 27° C (80° F).

After following steps 1 to 10 under “Engine Starting,” proceed as follows:

11. If the engine does not start within 15 seconds of cranking, depress the cold start switch, 1, for two seconds while the engine is cranking and release to inject starting fluid. If the engine does not start after 15 more seconds, release the ignition switch. Allow the starter motor to cool down for two minutes, and repeat the procedure.

IMPORTANT: Use only one starting fluid charge per engine crank cycle of 30 seconds. Never hold the button longer than 5 seconds, as damage to the electric solenoid valve may result.

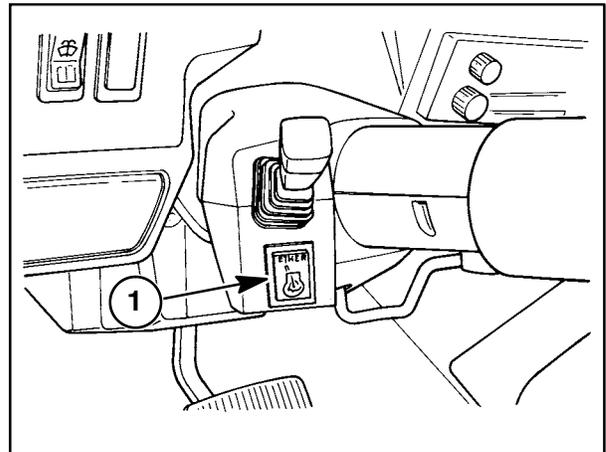


Figure 2-34

12. If, after the engine starts, it runs roughly while at low idle with an outside ambient temperature below 0° C (32° F), it is permissible to press the cold start button and inject an additional amount of starting fluid into the engine to aid in engine warm-up.

NOTE: The cold start system injects a 4.8 cc metered shot of starting fluid into the engine with each depression of the switch.

The engine is protected from starting fluid being injected into it when the engine temperature is above 27° C (80° F) by a temperature sensor, 1, mounted on the side of the engine block.

ATTENTION: Use a maximum of three injections of starting fluid into the engine for initial start-up and engine warm-up. If the engine will not start or will not smooth out, shut the tractor off and investigate the cause. See "Engine Troubleshooting" in Section 4 of this manual.

13. Once the engine has started, allow it to warm up before putting it under load.

IMPORTANT: Pay attention to the warning light bar and electronic monitor for any indication of a problem. Stop the tractor immediately and investigate the problem.

NOTE: If the engine fails to start after three attempts, use a block heater or other means to warm the engine.

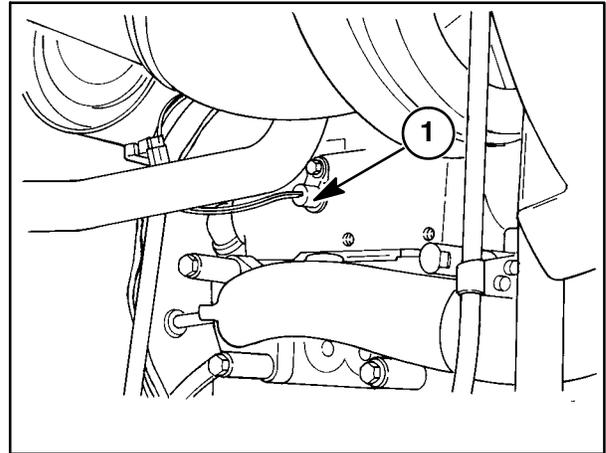


Figure 2-35

Engine Block Heater

1. Block heaters are standard equipment on Buhler Versatile tractors. The block heater cord, 1, is located on the right side of the engine.
2. A 3-wire 15-amp extension cord is required to connect the block heater to a grounded 115-volt electrical outlet.



WARNING: TO AVOID SHOCKS OR OTHER INJURIES, NEVER USE AN UNGROUNDED OR INADEQUATE EXTENSION CORD. ALWAYS USE A GROUNDED 3-WIRE EXTENSION CORD WITH A 3-WIRE PLUG WHICH IS RATED FOR AT LEAST A 15-AMPERE LOAD, AND PROTECTED BY A SUITABLE FUSE OR CIRCUIT BREAKER.

3. To operate the heater, plug the heater cord in for at least four hours before attempting to start. Maximum starting ability is usually obtained within four hours.
4. Disconnect the cord when the engine has started.



WARNING: ELECTRICAL SHOCK HAZARD!

BE SURE CORDS ARE PROPERLY GROUNDED; DO NOT HANDLE IF WET. DO NOT PLUG THE HEATER IN IF NOT IMMERSSED IN COOLANT. IT MAY OVERHEAT AND BURST CAUSING INJURY.

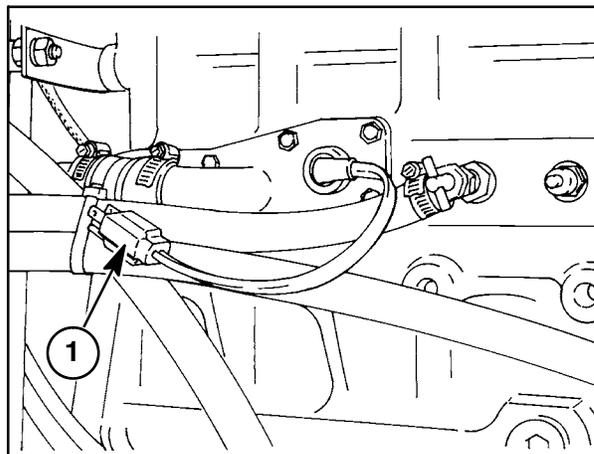


Figure 2-36

Tractor Boosting

1. Set the park brake, put the transmission in neutral, PTO clutch control and all accessories OFF.
2. Attach one end of the booster cable to the positive terminal of the booster batteries and the other end of the same cable to the positive terminal of the center battery on the tractor.
3. Attach one end of the negative cable to the negative terminal of the booster battery, and the other end of the same cable to a ground on the tractor frame at least 305 mm (12") from the discharged batteries. DO NOT CONNECT TO THE NEGATIVE POST OF THE DISCHARGED BATTERIES.
4. Be sure that the clamps from one cable do not touch the clamps of the other cable. Do not lean over the battery when making connections.
5. Start the tractor following normal engine starting procedures.
6. When the tractor starts, remove the booster cables. Disconnect the negative cable, then the positive cable.
7. If the tractor fails to start, charge the batteries.

All models have three batteries connected in parallel that have 950 CCA (BCI Group 31).



CAUTION: WHEN SERVICING BATTERIES, DISCONNECT THE NEGATIVE (BLACK) CABLES BEFORE THE POSITIVE (RED) CABLES. WHEN CONNECTING CABLES, CONNECT THE POSITIVE (RED) CABLE FIRST, THEN THE NEGATIVE (BLACK). THIS WILL REDUCE THE POSSIBILITY OF SPARKING AND BATTERY EXPLOSION.



WARNING: ALL BATTERIES GENERATE HYDROGEN GAS, WHICH IS HIGHLY FLAMMABLE. IF IGNITED BY A SPARK OR FLAME, THE GAS MAY EXPLODE VIOLENTLY CAUSING A SPRAY OF ACID, FRAGMENTATION OF THE BATTERY, AND POSSIBLE SEVERE PERSONAL INJURY, PARTICULARLY TO THE EYES.

THEREFORE, AS A SAFETY PRECAUTION:

WEAR PROTECTIVE CLOTHING AND GOGGLES.

DO NOT SMOKE OR EXPOSE THE BATTERY TO OPEN FLAME.

DO NOT CONNECT OR DISCONNECT LIVE CIRCUITS.

FOLLOW THE CONNECTION PROCEDURE AS OUTLINED ABOVE.

THROTTLE

The tractor is equipped with a hand throttle, located on the right console. Rated operating speed is 2100 RPM. Idle speed is 850–900 RPM. High idle no load speed varies by model from 2250 RPM to 2300 RPM.

To increase engine speed, move the lever forward (rabbit). Pulling the lever backward will reduce engine speed (turtle).

Fuel consumption can be reduced by operating at lower engine speeds under light load.

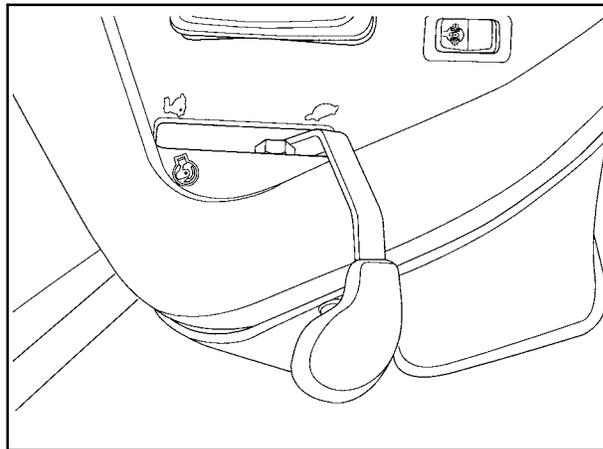


Figure 2-37

CRUISE CONTROL OPERATION

Cruise control automatically keeps the engine speed at a specified RPM. Two switches control cruise mode operation. The “CRUISE/OFF” button, 1, enters and exits cruise mode. The “+/(SET)” button, 2, adjusts the cruise setting. When cruise mode is activated, the engine returns to the last cruise setting, if possible, based on throttle lever position.

The cruise function can be set to any engine RPM, but the operating cruise RPM cannot exceed the normal RPM for the current throttle position. For example, if the cruise setting is 1800 RPM but the hand throttle is at a normal 1700 RPM position, cruise will not increase the RPM.

On the 2360/2425 models equipped with the N14 the operating cruise RPM always stays about 100 RPM under the normal throttle position RPM.

On the models, 2290, 2335 and 2375 equipped with the QSM 11 the cruise RPM is always less than or equal to the normal throttle RPM.

Setting - Move the throttle handle higher than the desired cruise setting and press the “CRUISE” button, 1, to enter cruise operation. On the QSM 11 engine cruise will not engage unless the throttle is set to a higher operating speed than the previous set point. The engine speed will go to the RPM of the cruise setting. Adjust the cruise setting with the “+/(SET)” button, 2. Set the cruise mode with the throttle lever at Full Throttle (throttle lever fully forward) whenever possible. Cruise function will disengage if the cruise RPM is set to a value equal to the throttle position RPM—moving the throttle to a higher position will return cruise function.

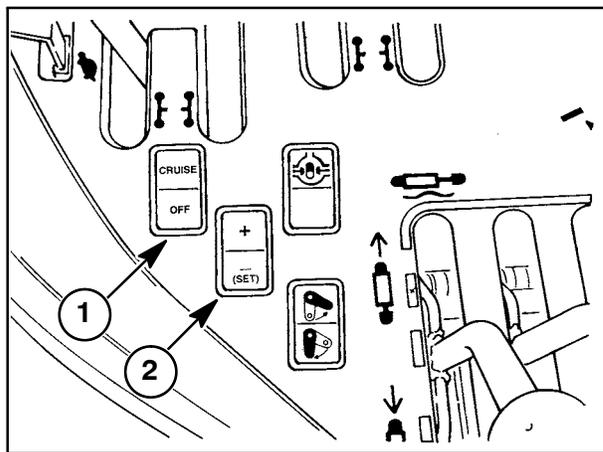


Figure 2-38

The “+/(SET)” button will change the setting 10 RPM per momentary push. When the button is held down, the RPM will continue to move up or down. However, the dash RPM display will not keep up with RPM changes when the button is held down. In this case, it is advisable to estimate the setting by ear, wait for the dash to catch up, and fine tune the RPM using momentary pushes. It is never possible to set the cruise higher than the current throttle lever position.

If the last cruise setting was above the throttle position, the system will remember that cruise setting unless the “+/(SET)” button is pressed in cruise mode. The cruise RPM will return to the stored cruise setting if the throttle is moved above that RPM.

The electronic system remembers the current cruise control setting at all times. The cruise setting remains in memory after the cruise switch is turned off, after the engine is shut off, or if the batteries are disconnected.

Alternate Engine Speed Overrun - All N14 engines in 2360 and 2425 tractors have a rated engine speed of 2100 RPM. Actual high engine speed, when the throttle lever is placed in the full forward position, is 2225 +/- 50 RPM. The difference between the rated speed and the actual full throttle speed (125 RPM) is called throttle overrun (or sometimes referred to as high speed droop). The 125 RPM results in a 6% overrun ($125 \text{ RPM} \div 2225 \text{ RPM} = 0.06 \times 100\%$) of the engine in normal loaded operating conditions when tractor ground speed is below approximately 18.5 KPH (11.5 MPH).

In situations where engine load is minimal and tractor ground speed is high above 18.5 KPH (above 11.5 MPH), the Electronic Engine Control System will progress to an alternate engine speed overrun condition. The full throttle overrun will now be 15% (2450 +/- 50 RPM) instead of the normal 6% (2225 +/- 50 RPM). An example of this would be a tractor traveling at 12.9 KPH (8 MPH), over the road, with the throttle lever fully forward and the cruise switch in the OFF position. Maximum engine RPM shown on the EICS of the tractor will be 2225 +/- 50 RPM. If the transmission is shifted into a higher gear and ground speed increases above 18.5 KPH (11.5 MPH), the engine will accelerate to a new higher speed, with the EICS now displaying a maximum engine speed of 2450 +/- 50 RPM.

The alternative engine speed overrun feature of the electronic engine controls provide a higher ground speed when traveling over the road with the tractor.

If tractor ground speed is reduced below 18.5 KPH (11.5 MPH), the system will revert to the 6% normal overrun mode.

IMPORTANT: Loads placed on the engine while roading (implements, road grade) will affect tractor ground speed and the alternate speed overrun feature.

Deceleration (manual or pedal) - When in cruise mode and hand throttle, 1, moves lower than the cruise setting, the cruise RPM decreases as well and stays 100 RPM less than the normal RPM for that throttle position. The RPM will increase back up to the cruise setting if the throttle handle is moved forward again.

Example: With the throttle handle at Full Throttle, the cruise is set to 1800 RPM. When the throttle handle is moved back past the normal 1800 RPM position, the cruise speed will drop to 1700 RPM and continue to decrease as the throttle decreases. When the handle moves back up to full throttle, the cruise speed increases until it reaches 1800 RPM again.

Using the deceleration pedal in cruise mode works the same as moving the throttle handle. If the deceleration pedal causes the throttle linkage to decrease past the cruise setting, the cruise speed will decrease as well. When the deceleration pedal is released, the cruise RPM will return to the specified setting. **It is not possible to use the “+” button to increase the cruise setting higher than the current throttle position.**

Exiting Cruise Mode - Pressing the “OFF” button, 1, exits cruise mode and returns to the normal engine speed for the current throttle position. The cruise function can be used in this way for two-speed applications. The throttle position for high speed, the cruise setting for low speed.

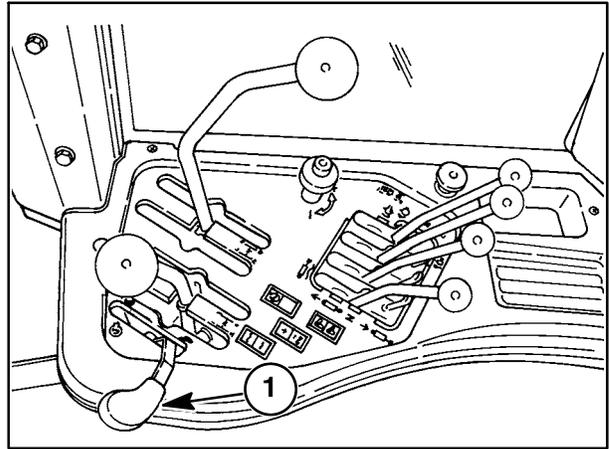


Figure 2-39

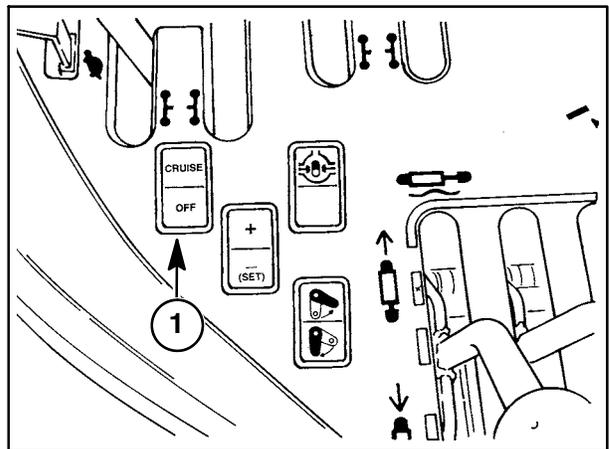


Figure 2-40

STOPPING THE TRACTOR

1. Gradually slow down the tractor. Set the throttle as low as possible.
2. Disengage the clutch, apply the brake and put the controls into neutral.
3. Reduce the engine speed to Idle. Run the engine for 3 to 5 minutes before shutdown to allow the engine to cool.
4. Shut down the engine and remove the key. Turn all electrical accessories OFF.

IMPORTANT: If the engine has overheated, allow it to idle an extended length of time to reduce the temperature. If the temperature does not return to normal or the coolant level warning lamp is ON, shut down the tractor immediately.

OVERHEAD CLIMATE CONTROLS

Above the right console is a panel containing the climate controls. These consist of a rocker switch, which activates the air conditioning, and three rotary switches, controlling the pressurizer fan, temperature, and recirculation mix.



CAUTION: THE CAB IS NOT DESIGNED TO PROVIDE A “SPRAYER SAFE” ENVIRONMENT FOR THE OPERATOR. WHEN APPLYING CHEMICALS FROM A SPRAY UNIT, DO NOT RELY ON THE CAB FILTER ELEMENTS TO PROVIDE PROTECTION TO THE OPERATOR FROM AIRBORNE CHEMICALS.

Heater

1. To activate the heater, open the heater hose valve, 1, on the right side of the engine block. Under most cold-weather conditions it is not necessary to have the valve completely open.

During hot weather, shut the heater valve off on the side of the engine. This will ensure no heated engine coolant will flow into the heater core.

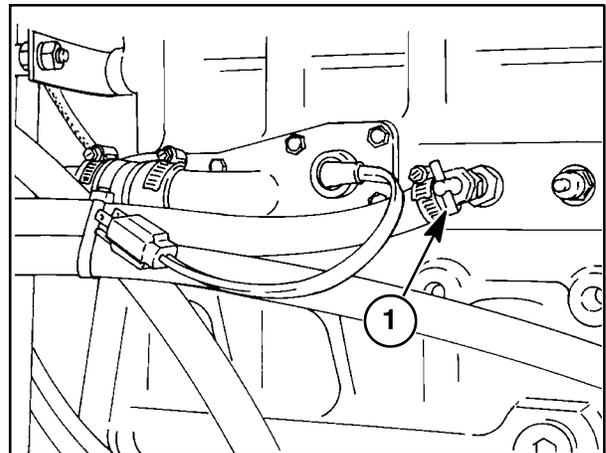


Figure 2-41

2. Rotate the temperature control knob, 1, counterclockwise (toward the red) to increase the temperature and clockwise (toward the blue) to decrease the temperature.
3. There are four positions on the pressurizer fan switch, 2. The full counterclockwise position is off. Each detent in the clockwise direction increases the speed of the fan. The fan speeds are low, high, and purge.
4. The recirculation knob, 3, controls the mix between external air and recirculated cab air. To increase the amount of fresh air entering the cab, rotate the knob counterclockwise. Rotate the knob clockwise to recirculate the cab air. Do not block the recirculation vent, 4, when recirculating cab air.

NOTE: The left-hand side of the cab roof has a second recirculation vent that has a fixed opening and is not adjustable.

5. To dehumidify the cab air during cold weather, use the heater in conjunction with the air-conditioning system to reduce air humidity. Turn the air conditioner on and turn the recirculation knob clockwise to recirculate the cab air. Place the temperature control knob to the desired heat level.

Air Conditioning

1. The air conditioning is activated by a two-position rocker switch, 1. An indicator light on the switch will glow when the air conditioning is activated.

NOTE: The air-conditioning system uses R134A refrigerant. DO NOT mix with other refrigerants. DO NOT attempt to top off the system with any other refrigerants. Rely on a qualified technician for all air conditioning repairs.

2. Rotate the temperature control knob, 2, counterclockwise (toward the red) to increase the temperature and clockwise (toward the blue) to decrease the temperature.
3. There are four positions on the pressurizer fan switch, 3. The full counterclockwise position is off. Each detent in the clockwise direction increases the speed of the fan. The fan speeds are low, high, and purge.

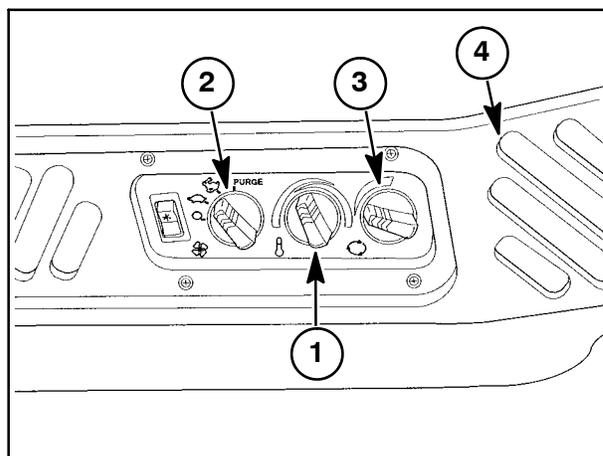


Figure 2-42

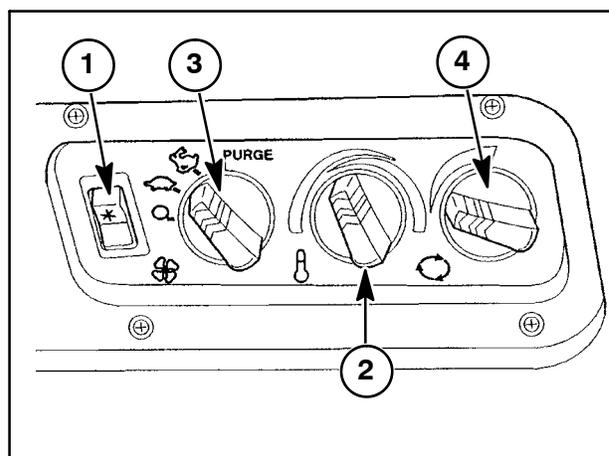


Figure 2-43

- The recirculation knob, 4, controls the mix between external air and recirculated cab air. To increase the amount of fresh air entering the cab, rotate the knob counterclockwise. Rotate the knob clockwise to recirculate the cab air. Do not block the recirculation vent when recirculating cab air.

NOTE: The left-hand side of the cab roof has a second recirculation vent that has a fixed opening and is not adjustable.

IMPORTANT: Always turn the air conditioner off when cooled or dehumidified air is not required. For proper air conditioner operation, the cab air filter must be serviced regularly.

Pressurizer Vents

The pressurizer fan has several adjustable vents to direct air flow as required. All vents can be rotated to adjust direction and have adjustable fins to direct the angle of air flow. The forward vents, 1, can be adjusted for the front or side windows. The rearward vents, 2, are for operator comfort.

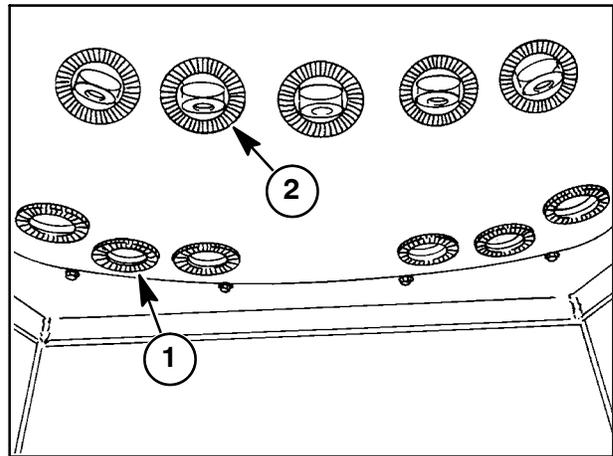


Figure 2-44

For additional comfort, a floor vent, 1, is provided at the bottom of the right console.

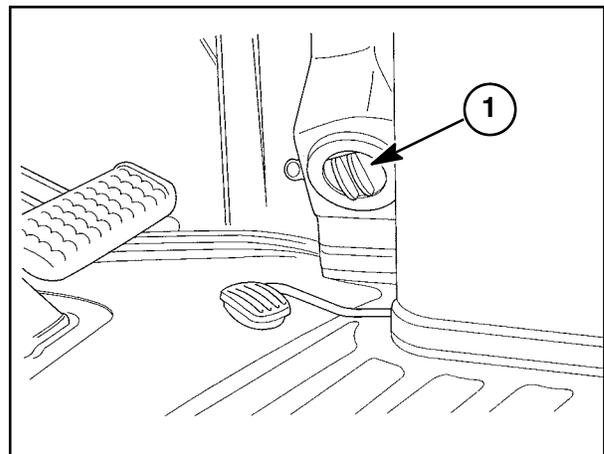


Figure 2-45

MIRROR

An interior rearview mirror, 1, is provided for your convenience. It is located on the right post and is adjustable.

NOTE: To provide a wider view, the mirror has a convex lens. This causes objects to appear farther away than they are.

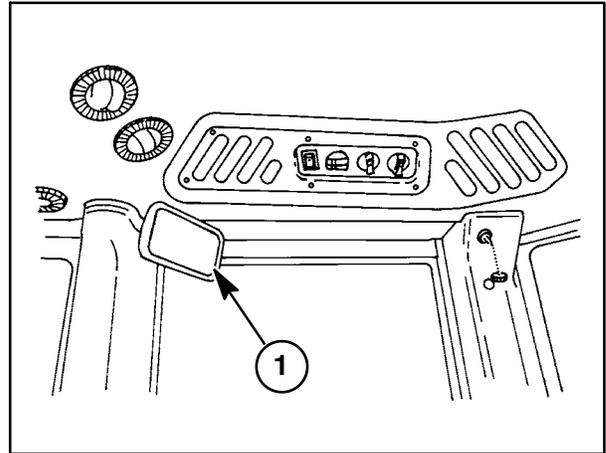


Figure 2-46

RADIO (Optional Equipment)

There are various optional radios that can be installed in the cab. If no radio has been installed in your tractor, your Buhler Versatile dealer can install the radio of your choice.

A separate operator's manual is supplied with each radio purchased through Parts and should be followed for proper radio operation.

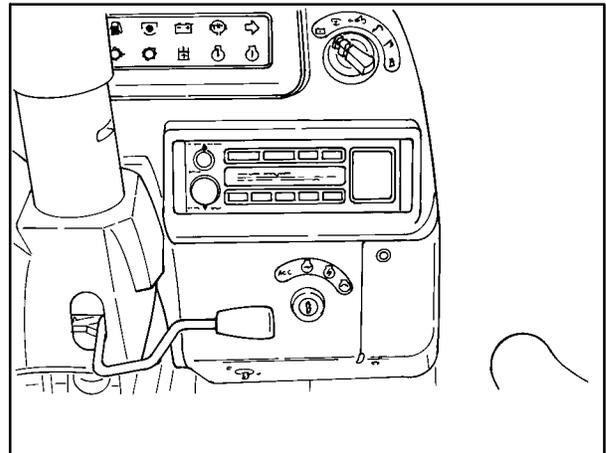


Figure 2-47

BRAKING SYSTEM

PARK BRAKE

The park brake is located on the floor just to the right of the operator's seat. The parking brake must be engaged (pulled up) to start the tractor. A light on the warning light bar will indicate park brake engagement.

NOTE: The tractor will not start if the park brake is not engaged.

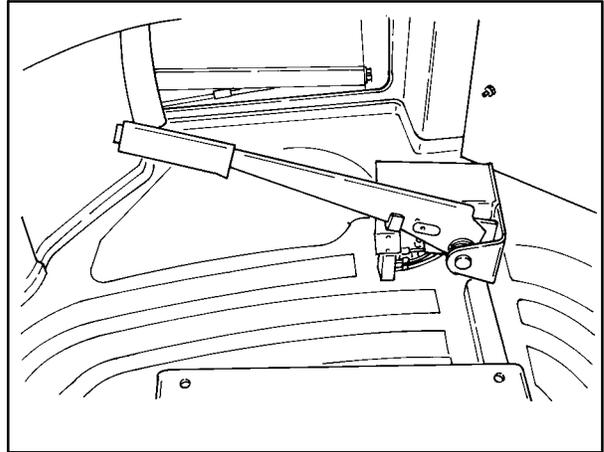


Figure 2-48

FOOT BRAKE

The foot brake pedal, 1, is located in the lower right corner of the operator's console near the cab floor. The pedal should be depressed to bring the tractor to a stop once the clutch pedal is fully depressed.



CAUTION: KEEP THE CAB FLOOR AREA FREE FROM DEBRIS OR OBJECTS WHICH MAY OBSTRUCT THE OPERATION OF THE BRAKE PEDAL. KEEP THE PEDAL CLEAN AND DRY TO PREVENT YOUR FOOT FROM SLIPPING OFF THE PEDAL.

DANGER: NEVER LEAVE THE OPERATOR'S SEAT WITHOUT FIRST BRINGING THE TRACTOR TO A COMPLETE STOP USING THE FOOT BRAKE, AND THEN ACTIVATING THE PARK BRAKE.

DANGER: NEVER OPERATE THE TRACTOR IF THE FOOT OR PARK BRAKE DOES NOT FUNCTION PROPERLY.

DANGER: NEVER RELY SOLELY ON THE TRANSMISSION TO HOLD THE TRACTOR STATIONARY WHEN PARKED; ALWAYS SET THE PARK BRAKE.

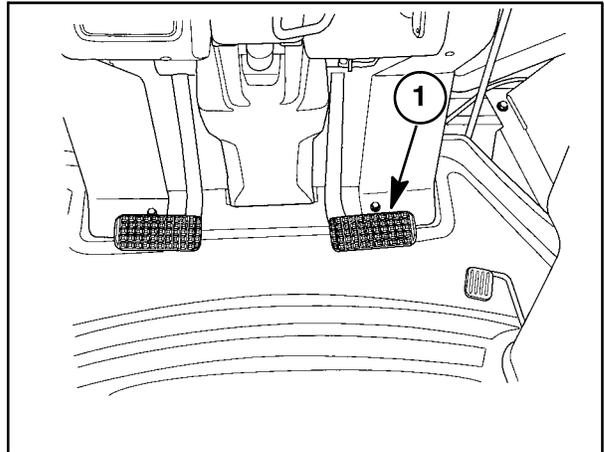


Figure 2-49

TRANSMISSION OPERATION

QUAD SHIFT III 12 x 4 OPERATION

The transmission has three forward ranges and one reverse range. Within each range, including reverse, there are four synchronized speeds. The synchronized speeds allow for easier shifting within each range. This combination allows for twelve forward speeds and four reverse speeds.

All shifting is done manually, in conjunction with the clutch. The transmission incorporates a shaft brake, which is designed to stop transmission rotation when shifting between ranges. This is activated when the range lever is in neutral and the clutch pedal is fully depressed.

IMPORTANT: Engage the clutch at a low throttle setting and as light a draft load as possible to extend clutch and synchronizer life. Do not engage the clutch when the throttle is set higher than 1700 RPM while under load. Raise the implement whenever possible during shifting. Use the decelerator pedal to bring the engine speed down when shifting or engaging the clutch.

All gears in the transmission are constantly in mesh. When a range is selected, shift collars splined to the shafts are being engaged with the range gears. **The tractor must be at full stop in order to shift between ranges.**

The transmission bearings and gears are pressure lubricated. The lubrication circuit consists of a gear pump located on and driven by the transmission, an oil cooler located in front of the engine radiator, a filter located inside the frame at the front of the tractor, and the oil distribution manifold on the transmission. The transmission case acts as a reservoir.

Should the transmission oil pressure light come on, immediately shut down the tractor and contact your Buhler Versatile dealer to investigate the cause of lubrication failure.



CAUTION: KEEP THE CAB FLOOR AREA FREE FROM DEBRIS OR OBJECTS WHICH MAY OBSTRUCT THE OPERATION OF THE CLUTCH PEDAL. KEEP THE PEDAL CLEAN AND DRY TO PREVENT YOUR FOOT FROM SLIPPING OFF THE PEDAL, CAUSING ABRUPT ENGAGEMENT.

QUAD SHIFT III SHIFTING**Range Shifting**

1. Be sure the engine speed is below 1700 RPM. Whenever possible, reduce engine speed to idle.
2. Depress the clutch fully and bring the tractor to a complete stop. Place the range shift lever, 1, in neutral. Wait three to four seconds to allow the gears to slow down to a near stopped condition. Select the desired range. Shift pattern decals, 2, are located behind the shift lever indicating range position. A decal on the right cab window gives the range and gear position for speed selections based on tire size options.
3. If you are not able to move to the desired position, turn the steering wheel to the left or right to allow gears to mesh.
4. Slowly release the clutch pedal to achieve a smooth start.
5. Reset the engine speed to operating range.

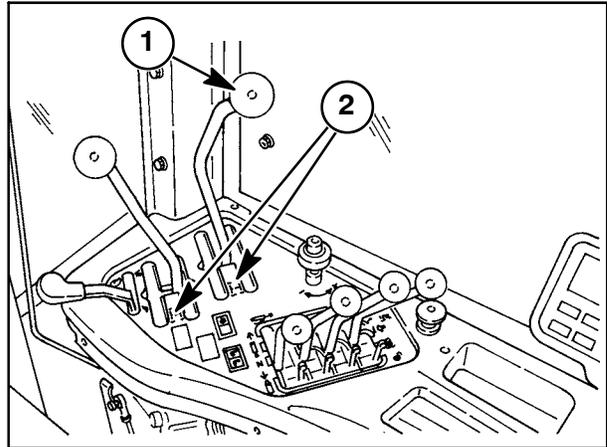


Figure 2-50

The range shift decal located behind the range shift lever displays the position the range shift lever should be in for high (H), medium (M), low (L), or reverse (R) range.

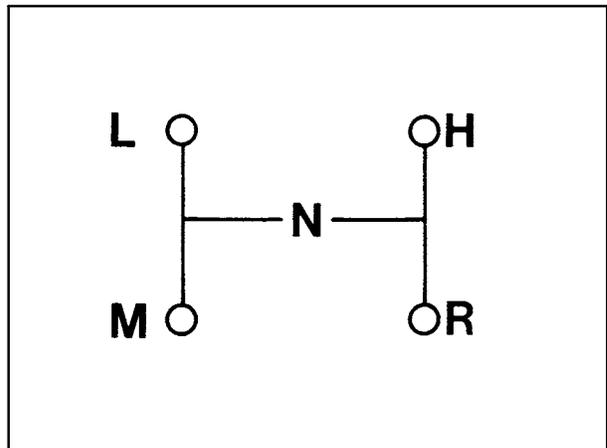


Figure 2-51

Gear Shifting within a Range

IMPORTANT: It is recommended that shifting on the fly be limited to light draft or rolling loads and only within a gear range. **Do not attempt to shift between ranges without first coming to a complete stop.**

1. Depress the clutch pedal fully.
2. Move the gearshift lever, 1, to the proper gear. Shift pattern decals, 2, are located below the shift lever indicating gear position and a speed chart decal is located on the right window of the cab.

NOTE: It is not necessary to reduce engine speed for shifts within a range, but is recommended to increase the life of shift components.

3. Release the clutch pedal slowly to insure a smooth transmission engagement.

NOTE: While it is possible to shift on the fly within a range, under heavy loads the tractor will probably come to an abrupt stop before the shift is complete. For your safety, it is recommended that the operator throttle down, raise any implements, and stop before attempting any shifts.

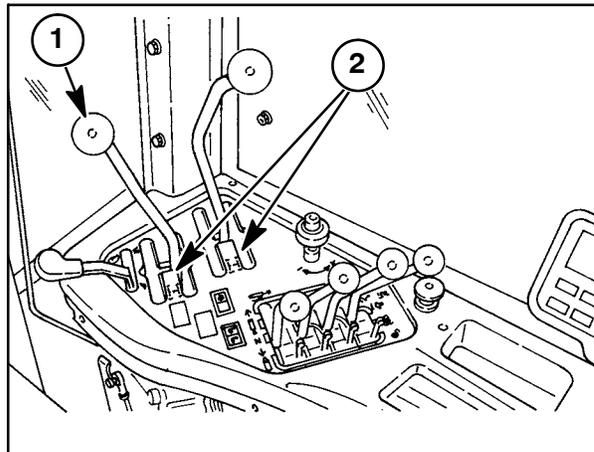


Figure 2-52

The gearshift decal located behind the gearshift lever displays the gearshift lever position during operation (1 - 2 - 3 - 4).

Forward/Reverse Shifting

Shuttle shifting should not be attempted between the forward and reverse ranges while the tractor is still moving. Harsh transmission engagement will occur as well as damage to the range shift mechanisms in the transmission.

1. Bring the tractor to a complete stop before shifting the range lever.
2. Select the range desired.
3. Release the clutch pedal slowly to achieve a smooth start.

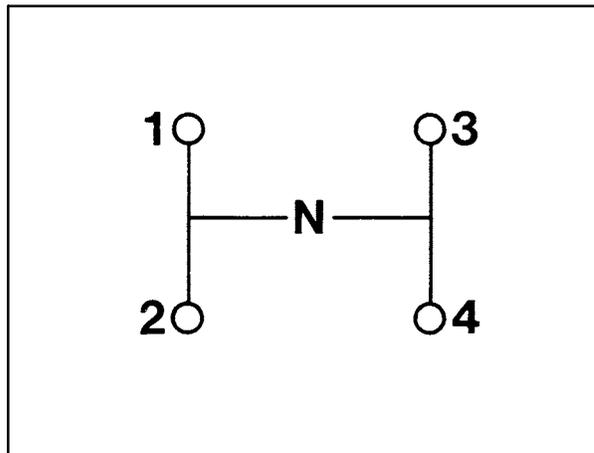


Figure 2-53

POWERSHIFT TRANSMISSION OPERATION

The powershift transmission gears are constantly in mesh. Gear shifting is done by the use of eight clutches in the transmission.

There are twelve forward speeds and two reverse speeds.

Clutch selection is controlled by electric solenoid valves which direct hydraulic oil to the required clutches. When the operator selects a gear, an electronically controlled shift system activates the solenoids required for the specified gear.

The tractor may be started by either moving the shift lever in the appropriate direction (forward or reverse) or by using the clutch pedal.

The clutch pedal is used to modulate pressure to the master clutch allowing the operator to feather engagement to any of the first seven forward gears or first reverse gear. Use of the clutch pedal allows for safe, accurate positioning of the tractor when hitching up implements or operating in confined spaces. Optimum inching control, particularly with heavy loads, is best achieved in lower gears and by reducing engine RPM.

The powershift transmission controller has built-in error codes which may appear on the powershift display of the tractor. Refer to "Transmission Troubleshooting" in Section 4 for an explanation and possible causes of the error codes.

Powershift Transmission Shifting

When the tractor is started, the transmission display module will display 3N showing that the shifter is in neutral position and that it is the default 3rd gear selection. Depressing the clutch pedal with the tractor stationary will automatically change the transmission to the first gear setting. By shifting the shift lever forward with inching pedal released, the transmission automatically will go to any operator pre-selected gear from 1st thru 7th gears.

NOTE: When gears 4 thru 7 are selected, the programming starts the tractor in 3rd gear and automatically shifts up to the pre-selected gear.

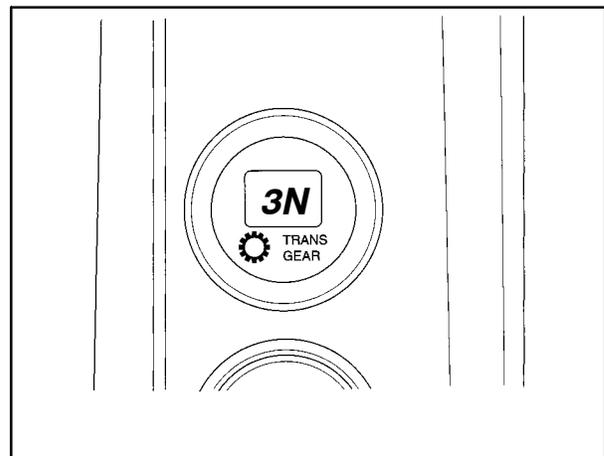


Figure 2-54

The powershift transmission is operated by a single control lever, 1. Because the transmission has only one control lever, it is extremely easy to use.

NOTE: The control lever is equipped with a neutral lock button, 2. The control lever may only be moved to the forward or reverse positions if the neutral lock button on the control lever knob is depressed. Neutral may be selected without depressing the neutral lock button.

The control lever is used to select forward or reverse travel and to change transmission speeds. Move the lever forward for forward travel and rearward for reverse travel.

IMPORTANT: Shifting the transmission at low throttle setting and a light draft load will extend clutch life.

The control lever is also used to make instantaneous upward or downward gear ratio changes. Nudge the lever to the right for upward changes and to the left for downward changes. (In this context, “nudge” means move the lever and then release.)

Consecutive gear ratio changes may be made, either by nudging the lever several times or by holding the lever to the left or right and allowing the transmission to shift through the gear ratios automatically.

NOTE: Reverse gears are displayed as R1 and R2.

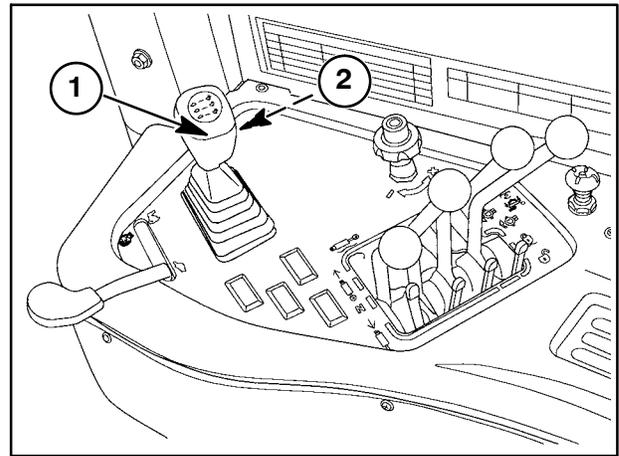


Figure 2-55

Automatic Range Select

Depressing the clutch pedal while the tractor is moving causes a neutral condition, allowing the electronic control to automatically select a transmission range matching tractor ground and engine speeds when the clutch pedal is released. For example, if the tractor is in ninth gear forward and the operator depresses the clutch pedal, tractor ground speed will be reduced but engine RPM will remain the same. The transmission controller will sense the reduction in ground speed and automatically shift the transmission down to a gear that will match the ground speed when the clutch pedal is released.

If the clutch pedal is held down and the tractor comes to a rolling stop, the transmission controller will shift the tractor to first gear. The transmission will not shift to neutral unless the control lever is put in the neutral position.

Forward/Reverse Shifting

The automatic modulation feature of the transmission allows the transmission to be shuttled from a pre-selected forward gear (1st through 7th gear) to R1 using the control lever. Shuttling the control lever back to forward will return the tractor to the pre-selected gear up to 7th gear.

It is not necessary to come to a complete stop for this shuttle shifting operation.

DECELERATOR PEDAL

At the lower front of the right console is a mechanically actuated decelerator pedal, 1, which can be used to reduce engine speed when turning or while shifting. When fully depressed, engine speed will drop to a preset level. If the pedal is not fully depressed, engine speed will be reduced proportionally. When the pedal is released, engine speed will return to the previous throttle setting.

IMPORTANT: Do not release the decelerator before completing the turn. If the transmission is in a high gear, the tractor will accelerate quickly, reducing the time to correct tractor direction.

The factory presets the decelerator pedal to reduce the engine speed to 1400 RPM. See Section 3 of this manual for adjustment procedures.

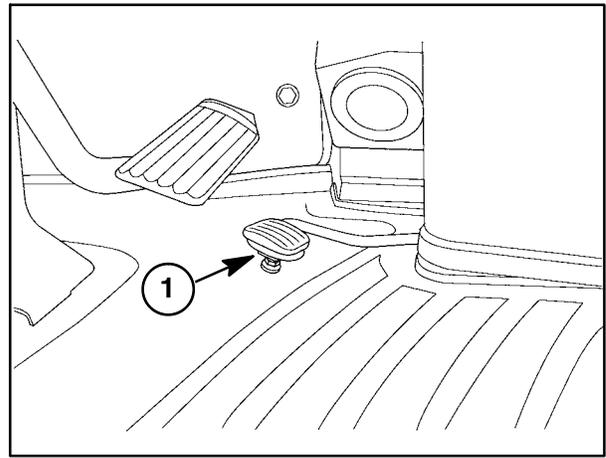


Figure 2-56

DIFFERENTIAL LOCK

The tractor may be factory equipped with an electronically controlled front axle differential lock. This will provide additional tractive effort on hillsides or wet ground. The switch, 1, is a three-position momentary switch located on the right console. To activate, push the front side of the switch. An indicator light will illuminate on the warning light bar. The differential lock can be locked when the tractor is moving or stopped.

IMPORTANT: Do not engage the lock when the tractor wheels are spinning or when the wheels are turning at different speeds, such as an end of the field turn. Drivetrain damage may result.

To disengage the differential lock, push the rear of the switch down until the indicator light on the warning light bar turns off. Depressing the brake pedal will also disengage the differential lock.

Disengage the differential lock when not required, such as during high speeds and road travel, turning and parking, or when additional traction is not needed.

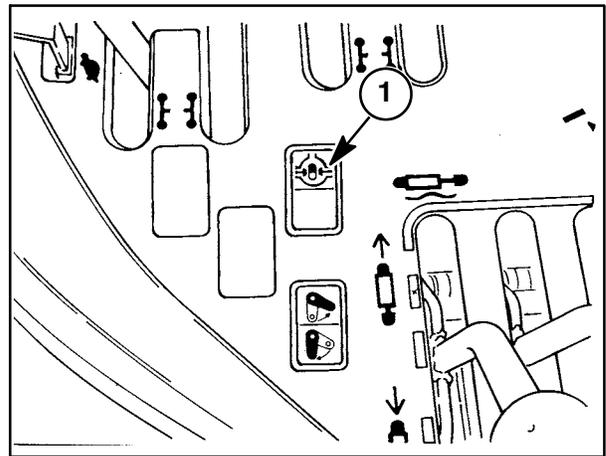


Figure 2-57



CAUTION: DO NOT USE THE DIFFERENTIAL LOCK WHEN DRIVING THE TRACTOR ON ROADS OR STEERING MAY BE IMPAIRED.

DRIVING THE TRACTOR



WARNING: OBSERVE THE FOLLOWING PRECAUTIONS WHEN DRIVING THE TRACTOR:

WATCH WHERE YOU ARE GOING - ESPECIALLY AT ROW ENDS, ON ROADS, AND AROUND TREES.

USE CAUTION WHEN OPERATING ON SLOPES.

KEEP THE TRACTOR IN GEAR WHEN GOING DOWNHILL. USE A LOW GEAR TO MAINTAIN CONTROL WITH MINIMUM BRAKING.

ALWAYS USE THE DRAWBAR FOR PULL-TYPE WORK. DO NOT PULL FROM ANY OTHER PART OF THE TRACTOR SINCE IT MAY TIP OVER.

DIM THE TRACTOR HEADLIGHTS WHEN MEETING A VEHICLE ON THE HIGHWAY AT NIGHT. KEEP THE LIGHTS ADJUSTED SO THEY DO NOT BLIND THE OPERATOR OF AN ONCOMING VEHICLE.

ENGAGE THE CLUTCH PEDAL SLOWLY WHEN DRIVING OUT OF A DITCH, GULLY, OR UP A STEEP HILLSIDE.

REDUCE SPEED BEFORE TURNING OR APPLYING THE BRAKE.

NEVER APPLY THE DIFFERENTIAL LOCK WHEN TURNING.

USE EXTREME CAUTION AND AVOID HARD APPLICATIONS OF THE TRACTOR BRAKE WHEN PULLING HEAVY, TOWED LOADS AT ROAD SPEEDS.

TOWED LOADS THAT WEIGH MORE THAN THE WEIGHT OF THE TRACTOR SHOULD HAVE BRAKES FOR SAFE OPERATION. ENSURE COMPLIANCE WITH LOCAL REGULATIONS.

ALWAYS SIT IN THE DRIVER'S SEAT WHILE STARTING OR DRIVING THE TRACTOR.

ALWAYS USE A SLOW-MOVING VEHICLE (SMV) EMBLEM WHEN TRAVELING ON PUBLIC ROADS.

TRACTOR LIGHTING

Rotary Light Switch

The rotary light switch is a five-position switch. Rotating the switch clockwise will activate the tractor lighting as follows:

- 1 Off
- 2 Hazard lights
- 3 Roadway use
- 4 Field use
- 5 Field use

NOTE: The rotary light switch is wired live at all times and will work with the ignition key switch in any position.

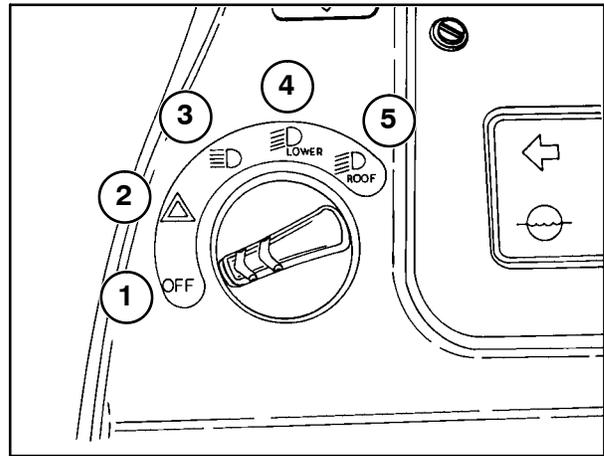


Figure 2-58

Position One - "OFF" - No lights will be lit.

Position Two - "Hazard Lights" - The two front roof-mounted amber lights, 1, and the two rear roof-mounted amber lights, 2, will flash (as will the wide transport marker lights). The red taillights, 3, on each of the rear fenders will be lit.

NOTE: When the rotary light switch is in position two, and the multifunction switch is placed in the right or left turn signal position, the front and rear roof-mounted amber warning lights will stop flashing, except for the front and rear roof-mounted warning lights on the side to which the turn is being made. The opposite front and rear mounted warning lights will remain lit, but will not flash (as will the extremity lights).

When the rotary light switch is in position two, depressing the brake pedal will cause the taillights to get brighter.



WARNING: FOR YOUR PROTECTION, USE THE HAZARD WARNING LIGHTS WHEN TRAVELING ON PUBLIC ROADS UNLESS PROHIBITED BY LAW

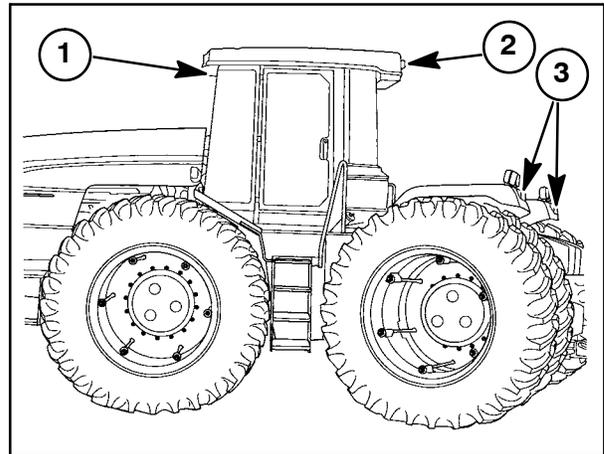


Figure 2-59

Position Three - "Roadway Use" - When the rotary switch is in this position, the front and rear roof-mounted amber warning lights and the taillights mounted on the rear fenders will continue to work as described in position two (as will the wide transport marker lights). In addition, the left and right outermost headlights, 1, mounted above the front grille, will be lit.

The grille-mounted headlights are adjustable left and right, and up and down, without loosening any hardware.

The background lights on the operator's control panel behind the engine oil pressure and engine coolant temperature gauges, as well as the background light behind the fuel gauge and powershift gear display, if equipped, mounted on the right front cab post, will light. The small amber console light on the right front cab post under the fuel gauge, and the background light in the performance monitor display window will also be lit.

NOTE: If the multifunction switch is put in the "High/Low Beam" position, the right and left inner headlights mounted above the front grille will turn off and on, depending on beam selection.

When the high beam position is selected, a blue indicator light will light on the warning light bar indicating that the high beams are on.



WARNING: FOR YOUR PROTECTION, USE THE HAZARD WARNING LIGHTS WHEN TRAVELING ON PUBLIC ROADS, UNLESS PROHIBITED BY LAW

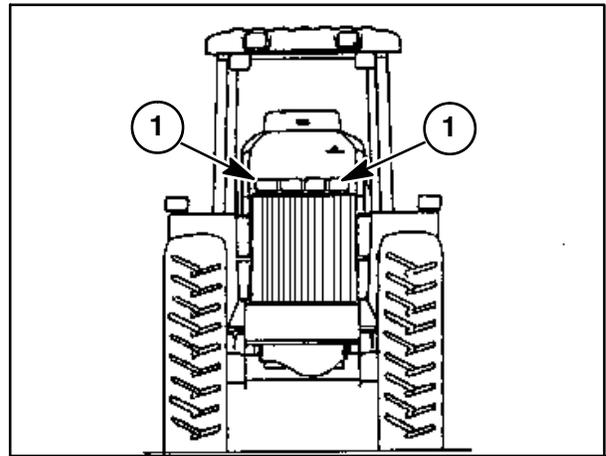


Figure 2-60

Position Four - "Field Use" - Rotating the switch to position four will shut off the front and rear roof-mounted warning lights and the rear fender-mounted taillights. The two sets of work lights, 1, located on the rear fenders will light. The single work lights, 2, located on the right and left front fenders will also light. All four headlights located above the front grille will also be lit.

All fender-mounted work lights can be adjusted up and down without loosening any hardware.

The background lights on the operator's control panel behind the engine oil pressure and engine coolant temperature gauges, as well as the background light behind the fuel gauge and powershift gear display, if equipped, mounted on the right front cab post, will light. The small amber console light on the right front cab post under the fuel gauge and the background light in the performance monitor display window will also be lit.

NOTE: The multifunction stalk switch will not operate the high/low beam when the rotary light switch is in this position, even though the blue high beam light indicates high beam. All other functions of the multifunction stalk switch operate as if the rotary light switch was in the "OFF" position.

Position Five - "Field Use" - Rotating the switch to position five will do the same functions as in position four, but will also turn on the front and rear roof-mounted work lights, 1, if the tractor is equipped with this **optional feature**.

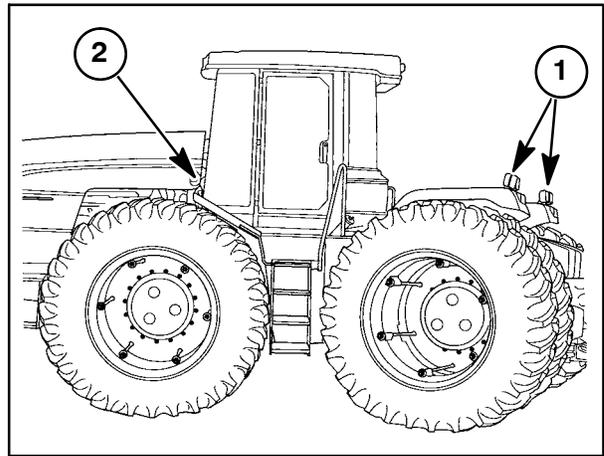


Figure 2-61

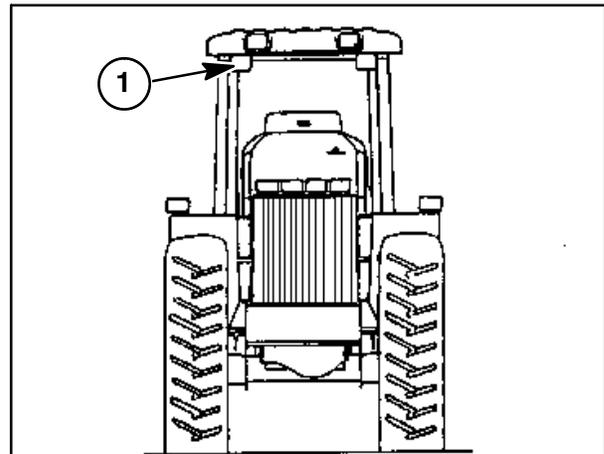


Figure 2-62

Cab Dome Light

The cab dome light, 1, mounted on the upper left side of the cab, has a three-position control switch, 2. The light switch functions as follows:

Center - Light is off.

Bottom - Light is on constantly.

Top - Light is on only when the cab door is open. Light will turn off when door is closed.

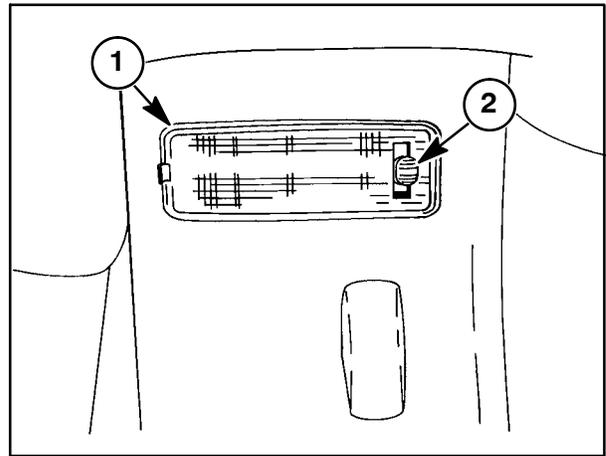


Figure 2-63

Trouble Light

A trouble light, 1, is located in the left, rear corner of the cab, under the rear shelf. The light has an 5.5 m (18') cord attached to it that can be reeled in and out using the crank handle, 2. To remove the light, flip the lever, 3, downward and pull the light from the receptacle.

The light switch, 4, is a two-position switch. With the switch lever in the off position (horizontal), the light is off. With the switch lever in the on position (vertical), the light is on as long as the cab door is open. When the cab door closes, the light goes out.

The trouble light is used in conjunction with the cab dome light to illuminate the cab interior when the cab door is open.

To put the trouble light in the storage position, reel the cable all the way in with the crank handle, 2, insert the light into its socket, and flip the lever, 3, upward to catch the small knob on the side of the light.

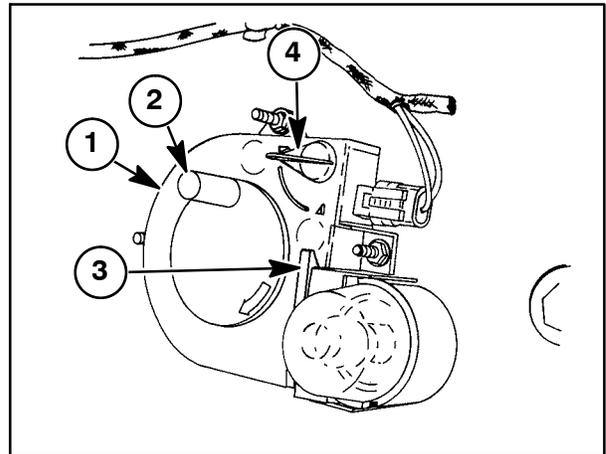


Figure 2-64

Wide Transport Marker Lights

Wide transport marker lights are standard with all tire options.

The flashing wide transport marker lights function in unison with the front and rear roof-mounted warning lights. The lights will flash in the hazard lights, roadway use, and turn signal position of the rotary light switch and multifunction switch.

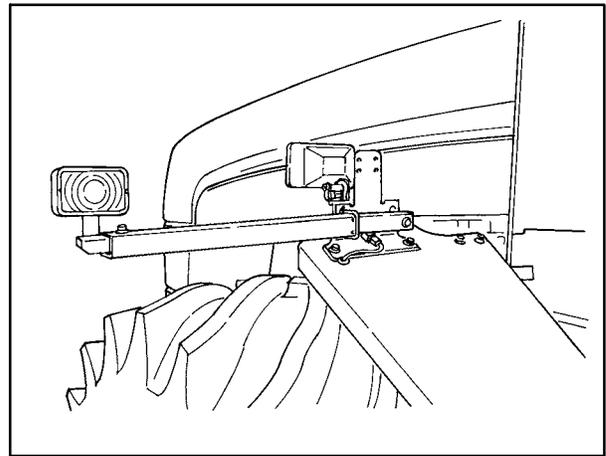


Figure 2-65

The wide transport marker lights have an adjustable width with three settings depending on the size of tires used. It is recommended that the tube be adjusted so the outside edge does not extend passed the tire edge. To change the width of the tube, remove the bolt, 1, from the tube and reposition it to the desired width. Reinstall the bolt and tighten.

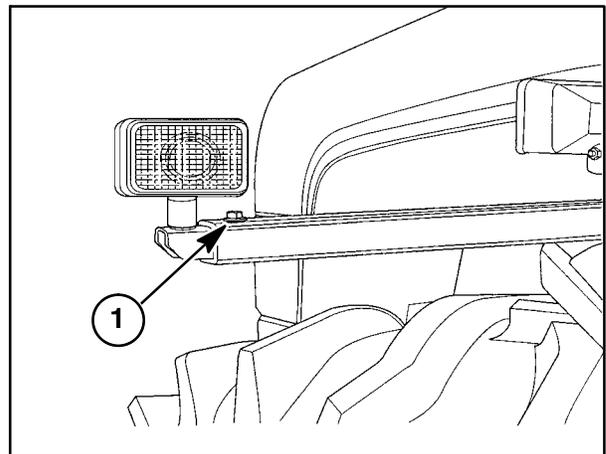


Figure 2-66

When not in use, the wide transport marker lights can be swung up toward the tractor frame at approximately either 70° or 90° angle and held in this position using the existing hardware.

See Section 3 for information on how to adjust the light to the storage position.

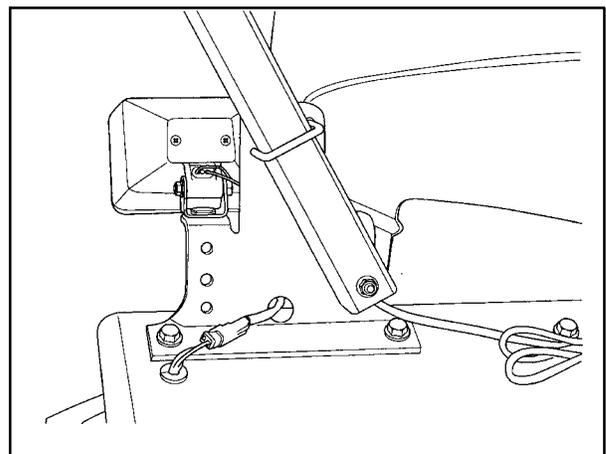


Figure 2-67

Roof-Mounted Work Lights (Optional)

Additional roof-mounted work lights, 1, are available to provide increased illumination to the front and back of the tractor. The lights are fully adjustable side to side, and up and down.

The roof-mounted work lights will be activated when the rotary light switch is in position five.

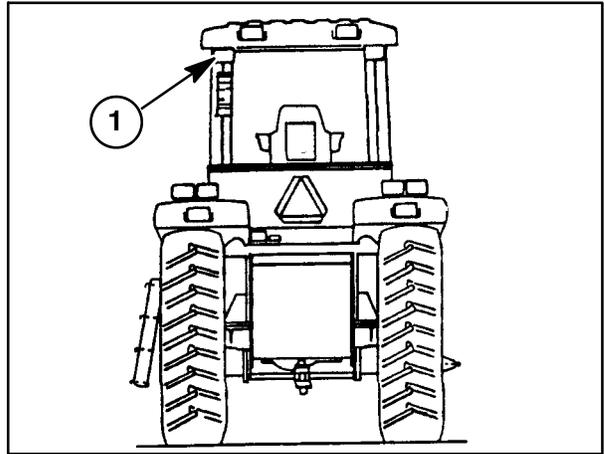


Figure 2-68

Trailer Socket

The trailer socket, 1, is attached to the hydraulic remote coupler bracket at the rear of the tractor. It is a seven-pin connector that can be used for a trailer light hookup or as an outlet to attach the implement status switch on tractors equipped with an optional performance monitor.

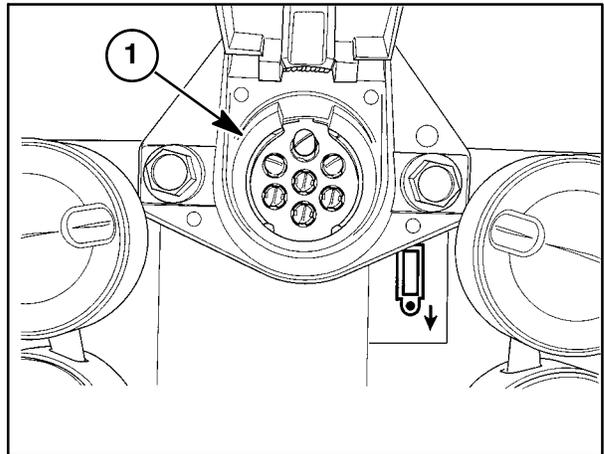
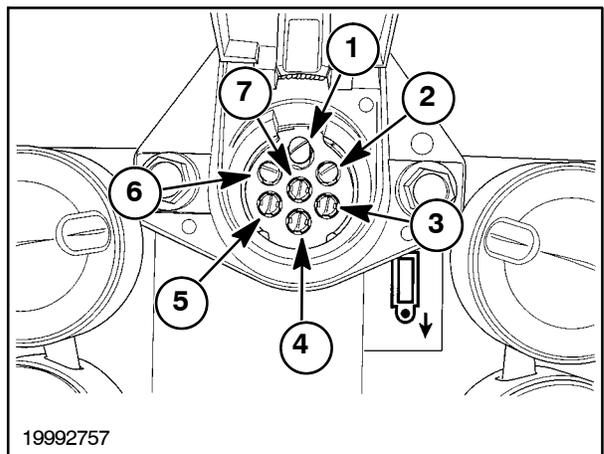


Figure 2-69

The pins in the socket are identified as follows:

- Pin 1 - Ground
- Pin 2 - Trailer lights
- Pin 3 - Left flasher
- Pin 4 - Implement status switch
- Pin 5 - Right flasher
- Pin 6 - Tail lamps
- Pin 7 - Auxiliary



19992757

Figure 2-70

There is a male connector, 1, available through your Buhler Versatile dealer, part #V59624, that can be purchased to accommodate trailer wire harnesses.

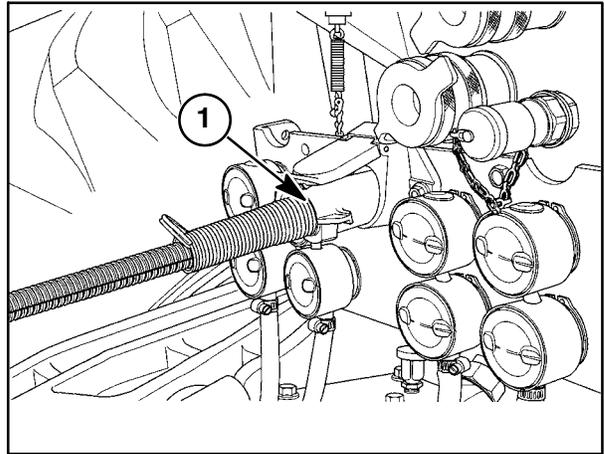


Figure 2-71

ELECTRONIC INSTRUMENT CONTROL SYSTEM

The 2290, 2335, 2360, 2375 and 2425 tractors are equipped with an Electronic Instrument Control System designed to provide the operator with information concerning tractor functions, calibration procedures to meet specific operation requirements, and serve as a visual and audio warning system of malfunctions that have occurred in the tractor operating systems.

The Electronic Instrument Control System is comprised of four dash-mounted components and various senders and switches located throughout the tractor. The four dash-mounted components are identified as follows:

- 1 Electronic monitor digit select switch
- 2 Electronic monitor
- 3 Electronic monitor acknowledge/reset button
- 4 Electronic monitor rotary select switch

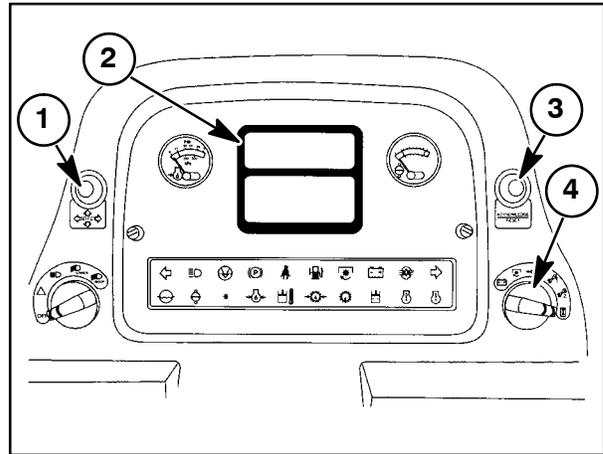


Figure 2-72

Electronic Monitor Digit Select Switch

The electronic monitor digit select switch is a five-position switch used to select digits and units of measurement during the calibration of the electronic monitor:

Center - neutral position

Up - changes the selected digit upward between zero and nine. Tapping the switch changes one value at a time. Holding the switch up will roll the numbers.

Down - changes the selected digit downward between nine and zero. Tapping the switch changes one value at a time. Holding the switch down will roll the numbers.

Left - selects the next digit position to the left.

Right - selects the next digit position to the right.

The switch does not function during normal operation of the tractor, but only when the operator has selected the calibration mode to program the system for specific operational requirements.

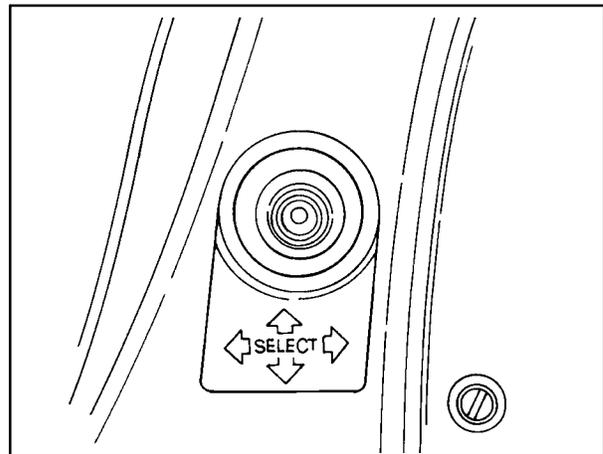


Figure 2-73

Electronic Monitor

The electronic monitor, 1, is an LCD (Liquid Crystal Display) that is divided into two sections; an upper section, 2, and a lower section, 3.

The upper section of the monitor is dedicated to providing engine RPM readout at all times during normal tractor operation, regardless of the position of the rotary select switch.

The lower section of the monitor is dedicated to providing six different readouts, based on the position of the rotary select switch during normal tractor operation.

The electronic monitor also has an audible alarm which will call the operator's attention to the Electronic Instrument Control System.

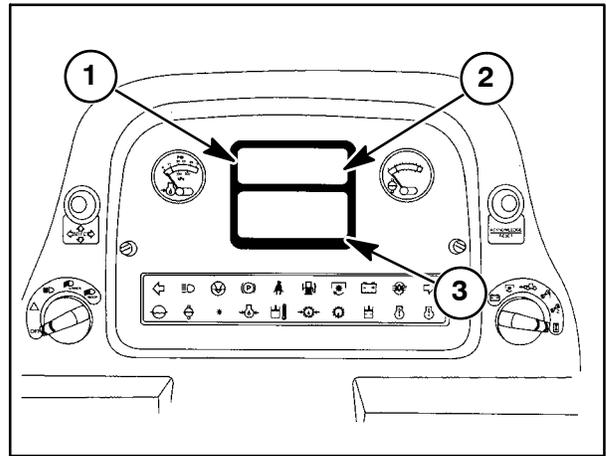


Figure 2-74

Electronic Monitor Acknowledge/Reset Button

The electronic monitor acknowledge/reset button is a push-button two-position momentary switch that allows the operator to acknowledge information provided by the Electronic Instrument Control System. The button is also used during the calibration procedure.

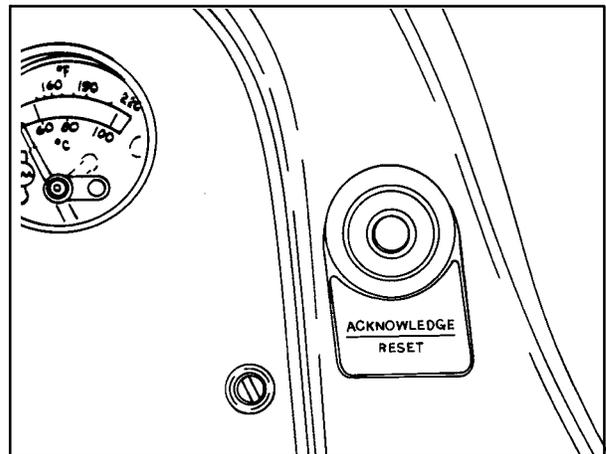


Figure 2-75

Electronic Monitor Rotary Select Switch

The electronic monitor rotary select switch is a six-position rotary switch used to select LCD readouts on the lower half of the electronic monitor.

- 1 Electrical system voltage
- 2 PTO speed
- 3 Tractor ground speed
- 4 Service interval one
- 5 Service interval two
- 6 Tractor accumulated hours

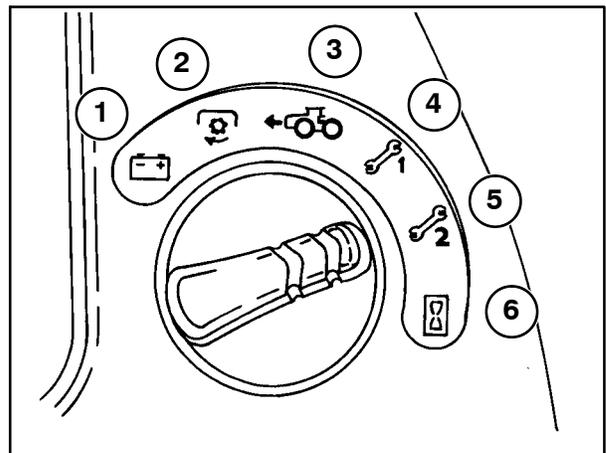


Figure 2-76

The rotary select switch is active at all times during normal operation of the tractor.

Engine and EICS

The large 4WD tractors are equipped with electronic engine controls. The Cummins Engine Company Electronic Fuel Control System controls the injection of fuel (both quantity and timing). The Cummins electronically engines have a control module, 1, (N14 engine shown) and related control and sensing devices are attached to the engine at various locations.

Tractors equipped with these Electronic controlled engines have additional electronic control features. Some of the control features are tied into the EICS of the tractor and illuminate certain warning light bar lamps when a condition is present in the engine that the Operator needs to be aware of. Some of the control features are passive to the Operator as far as visual indications (no lights illuminated) are concerned, but a definite change in engine performance will be noticed when the condition is present.

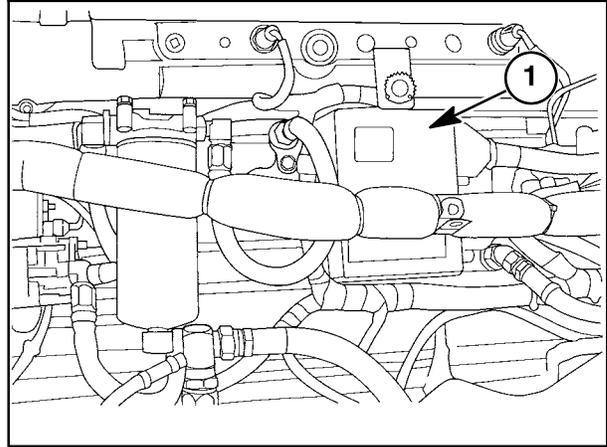


Figure 2-77

Engine Derate and EICS Warning Lights

If an alarm condition exists on the Cummins electronic engine, the system will usually (depending on source of alarm condition) react with a change in engine performance output. The change in engine performance is called an engine “derate”. The term derate means the module will control the fuel system of the tractor to do one of the following:

1. Lower the engine rpm to a preset level (1400 rpm) and allow no acceleration of the engine above that level.
2. Lower the horsepower output level of the engine a preset amount (20% of gross horsepower) but maintain full range of engine rpm based on throttle position.
3. Lower the engine rpm to a preset level (1400 rpm) and allow no acceleration of the engine above that level AND lower the horsepower output level of the engine a preset amount (20% of gross horsepower).

The throttle lever, 1, in the cab of the tractor is attached to a potentiometer (POT) in the right hand side console. The POT sends an electronic signal (via the tractor wire harness) to the controller on the side of the engine, telling it where to set the engine speed. By moving the throttle lever, the POT signal is changed and the module reacts accordingly to set engine speed to match the lever position. During an engine speed derate (engine speed reduced by the engine control module to 1400 rpm), the module will not recognize or react to a throttle position above the 1400 rpm POT signal. If the throttle lever is moved above the 1400 rpm position, the engine will not speed up.

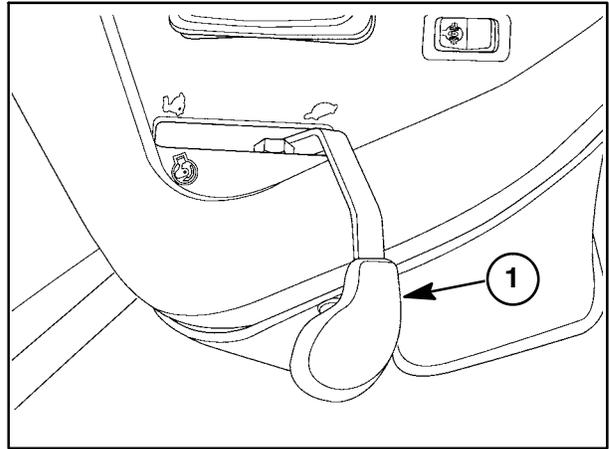


Figure 2-78

The engine control module controls the timing of and the amount of fuel that is injected into the engine via the electronic fuel injectors. This is called fuel metering and is the basis of power derate. Power derate will occur within a specified time span (e.g. low engine oil pressure) or will be gradual based on severity of the alarm condition present on the tractor (e.g. engine coolant temperature). The engine will now perform to a modified horsepower curve (20% less than maximum gross horsepower), with the end result being that it will no longer pull the same load at the same ground speed or at the same working depth. The tractor may have to be downshifted or the implement raised out of the ground to continue operation (or both).

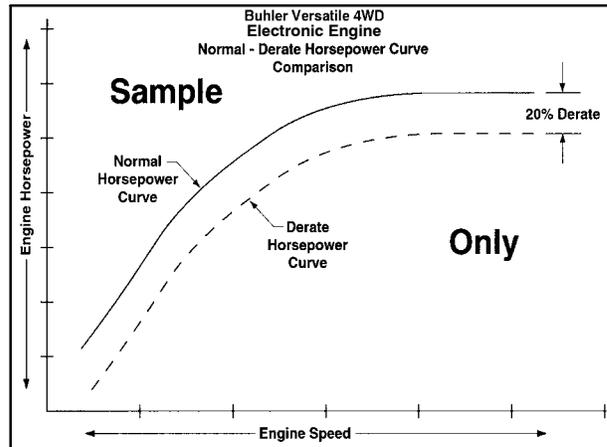


Figure 2-79

The Cummins engine control module is also tied to three indicator lights on the warning light bar of the EICS. The Module controls illumination of these lights:

1. Engine Coolant Level
2. Yellow Engine Warning Light
3. Red Engine Warning Light

The EICS and Cummins control module combine to protect the engine from damage by informing the operator that a particular condition exists using the lights, performance derate or both lights and derate.

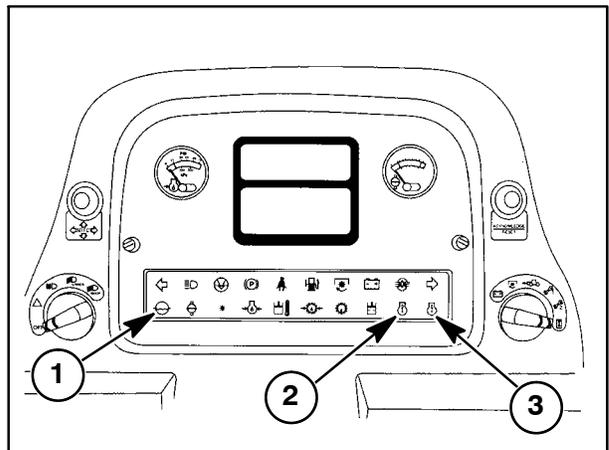


Figure 2-80

NORMAL OPERATION OF THE ELECTRONIC INSTRUMENT CONTROL SYSTEM

The following is a description of how the Electronic Instrument Control System will work at engine start-up and field operation. The information is based on a tractor that has no errors indicated and is properly calibrated.

Key to the “RUN” Position - Engine Off

Turning the key to the “RUN” position without starting the tractor will cause the electronic monitor to display all the LCD segments for one second and the audible alarm to sound twice. The display will then show zero and the engine symbol in the upper half of the module. The lower half of the module will display a readout based on the position of the rotary select switch.

When the ignition switch turns to the “RUN” position without the engine running, the system also checks certain sensors and the operation of the warning light bar. The warning light bar activates these lights:

- Park Brake
- Safety Belt
- Alternator Output
- Engine Coolant Level
- Engine Oil Pressure
- Hydraulic Oil Temperature
- Transmission Lube Pressure
- Transmission Lube Filter
- Hydraulic Lube Filter
- Yellow Engine Warning
- Red Engine Warning

After several seconds, the system turns off the Engine Coolant Level, Hydraulic Oil Temperature, Transmission Lube Filter, Hydraulic Lube Filter, Safety Belt, Yellow Engine Warning, and Red Engine Warning lamps.

With the key in the “RUN” position, four lights will remain on until the switch moves to the “ENGINE START” position:

- Park Brake
- Alternator Output
- Engine Oil Pressure
- Transmission Lube Pressure

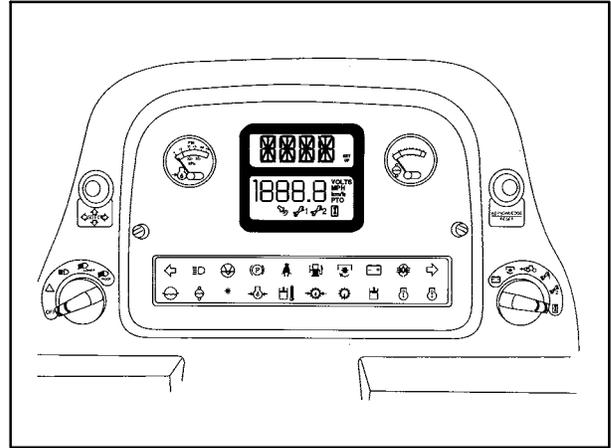


Figure 2-81

Key to the “ENGINE START” Position - Engine Cranking

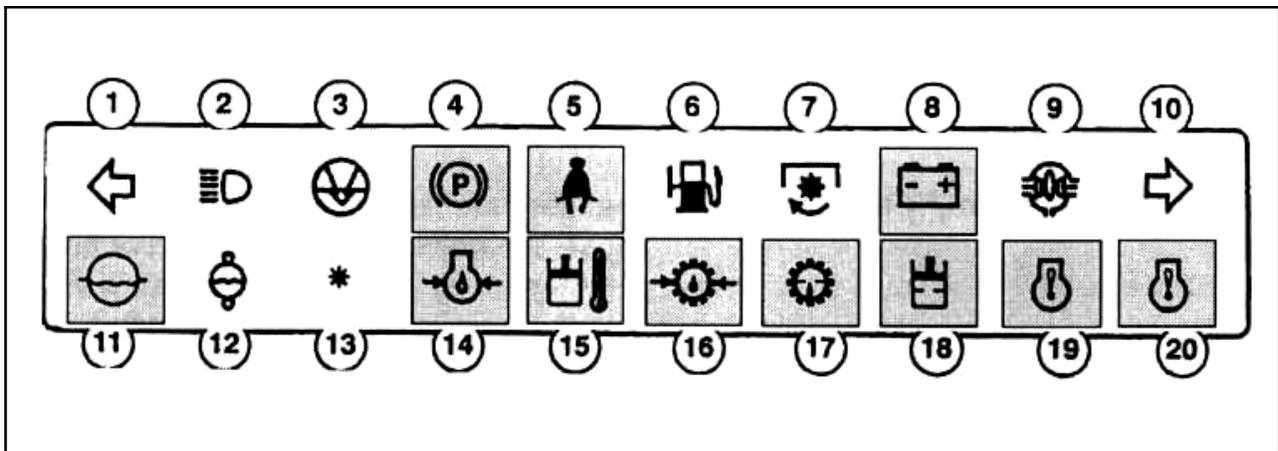
When the key turns to the “ENGINE START” position, the engine starts to crank and the four lights illuminated with the switch in the “RUN” position remain on.

Key in the “RUN” Position - Engine Running

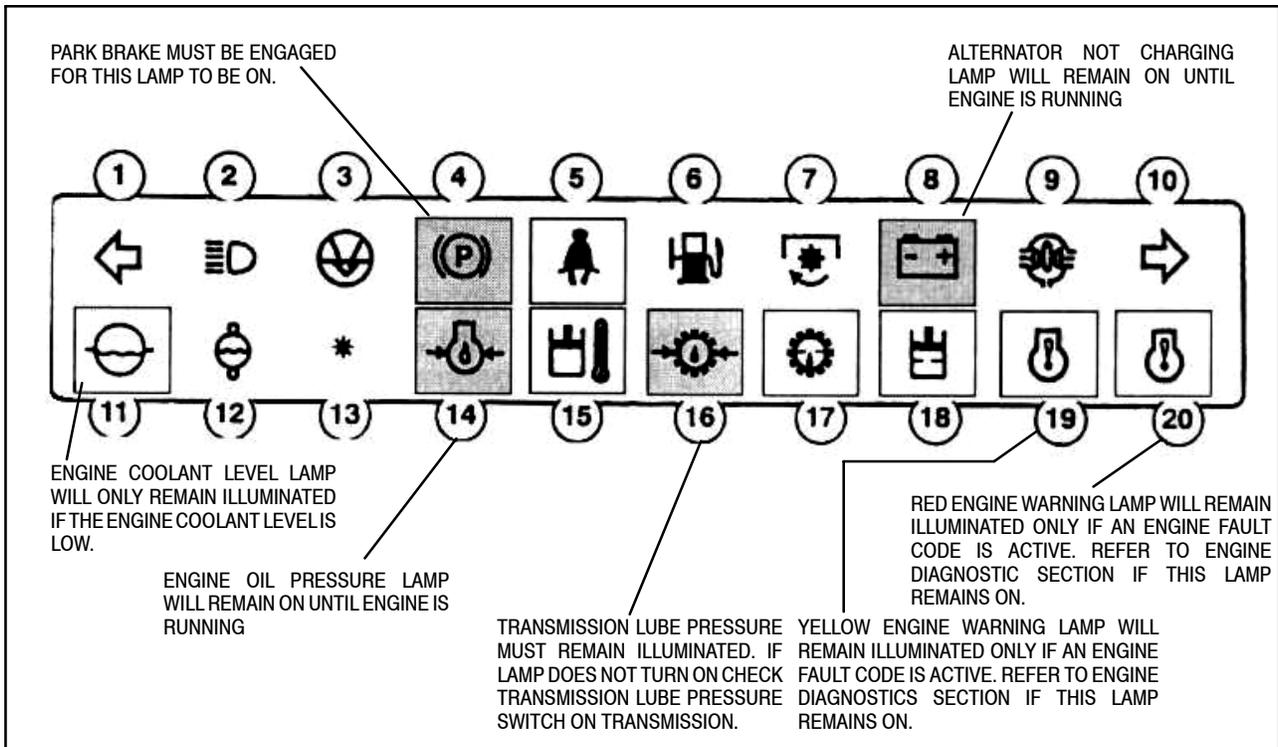
Once the engine is running, the Engine Oil Pressure and Transmission Lube Pressure lamps will go out as soon as sufficient pressure builds up to cancel the warnings. The alternator output lamp will also go out when the alternator begins to charge. The park brake goes out when the park brake is released. Any other illuminated light indicates a problem.

NOTE: In low, ambient temperatures the transmission lube filter and the hydraulic filter by-pass light may stay on until the oil reaches operating temperature.

At first key “ON” the following warning lamps will illuminate



After a few seconds only the following warning lamps should remain on



Engine Running - Normal Operation

There are six different modes the electronic monitor will be in depending on the position of the rotary select switch.

The upper half of the display will always show engine RPM no matter what position the rotary select switch is set at. The bottom half of the display will show a readout based on the position of the rotary select switch.

The readout will appear as follows for the six positions of the rotary select switch:

NOTE: See “Tractor Ground Speed” position for operation of the Electronic Instrument Control System at speeds greater than 20 km/h (12.5 MPH) when the rotary select switch is in positions other than “Tractor Ground Speed.”

Electrical System Voltage - The lower half of the display will show the condition of the battery voltage to the tenth of a volt and will also show the word “VOLTS” in the upper right corner of the lower display.

The readout value can be as much as one to one-and-a-half volts higher than with the engine off.

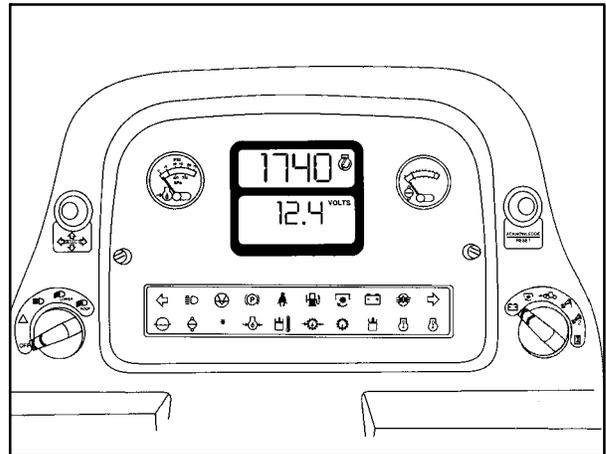


Figure 2-82

PTO Speed - The lower half of the display will show the speed at which the PTO shaft is turning based on the engine RPM. The letters “PTO” will also be displayed in the lower right corner of the lower display.

The readout value shown for PTO speed is a factor of engine speed and is automatically calculated by the electronic monitor. There is no sensor on the tractor reading actual PTO output speed.

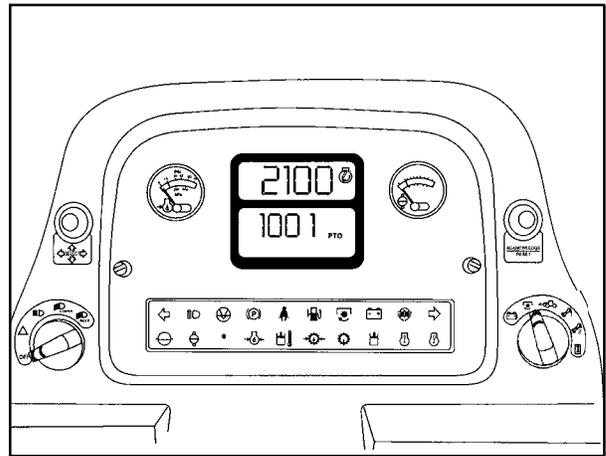


Figure 2-83

Tractor Ground Speed - The lower half of the display will show the true ground speed (if equipped with optional radar unit) and the radar symbol, or calculated ground speed (unit less radar option). The display will read km/h or MPH on the right side of the lower display based on the unit of measurement selected by the operator (see “Calibrating the Electronic Control Instrument System” later in this section for unit of measurement selection).

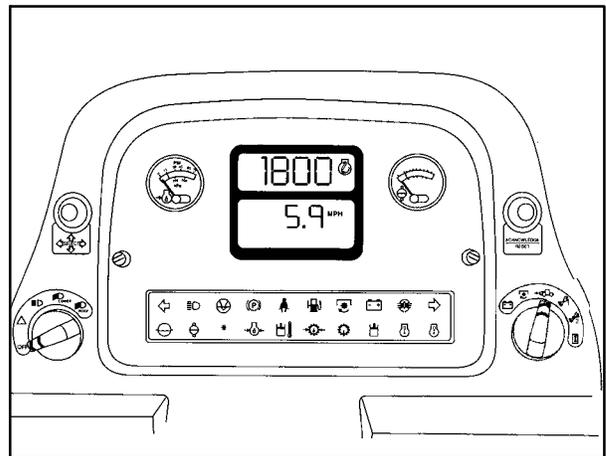


Figure 2-84

If the tractor is equipped with the optional radar unit, the radar symbol, 1, will also appear on the lower display indicating that the value shown is a true ground speed. If the radar symbol is not shown, then the ground speed is being calculated by the monitor based on a sensor signal on the transmission output shaft.

The value shown will be to the tenth of the unit of measurement, MPH or km/h, as selected by the operator.

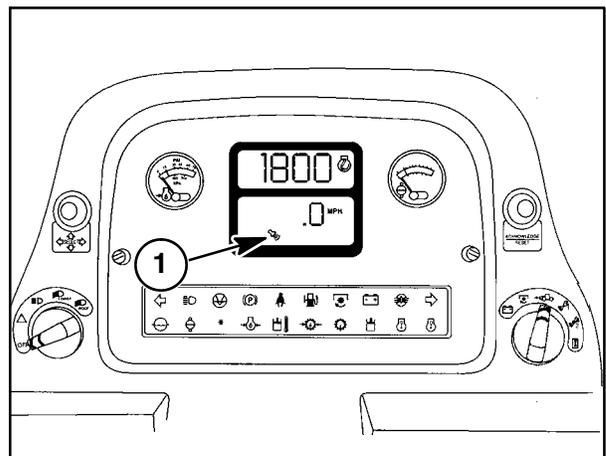


Figure 2-85

NOTE: The Electronic Instrument Control System has a feature to alert the operator of tractor ground speeds over 20 km/h (12.5 MPH). If at any time the tractor ground speed reaches 20 km/h (12.5 MPH), the lower portion of the monitor will display the ground speed and MPH or km/h symbol no matter which position the rotary select switch is in.

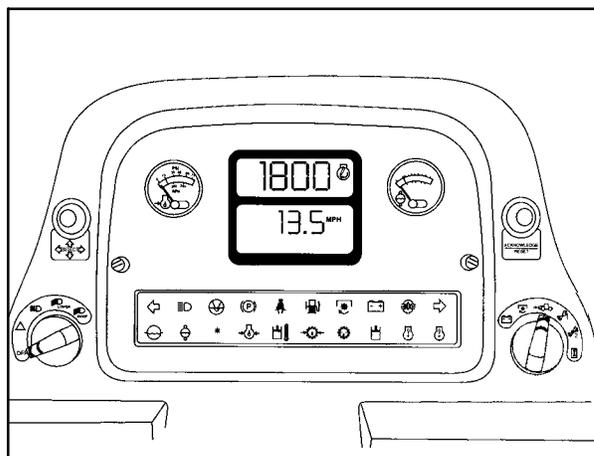


Figure 2-86

The operator can switch the lower portion of the monitor back to its former display by pressing the acknowledge/reset button. The former readout will return to the monitor and the symbol “km/h” or “MPH” will flash to remind the operator that the tractor is traveling at a speed of 20 km/h (12.5 MPH) or greater.

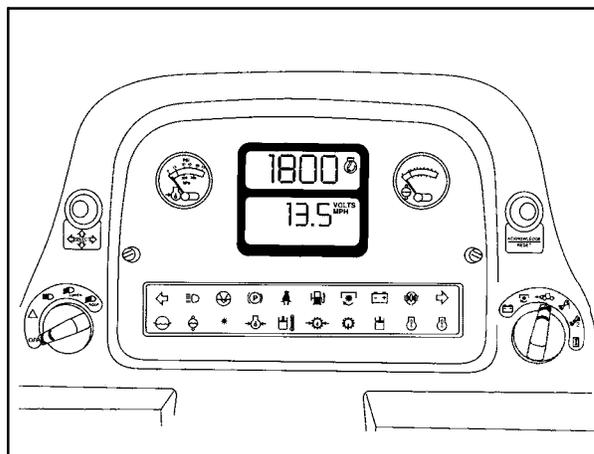


Figure 2-87

Service Interval One - The purpose of the service interval one position is to allow the user to preprogram the hour value to perform a specific tractor service. An example of this would be a 50-hour lubrication service. The user can preprogram the monitor alarm to indicate that 50 hours have been accumulated on the tractor and lubrication is required. Any value above ten hours can be selected and programmed into the monitor (see “Calibrating the Electronic Instrument Control System” later in this section for information on how to program the service interval one setting).

Usually the service interval one position is used for low-hour lubrication checks.

When the service interval one position is selected, the lower half of the display will show a “service one” symbol and the hours accumulated since the last service was performed on the tractor. If the user presses the acknowledge/reset button, the lower half of the display will show the setting at which service interval one has been programmed. Pushing the acknowledge/reset button again will return the display back to the accumulated hours for service interval one.

NOTE: If the rotary select switch is in any other position except “Service Interval One,” the service interval one symbol will flash in the lower portion of the monitor when the accumulated hours on the tractor are within ten hours of the preset interval. This alerts the operator that service interval one maintenance will be required in ten hours or less.

Service Interval Two Position - The purpose of the service interval two position is to allow the user to preprogram an hour value to perform a specific tractor service, but different than service interval one. An example of this would be a 250-hour maintenance check. The user can preprogram the monitor alarm to indicate that 250 hours have accumulated on the tractor and maintenance is required. Any value above ten hours can be selected and programmed into the monitor (see “Calibrating the Electronic Instrument Control System” later in this section for information on how to program the service interval two setting).

Usually the service interval two position would be used for high-hour maintenance checks.

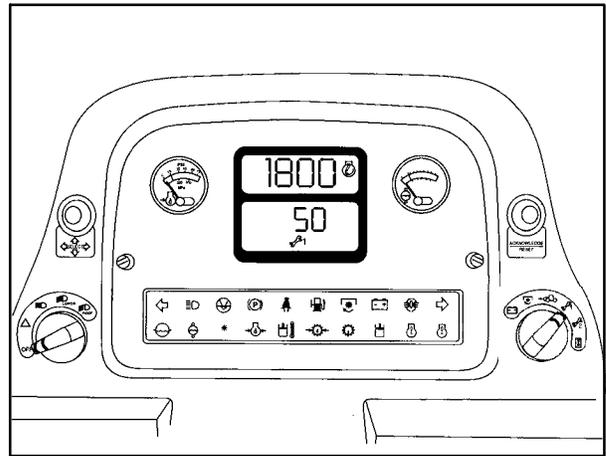


Figure 2-88

When the service interval two position is selected, the lower half of the display will show a “service two” symbol and the hours accumulated since the last service was performed on the tractor. If the user presses the acknowledge/reset button, the lower half of the display will show the setting at which service interval two has been programmed. Pushing the acknowledge/reset button again will return the display back to the accumulated hours for service interval two.

NOTE: If the rotary select switch is in any other position except “Service Interval Two,” the service interval two symbol will flash in the lower portion of the monitor when the accumulated hours on the tractor are within ten hours of the preset interval. This alerts the operator that service interval two maintenance will be required in ten hours or less.

Tractor Accumulated Hours - The tractor accumulated hours position on the rotary select switch has two functions:

Function one is to show total tractor hour usage. The lower half of the display will show a whole number (without tenths) and an hourglass symbol in the lower right corner. This display of a whole number will remain on the lower portion of the monitor for ten seconds any time the rotary select switch is turned from any of the other five positions available or if the tractor is in the tractor accumulated hour position and the tractor is started. The highest whole number possible to accumulate on total tractor hours is 19999. Once this value is reached, the display will reset to zero.

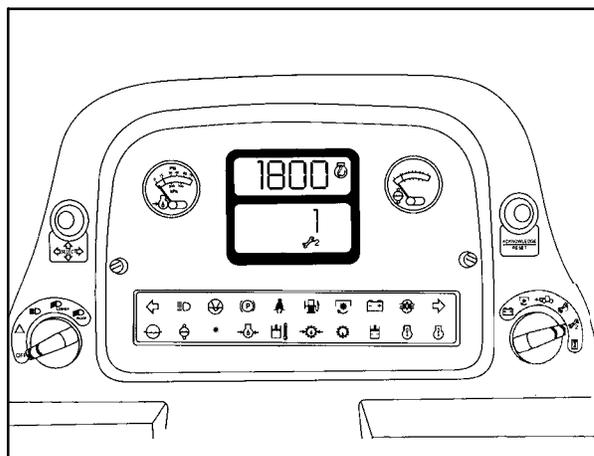


Figure 2-89

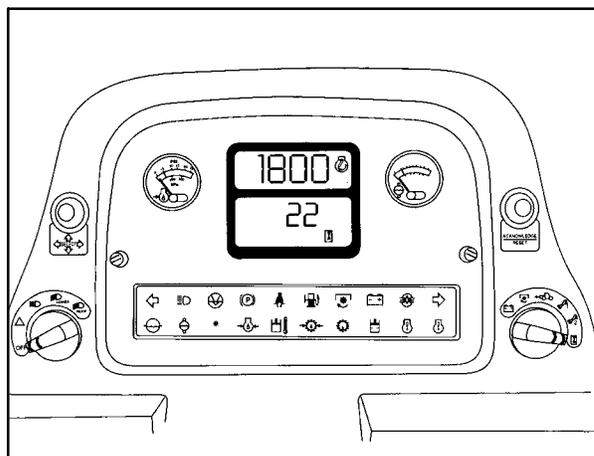


Figure 2-90

The second function of the tractor accumulated hours position is to display a whole number value (to the tenth digit) reflecting the total number of hours accumulated on the tractor up to 1999.9. This allows the user to keep track of tractor usage accumulated during different tractor operations. This will appear on the lower half of the display along with the hourglass symbol after the total tractor hours display disappears. At any time, the operator can press the acknowledge/reset button and zero the display to begin recounting hours for a specific function. This will not affect total tractor accumulated hours. Unless the operator does it manually, the display will automatically revert back to zero after it has reached 1999.9 hours.

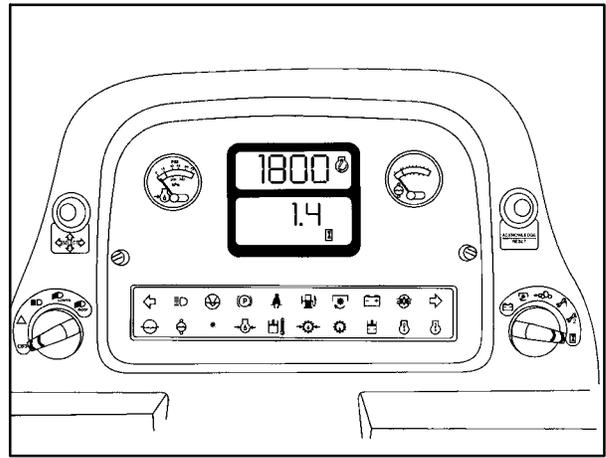


Figure 2-91

CALIBRATING THE ELECTRONIC INSTRUMENT CONTROL SYSTEM

As detailed in “Normal Operation of the Electronic Control Instrument System” (earlier in this section), certain values must be preprogrammed into the control module for proper operation and maximum benefit.

A detailed description of proper programming and calibration of the module follows. It is not necessary to follow the steps in the order shown to properly program the module. Select the area to be calibrated and follow the instructions given. The only required step is “Entering the Calibration Mode.” If the tractor is being calibrated for the first time, use the following steps in the order shown.

All programming and calibration is done with the key switch in the “RUN” position and the engine off.

There are nine possible items to calibrate when in one of the three rotary select switch positions:

Tractor Ground Speed Position

1. Setting the Tire Rolling Radius
2. Programming Units of Ground Speed Measurement (MPH or km/h)

Service Interval One Position

3. Service Interval One Reset
4. Service Interval One Alarm Reset

Service Interval Two Position

5. Service Interval Two Reset
6. Service Interval Two Alarm Reset

Tractor Accumulated Hours Position

7. Setting the Final Drive Ratio (FDR)
8. Setting the Transmission Output Shaft Gear Profile (GEAR) N14 engine only
9. Setting the Engine Flywheel Ring Gear Profile (Eng)

Entering the Calibration Mode

It will be necessary to put the system into the calibration mode. To do this, the ignition must be in the “OFF” position. Place the rotary select switch in the desired position to be calibrated. Press and hold the acknowledge/reset button. Continue to hold the acknowledge/reset button and turn the ignition to the “RUN” position. The display monitor will go through its normal initial test sequence. Once this is done, release the acknowledge/reset button.

The monitor is now in the calibration mode and ready to be programmed. No matter which of the nine items is to be calibrated, the upper portion of the monitor will always display the words “SET UP” along with a flashing display based upon the position of the rotary select switch. This tells the user that he is in the calibration mode for that particular function.

NOTE: At any time, the calibration mode can be exited by the user by simply turning the ignition to the “OFF” position and then turning the ignition back to the “RUN” position. This will place the system back into the normal operate mode. The words “SET UP” will disappear from the upper portion of the monitor display.

1. Setting the Tire Rolling Radius

NOTE: Setting the tire radius is only necessary when the tractor is not equipped with the Tractor Performance Monitor option. If the tractor being calibrated is equipped with the performance monitor, skip this step and proceed to “Programming Units of Ground Speed Measure.”

- A. If the tractor is not equipped with the optional Tractor Performance Monitor, the upper portion of the monitor will flash “RAD” with “SET UP” displayed when the calibration mode is first entered. The lower portion of the monitor will have a number displayed with the tenth digit (0.1) flashing.
- B. Without a Tractor Performance Monitor radar unit installed on the tractor, it is necessary to measure the rolling radius of the tires that are installed on the tractor and program this value into the system for accurate displays of ground speed.

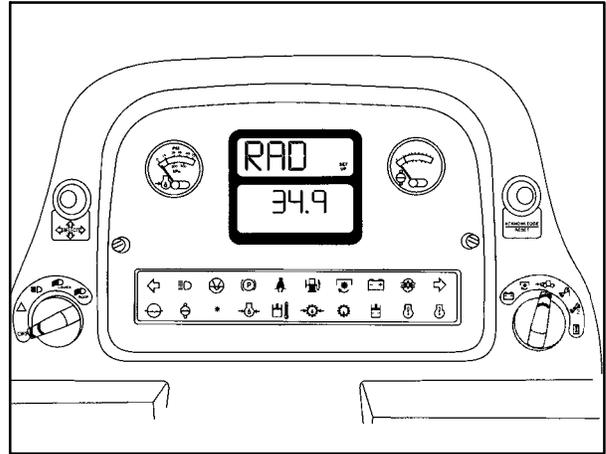


Figure 2-92

- C. To measure the rolling radius of the tire, the tractor must have its duals/triples installed, if equipped, and be properly ballasted and inflated (See “Ballasting” later in this section). Park the tractor on a flat surface and apply the park brake. Take a tape measure and **accurately** measure the distance from the **center** of the level plug, 1, (located next to the axle oil level sight gauge) to the ground on the front and rear axle. The measurement must be taken from the exact center of the level plug. Record these measurements.

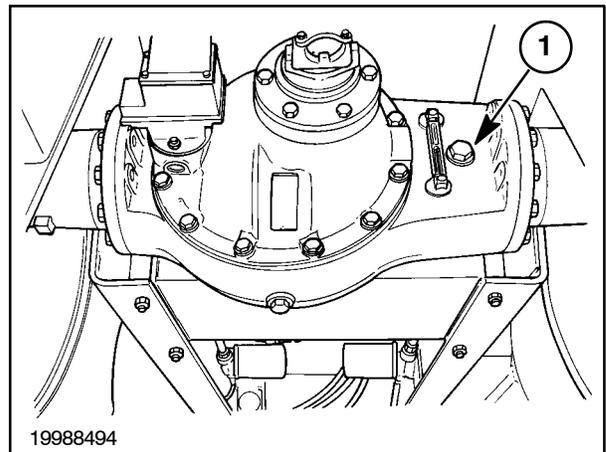


Figure 2-93

- D. Add the two measurements taken and divide by two to give an average rolling radius value. Round this value to the nearest tenth (0.1).

EXAMPLE

Axle #1 87 cm (34.25")

Axle #2 86 cm (33.75")

Total 173 cm (68.00") $\div 2 = 86$ cm
(34.00")

Rounded Totals 86 cm (34.0")

- E. To place the value into the monitor, use the digit select switch to select the necessary numbers. The monitor will accept values between 50.8 cm and 127.0 cm (20.0" and 50.0").
- F. Push the acknowledge/reset button again to enter the value into the monitor's memory. The display will now go to "Programming Units of Ground Speed Measurement." If no further calibration is needed, turn the ignition to the "OFF" position. If further calibration is needed in other areas, select the area to be calibrated with the rotary select switch and proceed as detailed for that switch position.

2. Programming Units of Ground Speed Measurement

- A. With the upper portion of the monitor flashing “SEL” and “UNIT,” and displaying the word “SET UP,” select the unit of measurement desired (MPH or km/h) in the lower portion of the monitor. To do this, move the monitor select switch up or down.
- B. Moving the digit select switch upward will make the MPH symbol become steady in the lower display. This means that the unit of measurement for tractor ground speed will be measured in miles per hour (MPH). The “km/h” will flash.

Moving the digit select switch downward will make the km/h symbol become steady. This means that the unit of measurement will be measured in kilometers per hour. The “MPH” will now flash.

- C. After the unit of measurement has been selected, press the acknowledge/reset button once to enter the selection into the monitor’s memory.

NOTE: On tractors without the optional Tractor Performance Monitor, the display will now return to “Setting the Tire Radius.” On tractors with the optional Tractor Performance Monitor, the display will now return to step 1 of “Programming Units of Ground Speed Measurement.”

All possible calibration numbers for the ground speed position of the rotary select switch are now entered. If no further calibration is needed, turn the ignition to the “OFF” position. If further calibration is needed in other areas, select the area to be calibrated with the rotary select switch and proceed as detailed for that switch position.

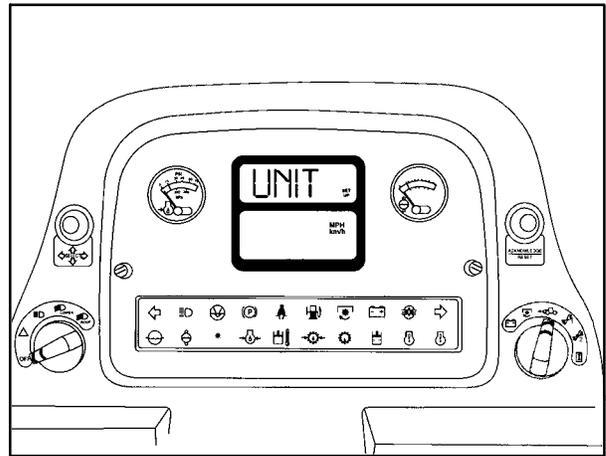


Figure 2-94

3. Service Interval One Reset

Follow this procedure after the Electronic Instrument Control System has notified you that service interval one should be performed. Go through the scheduled service and then reset the accrued hours to zero.

- A. The upper portion of the monitor will flash “PUSH,” “RE,” and “SET” along with displaying “SET UP.” The bottom portion will show the current hour meter reading accrued since the last service interval one reset.

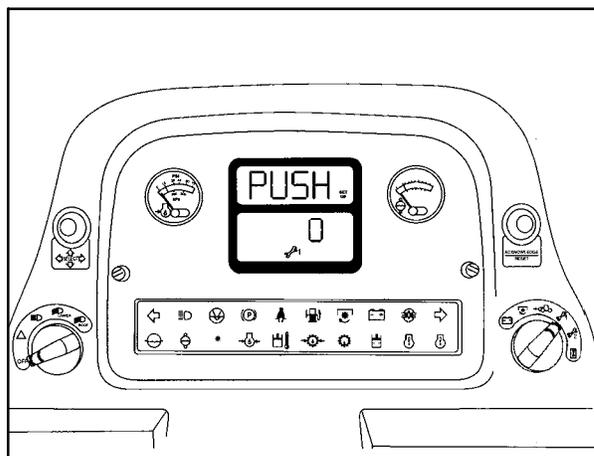


Figure 2-95

- B. Press the acknowledge/reset button once. The upper portion of the monitor will flash “RE” and “SET” along with displaying “SET UP.” The bottom portion of the display will show zero and has been reset. The monitor will now begin to recount the hours accumulated for the next service interval one.

If no further calibration is needed, turn the ignition to the “OFF” position. If further calibration is needed in other areas, select the area to be calibrated with the rotary select switch and proceed as detailed for that switch position.

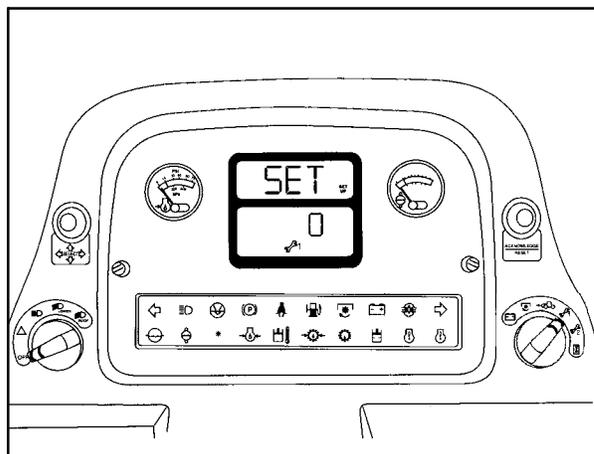


Figure 2-96

4. Service Interval One Alarm Reset

NOTE: If any changes are made to the alarm, the accrued hours that have been recorded for service interval one will be reset to zero automatically during the alarm reset procedures. It is recommended that the alarm setting be changed once the service interval one setting has been reached and needs to be reset.

- A. If you want to change the hour interval at which the audible alarm indicates service interval one is required, follow the steps detailed in “Service Interval One Reset” and push the acknowledge/reset button again.
- B. The upper portion of the monitor will flash “ALR” and “SET” while displaying “SET UP.” The lower portion of the monitor will show the current hour level setting at which the alarm will sound with the last digit flashing. Use the digit select switch to program the value between 10 and 1500 hours at which the alarm will notify the operator to perform service interval one.
- C. Push the acknowledge/reset button again to enter the value into the monitor’s memory. The display will now return to “Service Interval One Reset” mode.

All possible programming for the service interval one position is now complete. If no further calibration is needed, turn the ignition to the “OFF” position. If further calibration is needed in other areas, select the area to be calibrated with the rotary select switch and proceed as detailed for that switch position.

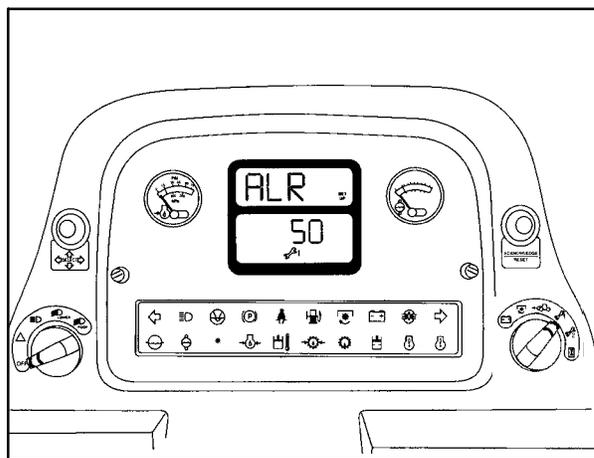


Figure 2-97

5. Service Interval Two Reset

Follow this procedure after the Electronic Instrument Control System has notified you that service interval two should be performed. Go through the scheduled service and then reset the accrued hours to zero.

- A. The upper portion of the monitor will flash “PUSH,” “RE,” and “SET” along with displaying the word “SET UP.” The bottom portion will show the current hour meter reading accrued since the last service interval two reset.

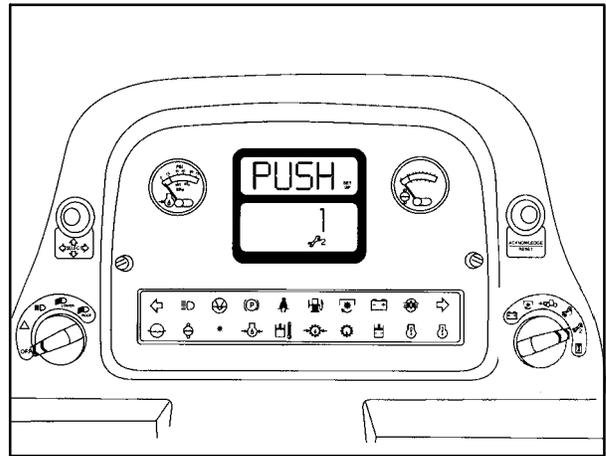


Figure 2-98

- B. Press the acknowledge/reset button once. The upper portion of the monitor will flash “RE” and “SET” along with displaying “SET UP.” The bottom portion of the display will show zero and has been reset. The monitor will now begin to recount the hours accumulated for the next service interval two.

If no further calibration is needed, turn the ignition to the “OFF” position. If further calibration is needed in other areas, select the area to be calibrated with the rotary select switch and proceed as detailed for that switch position.

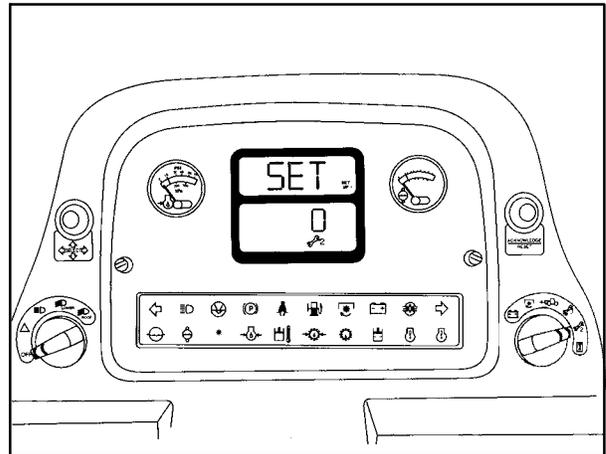


Figure 2-99

6. Service Interval Two Alarm Reset

NOTE: If any changes are made to the alarm, the accrued hours that have been recorded for service interval two will be reset to zero automatically during the alarm reset procedures. It is recommended that the alarm setting be changed once the service interval two setting has been reached and needs to be reset.

- A. If you want to change the hour interval at which the audible alarm indicates that service interval two is required, follow the steps detailed in “Service Interval Two Reset” and push the acknowledge/reset button again.

- B. The upper portion of the monitor will flash “ALR” and “SET” along with displaying the words “SET UP.” The lower portion of the monitor will show the current hour level setting at which the alarm will sound with the last digit flashing. Use the digit select switch to program the value between 10 and 1500 hours at which the alarm will notify the user to perform service interval two.

- C. Push the acknowledge/reset button again to enter the value into the monitor’s memory. The display will now return to “Service Interval Two Reset” mode.

All possible programming for the service interval two position is now complete. If no further calibration is needed, turn the ignition to the “OFF” position. If further calibration is needed in other areas, select the area to be calibrated with the rotary select switch and proceed as detailed for that switch position.

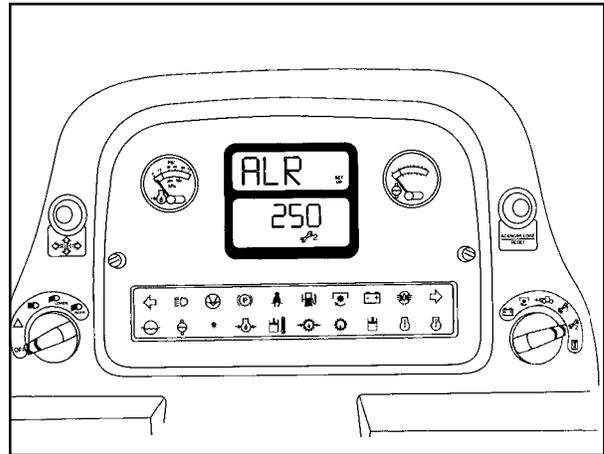


Figure 2-100

7. Setting the Final Drive Ratio

NOTE: This value is set when the machine is built. It does not require operator setup, and should never be changed. Instructions are provided here only in the event the value was inadvertently changed.

- A. The upper portion of the monitor will flash "FDR" and "SET," with "SET UP" displayed when the calibration mode is first entered. The lower portion of the display will have the number displayed with the tenth digit (0.1) flashing.
- B. The final drive ratio should be set at **25.8**.
- C. To place the correct value into the monitor, use the digit select switch to select the necessary numbers. The monitor will accept a value of 25.8.
- D. Push the acknowledge/reset button to enter the value into the monitor's memory. The display will now go to "Setting the Transmission Output Shaft Gear Profile." If no further calibration is needed, turn the ignition switch to the "OFF" position. If further calibration is needed in other areas, select the area to be calibrated with the rotary select switch and proceed as detailed for that switch position.

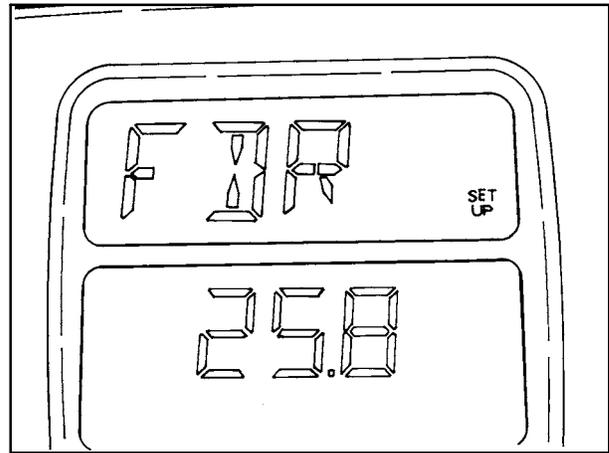


Figure 2-101

8. Setting the Transmission Output Shaft Gear Profile

NOTE: Operation not applicable to tractors equipped with QSM 11 engines.

NOTE: This value is set when the machine is built. It does not require operator setup, and should never be changed. Instructions are provided here only in the event the value was inadvertently changed.

- A. The upper portion of the monitor will flash "GEAR" and "SET," with "SET UP" displayed. The lower portion of the display will show 30 or 60 depending on current programmed selection.
- B. The output shaft gear profile is set depending on the transmission installed in the tractor:
 - 12 x 4 Quad Shift III - 30
 - 12 x 2 Powershift - 60
- C. To place the correct value into the monitor, use the digit select switch. Move the switch to "UP" for 60, or "DOWN" for 30.
- D. Push the acknowledge/reset button to enter the value into the monitor's memory. The display will now go to "Setting the Engine Flywheel Ring Gear Profile." If no further calibration is needed, turn the ignition switch to the "OFF" position. If further calibration is needed in other areas, select the area to be calibrated with the rotary select switch and proceed as detailed for that switch position.

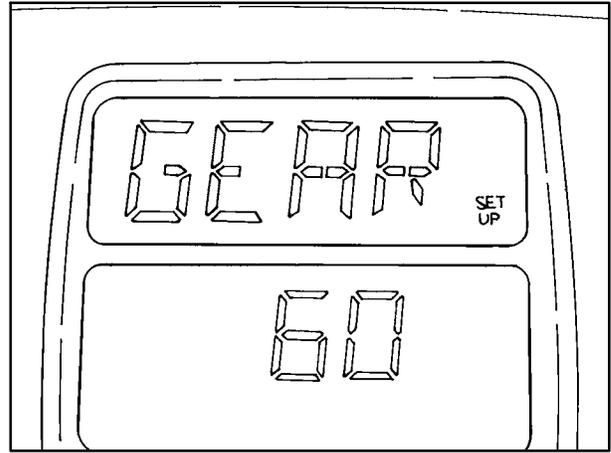


Figure 2-102

9. Setting the Engine Flywheel Ring Gear Profile

NOTE: This value is set when the machine is built. It does not require operator setup, and should never be changed. Instructions are provided here only in the event the value was inadvertently changed.

- A. The upper portion of the monitor will flash “ENG” and “SET” with “SETUP” displayed. The lower portion of the display will show 103 or 12, depending on current programmed selection.
- B. Use the following chart to determine which “ENG” number should be programmed into the EIC:

Model Number	Engine	“ENG” Number
2290, 2335, 2375	QSM11	12
2360, 2425	N14	103

- C. To place the correct value into the monitor, use the digit select switch. Move the switch up for 103, or down for 12.
- D. Press the Acknowledge/Reset button to enter the value into the monitor’s memory. The display will now return to “Setting the Final Drive Ratio.”

All possible programming for the hours position is now complete. If no further calibration is needed, turn the ignition to the “OFF” position.

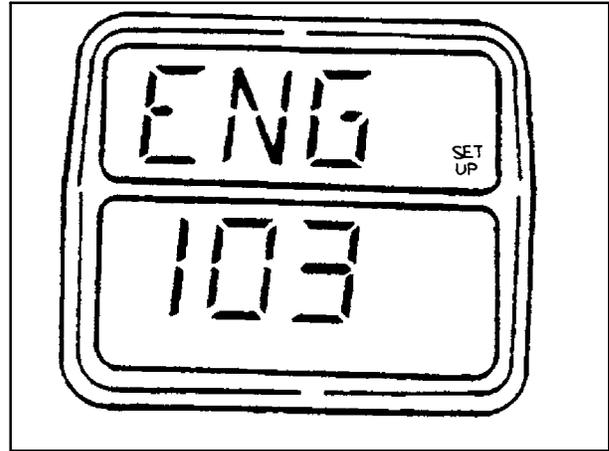


Figure 2-103

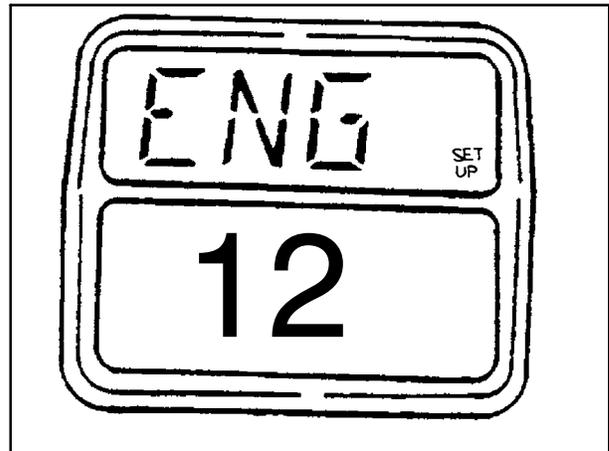


Figure 2-104

AUDIBLE/VISUAL ALARMS OF THE ELECTRONIC INSTRUMENT CONTROL SYSTEM

Low Transmission Lube Pressure

The Electronic Instrument Control System will notify the operator that the transmission lubrication pressure is below 21 kPa (3 PSI) and the quantity of oil entering the transmission is not adequate to properly lubricate the internal components. See “Transmission” in Section 4 for possible causes of low transmission lube pressure. Failure to correct the low pressure condition can cause serious damage to the transmission. The following description details the reaction of the electronic monitor and audible alarm in the event of low transmission lube pressure:

With the engine running and transmission lube pressure below 21 kPa (3 PSI), the transmission pressure warning light, 1, on the warning light bar will illuminate. There will be a six-second delay before the audible alarm sounds a solid tone for four seconds. The upper portion of the monitor will flash “CHK” “LMPS,” indicating the operator should look at the light bar to determine the function causing the alarm to sound, i.e., transmission lube pressure. The lower portion of the monitor will continue to display whatever is selected on the rotary select switch.

The operator can cancel the audible alarm and the “CHK” “LMPS” display on the upper portion of the monitor by pressing the acknowledge/reset button once. The transmission lubrication light on the warning light bar will stay lit until the low pressure condition is corrected. The audible alarm and “CHK” “LMPS” display will not return until the ignition switch is turned to the “OFF” position and the tractor is restarted.

Transmission lube pressure is considered a non-critical alarm function and will not cause the electronic monitor to go into the “STOP” mode or cause the automatic shutdown to activate.

ATTENTION: It is important that the operator shut the tractor off and find out the cause of the low transmission lube pressure light indication. Take corrective action immediately to prevent damage to the transmission.

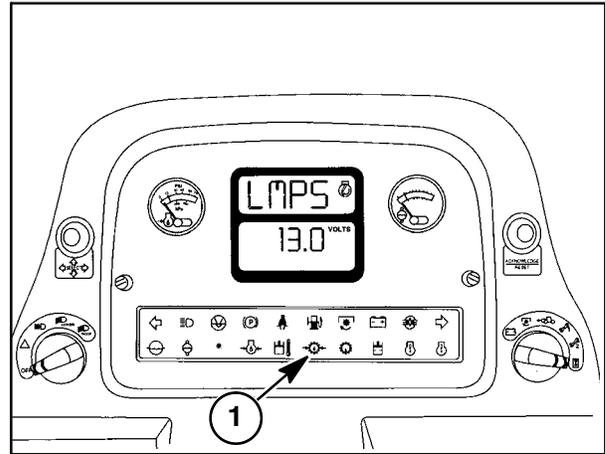


Figure 2-105

Transmission Lubrication Filter Bypass

The Electronic Instrument Control System will notify the operator that the transmission lubrication filter is in the bypass condition and oil entering the transmission is not passing through the filter element. The transmission will still receive lubrication oil, but the oil will not be filtered, and may contain contaminants. See “Transmission Troubleshooting” in Section 4 for possible causes of filter bypass. Failure to correct the filter bypass condition may cause damage to the transmission components. The following description details the reaction of the electronic monitor and audible alarm in the event of transmission lubrication filter bypass:

With the engine running, and the transmission lube filter in the bypass condition, the transmission lube filter warning light, 1, on the warning light bar will illuminate. There will be a six-second delay before the audible alarm sounds a solid tone for four seconds. The upper portion of the monitor will flash “CHK” “LMPS,” indicating the operator should look at the light bar to determine the function causing the alarm to sound, i.e., transmission lube filter bypass. The lower portion of the monitor will continue to display whatever is selected on the rotary select switch.

The operator can cancel the audible alarm and the “CHK” “LMPS” display on the upper portion of the monitor by pressing the acknowledge/reset button once. The transmission lube filter bypass light on the warning light bar will stay lit until the bypass condition is corrected. The audible alarm and “CHK” “LMPS” display will not return until the ignition switch is turned to the “OFF” position and the tractor is restarted.

Transmission lube filter bypass is considered a non-critical alarm function, and will not cause the electronic monitor to go into the “STOP” mode or cause the automatic shutdown to activate.

ATTENTION: *It is important that the operator shut the tractor off and find out the cause of the transmission lube filter bypass light indication. Take corrective action immediately to prevent damage to the transmission.*

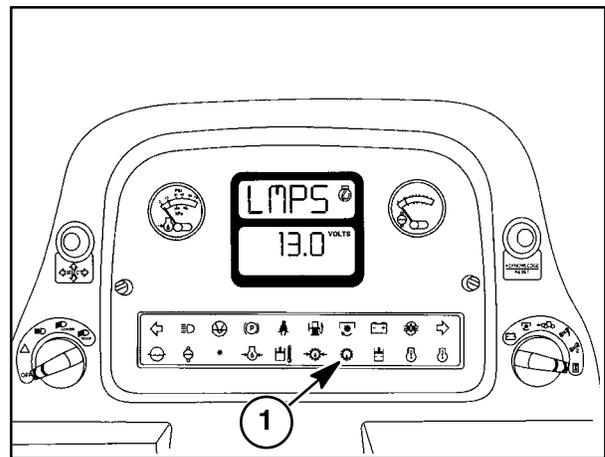


Figure 2-106

Hydraulic System Filter Bypass

The Electronic Instrument Control System will notify the operator that the hydraulic system filter is in the bypass condition and oil entering the hydraulic system is not passing through the filter element. The hydraulic system will still receive oil, but the oil will not be filtered and may contain contaminants. See “Hydraulic System Troubleshooting” in Section 4 for possible causes of filter bypass. Failure to correct the filter bypass condition may cause damage to the hydraulic system components. The following description details the reaction of the electronic monitor and audible alarm in the event of hydraulic system filter bypass:

With the engine running and the hydraulic system filter in the bypass condition, the hydraulic system filter warning light, 1, on the warning light bar will illuminate. There will be a six-second delay before the audible alarm sounds a solid tone for four seconds. The upper portion of the monitor will flash “CHK” “LMPS,” indicating that the operator should look at the light bar to determine the function that is causing the alarm to sound, i.e., hydraulic system filter bypass. The lower portion of the monitor will continue to display whatever is selected on the rotary select switch.

The operator can cancel the audible alarm and the “CHK” “LMPS” display on the upper portion of the monitor by pressing the acknowledge/reset button once. The hydraulic system filter bypass light on the warning light bar will stay lit until the bypass condition is corrected. The audible alarm and “CHK” “LMPS” display will not return until the ignition switch is turned to the “OFF” position and the tractor is restarted.

Hydraulic system filter bypass is considered a non-critical alarm function and will not cause the electronic monitor to go into the “STOP” mode or cause the automatic shutdown to activate.

ATTENTION: *It is important that the operator shut the tractor off and find out the cause of the hydraulic system filter bypass light indication. Take corrective action immediately to prevent damage to the hydraulic system components.*

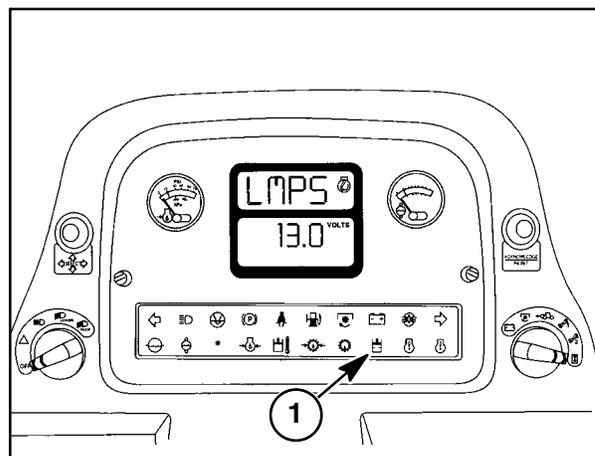


Figure 2-107

Low Engine Oil Pressure (below 100 kPa (15 psi))

The Electronic Instrument Control System will notify the operator that the engine lubrication oil pressure has dropped to a point that will no longer provide adequate lubrication to the engine. Simultaneously, the module of the Cummins engine will begin an engine derate sequence that will protect the engine from harm due to low oil pressure. The engine may be receiving oil, but it may not be providing sufficient lubrication causing possible engine damage. See “Engine” in Section 4 of the Operator’s manual for possible causes of low engine oil pressure. Failure to correct the low-pressure condition can cause serious damage to the engine. The following description details the reaction of the EICS, Cummins Module and audible alarm in the event of low engine oil pressure (below 100 kPa (15 psi)):

With the engine running, and the engine oil pressure at the low pressure point (100 kPa (15 psi)), the oil pressure warning light, 1, will illuminate on the warning light bar. The audible alarm will beep rapidly for 10 seconds with the word “STOP” flashing in the upper portion of the monitor. The lower portion of the monitor will flash all of the symbols related to the rotary select switch. Any numerical display in the lower portion of the monitor, regardless of the position of the rotary select switch, will be gone. This is called the pre-alarm sequence of the monitor. During the 10-second time period of the pre-alarm sequence, the Operator can press the acknowledge/reset button on the dash panel. This will stop the EICS in the pre-alarm stage and keep it from progressing into the full critical alarm stage. The engine will continue to run, but the EICS will stay in the pre-alarm stage. This will allow the Operator to move the tractor from an undesirable location and make repairs.

ATTENTION: *If the low engine oil pressure warning sequence is stopped in the pre-alarm stage, the engine will continue to run while not receiving adequate amounts of lubrication. Serious engine damage can result from running the engine in this condition. It is imperative that the low engine oil pressure condition be investigated as soon as possible so as to avoid serious engine damage.*

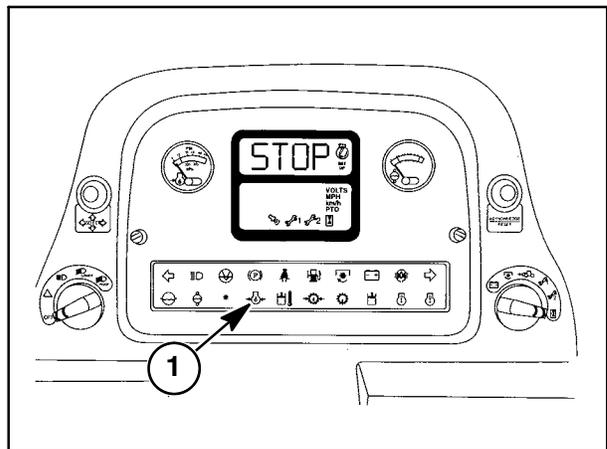


Figure 2-108

If the Operator does not press the acknowledge/reset button during the pre-alarm sequence, the EICS will progress to the full critical alarm stage. The EICS will display a constant "STOP" message in the upper portion of the display and the lower portion will display all symbols related to the rotary select switch. The audible alarm will become a steady, solid tone. If the automatic shutdown system is enabled on the tractor, the engine will shut off automatically. If the automatic shutdown system is not enabled, the tractor will continue to run. See "Automatic Shutdown Conversion" in the Operator's manual for information on how to enable and disable this system. Pressing the acknowledge/reset button will not clear the display or audible alarm after the EICS has reached the critical alarm stage.

ATTENTION: If the tractor electrical system is not converted to the automatic shut down mode, the engine will continue to run while not receiving adequate amounts of lubrication. Serious engine damage can result from running the engine in this condition. It is imperative that the low engine oil pressure condition be investigated as soon as possible so as to avoid serious engine damage

Whether the Operator chooses to stop the EICS in the pre-alarm stage, or allow it to progress to the critical alarm stage (not converted to automatic shut down) the module on the engine will be simultaneously reacting to the low engine oil pressure signal it is receiving from its own sending unit circuit.

NOTE: If the Operator allows the EICS to progress to the critical alarm stage and has the tractor converted to automatic shut down, the engine will shut off without the module causing a derate to the engine. There will not be enough time for the module to react from the pre-alarm sequence to the critical alarm sequence and shut down.

The module will sense the low oil pressure condition and begin an engine speed/engine power derate. The module will lower the engine rpm to a preset level (1400 rpm) allowing no acceleration of the engine above that level AND lower the horsepower output of the engine a preset amount (20% of gross horsepower) as long as the low engine oil pressure condition exists.

Both the speed and engine power derate will be gradual and simultaneous. Elapsed time of the speed and power derate from maximum horsepower and 2100 engine rpm to the 1400 rpm and 20% reduced horsepower output level will be approximately 25 seconds (approximately 40 rpm/second, and 1% horsepower/second). This reduced speed and power output mode will allow the Operator to move the tractor from an undesirable location and make repairs.

The Operator cannot cancel or interrupt the derate sequence from occurring on the engine. The module does not recognize activation of, nor is it tied into the EICS acknowledge/reset button on the dash of the tractor.

If the tractor is shut down and then restarted, and the alarm condition still exists, (low engine oil pressure) the EICS and module will repeat the alarm and derate sequence. If the tractor is restarted and the alarm condition has been corrected, the tractor will return to normal operation. If the tractor is not shut down, and the alarm condition is corrected, the tractor will return to normal operation without having to shut it off and restart it.

Low Engine Oil Pressure (140-210 kPa (20-30 psi)) at Engine Speeds Above 1200 rpm

The Module on the Cummins engine will react to a condition of low engine oil pressure (140 - 210 kPa (20-30 psi)) when the engine speed is above 1200 rpm. The quantity of oil in the lube circuit is not adequate to properly protect the engine components at the selected engine speed (normal oil pressure for engine speeds above 1200 rpm is 210 - 345 kPa (30-50 psi)). See "Engine" in Section 4 of the Operator's manual for possible causes of low engine oil pressure. Failure to correct the low oil pressure condition can cause serious damage to the engine. The following description details the reaction of the EICS, Cummins Module and audible alarm in the event of low engine oil pressure when engine speed is above 1200 rpm:

With the engine running at a speed above 1200 rpm and the engine lubrication pressure between 140 - 210 kPa (20-30 psi), no warning lights will be illuminated on the EICS of the tractor.

The module, 1, will sense the low oil pressure condition and begin an engine speed/engine power derate. The module will lower the engine rpm to a preset level (1400 rpm) allowing no acceleration of the engine above that level AND lower the horsepower output of the engine a preset amount (20% of gross horsepower) as long as the low engine oil pressure condition exists.

Both the speed and engine power derate will be gradual and simultaneous. Elapsed time of the speed and power derate from maximum horsepower and 2100 engine rpm to the 1400 rpm and 20% reduced horsepower output level will be approximately 25 seconds (approximately 40 rpm/second, and 1% horsepower/second). This reduced speed and power output mode will allow the Operator to move the tractor from an undesirable location and correct the concern.

ATTENTION: *The engine will continue to run while not receiving adequate amounts of lubrication. Serious engine damage can result from running the engine in this condition. It is imperative that the low engine oil pressure condition be investigated as soon as possible so as to avoid serious engine damage.*

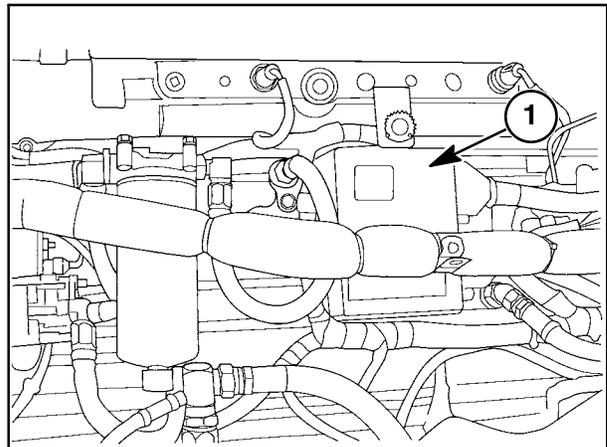


Figure 2-109

If engine oil pressure continues to drop and reaches 100 kPa (15 psi), the EICS will react as detailed in “Low Engine Oil Pressure (below 100 kPa (15 psi)) at Any Engine Speed” in this manual.

The Operator cannot cancel or interrupt the derate sequence from occurring on the engine. The module does not recognize activation of, nor is it tied into the EICS acknowledge/reset button on the dash of the tractor.

If the tractor is shut down and then restarted, and the alarm condition still exists, (low engine oil pressure at engine speeds above 1200 rpm) the module will repeat the derate sequence. If the tractor is restarted and the alarm condition has been corrected, the tractor will return to normal operation. If the tractor is not shut down, and the alarm condition is corrected, the tractor will return to normal operation without having to shut it off and restart it.

Low Coolant Level

The Electronic Instrument Control System will notify the operator that the engine coolant level has dropped 4.5 L (5.3 US qts) below the acceptable fill level in the radiator. Simultaneously, the module of the Cummins engine will begin an engine derate sequence that will protect the engine from harm due to low engine coolant. A low coolant level condition can overheat the engine, causing extensive engine damage. See "Engine" in Section 4 of the Operator's manual for possible causes of low engine coolant. Failure to correct the low engine coolant condition can cause serious damage to the engine. The following description details the reaction of the EICS and Cummins module in the event of low engine coolant level:

With the engine running and the coolant level 4.5 L (5.3 US qts) below the acceptable fill level in the radiator, the low engine coolant light, 1, on the warning light bar will illuminate. The EICS will not react in any other fashion (no error message, no audible alarm). Pressing the acknowledge/reset button on the dash will not cancel the low coolant level lamp on the EICS. The light will only turn off when the coolant level returns to the proper level.

The module will also sense the low engine coolant level and begin an engine power derate. Engine speed will not be affected by the derate in power, and the Operator will have full range of engine speed available using the hand throttle. The module will lower the horsepower output of the engine a preset amount (20% of gross horsepower) as long as the low engine coolant condition exists.

The engine power derate will be gradual as long as the condition exists on the tractor and the engine is running. Elapsed time of the power derate from maximum horsepower to the derate output level will be approximately 25 seconds (approximately 1% horsepower/second). This reduced power output mode will allow the Operator to move the tractor from an undesirable location in order to make repairs.

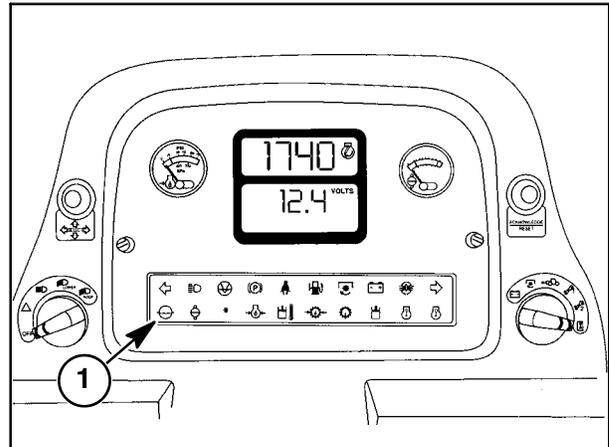


Figure 2-110

The Operator cannot cancel or interrupt the derate sequence from occurring on the engine. The module does not recognize activation of, nor is it tied into the EICS acknowledge/reset button on the dash of the tractor.

If the tractor is shut down and then restarted, and the alarm condition still exists on the tractor (low engine coolant level), the EICS and module will repeat the alarm and derate sequence. If the

tractor is restarted and the alarm condition has been corrected, the tractor will return to normal operation. If the tractor is not shut down, and the alarm condition is corrected, the tractor will return to normal operation without having to shut it off and restart it.

High Engine Coolant Temperature

The Electronic Instrument Control System will notify the operator that the engine coolant temperature has reached a point that will no longer provide adequate cooling, and engine overheating may occur. Simultaneously, the module of the Cummins engine will begin an engine derate sequence that will help protect the engine from harm due to high engine coolant temperature. See “Engine” in Section 4 of the Operator’s manual for possible causes of high engine coolant temperature. Failure to correct the high engine coolant temperature can cause serious damage to the engine components. The following description details the reaction of the EICS and Cummins module in the event of high engine coolant temperature:

With the engine running, and the coolant temperature at 103°C (218° F), the module will sense the high engine coolant temperature and begin an engine power derate. Engine speed will not be affected by the derate in power, and the Operator will have full range of engine speed available using the hand throttle. The engine power derate will be gradual as long as the high coolant temperature condition exists and the engine is running. The derate will occur in stages based on the temperature of the engine coolant. For every degree of coolant temperature above 103°C (218° F), the power level of the engine will be reduced 2% of gross engine horsepower, to a maximum of 20% power derate at 103°C (218° F). An example of this would be an engine that is operating at 106°C (222° F). The coolant temperature is 3 °C (4° F) over 103°C (218° F), therefore the derate in power is 8%.

At this point, two choices for continuing operation of the tractor are available. First, the Operator can reduce the load on the engine by shifting down and/or raising the implement out of the ground. Secondly, the Operator can stop the tractor forward motion and allow the engine to run with no load on it.

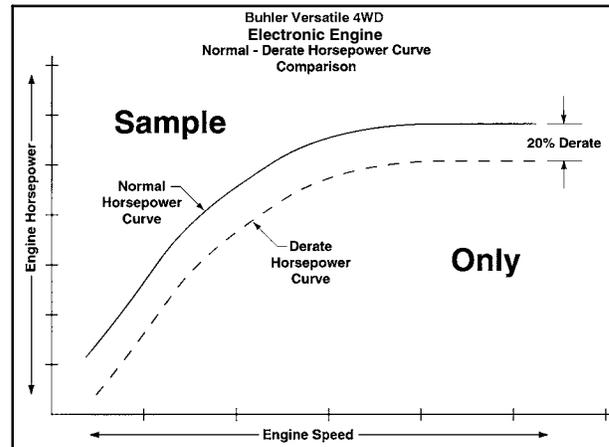


Figure 2-111

Doing either one of these two items will allow the engine coolant temperature to drop below 106°C (222° F), where normal horsepower level will resume.

If the Operator takes no action to cool the engine down (reduce load or stop tractor motion and run engine unloaded), the engine coolant temperature will continue to increase. The module will continue the proportional derate of 2% power decrease for each 1°C (1° F) of coolant temperature above 106°C (222° F).

When the engine coolant temperature reaches 109°C (228° F), the module will have reached a full 20 % derate level for engine power output. The engine coolant temperature light, 1, will illuminate. The audible alarm will beep rapidly for 10 seconds with the word “STOP” flashing in the upper portion of the monitor. The lower portion of the monitor will flash all of the symbols related to the rotary select switch. Any numerical display in the lower portion of the monitor, regardless of the position of the rotary select switch, will be gone. This is called the pre-alarm sequence of the monitor. During the 10-second time period of the pre-alarm sequence, the Operator can press the acknowledge/reset button on the dash panel. This will stop the EICS in the pre-alarm stage and keep it from progressing into the full critical alarm stage. The engine will continue to run, but the EICS will stay in the pre-alarm stage. The Operator can cool the engine down by reducing the load or by stopping the tractor motion and allow the engine to run unloaded.

ATTENTION: *If the high engine coolant temperature warning sequence is stopped in the pre-alarm stage and the engine is continued to be run in a loaded condition, the coolant temperature will continue to raise above 109°C (228° F). Serious engine damage can result from running the engine in this condition. It is imperative that the high coolant temperature condition be corrected and investigated as soon as possible so as to avoid serious engine damage.*

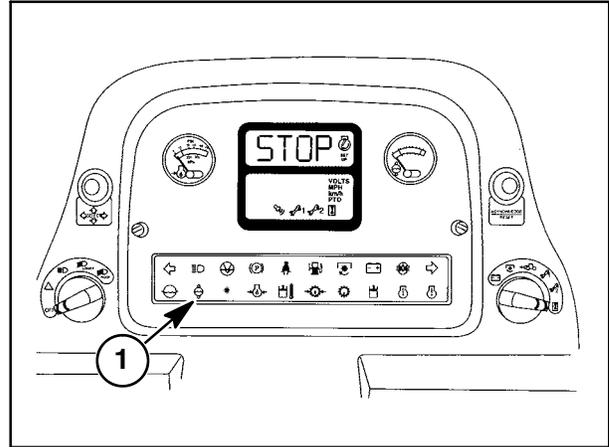


Figure 2-112

If the Operator does not press the acknowledge/reset button during the pre-alarm sequence, the EICS will progress to the full critical alarm stage. The EICS will display a constant "STOP" message in the upper portion of the display and the lower portion will display all symbols related to the rotary select switch. The audible alarm will become a steady, solid tone. If the automatic shutdown system is enabled on the tractor, the engine will shut off automatically. If the automatic shutdown system is not enabled, the tractor will continue to run. See "Automatic Shutdown Conversion" in the Operator's manual for information on how to enable and disable this system. Pressing the acknowledge/reset button will not clear the display or audible alarm after the EICS has reached the critical alarm stage.

ATTENTION: If the tractor electrical system is not converted to the automatic shut down mode, the engine will continue to run at a high engine coolant temperature. Serious engine damage can result from running the engine in this condition. It is imperative that the high coolant temperature condition be corrected and investigated as soon as possible so as to avoid serious engine damage.

If the tractor is shut down and then restarted, and the alarm condition still exists on the tractor (High Engine Coolant Temperature), the EICS and module will repeat the alarm and derate sequence. If the tractor is restarted and the alarm condition has been corrected, the tractor will return to normal operation. If the tractor is not shut down, and the alarm condition is corrected, the tractor will return to normal operation without having to shut it off and restart it.

Electrical System High/Low Voltage

The Electronic Instrument Control System will notify the operator that the electrical system of the tractor is operating at a voltage too high or too low for normal operation. The following operating conditions will cause the voltage warning system to actuate:

- A. The tractor running and more than 15 volts is measured in the electrical system.
- B. The tractor running above 1500 RPM and less than 12.5 volts is measured in the electrical system.
- C. The tractor running at any speed and less than 11.5 volts is measured in the electrical system.

See “Electrical System Troubleshooting” in Section 4 for the proper steps to follow to find a possible electrical system high/low voltage problem. Failure to correct this problem may cause damage to the electrical system. The following description details the reaction of the electronic monitor and audible alarm in the event of electrical system high/low voltage:

With the engine running and any of the above three conditions existing in the electrical system, the lower portion of the monitor will flash “VOLTS” along with the numerical value of the electrical system voltage. The audible alarm will sound a steady tone for four seconds. Even if the rotary select switch is not in the electrical system voltage position, the lower portion of the monitor will still revert to the “VOLTS” display. The upper portion of the monitor will continue to display engine speed. The alternator output warning light on the warning light bar will not illuminate. The electronic monitor is not tied in specifically to alternator output. It is reading total electrical system voltage. The warning light is dedicated to alternator output and will only illuminate if the alternator stops charging.

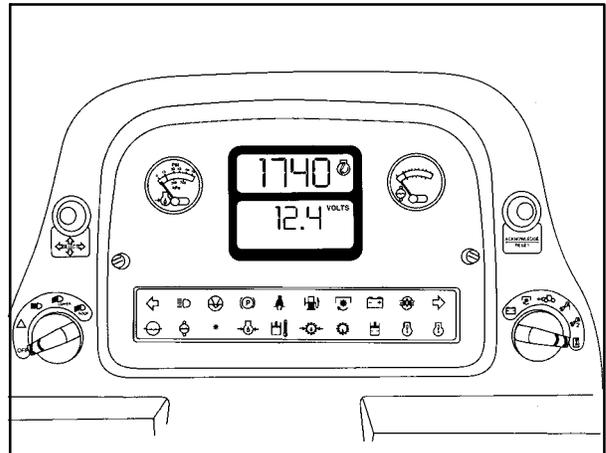


Figure 2-113

The operator can cancel the audible alarm and the “VOLTS” only display on the lower portion of the monitor by pressing the acknowledge/reset button. The lower portion of the monitor will revert back to its previous display based on the position of the rotary select switch, but “VOLTS” will flash in the lower portion of the monitor along with the selected display. The audible alarm will not return until the ignition switch is turned to the “OFF” position and the tractor is restarted.

High/low electrical system voltage is considered a non-critical alarm function and will not cause the electronic monitor to go into the “STOP” mode or cause the automatic shutdown to activate.

ATTENTION: *It is important that the operator shut the tractor off and find out the cause of the high/low electrical system voltage indication. Take corrective action immediately to prevent damage to the electrical system.*

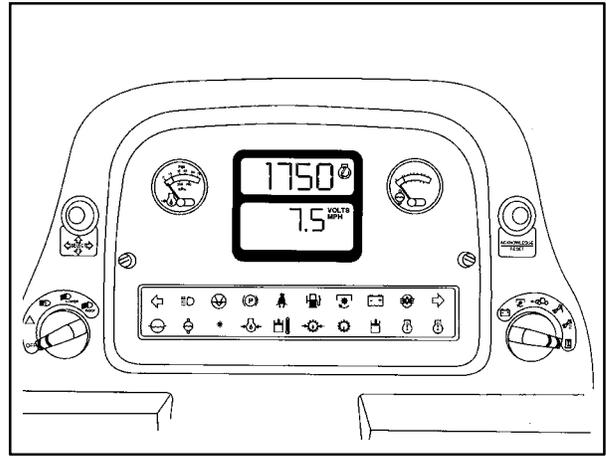


Figure 2-114

Fuel Level

The Electronic Instrument Control System will notify the operator that the fuel level in the fuel tanks has reached 1/12 of total fuel capacity 1/12 equals 68.1 L (18 gals.) and that tractor refueling is required.

The system also has a feature to assist the operator during refueling procedures. An audible indicator for fuel level alerts the operator that the tanks are 3/4 and 7/8 full.

The following description details the reaction of the electronic monitor, low fuel level indicator light, and audible alarm during a low fuel level situation and tractor refueling operations:

With the key in the “RUN” position, and the fuel level at 1/12 capacity in the tanks, the low fuel level warning light, 1, on the warning light bar will illuminate. There will be a six-second delay before the audible alarm sounds a solid tone for four seconds. The upper portion of the monitor will flash “LOW” “FUEL”. The lower portion of the monitor will continue to display whatever is selected on the rotary select switch.

The operator can cancel the audible alarm and the “LOW” “FUEL” display on the upper portion of the monitor by pressing the acknowledge/reset button once. The low fuel level light on the warning light bar will stay lit until the low fuel level is corrected. The audible alarm and “LOW” “FUEL” display will not return until the ignition switch is turned to the “OFF” position and then returned to the “RUN” position.

Low fuel level is considered a non-critical alarm function and will not cause the electronic monitor to go into the “STOP” mode or cause the automatic shutdown to activate.

ATTENTION: *It is important that the operator refuel the tractor as soon as possible.*

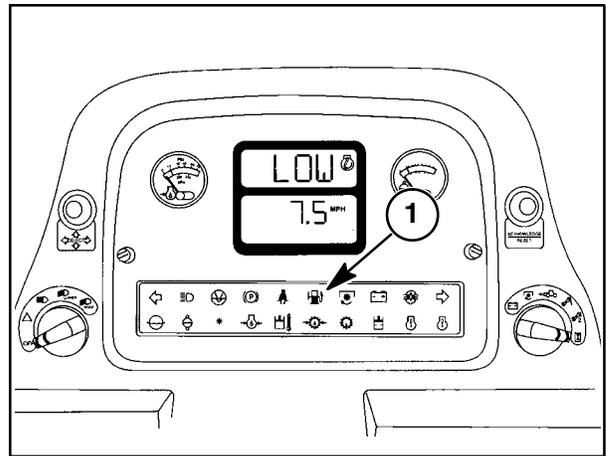


Figure 2-115

During refueling of the tractor, when the ignition is in the “RUN” position and the engine off, and the fuel level reaching 3/4 capacity, the audible alarm will sound rapidly. The top portion of the monitor will flash the words “FULL” “3/4” indicating the fuel tanks are nearing capacity.

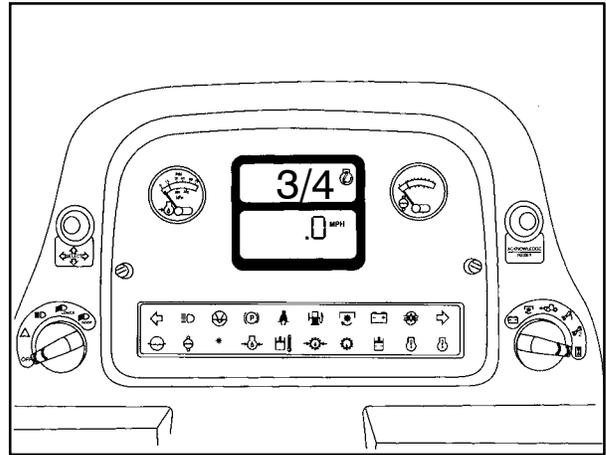


Figure 2-116

Continued filling of the tanks to the 7/8 level will cause the audible alarm to sound a solid tone continuously and the upper portion of the monitor will flash “FUEL” “FULL”. This audible and visual alarm system will allow the operator to monitor the refueling procedure and not overfill the tank.



CAUTION: ALWAYS SHUT THE ENGINE OFF DURING REFUELING PROCEDURES.

The operator can cancel the audible alarms and the “FUEL” “3/4” and “FUEL” “FULL” displays on the upper portion of the monitor at any time by pressing the acknowledge/reset button once. If the acknowledge/reset button is not pressed, the tone and display will continue until the ignition is turned to the “OFF” position and then turned back to the “RUN” position or the acknowledge/reset button is pressed.

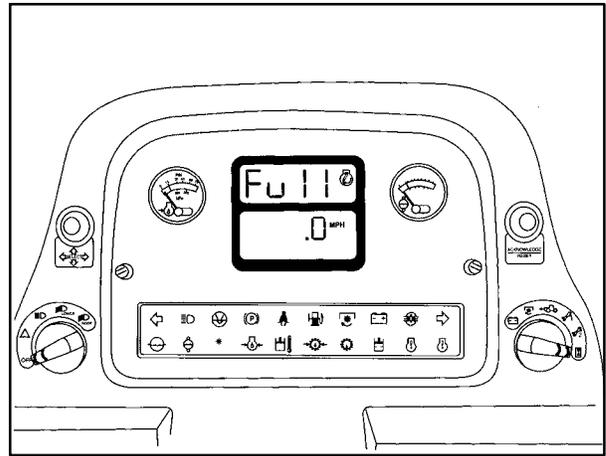


Figure 2-117

Transmission Speed Sensor Failures

The Electronic Instrument Control System will notify the operator that the transmission speed sensor or the wiring to the sensor has an open or short circuit. See “Electrical Troubleshooting” in Section 4 for the proper steps to follow to find a possible open or short circuit. The following description details the reaction of the electronic monitor and audible alarm in the event of an open or short in the transmission speed sensor circuit.

When the ignition is in the “RUN” position and an open circuit is detected, the lower portion of the monitor will flash “OPEN” and display the MPH or km/h symbol. The audible alarm will sound continuously. This will happen no matter what position the rotary select switch is in. The upper portion of the monitor will continue to display engine RPM.

If the operator presses the acknowledge/reset button, the audible alarm will turn off and the lower portion of the monitor will display “OPEN” steadily. If the ignition is turned to the “OFF” position and then turned back to the “RUN” position, the process will repeat itself until the open circuit is corrected.

When the ignition is in the “RUN” position and a short circuit is detected, the lower portion of the monitor will flash “SHCR” and display the MPH or km/h symbol. The audible alarm will sound continuously. The upper portion of the monitor will continue to display engine RPM.

If the operator presses the acknowledge/reset button, the audible alarm will turn off and the lower portion of the monitor will display the word “SHCR” steadily. If the ignition is turned to the “OFF” position and then turned back to the “RUN” position, the process will repeat itself until the short circuit is corrected.

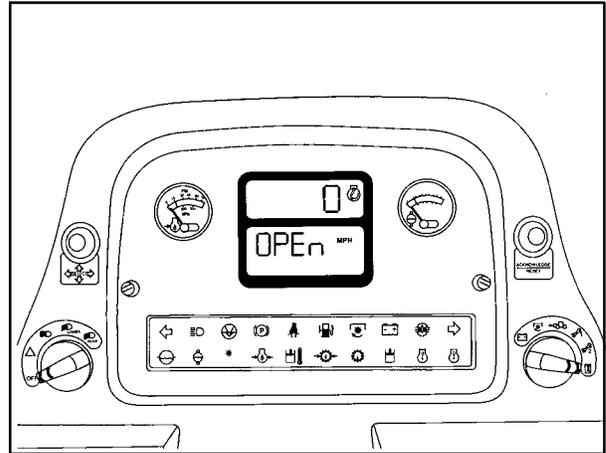


Figure 2-118

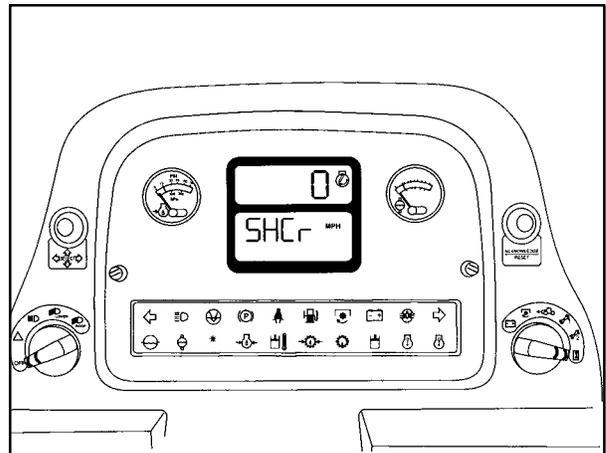


Figure 2-119

A transmission speed sensor open or short circuit is considered a non-critical alarm function and will not cause the electronic monitor to go into the “STOP” mode or cause the automatic shutdown to activate.

ATTENTION: *It is important that the operator shut the tractor off and find the cause of the open or short circuit to maintain proper operation of the Electronic Instrument Control System.*

Park Brake Alert

The Electronic Instrument Control System will notify the operator that the park brake has been left on while the tractor is moving. In the lower gear ranges, the tractor has enough power to over power the park brake if it is not fully released. Failure to release the park brake completely can cause damage to the brake and related driveline components. The following description details the reaction of the electronic monitor and audible alarm in the event the park brake is engaged with the tractor moving:

NOTE: **Any time the park brake is not fully released, the park brake indicator light on the warning light bar will be illuminated. The indicator light is completely independent of the electronic monitor and audible alarm.**

When the tractor is moving and the park brake partially or fully engaged, the audible alarm will sound rapidly and the upper portion of the monitor will flash “PARK” and “BRAK.” The lower portion of the monitor will continue to display whatever is selected on the rotary select switch.

Pressing the acknowledge/reset button will cancel the audible alarm but the “PARK” “BRAK” display will remain on the upper portion of the monitor. Releasing the park brake completely will cancel the “PARK” “BRAK” display, the audible alarm, and the park brake warning light.

A park brake alert is considered a non-critical alarm function and will not cause the electronic monitor to go into the “STOP” mode or cause the automatic shutdown to activate.

ATTENTION: *It is important that the operator release the park brake fully so that there is no damage to the brake or driveline components.*

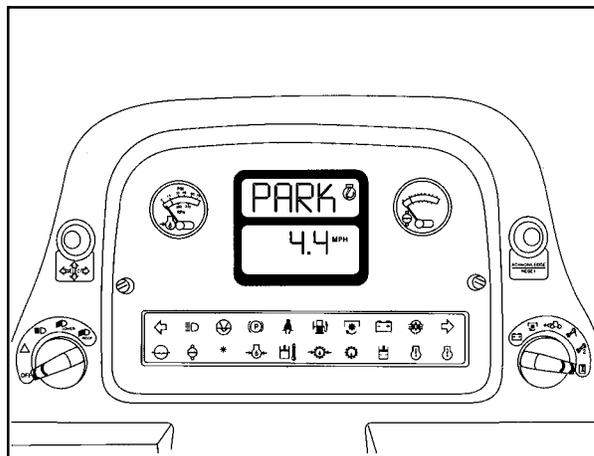


Figure 2-120

Electronic Monitor Rotary Select Switch Failures

The Electronic Instrument Control System will notify the operator that the rotary select switch has an open circuit. The select switch will not function in any of the calibration modes or normal operation positions. Refer to “Electrical Troubleshooting” in Section 4 for possible causes of an open circuit. The following description details the reaction of the electronic monitor in the event of an open circuit on the rotary select switch:

With the ignition in the “RUN” position and an open circuit detected on the rotary select switch, the lower portion of the monitor will flash “SEL” and “OPEN.” No audible alarm will sound. Pressing the acknowledge/reset button will not clear the “SEL” “OPEN” display. The upper portion of the monitor will continue to show engine RPM. The “SEL” “OPEN” display will be activated in any position of the rotary select switch if an open circuit is detected.

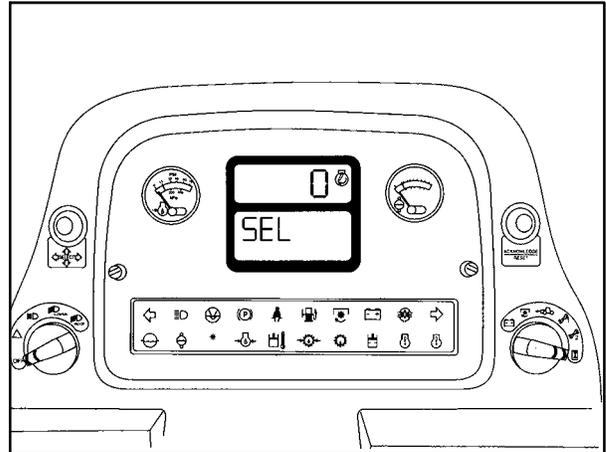


Figure 2-121

Engine Overspeed Condition

The engine control module monitors engine speeds (rpm) during normal tractor operation. The module will protect the engine from an overspeed condition anytime it senses engine speed above 2630 rpm. Overspeed can damage internal engine components (especially valve train components), causing severe failure of the engine.

An example of this would be a tractor that is towing an implement and operating at the full throttle position (e.g. transporting the tractor over the road). If the tractor was to go down an incline, the implement could begin to push the tractor, causing the drivetrain to overspeed the engine. If the engine speed reaches 2630 rpm, the module will illuminate the red engine warning light, 1, on the EICS light bar. The module will also cut power off to the fuel solenoid valve on the fuel pump so as to slow the engine down and prevent damage to internal components. When the engine speed drops below 2630 rpm, the red engine warning light will go out. When engine speed drops below 2000 rpm, the module will re-apply power to the fuel solenoid valve, and the engine will return to normal operation.

The Operator cannot cancel or interrupt the engine overspeed protection sequence from occurring on the engine. The module does not recognize activation of, nor is it tied into the EICS acknowledge/reset button on the dash of the tractor.

WARNING: KEEP THE TRACTOR IN GEAR WHEN GOING DOWNHILL. DO NOT SHUT THE TRACTOR ENGINE OFF, OR SHIFT THE TRANSMISSION TO NEUTRAL. USE A LOW GEAR TO MAINTAIN CONTROL WITH MINIMUM BRAKING. NEVER COAST THE TRACTOR DOWNHILL.

WARNING: TOWED LOADS THAT WEIGH MORE THAN THE WEIGHT OF THE TRACTOR SHOULD HAVE BRAKES FOR SAFE OPERATION. ENSURE COMPLIANCE WITH LOCAL REGULATIONS.

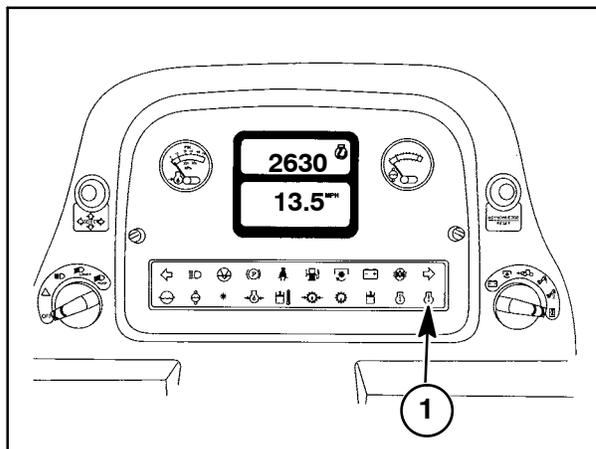


Figure 2-122

Yellow and Red Engine Warning Lights

The EICS has two engine lamps located in the lower right hand corner of the warning light bar. The module on the side of the engine controls these lights.

The yellow engine warning light, 1, will illuminate when the module senses non-critical electrical faults. Non-critical faults are related to the engine electrical components that communicate with the module. These components receive data from or send data to the module, which is used to control the engine performance. When a fault is detected in one of the electrical component circuits, the module will notify the Operator by illuminating the yellow engine warning lamp. Examples of electrical faults that can cause the yellow lamp to illuminate are (but not limited to):

- Loss of ground speed signal into the module from the tractor EICS
- Low/High voltage at specific pin connectors of the module
- Open/Shorted circuits connected to the module

The red engine warning light, 1, will illuminate when the module senses critical faults. Critical faults are related to the module itself (internal hardware) or to the engine electrical components that communicate with the module. These components receive data from or send data to the module, which is used to control the engine performance. When a fault is detected in the module hardware or one of the electrical component circuits, the module will notify the Operator by illuminating the red engine warning lamp. Examples of electrical faults that can cause the red lamp to illuminate are (but not limited to):

- Failure of the internal microprocessor of the module
- High/Low voltage signal from the throttle POT inside the tractor cab
- Loss of engine speed signal into the module

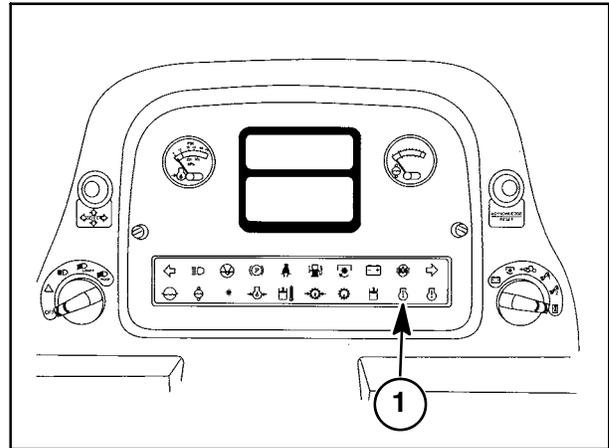


Figure 2-123

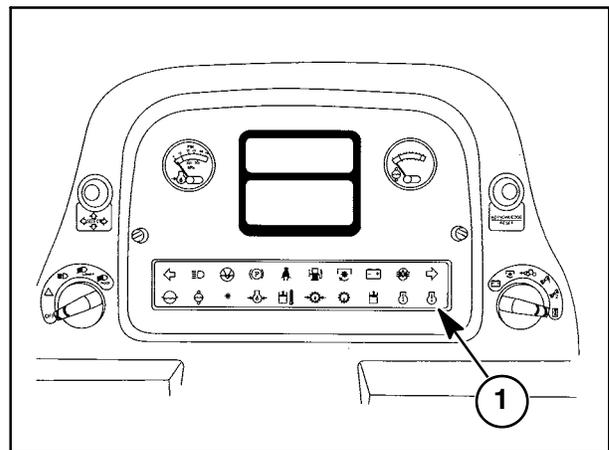


Figure 2-124

The module will illuminate the appropriate engine warning light (yellow or red) based on the source of the fault, and will take additional action by adjusting the performance of the engine by one of following methods:

- Illuminate engine warning light only, no performance modification
- Illuminate engine warning light, perform speed derate only
- Illuminate engine warning light, perform power derate only
- Illuminate engine warning light, perform speed and power derate

The appropriate engine warning light will remain illuminated and the performance derate will remain in effect until the system fault is corrected. The Operator cannot cancel or interrupt the derate sequence from occurring on the engine. The module does not recognize activation of nor is it tied into the EICS acknowledge/reset button on the dash of the tractor.

If the tractor is shut down and then restarted, and the electrical fault still exists on the tractor (non-critical or critical), the module will repeat the warning light and derate sequence. If the tractor is restarted and the fault has been corrected, the tractor will return to normal operation. If the tractor is not shut down, and the alarm condition is corrected, the tractor will return to normal operation without having to shut it off and restart it.

Important: Whenever an engine warning light (yellow or red) is illuminated on the EICS of the tractor shut the tractor down and contact your Buhler Versatile Dealer to investigate the cause of the concern. Your Buhler Versatile Dealer will coordinate the repair of the engine via an authorized Cummins Engine Company dealer/distributor.

ADDITIONAL FEATURES OF THE ELECTRONIC INSTRUMENT CONTROL SYSTEM

Automatic Shutdown Conversion - Each tractor is manufactured so that the operator can convert the Electronic Instrument Control System to shut the tractor engine off. Tractors are assembled with the engine shutdown feature disabled. The operator has the option of enabling the feature at any time.

If the operator desires to enable the automatic shutdown feature, proceed as follows:

1. Unhook the battery cables from the batteries. This will prevent any possibility of an accidental short while making the conversion. See Section 3 for information on how to disconnect the cables.

NOTE: Disconnecting the batteries will not remove any calibration numbers from the memory of the Electronic Instrument Control System. If the tractor is equipped with an optional Tractor Performance Monitor (TPM), the TPM may have to be reset.

2. Remove the cover, 1, from the electrical control panel located directly behind the operator's seat.

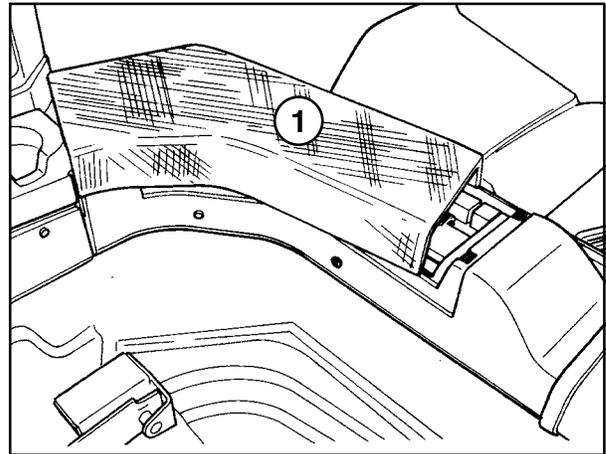


Figure 2-125

SECTION 2 - OPERATION

3. Locate the small pin connector, 1, for the shutdown circuit. The pin connector is between the 3-amp turn signal fuse and the 10-amp tail lamp fuse. Remove the 3-amp fuse and 10-amp fuse from their locations to give better access to the small pin connector.

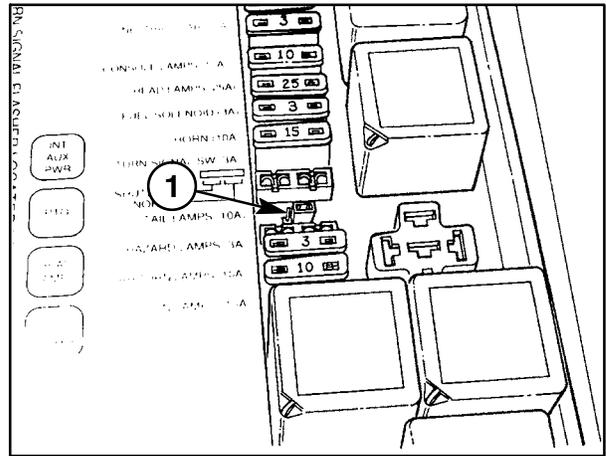


Figure 2-126

4. Using a small pair of needle-nose pliers, pull straight upward on the small pin connector, 1, and reinstall it so the front two pins are connected together. The rear pin will now be bare. Reinstall the 3-amp and 10-amp fuses.

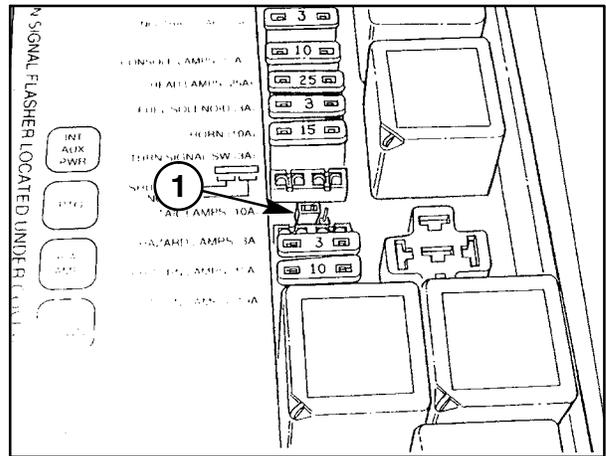


Figure 2-127

5. Locate the shutdown relay position, 1, (the fourth relay from the right), and install a relay (part #9706720 purchased from your Buhler Versatile dealership). Press the relay firmly into the electrical control panel.
6. Reinstall the cover onto the electrical control panel.
7. Reconnect the battery cables.

To disable the shutdown feature, follow this procedure in reverse order.

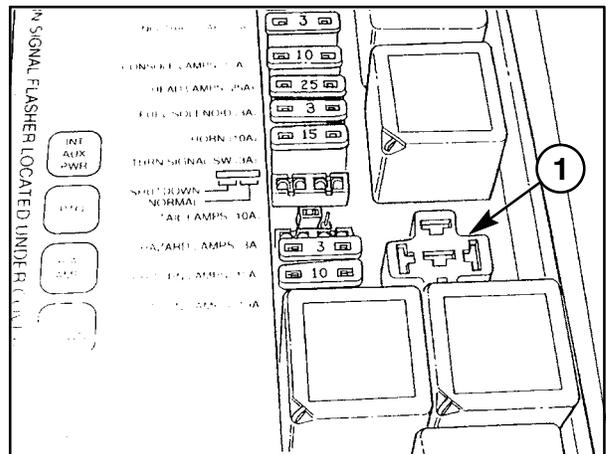


Figure 2-128

External Shutdown Conversion - Each tractor is manufactured so that the operator can convert the Electronic Instrument Control System to shut the tractor engine off via a signal from an outside source (i.e., a towed implement that is powered by a separate engine). If the tractor Electronic Instrument Control System receives a signal from an external source, the Electronic Instrument Control System will react in the same manner as detailed in “Low Engine Oil Pressure” or “High Engine Coolant Temperature”

If the external shutdown conversion is made on the tractor and a shutdown situation is present, the electronic monitor will not inform the operator whether it is a tractor function or an external signal causing the shutdown. The operator must look at the warning lights and gauges on the dash to determine the cause.

NOTE: Only low engine oil pressure or high engine coolant temperature will cause a tractor related automatic shutdown.

Tractors are assembled with the external engine shutdown feature disabled. The operator has the option of enabling the feature at any time.

If the operator desires to enable the external automatic shutdown feature, proceed as follows:

1. Unhook the battery cables from the batteries. This will prevent any possibility of an accidental short while making the conversion. See Section 3 in this manual for information on how to disconnect the cables.

NOTE: Disconnecting the batteries will not remove any calibration numbers from the memory of the Electronic Instrument Control System. If the tractor is equipped with the optional Tractor Performance Monitor (TPM), the TPM may have to be reset.

2. Locate the two-terminal bus bar, 1, on the right side of the electronic control panel.

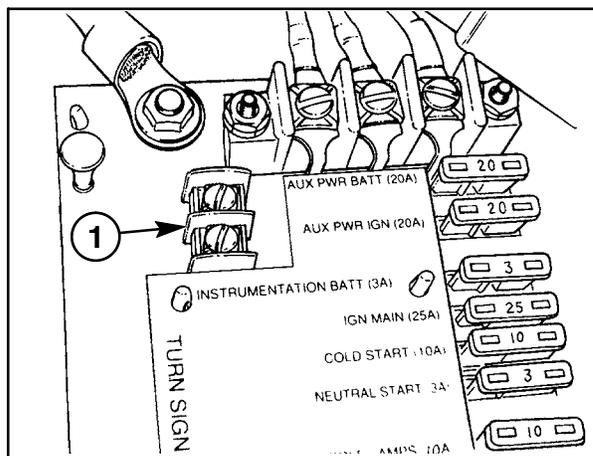


Figure 2-129

3. Attach the wire leading out to the external source to the right terminal of the bus bar, 1, (the terminal is marked "Shutdown External").
4. Route the wire out to the external source through the cover plate at the right rear corner of the cab. See "Installation of Cab-Mounted Accessories" for correct wire routing.
5. The external end of the wire must be hooked to a grounded sending unit of some type to provide a ground source for the Electronic Instrument Control System. An example of this would be an oil pressure sending unit or a coolant temperature sending unit on an external engine.

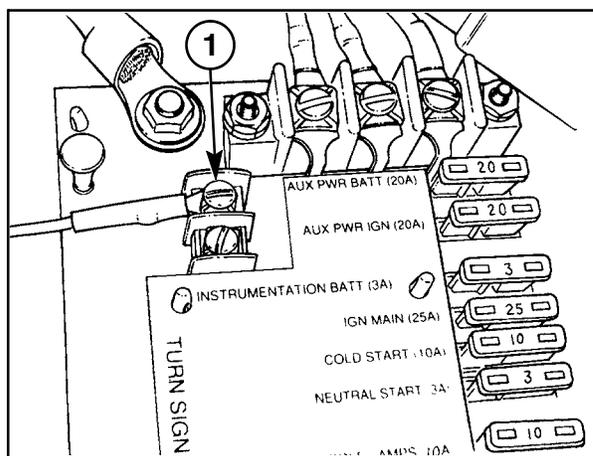


Figure 2-130

NOTE: Any type of external grounding source will work, but there must be a good ground connection between the towed implement and the tractor frame. Just using the drawbar pin may not be adequate, and a safety chain is suggested for additional ground contact.

6. Reinstall the cover onto the electrical control panel.
7. Reconnect the battery cables.

To disable the shutdown feature, follow this procedure in reverse order.

External Alarm Control Conversion - Each tractor is manufactured so that the Electronic Instrument Control System can be converted to inform the operator, via the electronic monitor and audible alarm, that there is a problem with an outside source (i.e., a towed implement that is powered by a separate engine).

If the tractor Electronic Instrument Control System receives a signal from an external source, the upper portion of the electronic monitor will flash “EXT” “ALR”. The audible alarm will beep rapidly. The lower portion of the monitor will continue to display whatever is selected on the rotary select switch.

The operator can cancel the audible alarm and the “EXT” “ALR” display by pressing the acknowledge/reset button. The audible alarm and display will return if the external signal is received by the monitor again.

NOTE: On tractors equipped with a Tractor Performance Monitor (TPM), the external alarm feature will activate when the “% slip” or “Time of Day” alarm settings are reached. See the TPM operation section of this manual for further information.

When the external audible alarm control is enabled and a signal is received by the Electronic Instrument Control System from an outside source, the automatic shutdown feature will not be engaged.

Tractors are assembled with the external alarm control feature disabled. The operator has the option of enabling the feature at any time.

If the operator desires to enable the external alarm control feature, proceed as follows:

1. Unhook the battery cables from the batteries. This will prevent any possibility of an accidental short while making the conversion. See Section 3 for information on how to disconnect the cables.

NOTE: Disconnecting the batteries will not remove any calibration numbers from the memory of the Electronic Instrument Control System. If the tractor is equipped with the optional Tractor Performance Monitor (TPM), the TPM may have to be reset.

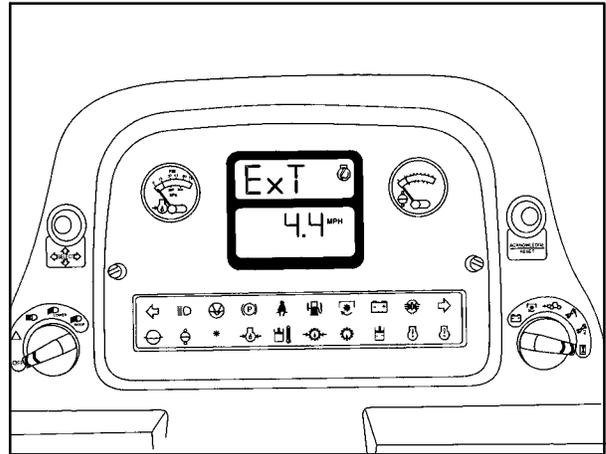


Figure 2-131

2. Locate the two-terminal bus bar on the right side of the electronic control panel.

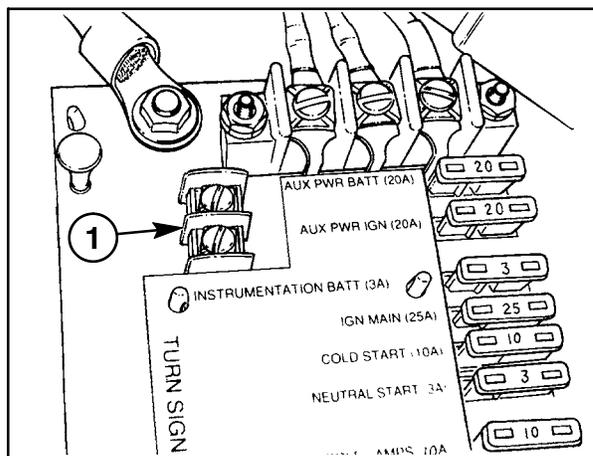


Figure 2-132

3. Attach the wire leading out to the external source to the left terminal of the bus bar, 1, (the terminal is marked "Audio External").
4. Route the wire out to the external source through the cover plate at the right rear corner of the cab (See "Installation of Cab-Mounted Accessories" in Section 1 for correct wire routing).
5. The external end of the wire must be hooked to a grounded sending unit of some type to provide a ground source for the Electronic Instrument Control System. An example of this would be an oil pressure sending unit or a coolant temperature sending unit on an external engine.

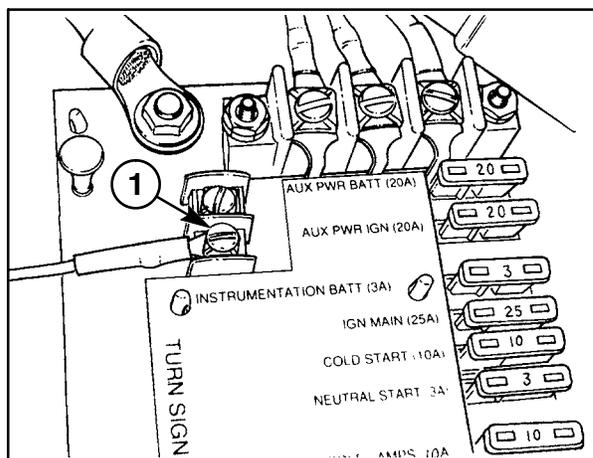


Figure 2-133

NOTE: Any type of external grounding source will work, but there must be a good ground connection between the towed implement and the tractor frame. Just using the drawbar pin may not be adequate, and a safety chain is suggested for additional ground contact.

6. Reinstall the cover onto the electrical control panel.
7. Reconnect the battery cables.

To disable the shutdown feature, follow this procedure in reverse order.

NOTE: There is a secondary source for connecting an external signal to the external alarm control system. This source is the number four pin (the bottom post) on the four-post bus bar located in the right front cab post, behind the gauge cowling. See "Installation of Cab-Mounted Accessories" in Section 1 for more information on the four post bus bar.

Engine Diagnostics

The control module on the engine has diagnostic features built into it that allow an authorized Cummins dealer/distributor to access and review fault codes that have occurred in the engine.

Each time a fault occurs in the system, the module records it in memory. The Cummins dealer/distributor can retrieve these codes to assist in diagnosing an engine failure. Two methods of error code retrieval are possible:

Flashing Light Retrieval: Your Buhler Versatile Dealer can use a shorting connector located on the fuse and relay panel at the rear of the tractor cab. The connector, 1, labeled "DIAGNOSTICS", is located in the lower right hand corner of the panel. When activated, the

shorting connector will cause the yellow engine warning light to flash once, then the red engine warning light (both lights located on EICS light bar) to flash in a predetermined sequence based on the fault code resident in the memory of the module. The yellow engine warning light will flash once more to signify the end of the error code sequence. To cycle to the next error code press the cruise +/- switch once, and the engine lights will begin a new flash sequence for the next code. Continue this way until error codes start to repeat, signifying no new codes are present. The flashing light sequences are then decipherable to fault codes that tell the Buhler Versatile Service Technician the concern with the engine. The flashing light method of fault code retrieval is very similar to Morse code communication between the engine and the service technician.

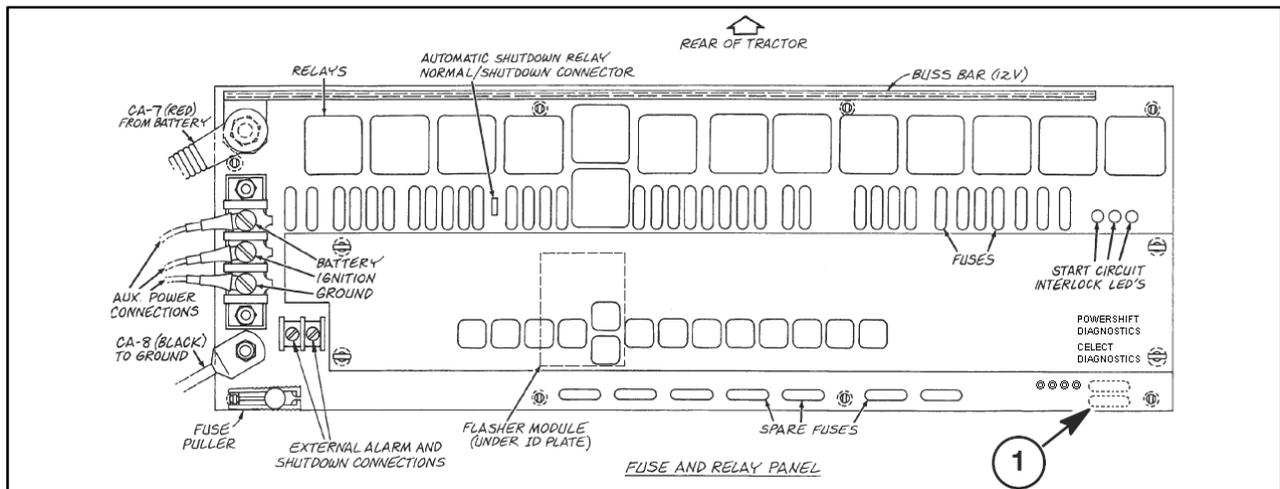


Figure 2-134

Echek™ /Compulink™ /Insite™ Connection: Authorized Cummins dealers/distributors have access to hand held diagnostic tools that can be connected to the electronic module via a data link connector resident on the engine wire harness. The Echek/Compulink/Insite diagnostic tools allow the technician to read engine fault code information directly, download software upgrades to the module and make modifications to existing software in the module.

Regardless of the method of fault code retrieval, the electronic engine control system makes it easy for the service technician to diagnose engine concerns and make repairs to the cause of the fault code.

ATTENTION: Diagnostic procedures on the engine are to be completed only by an authorized Cummins dealer/distributor or Buhler Versatile Dealer.

Do not attempt to enter the diagnostic mode of the module without direct involvement from your Buhler Versatile Dealer or Cummins dealer/distributor.

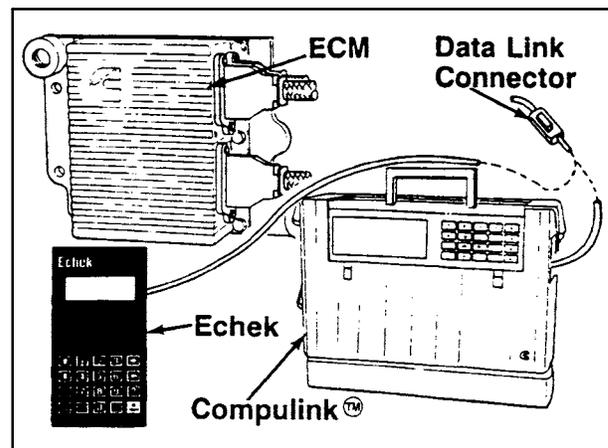


Figure 2-135

TRACTOR PERFORMANCE MONITOR (Optional)

DESCRIPTION AND OPERATION

The optional Tractor Performance Monitor automatically begins to work as the ignition switch is turned to the "RUN" position.

The system consists of the following items:

Control Console - LCD display and three touch-sensitive switches.

Radar Ground Speed Sensor- Determines true ground speed.

Implement Status Switch - Determines whether implement is engaged.

Transmission Output Shaft Sensor - Actual wheel speed.

The system provides operating information on:

Area/Hour - Acres (or Hectares) per hour based on last five seconds of operation.

Area - Total accumulated area (since the last reset of AREA display).

Slip - Wheel slip in percent (%) with alarm.

Each function readout can be displayed by touching the respective switch (except alarms) at any time.

Control Console

The console, 1, contains a 4-digit readout and messages to inform the operator of the value and function being displayed.

The three touch-sensitive switches, 2, are used to display different data. The print and symbols on the top half of the switches indicates switch function when in OPERATE mode. The symbols on the lower half of switches indicate a switch function when in SET UP mode. The location of the 'caret' in the display area indicates information selected. A bar graph at top of display indicates slip percentage.

The display is backlit for night visibility when the rotary light switch is in positions three, four, or five. The TPM uses a number **GE-73** bulb for the backlit display. The console is active with the ignition switch in the "RUN" position. The memory is retained if the battery is disconnected.

NOTE: Whenever the ignition switch is turned from "OFF" to "RUN," the performance monitor will automatically be in the OPERATE mode.

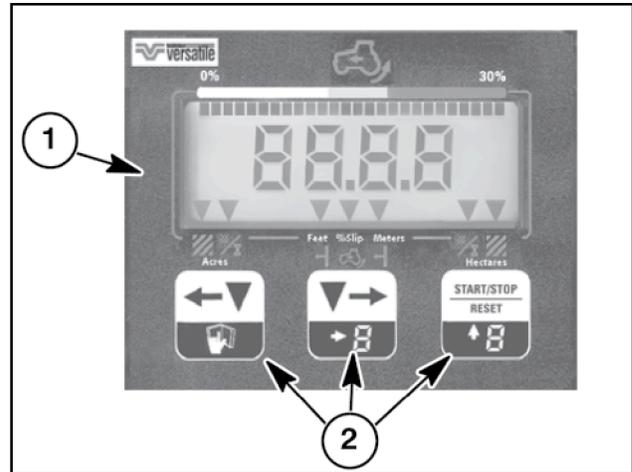


Figure 2-136

Radar Ground Speed Sensor

The radar sensor, 1, provides the Electronic Instrument Control System with a true ground speed input. This sensor signal is shared with the performance monitor and compared to the transmission output speed sensor signal to provide "% SLIP" readings. The true ground speed also provides the base for accurate "AREA/HR" readings.

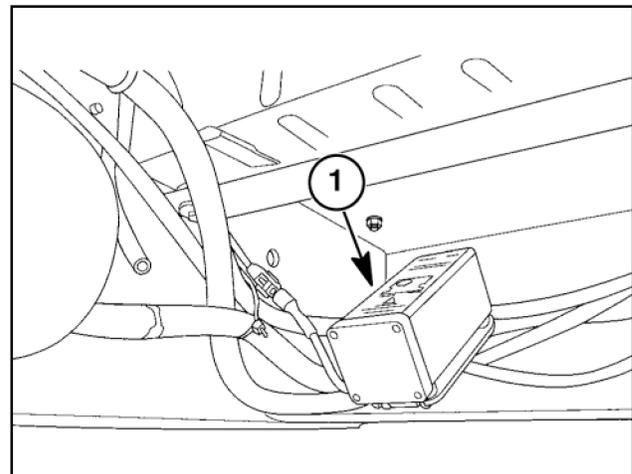


Figure 2-137

Implement Status Switch

The implement status switch, 1, installed at a location on the 3-point hitch or on the drawbar implement, indicates to the console whether the implement is up (area accumulation off) or down (area accumulation on).

The console displays an “UP” message which should be synchronized with the implement position.

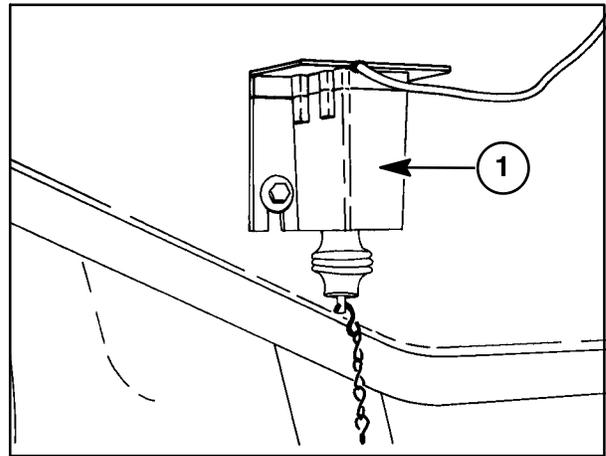


Figure 2-138

OPERATOR'S CONTROLS

The various functions of the touch-sensitive switches of the performance monitor are detailed in the following description. **Read through this description completely before attempting to use the switches.**

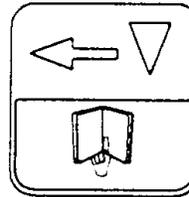
Each of the three touch-sensitive switches is multifunctional, performing one function in the OPERATE mode and another function in the SET UP mode.

The SET UP functions are indicated on the switch by symbols in the lower half and OPERATE functions in the upper half.

NOTE: Whenever the ignition switch is turned from “OFF” to “RUN,” the Tractor Performance Monitor will automatically be in the OPERATE mode.

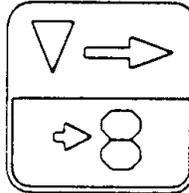
Each **correct touch operation** of any switch will be accompanied by a short beep from the alarm.

MOVE CARET LEFT / SETUP

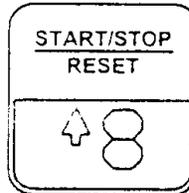


- HOLD 5 SEC. TO ENTER SETUP
- PRESS AGAIN TO SCROLL FUNCTIONS
- HOLD 5 SEC. TO EXIT SETUP

MOVE CARET RIGHT / DIGIT SELECT



START/STOP & RESET / DIGIT INCREMENT



- ON/OFF SWITCH FOR DISTANCE CALIBRATION, ZERO SLIP CALIBRATION AND DISTANCE COUNTER
- HOLD 5 SEC. TO RESET COUNTER
- IN SLIP MODE, HOLD 5 SEC. TO ZERO SLIP

XXX

XXXXXXXXX

TPM SWITCH & ICONS

User Interface

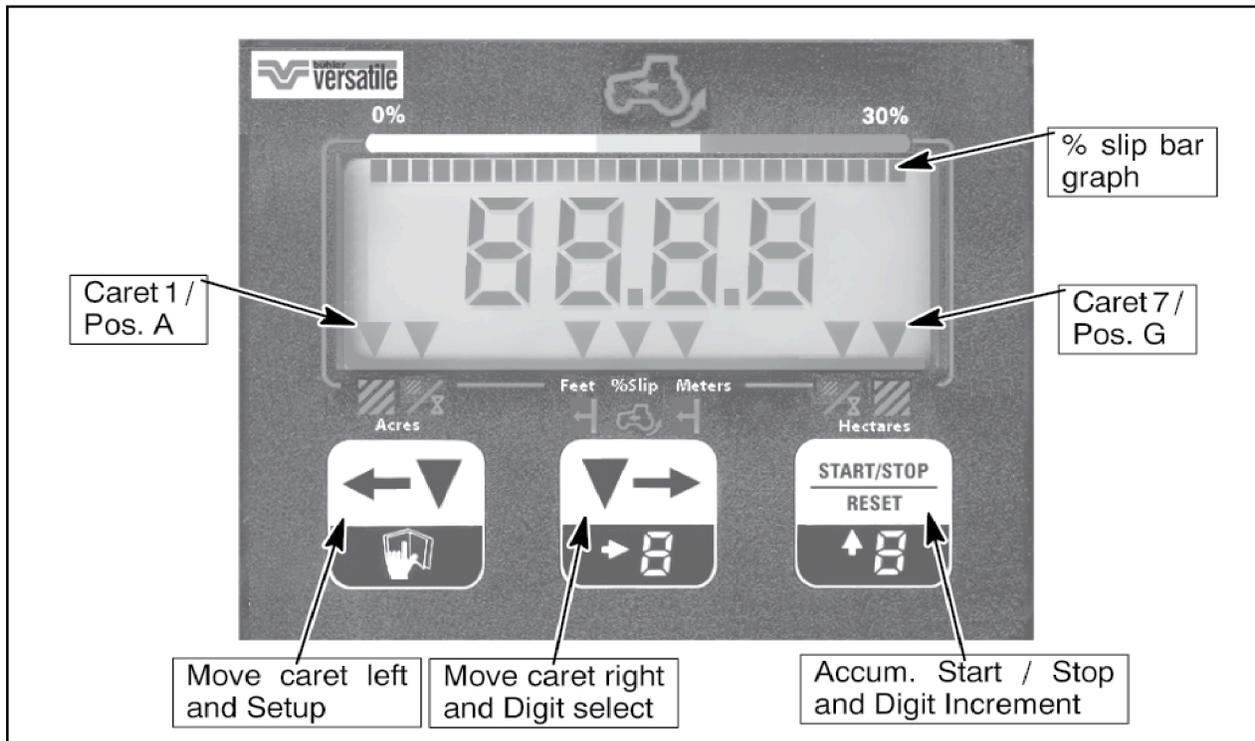


Figure 2-139

CARET	POS.	SYMBOL	FUNCTION
1	A	Block with hash marks	Acres Accumulator
2	B	Block with hour glass	Acres/Hour
3	C	Line w/ left pointing arrow	Feet Accumulator
4	D	Tractor w/ rotating arrow	% Slip
5	E	Line w/ left pointing arrow	Meters Accumulator
6	F	Block with hour glass	Hectares/Hour
7	G	Block with hash marks	Hectares Accumulator

The Buhler Versatile TPM has two modes:

1. **Operate Mode:** The TPM displays information that corresponds to the designated caret location and percent slip in a bargraph form at the top of the display.

2. **Setup Mode:** There are two levels, user setup level and factory setup level.

OPERATE MODE

Power Up Sequence

No instruments are displayed during the power up sequence. The default caret for operating is caret 4 / Pos. D, percent slip.

Operation Instruments

In the operate mode, the TPM consists of two displays. One displays the bargraph at the top of the LCD, the second is the digital readout of one of seven functions indicated by the caret at the bottom of the LCD. To change which digital function is displayed, press the left or right touch switches that are below the LCD. All of the instruments are updated every second.

Bargraph Percent Slip

The TPM constantly displays the percentage of slip in the 0--30% bargraph at the top of the LCD. The bargraph does not flash when 30% is exceeded.

Caret 1/ Pos. A Acre accumulator

This displays the acres covered in XXX.X format based on the implement width and the ground speed. The display increments as long as the implement status is down. When the implement status is up, the acres value stops accumulating and flashes the value when the acre accumulator caret is selected.

Caret 2/ Pos. B Acres per hour

This displays the calculated acres covered per hour in XXX.X format based on the implement width and ground speed. This display updates as long as the implement status is down. When the implement status is up, the acre per hour value will display “.0” and an alarm will sound for 3 seconds to indicate that the implement is up.

**Caret 3/ Pos. C Distance Accumulator
(Feet)**

This accumulates feet from the radar input in an XXXX format. To start and stop the distance accumulator, select a distance accumulator caret function and press the start/stop touch switch. To reset the distance accumulator press and hold the start/stop touch switch until the LCD blinks and displays “0”. The distance accumulators (feet and meters) are tied together, so starting, stopping, or resetting either distance accumulator does the same action on the other caret function. The accumulated distance flashes when accumulation stops.

Caret 4/ Pos. D Percent slip

This displays the percentage difference between the radar input and the sensor input from the transmission in XXXX format. The slip caret flashes when the slip is greater than the slip alarm percentage regardless of what function is being viewed. When the caret is flashing, a continuous alarm sounds until the slip drops below the slip alarm percentage. While in the alarm condition, other carets can still be selected and viewed; however the slip caret will continue to flash until the slip drops below the slip alarm value. The default alarm percentage is 15%.

**Caret 5/ Pos. E Distance Accumulator
(Meters)**

This accumulates meters from the radar in an XXXX format. To start and stop the distance accumulator, select a distance accumulator caret function and press the start/stop touch

switch. To reset the distance accumulator press and hold the start/stop touch switch until the LCD blinks and displays “0”. The distance accumulators (feet and meters) are tied together, so that starting, stopping, or resetting either distance accumulator does the same to the other caret function. The accumulated distance will flash when accumulation has stopped.

Caret 6/ Pos. F Hectares per hour

This displays the calculated hectares covered per hour in XXX.X format based on the implement width and ground speed. This display updates as long as the implement status is down. When the implement status is up the hectare per hour value will display “.0” and an alarm will sound for 3 seconds to indicate that the implement is up.

Caret 7/ Pos. G Hectare accumulator

This will display the hectares covered in XXX.X format based on the implement width and the current speed in XXX.X format. This display will increment as long as the implement status is down. When the implement status is up the hectares value will stop accumulating and flash that value when the hectare accumulator caret is selected.

Slip Alarm

When the percent slip is above the alarm percent setting a continuous audible alarm sounds and the slip caret flashes until the percent slip drops below the alarm value. If the percent slip caret is selected during an alarm condition, the current slip value will be displayed and updated. The maximum value that can be displayed is 30%.

NOTE: Whether in Percent Slip mode or not, when the alarm percentage is reached, the TPM will activate the alarm.

Zeroing Slip Function

To set the zero slip, select the percent slip caret and drive the tractor at a constant speed in a zero slip condition then press and hold the reset touch switch for three seconds until the LCD blinks.

Acres Accumulator Zeroing Function

To reset the acres accumulators to zero, select the acres area accumulator and press and hold the reset touch switch for three seconds until the LCD blinks and displays “.0”. This resets the acre area accumulator to zero.

Hectares Accumulator Zeroing Function

To reset the hectares accumulator to zero, select the hectares area accumulator and press and hold the reset touch switch for three seconds until the LCD blinks and displays “.0”. This resets the hectare area accumulator to zero.

PROGRAMMING AND CALIBRATING

This procedure includes entering information into the Tractor Performance Monitor (TPM) memory, calibrating the TPM to the ground speed sensor, setting the %Slip alarm, and calibrating the zero wheel slip.

- STEP 1 - Setting the implement width
- STEP 2 - Setting the %Slip alarm limit
- STEP 3 - Setting the ground speed calibration number
- STEP 4 - Distance calibration verification
- STEP 5 - Zero wheel slip

Entering the SET UP Mode

To enter the SET UP mode, the ignition switch must be turned to the “RUN” position. Hold down the SELECT switch, 1, for 5 seconds. The console display will at first begin to flash 4 dashed lines (-----). Continue to hold the SELECT switch until the 4 dashed lines come on solid. Release the SELECT switch and the first SET UP mode Cd 1 will be displayed.

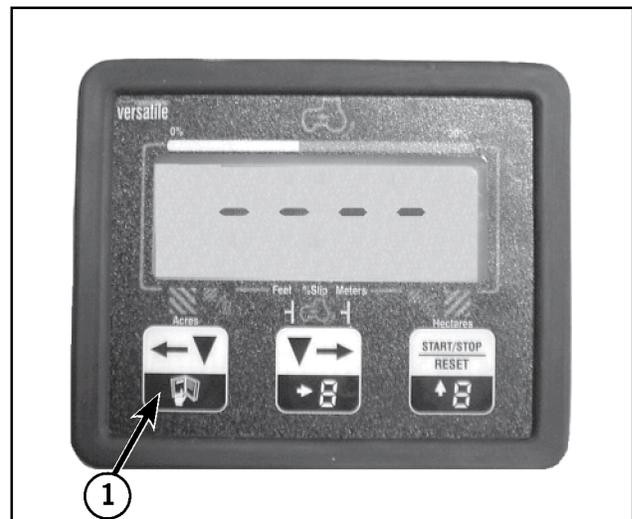
Selecting different settings while in SET UP mode

While in the SET UP mode, you can scroll through the available setting by repeatedly pressing the SELECT switch, 1.

In the user SET UP mode there are four configurable settings:

- Cd 1 - %Slip alarm limit
- dC 1 - Ground speed calibration
- dC 2 - Known ground speed constant
- b 1 - Implement width

Programming and calibrating must be carried in the following order. Values entered into specific steps have an effect on other areas of calibration. **Do not deviate from the order or steps given.**



STEP 1 - Setting the implement width

The first setting to be configured will be the implement width (b 1).

With the TPM in its SET UP mode, use the SELECT switch, 1, to change the console display to read b 1.

To enter mode b 1, momentarily press the START/STOP button, 2.

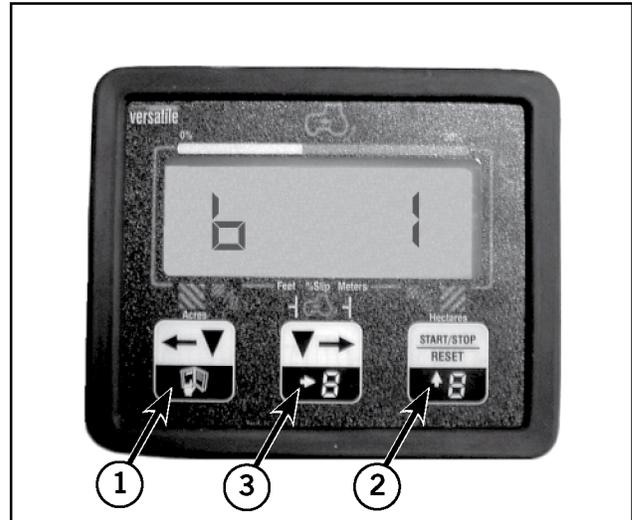
The console display will change to show 4 digits (XXXX), one digit will be flashing.

Touching the DIGIT SELECT switch, 3, will select the digit to be changed. The selected digit will flash. Set the proper value for each digit by repeatedly touching the START/STOP switch.

The implement width must be programmed accurately when different implements are used to ensure proper area readings. Be sure to consider any overlap that occurs, particularly with tillage equipment.

Once the implement width has been set, touch the SELECT switch, 1, to advance to the next step the %Slip alarm limit.

NOTE: The implement width can be changed at any time and the remaining steps; once configured, do not need to be repeated.

**STEP 2 - Setting the %Slip alarm**

The second setting to be configured will be the %Slip Alarm limit (Cd 1).

With the TPM in its SET UP mode, use the SELECT switch, 1, to change the console display to read Cd 1.

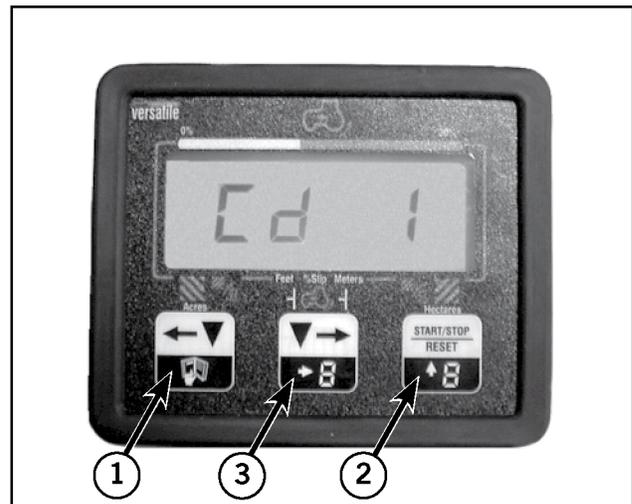
To enter Cd 1, momentarily press the START/STOP button, 2.

The console display will change to show 4 digits (XXXX), one digit will be flashing.

Touching the DIGIT SELECT switch, 3, will select the digit to be changed. The selected digit will flash. Set the proper value for each digit by repeatedly touching the START/STOP switch.

NOTE: TPM units will come with the %Slip Alarm set to 0100.

Once the %Slip Alarm has been set, touch the SELECT switch, 1, once to advance to the next step Ground Speed Calibration.



STEP 3 - Setting the Ground Speed Calibration number

The second SET UP mode is the Ground Speed Calibration (dC 1).

To determine the Ground Speed Calibration number, proceed as follows.

Measure accurately a 122 m (400') course, in a straight line on hard, level ground.

Mark the start and finish points.

With the TPM in its SET UP mode, use the SELECT switch, 1, to change the console display to read dC 1. dC 1 is the Ground Speed Calibration mode.

To enter the Ground Speed Calibration mode press the START/STOP button, 2, once. The console display will change to show 4 digits (XX.XX).

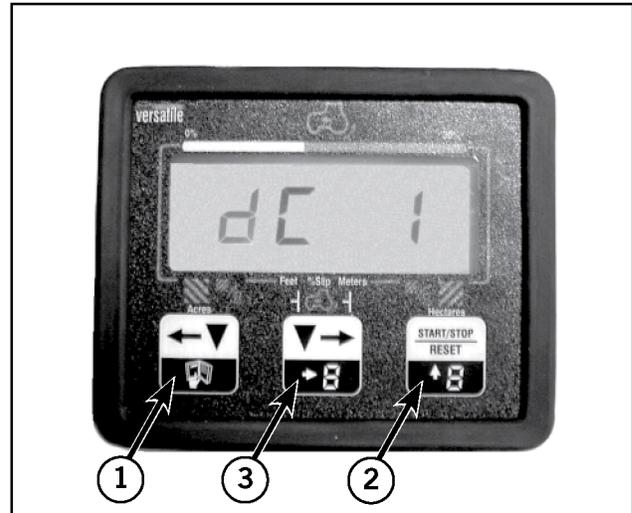
Proceed onto course and as you drive past the start marker touch the START/STOP switch. The console display will begin counting up from 00.00.

Drive the 122m (400') course at a moderate and steady speed.

As you drive past the 122m (400') marker touch the START/STOP switch again. The display will show a Ground Speed Calibration number (approx. 40.00).

Touch the SELECT switch once to exit the Ground Speed Calibration mode. The console display will show the next mode (dC 2).

The TPM calibrations are now complete. To exit out of the SET UP mode press and hold the SELECT switch. As you hold down the SELECT switch the console display will begin to flash 4 dashed lines (-----). Continue to hold until the dashed lines come on solid. Release the SELECT switch and you are now out of the SET UP mode and are now back in normal operating mode.



STEP 4 - Distance calibration verification

Confirm that the Ground Speed Calibration has been done correctly by performing a distance calibration verification.

Press the DIGIT SELECT switch, 3, until the CARET is pointing to the “metre” or “feet” display indicator.

Reset the digital readout on the console display using the START/STOP switch, 2, to show zero.

Drive at moderate speed and touch the START/STOP switch, 2, at the 122 m (400') marker. The display will begin to count the distance.

Touch the START/STOP switch, 2, as you pass the end marker. The display will stop, indicating the distance traveled.

The display should show 121 - 123 meters (396 ft -- 404 ft) if the Ground Speed Calibration in STEP 3 was done correctly.

NOTE: If the display number is incorrect repeat the Ground Speed Calibration done in STEP 3.

STEP 5 - Zero wheel slip

To insure an accurate readout of the %Slip, the console must be set to a zero wheel slip condition.

Press the DIGIT SELECT switch until the CARET is pointing to the “%Slip” display indicator.

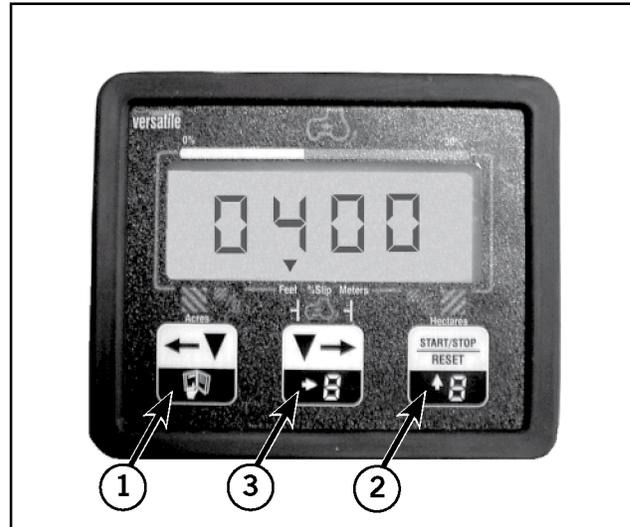
Drive the tractor in a straight line in normal gear, at a slow and steady pace, in a zero slip condition.

While the tractor is traveling press and hold the START/STOP switch for 3 to 5 seconds until the console display blinks and the %Slip reads zero.

You have now zeroed the %Slip display.

Factory Setup

To enter the factory setup press and hold the setup key at power up of the TPM. When in this mode the user will be able to change five constants. These constants are always to be entered in U.S. units. To advance the next constant press the setup touch switch. To edit the constant use the digit select touch switch to step through the digits and use the digit increment key to change the desired digit.



The first constant (Fb1) is the slip alarm in percentage. The default for the slip alarm is 15%. The second constant (dc1) is the ground speed course distance in feet. The default for the ground speed course distance is 400 ft.

The third constant (dc2) is the running ground speed calibration. This constant can be captured when a 400 foot course has been marked off as outlined in Step 3 of Operator Calibration Mode.

The fourth constant (dc3) is the ground speed constant entry. This constant will be displayed with one of the numbers flashing. This number can be incremented by using the start//stop touch switch. The selecting of numbers can be done by pressing the digit select touch switch will move to the next left digit. The default constant is 34.56. The third and fourth constant values will always be the same.

The fifth constant (Fp1) is ground speed cutoff. This value is the ground speed in MPH that when the area accumulators will stop incrementing. The default value is 1.0 MPH.

IMPLEMENT STATUS SWITCH

The implement status switch is to be mounted to the tractor for 3-point hitch applications, or to the implement for drawbar applications, to provide an “on/off” signal to the Tractor Performance Monitor (TPM) to start and stop the calculation of the area covered.

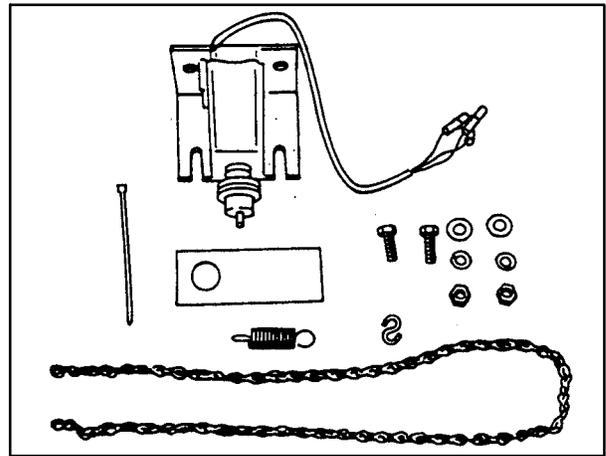


Figure 2-140

Examples of various mounting arrangements are shown:

- A. Tractor Equipped with 3-Point Hitch - The implement status switch is attached to the fender and connected to the lift arm.

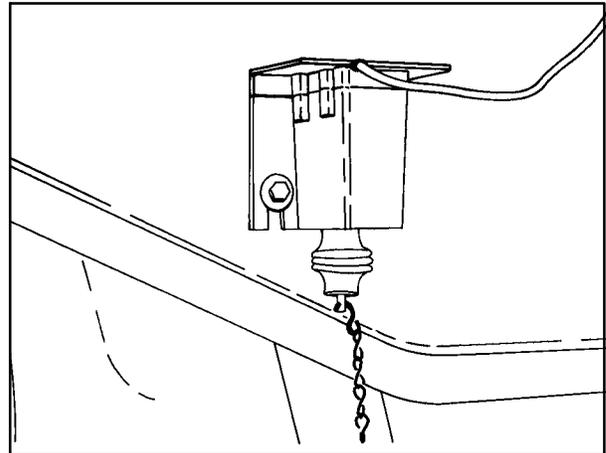


Figure 2-141

- B. Remote Mount to an Implement - The implement status switch is attached to the linkage that lifts the implement.

Instructions for mounting the switch are provided with the kit. Tractors with a factory-installed TPM will have the switch shipped with it.

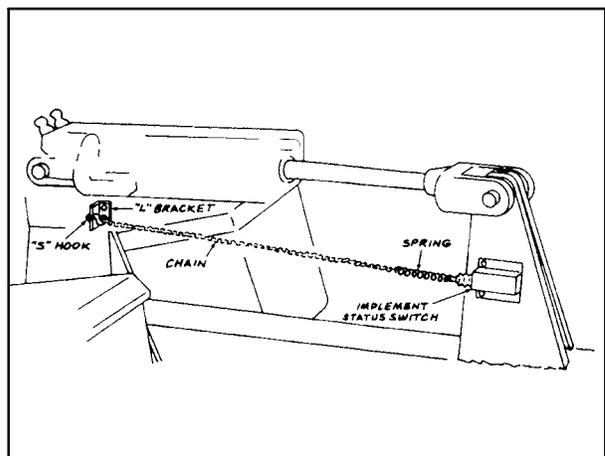


Figure 2-142

NOTE: In order to remote mount the implement status switch on a trailing implement, the tractor will require a remote mount wiring harness kit available from your Buhler Versatile dealer (part #86001101). The wiring harness has a male connector that will plug into the trailer light socket at the rear of the tractor and will connect the remote mount implement status switch with the TPM via the tractor's wiring harness. No additional wiring modifications are necessary to remote mount the implement status switch.

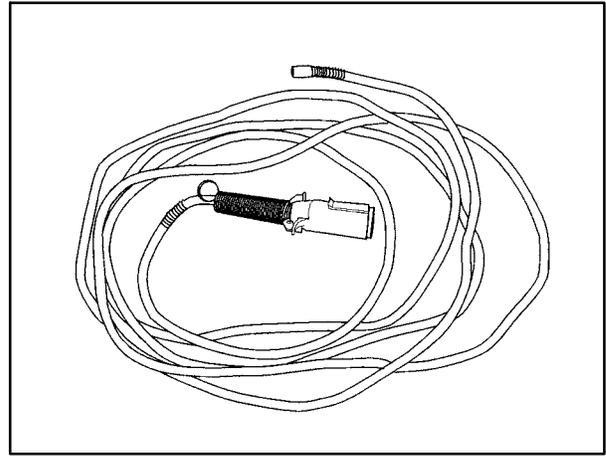


Figure 2-143

DRAWBAR ASSEMBLY

Manual Hitch Pin - BSN 300919

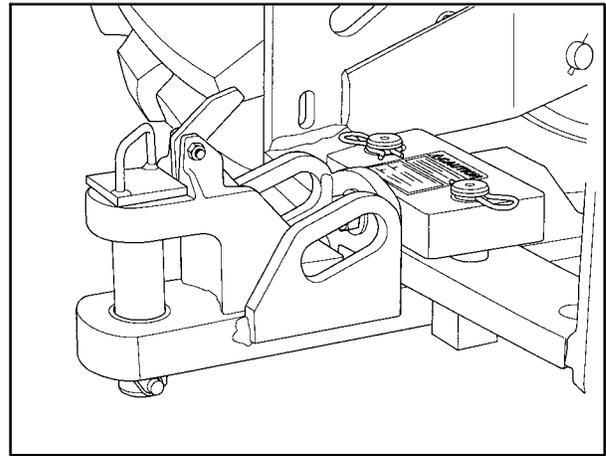


Figure 2-144

Automatic Hitch Pin - ASN 300918

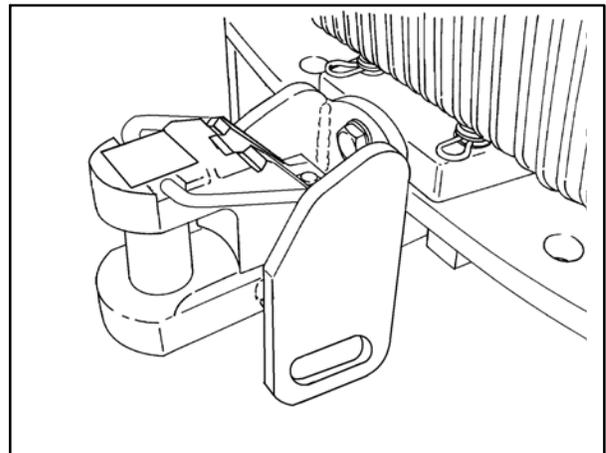


Figure 2-145

DRAWBAR ASSEMBLY

The drawbar height is fixed and must not be altered. It is designed to produce maximum traction for the wheelbase, tire size, weight distribution and ballast of the tractor. The drawbar length is nonadjustable and the hitch pin distance is 508 mm (20") from the end of the PTO shaft if the tractor is equipped with the optional PTO.

The bolt-on clevis on the manual hitch pin, 1, can be removed and bolted to the bottom of the drawbar to accommodate implement and PTO hookup.

IMPORTANT: A clip pin must be installed through the drawbar pin to hold it when the clevis is flipped over for PTO use.

IMPORTANT: This arrangement is not approved with the Automatic Hitch Pin.

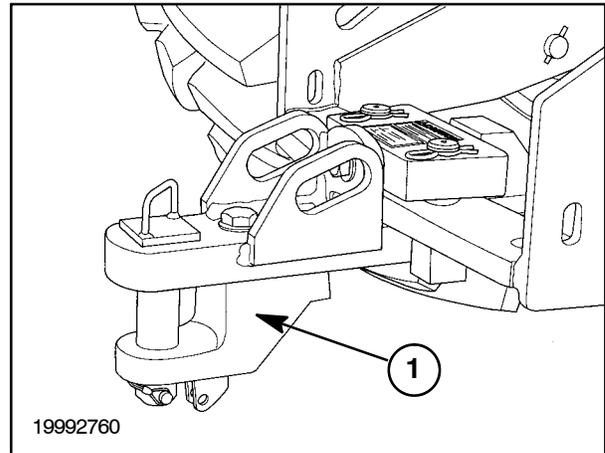


Figure 2-146

The drawbar is free-swinging and should be positioned for the best performance and the least side draft. There are five drawbar positions on a unit *without* a 3-point hitch option. To swing the drawbar, pull the hairpin clips, 1, from the wear blocks, 2. Remove the wear blocks, swing the drawbar to the desired position, and reinstall the wear blocks. On tractors without 3-point hitch, one single pin is used on any position except the center position, where two are used.

NOTE: Drawbar with Manual Hitch Pin shown.

On tractors that have a 3-point hitch installed, both wear block pins can be installed when the drawbar is swung to the right or left position. Three-point hitch equipped tractors have three drawbar positions.

Choose a position that is right for the job and insert the pin and wear block(s) in that position to keep the drawbar from moving.

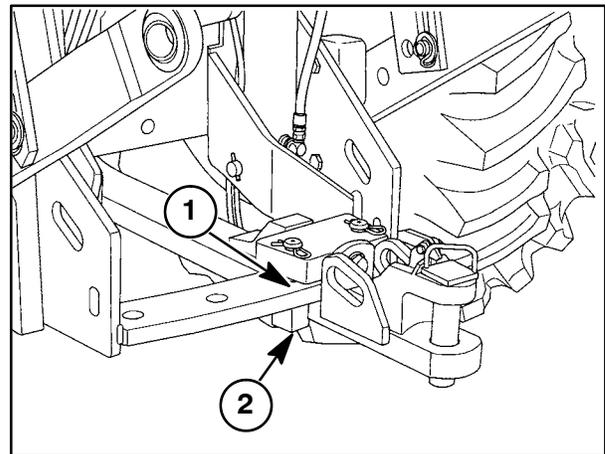


Figure 2-147

It is recommended that the drawbar be pinned in position at all times. On occasion, it may be necessary to allow the drawbar to swing freely for implements that place side loads on the rear of the tractor. The drawbar can be used in a swinging application but may require replacement of the drawbar wear block after extended use.

Clevis-type implement hitches should be connected only to the lower plate of the drawbar. Other hitches should be connected between the plates as shown on the decal on top of the drawbar wear block.

DRAWBAR WITH MANUAL HITCH PIN

All Models are manufactured with a 50.8 mm (2") drawbar pin, 1.

The tractor can have a kit installed to convert it to the 38.1 mm (1-1/2") drawbar pin.

The drawbar pin, regardless of size, is retained in place using a latch, 2, that locks the pin in place. The 38.1 mm (1-1/2") pin also has a click pin installed at the bottom of the pin.

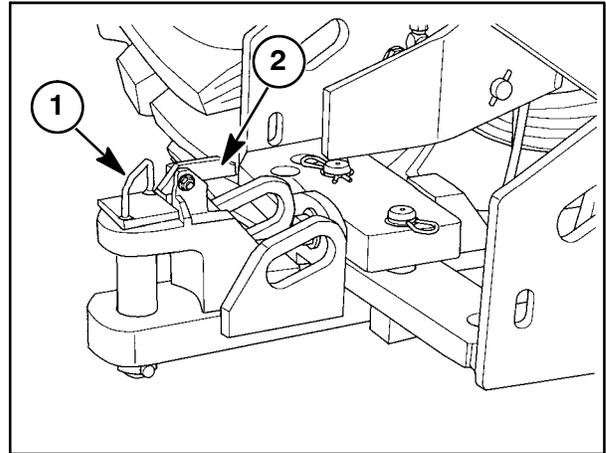


Figure 2-148

To remove the drawbar pin from the drawbar, lift the front side of the latch, 1, and pull the pin from the drawbar. Reinstall the pin and pivot the latch forward to lock the pin in place.



CAUTION: NEVER ATTACH AN IMPLEMENT TO THE DRAWBAR IF THE DRAWBAR PIN LATCH IS DAMAGED OR MISSING. REPAIR OR REPLACE THE LATCH.

CAUTION: DO NOT ALLOW MATERIAL BUILDUP IN THE DRAWBAR PIN AREA SO THAT THE MATERIAL CAN INTERFERE WITH PROPER DRAWBAR PIN LATCH OPERATION.

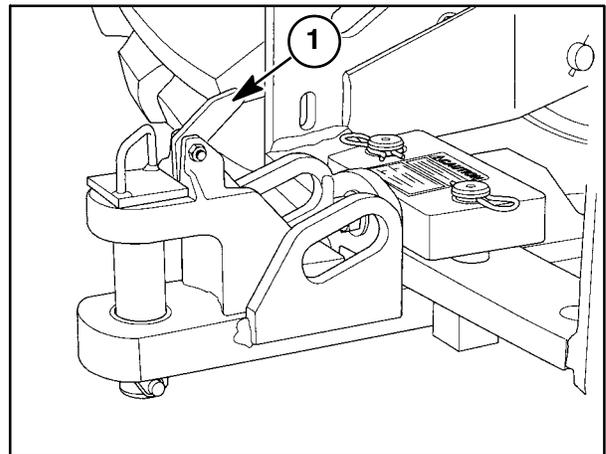


Figure 2-149

DRAWBAR WITH AUTOMATIC HITCH PIN

The drawbar is equipped with a hitch pin that will automatically drop in place when hitching up to implements.

To operate, place the hitch pin, 1, in the raised position. Retaining ring, 2, fits in the upper notch, 3, of the clevis to hold the hitch pin in the raise position. Release strap, 4, must be positioned in front of the retaining ring as shown. The drawbar is now prepared to hitch to the implement.

When backing the tractor to attach the implement, the implement hitch will contact the release strap, 4, when aligning the drawbar. As the release strap is pushed forward it dislodges the retaining ring, 2. Hitch pin, 1, will drop as the retaining ring, 2, slides down the incline, 5, on the front of the clevis. The implement is now attached to the tractor without requiring the operator to leave the cab of the tractor or a second operator.

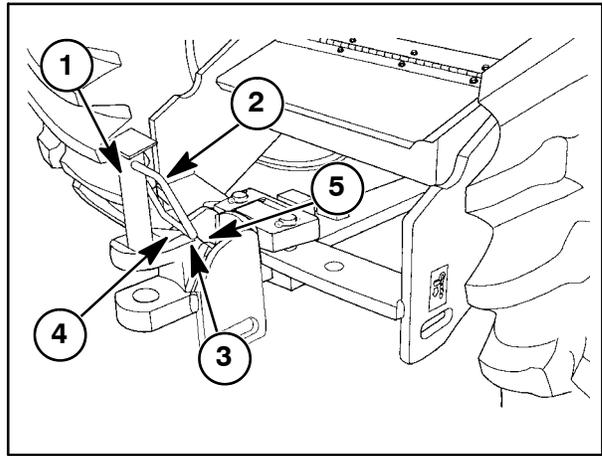


Figure 2-150



WARNING: NEVER ALLOW ANYONE TO STAND BETWEEN THE TRACTOR AND IMPLEMENT WHILE BACKING THE TRACTOR TO THE IMPLEMENT. ALWAYS BRING THE TRACTOR TO A COMPLETE STOP AND ENGAGE THE PARKING BRAKE BEFORE ALLOWING ANYONE BEHIND THE TRACTOR TO HITCH THE IMPLEMENT.

After hitch pin, 1, drops into place, retaining ring, 2, locks into the lower notch, 3, of the clevis. Notch, 3, holds the retaining ring in the lower position preventing the hitch pin from inadvertently unhitching.

IMPORTANT: Always install a safety retaining pin in the hitch pin, 4, to secure the hitch pin and prevent any accidental unhitching of the implement.

To manually unhitch the implement, first pivot the retaining ring, 2, up away from notch, 3, then pull the hitch pin from the clevis.

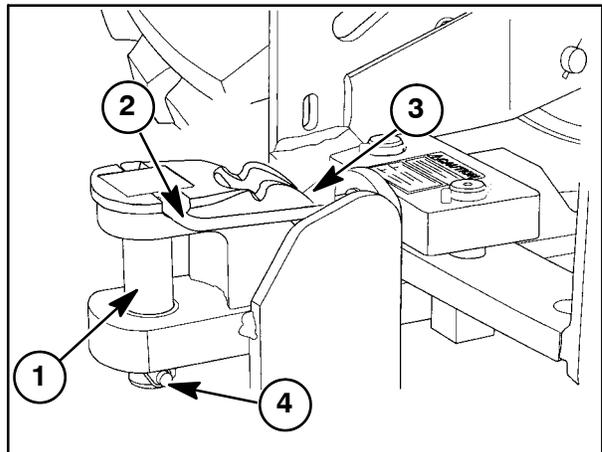


Figure 2-151



WARNING: ALWAYS SECURE THE DRAWBAR TO PREVENT SWINGING WHEN TRANSPORTING EQUIPMENT OR WHEN OPERATING ANY EQUIPMENT EXCEPT GROUND ENGAGING EQUIPMENT.

**38.1 mm (1/2") Drawbar Pin Kit
(Manual Hitch Pin)**

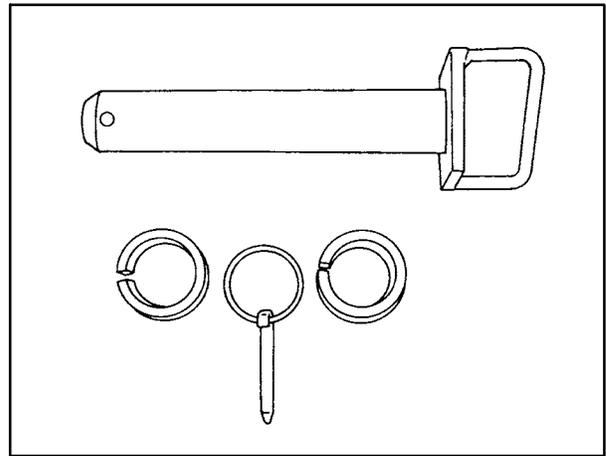


Figure 2-152

**38.1 mm (1/2") Drawbar Pin Kit
(Automatic Hitch Pin)**

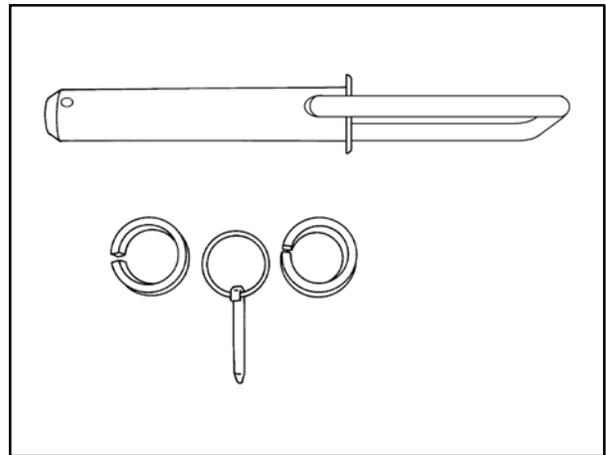


Figure 2-153

38.1 mm (1/2") Drawbar Pin Kit

The 38.1 mm (1-1/2") drawbar pin conversion kit is available from your Buhler Versatile dealer as part #86027940 (Manual) and #86030679 (Automatic). This kit allows the existing drawbar pin to be replaced with a 38.1 mm (1-1/2") diameter pin to fit implements with 38.1 mm (1-1/2") tongue holes.

DRAWBAR LOADING

The maximum recommended weight that can be carried on the drawbar is as follows:

Drawbar Position 508 mm (20")

Max. Vertical Load 2700 kg (6000 lbs.)

IMPORTANT: Loads on the drawbar increase greatly when traveling in rough conditions. Reduce speed to reduce the possibility of damage to the tractor or implement.

The vertical load on the drawbar must be considered as ballast and added to the weight of the tractor. Do not exceed the maximum operating weight of the tractor.

NOTE: An optional drawbar support is available for applications that may require extra support.

IMPLEMENT SAFETY CHAINS

Implements that have safety chains can be attached to the tractor using the tie-down slots, 1, and the chain slot, 2, on the drawbar and drawbar cage. Make sure the chain has enough slack in it to allow the tractor to turn and not restrict implement turning.

The safety chain should be strong enough to carry the gross weight of the implement to be towed by the tractor. Check the implement operator's manual for weight and safety chain attachment instructions.

Your Buhler Versatile dealer can assist in properly attaching safety chains to the tractor.

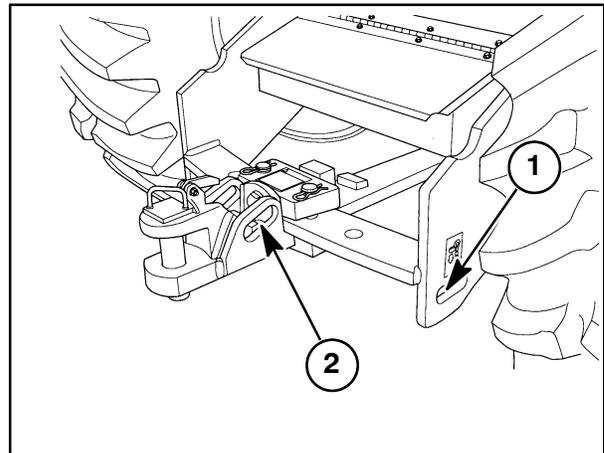


Figure 2-154

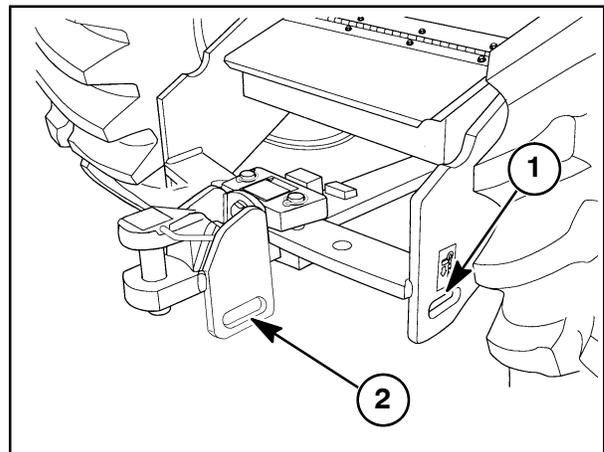


Figure 2-155

IMPLEMENT TRANSPORT

Use the following precautions when attaching and towing implements with the tractor:

Hook equipment to the drawbar only.

Be sure that the drawbar is locked in position with the side wear blocks to keep it from swinging side to side.

When transporting implements on the highway, place the drawbar in the center position to stabilize the tractor and towed implement

Use the drawbar pin retainer on the drawbar at all times to prevent the equipment from unhitching from the tractor.

Use safety chains from the drawbar and drawbar cage to the implement when on public roads to prevent the equipment from rolling into oncoming traffic or ditches should the hitch pin be lost.

Use a safe towing speed as specified by the implement manufacturer.

Use safety warning equipment as required by law.



CAUTION: WHEN TOWING LOADS OR IMPLEMENTS ABOVE 16 KM/H (10 MPH), THE TOWED IMPLEMENT MUST NOT EXCEED THE WEIGHT OF THE TRACTOR, UNLESS THE IMPLEMENT IS EQUIPPED WITH BRAKES. IF EQUIPPED WITH BRAKES, THE IMPLEMENT WEIGHT MUST NOT EXCEED 2 TIMES THE TRACTOR WEIGHT.

PTO OPERATION



CAUTION: BE SURE ALL SHIELDS AND GUARDS ARE IN PLACE BEFORE OPERATING THE PTO.

CAUTION: USE THE ARTICULATION LOCK FOR STATIONARY PTO APPLICATIONS OR TRACTOR SERVICING.

IMPORTANT: Excessive clutch slippage can cause premature clutch failure. Do not attempt to unplug a jammed implement by repeatedly engaging and disengaging the PTO clutch.

A PTO is a factory- or dealer-installed option. If your tractor does not have a factory-installed PTO, and you desire one, see your Buhler Versatile dealer.

The PTO is a wet disc type clutch with an integral brake, controlled by a solenoid operated valve. It can be operated through the full range of engine RPM, but cannot be engaged when the engine speed is above 1400 RPM.

NOTE: Any tractor equipped with a PTO option must be equipped with 38° articulation blocks (or 33° - 31° based on tire options).

PTO Requirements

The implement PTO drive shaft must have a 45 mm (1-3/4") diameter splined shaft (20 spline) yoke designed for 1000 RPM. Do not use an adapter for a smaller yoke.



CAUTION: DO NOT USE A 35 MM (1-3/8") PTO ADAPTOR SHAFT. THE SHAFT MAY BREAK AND CAUSE SERIOUS PERSONAL INJURY.

Before operating any PTO implement:

1. Lock the drawbar directly behind the PTO shaft to eliminate any swinging action.
2. Check for proper clearance of the PTO drivelines to the PTO shaft and 3-point hitch, especially when turning or in rough terrain.
3. The correct distance between the drawbar hitch pin and the PTO shaft is 508 mm (20"). This distance is not adjustable. No drawbar extension is necessary to operate PTO driven implements at 1000 RPM.

NOTE: Some implement manufacturers may require a specific drawbar to PTO shaft distance relationship. Refer to the implement operator's manual.

- Be sure that the PTO drive shaft halves have adequate overlap and will not separate when turning.

Pull drive halves apart until fully extended, just before they come completely apart. This is dimension A.

From dimension A, subtract 152.4mm (6"), establishing dimension B.

IMPORTANT: Never operate equipment with the driveline extended past dimension B.

Push drive halves together as far as possible. This is dimension C. Add 25.4mm (1") to dimension C to establish dimension D.

IMPORTANT: Never operate equipment with the driveline collapsed past dimension D.

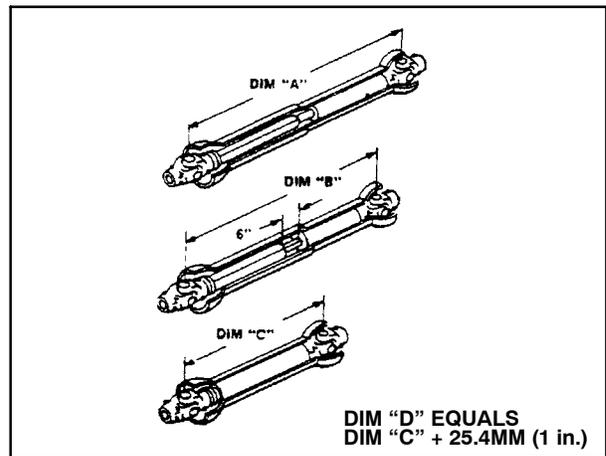


Figure 2-156

- Be sure that all shields are in place and in good condition. They must fully shield the driveline.
- Ensure that the PTO master shield, 1, is in position.



DANGER: NEVER REMOVE OR ALTER THE PTO MASTER SHIELD AT ANY TIME TO ASSIST IN ATTACHING ANY TYPE OF IMPLEMENT.

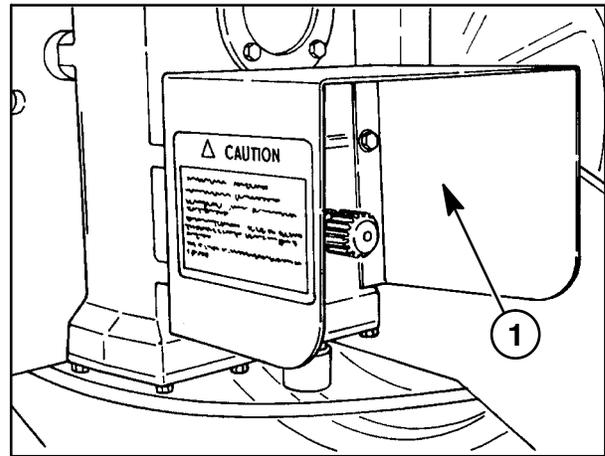


Figure 2-157

PTO Operation

- Stop the engine and park the tractor. Connect the drawbar to the implement hitch. Turning the engine off releases the PTO brake, allowing the stub shaft to be hand turned for spline alignment. Be sure the drive shafts are straight for easier connection.
- Attach the implement drive shaft to the tractor output shaft. Check for adequate telescope action and for clearance to the surrounding frame. The drawbar clevis, 1, can be flipped over to provide additional clearance for the PTO drive shaft.

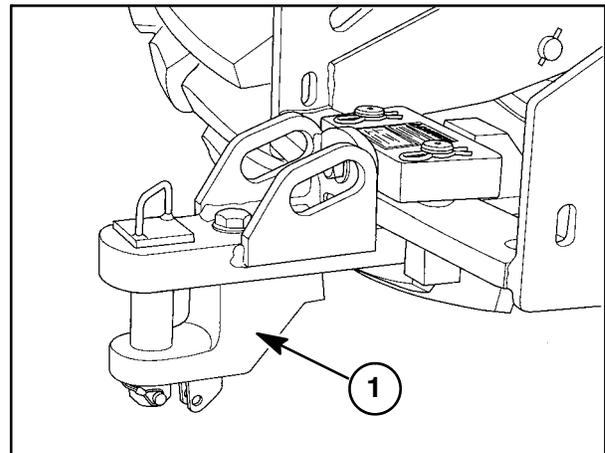


Figure 2-158

3. Start the tractor with the transmission in neutral and the PTO switch, 1, in the off (clutch disengaged) position.
4. With the PTO clutch disengaged, raise and lower the implement to ensure proper clearance exists between the tractor and implement. Be sure the implement is free of obstructions.

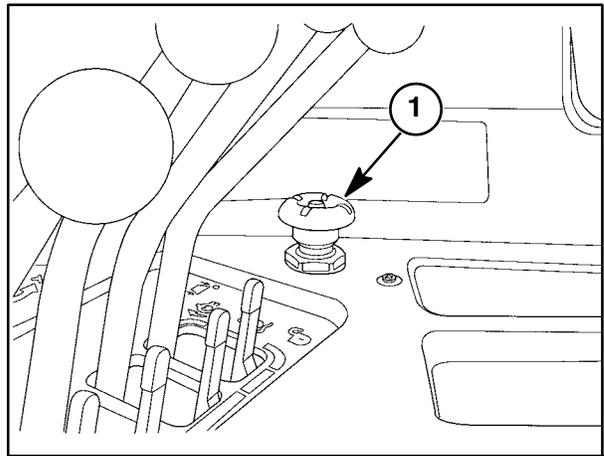


Figure 2-159

- With the engine at 1000 RPM, engage the PTO. It is activated by a two-motion switch, 1, located on the right console. To engage the clutch, push down on the center button, 1, and lift up on the outer knob, 2. An indicator lamp will light on the warning light bar. The PTO has built-in modulation to provide a smooth transition during start-up of the PTO clutch.

NOTE: The PTO will not engage if engine speed is greater than 1400 RPM. If the engine speed is dropping from above 1400 RPM, the PTO will not engage until the engine speed drops below 1340 RPM. Shut the switch off, lower the engine speed, and turn the switch on.

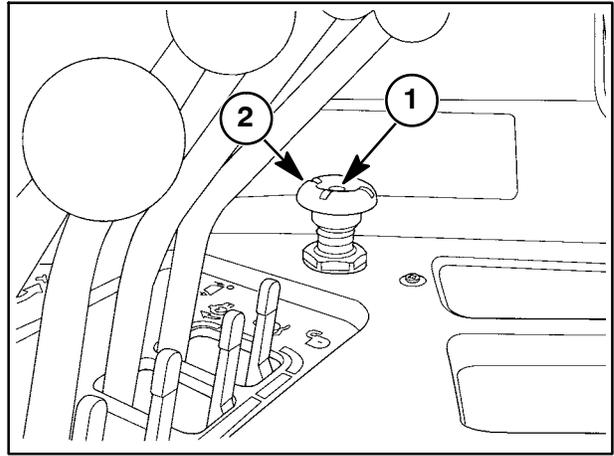


Figure 2-160

- Increase the engine speed to 2100 RPM before beginning field operation. To display PTO output speed, turn the rotary select switch to the "PTO Speed" position.

NOTE: When the engine speed is at 2100 RPM, the PTO speed will be 1000 RPM. Be sure to adjust the loaded or unload engine speed to 2100 RPM to maintain 1000 RPM on the PTO shaft.

- If possible, lower the engine RPM, disengage the PTO, and raise the implement before making sharp turns.
- Be sure that the park brake is on, the transmission is in neutral and the tractor is in a straight line configuration with the articulation lock engaged for stationary applications.



DANGER: NEVER LEAVE THE TRACTOR SEAT WITH THE ENGINE RUNNING AND/OR THE PTO ENGAGED.

9. The PTO can be shut off at any time by simply pressing the PTO knob, 1, downward. If the engine is shut off with the PTO switch in the "ON" position, the tractor will not start until the PTO switch is placed in the off position.

IMPORTANT: When using implements with high momentum, such as combines and forage harvesters, brake the speed of the implement by lowering the engine speed before disengaging the PTO clutch. This will increase the PTO brake life.

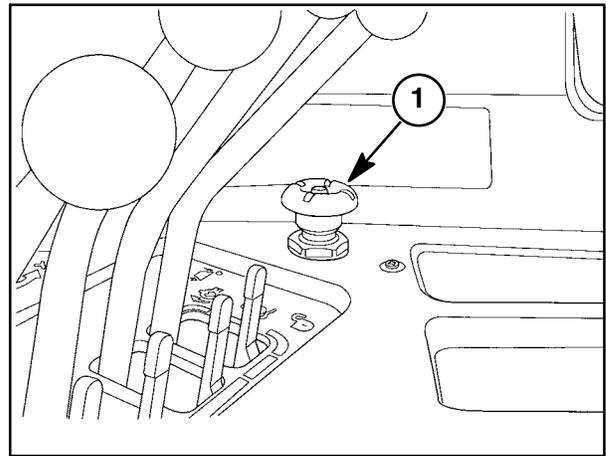


Figure 2-161

HYDRAULIC SYSTEM OPERATION

HYDRAULIC SYSTEM

The tractor is equipped with a specially designed hydraulic system that consists of a hydraulic reservoir, a load-sensing variable-flow hydraulic pump, an implement valve assembly with flow control capability, quick couplers, a filter and oil coolers as standard equipment.

Optional equipment available for the hydraulic system include a 3-point hitch and a 1.9mm (3/4") coupler kit for high flow requirements. These optional features can be dealer or factory installed.

The steering system of the tractor uses a separate constant displacement pump to supply oil to the steering valve. The steering pump oil is also supplied to the implement valve (when required) to supplement hydraulic pump flow

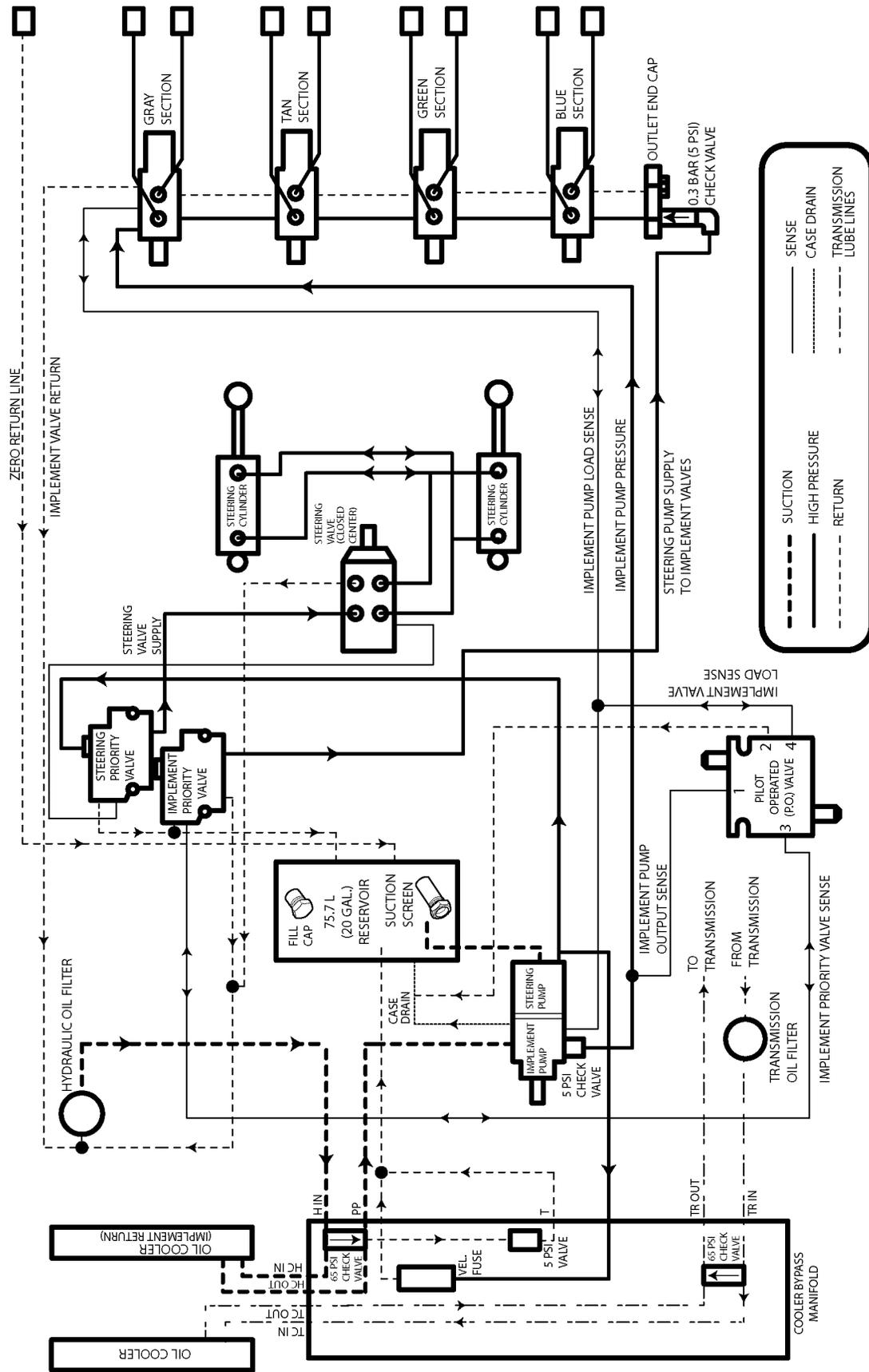
during high flow demand situations (i.e., air seeder operation). Steering oil flow has first priority for the steering circuit, then supplementing implement valve oil requirements.

The steering system consists of a constant displacement pump, a P.O. valve, priority valves (2), a closed center steering motor and steering cylinders.

The steering system shares the hydraulic reservoir, filter and oil coolers with the hydraulic system.

Figure 2-162 shows the complete layout of the hydraulic system.

Figure 2-163 shows the orientation of hydraulic components on the tractor.



HYDRAULIC SYSTEM LAYOUT - BUHLER VERSATILE 4WD TRACTORS 2290, 2335, 2375

SECTION 2 - OPERATION

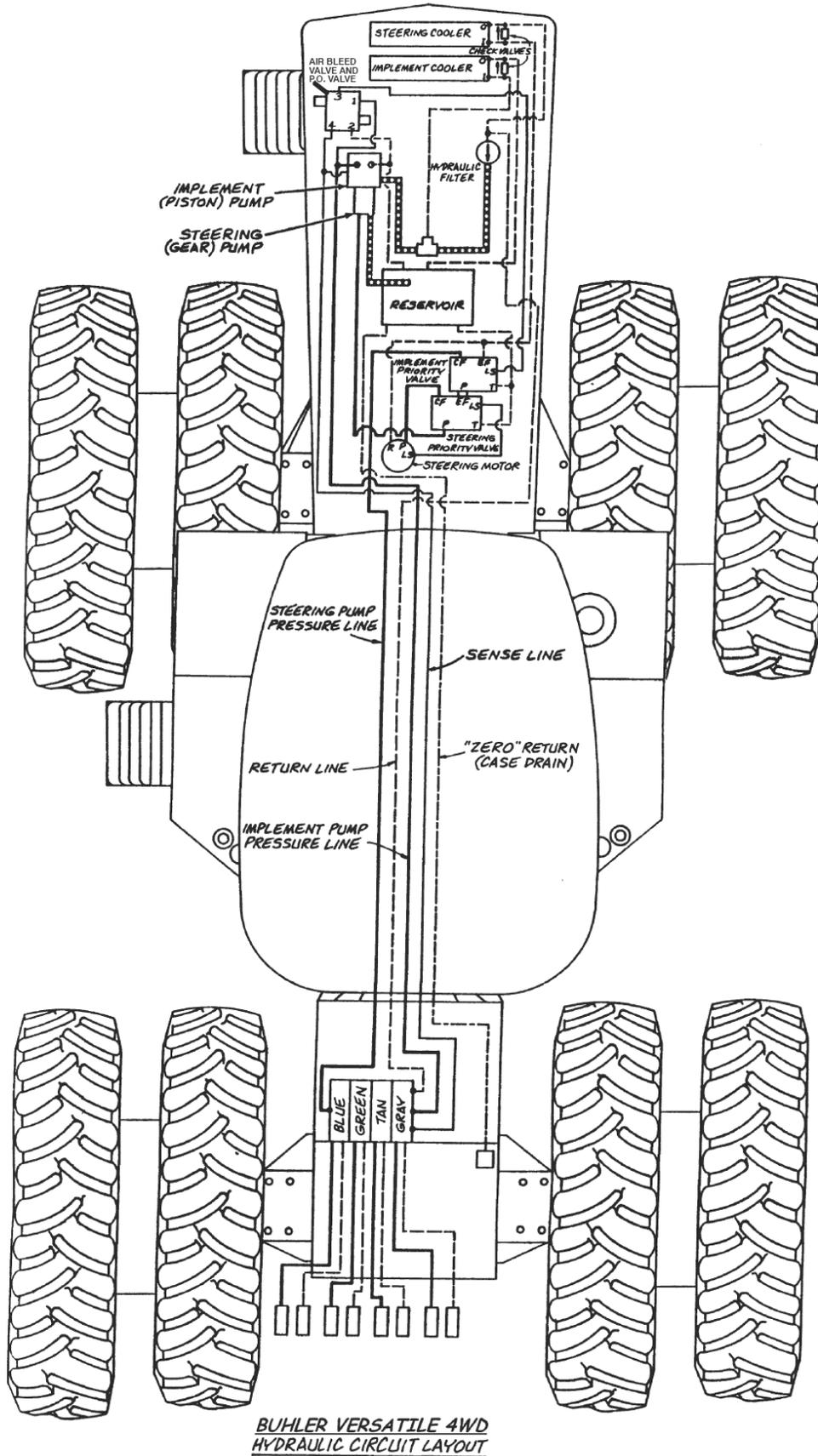


Figure 2-163

REMOTE CONTROL OPERATION

Four remote hydraulic control levers are located on the right console. These are color-coded to match the quick couplers at the rear of the tractor. The colors should be (from left to right), blue, 1; green, 2; tan, 3; and gray, 4.

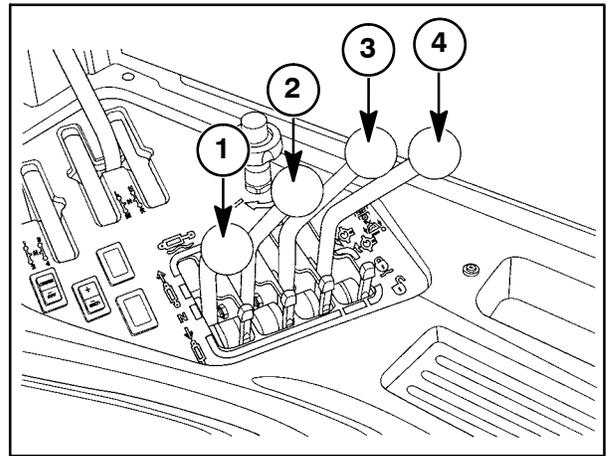


Figure 2-164

The levers have four positions: neutral, 1; extend (or raise), 2; retract (or lower), 3; and float, 4, as indicated by the decals. When not in use, the levers should be in the neutral position where they can be locked to prevent accidental actuation.

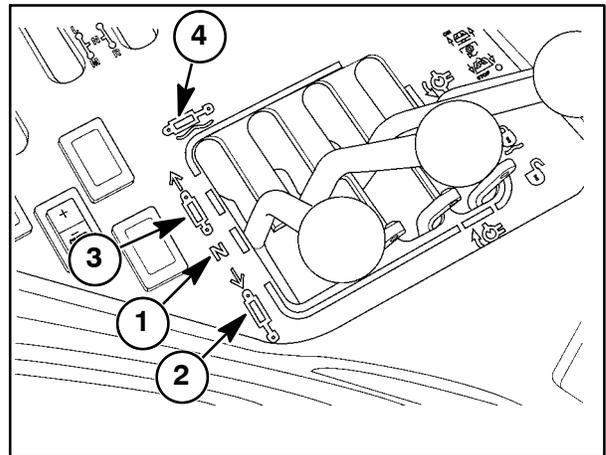


Figure 2-165

For the extend position, the lever, 1, is pulled toward the operator. This is normally the implement raise position. An adjustable pressure release detent will hold the lever in the raised position until the cylinder reaches the end of its travel, then release to the neutral position. The lever lockout has no function in this position.

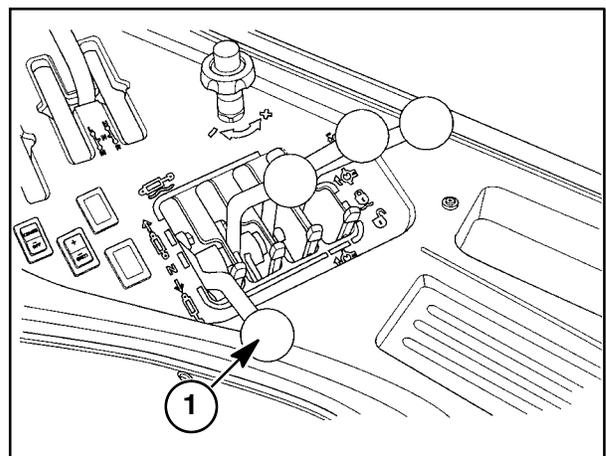


Figure 2-166

For the retract position, the lever, 1, should be moved away from the operator one position. An adjustable pressure detent will hold the control lever in this position until the cylinder reaches the end of its travel, then release to the neutral position. To prevent over-travel into the float position, the lockout lever can be moved to the first (center) position.

IMPORTANT: Do not manually restrain a lever to override the detent release for continuous operation or excessive noise and detent damage may occur.

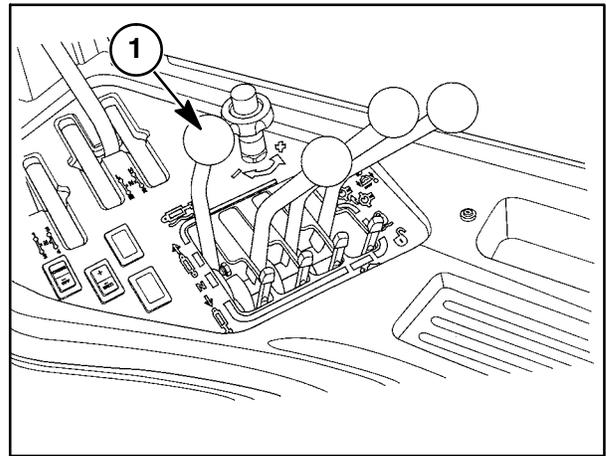


Figure 2-167

The float position is the position farthest away from the operator (two detents from neutral). The float position will be locked out when the lockout lever is in the first detent and the control lever is in neutral. Once in the retract or float position, the lockout lever can be moved to the second detent to prevent the lever from moving back into the neutral position for motor operation.

The float position is generally used for implements that are designed to “float” over the ground during normal operation. When the remote valve is in the float position, hydraulic oil on the rod end and piston end of a cylinder can flow freely from one side of the cylinder to the other.

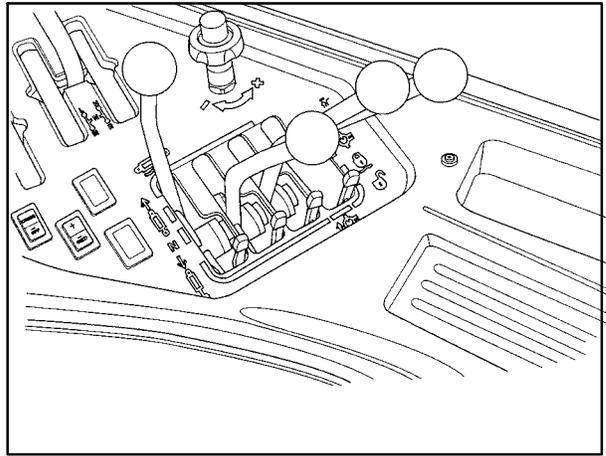


Figure 2-168

LOCKOUT LEVERS

Below each control lever is a corresponding lockout lever to prevent or limit travel of the control lever. The lockout lever has three positions.

The rearward position, 1, (closest to the operator) releases the lock and allows full travel to all control lever positions.

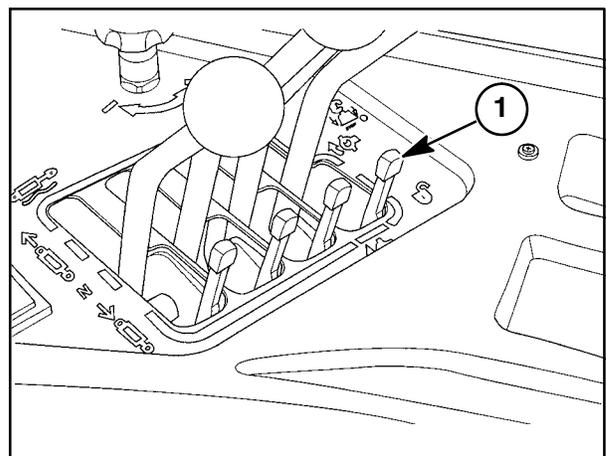


Figure 2-169

The second position, 1, prevents the control lever from entering the float position.

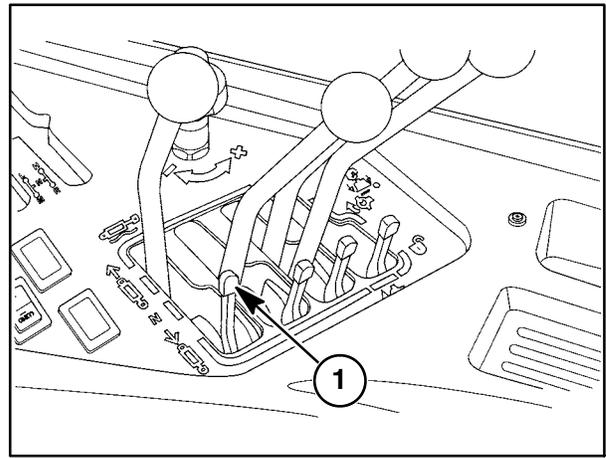


Figure 2-170

The final position, 1, has two functions. It will lock the lever into the neutral position to prevent accidental actuation of the lever. If the lockout lever is moved to this position while the control lever is in the retract position, the control lever is limited to travel between the float and retract positions. This position can be used for continuous flow applications.

By limiting the travel of the remote control lever from returning to the neutral position during continuous flow applications, the lockout will protect the hydraulic system from pressure spikes created by hydraulically driven implements during implement shutdown.

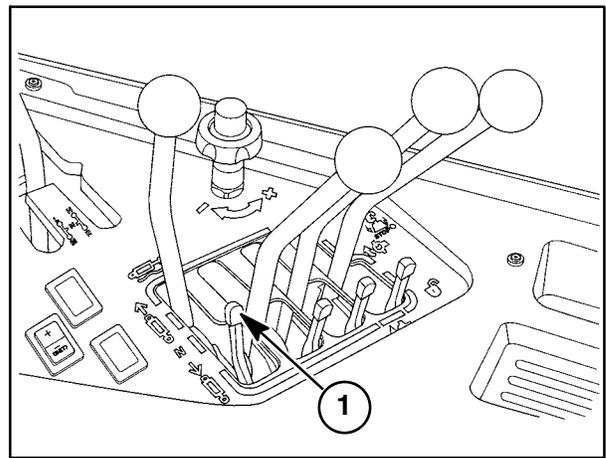


Figure 2-171

IMPORTANT: When shutting off hydraulically driven implements, place the remote lever in the float position to allow the implement to coast to a stop. Shut the tractor off and place the remote lever in the neutral position.

FLOW CONTROL ADJUSTMENT

Each valve spool has a flow control valve to meter oil flow to that coupler. Flow can range from a minimum of 11.4 L/min (3 GPM) to full available flow 114L/min (approximately 30 GPM).

Buhler Versatile 4WD tractors are equipped with four rotary knob style flow controls as standard equipment. (1 (grey section) shown in figure 2-195)

The knob can be rotated counterclockwise to increase flow and clockwise to decrease flow. This knob will control only the grey valve section.

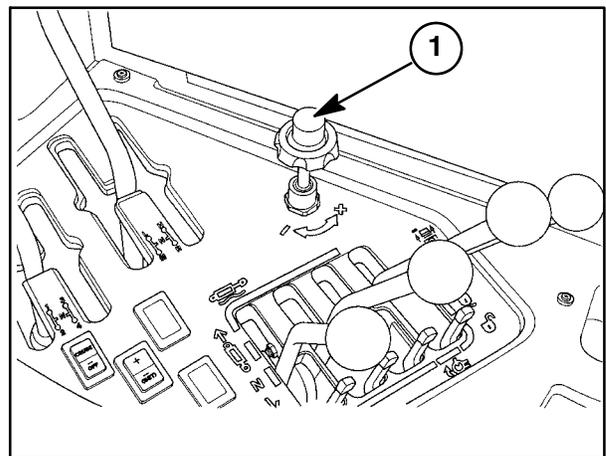


Figure 2-172

By pushing the button in the center of the knob, the control knob can be pulled upward or pushed downward to change the flow control setting.

The blue, green and tan in cab flow control knobs are in the right rear corner of the cab and function identically to the grey flow control.

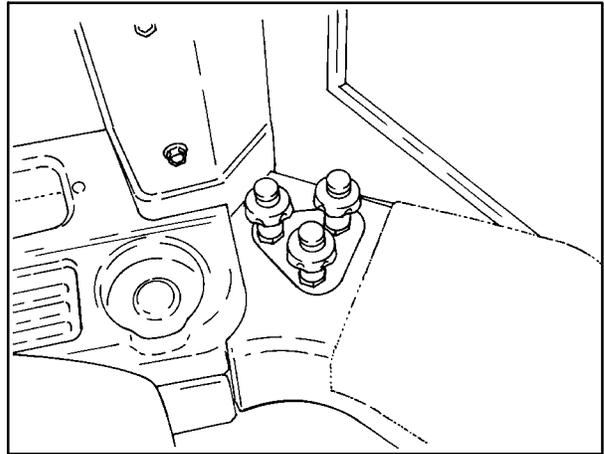


Figure 2-173

PRESSURE RELEASE DETENT ADJUSTMENT

The detent adjustment screw, 1, located on the rear of the valve, may be adjusted to vary the system pressure required to return each lever to the neutral position.

To adjust, loosen the jam nut and rotate the screw clockwise to increase the release detent pressure. A variable pressure flowmeter should be used to slowly raise the system pressure to accurately set each detent. The adjustment should be made by your authorized Buhler Versatile dealer.

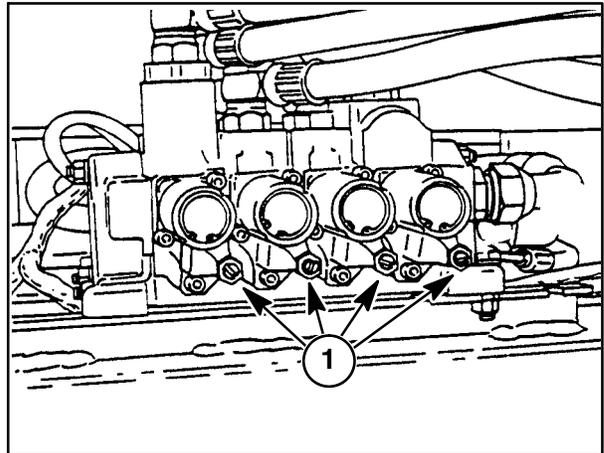


Figure 2-174

NOTE: The factory pressure release detent setting is 15.0 bar (2175 PSI).



WARNING: ONLY ADJUST THE SCREW WHEN THE REMOTE CONTROL LEVERS ARE IN NEUTRAL AND THE TRACTOR IS SHUT OFF.

QUICK COUPLERS

Each remote valve section has a set of hydraulic quick couplers, 1, located at the rear of the tractor. These are self-sealing, leverless couplers that require no tools for connecting and disconnecting hoses. These couplers also permit hoses to be pulled from the coupler if an implement should become disconnected from the tractor.

The upper couplers are the “retract/lower” couplers and the lower couplers are the “extend/raise” couplers.

Each set of couplers has a decal next to it to identify which remote lever they are hooked to and which coupler extends or retracts a cylinder.

Excess oil drain hoses, 2, are attached to each coupler to drain away oil released during connection and separation of the couplers.

The couplers will accept standard 12mm (1/2”), SAE or ISO tips. The couplers can be connected or disconnected under pressure.

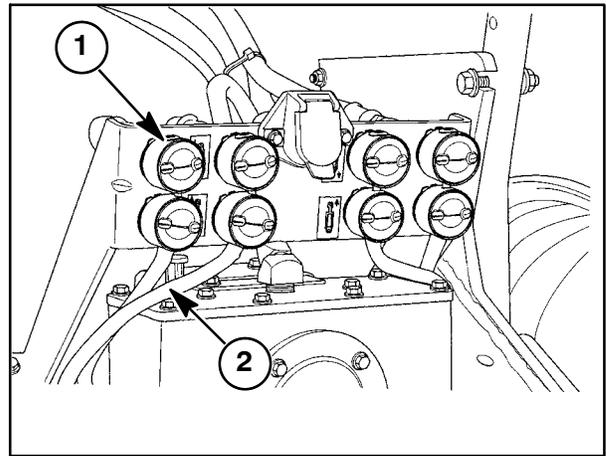


Figure 2-175

COUPLER CONNECTION

1. To connect couplers, wipe the outside of the coupler and the tip of the implement to remove any dust and minimize contamination.
2. Insert the coupler tip through the seal and into the coupler, making sure the coupler is properly seated.
3. Actuate the remote valve to supply hydraulic pressure which will complete the hydraulic coupling of the tractor and implement.

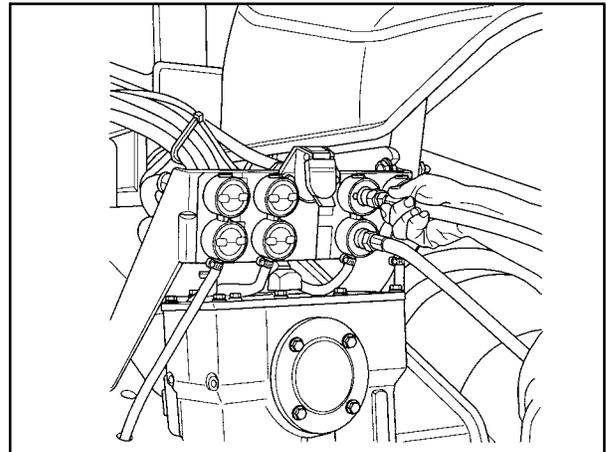


Figure 2-176

When using a double-acting cylinder, connect the feed hose from the cylinder to the bottom coupler and the return hose to the top coupler. To extend a double-acting cylinder, pull the remote lever rearward to position 2. To retract the cylinder, push the lever forward to position 3. The cylinder can be put into the float position by pushing the remote lever full forward in position 4.

When using a single-acting cylinder, connect the supply line to the lower coupler. To extend the cylinder, pull the remote lever rearward to position 2. To retract, push the control lever fully forward to "float," position 4.

IMPORTANT: Always use the float position to lower a single-acting cylinder. The retract position is for double-acting cylinders only.

To disconnect the coupler, make sure that the remote control lever is in the neutral position and the engine is off. Check to be sure that the implement has its transport stops in place or is lowered to the ground.

Grasp the coupler tip behind its hose connection and firmly pull the tip straight back from the coupler. Cover the tip with a protective cap to minimize contamination.



WARNING: HYDRAULIC FLUID ESCAPING UNDER PRESSURE CAN PENETRATE THE SKIN CAUSING SERIOUS PERSONAL INJURY. WEAR GLOVES AND PROTECTIVE CLOTHING WHEN SERVICING HYDRAULICS. BE SURE THAT ALL CONNECTIONS ARE TIGHT AND HOSES AND LINES ARE UNDAMAGED.

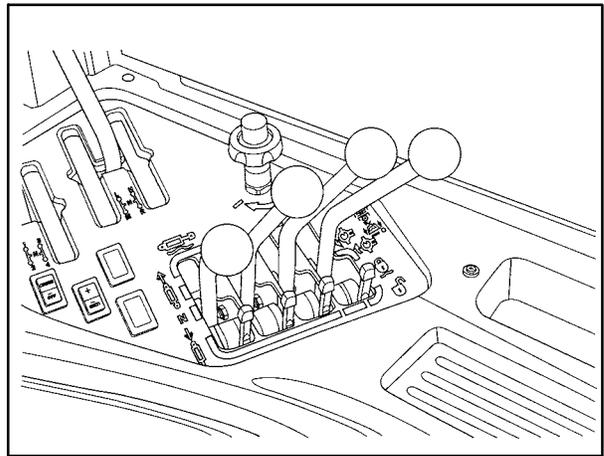


Figure 2-177

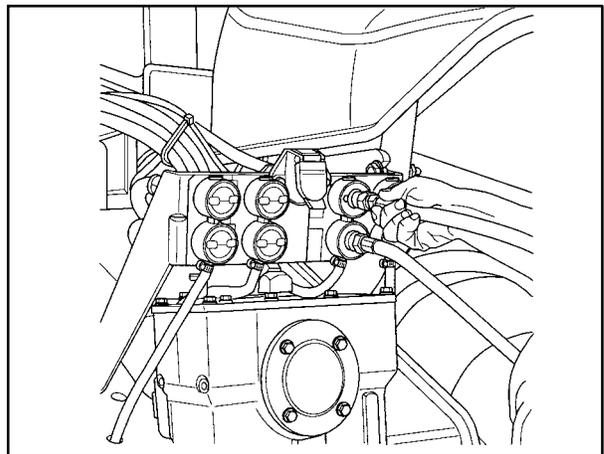


Figure 2-178

BLEEDING REMOTE CYLINDERS

When connecting a cylinder with trapped air (i.e., a new cylinder, one that has been out of service, or one that has had the hoses disconnected), it will be necessary to bleed the cylinder to remove the air.

With the hoses connected to the remote control valve couplers at the rear of the tractor, position the cylinder with the hose end uppermost and extend and retract the cylinder seven or eight times using the remote control valve operating lever. Check the hydraulic tank oil level before and after operating the remote cylinder.

OPERATING CONTINUOUS FLOW HYDRAULIC EQUIPMENT

Continuous flow hydraulic equipment (i.e., hydraulic motors) should be connected to the right-side (color-code gray) remote control valve couplers with the pressure hose connected to the upper coupler and the return hose connected to the lower coupler. These are indicated by a hydraulic motor symbol at the couplers with counterclockwise rotation on the upper coupler and clockwise rotation shown on the lower coupler.

NOTE: There is a “zero return” line, 1, installed next to the implement valve on the right-hand side. This line runs directly back to the hydraulic reservoir and is intended to be used as a hydraulic motor case drain line.

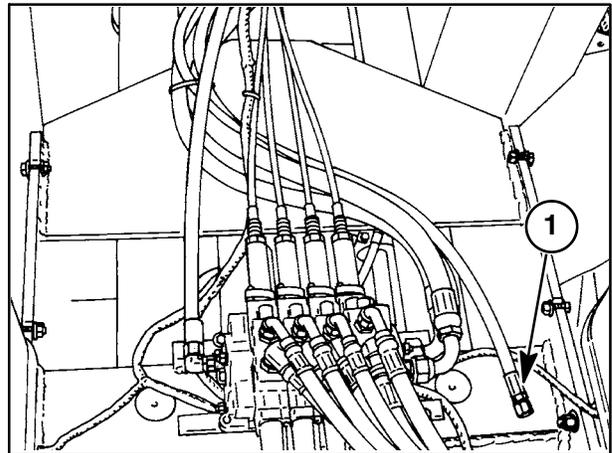


Figure 2-179

Use the flow control to regulate the motor speed. This will ensure that the hydraulic system will supply only the oil required by the motor. This will allow higher oil flow reserve for other valve sections and their oil circuits.

NOTE: Hydraulic motors that are equipped with (1/2") supply and return hoses, and require less than 10 GPM, can be hooked up directly to the gray couplers. Hydraulic motors that have (3/4") supply and return hoses, and require greater than 37.85 L/min (10 GPM), should be hooked up to the optional (3/4") coupler kit. See "Optional Hydraulic Equipment" later in this section for more information on this kit.

With the remote control valve lever fully forward in the float position, the motor will be stationary. The hydraulic motor will operate if the lever is pulled back one detent to the retract position. To stop the motor, move the lever from the retract position to the float position. In the float position, the motor will be able to stop slowly, which will not damage the motor. When moving from the float position to the neutral position, i.e., for road travelling, move through the retract position quickly to prevent pressurizing the circuit.

IMPORTANT: When operating continuous flow equipment, the remote control valve lever must not be moved from the full on position to the neutral or raise positions as damage to the equipment may result. Use the lockout levers on the control levers to prevent the levers from moving to these positions.

Observe the following to further protect the tractor and equipment:

- Do not open any bypass valve in the equipment or motor. Use the flow control valve to control the rate of flow or speed of the motor.
- Do not hold the remote control valve lever to operate the equipment. If the detent will not hold the lever in the retract position, check the equipment for proper adjustment or contact your dealer for assistance in adapting the equipment to suit the tractor.
- To ensure optimum hydraulic oil cooling, operate continuous flow equipment at the highest flow setting (by use of the flow control valve) and lowest engine speed that will give the required machine performance and speed.

HYDRAULIC MOTOR APPLICATIONS

The hydraulic system is a load sensing, pressure and flow compensating system. Pressure and flow are regulated by a load sensing line from the implement valve. For proper and efficient use of the system, low volume open center hydraulic motors or closed center system motors with restricting orifices removed and bypass valve closed should be used. Motor speed must be regulated with tractor implement valve flow control rather than bypass valves and orifices at the motor. This will reduce heat buildup, save oil for other simultaneous operations of the implement valve, and increase system reliability.

1. Use hydraulic motors designed for open center or pressure/flow load compensating hydraulic systems only. **Do not** use a hydraulic motor designed for closed center hydraulic systems unless it is adapted for use by removing the inlet restrictor.
2. Be sure the hydraulic motor does not have restricters in the ports or fittings.
3. Hydraulic motors rated at less than 37.85 L/min (10 US GPM) may be equipped with 12mm (1/2") ID hoses and standard (ASAE/SAE/ISO) couplers.
4. Hydraulic motors rated at greater than 10 US GPM (37.85 L/min) should be connected with 19mm (3/4") hoses and (ASAE/SAE/ISO) couplers to prevent excessive restriction and heat generation. Use the optional 19mm (3/4") coupler kit P/N 86010513 available from your Buhler Versatile dealer. See "Optional Hydraulic Equipment" later in this section for more information on this kit.

OPERATING REMOTE EQUIPMENT SIMULTANEOUSLY OR REMOTE EQUIPMENT AND HYDRAULIC LIFT SIMULTANEOUSLY

NOTE: Hydraulic pump output varies with engine speed. Oil flow will be relatively constant in the remote control valve circuits if the flow control valve is used to provide reduced oil flow, thus providing constant operating speed for hydraulic motors, etc. even if engine speed varies. Maintain the engine speed above the minimum required for simultaneous operation of all required circuits and vary ground speed by selection of the appropriate gear ratio.

If operating two or more remote control valves simultaneously or remote valves and 3-point hitch, the flow control should be adjusted to provide a partial flow to each valve circuit. (The hydraulic system of the tractor is designed to provide adequate oil flow to the implement valve to satisfy system demand, regardless of the number of valve sections that are activated (i.e., running an air seeder fan motor and lifting the cultivator).)

By adjusting the flow control of each valve section, the system performance will be maximized and will show up as proper performance of the implement functions.

OPTIONAL HYDRAULIC EQUIPMENT

19 mm (3/4") Coupler Kit P/N 86010513

This kit will allow hydraulic motors that require 19 mm (3/4") supply and return hoses and couplers, 1, to be hooked to the tractor and operated using the gray remote control circuit.

The kit also contains a case drain line, 2, for the motor if required in the application. The case drain line hooks into the existing "zero return" line on the right-hand side of the implement valve.

Operation of the gray circuit when equipped with the 19 mm (3/4") kit is identical to operation of the circuit without the kit.

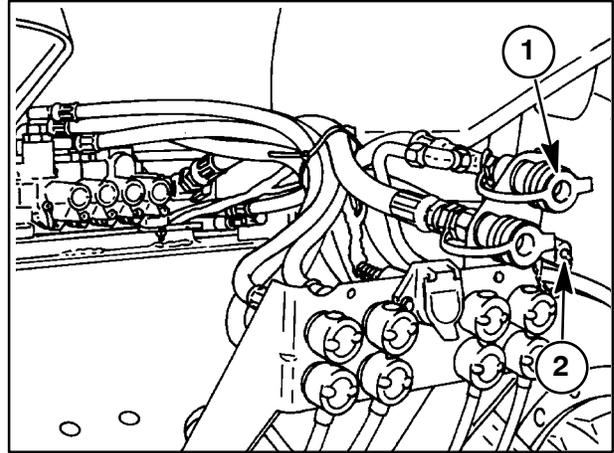


Figure 2-180

3-POINT HITCH (Optional)

3-POINT HITCH DESCRIPTION

All tractors can be equipped with a Category IV Narrow 3-point hitch which converts to a Category III hitch. The 3-point hitch can be factory or dealer installed.

The 3-point hitch is an electrohydraulic system that has an automatic **position control** feature to maintain implement depth as determined by the operator.

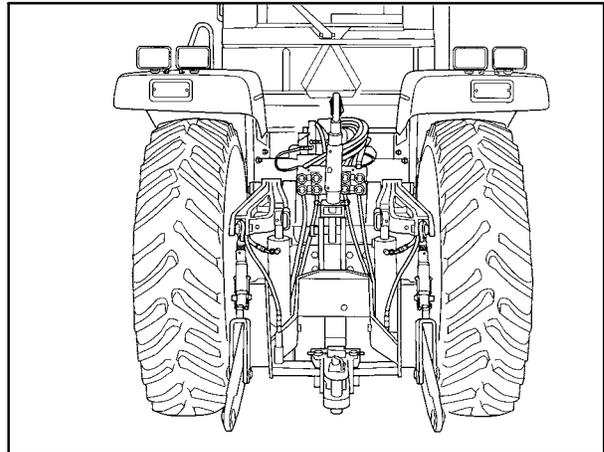


Figure 2-181

Be sure that the implements used conform to the hitch dimensions shown:

- (A) 51 mm (2")
- (B) 45 mm (1.78")
- (C) 920 mm (36.23")
- (D) 51 mm (2")

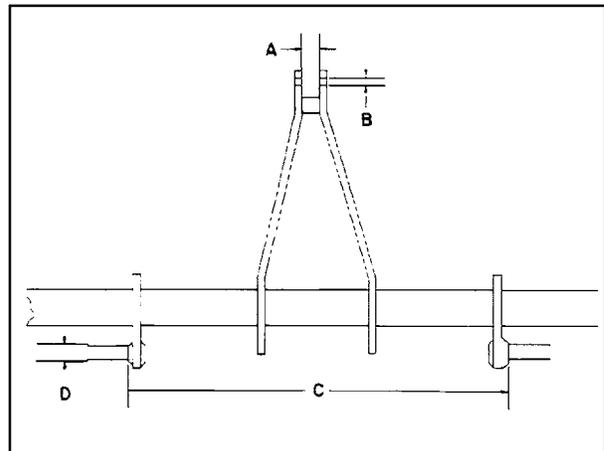


Figure 2-182

3-POINT HITCH CONTROLS

There are two control switches and two rotary control knobs located on the right console of the cab, and a flow control adjustment on the 3-point hitch electrohydraulic valve that controls the 3-point hitch. The function of these controls is as follows:

Automatic Raise/Lower Switch

Switch, 1, controls the 3-point hitch when the system is in the automatic mode. Pressing the switch will put the system into the automatic mode from the manual mode. When the system is in the automatic mode, it will automatically adjust the implement depth position as defined by the operator using the depth control.

Pressing the top of the switch when the system is in the automatic mode will cause the hitch to raise to its fullest upward position for transporting the implement or when turning at the end of a field. Pressing the bottom of the switch when the system is in the automatic mode will cause the hitch to lower to a predetermined position as defined by the operator with the depth control knob.

When the system is in the automatic mode, and the auto raise/lower switch is depressed for either raise or lower, the hitch will cycle through its full range of movement. There is no incremental control of the hitch in the automatic mode.

Anytime the system is in the automatic mode, the small indicator light, 1, will be illuminated.

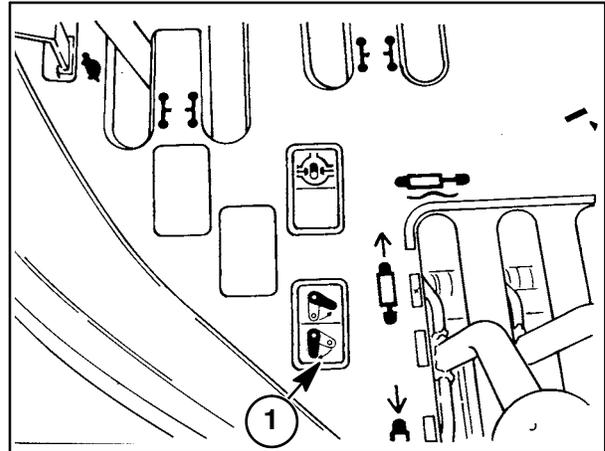


Figure 2-183

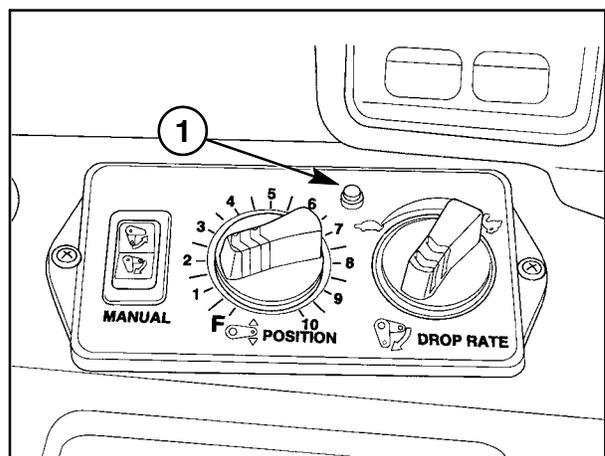


Figure 2-184

Manual Raise/Lower Switch

Switch, 1, controls the 3-point hitch system when it is in the manual mode. Anytime the manual raise/lower switch is depressed, the system is put into the manual mode and the automated mode is overridden. When the system is in the manual mode, the operator can control the height of the hitch to any desired position.

Pressing the top of the switch will cause the hitch to raise, and depressing the bottom of the switch will lower the hitch.

The operator can control incremental raise and lower positions of the hitch by momentarily depressing the switch. The hitch will stop moving as soon as the switch is released for either raise or lower.

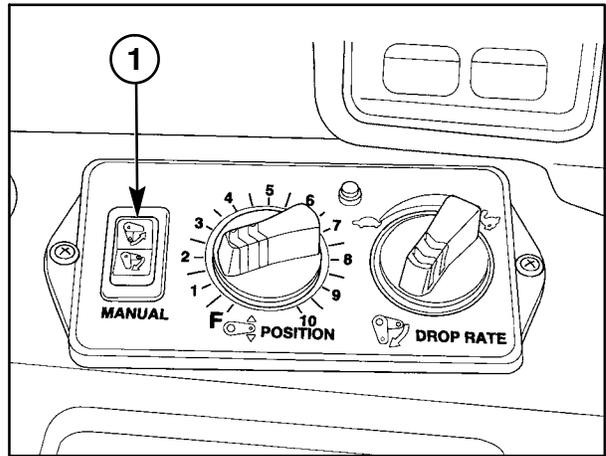


Figure 2-185

Rotary Depth Control Knob

This knob is used to set the implement working depth when the system is in the automatic mode. The control knob, 1, is labeled in increments from one to ten and has an "F" position below the number one position. Turning the knob clockwise will cause the hitch to raise, and turning it counterclockwise will cause the hitch to lower. Turning the knob fully counterclockwise to the "F" position will place the hitch in the float mode so that the hitch follows ground contour. There is a small detent in the control knob indicating the float position.

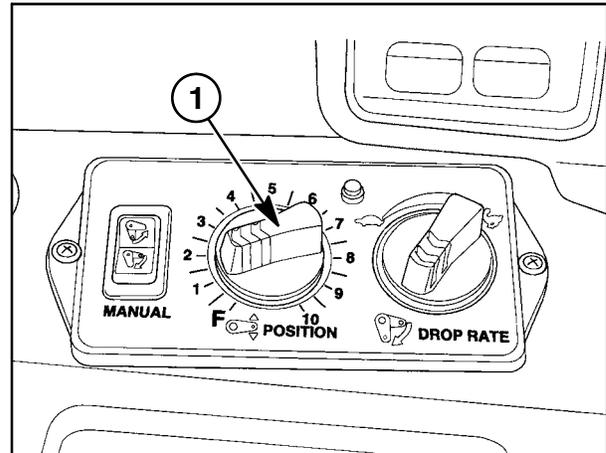


Figure 2-186

Rotary Lowering Rate Control Knob

Knob, 1, is used to set the rate at which the implement will drop to the ground. Turn the knob clockwise to increase the lowering rate and counterclockwise to decrease the lowering rate.

NOTE: Each time an implement is changed on the tractor, the lowering rate must be reset for that particular implement.

The control operates in the manual and automatic mode with the exception of the automatic float mode.

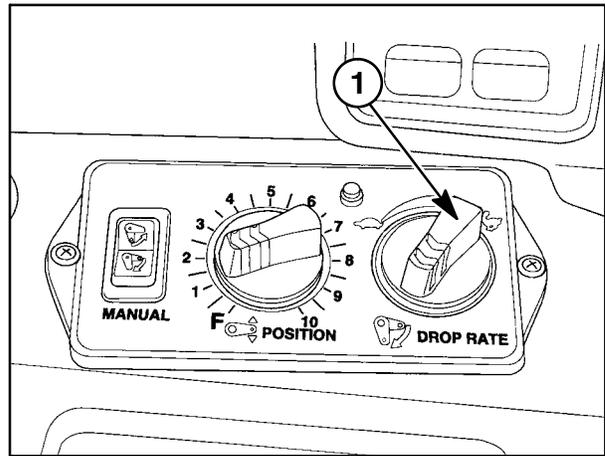


Figure 2-187

Rate of Hitch Raise Adjustment

The electrohydraulic valve has a flow control adjustment located at the front of the valve that will determine the rate at which the 3-point hitch will raise.

To access the flow control adjustment, the rear frame deck shield, 1, must be removed from above the implement valve. Loosen the four screws, 2, that attach the shield to the tractor and lift it off.

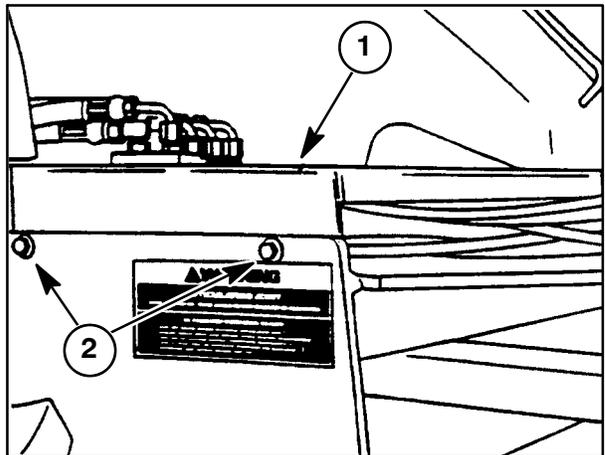


Figure 2-188

Turn the adjustment, 1, counterclockwise to increase the rate of raise and clockwise to decrease the rate of raise. The operator can set this adjustment to any position desired for the implement attached to the tractor.



WARNING: ONLY ADJUST THE RAISE RATE WHEN THE 3-POINT HITCH CONTROLS ARE IN NEUTRAL AND THE TRACTOR IS SHUT OFF. ENGAGE THE ARTICULATION LOCK WHEN WORKING IN THE ARTICULATION AREA.

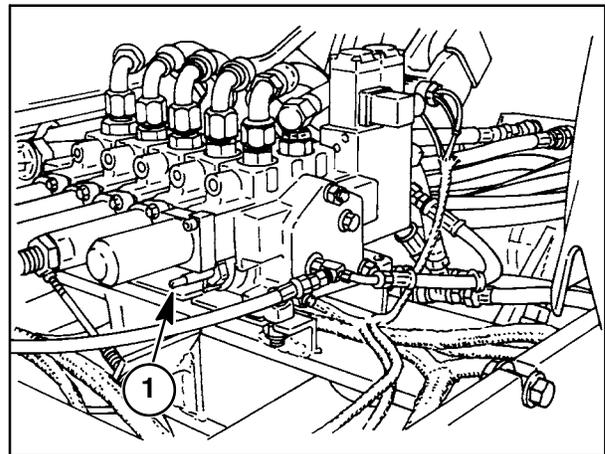


Figure 2-189

HITCH ADJUSTMENTS

Lower Links

When the lift links are adjusted halfway, the lower link hitch point, 1, should be 200 mm - 250 mm (8" - 10") from the ground when the lift cylinders are fully retracted. Be sure that the implement is level on the right and left sides of the hitch by adjusting the lift link length.

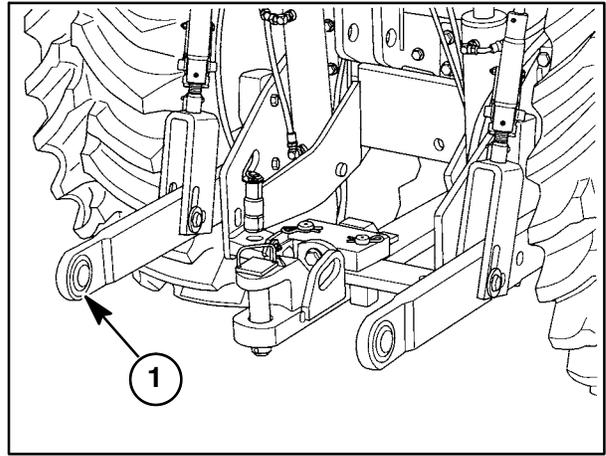


Figure 2-190

Lift Links

The lift links, 1, on the 3-point hitch may be adjusted to level the hitch or an implement from side to side by turning the latch handle, 2, on the link to raise or lower that side of the hitch. Fold the handle out and turn it until the lift link is adjusted. Return the handle to the storage position by lining up the square sides of the threaded lift link rod with the handle and snapping it down onto the lift link.

NOTE: Only level the implement side to side when it is in the full down position and the weight is off the hitch.

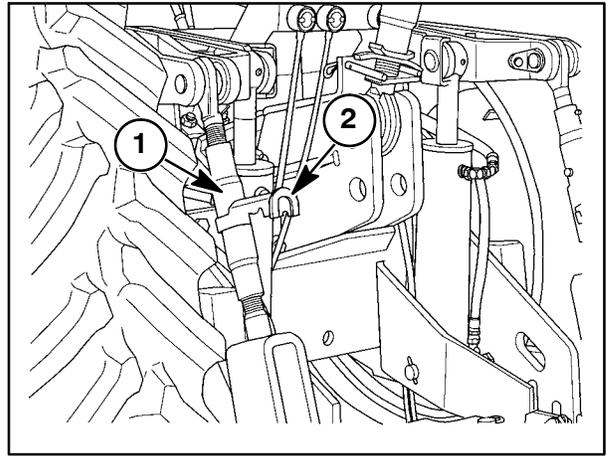


Figure 2-191

Upper Link

The upper link, 1, is used to level the implement from front to rear. Loosen the locking plates, 2, on the upper link. Turn the center collar to shorten or lengthen the upper link to level the implement. Tighten the locking plates.

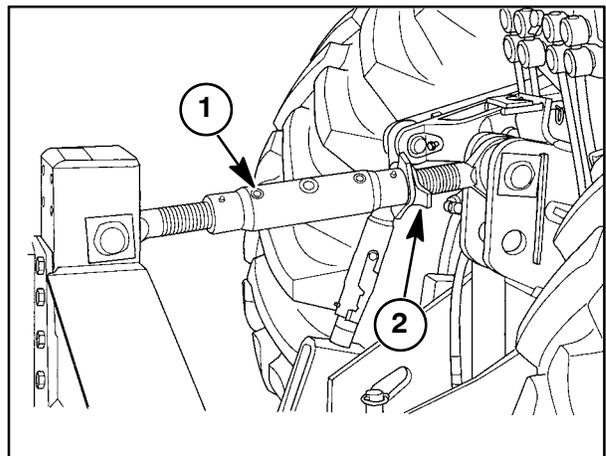


Figure 2-192

Place the upper link in the appropriate hitching point on the upper link bracket. The top hole, 1, is for Category III or IV implements. The bottom hole, 2, is for Category III implements only.

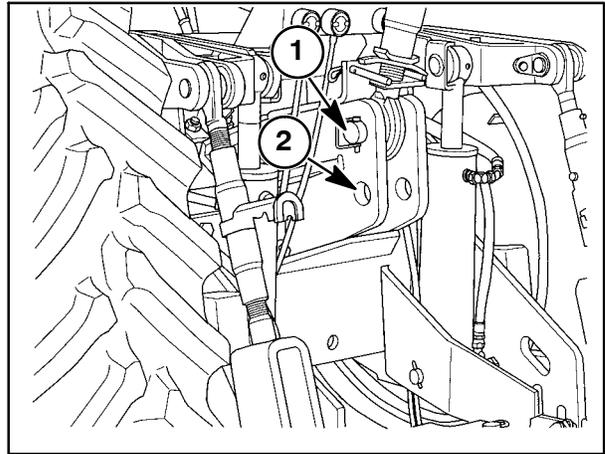


Figure 2-193

To store the upper link, remove the two small hairpin clips, 1, that attach the storage bracket, 2, to the upper link bracket, and pull the bracket away from the tractor. Swing the upper link upward and reinstall the bracket and clips.

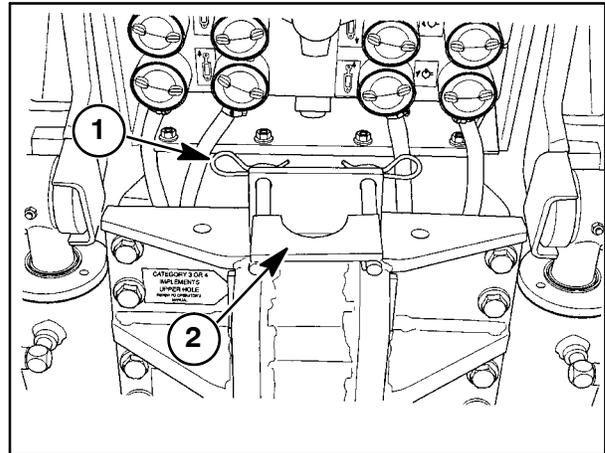


Figure 2-194

Shims

Shims, 1, prevent the lower links from contacting the tires when the lower links are not connected to an implement and are free to move side to side. Use shims so that the lower links do not contact the tires when in their maximum sway position, or when the links are unhooked from the implement.

Shims can be removed or installed by removing the two bolts that hold the shims in place.

Tractors are shipped from the factory with approximately 25.4 mm (1") shim packs installed.

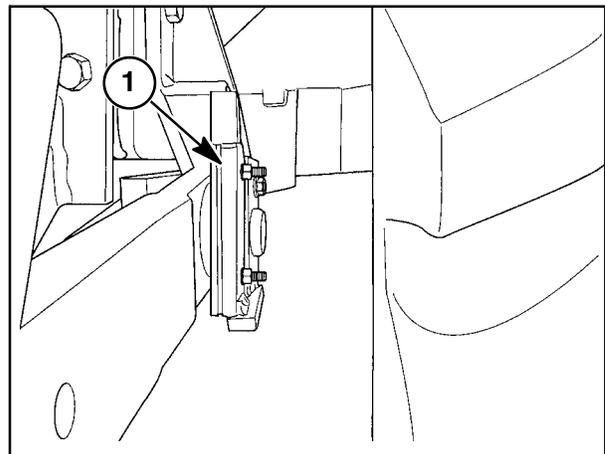


Figure 2-195

Float (Mechanical)

To put the lift links into mechanical float position, remove the pin, 1, securing the lower link to the hole on the lift link. Reconnect the lower link to the lift link using the slot on the lift link. Reverse this procedure to convert to non-float position.

When in this position, the hitch will float approximately 76mm (3") when fully lowered.

NOTE: Full float position is achieved by adjusting the hitch position knob on the side console to its float detent position when in the automatic mode.

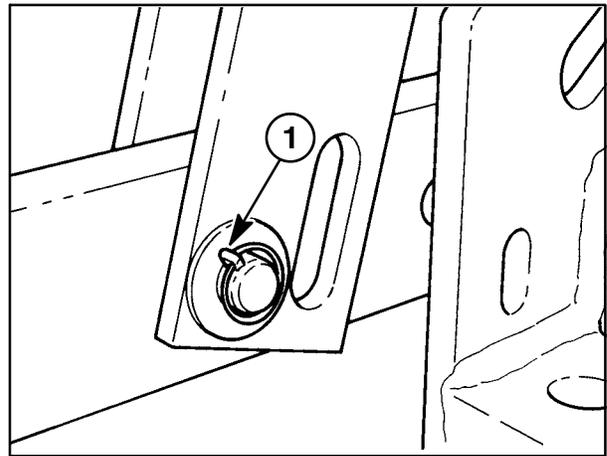


Figure 2-196

Sway Blocks

Sway blocks, 1, have two positions for use with the 3-point hitch. When the blocks are in the sway position, the lower links can move side to side approximately 51mm (2"). When in the non-sway position, the lift arms will be limited in their side-to-side movement when hooked to an implement.

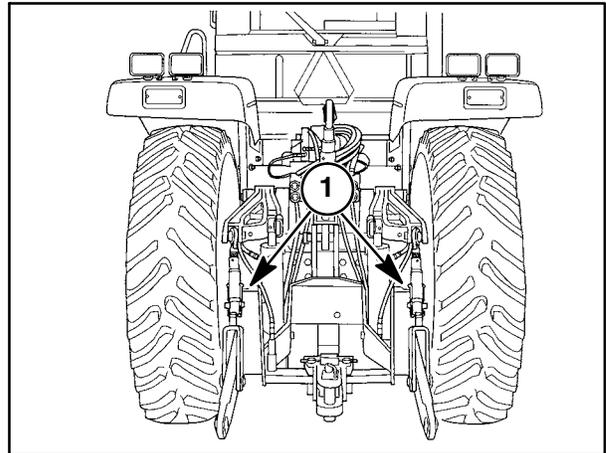


Figure 2-197

When the sway blocks, 1, are in the sway position, the block is rotated so that the narrow end of the block is downward.

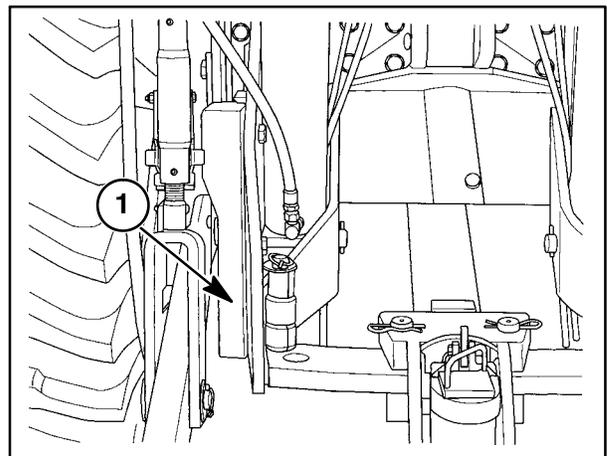


Figure 2-198

When the sway block, 1, is in the non-sway position, it is rotated 90° so that the narrow portion of the block is turned away from the lower link and the block is of equal thickness from top to bottom.

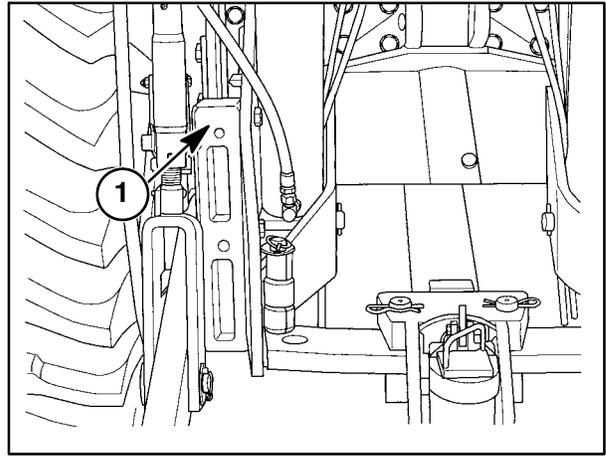


Figure 2-199

To convert the block from the sway to the non-sway position, or vice versa, loosen and remove the two attaching bolts, 1, from inside the drawbar cage. Rotate the block to the desired position, and reinstall the attaching bolts. Torque the bolts to 270 N·m . (200 ft. lbs)

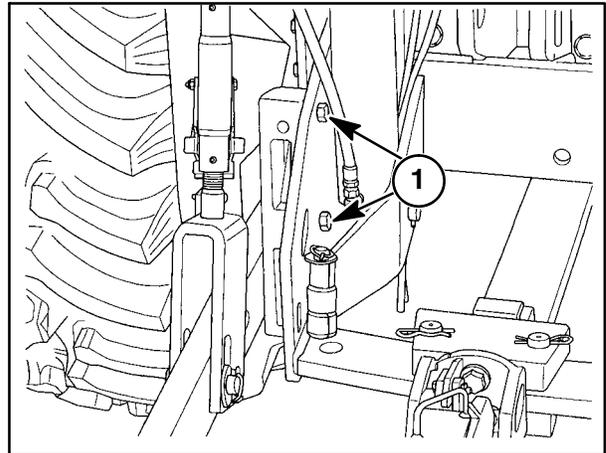


Figure 2-200

Drawbar Positioning

To eliminate interference between the drawbar and mounted implement, lock the drawbar into the middle position.

PTO (Option)

IMPORTANT: The 3-point hitch must be in the non-sway position to use the PTO.

When using the PTO to power 3-point hitch mounted implements, put the hitch into the non-sway position with sway blocks to prevent damage to the PTO drivelines and universal joints.

Category Conversion

The hitch is shipped in the Category IV Narrow position. To convert the hitch to the Category III position (implement side), proceed as follows:

Remove the pin, 1, that attaches the lift link to the lower link by removing the klick pin and washer from inside the lower link.

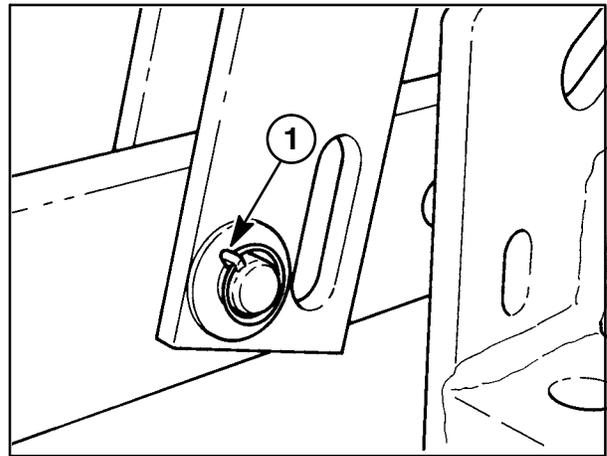


Figure 2-201

Remove the lower links, 1, by removing the locking plate bolt, 2, and locking plate, 3. Remove the lower link attaching pin, 4, and bushing.

Turn the lower links end over end and attach the lower link to the tractor using pin, 4; locking plate, 3; and bolt, 2. Store the bushing on the storage pin.

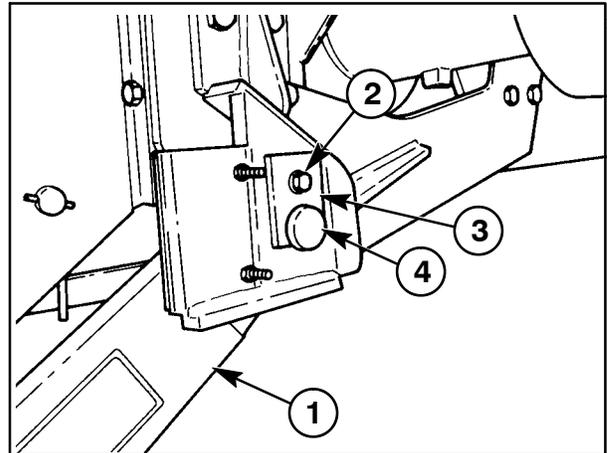


Figure 2-202

Reattach the lift link to the lower link, using the rearmost hole on the lower link, with the klick pin and washer.

Repeat this procedure for the other side of the hitch.

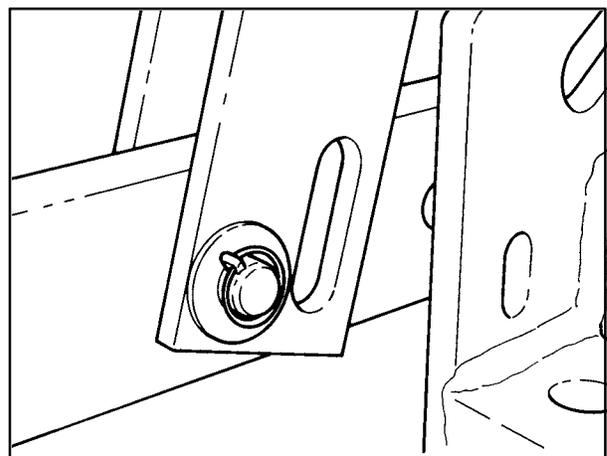


Figure 2-203

Turn the upper lift link end over end and mount it to the bottom hole in the upper link bracket.

NOTE: Turn end over end means that the hitch point of the link becomes the link point and vice versa.

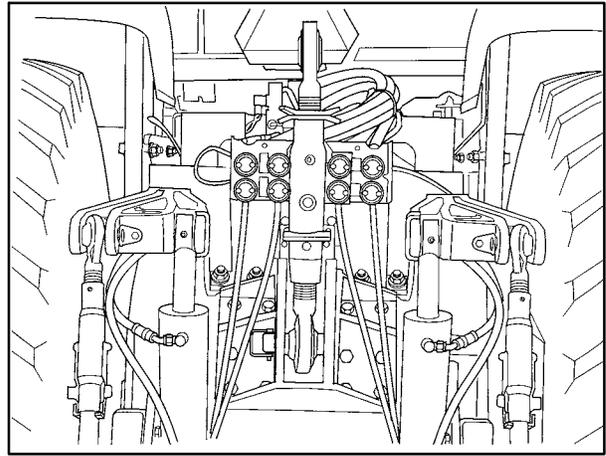


Figure 2-204

Put the Category III bushings that are stored on the drawbar cage storage pin into the ball swivels, 1, at the upper and lower link hitch points.

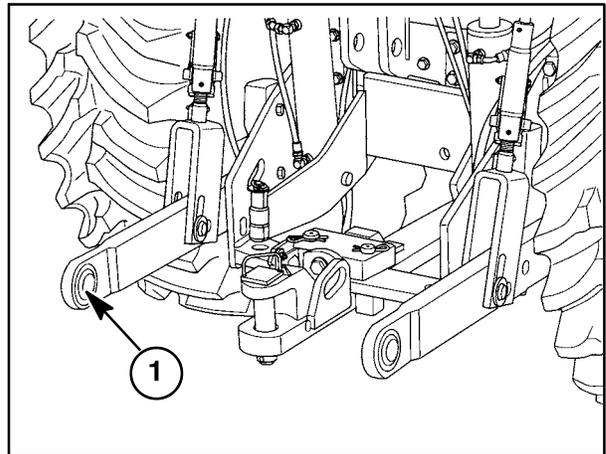


Figure 2-205

Add or remove shims, 1, to ensure that the lower links do not contact the tires when they are free of the implement.

Reverse these steps to convert from a Category III to Category IV Narrow.

Be sure that the correct diameter pins are used in the hitch attaching points. Undersized pins may break and damage the implement or ball ends.

IMPORTANT: Use the correct diameter pins in the 3-point attaching links. Category III upper link pin size: 32 mm (1-1/4") diameter. Lower link pin size: 37 mm (1-7/16") diameter. Category IVN upper link pin size: 45 mm (1-3/4") diameter. Lower link pin size: 50 mm (2") diameter.

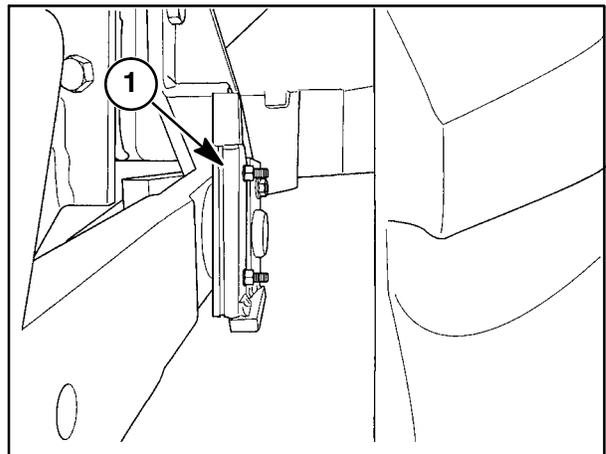


Figure 2-206

Quick Hitch Installation (Optional - Category III/IVN)



CAUTION: BE SURE NO ONE IS BETWEEN THE IMPLEMENT AND TRACTOR WHEN BACKING UP.

An optional quick hitch is available to attach to the Category III/IVN 3-point hitch that allows quick attachment of implements to the tractor. To use the quick hitch, proceed as follows:

The 3-point hitch can be set for Category III or Category IVN with the quick hitch. If Category III is used, it will be necessary to remove the bushings in the link pins. The quick hitch uses Category IVN pins.

Connect the quick hitch, 1, to the upper and lower hitch points of the 3-point hitch with pins and cotter pins.

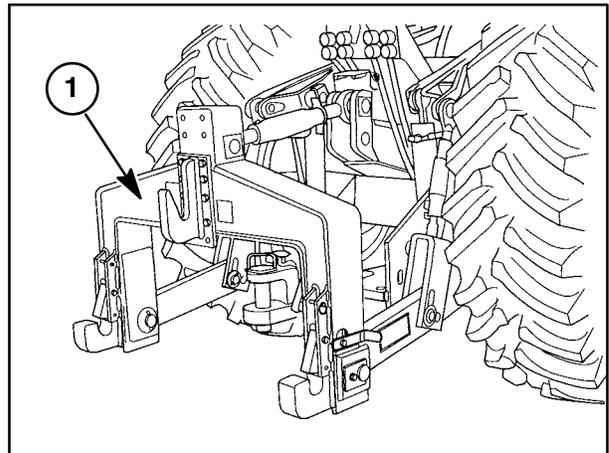


Figure 2-207

The upper implement attaching point of the quick hitch must be positioned properly for either a Category III or a IVN implement. Remove the eight attaching bolts, 1, from the quick hitch frame and position the bracket properly for the implement to be used.

NOTE: When Category III implements are attached to the quick coupler, proper bushings must be used to adapt the coupler to the implement. The coupler attaching points are set up for Category IV implements.

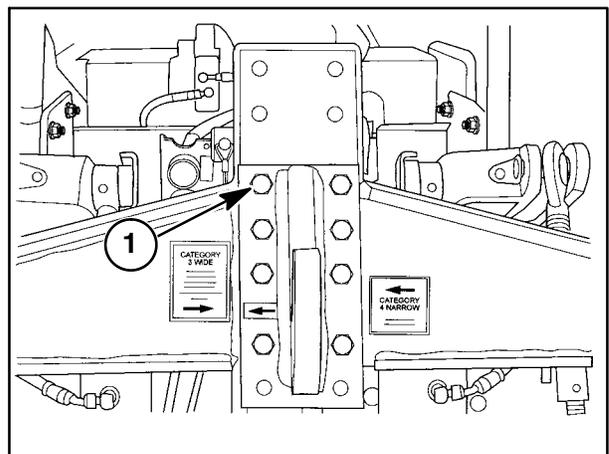


Figure 2-208

IMPLEMENT CONNECTION

With the levers, 1, horizontal and the safety pins, 2, in the storage position, back the tractor up to the implement. Using the manual raise/lower switch, couple the quick hitch to the implement.

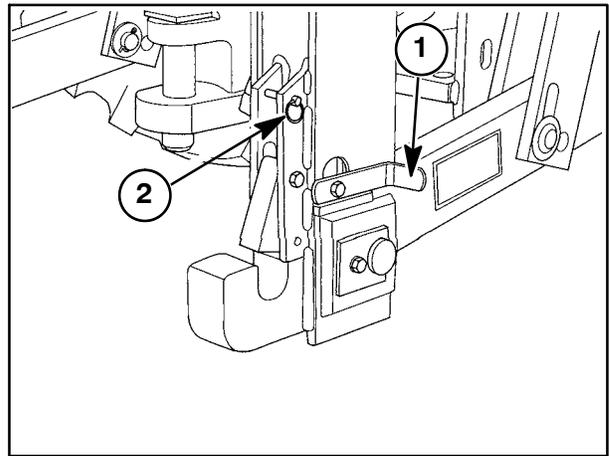


Figure 2-209

When the lower links are seated properly, insert the safety pins, 1, to lock the spring-loaded latches in place.



WARNING: WHENEVER AN IMPLEMENT IS ATTACHED TO THE QUICK HITCH, USE THE SAFETY PINS. IF THE SAFETY PINS ARE NOT IN PLACE, THE POSSIBILITY OF INADVERTENT DETACHMENT EXISTS, PARTICULARLY DURING TRANSPORT.

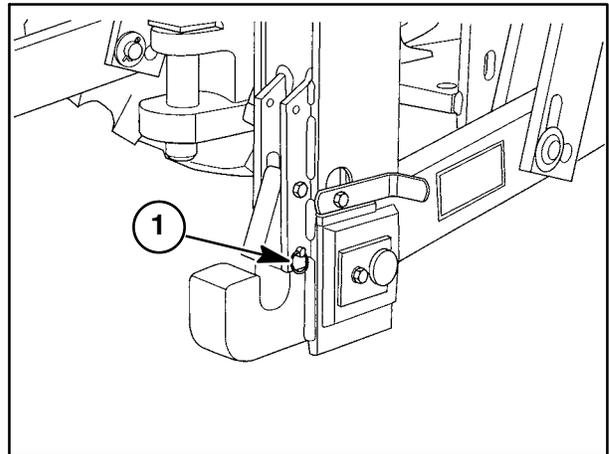


Figure 2-210

IMPLEMENT DISCONNECT

Lower the implement to the ground where you want to disconnect. Be sure the implement is sitting in a secure position and will not shift or tip when disconnected from the quick hitch. Remove the safety pins, 1, and move the lever, 2, to a vertical position. The implement is now attached only by the top link. Using the manual raise/lower switch, lower the 3-point hitch to clear the top link pin.

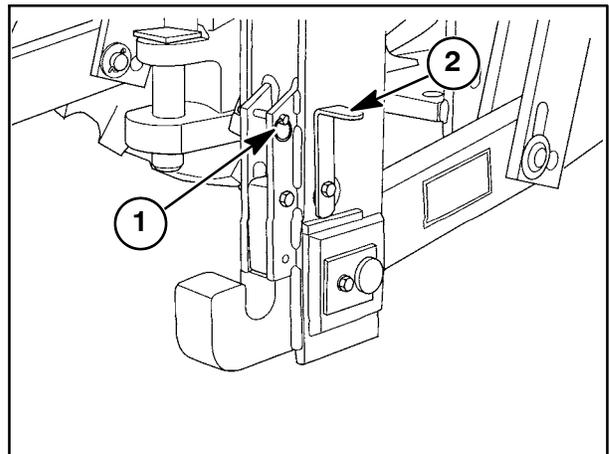


Figure 2-211

FEEDBACK POTENTIOMETER

On occasion, the feedback potentiometer, located on the right hand side of the rockshaft, may need to be adjusted. This will ensure that the lift cylinders do not overextend or retract too far and place the hydraulic system in high pressure standby during full raise or lower modes of operation while in the automatic mode. To adjust the potentiometer, use the following procedure:

1. Park the tractor on level ground. Set the parking brake and engage the articulation lock.
2. Engage the manual switch and raise the hitch to the full up position.
3. Turn the engine off.
4. Measure the length of the exposed lift cylinder rod from the base of the rod ,1, to the grease zerk, 2.
5. Start the tractor and lower the three-point hitch.
6. Engage the automatic mode of operation and raise the hitch to the full UP position.
7. Turn the engine off.

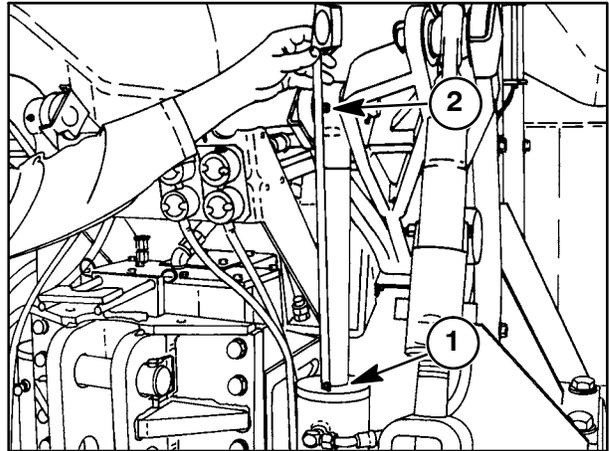


Figure 2-212

8. Measure the length of the exposed lift cylinder rod from the base of the rod ,1, to the grease zerk, 2. The measurement should be approximately 6mm to 5mm (1/4" to 3/16") shorter than the measurement obtained in step 4 of this procedure.

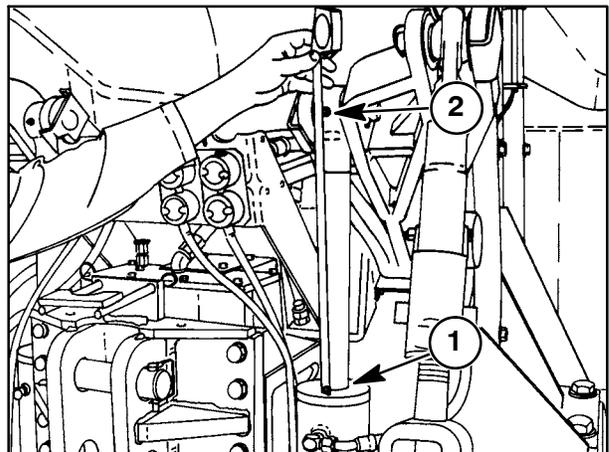


Figure 2-213

9. If the measurement is not within specs, loosen the feedback potentiometer cover screws, 1.
10. Adjust the potentiometer by rotating the potentiometer cover plate tab, 2, CW to raise the hitch and CCW to lower the three-point hitch.
11. Tighten the adjustment screws and repeat the measuring procedures as detailed in steps 2 through 8.
12. A final quick check for the proper adjustment is to lift the three-point hitch in the automatic mode. Switch to the manual mode and depress in the raise position. The lift cylinder should extend approximately 6mm (1/4") upward from the full automatic raise position.

IMPORTANT: In the automatic raise mode, the three-point hitch must automatically stop raising before the cylinders are fully extended.

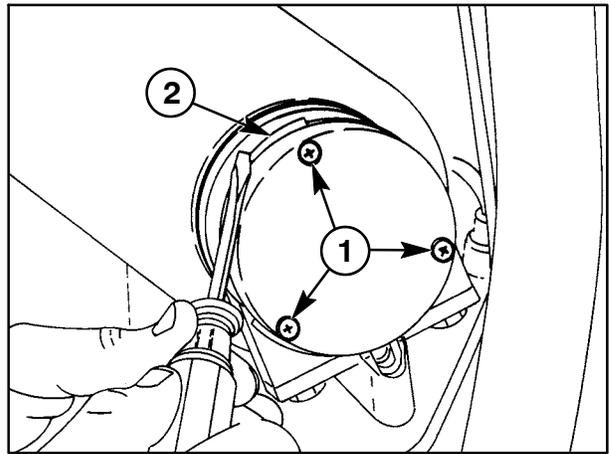


Figure 2-214

IMPLEMENT HOOK-UP

3-Point Hitch Implements

IMPORTANT: Before hitching implements to the 3-point hitch, be sure that the implement is compatible with the tractor hitch.



CAUTION: BE SURE THAT NO ONE IS BETWEEN THE TRACTOR AND IMPLEMENT WHEN BACKING UP THE TRACTOR.

Before attaching 3-point hitch implements, be sure that the drawbar does not interfere when the implement is raised or lowered.



CAUTION: SHUT THE TRACTOR OFF WHEN HOOKING UP AN IMPLEMENT.

1. Back the tractor so that the lower link hitch points are even with the implement connections.
2. Connect the lower links to the implement with the correct size hitch pins and secure with klick pins.
3. Adjust the upper link length and setting on the link bracket. Connect the link to the implement with the hitch pin and lock with klick pins.

IMPORTANT: The hitch pins must fit snugly into the connection points. If loose, the implement and tractor have different hitch dimensions. Verify the correct hitch category.

4. Level the implement.
5. Install sway blocks and shims as required.

Semi-integral Implements

1. Large rear-mounted equipment is usually connected to the two lower lift links only.
2. Attach the implement in the same manner as a 3-point hitch implement, but do not connect the upper link. The lower links lift the implement front, and a remote hydraulic cylinder lifts the rear.
3. See the “Hydraulic System Operation” earlier in this section for information on the connection of hydraulics to lift semi-integral implements.



CAUTION: WHEN SERVICING IMPLEMENTS MOUNTED TO THE 3-POINT HITCH, BE SURE THAT THE IMPLEMENT IS PROPERLY SUPPORTED WITH BLOCKING.

3-POINT HITCH OPERATION

NOTE: See “3-Point Hitch Controls” earlier in this section for an explanation of the function of the controls.



WARNING: DO NOT SET THE ROTARY DEPTH CONTROL KNOB TO THE FLOAT POSITION WHEN IN THE AUTOMATIC MODE UNLESS THE IMPLEMENT WEIGHT IS ON THE GROUND. IF THE KNOB IS SET IN THE FLOAT POSITION WITH THE IMPLEMENT RAISED, IT WILL DROP QUICKLY, POSSIBLY CAUSING DAMAGE.

1. Start the tractor. The hitch will be in the manual mode.
2. Raise the hitch fully, using the manual raise/lower switch.
3. Set the rotary lowering rate control knob, 1, to the fully counterclockwise position. Press and hold the manual raise/lower switch, 2, in the lower position. Slowly turn the lowering rate control knob clockwise to set the rate of lowering for the implement. Release the manual raise/lower switch. Repeat this procedure until the desired rate of lowering is reached.
4. Set the raise rate of the implement using the flow control on the 3-point hitch section of the implement valve. (See “3-Point Hitch Controls” earlier in this section.)

NOTE: The lowering and raise rate of the implement has to be set for each implement of different weight.



WARNING: ONLY ADJUST THE RAISE RATE WHEN THE 3-POINT HITCH CONTROLS ARE IN NEUTRAL AND THE TRACTOR IS SHUT OFF. ENGAGE THE ARTICULATION LOCK WHEN WORKING IN THE ARTICULATION AREA.

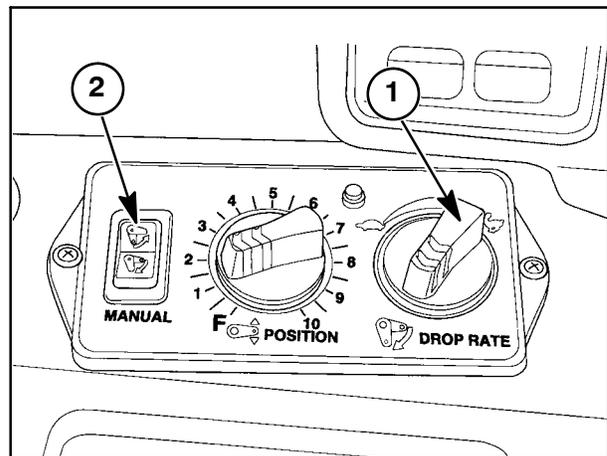


Figure 2-215

5. Raise the hitch to the full up position using the manual raise/lower switch.
6. Set the rotary depth control knob to 10 (fully raised position).
7. Press the auto raise/lower switch, 1, to place the hitch in the automatic mode. The light will come on to indicate automatic mode operation. Start the tractor and implement down through the field and use the rotary depth control knob to control the height of the implement. Once the working depth is reached, the hitch will automatically keep the implement at the preset depth unless the depth is changed by the operator using the rotary depth control knob.
8. Use the auto raise/lower switch to raise the hitch at the end of the field or row.

Press the top of the switch to fully raise the hitch. Make the turn with the tractor and start down the field. Press the bottom of the switch to return the implement to the preselected working depth.

9. Use the manual raise/lower switch to raise or lower the hitch manually. The hitch will stop when the switch is released. The manual raise/lower switch will override the automatic mode and place the hitch to manual.

IMPORTANT: *The auto switch must be depressed to resume auto operation.*

Pressing the lower portion of the auto raise/lower switch will resume auto operation and position the hitch to the height preset with the rotary depth control knob, regardless of the current hitch position. Pressing the top of the auto raise/lower switch will also resume auto operation, and the hitch will raise to the highest position.

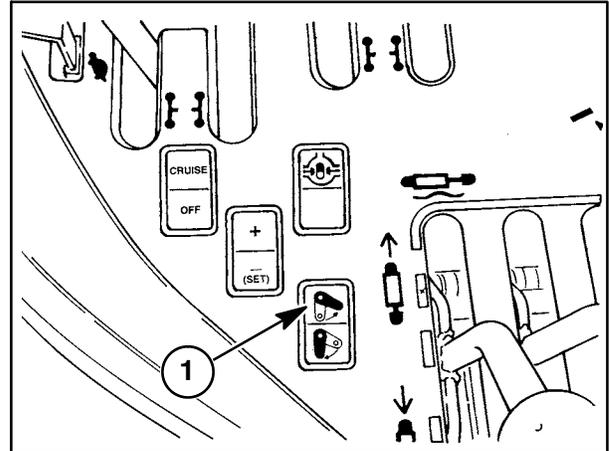


Figure 2-216

10. The hitch can be put into the float mode any time the system is in the automatic mode. Rotate the rotary depth control knob to the "F" position until it detents. The hitch will now follow the ground contour. Pressing the top of the auto raise/lower switch will cause the hitch to fully raise, and pressing the bottom of the switch will return the hitch to the float position.



WARNING: DO NOT SET THE ROTARY DEPTH CONTROL KNOB TO THE FLOAT POSITION WHEN IN THE AUTOMATIC MODE UNLESS THE IMPLEMENT

WEIGHT IS ON THE GROUND. IF THE KNOB IS SET IN THE FLOAT POSITION WITH THE IMPLEMENT RAISED, IT WILL DROP QUICKLY, POSSIBLY CAUSING DAMAGE.

11. When transporting implements, set the rotary depth control to the fully raised position (10). Place the hitch in the automatic mode and press the top of the auto raise/lower switch to raise the hitch. Do not use auto or move the rotary depth control knob as the hitch may drop during transport.

TIRES AND ARTICULATION BLOCKS

PROPER TIRE SELECTION

Selecting the proper size and type of tires is important in achieving maximum tractor efficiency. Various sizes and types of tires are available for your tractor. Refer to Section 1 of this manual for approved tire sizes by tractor model number.

If a specific size of tire or tire configuration is not listed under a particular model, do not attempt to install that size tire.

The tires selected for your tractor must be able to support the weight of the tractor and equipment. The tires must also be able to provide adequate tire traction to utilize the tractor engine horsepower and turn it into useful drawbar horsepower.

You will have to adjust the ballast, tire pressure and tractor weight split between the front and rear axles for various loads and conditions to achieve the best ride and performance.

Always maintain the proper air pressure in the tire to carry the load. Do not over inflate radial or bias ply tires. Radial tires will work with LOWER air pressures. Radial tires will show up to 20% sidewall deflection or bulge when properly inflated.

The force that enables the tires to drive the tractor must be transmitted through the tire sidewalls. The tires work best when all the tires on a given axle are working at the same rate. Think of them like a shock absorber; they must respond the same way to share the load equally.

Factors Determining Best Tire Performance

Good Performance

Proper air pressure for the load

Proper sidewall deflection

8%-15% wheel slip

Proper tire size for expected load

Less than 50% fill of liquid ballast

Maintaining equal tire pressure in all tires on a given axle

Poor Performance

High or low air pressure

Stiff sidewalls

High or low wheel slip

Overloaded or underloaded tire

Excessive liquid calcium in a tire

Treating tires on an axle differently

Bias ply tires are rated using a ply rating and radial-type tires are rated using a * rating on the sidewall of the tire. Refer to Section 5 of this manual for information on load carrying capacity based on ply or * rating.

As a general comparison, the following chart details the relationship between ply and * ratings of bias and radial tires.

Bias Ply Rating	Radial * Equivalent
6	*
8	*
10	**
12	***

Refer to "Ballasting" later in this section for proper tractor weight procedures once the tire size has been selected.

ARTICULATION BLOCKS

Each individual tire size requires a specific articulation block to be used with that tire size. Refer to “Tire Configurations” in Section 1 for the maximum articulation angle allowed based on tire selection.

There are four possible articulation angles used on the tractors. They are 42°, 38°, 33°, 31°. The following information shows what each articulation block configuration looks like. The articulation blocks are located on the front frame adjacent to each fuel tank.

***IMPORTANT:** Install the proper articulation blocks on the tractor before the dual or triple wheels are installed on the unit to prevent any accidental damage from occurring.*

NOTE: Any tractor that is equipped with a PTO option requires a 38° articulation block kit be installed on it. If the tire size of the tractor requires a 33° or 31° articulation kit, use those kits instead of the 38° kit for a PTO option.



WARNING: IMPROPER ASSEMBLY OF THE ARTICULATION BLOCKS CAN CAUSE THE TRACTOR WHEELS TO CONTACT THE FUEL TANK WHEN TURNING, LIMITING TURNING ABILITY AND CONTROL OF THE TRACTOR.

42° - The maximum turning angle allowed by the steering cylinders is 42°. If your tractor tire size allows an angle of 42°, no articulation blocks are required.

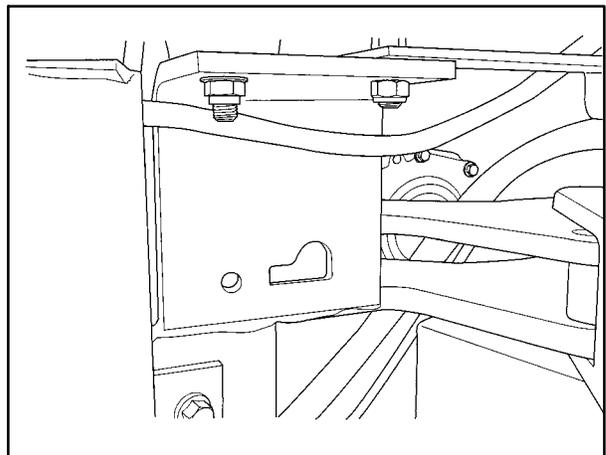


Figure 2-217

38° - To limit the articulation angle to 38°, use the articulation blocks with the thin portion toward the inside.

NOTE: Any tractor that is equipped with a PTO option requires a 38° articulation block kit be installed on it. If the tire size of the tractor requires a 33° or 31° articulation kit, use those kits instead of the 38° kit for a PTO option.

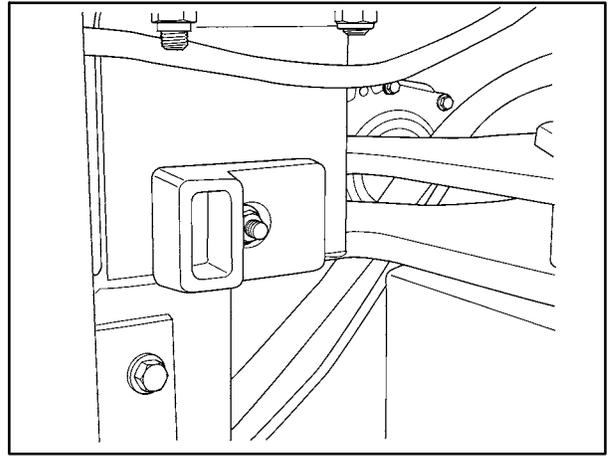


Figure 2-218

33° - To limit the articulation angle to 33°, use the articulation blocks with the thick portion to the inside.

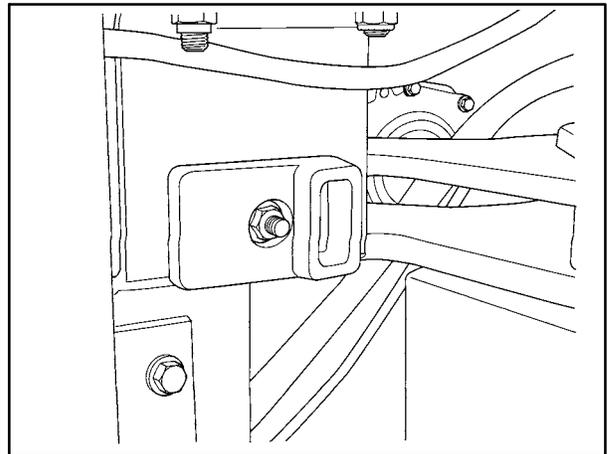


Figure 2-219

31° - To limit the articulation angle to 31°, use the articulation blocks in conjunction with the backing plate, 1. The articulation block should have the thick portion toward the inside.

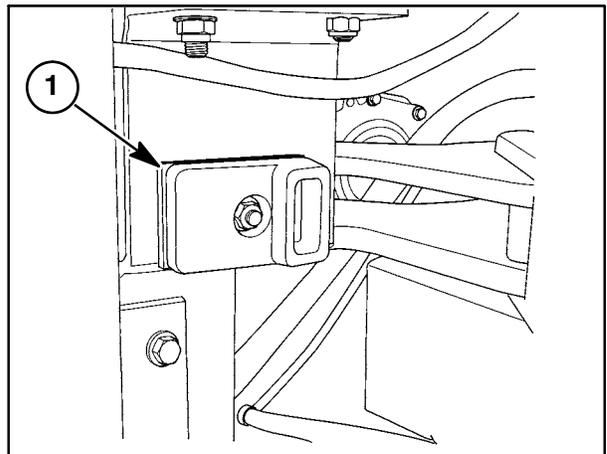


Figure 2-220

BALLASTING

Basic Rules of Thumb for Ballasting

1. When using fluid, put equal amounts in each tire on a given axle.
2. Ballast tractors to a minimum amount as a starting point.
3. For light-duty application, weight distribution front to rear is not as important as in heavier draft applications.
4. At maximum operating weight, the correct recommended weight distribution of 55/45 (front/rear) for drawbar applications and 65/35 (front/rear) for 3-point hitch applications is essential.
5. Set tire inflation pressures based on weight carried by each wheel. Do not go below 55 kPa (8 PSI) on radials or 83 kPa (12 PSI) on bias tires.

Application and Ballasting

Buhler Versatile 4WD tractors work in many different conditions and operations. Therefore it is up to the operator to ensure that the tractor is performing at its peak in its specific operations.

Unlike crawler-type tractors, these tractors are designed to operate at speeds of 7.2 KPH (4.5 MPH) and higher. At these speeds, they are more productive and are less likely to have mechanical breakdowns.

Many factors determine a tractor's productivity. Factors such as the size of the load, tractor wheel slip, tire rolling resistance, tractor operating weight and tractor weight distribution all must be taken into consideration when operating an Buhler Versatile 4WD tractor.

Loads Matched to the Tractor

Do not operate the tractor with heavy implement loads that need the use of gears in the lower ranges. The tractor is made for continued field operation at the rated HP and ground speed of 7.2 KPH (4.5 MPH) and faster with a load that is correctly matched to the tractor. If you operate the tractor with too much ballast and pull too heavy a load for a long period of time in the low gears, you will cause damage to the drivetrain and decrease tire life.

The best traction occurs when wheel slip is between 8% and 15% for drawbar work and 13% to 15% for 3-point hitch work. The extra 5% is to compensate for additional tire distortion caused by weight transfer from the hitch.

If possible, remove ballast when not needed for lighter loads.

Pull lighter loads at a faster speed to do more work and increase efficiency. Do not overweight the tractor to pull very heavy loads.

If the implement cannot be pulled at the needed depth at 7.2 KPH (4.5 MPH) or greater, the implement is over matched for your tractor.

The best guide to follow in ballasting is to not have the full load wheel slippage fall below 12%. This amount of slippage is your best protection against overloading.

Wheel Slip

Wheel slippage is a vital consideration in any farming operation. Too much slippage represents lost time and wasted production. Too much wheel slippage is a major cause of wheel traffic-induced soil compaction. Too little can result in reduced reliability of the drivetrain.

Strive for 8% to 15% wheel slippage on a 4WD.

Wheel slip is defined as the amount of tire rotation "wasted" during one complete rotation of a tire. Wheel slip is not a deterrent to tractor operation. It is a necessary function of the tires and helps prevent damage to the tractor drivetrain due to tractor overload.

Every time a tractor wheel makes a revolution, the wheel covers a certain distance. On a very firm dry surface (i.e., asphalt), the distance covered in one tire revolution will be very close to the actual circumference of the tire. On a very loose surface (i.e., sand), the distance covered in one tire revolution will be significantly less than the actual circumference of the tire. This "wasted" distance is referred to as wheel slip.

Every tire contact on every surface will produce some amount of wheel slip. If there were no wheel slip, significant drivetrain wear would be present and damage to the tractor may occur. Ballasting the tractor and operating with the proper size and inflated tires will maintain wheel slip at a manageable level (8%-15%).

Measuring Wheel Slip

Tractors that are equipped with an optional Tractor Performance Monitor will measure wheel slip automatically and inform the operator if the wheel slip is at an unacceptable level based on a preprogrammed value set by the operator. For more information on the wheel slip feature on the Tractor Performance Monitor, see "Tractor Performance Monitor" earlier in this section.

If the tractor does not have the optional Tractor Performance Monitor, wheel slip can be measured as follows:

1. Put a reference mark on the side of the tractor rear tire.
2. Operate the tractor with the implement in the ground.
3. While the tractor is moving, have an assistant put a marker on the ground outside the implement width where the reference mark on the tire comes down to the ground.



DANGER: MAKE SURE THE ASSISTANT IS CLEAR OF THE IMPLEMENT AND TRACTOR DURING WHEEL SLIP MEASUREMENTS.

4. Continue to move along with the tractor and count ten wheel revolutions. Put a second marker on the ground outside the implement width where the reference mark on the tire comes down to the ground for the tenth time.
5. Lift the implement out of the ground. Put the tractor in position and put a new reference mark on the rear tire aligned with the first ground marker.

6. Operate the tractor, with the implement raised, from the first ground marker to the second ground marker. Count the number of wheel revolutions between the two ground markers.
7. The tire will require fewer revolutions to cover the same distance because of less slip. The following table will determine the percent of wheel slip from the number of wheel revolutions:

Revolutions of Wheel	Slip %
9-1/2	5
9	10
8-1/2	15
8	20
7-1/2	25
7	30

When you have too much ballast installed on the tractor, you will see the clear shape of the tire bar in the ground which is an indication of no slippage. With too little ballast, the tire bar marks will not show because of the tire slippage.

Too Little Ballast

1. Excessive wheel spin
2. Power loss
3. Tire wear
4. Excessive fuel consumption
5. Lower productivity

Too Much Ballast

1. Increased drivetrain load and power operating cost
2. Power loss
3. Tire strain
4. Soil compaction
5. Lower productivity, i.e., more power required to move the overloaded tractor, allowing less power available to pull the implement.

Rolling Resistance

The greatest loss of engine power occurs in the area of traction factors such as rolling resistance and wheel slippage. Those losses will occur in any and every practical traction situation.

Therefore, choosing the right amount of weight is the first step. Too little weight permits excessive wheel slippage while too much weight increases soil compaction and rolling resistance. Rolling resistance is the power required to roll the tractor's tires forward with no load except weight.

Tractor Weight Distribution

Although Buhler Versatile 4WD tractors are manufactured with an approximate weight distribution of 65% to 67% over the front axle and 33% to 35% over the rear axle, the intent of the design is to have the tractor operating in the field with an ideal 50/50 dynamic weight distribution.

The benefits of operating a tractor in the field under the ideal 50/50 dynamic weight distribution are:

1. The work is divided equally between the axles, allowing a more even distribution of work and load.
2. Compaction is lessened since the axles are the lightest force possible on the soil. If a 13,636 kg (30,000-lb.) tractor has a 50/50 split, each axle exerts a force of 6,818 kg (15,000 lbs.). A 60/40 split would create an 8,182 kg (18,000-lb.) force under the heavier axle, increasing the compaction by 1364 kg (3000 lbs.).
3. Maximum traction, with the least rolling resistance, is gained by distributing the load equally between both axles.
4. With the total tractor weight equally divided (under load) on all four wheels, you increase reliability by spreading the torque output of the tractor equally to all four wheels. The greatest torque always goes to the wheels with the most weight.

CALCULATION OF BALLAST

The following information is provided as a guide for proper ballasting:

Shipping Weight and Fore/Aft Ratio

Generally the tractor will come from the factory with an approximate weight distribution of 65% - 67% on the front axle and 33% - 35% on the rear axle. **Do not assume that every tractor will come from the factory with this weight distribution.** Various options and wheel packages will significantly change the weight of the tractor. Determine the shipping weight BEFORE any ballast is added to the tractor by weighing the tractor on a scale. This is the most accurate method of determining actual tractor weight and ballasting the unit correctly. Possible locations of a scale of adequate size to weigh the tractor would be a feed/fertilizer store, asphalt plant, gravel quarry, grain elevator, etc.

NOTE: There is an additional method of calculating the shipping weight of the tractor using calculated weight from theoretical value charts located in the Section 5 of this manual. Weighing the tractor on a scale is preferred.

When weighing the tractor, pull the front axle on the scale first. Make sure the inside wheels of the dual or triple tires are fully on the scales and the outer tires are off of the ground. Since most scales are less than 3 m (10') wide, driving the inner wheels up on wooden blocks will accomplish this. Repeat this procedure for the rear axle. Record the unballasted weight of each axle. Add the weight recorded for each axle together to get a total tractor shipping weight. Divide the individual axle weights by the total tractor shipping weight to get the front to rear weight distribution percentage.

Example:

2335 Unballasted Shipping Weight

Front axle weight: 7,265 kg (16,017 lbs.)
Rear axle weight: 3,966 kg (8743 lbs.)
Total tractor shipping weight: 11,231 kg (24,760 lbs.)

Weight distribution
front axle: $7,265 \div 11,231$
(16,017 \div 24,760)=65%

Weight distribution
rear axle: $3,966 \div 11,231$
(8,743 \div 24,760)=35%

NOTE: The above example is not an exact shipping weight of a 2335. Weigh your specific tractor to get accurate figures to work with.

The optimum ballast to be obtained is to get the tractor weighted so that 50% of the load is being carried on each axle during field work. This makes each axle pull its share of the load so that one component is not overworked.

Operating Weight and Fore/Aft Ratio

Buhler Versatile has determined that Buhler Versatile 4WD tractors operate at top efficiency when ballasted to **43.1 Kg (95 lbs.) per engine brake horsepower**. This is the total vehicle weight at which the tractor can pull an implement and propel itself without causing excess soil compaction. The following chart shows recommended operating weights based on tractor model by horsepower at 43.1 Kg (95 lbs.) per horsepower ballast.

MODEL	RATED HORSEPOWER	RECOMMENDED OPERATING WEIGHT AT 95 LBS/HP
2290	290	12,500 kg (27,550 lbs.)
2335	335	14,440 kg (31,825 lbs.)
2360	360	15,515 kg (34,200 lbs.)
2375	375	16,160 kg (35,625 lbs.)
2425	425	18,315 kg (40,375 lbs.)

Additional Ballast Requirements

Total ballast to be added can now be calculated by subtracting the shipping weight of the tractor, from the recommended operating weight, determined from the chart. Example:

Recommended Operating Weight of 2335 (335 HP)	14,440 kg (31,825 lbs.)
Shipping Weight of 2335	11,231 kg (24,760 lbs.)
Total Ballast to Be Added	3,209 kg (7,065 lbs.)

The figure of 3,209 kg (7,065 lbs.) is the total amount of ballast to be added to the tractor to get it to 43.1 kg (95 lbs) per horsepower. This total ballast figure now needs to be divided between the front and rear axle.

To calculate the amount of ballast to be added to each axle, first determine what type of implement the tractor will be used with.

If the tractor is to be used with a drawbar pull-type implement, the field ready ballasted weight distribution should be 55% on the front axle and 45% on the rear axle of the recommended operating weight. Once the tractor is in the field operating with the implement, the draft load imposed on the tractor by the implement will balance the weight distribution between the axles to a 50/50 dynamic ratio.

If the tractor is to be used with a 3-point hitch-type implement, the field ready ballasted weight distribution should be 65% on the front axle and 35% on the rear axle of the recommended operating weight. Once the tractor is in the field operating with the implement, the draft load imposed on the tractor by the implement will balance the weight distribution between the axles to a 50/50 dynamic ratio.

The following charts detail the proper front to rear ballast for a drawbar application and a 3-point hitch application based on the previous examples.

Example A: Drawbar pull-type implement on a 2335 (335 HP) tractor.

WEIGHTS

	Total kg (lbs.)	Front kg (lbs.)	Rear kg (lbs.)
Optimum Operating Weight & Percentage 43.1kg x 338 @ (95 lb x 335)	14,440kg (31,825lbs.)	7,942kg (17,503 lbs.)	6,498kg (14,322lbs.)
Scaled Shipping Weight	11,231kg (24,760lbs.)	7,625kg (16,017lbs.)	3,966kg (8,743lbs.)
Additional Ballast Required/Axle	3,209kg (7,065lbs.)	677kg (1,486lbs.)	2,046kg (5,579lbs.)

Example B: 3-point hitch implement on a 2335 (335 HP) tractor.

NOTE: Since this example tractor is equipped with a 3-point hitch, the overall weight of the tractor will increase from 11,255 kg (24,760 lbs.) to approximately 11,945 kg (26,333 lbs.). The additional 713.5 kg (1,573 lbs.) is the approximate weight of the 3-point hitch kit that has been installed. The full 713.5 kg (1,573 lbs) has been applied to the rear axle of the tractor only. Front axle weight will remain the same. Notice that with the 3-point hitch kit installed, the front and rear axle shipping weight ratios change significantly.

WEIGHTS

	Total kg (lbs.)	Front kg (lbs.)	Rear kg (lbs.)
Optimum Operating Weight & Percentage @ 43.1kg x 338 (95 lbs x 355)	14,440kg (31,825lbs.)	9,386kg (20,686lbs.)	5,054kg (11,139lbs.)
Scaled Shipping Weight	11,945kg (26,333lbs.)	7,265kg (16,017lbs.)	4,679kg (10,316lbs.)
Additional Ballast Required/Axle	2,495kg (5,492lbs.)	2121kg (lbs.)	375kg (823lbs.)

Weight on Buhler Versatile 4WD tractors is to be added in the form of liquid ballast to the tires or by using the front or rear weight kits available.

Once the weight per axle of additional ballast is determined, the preferred method of adding this weight is to use as much dry weight (i.e., front and rear weight kits) before liquid ballast is added to the tires. This will allow ballast to be easily removed or installed, depending on varying needs. Also, by reducing the liquid ballast inside of a tire, more benefit can be derived from the construction of the tires. When liquid ballast is installed inside of a tire, either bias ply or radial, some of the cushioning action of the tire is reduced and the ability to adjust tire air pressure within a specific range is diminished. These are important factors when trying to eliminate concerns with wheel slippage and "power hop."

The front weight kit can have either thirty-nine 30 kg (67-lb.), suitcase-style weights and, along with its brackets and hardware, weighs approximately 1300 kg (2,860 lbs.). Or twelve 30 kg (67-lb.), suitcase-style weights and, along with its brackets and hardware, weighs approximately 443 kg (934 lbs.). Most applications will not require front weight packages.

Front weights can be removed by taking the tie rod, 1, out of the weight package, loosening the bolt, 2, on the rear of the bracket, then removing the cast block, 3, and lifting the weights from the bracket. The last four weights on the right and left hand side have the cast block installed through the weight cut out. The remaining weights are held in position by the tie rod.

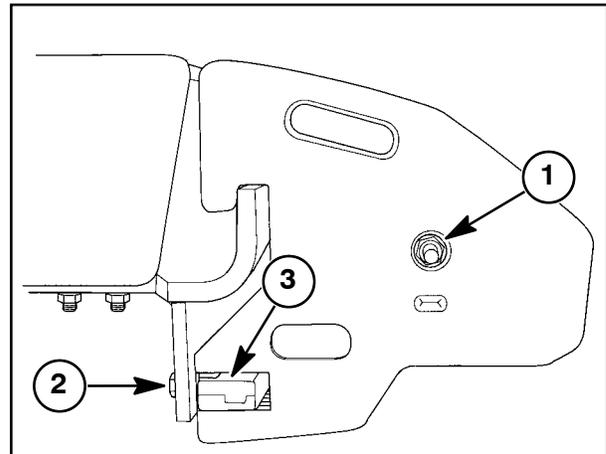


Figure 2-221

EVERY 500 HOURS

Slide the boot toward the front of the tractor on the tube. Look at the inlet, 1, of the precleaner, and remove any debris accumulated in this area.

After the precleaner is cleaned, reinstall the boot and tighten the hose clamps securely. (2360 and 2425 models illustrated)

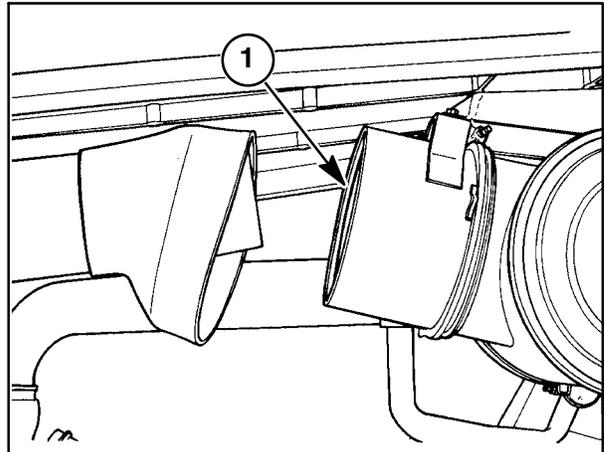


Figure 3-61

OPERATION 40**Clean the Fuel Tank Vent**

Clean the fuel tank vent to be sure the fuel system does not create a vacuum or pressurize causing a malfunction of the fuel pump.

To access the vent, open the SMV sign latch and allow the sign and windshield washer bottle to pivot outward. The vent, 1, is attached to the rear wall of the cab by a bracket.

The vent does not need to be removed to clean it. Use low pressure compressed air 3.5 bar (50 PSI or less) to remove any debris collected around the vent.

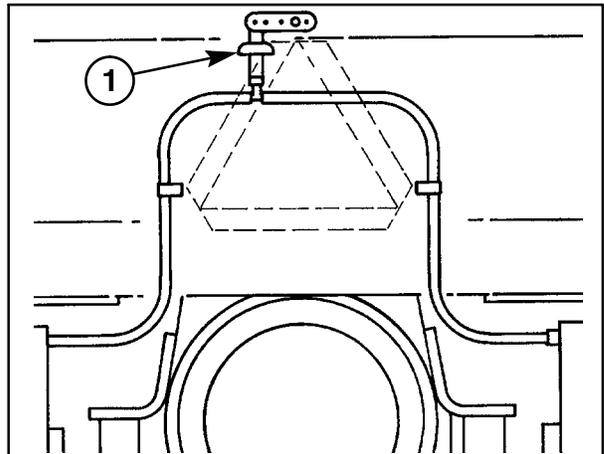


Figure 3-62

OPERATION 41**Clean the Hydraulic Suction Screen**

The hydraulic suction screen can be removed from the top of the hydraulic tank without draining the hydraulic fluid.

To remove the suction screen, first clean the top of the tank where the hydraulic pump suction hose attaches to the suction screen port. Loosen the hose clamps, 1, that attach the suction hose to the steering pump.

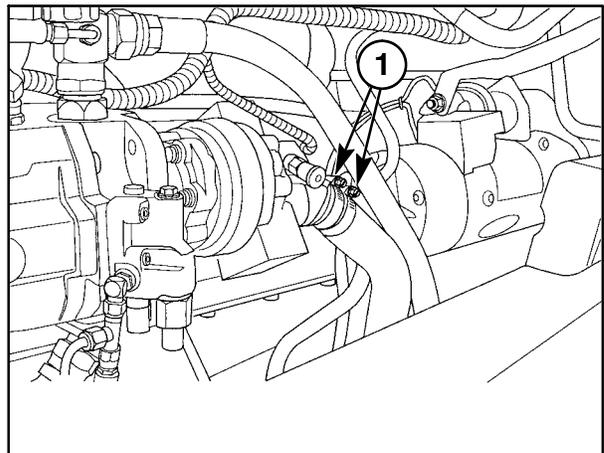


Figure 3-63

The rear weight kit, 1, has thirty-three 30 kg (67-lb.), suitcase-style weights and, along with its brackets and hardware, weighs approximately 1100 kg (2,400 lbs.).

NOTE: The rear weight kit cannot be installed on units that have a PTO option or a 3-point hitch option. The 3-point hitch or PTO is now considered part of the rear axle ballast, and the remaining additional weight required can be installed as liquid weight in the tires.

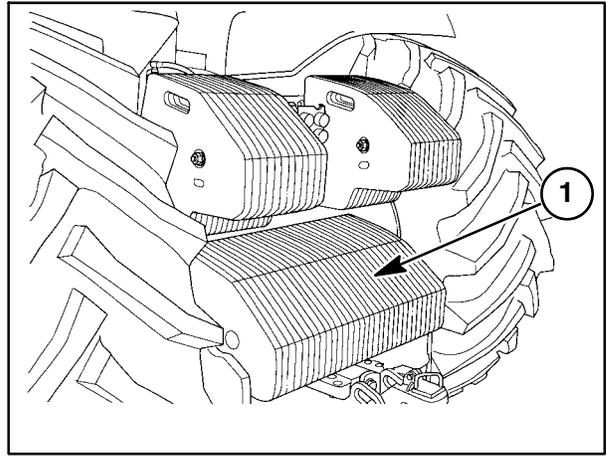


Figure 2-222

Rear weights can be removed by loosening the nut, 1, on the left side of the tie rod, 2, and pulling the tie rod fully to the right against the right tire.

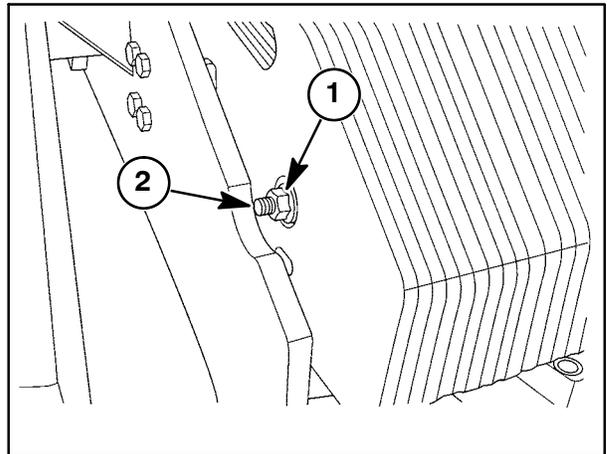


Figure 2-223

Remove the two, capscrews, 1, from the underside of the weight package.

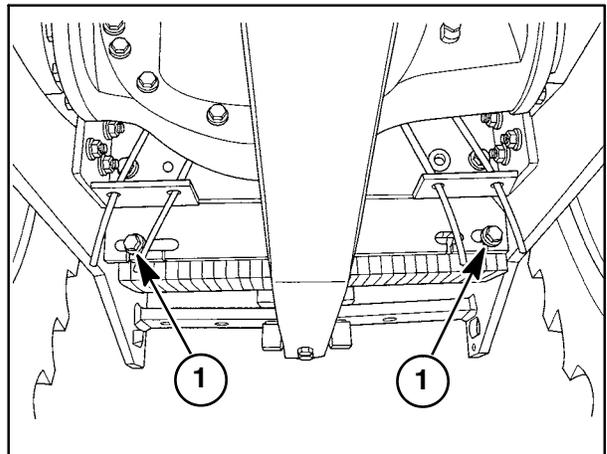


Figure 2-224

SECTION 2 - OPERATION

Pry upward on the fifth weight (from the left), 1, and remove it from the tractor.

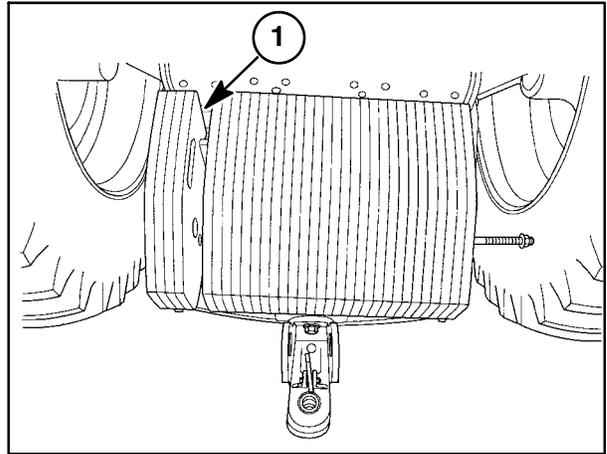


Figure 2-225

Starting with the sixth weight from the left, remove six additional weights from the package. Slide the four left hand weights, 1, to the right (on the bracket) and remove the cast retaining block, 2, from the left hand weights.

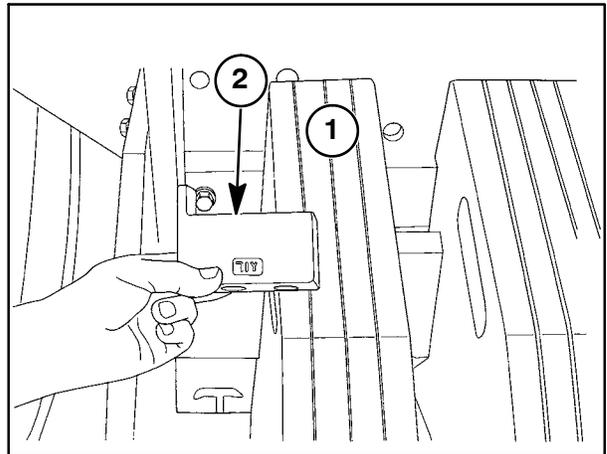


Figure 2-226

Remove all remaining weights from the bracket by sliding them to the left and lifting off of the bracket. This will expose the right hand cast retaining block, 1. Remove the block and remove the remaining four weights.

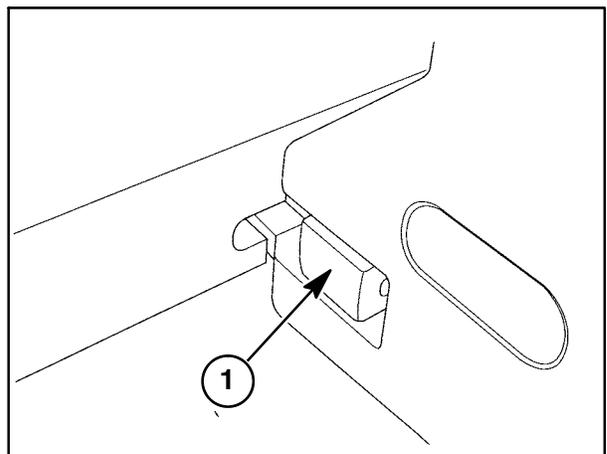


Figure 2-227

Additional rear weight can be added by installing an auxiliary rear weight kit, 1. This kit has twenty-four 30 kg (67-lb.) suitcase-style weights and, along with its brackets and hardware, weighs approximately 738 kg (1628 lbs.). This auxiliary rear weight kit is in addition to, and not part of, the rear weight that fastens to the rear of the tractor.

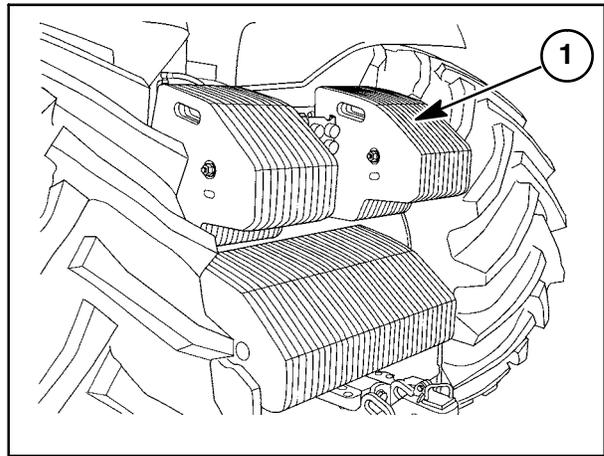


Figure 2-228

Auxiliary rear weights can be taken off by removing the tie rod, 1, then loosening the nut on the front of the bracket, removing the bolt, 2, and clip, 3, and lifting the weight from the bracket.

NOTE: The auxiliary rear weight kit cannot be installed on tractors that have a 3-point hitch option. It can be installed on tractors that have a PTO or rear weight kit installed.

After dry ballast has been installed on the tractor, liquid ballast (if required) should be put into the wheels evenly across the duals or triples. This will allow lower tire air pressures to be used to help improve the ride of the tractor. Tire air pressure is based on the individual load a tire will carry. The total weight on the axle should be divided by the number of tires on that axle to determine the load that each individual tire will carry. By using the "Tire Load and Inflation Tables" in Section 5, proper tire air pressure can be determined.

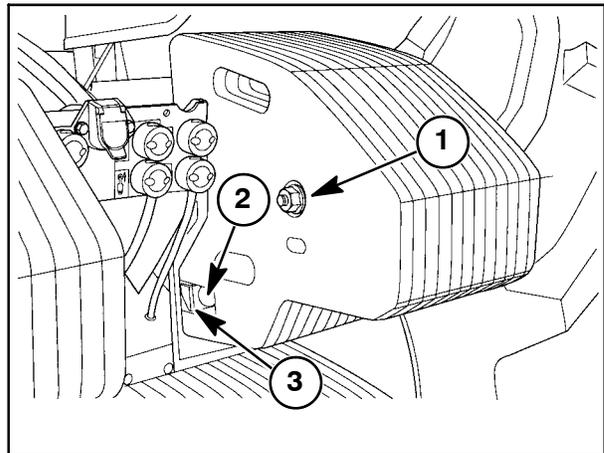


Figure 2-229

For more information on liquid ballast and tire air pressures, refer to the charts in Section 5.

Never exceed the maximum operating weight of a specific model tractor as specified in the following chart. Staying as close as possible to the recommended operating weights will provide the greatest degree of customer satisfaction and tractor performance.

Maximum Operating Weight

Model	Maximum weight
2290	13,800 kg (30,500 lbs.)
2335	16,000 kg (35,000 lbs.)
2360	17,200 kg (38,000 lbs.)
2375	17,900 kg (39,500 lbs.)
2425	20,300 kg (44,500 lbs.)

TOOLBOX/STORAGE TRAY

Toolbox

The toolbox is located on the right front frame on tractors equipped with a PTO, rear weight kit, or 3-point hitch. If the tractor does not have any of these options, the toolbox will be mounted on the rear frame, directly above the drawbar.

The toolbox has a hole drilled through the lid to accommodate a lock.

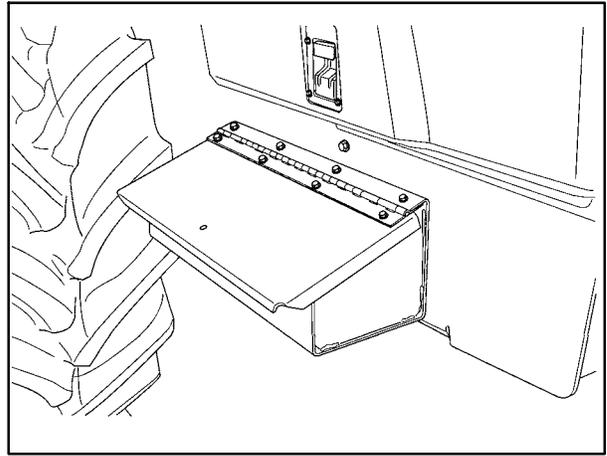


Figure 2-230

Storage Tray

A storage tray is located under the operator's seat and can be pulled out to store miscellaneous articles.

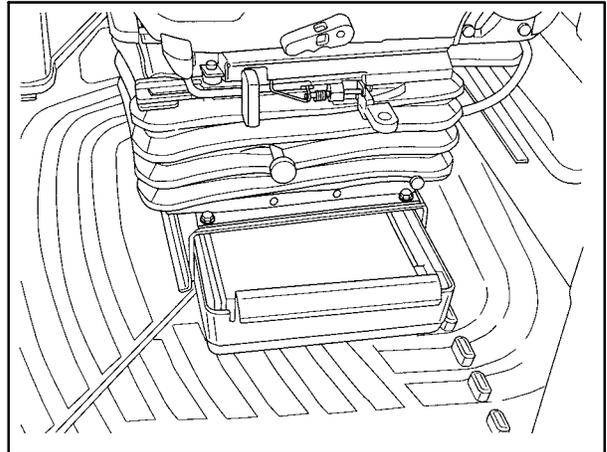


Figure 2-231

BREAK-IN PERIODS

BREAK-IN PERIOD

The first 50 hours of operation are the most critical for insuring long and dependable tractor life. Do the following:

1. Review the tractor Predelivery Checklist contained in the assembly manual with your dealer. Be sure all applicable items on the sheet have been checked.
2. Check all fluid levels and be sure all systems are filled with the correct fluids for your operating conditions.
3. Check the engine, transmission, and hydraulic oil levels hourly during the first 10 hours of operation.
4. Inspect the tractor for leaks hourly during the first 10 hours of operation.
5. Torque the tie rods and wheel bolts after the first hour of operation and every 50 hours thereafter. Torque the tie rods to 300 N·m (220 ft. lbs.), jam nuts to 320 N·m (235 ft. lbs.), and wheel bolts to 715 N·m (525 ft. lbs.).
6. Operate the engine at 3/4 load as much as possible during the first 50 hours (3/4 load is approximately one gear lower than would be normally used to pull a matched load).

7. Do not operate the engine at idle speed or maximum horsepower for more than 5 minutes at a time for the first 50 hours.
8. Check the frame pivot pin, drag link and steering cylinder cap screw torques after the first 10 hours of operation. Torque the frame pivot pin to 1365 N·m (1000 ft. lbs.) and the remaining pins to 175 N·m (130 ft. lbs.).
9. Have your dealer complete the "First 50-Hour Service" checklist at the end of this manual.

ENGINE BREAK-IN

The Cummins engine used in Buhler Versatile 4WD tractors has been run on a dynamometer before installation but not enough to be considered broken in.

1. Do not operate the engine at more than 3/4 load for the first 24 hours of operation. Full load should only be held for short intervals during the next 24 hours of operation.
2. Check the oil level every 8 to 10 hours for the first 100 hours of operation.
3. Follow the recommendations outlined in the Cummins manual supplied with your tractor.

SECTION 3

LUBRICATION AND MAINTENANCE

GENERAL INFORMATION

INTRODUCTION

This section gives full details of the service procedures necessary to maintain your tractor at peak efficiency. The Lubrication and Maintenance Chart provides a ready reference to these requirements. Each operation is numbered for easy reference.

In addition to the regular maintenance operations listed, check the following items every 10 hours or daily during the first 50 hours of operation:

- Wheel hardware for tightness.
- Planetary hub and differential oil level

IMPORTANT: Park the tractor on level ground and, where applicable, extend all cylinders before checking oil levels.

SAFETY PRECAUTIONS

Read and observe all safety precautions listed in Section 0, "Safety: Servicing The Tractor."

NOTE: Dispose of used filters and fluids properly. Consult local officials for proper procedures.



CAUTION: DO NOT CHECK, LUBRICATE, SERVICE OR ADJUST THE TRACTOR WITH THE ENGINE RUNNING.

PREVENTING SYSTEM CONTAMINATION

To prevent contamination when changing oils, filters, etc., always clean the area around the filler caps, level plugs, drain plugs, dipsticks and filters prior to removal. Before connecting remote cylinders, ensure that oil contained within them is clean, has not degenerated due to long storage, and is of the correct grade.

To prevent dirt entry during greasing, wipe dirt from the grease fittings before greasing. Wipe excess grease from the fitting after greasing.

FLEXIBLE MAINTENANCE INTERVALS

The intervals listed in the Lubrication and Maintenance Chart are guidelines to be used when operating in normal working conditions.

Adjust the intervals for environmental and working conditions. Intervals should be shortened under adverse (wet, muddy, sandy, extremely dusty) working conditions.

LUBRICATION AND MAINTENANCE CHART

The chart lists the intervals when routine checks, lubrication, service and/or adjustments should be performed. Use the chart as a quick reference guide when servicing the tractor. The operations follow the chart.

FIRST 50-HOUR SERVICE

At the first 50-hour service, ensure that the maintenance operations listed on the "First 50-Hour Service" checklist, located at the back of this manual, are carried out.

IMPORTANT: Items listed in the first 50-hour check are important. If not performed, early component failure and reduced tractor life may result.

FUELING THE TRACTOR



CAUTION: WHEN HANDLING DIESEL FUEL, OBSERVE THE FOLLOWING:

DO NOT SMOKE AROUND DIESEL FUEL. UNDER NO CIRCUMSTANCES SHOULD GASOLINE, ALCOHOL, GASOHOL OR DIESELHOL (A MIXTURE OF DIESEL FUEL AND ALCOHOL) BE ADDED TO DIESEL FUEL BECAUSE OF INCREASED FIRE OR EXPLOSION RISKS. IN A CLOSED CONTAINER, SUCH AS A FUEL TANK, THEY ARE MORE EXPLOSIVE THAN PURE GASOLINE. DO NOT USE THESE BLENDS. ADDITIONALLY, DIESELHOL IS NOT APPROVED DUE TO POSSIBLE INADEQUATE LUBRICATION OF THE FUEL INJECTION SYSTEM.

CLEAN THE FILLER CAP AREA AND KEEP IT FREE OF DEBRIS.

FILL THE TANKS AT THE END OF EACH DAY TO REDUCE OVERNIGHT CONDENSATION.

NEVER TAKE THE CAPS OFF OR REFUEL WITH THE ENGINE RUNNING.

KEEP CONTROL OF THE FUEL NOZZLE WHILE FILLING THE FUEL TANKS.

DON'T FILL THE TANKS TO CAPACITY. ALLOW ROOM FOR EXPANSION. IF THE ORIGINAL FUEL TANK CAPS ARE LOST, REPLACE THEM WITH BUHLER VERSATILE CAPS AND TIGHTEN SECURELY.

WIPE UP SPILLED FUEL IMMEDIATELY.

USE ONLY INTERNALLY GROUNDED FUELING HOSE FROM STORAGE TANK AND PUMP TO TRACTOR FUEL TANK. IF IN DOUBT CHECK WITH YOUR FUEL HOSE SUPPLIER. (AN ACCEPTABLE FUEL HOSE WOULD BE ONE WITH AN INTERNAL WIRE THAT CAN BE CHECKED USING A CONTINUITY TESTER.)

WHEN REFUELING, MAKE SURE THE NOZZLE IS IN CONTACT WITH THE FILLER NECK OF THE TRACTOR FUEL TANK BEFORE FUEL STARTS FLOWING AND DURING THE ENTIRE TIME FUEL IS FLOWING.

FUEL STORAGE

Take the following precautions to ensure stored fuel is kept free of dirt, water, and other contaminants.

- Store fuel in black iron tanks, not galvanized tanks, as the zinc coating will react with the fuel and form compounds that will contaminate the injection pump and injectors.
- Install bulk storage tanks away from direct sunlight and angle them slightly so sediment in the tanks will settle away from the outlet pipe. Check the fuel storage tanks regularly for condensation by draining from the tank bottom.
- To facilitate moisture and sediment removal, provide a drain plug at the lowest point at the end opposite the outlet pipe.
- If fuel is not filtered from the storage tank, put a funnel with a fine mesh screen in the fuel tank filler neck when refueling.
- Arrange fuel purchases so summer grade fuels are not held over and used in winter.
- Ground the storage tanks to prevent static buildup.

Fuel Requirements

The quality of fuel used is an important factor for dependable performance and satisfactory engine life. Fuels must be clean, well-refined, and noncorrosive to fuel system parts. Be sure to use fuel of a known quality from a reputable supplier.

To obtain optimum combustion and minimum engine wear, the fuel selected for use should conform to the application and property requirements outlined in the following "Diesel Fuel Selection Chart."

NOTE: When long periods of idling or cold-weather conditions below 0°C (32°F) are encountered or when continuously operating at an altitude above 1,524 m (5,000'), use Number 1-D fuel.

Using diesel fuel with sulphur content above 0.50% requires more frequent oil changes as noted in the maintenance schedule.

The use of diesel fuel with a sulphur content above 1.3% is not recommended.

Do not use Number 2-D fuel at temperatures below -7°C (20°F). The cold temperatures will cause Number 2-D fuel to thicken, which may keep the engine from running. (If this happens, contact your Buhler Versatile dealer.)

For the best fuel economy, use Number 2-D whenever the temperature will permit.

To be sure a fuel meets the required properties, enlist the aid of a reputable fuel oil supplier. The responsibility for clean fuel lies with the fuel supplier as well as the fuel user.

Diesel Fuel Selection Chart

General Fuel Class	Final Boiling Point (Max.)	Temp. Range	Cetane (Min.)	Sulphur Content (Max.)
No. 1-D	288°C (550°F)	-7°C (20°F) and below	40*	0.30%
No. 2-D	357°C (675°F)	-7°C (20°F) and above	40	0.50%

*When continually operating at low temperatures or high altitude, a minimum cetane of 45 is required.

Cummins position relative to use of Biodiesel fuel

At this time biodiesel blends up to B5 are the only blends approved for use in all Cummins engines for both On Highway and Off highway markets. B5 which is a blend of 5 percent pure biodiesel (B100) and 95 percent standard petroleum diesel has demonstrated to have no impact on engine performance, durability or maintenance. The industry standard known as ASTM D6751 defines the specifications for B100. However, this standard currently lacks a specification for stability. Without a specification, the quality of the fuel in blends higher than B5 could degrade to a point which could be damaging to engines. Cummins is supporting industry efforts to add a stability specification to the current ASTM standard, and continues to evaluate the impact of these blends on durability of engines. Until this spec is developed and tested, other blends of biodiesel will be unsuitable for use in Cummins On highway and Off highway engines.

ADDING DIESEL FUEL

Fuel can be added to either tank. The two tanks are connected via a crossover tube. Total usable capacity of the two tanks is 870L (230 U.S. gallons).

When filling the tanks, make sure the vent, 1, located at the rear of the cab, behind the washer fluid reservoir, is unobstructed.



CAUTION: DO NOT OVER FILL THE TANKS TO CAPACITY. EITHER FILL TO BOTTOM OF FILLER NECK OR USE THE ELECTRONIC INSTRUMENT CONTROL SYSTEM TO AID IN REFUELING. WHEN THE ALARM SOUNDS A SOLID TONE, THE TANK IS FULL. ALLOW ROOM FOR EXPANSION. FUEL EXPANSION OF OVER FILLED TANKS CAN RESULT IN FUEL ENTRY TO ENGINE CYLINDERS AND ACCOMPANYING HYDRAULIC LOCK.

IF THE ORIGINAL FUEL TANK CAPS ARE LOST, REPLACE THEM WITH BUHLER VERSATILE CAPS AND TIGHTEN SECURELY.

To add fuel to the tractor, follow the steps below:

1. Clean the area around the fuel cap(s) to prevent debris from entering the fuel tank.
2. To remove the cap, turn handle, 1, in the center of the cap counterclockwise until loose and pull the cap from the tank. Place it in a clean area during refueling.

NOTE: With the engine off, and the ignition switch in the "RUN" position, the fuel fill mode of the Electronic Instrument Control System will be operational and will assist in refueling procedures. Refer to "Electronic Instrument Control System" in Section 2 for further information.

3. After filling the tank, replace and tighten the fuel cap. The cap has a locking tab for additional security.

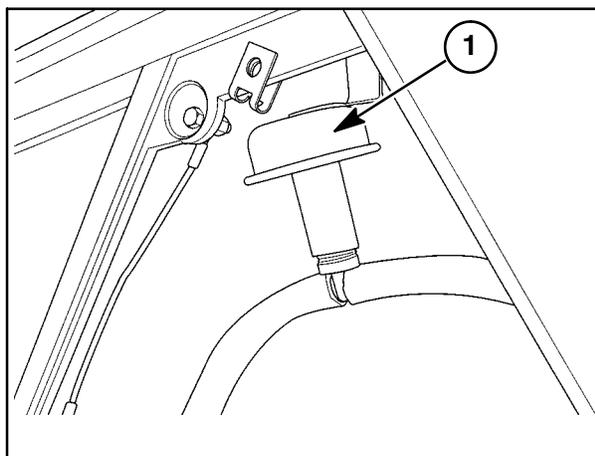


Figure 3-1

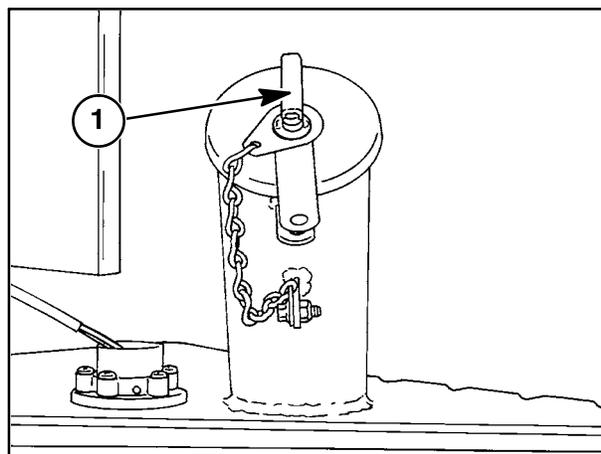


Figure 3-2

REMOVING SHIELDING TO GAIN ACCESS TO COMPONENTS FOR INSPECTION AND MAINTENANCE

ENGINE ACCESS

In order to perform service, inspection and lubrication operations to the tractor, it may be necessary to open or remove various panels and shields.

IMPORTANT: After performing work on the tractor, install all safety shields before operating the tractor.

OPENING THE HOOD PANELS

To provide easy access to the engine, each hood side panel swings open vertically. There is an external latch, 1, that releases the panel. Each panel is held open by a single gas strut.

Close the hood panels by pulling downward from the side of it and keeping a steady pressure on the panel. The gas strut will collapse and the panel will go over center and latch. Do not force the panel down against the gas strut.

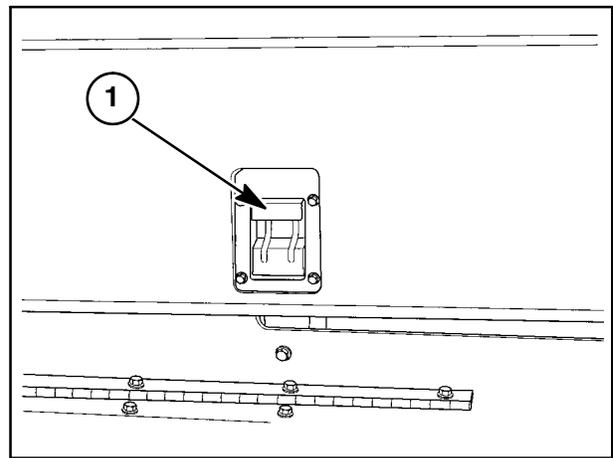


Figure 3-3

REMOVING THE HOOD PANELS

The hood panels can be removed easily if greater access is required for a maintenance or service operation.

1. Remove the hairpin clip, 1, from the front pivot stud.
2. Unhook the gas strut from under the hood.
3. Slide the panel front and clear the front pivot stud.
4. Slide the panel toward the rear of the tractor to remove the panel from the rear pivot stud.
5. Set the panel off to the side out of the way.

To reinstall the panels, reverse the above procedure.

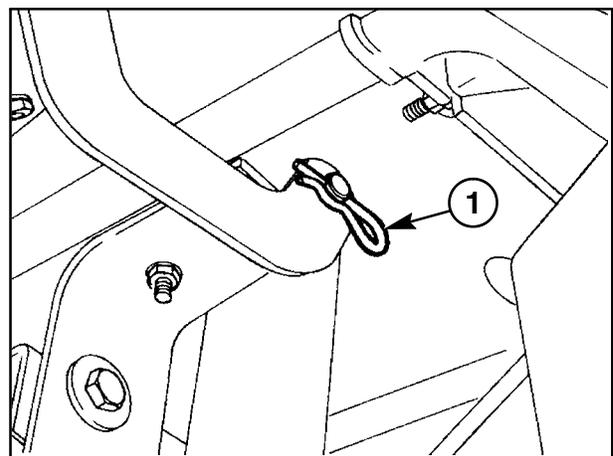


Figure 3-4

BATTERY ACCESS

The batteries are located on top of the right side fuel tank. Release the latch and lift the battery cover. It is supported by a gas spring.

Make sure the cover is down and latched when operating the tractor.

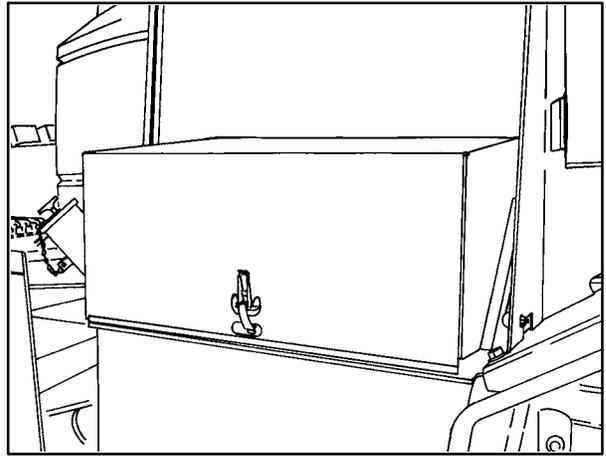


Figure 3-5

REMOTE VALVE ACCESS

The remote valve, located on the rear frame, is protected by a rear deck plate, which also provides a step for access to the cab filter. To access the remote valve, it may be necessary to remove the rear deck plate.

There are four bolts, 1, which hold the rear deck plate, 2, to the frame. The frame is slotted so it is only necessary to loosen the bolts to remove the rear deck plate.

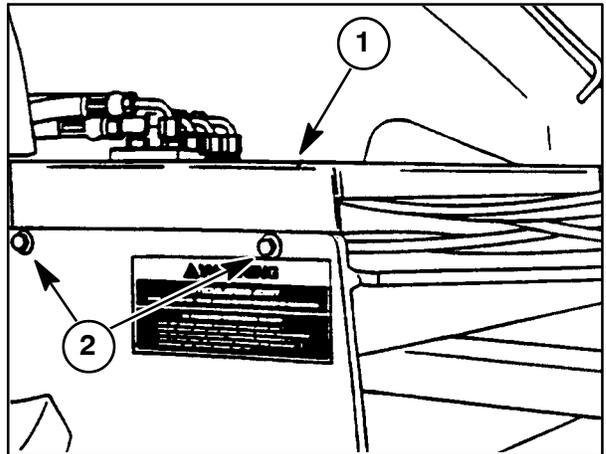


Figure 3-6

FRONT GRILLE

The front grille will swing out for access to the cooling system components. To open the front grille, lift the latch, 1, and swing the grille outward.

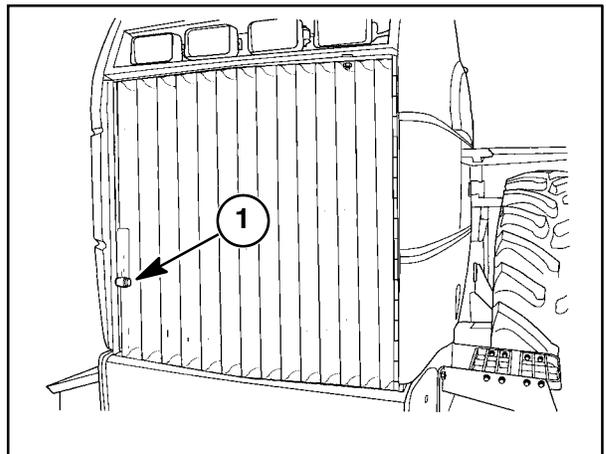


Figure 3-7

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SECTION 3 - LUBRICATION AND MAINTENANCE

LUBRICATION AND MAINTENANCE CHART*

SERVICE INTERVAL	OPERATION NUMBER	OPERATION	CHECK	CLEAN	LUBE	CHANGE	ADJUST	DRAIN	
EVERY 10 HRS OR DAILY	1	FRONT GRILLE		X					
	1	HYDRAULIC COOLERS		X					
	1	TRANSMISSION COOLER		X					
	1	AIR-CONDITIONER CONDENSER		X					
	1	RADIATOR		X					
	1	FUEL COOLER		X					
	2	ENGINE COOLANT LEVEL	X						
	3	ENGINE FAN BELT TENSION	X						
	4	ENGINE WATER PUMP BELT TENSION (2360 AND 2425 ONLY)	X						
	5	AIR-CONDITIONER COMPRESSOR BELT TENSION	X						
	6	ALTERNATOR DRIVE BELT TENSION (2360 AND 2425 ONLY)	X						
	7	ENGINE OIL LEVEL	X						
	8	FUEL FILTER							X
	9	HYDRAULIC OIL LEVEL	X						
	10	TRANSMISSION OIL LEVEL	X						
	11	BRAKE RESERVOIR LEVEL	X						
	12	BRAKES						X	
	13	3-POINT HITCH (Option)				X			
	14	LOWER ARTICULATION PIN				X			
	15	FRONT STEERING CYLINDER PIN (2)				X			
16	REAR STEERING CYLINDER PIN (2)				X				
17	UPPER ARTICULATION PIN				X				
18	FRONT DRAG LINK PIN (2)				X				
19	REAR DRAG LINK PIN (2)				X				
20	REAR AXLE DRIVE SHAFT STEADY BEARING				X				
EVERY 50 HRS	21	AIR CLEANER CONNECTIONS	X						
	22	CAB AIR FILTER		X					
	23	DIFFERENTIAL OIL LEVEL	X						
	24	PLANETARY HUB OIL	X						
	25	TIRE AND PRESSURE	X						
EVERY 250 HRS	26	ENGINE OIL				X			
	26	ENGINE OIL FILER				X			
	27	COOLING SYSTEM FILTER				X			
	28	ENGINE DCA COOLANT LEVEL	X						
	29	FUEL FILTER				X			
	30	AIR-CONDITIONER SIGHT GLASS	X						
	31	AIR-CONDITIONER DRAIN HOSES		X					
	32	WEIGHT KIT HARDWARE (OPTIONAL)	X						
	33	WHEEL HARDWARE	X						
	34	TRANSMISSION INPUT CROSS AND BEARING (2290, 2335, 2360* & 2375* ONLY)				X			
	34	REAR AXLE CROSS AND BEARING (2290, 2335, 2360* & 2375* ONLY)				X			
34	REAR AXLE DRIVELINE ARTICULATION CROSS AND BEARING (2290, 2335, 2360* & 2375* ONLY)				X				
34	TRANSMISSION REAR OUTPUT CROSS AND BEARING (2290, 2335, 2360* & 2375* ONLY)				X				
34	TRANSMISSION FRONT OUTPUT CROSS AND BEARING (2290, 2335, 2360* & 2375* ONLY)				X				
34	FRONT AXLE CROSS AND BEARING (2290, 2335, 2360* & 2375* ONLY)				X				

*Note: Service interval recommendations are based on regular agricultural applications. More frequent servicing may be required in severe duty applications.

SECTION 3 - LUBRICATION AND MAINTENANCE

SERVICE INTERVAL	OPERATION NUMBER	OPERATION	CHECK	CLEAN	LUBE	CHANGE	ADJUST	DRAIN
EVERY 250 HRS	35	REAR AXLE ARTICULATION DRIVE SHAFT SLIP YOKE			X			
	35	PTO ARTICULATION DRIVE SHAFT SLIP YOKE (Option)			X			
	35	PTO DRIVE SHAFT REAR SLIP YOKE (Option)			X			
	35	INPUT DRIVELINE SLIP YOKE			X			
	35	FRONT OUTPUT DRIVELINE SLIP YOKE			X			
EVERY 500 HRS	36	BATTERY CONNECTION		X				
	37	BATTERY ELECTROLYTE LEVEL	X					
	38	STARTER BATTERY CONNECTIONS	X					
	39	ENGINE AIR PRECLEANER		X				
	40	FUEL TANK VENT		X				
	41	HYDRAULIC SUCTION SCREEN		X				
	42	HYDRAULIC RESERVOIR BREATHER		X				
	43	HYDRAULIC FILTER				X		
	44	TRANSMISSION FILTER				X		
	45	DIFFERENTIAL OIL				X		
	46	PLANETARY HUB OIL				X		
	47	AXLE MOUNT BOLTS	X					
	48	DRAWBAR WEAR BLOCK	X					
49	STEAM CLEAN TRACTOR		X					
EVERY 1000 HRS	50	ENGINE OUTER AIR ELEMENT				X		
	50	ENGINE INNER AIR ELEMENT				X		
	51	CAB AIR FILTER				X		
EVERY 1500 HRS**	52	TRANSMISSION OIL				X		
	53	TRANSMISSION SUCTION SCREEN (12X4 Quad Shift III only)		X				
	54	TRANSMISSION MOUNTS	X					
	55	HYDRAULIC OIL				X		
	56	ENGINE MOUNTS	X					
	57	ENGINE TURBO CONNECTIONS	X					
	58	RADIATOR AND HEATING SYSTEM HOSES	X					
59	CAB MOUNTS	X						
EVERY 2000 HRS	60	ENGINE COOLANT				X		
INDICATED BY WARNING LIGHT	61	ENGINE AIR CLEANER OUTER AIR ELEMENT		X				
AS REQUIRED	62	HEADLIGHTS / WORK LIGHTS				X		
	63	ROOF WARNING LIGHT BULB				X		
	64	BRAKE LIGHT BULB				X		
	65	FUSES/RELAYS				X		
	66	THROTTLE LINKAGE SETTINGS	X					
	67	DECELERATOR LINKAGE					X	
	68	CAB FLOOR		X				
	69	CAB SEAT AND UPHOLSTERY		X				
	70	WINDSHIELD WASHER FLUID	X					
	71	WINDSHIELD WIPER BRADE				X		
	72	BRAKE FLUID				X		
	73	ETHER CANISTER				X		
	74	FUEL TANKS						X
	75	WHEEL INSTALLATION					X	
76	STORAGE					X		

*Only when equipped with standard axle option. Heavy duty axle utilizes sealed bearings.

**Be sure that the engine valve lash and injector lash is adjusted on the Cummins engine initially at 1500 hours and every 1500 hours thereafter. See the Cummins engine operator's manual for details.

EVERY 10 HOURS OR DAILY**OPERATION 1**

Clean the Front Grille, Hydraulic Coolers, Transmission Cooler, Air-Conditioning Condenser, Radiator and Fuel Cooler.

Access to the components can be gained by unlatching the front grille screen at the front of the tractor. Swing the grille screen out.

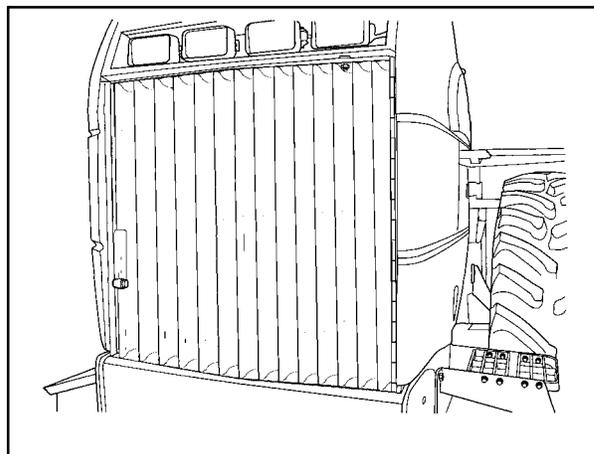


Figure 3-8

2360 and 2425 Tractors

To swing the oil coolers, air-conditioning condenser, and fuel cooler out, pull the latch lever, 1, downward 90° and swing the cooler outward using the crossbar, 2.

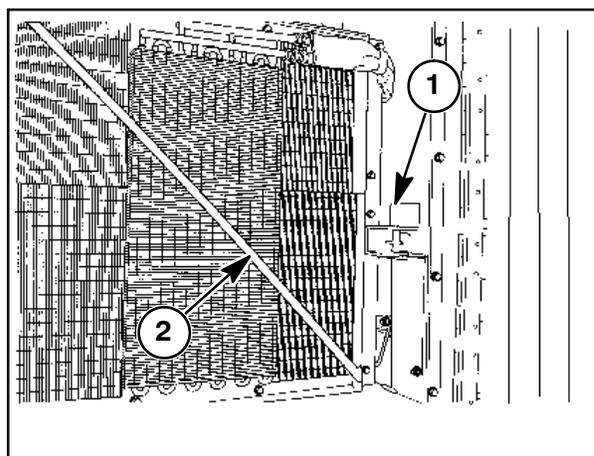


Figure 3-9

The coolers, 1; condenser, 2; radiator, 3; grille screen, 4, and fuel cooler, 5, are now exposed and can be cleaned using compressed air. Thoroughly remove any chaff or debris that has accumulated in any of the fins of the components. Blowing compressed air in both directions through the fins will clean the components completely. Make sure that all perimeters of the components are cleaned out (not just the center area where the engine fan circulates).

NOTE: Never use a high-pressure washer to clean out radiator fins. The fins will be bent over and the radiator core rendered useless.

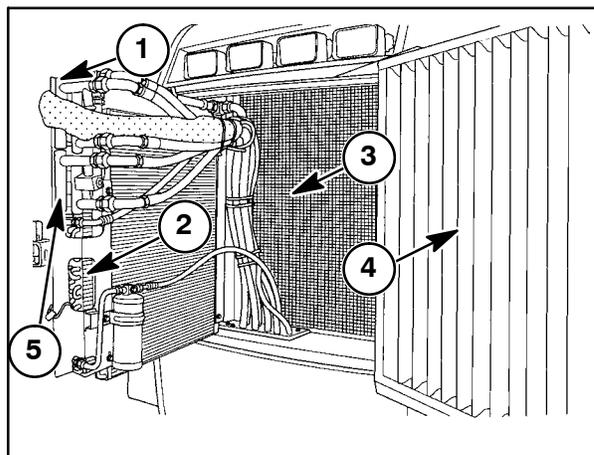


Figure 3-10

EVERY 10 HOURS OR DAILY**2290, 2335 and 2375 Tractors**

To swing out the fuel cooler and air conditioning condenser, pull the latch lever, 1, and swing the assembly out using the crossbar, 2.

This allows access to clean the front of the intercooler/oil cooler assembly.

Open the engine side panels to access the cavity between the radiator and the intercooler/oil cooler. Cleaning of this area may be done through access ports located on the sides of the radiator support. Use compressed air to thoroughly remove any chaff or debris that has accumulated in any of the fins of the components. Blowing compressed air in both directions through the fins will clean the components completely. Make sure that all perimeters of the components are cleaned out (not just the center area where the engine fan circulates).

NOTE: Never use a high-pressure washer to clean out radiator fins. The fins will be bent over and the radiator core rendered useless.

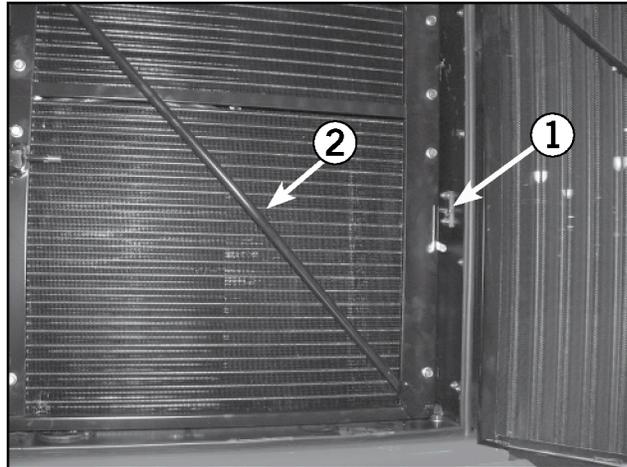


Figure 3-11



CAUTION: TO AVOID POSSIBLE EYE INJURY, ALWAYS WEAR SAFETY GLASSES WHEN USING COMPRESSED AIR. DEBRIS PROPELLED BY HIGH-PRESSURE AIR CAN ENTER THE EYES AND CAUSE SERIOUS INJURY.

OPERATION 2**Check the Engine Coolant Level**

The level of coolant in the engine can be easily checked without removing the radiator cap.

To check the coolant level, open the left engine shield and look at the sight glass, 1, located at the top left corner of the radiator. Engine coolant should completely fill the sight glass.

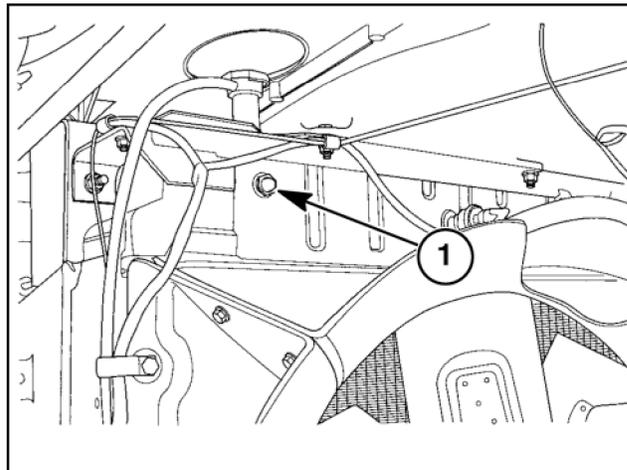


Figure 3-12

EVERY 10 HOURS OR DAILY

If the engine coolant is low, add coolant through the radiator cap, 1, at the top of the hood.



CAUTION: THE COOLING SYSTEM OPERATES UNDER PRESSURE WHICH IS CONTROLLED BY THE RADIATOR CAP. IT IS DANGEROUS TO REMOVE THE CAP WHILE THE SYSTEM IS HOT. ALWAYS TURN THE CAP SLOWLY TO THE FIRST STOP AND ALLOW THE PRESSURE TO ESCAPE BEFORE REMOVING THE CAP ENTIRELY. WEAR GLOVES WHEN REMOVING THE CAP.

The coolant added to the engine must meet specific requirements. Use a low silicate antifreeze which meets Engineering Standard GM 6038-M, or which contains no more than 0.1% anhydrous alkali metasilicate and meets either Engineering Standard GM 1825-M or GM 1899-M, which are performance specifications.

NOTE: Factory fill is a fully formulated coolant mixture (pink in colour). Propylene and ethylene glycol can be mixed in the cooling system.

Use soft water in the coolant mixture. Contaminants in hard water neutralize the corrosion inhibitor components. Water must not exceed 300 ppm hardness, or contain more than 100 ppm of either chloride or sulfate.

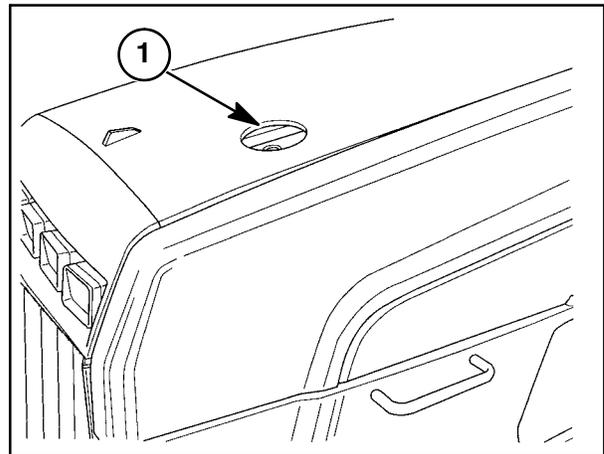


Figure 3-13

EVERY 10 HOURS OR DAILY

Antifreeze must be used in any climate for both freeze and boiling point protection. Cummins Engine Company, Inc. recommends a 50% concentration level, 40% - 60% range of ethylene glycol or propylene glycol in most climates. Antifreeze at 68% concentration provides the maximum freeze protection and must never be exceeded under any condition. Antifreeze protection decreases above 68%.

	Ethylene Glycol	Propylene Glycol
40%	-23°C (-10°F)	-21°C (-6°F)
50%	-37°C (-34°F)	-33°C (-27°F)
60%	-54°C (-65°F)	-40°C (-56°F)
68%	-71°C (-90°F)	-63°C (-82°F)

NOTE: Propylene glycol antifreeze protection levels CANNOT be checked using the same hydrometer as would be used with ethylene glycol antifreeze.

You must check the concentration level using a refractometer. This tool is available from your Buhler Versatile dealer under part #FGCC2805DS. Both propylene and ethylene glycol protection levels (of a mixture of both) can be measured with the refractometer.

Once the protection level of the coolant is decided (ratio of water to antifreeze), the mixture must contain one unit of Cummins DCA4 (dry chemical additive) per gallon of coolant. A DCA unit is equal to 42.5 g (1.5 dry ounces) or 120 ml (4 liquid ounces). Your Buhler Versatile dealer can assist you in obtaining the DCA4 additive.

IMPORTANT: Failure to maintain DCA4 in the cooling system will cause cooling system corrosion and engine failure.

IMPORTANT: The concentration of DCA4 should be checked with a test kit, available from Cummins and Fleetguard through your Buhler Versatile dealer.

IMPORTANT: Do not add cold coolant to a hot engine. Engine castings can be damaged. Allow the engine to cool to below 50°C (120°F).

EVERY 10 HOURS OR DAILY**OPERATION 3****Check the Fan Belt Tension**

The QSM11 and N14 engines use a spring-loaded idler, 1, (N14 illustrated) to keep a constant tension on the fan belt. No adjustment is required. If the belt is not tight, check the pivot of the spring-loaded idler for binding. If it is free, the belt is probably worn out and requires replacement.

If the belt requires replacement, install a square end of a 95mm (3/8") breaker bar into the slot of the idler and release the spring tension by pushing down on the wrench. Slip the old belt off the engine pulleys and install a new belt. Release the wrench and allow the spring-loaded idler to apply belt tension.

NOTE: Refer to your Cummins Engine Manual for more information regarding belt replacement, wear guidelines, and pulley alignment.

NOTE: Fan drive belts are supplied by Buhler Versatile. Contact your Buhler Versatile dealer if a new fan belt is required.

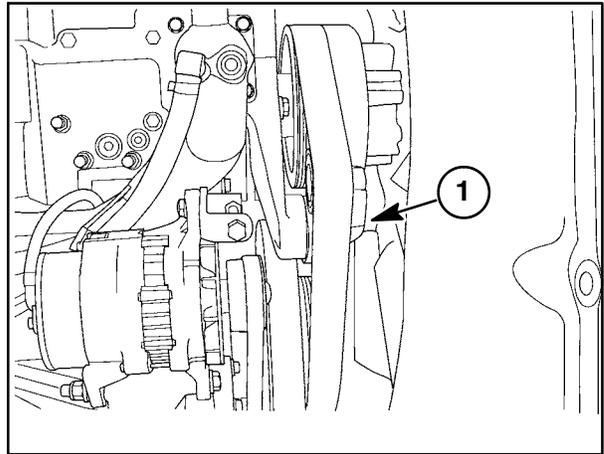


Figure 3-14

EVERY 10 HOURS OR DAILY**OPERATION 4****Check the Engine Water Pump Drive Belt Tension (2360 and 2425 Only)**

Use a belt tension gauge to check and/or adjust belts, or use firm thumb pressure and measure the deflection method. With firm thumb pressure, a properly adjusted belt should deflect 0.8 mm (1/32") for each 25 mm (1") of span between pulleys. If the belt requires adjustment, use the following procedure:

Loosen the locknut, 1, which secures the idler pulley to the water pump. Turn the adjusting screw, 2, to adjust the belt tension. Tighten the idler pulley locknut. Recheck the belt tension. Secure the idler pulley in position by tightening the locknut to 70 N·m (50 ft. lbs.). Loosen the adjusting screw 1/2 turn to prevent breakage.

NOTE: The water pump drive belt is supplied by Buhler Versatile. Contact your Buhler Versatile dealer if a new belt is required.

NOTE: Refer to your Cummins Engine Manual for more information regarding belt replacement, wear guidelines, and pulley alignment.

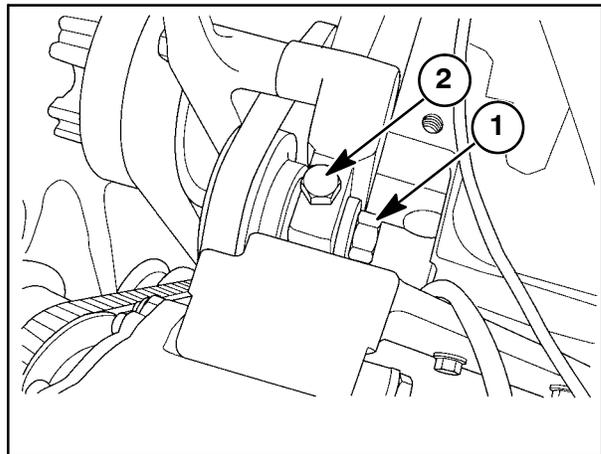


Figure 3-15

EVERY 10 HOURS OR DAILY**OPERATION 5****Check Air-Conditioner Compressor Belt Tension**

Use a belt tension gauge to check and/or adjust belts, or use the firm thumb pressure and deflection method. With firm thumb pressure a properly adjusted belt should deflect 0.8 mm (1/32") for each 25 mm (1") of span between pulleys. If the belt requires adjustment, use the following procedures based on tractor model:

2290, 2335, 2375 (QSM11) Engine

Loosen the compressor pivot bolt located behind the compressor next to the engine block. Tighten the adjustment nut, 1, to increase belt tension. Torque the pivot bolt to 79 N·m (58 ft. lbs.).

IMPORTANT: Do not adjust belt tension to full value with the adjusting nut. Belt tension can increase when the pivot bolt is tightened and, therefore, reduce belt and bearing life.

If the belt requires replacement, the adjustment should be backed off all the way, and the belt slipped up around the pulleys. Install the new belt by reversing the procedure and tension it as detailed above. Never pry a belt off or on a pulley as damage to the pulley and belt may result.

NOTE: The air-conditioning compressor drive belt is supplied by Buhler Versatile. Contact your Buhler Versatile dealer to obtain a new belt.

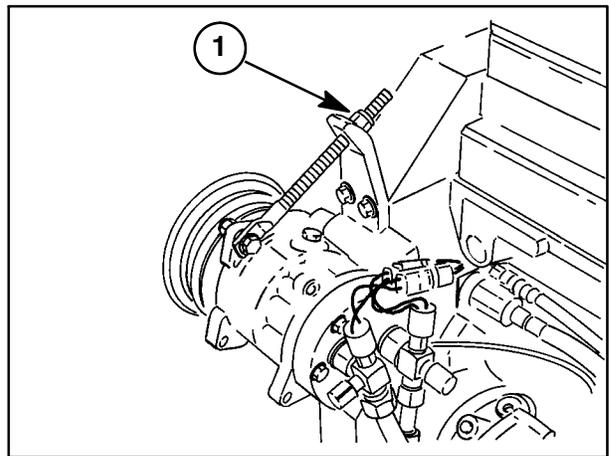


Figure 3-16

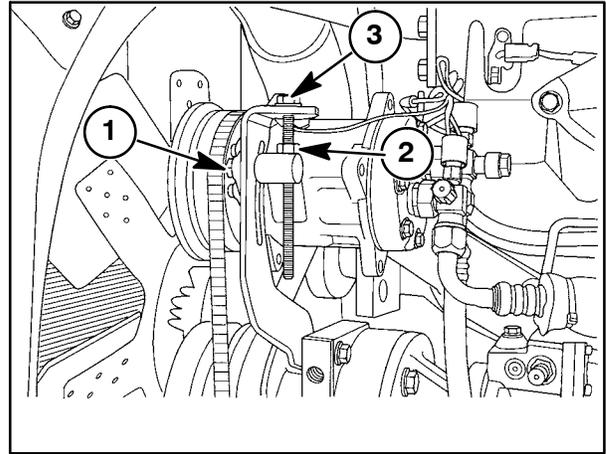
EVERY 10 HOURS OR DAILY**2360 and 2425 (N14) Engine**

Loosen the compressor pivot bolt located behind the compressor next to the engine block. Loosen the adjuster clamp bolt, 1, and adjustment locknut, 2. Tighten the adjuster bolt, 3, to increase belt tension. Tighten the adjuster clamp bolt, 1, locknut, 2, and pivot bolt after the correct belt tension is obtained. Recheck the belt tension once all hardware is tightened. Torque the pivot bolt and adjuster clamp bolt to 79 N·m (58 ft. lbs.), and the locknut to 61 N·m (45 ft. lbs.).

***IMPORTANT:** Do not adjust belt tension to full value with the adjusting screw. Belt tension can increase when the locknut is tightened and, therefore, reduce belt and bearing life.*

If the belt requires replacement, the adjustment should be backed off all the way, and the belt slipped up around the pulleys. Install the new belt by reversing the procedure and tension it as detailed above. Never pry a belt off or on a pulley as damage to the pulley and belt may result.

NOTE: The air-conditioning compressor drive belt is supplied by Buhler Versatile. Contact your Buhler Versatile dealer to obtain a new belt.

**Figure 3-17**

EVERY 10 HOURS OR DAILY**OPERATION 6****Check the Alternator Drive Belt Tension****2290, 2335, 2375 QSM11 Engine**

The QSM11 engines use a spring-loaded idler, (N14 illustrated) to keep a constant tension on the alternator belt. This is a shared drive using the fan belt. See operation 3, for details on checking tension.

2360, 2425 (N14) Engine

Use a belt tension gauge to check and/or adjust belts, or use the firm thumb pressure and deflection method. With firm thumb pressure, a properly adjusted belt should deflect 0.8 mm (1/32") for each 25 mm (1") of span between pulleys. If the belt requires adjustment, use the following procedure:

Loosen the pivot bolt, 1, which secures the alternator to the engine. Loosen the adjuster clamp bolt, 2, and locknut, 3. Adjust the belt tension by tightening the adjuster bolt, 4. Torque the adjuster clamp bolt to 79 N·m (58 ft. lbs.). (Recheck the belt tension.) Torque the locknut to 79 N·m (58 ft. lbs.) and pivot bolt to 61 N·m (45 ft. lbs.).

***IMPORTANT:** Do not adjust belt tension to full value with the adjusting screw. Belt tension can increase when the adjuster clamp bolt is tightened and, therefore, reduce belt and bearing life.*

NOTE: 2360, and 2425 tractor models use the same alternator adjustment bracket.

If the belt requires replacement, the adjustment should be backed off all the way, and the belt slipped up around the pulleys. Install the new belt by reversing the procedure and tension it as detailed above. Never pry a belt off a pulley as damage to the pulley may result.

NOTE: The alternator drive belt is supplied by Buhler Versatile. Contact your Buhler Versatile dealer if a new belt is required.

NOTE: Refer to your Cummins Engine Manual for more information regarding belt replacement, wear guidelines, and pulley alignment.

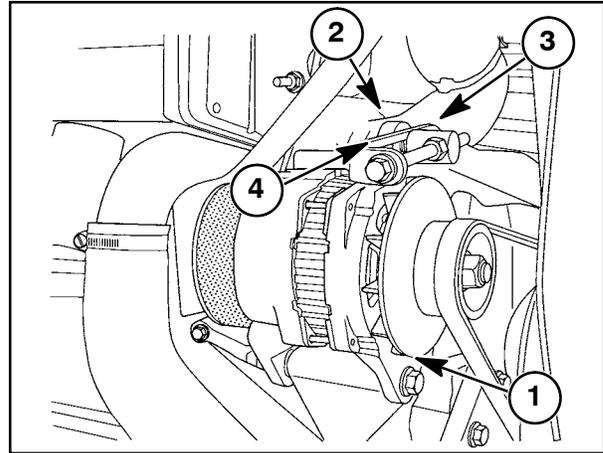


Figure 3-18

EVERY 10 HOURS OR DAILY

OPERATION 7

Check the Engine Oil Level

Check the engine oil level using the dipstick located on the right side of the engine. This should be done after the engine has been turned off and oil in the lubrication system has had time to drain back into the oil pan. (N14 shown in illustration)

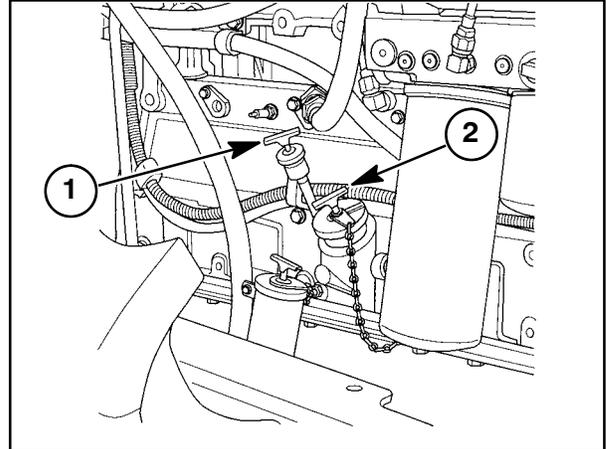


Figure 3-19

EVERY 10 HOURS OR DAILY**2290, 2335, 2375 (QSM11), 2360 and 2425 (N14) Engine**

Check the engine oil level using the dipstick located on the right side of the engine. This should be done after the engine has been turned off and oil in the lubrication system has had time to drain back into the oil pan.

Unscrew the dipstick handle, 1, and pull the dipstick from the tube. The dipstick is marked to show the minimum (L) and maximum (H) oil level for the engine. If additional oil is needed in the engine, unscrew the filler cap handle, 2, and add oil as necessary. (N14 Engine Shown in Illustration)

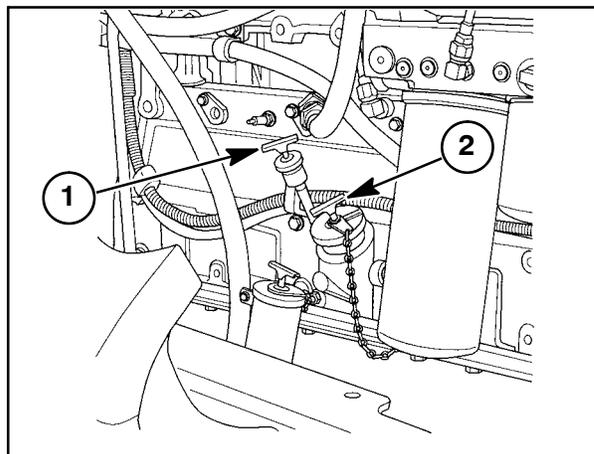


Figure 3-20

NOTE: The vehicle must be level when checking the oil level.

IMPORTANT: Never operate the engine with the oil level below the L (Low) mark or above the H (High) mark. Wait at least five minutes after shutting off the engine to check the oil. This allows time for the oil to drain to the oil pan.

NOTE: The engine is filled with 10W-30 oil at the factory. This weight oil aids in cold-weather starting at the manufacturing facility. SAE 15W-40 oil as listed is the preferred viscosity oil for normal operation.

Buhler Versatile and Cummins Engine Co. recommend the use of a high quality SAE 15W-40 heavy-duty engine oil with an API classification of CE or CF-4 for most applications. Contact your Buhler Versatile dealer to obtain engine oil.

Additional information on engine oil use under extreme conditions (hot or cold weather) can be found in the Cummins Engine Manual provided with the tractor.

EVERY 10 HOURS OR DAILY

OPERATION 8

Drain the Fuel Filter

During operation, the fuel filter on the engine will separate water that may be in the fuel system.

This accumulated water can be drained from the fuel filter by opening the small plastic valve, 1, on the bottom of the filter, and draining fluid out until clean fuel runs from the valve. Close the valve and hand tighten only.

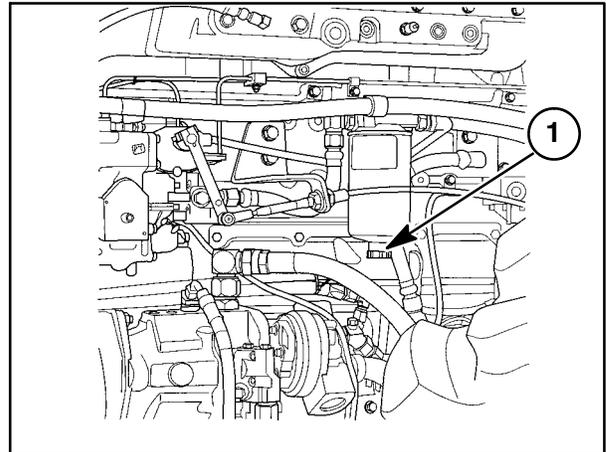


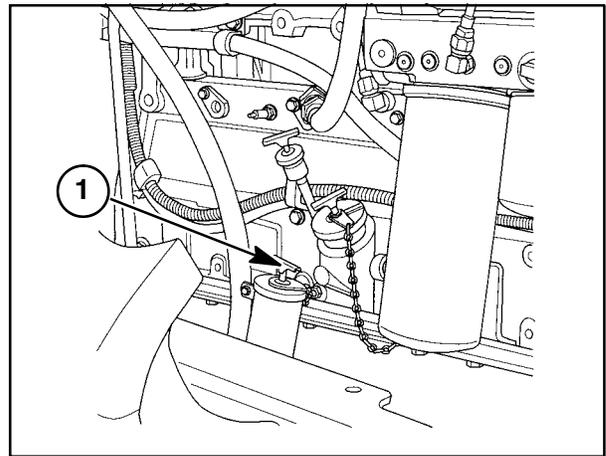
Figure 3-21

OPERATION 9**Check the Hydraulic Oil Level**

The oil level in the hydraulic oil reservoir must be maintained to ensure proper operation of the hydraulic system.

The hydraulic reservoir incorporates a sight gauge that can be viewed by looking down from the right side of the engine compartment. The sight gauge is in the upper right corner of the tank and is marked with an "ADD" and "FULL" line indicating oil level. If additional hydraulic oil is required, remove the cap, 1, from the filler tube and add oil as necessary.

When checking oil level, take into consideration the implement attached to the tractor. Depending on whether the implement is in a raised or lowered position, the tank level could be above or below the optimum level.

**Figure 3-22**

EVERY 10 HOURS OR DAILY**OPERATION 10****Check the Transmission Oil Level**

The oil level for the 12x4 Quad Shift III transmission is easily checked by looking at the sight gauge located on the rear lower left corner of the transmission case. Check the oil level when the engine is off.

The sight gauge, 1, has an "ADD" and "FULL" line indicated on it. If additional transmission oil is required, remove the cap, 2, from the filler tube and add oil as necessary.

The oil level for the 12x2 powershift is checked by looking at the sight gauge located on the rear lower left corner of the transmission case. Check the oil level with the tractor parked on a level surface with the engine shut off.

- With cold oil, the oil level should show in the sight glass section designated as cold. Add oil if necessary to bring the oil level to the bottom of the cold section of the sight glass.
- With hot oil, the oil level should show in the sight glass section designated as hot. Add oil if necessary to bring the oil level to the bottom of the hot section of the sight glass.

ATTENTION: Do not operate the transmission with oil levels above or below the recommended settings. Either condition can result in overheating or loss of power and damage to the equipment.

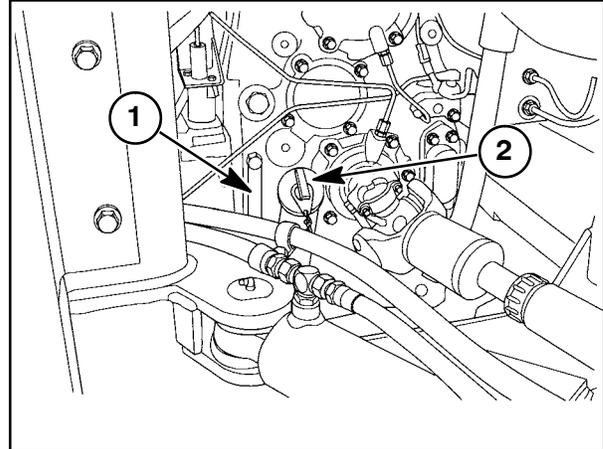


Figure 3-23

OPERATION 11**Check the Brake Reservoir Level**

The brake fluid level must be maintained for proper operation. The reservoir is located on the left front fire wall of the cab, below the air cleaner.

The reservoir, 1, has a minimum and maximum level line on its outside diameter indicating proper fluid level. Remove the cap of the reservoir and add fluid as necessary.

Only use DOT3 brake fluid available from your Buhler Versatile Dealer

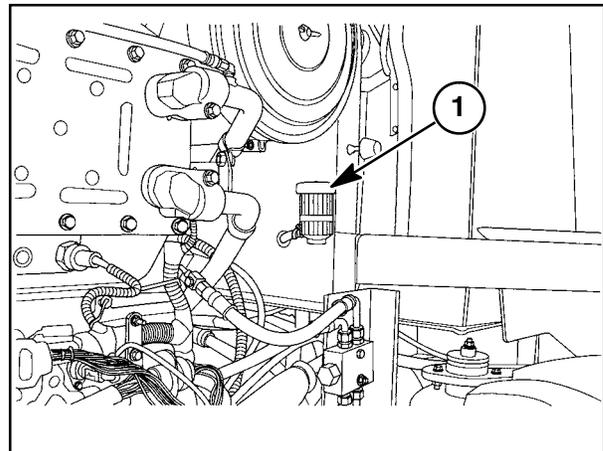


Figure 3-24

EVERY 10 HOURS OR DAILY**OPERATION 12****Brake Adjustment**

The foot and park brake unit is self-adjusting and requires no maintenance.

Engaging and disengaging the park brake lever, 1, several times will activate the self-adjusting mechanism within the caliper and keep the brake in proper adjustment. This will ensure a proper set point for the brake to stop the tractor and hold it on an incline when parked.

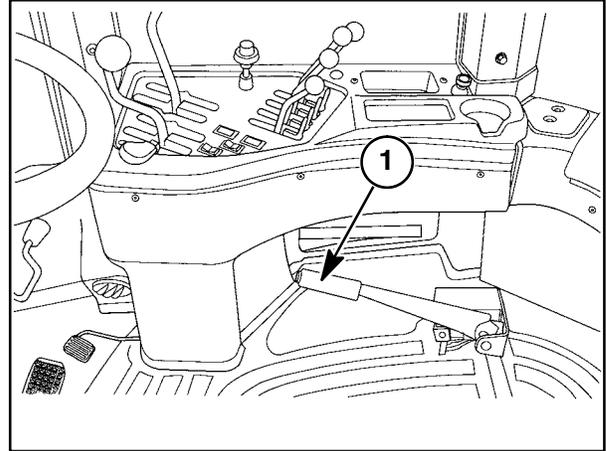


Figure 3-25

Visually inspect the brake rotor, 1, for nicks or damage and the brake pads for wear. The pads must be replaced if they are worn to 1 mm (1/32") or less. Consult your Buhler Versatile dealer for assistance in replacement of the brake rotor or pads.



WARNING: DO NOT OPERATE THE TRACTOR WITHOUT THE BRAKES IN GOOD WORKING ORDER.

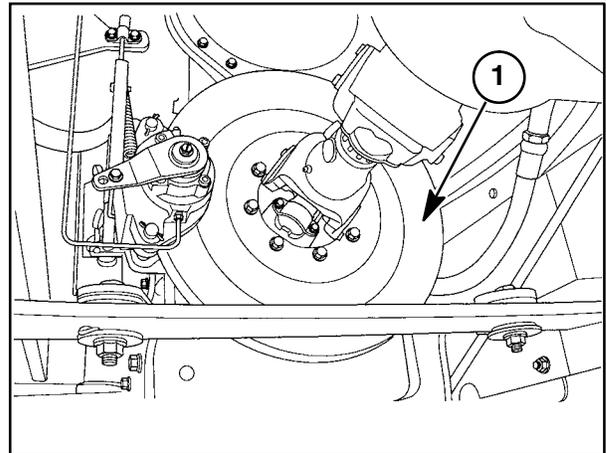


Figure 3-26

OPERATION 13**Lubricate the Optional 3-Point Hitch**

The 3-point hitch linkage requires lubrication to maximize performance.

Lubricate the grease fittings, 1, located at the top pivot pin point of each lift cylinder.

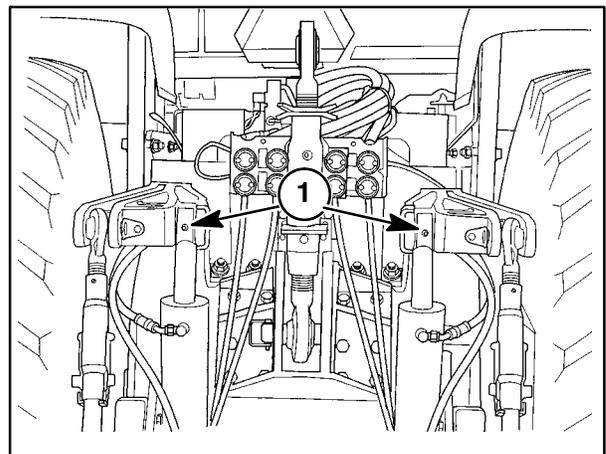


Figure 3-27

EVERY 10 HOURS OR DAILY

Lubricate the front and rear grease fittings, 1, located on the upper link.

These four grease fittings are the only points that require lubrication on the 3-point hitch.

Use lithium base EP high temperature grease available from your Buhler Versatile dealer.

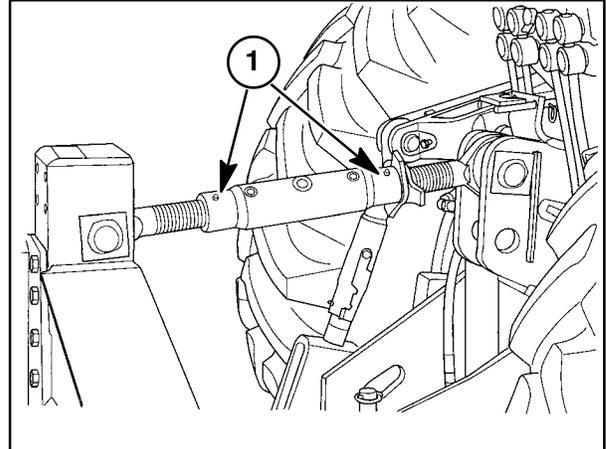


Figure 3-28

OPERATION 14**Lubricate the Lower Articulation Pin**

Lubricate the grease fitting, 1, until grease flows from around the pin seals. This will purge any dirt accumulated in the pivot pin area.

Start the unit and articulate from side to side to work the grease into the joint.

Use Moly based EP high temperature grease available from your Buhler Versatile dealer.

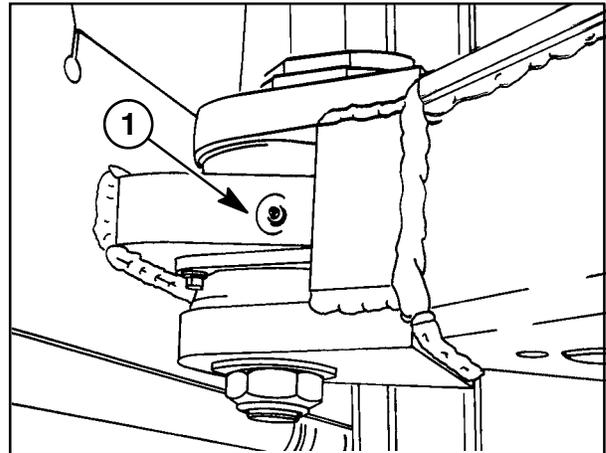


Figure 3-29

OPERATION 15**Lubricate the Front Steering Cylinder Pins**

Lubricate the grease fittings (one on each side), 1, until grease flows from around the pin seals. This will purge any dirt accumulated in the pivot pin area.

Use Moly based EP high temperature grease available from your Buhler Versatile dealer.

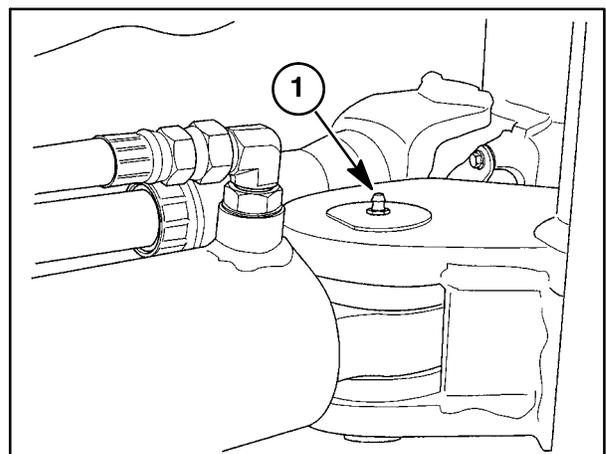


Figure 3-30

EVERY 10 HOURS OR DAILY**OPERATION 16****Lubricate the Rear Steering Cylinder Pins**

Lubricate the bottom two grease fittings, 1, remotely mounted on the left rear frame, until grease flows from around the pin seals. This will purge any dirt accumulated in the pivot pin area.

Use Moly based EP high temperature grease available from your Buhler Versatile dealer.

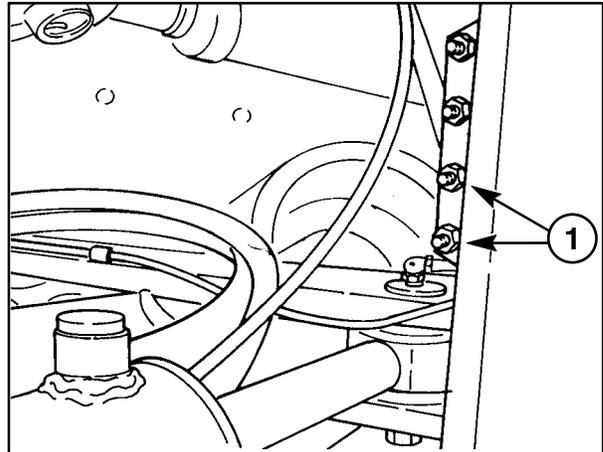


Figure 3-31

OPERATION 17**Lubricate the Upper Articulation Pin**

Lubricate the grease fitting, 1, until grease flows from between the frame pieces. This will purge any dirt accumulated in the pivot pin area.

Start the unit and articulate from side to side to work the grease into the joint.

Use Moly based EP high temperature grease available from your Buhler Versatile dealer.

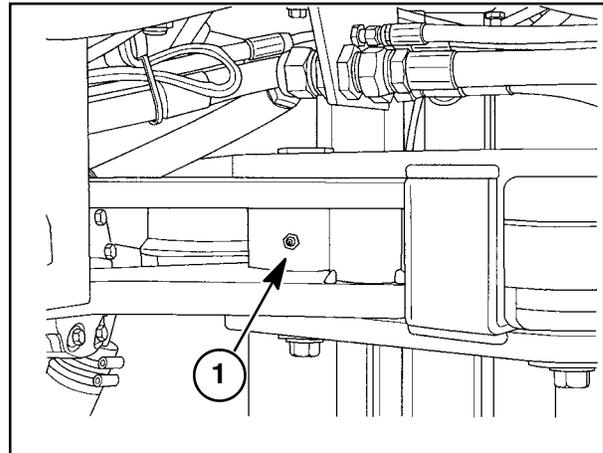


Figure 3-32

OPERATION 18**Lubricate the Front Drag Link Pins**

Lubricate the grease fittings (one on each side), 1, until grease flows from around the pin seals. This will purge any dirt accumulated in the pivot pin area.

Use Moly based EP high temperature grease available from your Buhler Versatile dealer.

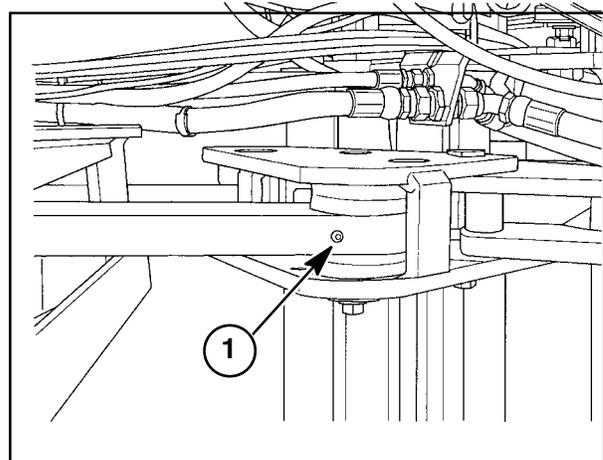


Figure 3-33

EVERY 10 HOURS OR DAILY**OPERATION 19****Lubricate the Rear Drag Link Pins**

Lubricate the top two grease fittings, 1, remotely mounted on the left rear frame, until grease flows from around the pin seals. This will purge any dirt accumulated in the pivot pin area.

Use Moly based EP high temperature grease available from your Buhler Versatile dealer.

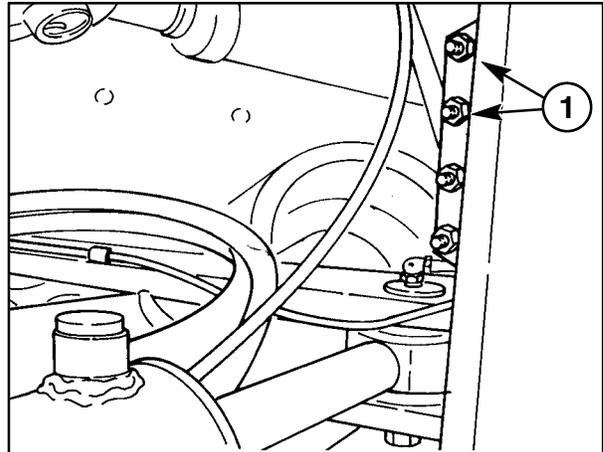


Figure 3-34

OPERATION 20**Lubricate the Rear Axle Drive Shaft Steady Bearing**

Lubricate the grease fitting, 1, until grease flows from the bearing area. This will purge any dirt accumulated in this area.

Use lithium base EP high temperature grease available from your Buhler Versatile dealer.

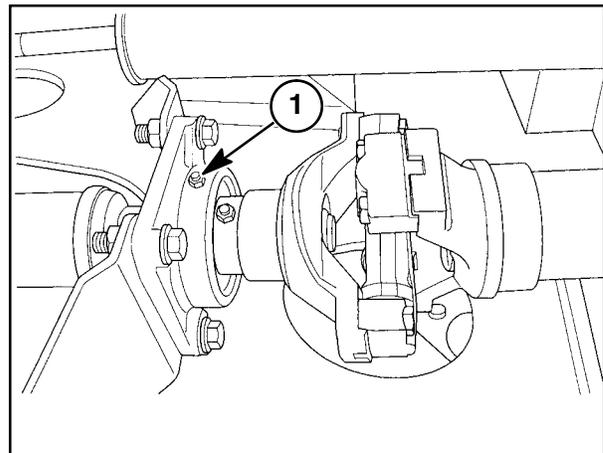


Figure 3-35

REMINDER

For the first week of operation all wheel mounting hardware should be re-tightened to the specified torque after the first hour of operation, then after every three hours of operation for the first day. Re-tighten to the specified torque daily until wheel hardware maintains specified torque. Refer to pages 3-79 thru 3-87.

EVERY 50 HOURS**OPERATION 21****Check the Engine Air Cleaner Connections**

The air induction system pipe work must be checked for proper sealing.

On the 2360 and 2425 (N14), check to be sure that the hose clamps, attaching the pipe work between the turbocharger and air cleaner are tight and that no air can enter the air induction system without first passing through the air cleaner. (N14 engine shown in illustration)

On the 2290, 2335 and 2375 (QSM11), check the hose clamps, on the pipe work between the air cleaner and turbocharger. Make sure the clamps are tight and no air can enter the engine air induction system without first passing through the air cleaner.

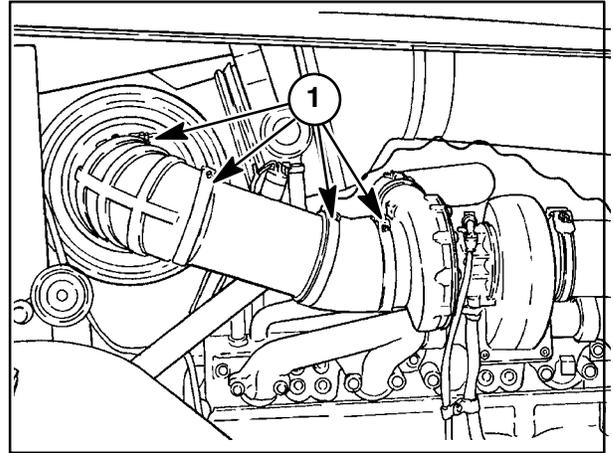


Figure 3-36

EVERY 50 HOURS**OPERATION 22****Clean the Cab Air Filter**

The cab air filter, 1, located on the rear of the cab must be cleaned to keep the cab air system operating at maximum efficiency.

Note: In humid conditions, such as occur on most early mornings, do not switch on the blower prior to servicing the filter. Damp particles drawn into the filter may be difficult to remove without washing.

Note: The filter is made of specially treated paper with a rubber sealing strip bonded to the upper surface. Do not damage the element during removal.

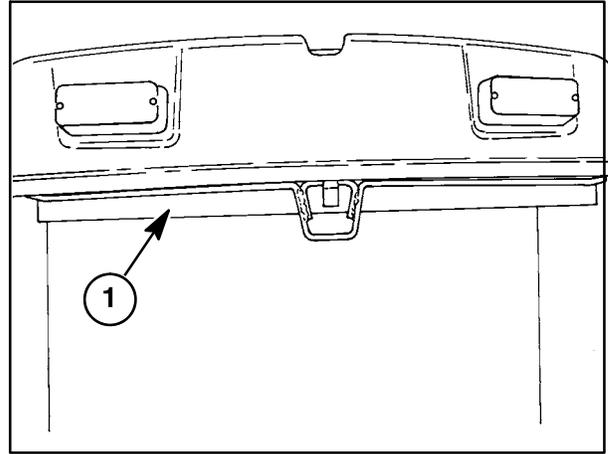


Figure 3-37

To remove the cab air filter, lift up on the filter frame handle, 1, and unhook the latch, 2. Allow the filter and frame to lower toward the cab window. Remove the filter element. The filter element may be cleaned using either method A or B depending on the condition of the element.

METHOD A

Clean the element with compressed air not exceeding 2 bar (30 PSI). Hold the nozzle at least 300 mm (12") from the filter to prevent damage to the paper pleats. Direct the compressed air through the filter opposite the normal air flow.

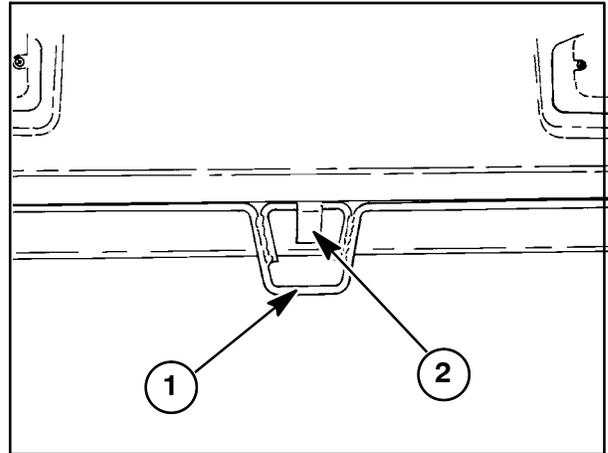


Figure 3-38

**WARNING**

Wear eye protection and a face mask when carrying out this operation.

METHOD B

- 1 Soak the filter for 15 minutes in warm water containing a mild detergent.
- 2 Rinse the filter with running water below 1.4 bar (20 PSI).
- 3 Shake off excess water and allow to air dry.

IMPORTANT: Do not attempt to dry the filter with heat or compressed air and do not install until thoroughly dry as the filter may rupture. It is recommended that a new filter is installed at this service and the washed one put aside for installation at a subsequent service. Store the spare filter in a dry place and wrap it to prevent dust contamination or damage.

NOTE: Wash the filter more frequently when operating in extremely dusty conditions.

NOTE: Replace the filter when holes or tears are visible.

NOTE: The element may be washed a maximum of 10 times.

Reinstall the element into its frame and check the seal, 1, around the perimeter of the element for nicks or cracks. Replace the element if any damage is found.

Clean the filter with a damp, lint-free cloth.

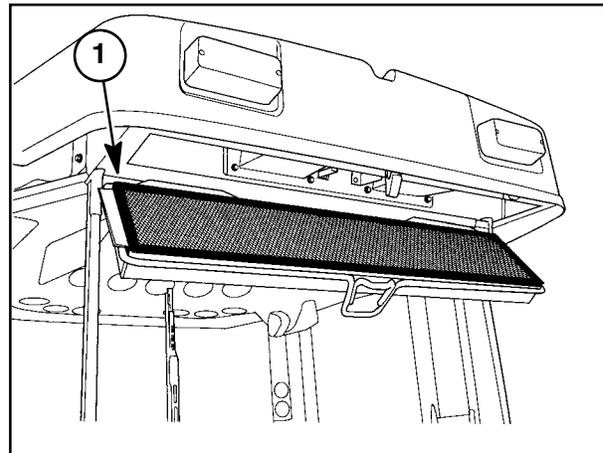


Figure 3-39

EVERY 50 HOURS

Reinstall the filter into its frame on the back of the cab roof. Lift the frame latch handle, 1, and hook the latch tab, 2, onto the frame.

**WARNING**

The cab air filter is designed to remove dust from the air but will not exclude chemical vapor. Follow the chemical manufacturers directions regarding protection from dangerous chemicals.

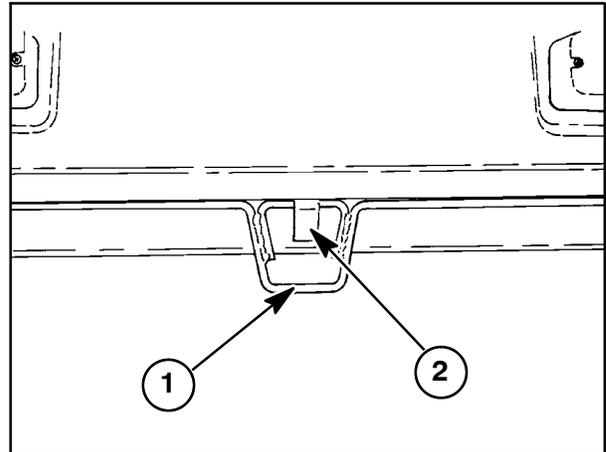


Figure 3-40

OPERATION 23**Check the Differential Oil Level**

Differential oil level must be maintained to provide adequate lubrication and cooling to the differential components.

Check the differential oil level when the tractor is on a level surface and has been stationary for one hour to allow the oil in the axle and planetary hubs to level out.

Each axle housing has a convenient sight gauge, 1, located on the right half of the axle when facing the differential input. The oil level in the gauge should be even with the center of plug, 2. If additional differential oil is required, remove the plug, 2, and add oil as necessary.

Buhler Versatile recommends 85W140 GL5 oil be used in temperatures above or 80W90 GL5 in temperatures below 0°C (32°F). This oil is available at your Buhler Versatile dealer.

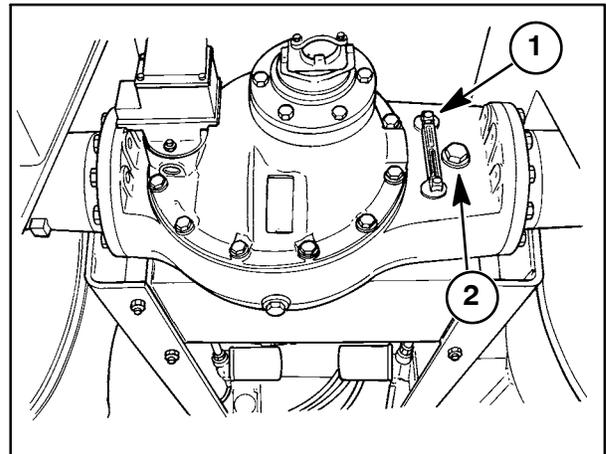


Figure 3-41

EVERY 50 HOURS**OPERATION 24****Check the Planetary Hub Oil Level**

The oil in the four planetary hubs (two on each axle) must be maintained at the proper level to provide lubrication for the outboard planetaries.

To check the planetary hub oil level, rotate the tire so that the check plug, 1, is at the 3 o'clock position. Remove the check plug and see if oil runs out or is level with the plug opening. If no oil runs out, the hub requires oil. Remove the fill plug, 2, and add oil until it runs out of the check plug, 1.

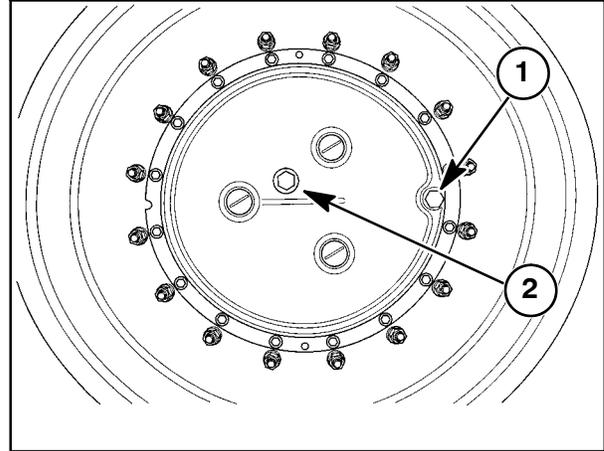


Figure 3-42

Check the differential oil level when the tractor is on a level surface and has been stationary for one hour to allow the oil in the axle and planetary hubs to level out.

Buhler Versatile recommends 85W140 GL5 oil be used in temperatures above 0°C (32°F) or 80W90 GL5 in temperatures below 0°C (32°F). This oil is available from your Buhler Versatile dealer.

OPERATION 25**Check Tire Air Pressure**

It is extremely important that tires (singles, duals, or triples) are kept at proper inflation pressures, based on the load being carried by the tires.

A special tire gauge capable of measuring low pressure, 0 to 1.4 bar (0 to 20 PSI), is available from your Buhler Versatile Dealer.

NOTE: If the tires are ballasted with a calcium chloride/water solution, check pressure with the valve stem at the top of the tire.

See the "Tire Load and Inflation Tables" in Section 5 of this manual for the proper inflation pressures.

EVERY 250 HOURS**OPERATION 26****Change the Engine Oil and Filter**

To change the engine oil and filter, operate the engine until the coolant temperature reaches 60°C (140°F). Shut off the engine.

There are two oil plugs, 1, located on the bottom of the oil pan. Either plug can be removed to drain the oil. Drain the oil completely to make sure all the oil and suspended contaminants are removed from the engine.

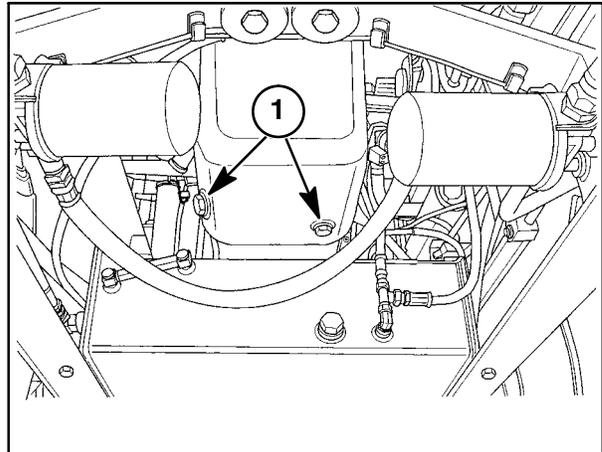


Figure 3-43

Clean the area around the lubricating oil filter head, 1. Remove the filter, 2.

NOTE: All model tractors use one single oil filter mounted on the right-hand side of the engine.

Clean the sealing surface of the filter head. The O ring may stick on the filter head. Make sure it is removed.

Using the correct oil filter for your engine, fill it with clean engine oil. The lack of lubrication during the delay until the filter is pumped full of oil is harmful to the engine. Apply a light film of oil to the gasket sealing surface before installing the new filter.

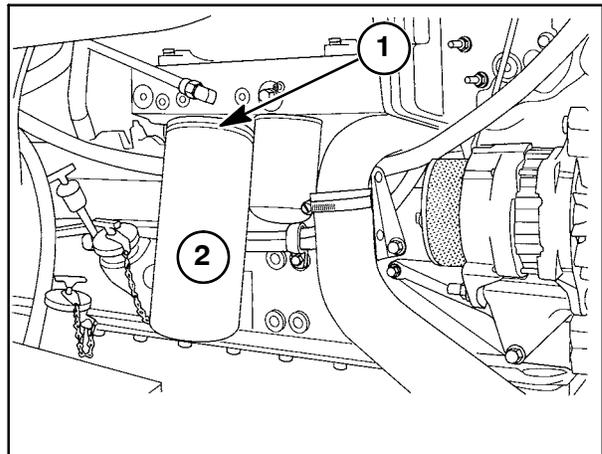


Figure 3-44

Install the filter on the filter head. Tighten the filter until the gasket contacts the filter head surface. Tighten the filter an additional 1/2 to 3/4 of a turn.

NOTE: Over-tightening can distort the threads or damage the filter element seal. Do not use tools to tighten the filter.

Clean and check the oil drain plug threads and the sealing surface. Install and tighten the oil drain plug to 88 N·m (65 ft. lbs.).

EVERY 250 HOURS

Fill the engine with oil to the proper level as indicated by the dipstick. The capacities of the engines are as follows:

2290, 2335, 2375 (QSM11)

Oil Pan Capacity - 34 L (9.0 gals.)
Filter Capacity - 2.7 L (0.7 gal.)

2360, 2425 (N14)

Oil Pan Capacity - 36 L (9.5 gals.)
Filter Capacity - 2.7 L (0.7 gal.)

Buhler Versatile and Cummins Engine Co. recommend the use of a high quality 15W-40 multi-viscosity oil for most applications. Available from your Buhler Versatile dealer.

NOTE: The engine is filled with 10W-30 oil at the factory. This weight oil aids in cold-weather starting at the manufacturing facility. SAE 15W-40 oil as listed is the preferred viscosity oil for normal operation.

Operate the engine at idle speed to inspect for leaks at the filters and drain plugs.

NOTE: Engine oil pressure must be indicated on the Electronic Instrument Control System within 10 seconds after starting. If oil pressure is not registered within 10 seconds, shut off the engine immediately to avoid engine damage. Confirm the correct oil level in the oil pan.

Shut off the engine. Wait approximately five minutes to let the oil drain from the upper parts of the engine. Check the oil level again.

Add oil as necessary to bring the oil level to the "H" (High) mark on the dipstick.

IMPORTANT: Discard used engine oil according to local laws and regulations.

EVERY 250 HOURS**OPERATION 27****Change the Coolant System Filter**

The coolant system filter must be changed to ensure the proper level of DCA4 (dry chemical additive) is maintained in the engine cooling system to provide maximum protection against corrosion. To change the filter, proceed as follows:

Turn the coolant shutoff valve, 1, to the "OFF" position. Remove the radiator cap. Remove and discard the coolant filter, 2. Clean the gasket surface. Apply a light film of lubricating oil to the gasket sealing surface before installing the new coolant filter.

NOTE: All model tractors have one single coolant system filter with a shut off valve mounted on the right-hand side of the engine.



WARNING: DO NOT REMOVE THE RADIATOR CAP FROM A HOT ENGINE. HOT STEAM WILL CAUSE SERIOUS PERSONAL INJURY. REMOVE THE COOLANT SYSTEM PRESSURE CAP AND CLOSE THE SHUTOFF VALVES BEFORE REMOVING THE COOLANT FILTER. FAILURE TO DO SO CAN RESULT IN PERSONAL INJURY FROM HEATED COOLANT SPRAY.

NOTE: Do not allow oil to get inside the filter. Oil will adversely affect the DCA4.

Install the filter on the filter head. Tighten the filter until the gasket contacts the filter head surface. Tighten the filter an additional 1/2 to 3/4 of a turn.

NOTE: Over-tightening can distort the threads or damage the filter head. Do not use tools to tighten the filter.

Turn the coolant shutoff valve to the "ON" position. Operate the engine, and check for coolant leaks. After the air has been purged from the system, check the coolant level again.

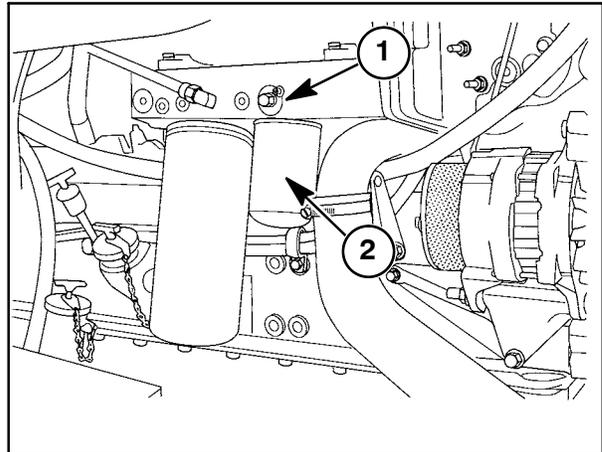


Figure 3-45

EVERY 250 HOURS**OPERATION 28****Check the Engine DCA4 Protection Level**

The DCA4 protection level must be checked whenever coolant is added to the cooling system or whenever the cooling system filter is changed.

Buhler Versatile has a test kit available, part number FGCC2602, to check the concentration level. Instructions are included with the test kit. Contact your Buhler Versatile dealer to obtain the test kit.

Follow the instructions in the kit to maintain proper DCA4 protection level.

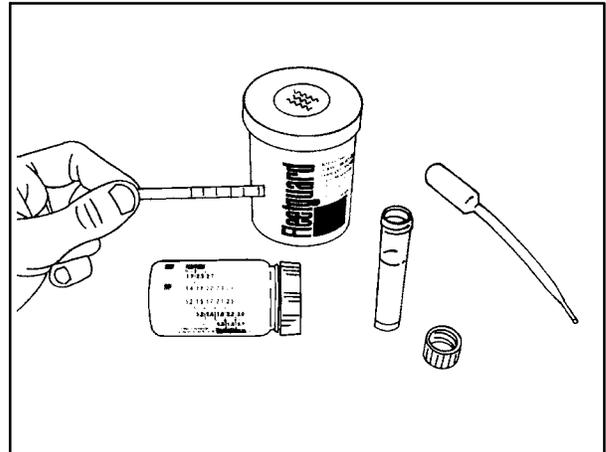


Figure 3-46

OPERATION 29**Change the Fuel Filter**

The fuel filter is located on the left side of the engine. To replace the fuel filter, 1, unscrew it from its filter head, 2, and discard the old filter. Fill the new filter with clean fuel and install it onto the filter head. Hand tighten the filter 1/2 to 3/4 of a turn after the seal on top of the filter contacts the filter head.

IMPORTANT: Discard the used fuel filter following local laws and regulations.

NOTE: There is no shutoff provided at the filter head to stop the flow of fuel from the tanks. The filter head is located high enough on the engine so that no fuel should escape when the filter is removed.

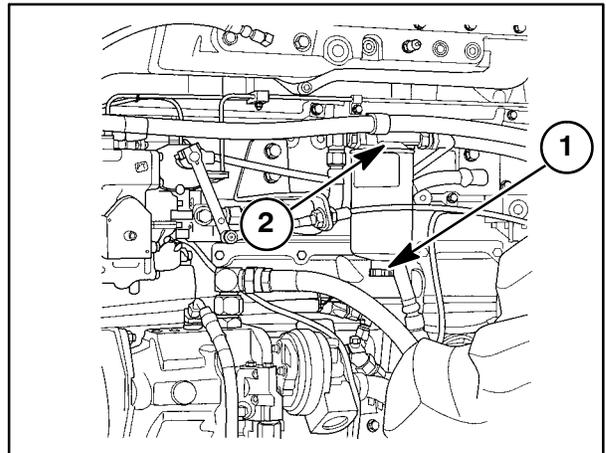


Figure 3-47

EVERY 250 HOURS**OPERATION 30****Check the Air-Conditioner Sight Glass**

The air-conditioner sight glass should be checked to see if the system is functioning properly.

The receiver/drier, 1, is located on the back of the condenser, in the front grille of the tractor on the 2360 and 2425 tractors (shown in illustration). It is located on the rear left hand hood support on the 2290, 2335 and 2375 tractors. Check the sight glass on the top of the receiver tank every 250 hours. If clear, the system is in good condition; if bubbles flow across the sight glass with the engine running, the system may be low on refrigerant. If the glass is cloudy, it is an indication that the system is contaminated with moisture. When moisture is present, the dryer will have to be replaced by qualified air-conditioning service technicians. Contact your Buhler Versatile dealer.

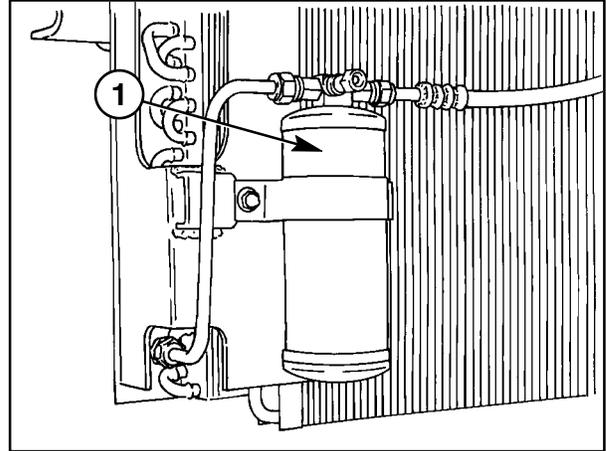


Figure 3-48



WARNING: NEVER LOOSEN, REMOVE OR DISCONNECT ANY HOSE IN THE AIR-CONDITIONING SYSTEM.

THE AIR-CONDITIONER HOSES ARE UNDER PRESSURE AT ALL TIMES, EVEN WHEN THE TRACTOR IS NOT RUNNING.

DO NOT ATTEMPT TO SERVICE THE AIR-CONDITIONING SYSTEM. IT IS POSSIBLE TO SUFFER SEVERE FROSTBITE OR INJURY FROM ESCAPING REFRIGERANT. SPECIAL EQUIPMENT AND INSTRUMENTS ARE REQUIRED TO SERVICE THE AIR-CONDITIONING SYSTEM WHICH USES R134A REFRIGERANT. SEE YOUR AUTHORIZED BUHLER VERSATILE DEALER FOR SERVICE.

EVERY 250 HOURS**OPERATION 31****Check the Air-Conditioner Drain Hoses**

Check to be sure the drain hoses, 1, located on each rear corner of the cab, are free of any obstructions and are not kinked or twisted blocking the free flow of water that is draining from the evaporator at the top of the cab.

The hoses are routed down into the front frame and should not interfere with any portion of the articulation area.

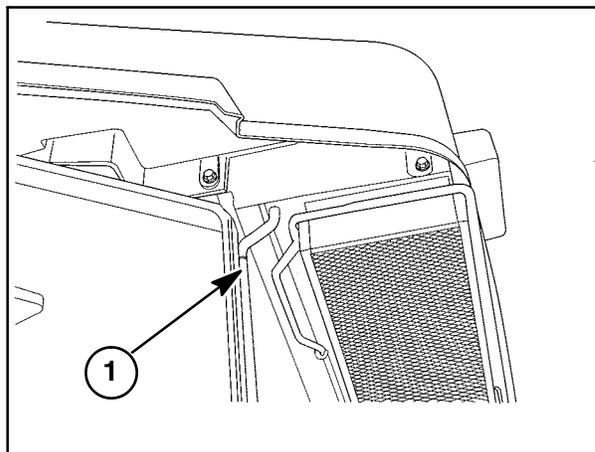


Figure 3-49

OPERATION 32**Check the Weight Kit Hardware Torque (Optional)**

Check the hardware securing the front and rear weight brackets and weights to the tractor.

Front weight kit - Check the weight mounting bolts, 1, securing the weights to the weight bracket and torque to 480 N·m (354 ft. lbs.). Check the hardware 2, securing the bracket to the tractor and torque to 633 N·m (467 ft. lbs.). Check the tie rod nuts, 3, and torque to 633 N·m (467 ft. lbs.).

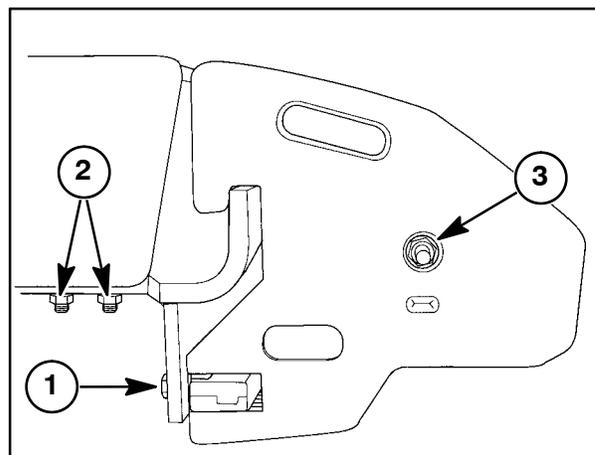


Figure 3-50

Rear weight kit - Check the weight mounting bolts, 1, securing the weights to the weight bracket and torque to 480 N·m (354 ft. lbs.). Check the eight nuts securing the bracket to the tractor and torque to 633 N·m (467 ft. lbs.). Check the tie rod nuts and torque to 633 N·m (467 ft. lbs.).

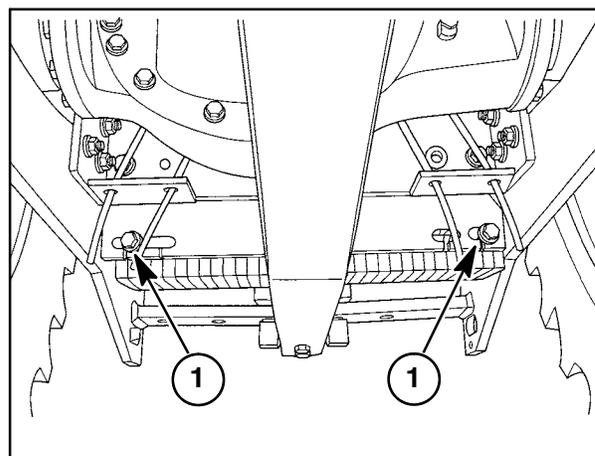


Figure 3-51

EVERY 250 HOURS

Auxiliary rear weight kit - Check the weight mounting nuts, 1, securing the weights to the weight bracket and torque to 480 N·m (354 ft. lbs.). Check the six nuts (three on each bracket) securing the bracket to the tractor and torque to 633 N·m (467 ft. lbs.). Check the tie rod nuts, 2, and torque to 633 N·m (467 ft. lbs.).

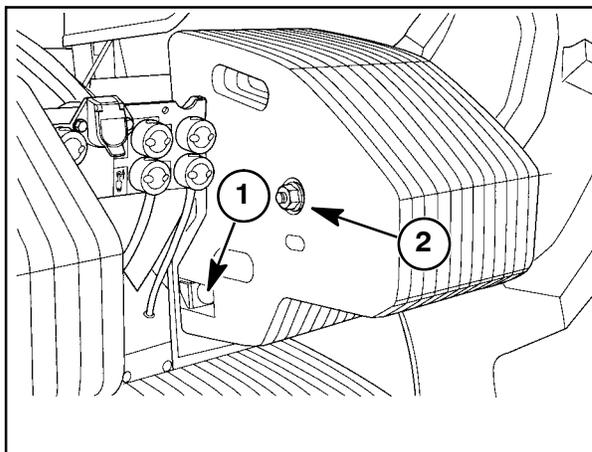


Figure 3-52

OPERATION 33**Check the Wheel Hardware Torque**

All wheel mounting hardware must be checked for proper torque. The following chart shows wheel torques, based on wheel configuration.

NOTE: For identification of particular hardware components, see Operation 75 later in this section.

CONFIGURATION	TORQUES
Singles	Wheel to Hub Nuts 710 N·m (525 ft. lbs.)
Special Tie Rod Duals	Wheel to Hub Nuts 710 N·m (525 ft. lbs.) Backing Nuts 440 N·m (325 ft. lbs.) Outer Wheel Nuts 300 N·m (220 ft. lbs.) Jam Nuts 320 N·m (235 ft. lbs.)
Standard Tie Rod Duals	Wheel to Hub Nuts 710 N·m (525 ft. lbs.) Outer Wheel Nuts 300 N·m (220 ft. lbs.) Jam Nuts 320 N·m (235 ft. lbs.)
Standard and Special Row Crop Drum Duals	Wheel to Hub Nuts 710 N·m (525 ft. lbs.)
Drum Style Triples	Wheel to Hub Nuts 710 N·m (525 ft. lbs.) Center Wheel to Outer Wheel Nuts 710 N·m (525 ft. lbs.)

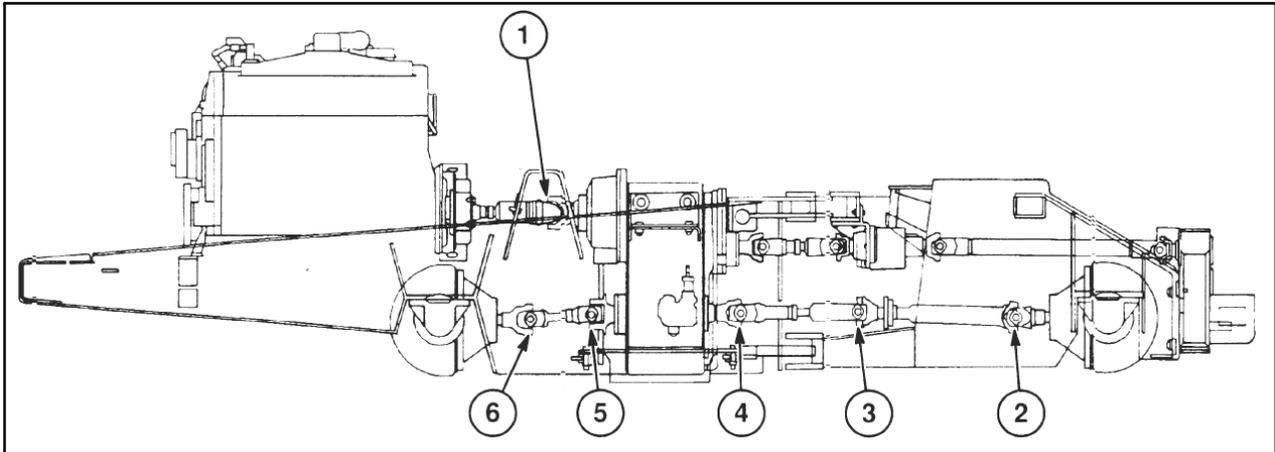
EVERY 250 HOURS

Figure 3-53

OPERATION 34**Driveline Cross and Bearing Lubrication**

NOTE: Not all models require lubrication of the cross and bearing on a given driveline. Read the procedure carefully to identify which cross and bearing requires lubrication on your particular tractor.

Lubricate the following items:

- 1 Transmission input cross and bearing (2290, 2335, 2360* and 2375* only)
- 2 Rear axle cross and bearing (2290, 2335, 2360* and 2375* only)
- 3 Rear axle driveline articulation cross and bearing (2290, 2335, 2360* and 2375* only)
- 4 Transmission rear output cross and bearing (2290, 2335, 2360* and 2375* only)
- 5 Transmission front output cross and bearing (2290, 2335, 2360* and 2375* only)
- 6 Front axle cross and bearing (2290, 2335, 2360* and 2375* only)

Use lithium base EP high temperature grease available from your Buhler Versatile dealer.

*Applies to units equipped with standard duty axles.

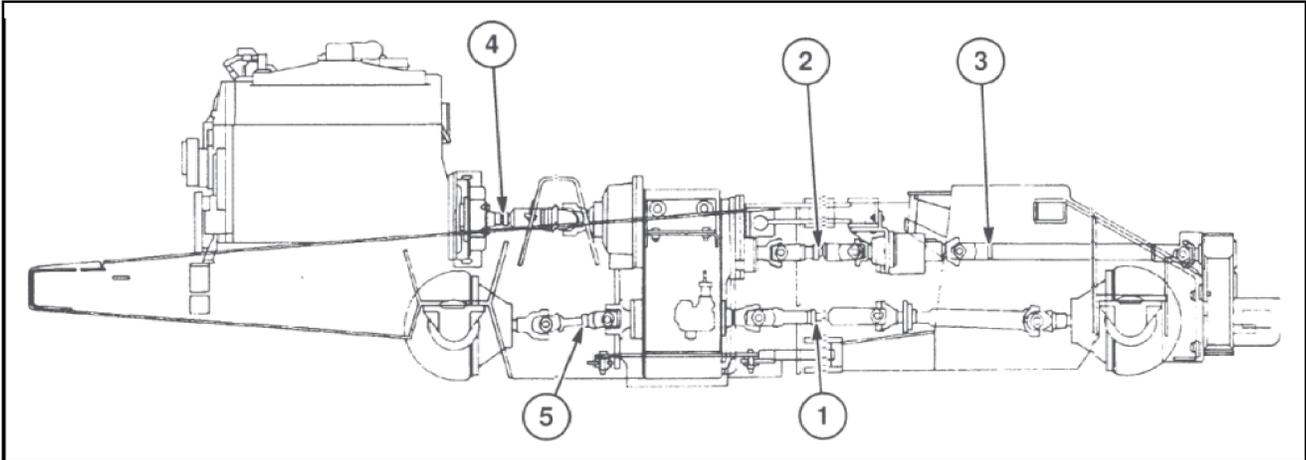
EVERY 250 HOURS

Figure 3-54

OPERATION 35

Lubricating The Rear Axle Drive Shaft Articulation Slip Yoke, PTO Articulation Drive Shaft Slip Yoke (Option), PTO Drive Shaft Rear Slip Yoke (Option), Input Driveline Slip Yoke, Front Output Driveline Slip Yoke

Lubricate the rear axle drive shaft articulation slip yoke, 1, until grease flows from the yoke. If the tractor is equipped with the PTO option, also grease the PTO articulation drive shaft slip yoke, 2, and PTO drive shaft rear slip yoke, 3, at this time.

Lubricate the input driveline slip yoke, 4, and the front output driveline slip yoke, 5, at the front of the transmission, until grease flows from the yoke. This will purge any dirt accumulated in this area.

Use lithium base EP high temperature grease available from your Buhler Versatile dealer.

To access the PTO articulation drive shaft slip yoke, remove the four bolts, 1, from the right side of the PTO articulation drive shaft shield. Replace the shield when lubrication is complete.

Use lithium base EP high temperature grease available from Buhler Versatile dealer.

EVERY 500 HOURS**OPERATION 36****Clean the Battery Connections**

The battery connections must be cleaned and tightened to maintain proper operation of the electrical system of the tractor.

Remove the three battery ground cable connections, 1, first, and then the six positive cable connections, 2, before cleaning. Each connection has a rubber boot covering it for protection. The connections are loosened by turning the nut counterclockwise and pulling the connection from the battery mounting stud.

Clean the battery stud, battery cable and mounting nut thoroughly with a brush and reinstall the cables. Attach the positive cables first and the ground cables last.

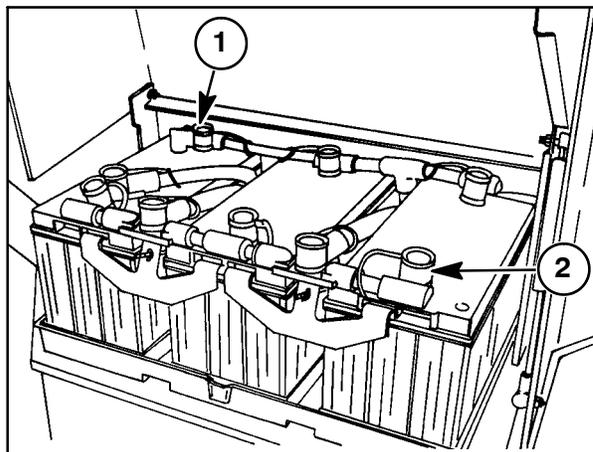


Figure 3-56



CAUTION: WHEN SERVICING THE BATTERIES, DISCONNECT THE NEGATIVE (BLACK) CABLES BEFORE THE POSITIVE (RED) CABLES. WHEN CONNECTING THE CABLES, CONNECT THE POSITIVE CABLE FIRST, THEN THE NEGATIVE. THIS WILL REDUCE THE POSSIBILITY OF SPARKING AND BATTERY EXPLOSION.

WARNING: ALL BATTERIES GENERATE HYDROGEN GAS, WHICH IS HIGHLY FLAMMABLE. IF IGNITED BY A SPARK OR FLAME, THE GAS MAY EXPLODE VIOLENTLY CAUSING A SPRAY OF ACID, FRAGMENTATION OF THE BATTERY, AND POSSIBLE SEVERE PERSONAL INJURY, PARTICULARLY TO THE EYES.

THEREFORE, AS A SAFETY PRECAUTION:

WEAR PROTECTIVE CLOTHING AND GOGGLES.

DO NOT SMOKE OR EXPOSE THE BATTERY TO OPEN FLAME.

DO NOT CONNECT OR DISCONNECT LIVE CIRCUITS.

EVERY 500 HOURS

If the batteries require removal, disconnect the cables as previously detailed. Loosen the wing nuts, 1, and lower the clamps, 2, downward. Lift the battery to be removed from the battery tray.

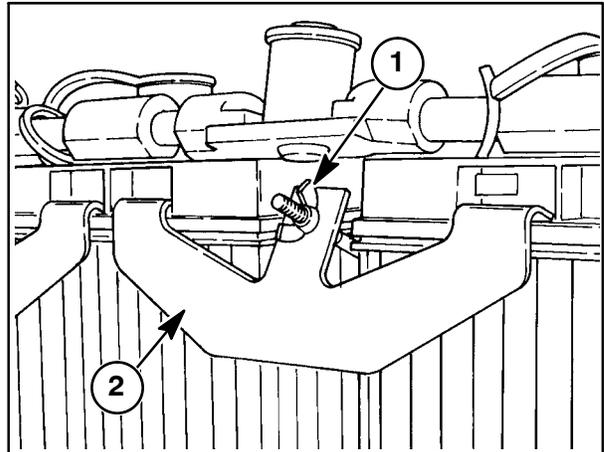


Figure 3-57

OPERATION 37**Check the Battery Electrolyte Level**

To check the battery electrolyte level, clean the top of the batteries with a damp cloth.

Remove the six fill plugs, 1, from each battery. Check that the electrolyte level is 6 mm (1/4") below the filler neck of each cell. Add distilled or demineralized water as required. Do not overfill. Replace all fill plugs.

Check for loose cable connections. Tighten as required.

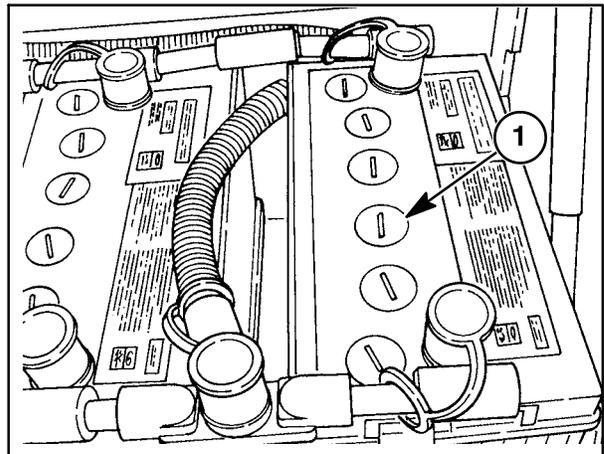


Figure 3-58



WARNING: BATTERIES CONTAIN SULFURIC ACID. IN CASE OF CONTACT WITH SKIN, FLUSH THE AFFECTED AREA WITH WATER FOR FIVE MINUTES. SEEK MEDICAL ATTENTION IMMEDIATELY.

WARNING: AVOID CONTACT WITH THE SKIN, EYES OR CLOTHING. WEAR EYE PROTECTION WHEN WORKING NEAR BATTERIES.

EVERY 500 HOURS**OPERATION 38****Check the Starter Battery Connections**

Check to be sure that the battery cable connection, 1, and the ground connection, 2, are tight and clean where they attach to the engine starter. Clean and tighten as necessary.

The starter is located on the left side of the engine.



WARNING: DISCONNECT THE BATTERY CABLES AT THE BATTERY BEFORE WORKING ON THE BATTERY CABLE CONNECTIONS AT THE STARTER.

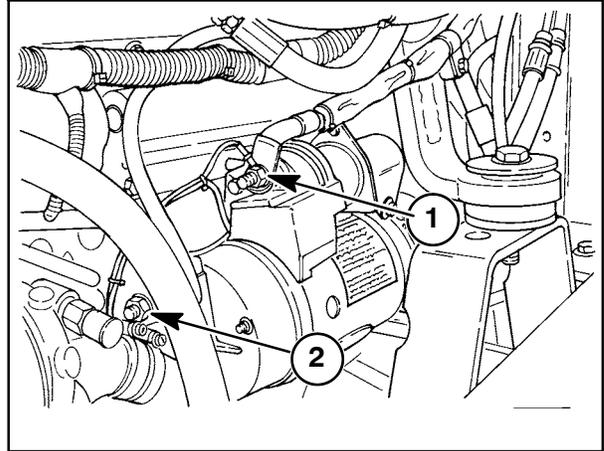


Figure 3-59

OPERATION 39**Clean the Engine Air Precleaner**

The engine air precleaner must be checked to be sure that debris is not causing any obstruction at the precleaner inlet.

To inspect the inlet to the precleaner, loosen the hose clamp, 1, attaching the air cleaner tube, 2, to the rubber boot, 3. Loosen the hose clamp, 4, attaching the boot to the precleaner, 5. (2360 - 2425 models illustrated).

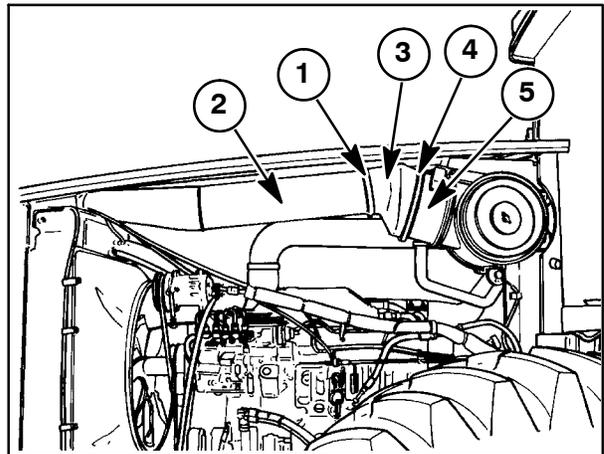


Figure 3-60

EVERY 500 HOURS

Loosen and remove the two hose clamps securing the suction hose, 1, to the suction screen port. Remove the suction hose. Unscrew the suction screen, 2, from the top of the hydraulic tank and remove it. Cover the hole in the tank so contaminants cannot enter.

The suction screen can be washed in a cleaning solvent to remove any debris accumulated in it.

Reinstall the suction screen into the top of the tank and tighten securely. Reinstall the suction hose onto the steering pump and suction screen and tighten the hose clamps to ensure that no air can enter the hydraulic system.

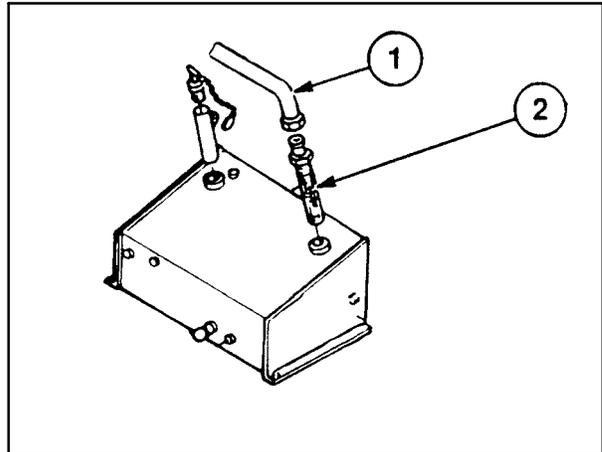


Figure 3-64

OPERATION 42**Clean the Hydraulic Reservoir Breather**

Clean the hydraulic reservoir breather, 1, so that the hydraulic system can breathe properly. Remove the breather from its mounting bolt and unscrew the breather from its hose. Clean it out using low pressure air 1.7 bar (25 PSI) or less. Reinstall the hose and replace the breather in its mounting location.

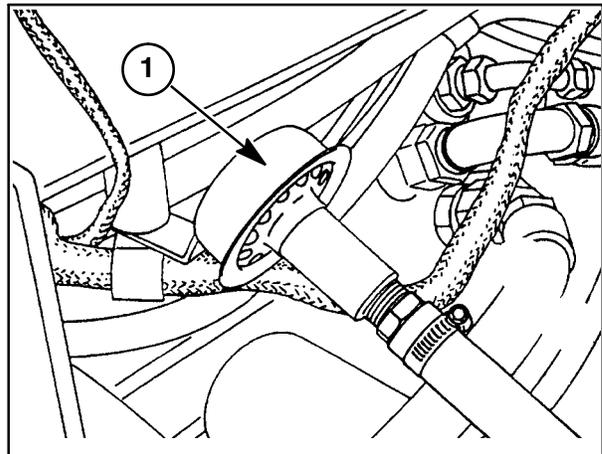


Figure 3-65

EVERY 500 HOURS**OPERATION 43****Change the Hydraulic Filter**

The hydraulic filter is located under the front end of the tractor, directly below the engine, and is the filter on the right side of the frame (when viewing it from the operator's seat).

The hydraulic filter, 1, is a spin-on, throwaway type and is removed by turning it counterclockwise. To install the new filter, lubricate the O ring on top of the new filter with clean hydraulic oil. Install the filter to the filter head, hand-tightening until the seal contacts the filter head. Tighten the filter an additional 1/2 to 3/4 turn.

NOTE: Some oil, approximately 1.9 L (2 qts.), may be lost when the filter is unscrewed from the filter head. Be sure to replenish the lost oil.

Start the engine and check for leaks at the filter.

NOTE: The transmission filter and hydraulic filter are the same part number.

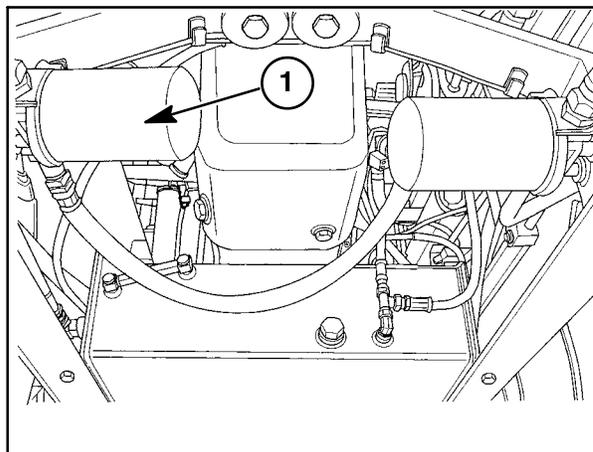


Figure 3-66

OPERATION 44**Change the Transmission Filter**

The transmission filter is located under the front end of the tractor directly below the engine, and is the filter on the left side of the frame (when viewing it from the operator's seat).

The transmission filter, 1, is a spin-on, throwaway type and is removed by turning it counterclockwise. To install the new filter, lubricate the O ring on top of the new filter with clean transmission oil. Install the filter to the filter head, hand-tightening until the seal contacts the filter head. Tighten the filter an additional 1/2 to 3/4 turn.

NOTE: Some oil, approximately 0.95 L (1 qt.), may be lost when the filter is unscrewed from the filter head. Be sure to replenish the lost oil.

Start the engine and check for leaks at the filter.

NOTE: The transmission filter and hydraulic filter are the same part number.

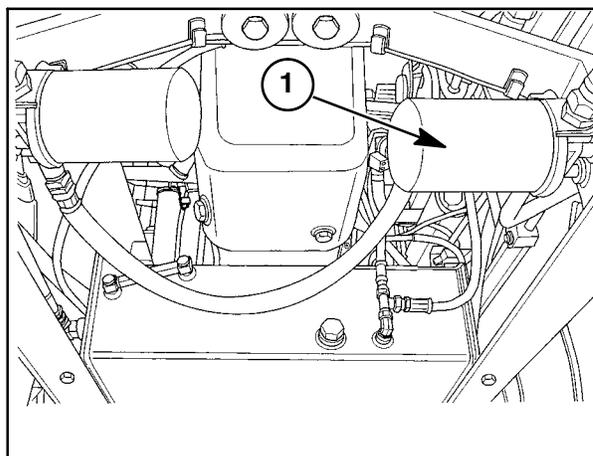


Figure 3-67

EVERY 500 HOURS**OPERATION 45****Change the Differential Oil**

To change the differential oil, operate the tractor a sufficient amount of time to warm up the oil in the differentials. Loosen the check plug, 1, and remove the drain plug, 2, to allow the oil to drain completely from the differential housings. Once all the oil is removed, replace the drain plug and tighten it to 74 N·m (55 ft. lbs.). Make sure the sealing surface on the plug is in good condition. Refill the differentials through the check plug to the proper level as indicated by the sight gauge, 3.

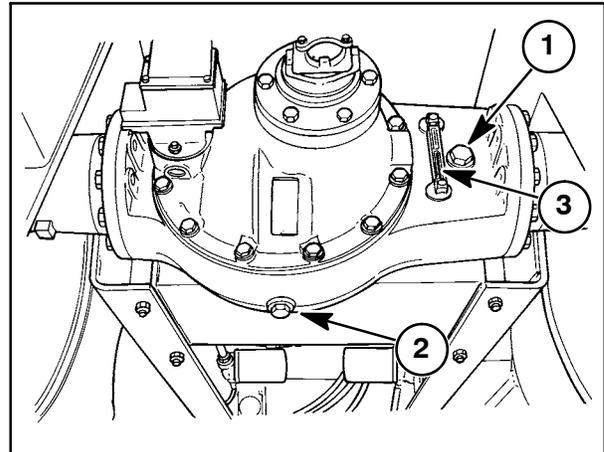


Figure 3-68

Buhler Versatile recommends that 85W140 GL5 oil be used in temperatures above 0°C (32°F) or 80W90 GL5 in temperatures below 0°C (32°F). This oil is available from your Buhler Versatile dealer.

NOTE: Oil will flow from the differential to the planetary hubs. Change the oil with the tractor on a level surface and allow the differential and planetary hub oil to level out.

OPERATION 46**Change the Planetary Hub Oil**

To drain the planetary hub oil, rotate the tire so that the drain plug, 1, is at the 6 o'clock position. Loosen the fill plug, 2, to allow all of the oil to drain from the planetary hub. Make sure that the plug, 1, is retightened, and then refill the hub as detailed in Operation 24.

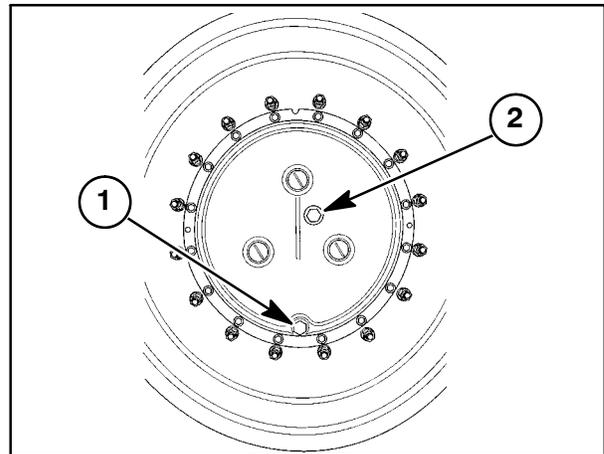


Figure 3-69

Buhler Versatile recommends that 85W140 GL5 oil be used in temperatures above 0°C (32°F) or 80W90 GL5 in temperatures below 0°C (32°F). This oil is available from your Buhler Versatile dealer.

NOTE: Oil will flow from the differential to the planetary hubs. Change the oil with the tractor on a level surface and allow the differential and planetary hub oil to level out.

EVERY 500 HOURS**OPERATION 47****Check the Axle Mount Bolt Torque**

Check the axle mount bolts for proper torque.

Torque the nuts, 1, and 2, must be torqued to 1335 N·m (1000 ft. lbs.). There are four sets of nuts on each end of both axles.

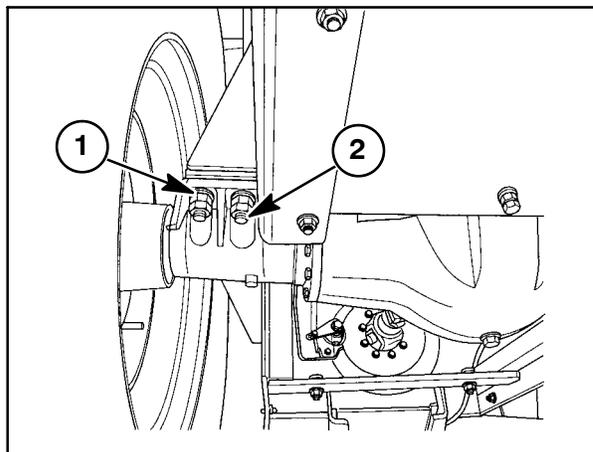


Figure 3-70

OPERATION 48**Check the Drawbar Wear Blocks**

Inspect the stop wear blocks, 1, for excessive wear. If there is wear on the blocks, rotate them 90° to provide a new wear surface for the drawbar to ride against.

Measure the clearance between the top bridge plate, 2, and the drawbar support, 3. If there is 3 mm (1/8") or less clearance, replace the wear block under the bridge plate. Support the drawbar and remove the clevis, 4, from the top of the drawbar. Remove the bolt, 5, and lift off the top bridge plate. Replace the wear block and reassemble the bridge plate. Torque the bridge plate bolt to 952 N·m (702 ft. lbs.). Replace the clevis and torque the clevis mounting bolts to 952 N·m (702 ft. lbs.).

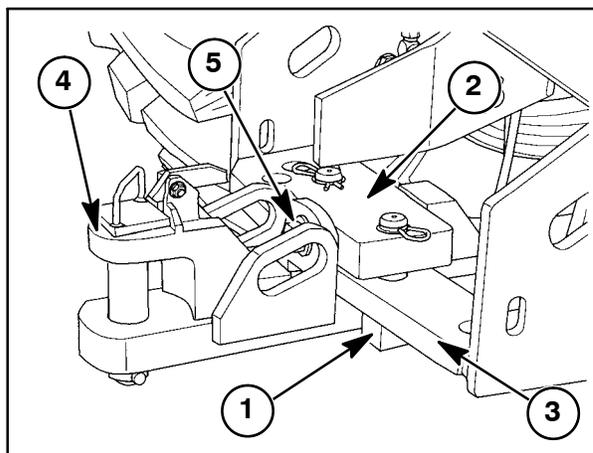


Figure 3-71

NOTE: The wear block under the bridge plate is attached to the plate with four cap screws. Be sure to reinstall the wear block cap screws during reassembly.

EVERY 500 HOURS

To access the PTO articulation drive shaft slip yoke, remove the four bolts, 1, from the right side of the PTO articulation drive shaft shield. Replace the shield when lubrication is complete.

Use lithium base EP high temperature grease available from Buhler Versatile dealer.

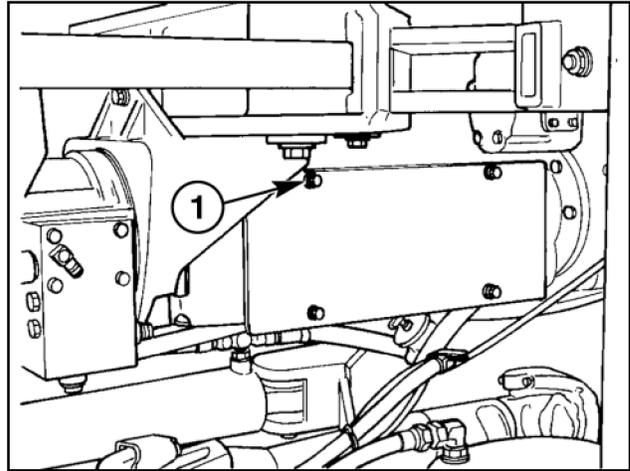


Figure 3-71

OPERATION 49**Steam Cleaning the Tractor**

If mud or debris is allowed to build up on the tractor, it can cause a safety hazard as well as detract from the appearance of the tractor.

Using a steam cleaner or high pressure washer, clean the tractor from end to end, paying particular attention to the underside and wheel area.



CAUTION: ALWAYS SHUT THE TRACTOR OFF WHEN CLEANING OR SERVICING.

IMPORTANT: Never spray cold water on a hot tractor engine. The sudden temperature change may cause cracking of the cast iron components.

The cold water hitting the injection pump can cause the components rotating inside the pump to seize due to the sudden temperature change.

IMPORTANT: Do not use caustic soaps that can cause damage to the paint finish on the tractor. Read the manufacturer's instructions carefully on the soap package.

IMPORTANT: Do not spray high pressure water into the cooler/radiator area of the front grille. Damage to the cooling fins will result.

EVERY 1000 HOURS**OPERATION 50****Change the Engine Inner and Outer Air Cleaner Elements**

2360 and 2425 models illustrated.

The engine air cleaner consists of a large outer element, smaller safety element, and an exhaust aspirated precleaner. The precleaner removes dirt from the air and discharges it through the exhaust muffler.

***IMPORTANT:** When servicing the air cleaner, wear a mask when changing the air filters. Do not breath in dust.*

To access the inner and outer elements, remove the large wing nut, 1, on the outside of the cover. Remove the cover, 2, from the cleaner.

Remove the outer element, 1, by removing the wing nut, 2, and pulling the element from the canister. Discard the old element.

Remove the inner element, 1, by removing the wing nut, 2, and pulling the element from the canister. Discard the old element.

Clean the air cleaner body with a lint-free towel before installing the element.

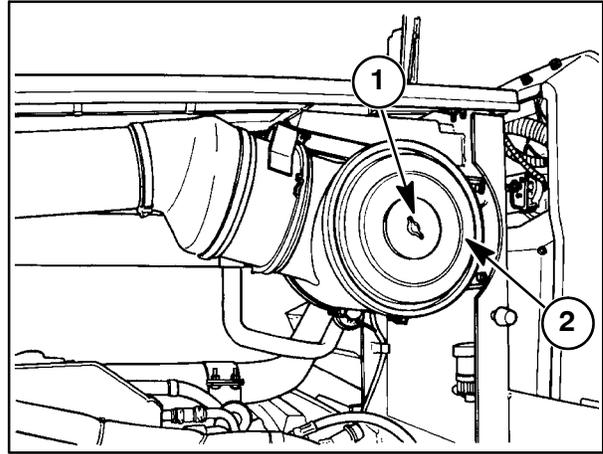


Figure 3-72

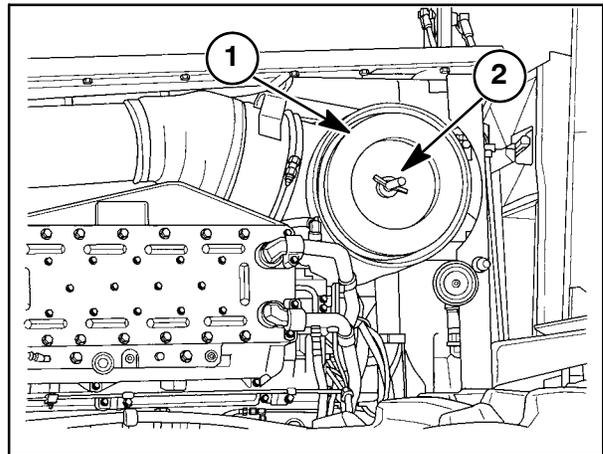


Figure 3-73

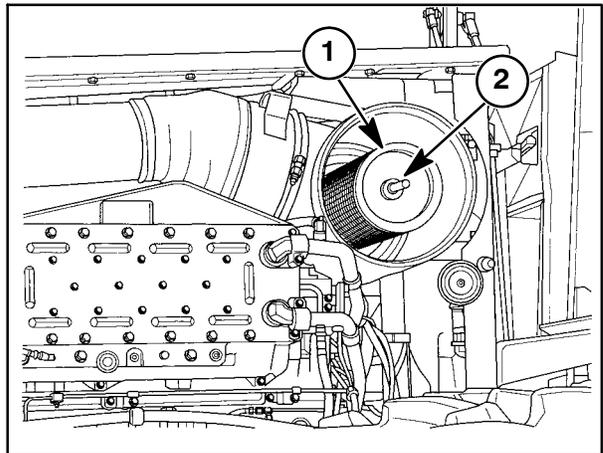


Figure 3-74

EVERY 1000 HOURS

Inspect the seal, 1, on both new elements before installing. Cracks or chips in the element sealing rubber indicate that the element is defective and must be replaced.

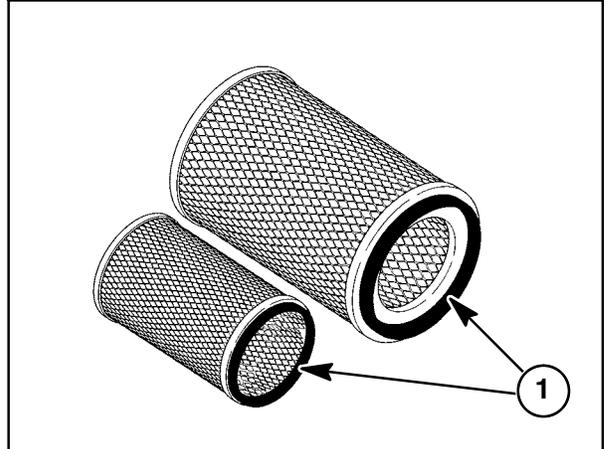


Figure 3-75

Install the elements into the canister. Be sure that the seal on the end of the filters fully contacts the air cleaner body. The wing nuts, 1, have a small seal on the inner face which should be in good condition before the wing nuts are tightened. If the seals on the wing nuts are damaged, replace them. Tighten the nuts securely.

NOTE: Contact your Buhler Versatile dealer to obtain the correct filter part numbers.

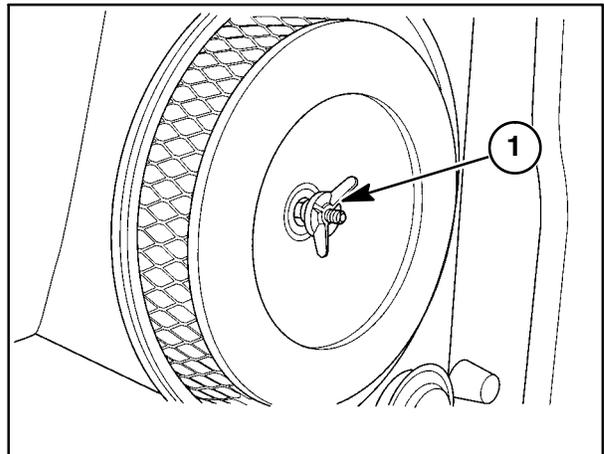


Figure 3-76

OPERATION 51**Change the Cab Air Filter**

The cab air filter, 1, located on the rear of the cab must be changed periodically to keep the cab air system operating at maximum efficiency.

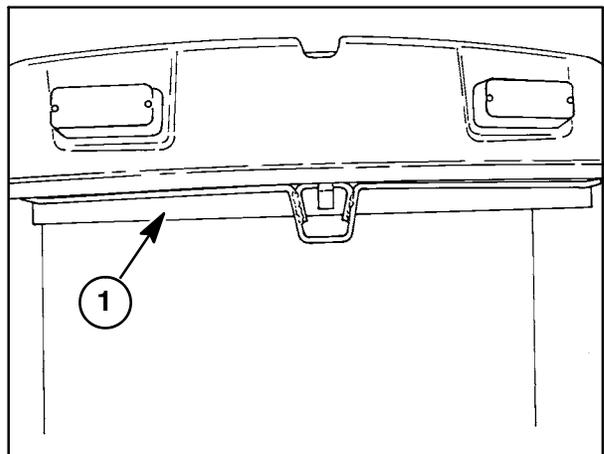


Figure 3-77

EVERY 1000 HOURS

To remove the cab air filter, lift up on the filter frame handle, 1, and unhook the latch, 2. Allow the filter and frame to lower toward the cab window.

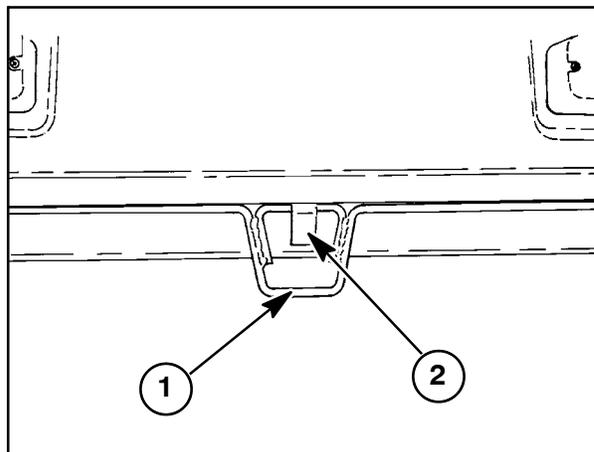


Figure 3-78

Hold a light on one side of the new element and check for ruptures. A pinpoint of light indicates a rupture in the element paper. If this occurs, the element is defective and must be replaced.

Install the new element into the frame and check the seal, 1, around the perimeter of the element for nicks or cracks. Replace the element if any damage is found.

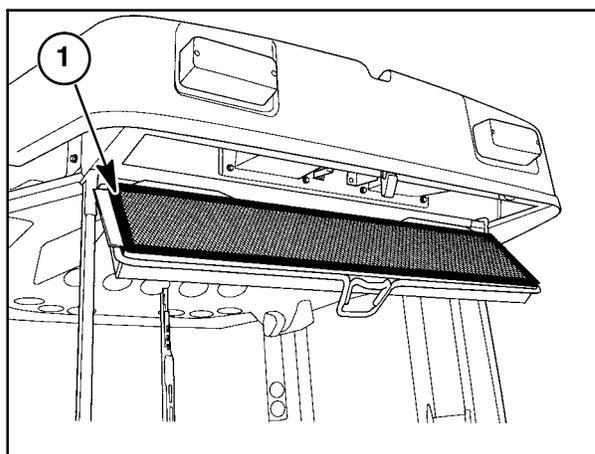


Figure 3-79

Reinstall the filter into its frame on the back of the cab roof. Lift the frame latch handle, 1, and hook the latch tab, 2, into the frame.

**WARNING**

The cab air filter is designed to remove dust from the air but will not exclude chemical vapor. Follow the chemical manufacturers directions regarding protection from dangerous chemicals.

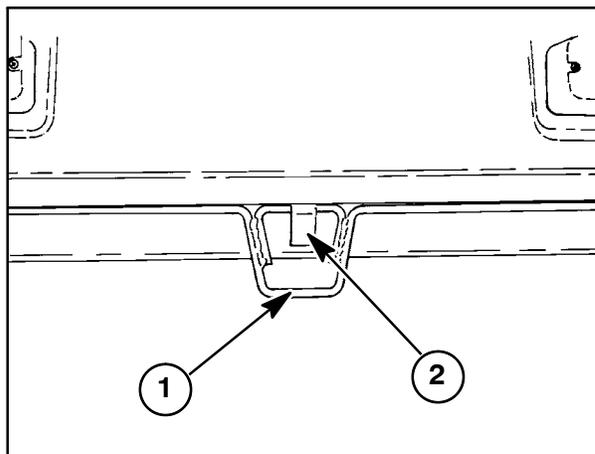


Figure 3-80

EVERY 1500 HOURS OR YEARLY**OPERATION 52****Change the Transmission Oil**

To drain the transmission oil, use the following procedure based on the type of transmission the tractor is equipped with.

Quad Shift III Transmission - Operate the tractor a sufficient amount of time to warm up the transmission oil. Remove the drain plug, 1, from the transmission housing and allow the oil to drain into a pan.

Replace the drain plug and tighten. Refill the transmission with new oil through the fill tube to the proper level as indicated by the sight gauge.

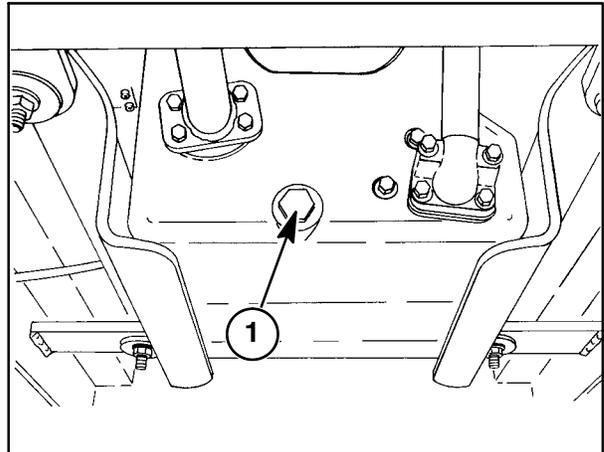


Figure 3-81

Quad Shift III transmissions equipped with a PTO option will not have a drain plug on the transmission. A PTO lubrication hose, 1, will be installed into the drain port. Loosen the hose and allow the hose to drain from the transmission. Replace the hose and tighten.

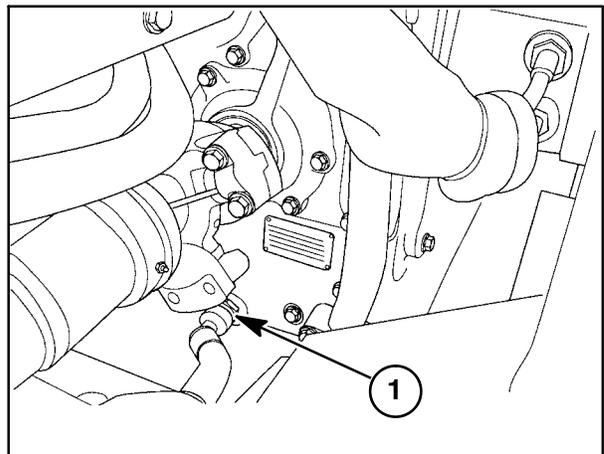


Figure 3-82

If the tractor is equipped with the PTO option, the PTO clutch housing will also require draining. To do this, remove the hose, 1, from the bottom of the clutch housing and allow the oil to drain from the clutch. Reattach the hose after the oil is removed. Tighten the hose fitting.

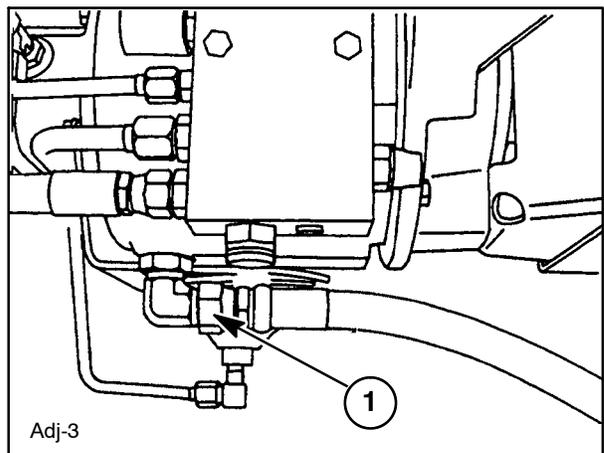


Figure 3-83

EVERY 1500 HOURS OR YEARLY

Powershift Transmission (with or without PTO option) - Operate the tractor a sufficient amount of time to warm up the transmission oil. Remove the drain plug, 1, from the lower left hand rear location on the transmission housing and allow the oil to drain into a pan.

Replace the drain plug and tighten. Refill the transmission with new oil through the fill tube to the proper level as indicated by the dipstick.

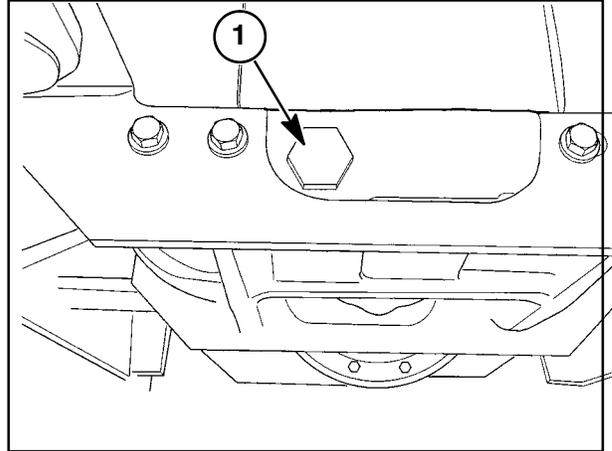


Figure 3-84

On powershift tractors *with* a PTO, the PTO clutch housing will also require draining. To do this, remove the hose, 1, from the bottom of the clutch housing and allow the oil to drain from the clutch. Reattach the hose after the oil is removed. Tighten the hose fitting.

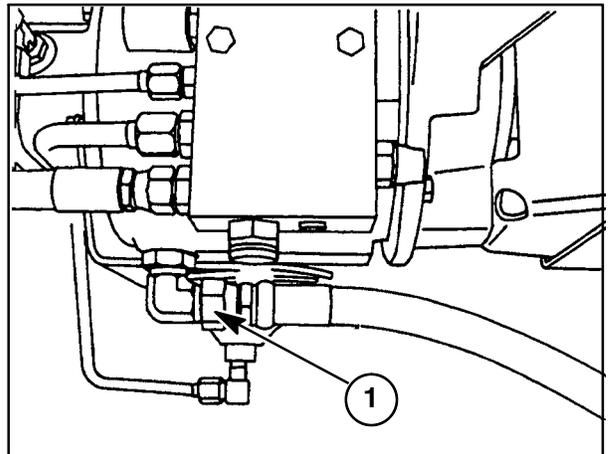


Figure 3-85

EVERY 1500 HOURS OR YEARLY

With either PTO equipped transmission, the PTO drop box is pressure lubricated by the transmission lube system. Drain the drop box at the rear of the tractor by removing the hose, 1, from the bottom of the box and allow the oil to drain out completely. Replace the hose and tighten the hose fitting.

Refill the transmission with new oil through the fill tube, 2, to the proper level as indicated by the sight gauge, 3, (or dipstick on powershift units). See "Checking the Transmission Oil Level" (Operation 10). Start the tractor at low idle and allow it to run for two minutes to refill the PTO clutch housing and rear PTO drop box. Shut the tractor off and recheck the transmission level. Add additional transmission oil as necessary.

NOTE: The PTO drop box located on the rear of the transmission does not require draining during transmission oil changing.

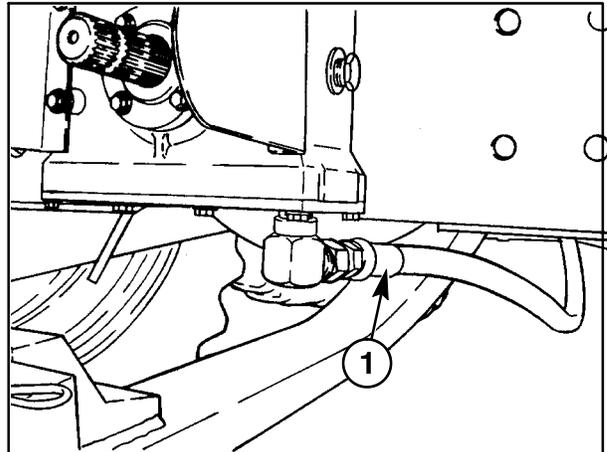


Figure 3-86

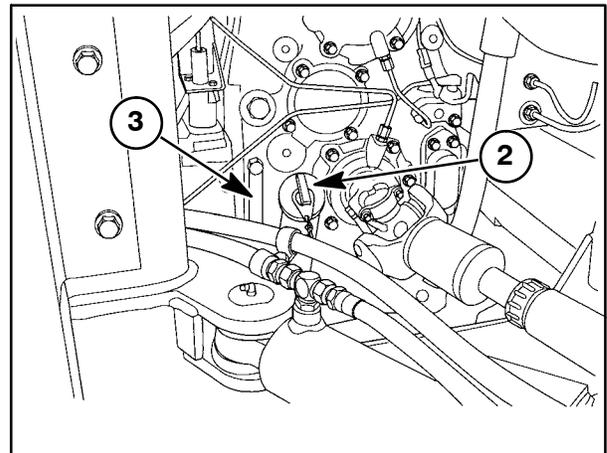


Figure 3-87

EVERY 1500 HOURS OR YEARLY**OPERATION 53****Clean the Transmission Suction Screen (12x4 Quad Shift III Transmission Only)**

The 12x4 transmission has a removable sump screen located under the suction tube that will require cleaning periodically. To remove the suction screen, proceed as follows:

Drain the transmission oil.

Loosen and remove the four cap screws, 1, that mount the suction tube block to the rear face of the transmission. Push the tube out of the way to access the suction port.

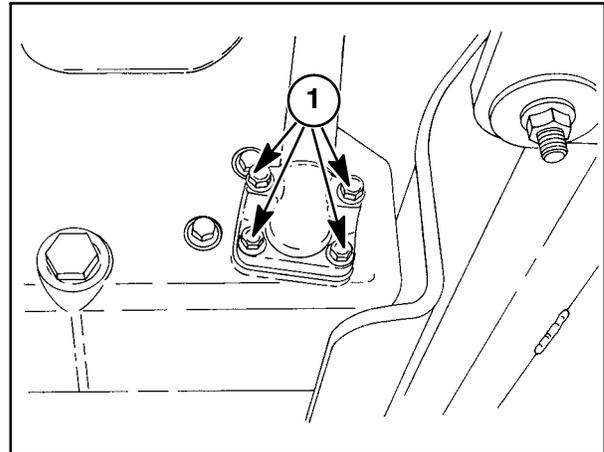


Figure 3-88

Remove the suction screen from the port and clean it in a suitable solvent. Replace the screen into the suction port.

Check the O ring on the front face of the suction tube block to be sure that it is in good condition and is positioned properly. Replace the O ring if it is damaged. Reinstall the suction tube block bolts and torque to 75 N·m (55 ft. lbs.).

IMPORTANT: The powershift transmission has a non-removable suction screen that does not require maintenance.

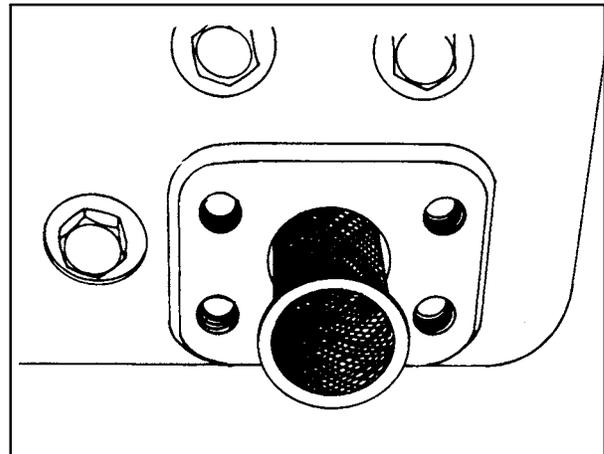


Figure 3-89

OPERATION 54**Check the Transmission Mounts**

Check the rubber transmission mounts and mounting hardware for condition and torque on both the powershift and Quad Shift III transmissions.

The Quad Shift III transmission is held in the front frame of the tractor by four bottom mounts, 1, and two top mounts, 2. Inspect the mounts for deterioration and wear. Torque the lower mounting bracket bolts, 3, to 224 N·m (165 ft. lbs.) and the upper mounting bracket bolts, 4, to 397 N·m (293 ft. lbs.). Torque the mount bolts, 5, to 280 N·m (205 ft. lbs.).

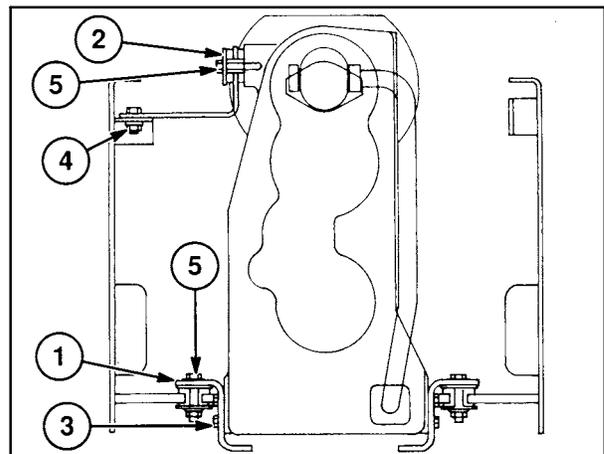


Figure 3-90

EVERY 1500 HOURS OR YEARLY

The powershift transmission is held in the front frame of the tractor by four bottom mounts, 1, and two top mounts, 2. Inspect the mounts for deterioration and wear. Torque the lower mounting bracket bolts, 3, and the upper mounting bracket bolts, 4, to 224 N·m (165 ft. lbs.). Torque the mount bolts, 5, to 280 N·m (205 ft. lbs.).

If the mounts require replacement, contact your Buhler Versatile dealer.

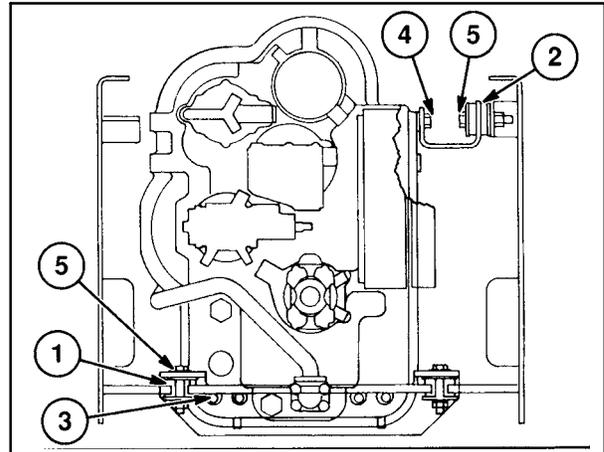


Figure 3-91

OPERATION 55**Change the Hydraulic Oil**

To drain the hydraulic oil from the hydraulic reservoir, use the following procedure:

Run the tractor to warm up the hydraulic system, and collapse all external remote cylinders or 3-point hitch lift cylinders to decrease the amount of oil remaining in the hydraulic system when the oil is drained.

Remove the drain plug, 1, from the bottom of the hydraulic reservoir tank under the front frame of the tractor. Allow all the oil to drain from the reservoir.

Replace the plug and tighten securely. Refill the reservoir to the proper level as indicated on the sight gauge. Restart the tractor. Extend any remote mounted cylinders and 3-point hitch lift cylinders and recheck the oil level. Add oil as necessary.

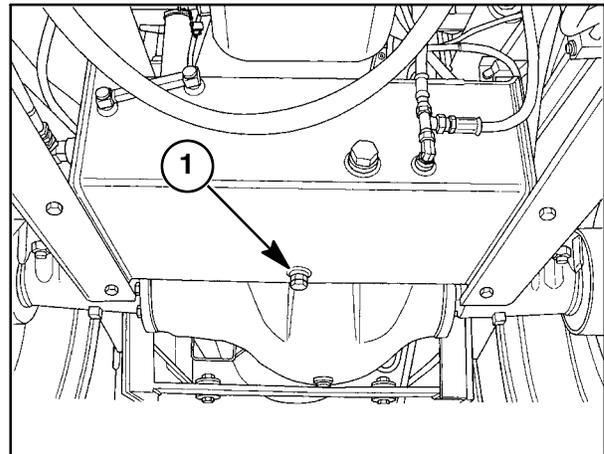


Figure 3-92

EVERY 1500 HOURS OR YEARLY**OPERATION 56****Check the engine mounts**

The engine is mounted in stationary rubber mounts at the two rear corners and the front center of the engine in the front frame of the tractor. The front center mount is a double rubber mount assembly.

On the 2290 and 2335, 2375 (QSM11) engine, check the two rear mounts, 1, for wear or deterioration and torque the mount bolt and nut to 280 N·m (205 ft. lbs.). Torque the mounting bracket to engine bolts, 2, to 260 N·m (190 ft. lbs.).

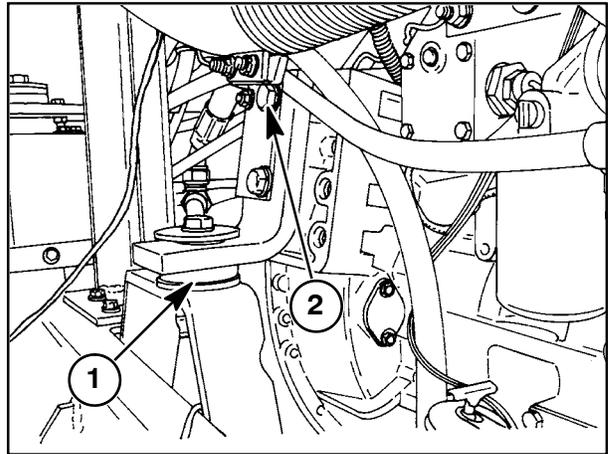


Figure 3-93

Check the 2290, 2335, and 2375 front mounts, 1, for wear or deterioration and torque the mount bolts and nuts to 280 N·m (205 ft. lbs.). Torque the mounting bracket to engine bolts, 2, to 45 N·m (35 ft. lbs.).

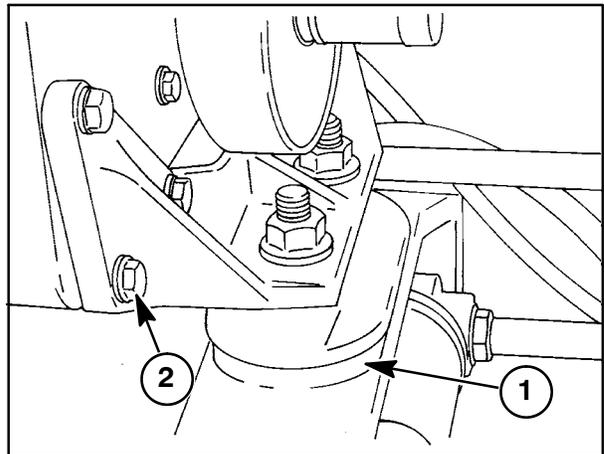


Figure 3-94

On the 2360 and 2425 (N14) engines, check the two rear mounts, 1, for wear or deterioration and torque the mount bolt and nut to 280 N·m (205 ft. lbs.). The mounting bracket to engine bolts are not easily accessible. If a concern of possible loose hardware is suspected, contact your Buhler Versatile dealer.

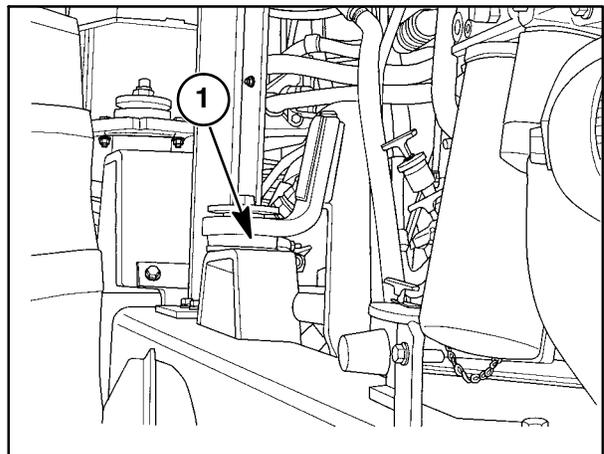


Figure 3-95

EVERY 1500 HOURS OR YEARLY

Check the front mounts, 1, for wear or deterioration and torque the mount bolts and nuts to 280 N·m (205 ft. lbs.). Torque the mounting bracket to engine bolts, 2, to 45 N·m (35 ft. lbs.).

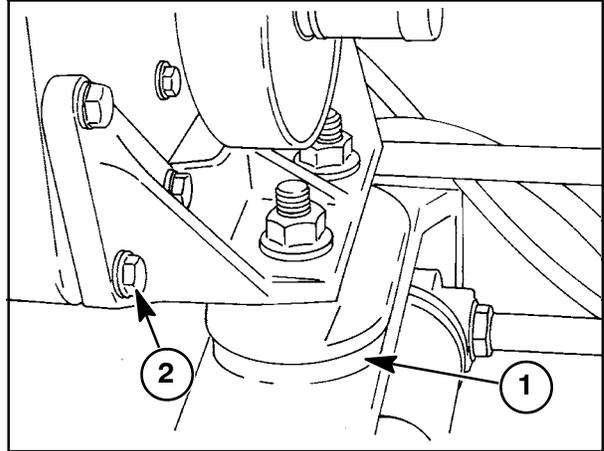


Figure 3-96

OPERATION 57**Check the Engine Turbocharger Connections**

On the Model 2290, 2335 and 2375 (QSM11), check the exhaust pipe to turbo outlet clamp, 1. Torque the clamp to 9 N·m (80 in. lbs.). Torque the lower oil drain line cap screws, 2, to 27 N·m (239 in. lbs.). Tighten the upper oil supply line fitting, 3. 20 N·m (177 in. lbs.)

Tighten the four nuts that mount the turbocharger to the exhaust manifold of the engine to 61 N·m (45 ft. lbs.).

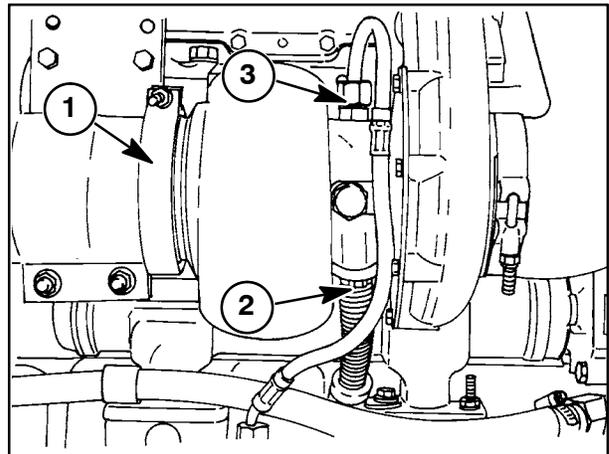


Figure 3-97

EVERY 1500 HOURS OR YEARLY

On the Model 2360 and 2425 (N14), check the exhaust pipe to turbo outlet clamp, 1, and the compressor housing to turbo body clamp, 2. Torque the clamps to 8 N·m (72 in. lbs.). Torque the lower oil drain line cap screws, 3, to 27 N·m (20 ft. lbs.). Make sure the upper oil line fitting, 4, is tight.

Tighten the four nuts that mount the turbocharger to the exhaust manifold of the engine to 65 N·m (50 ft. lbs.).

If any oil leaks or broken connections are found, contact your Buhler Versatile dealer.

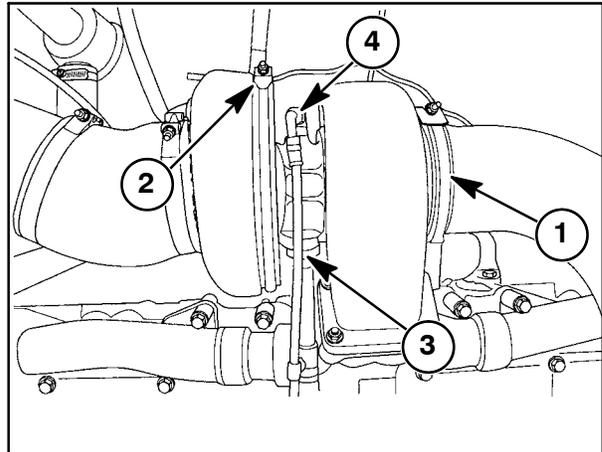


Figure 3-98

OPERATION 58**Check the Radiator and Heating System Hoses**

Check the upper and lower radiator hoses, 1, for deterioration due to heat or contact with other engine components. Inspect the heater hoses, 2, for any wear or damage.

If any hoses in the engine cooling system or tractor heating system require replacement, contact your Buhler Versatile dealer.

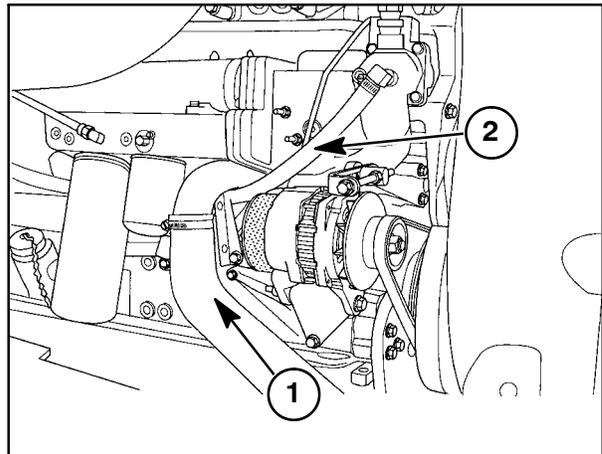


Figure 3-99

OPERATION 59**Check the Cab Mounts**

The cab is mounted on four rubber mounts in each corner of the cab.

Check the mounts, 1, for wear or deterioration and torque the mount bolt and nut to 217 N·m (160 ft. lbs.). Torque the bolts, 2, that hold the mounts to the frame to 97 N·m (72 ft. lbs.).

If the mounts require replacement, contact your Buhler Versatile dealer.

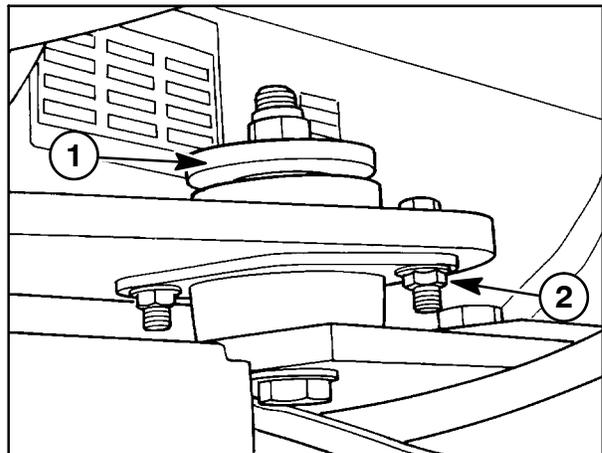


Figure 3-100

EVERY 2000 HOURS OR 2 YEARS

OPERATION 60

Change the Engine Coolant



WARNING: BEFORE DRAINING THE COOLING SYSTEM, WAIT UNTIL THE ENGINE TEMPERATURE IS BELOW 50°C (120°F) BEFORE REMOVING THE RADIATOR PRESSURE CAP. FAILURE TO DO SO CAN CAUSE PERSONAL INJURY FROM HEATED COOLANT SPRAY.

The cooling system must be clean to work correctly. Drain the system, and flush with clean water. If the system shows mineral buildup, scale, rust, or oil, clean with a heavy-duty engine coolant cleaner and follow the manufacturer's directions.

To drain the cooling system, first turn the temperature control knob in the cab to the maximum heat position. Make sure the heater shutoff valve on the engine is wide open.

Remove the radiator cap from the top of the radiator.



WARNING: THE COOLANT SYSTEM OPERATES UNDER PRESSURE WHICH IS CONTROLLED BY THE RADIATOR PRESSURE CAP. IT IS DANGEROUS TO REMOVE THE PRESSURE CAP WHILE THE SYSTEM IS HOT. WHEN THE SYSTEM HAS COOLED, USE A THICK CLOTH AND TURN THE CAP SLOWLY TO THE FIRST STOP AND ALLOW THE PRESSURE TO ESCAPE BEFORE FULLY REMOVING THE CAP. COOLANT SHOULD BE KEPT OFF THE SKIN. ADHERE TO THE PRECAUTIONS OUTLINED ON THE ANTIFREEZE AND INHIBITOR CONTAINERS, WHERE USED.

EVERY 2000 HOURS OR 2 YEARS

To drain the radiator, open the petcock, 1, at the bottom center of the radiator. This will drain whatever coolant is contained in the radiator.

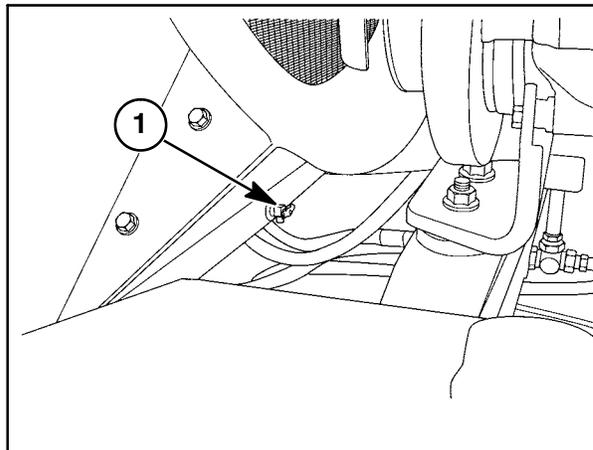


Figure 3-101

To remove the coolant in the engine block, disconnect the lower radiator hose, 1, from the base of the radiator. This will drain whatever coolant is in the water jacket of the engine.

Drain all the coolant into a suitable container and follow all local laws and regulations for disposal.

Turn off the coolant filter shutoff valve so the filter is isolated from the cooling system during cleaning and flushing operations.

IMPORTANT: Failure to isolate the cooling system filter by closing the shutoff valve will contaminate the cooling system filter, and the filter will have to be replaced whether its change interval has been reached or not.

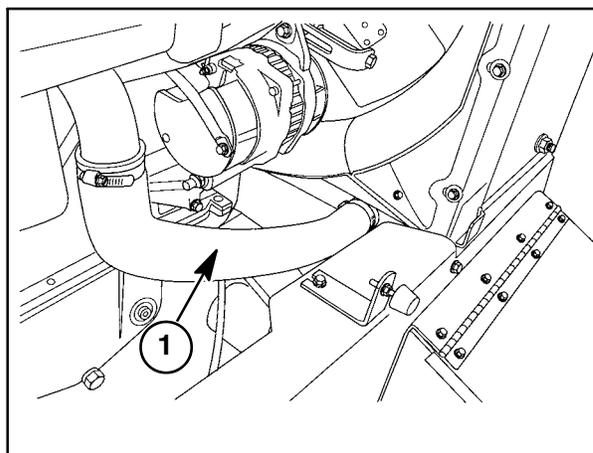


Figure 3-102

Flush the system with a commercial coolant system cleaner. Follow the instructions supplied with the cleaner.

Cummins Engine Co. recommends the use of a heavy-duty cooling system cleaner which removes corrosion products, silicate gelatin and other deposits. Your Buhler Versatile dealer has system cleaner, part number FGCC2610DS, available for cleaning the cooling system.

After the cooling system is cleaned, retighten the petcock and reinstall the lower radiator hose. Open the cooling system filter shutoff valve.

EVERY 2000 HOURS OR 2 YEARS

The coolant added to the engine must meet specific requirements. Use coolant from one of the following sources:

NOTE: Factory fill is a fully formulated coolant mixture, (pink in color). Propylene and ethylene glycol can be mixed in the cooling system.

- A. Refill the cooling system using a low silicate antifreeze which meets Engineering Standard GM 6038-M, or which contains no more than 0.1% anhydrous alkali metasilicate and meets either Engineering Standard GM 1825-M or GM 1899-M, which are performance specifications.

Use soft water in the coolant mixture. Contaminants in hard water neutralize the corrosion inhibitor components. Water must not exceed 300 ppm hardness or contain more than 100 ppm of either chloride or sulfate.

Antifreeze must be used in any climate for both freeze and boiling point protection. Cummins Engine Company, Inc. recommends a 50% concentration level, 40% - 60% range of ethylene glycol or propylene glycol in most climates. Antifreeze at 68% concentration provides the maximum freeze protection and must never be exceeded under any condition. Antifreeze protection decreases above 68%

	<u>Ethylene Glycol</u>	<u>Propylene Glycol</u>
40%	-23°C (-10°F)	-21°C (-6°F)
50%	-37°C (-34°F)	-33°C (-27°F)
60%	-54°C (-65°F)	-40°C (-56°F)
68%	-71°C (-90°F)	-63°C (-82°F)

NOTE: Propylene glycol antifreeze protection levels CANNOT be checked using the same hydrometer as would be used with ethylene glycol antifreeze.

You must check the concentration level using a refractometer. This tool is available from your Buhler Versatile dealer under part #FGCC2800DS. Both propylene and ethylene glycol protection levels (of a mixture of both) can be measured with the refractometer.

Once the protection level of the coolant is determined (ratio of water to antifreeze), the mixture must contain one unit of Cummins DCA4 (dry chemical additive) for every gallon of mix. A DCA unit is equal to 42.5 g (1.5 dry ounces) or 120 ml (4 liquid ounces). Your Buhler Versatile dealer can assist you in obtaining the DCA4 additive.

IMPORTANT: Failure to maintain the DCA4 in the cooling system will cause cooling system corrosion and engine failure.

IMPORTANT: Check the concentration of DCA4 with a test kit, available from Cummins and Fleetguard through your Buhler Versatile dealer.

IMPORTANT: Do not add cold coolant to a hot engine. Engine castings can be damaged. Allow the engine to cool to below 50°C (120°F).

Start and run the engine until normal operating temperature is reached. Stop the engine and allow the coolant to cool.

NOTE: The coolant level will drop as coolant is pumped around the system.

Remove the radiator cap and add coolant to the radiator to bring the coolant level to the bottom of the filler neck. Install the radiator cap.

NOTE: If the engine is not going to be operated immediately following the coolant and filter change, run the engine for one hour to ensure that the chemical conditioner within the system is dispersed into the cooling system.

The coolant capacity will vary based on the tractor model:

<u>Model</u>	<u>Capacity</u>
2290	59 L (15.6 gal)
2335	59 L (15.6 gal)
2375	59 L (15.6 gal)
2360	60 L (15.9 gal)
2425	60 L (15.9 gal)

INDICATED BY WARNING LIGHT

OPERATION 61

Clean the Engine Air Cleaner Outer Element

IMPORTANT: When servicing the air cleaner:

- *Do not service unless the restriction indicator light on the dash shows cleaning is necessary. Cleaning the filter too frequently will decrease the service life.*
- *Wear a mask when cleaning the air filter. Do not breath in dust.*
- *Do not attempt to clean the filter by knocking the element against a tire or other objects. This will cause the element paper to crack and allow dirt through the filter.*

To access the outer element, remove the large wing nut, 1, on the outside of the cover. Remove the cover, 2, from the cleaner.
(2360 and 2425 models illustrated)

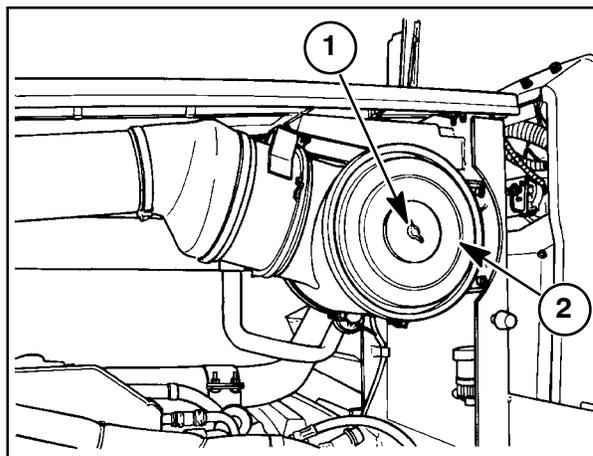


Figure 3-103

Remove the outer element, 1, by removing the wing nut, 2, and pulling the element from the canister. Clean the element with compressed air not exceeding 690 kPa (100 PSI). Keep the nozzle at least 150 mm (6") away from the element so as not to cause damage. Put the nozzle inside the element and blow the dust outward.

(2360 and 2425 models illustrated.)

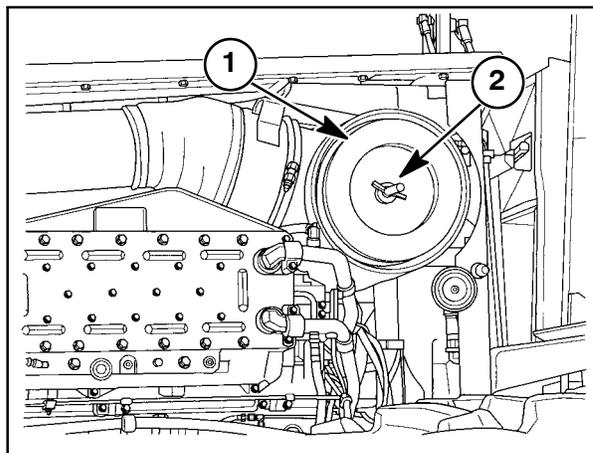


Figure 3-104

INDICATED BY WARNING LIGHT

Rinse the element with clean, running water. Rinse from the inside of the element through to the outside until the water is free of dirt. If a hose is used, do not exceed 2 bar (30 PSI). A gentle trickle of water is sufficient and will ensure that the element is not ruptured.

Shake out excess water from the element and allow to air dry. DO NOT use compressed air, a light bulb or heat to dry the element.

NOTE: It usually takes one to three days for a filter element to dry.

IMPORTANT: Do not attempt to dry the element with heat or compressed air and do not install until thoroughly dry as it may rupture. It is recommended that a new or previously cleaned element be installed at this service and the washed element be put aside for installation at the next service. The spare element should be stored in a dry place and wrapped to prevent dust contamination or damage.

When the element is dry, insert a light inside and check for ruptures. A pinpoint of light indicates a rupture in the element paper. If this occurs, replace the element.

Clean the air cleaner body with a lint-free towel before installing the element.

Inspect the element seal, 1, before installing. Cracks or chips in the element sealing rubber indicates a new element must be installed.

Install the air filter back into the canister. Be sure the seal on the end of the filter fully contacts the air cleaner body. The wing nut, 1, has a small seal on the inner face, and the seal should be in good condition before the wing nut is tightened. If the seal is damaged on the wing nut, replace it. Tighten the nut securely.

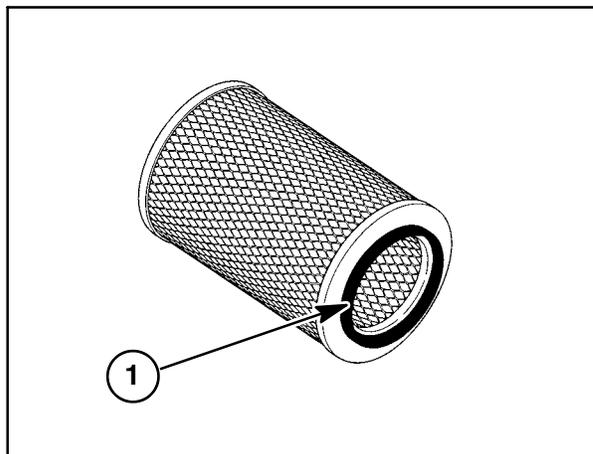


Figure 3-105

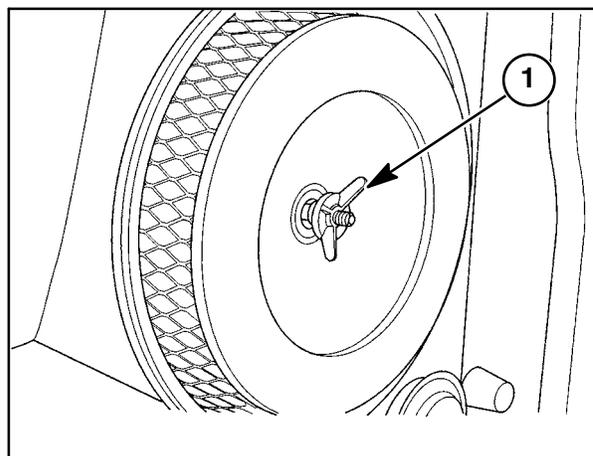


Figure 3-106

AS REQUIRED

OPERATION 62

Headlight/Work Lights Bulb Replacement

The sealed beam headlights and work lights can have the bulbs replaced in them by the following procedure:

Pivot the light to expose the two screws, 1, on the back of the molded plastic cover. Remove the two screws.

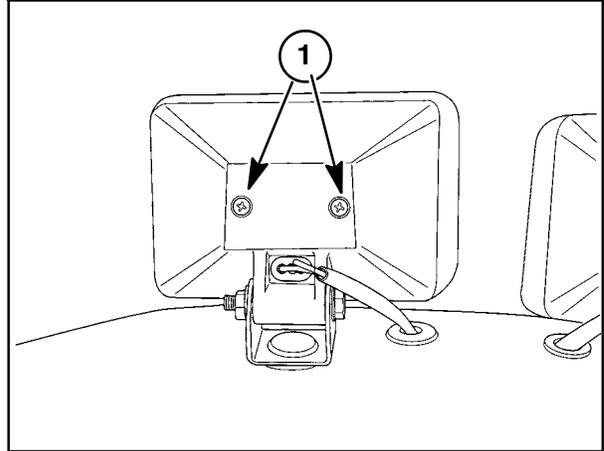


Figure 3-107

Unplug the wire connectors from the bulb and discard it. Reattach the wire connectors to the new bulb and place it into the cover. Reinstall the screws.

Replacement bulbs can be purchased from your Buhler Versatile dealer.

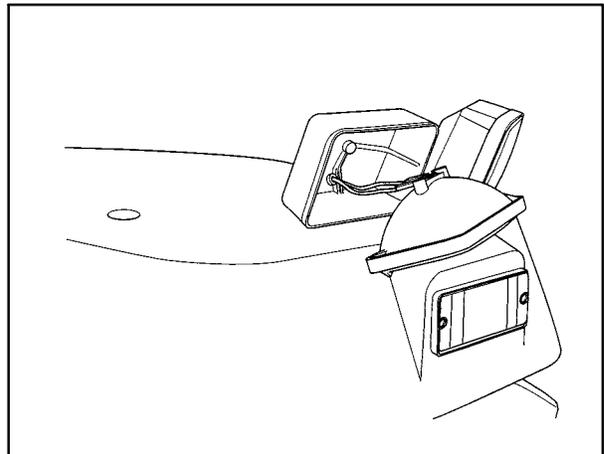


Figure 3-108

AS REQUIRED**OPERATION 63****Change the Roof Warning Light Bulbs**

To change a bulb on the roof-mounted hazard lights, remove the two screws, 1, from the light lens and remove the lens.

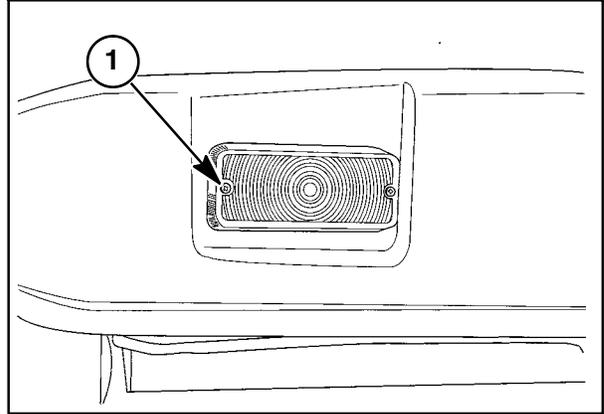


Figure 3-109

Unscrew the bulb, 1, from the light socket and replace it with a new bulb. Reassemble the lens to the roof using the two screws.

Replacement bulbs can be purchased from your Buhler Versatile dealer.

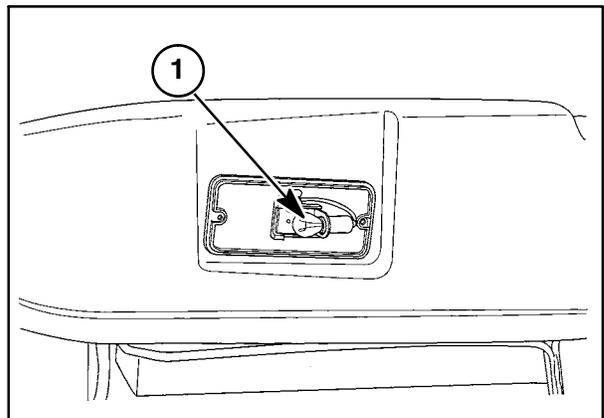


Figure 3-110

OPERATION 64**Change the Brake Light Bulbs**

To replace a bulb in the rear fender-mounted brake lights, remove the two mounting screws, 1, on the lens of the light. First, remove the nuts on the underside of the fender which retain the shield, 2. Then the screws, 1, can be removed, allowing access to the bulb, 3.

Unscrew the bulb from the socket and install a new bulb. Reinstall the lens onto the light socket.

Slide the light into the fender and install a washer and nut on each screw; tighten securely. Properly position the wire harness shield back into place making sure the shield hooks into the support strap that is under the rear fender-mounted work lamps. Install a washer and nut on each screw; tighten securely

Replacement bulbs can be purchased from your Buhler Versatile dealer.

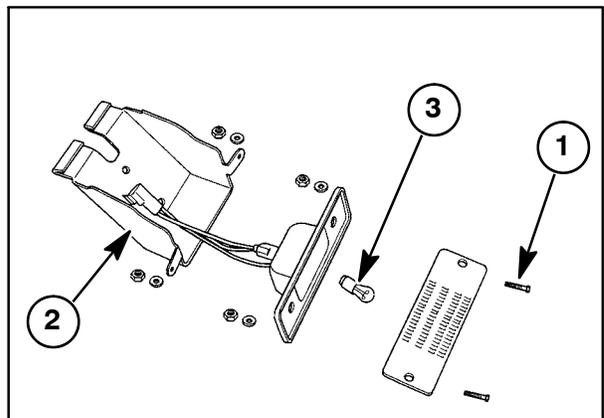


Figure 3-111

AS REQUIRED

OPERATION 65

Change Fuses/Relays

The fuse and relay panel is located in the right, rear corner of the cab on the rear shelf.

To access the relay panel, lift the cover, 1, from the panel. It is held on by velcro.

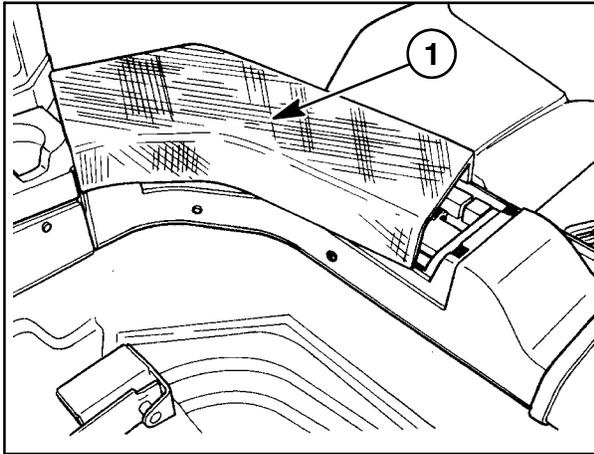


Figure 3-112

A. Turn signal flasher location.

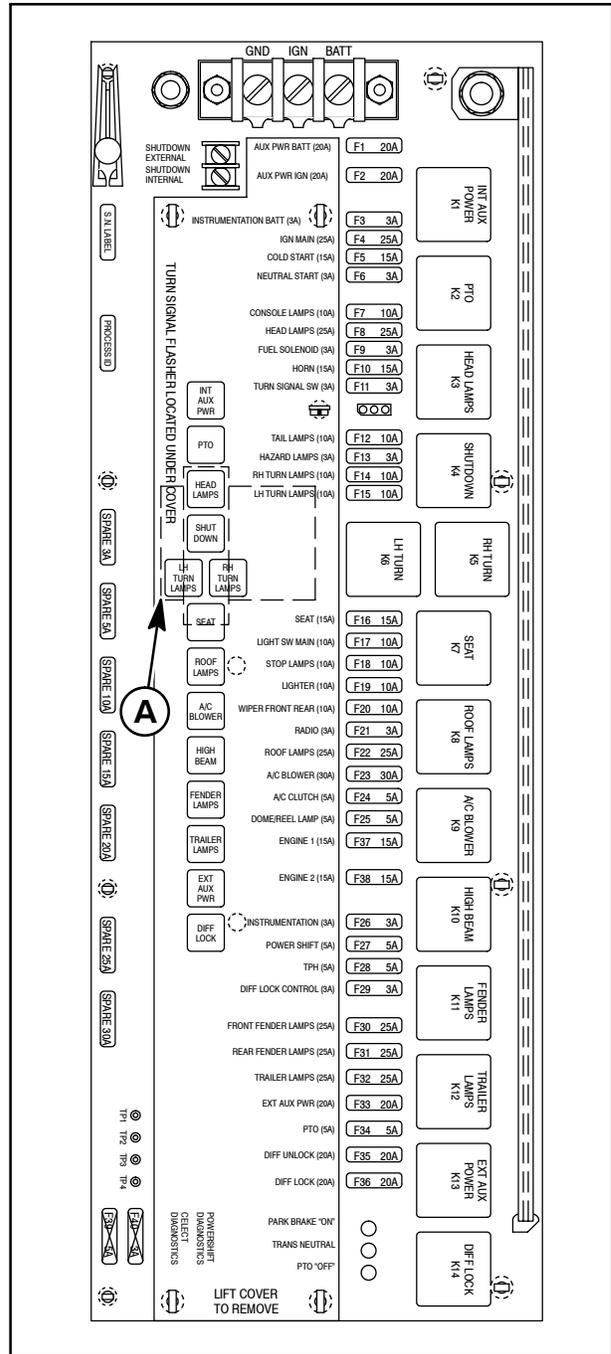


Figure 3-113

AS REQUIRED

The fuse and relay panel is clearly marked for all electrical functions. There are no circuit breakers on Buhler Versatile 4WD tractors. Not all relays that are used in the electrical system are housed in the fuse and relay panel area. If equipped with a powershift transmission, the neutral relay is located near the powershift control under the RH console. The brake/tail light relays (2 used) are located near the lower RH rear corner of the CAB, below the fuse/relay panel. In-line fuses for the optional 'Back-up Alarm', 'Beacon Light', 'Motorized Flow Control' are located beside the fuse/relay panel.

There are extra fuses, 1, located at the front of the fuse panel and a fuse removing tool, 2, is located in the right front corner of the panel. The fuses are clearly marked for amperage rating.

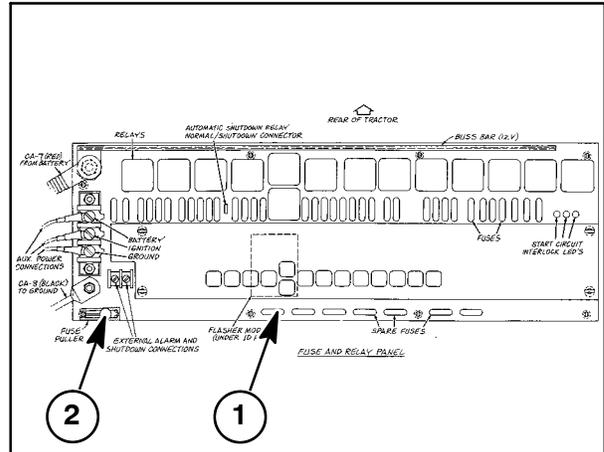


Figure 3-114

OPERATION 66

Check the Throttle Settings



DANGER: ANY THROTTLE ADJUSTMENT MUST BE MADE WITH THE ENGINE OFF AND THE PARK BRAKE APPLIED.

The throttle settings for the engine are controlled by the electronic module, 1, on the engine. The low idle speed is 850 - 900 RPM. High idle speed is 2225 ± 50 RPM. All settings are adjustable only by an authorized Buhler Versatile dealer or Cummins dealer/distributor.
(2360 and 2425 models illustrated)

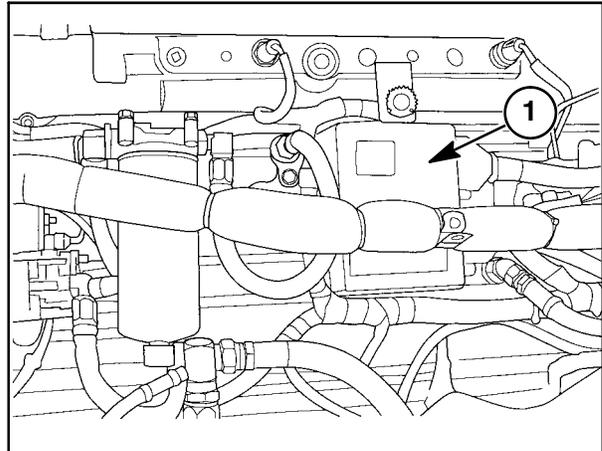


Figure 3-115

AS REQUIRED**OPERATION 67****Adjust the Decelerator Pedal Setting**

The decelerator pedal, when pushed, reduces the engine speed to a set speed. Move the hand throttle to Full Throttle and depress the decelerator pedal. The engine RPM should drop to a consistent set speed.

NOTE: The suggested decelerator speed setting is 1400 engine RPM.

To increase the decelerator RPM setting, turn the adjusting bolt, 1, on the bottom of the pedal counterclockwise. To decrease the RPM setting, turn the bolt clockwise.

Proper operation of the decelerator will let the throttle lever, 1, stay in the preset position when the decelerator is depressed. If the throttle lever moves rearward, tighten the nut on the lever. The nut can be reached through slot, 2. Tighten the nut 1/4 turn at a time until proper operation is achieved.

OPERATION 68**Clean the Cab Floor**

Keep the cab floor free of dirt and debris that may cause an obstruction or safety hazard, especially around the brake and clutch pedal area.

The cab floor should be kept clean by periodically vacuuming or sweeping, and washing.

The floor mat can be removed from the cab floor by rolling it away from the walls of the cab and pulling it upward and away from the floor. The floor mat is a two-piece rubber mat that can be washed using a mild detergent.

OPERATION 69**Clean the Cab Seat and Upholstery**

When the soft trim material and seat become dirty, they should be wiped clean. Dip a cloth in a warm water/detergent solution and wring out as much of the water as possible. Wipe the interior material with the damp cloth.

The interior molding inside the cab can be cleaned with a water/detergent solution as needed.

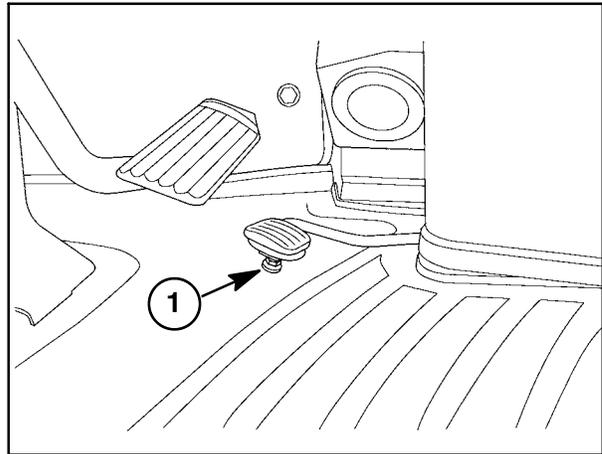


Figure 3-116

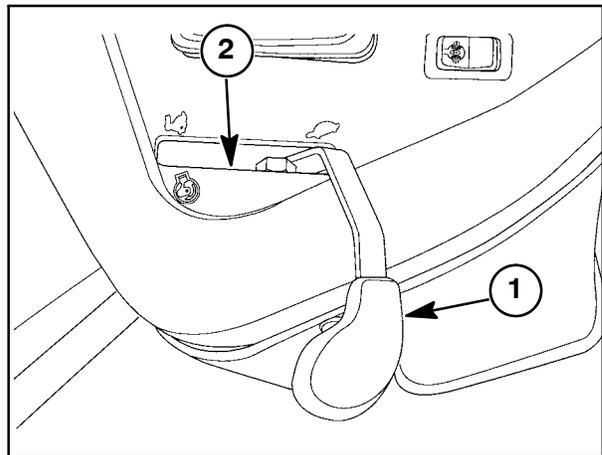


Figure 3-117

AS REQUIRED**OPERATION 70****Check the Windshield Washer Fluid**

To replenish the windshield washer fluid, turn the latch on the SMV sign on the rear of the cab. Allow the sign to pivot outward. Remove the lid, 1, on the reservoir and add fluid as necessary.

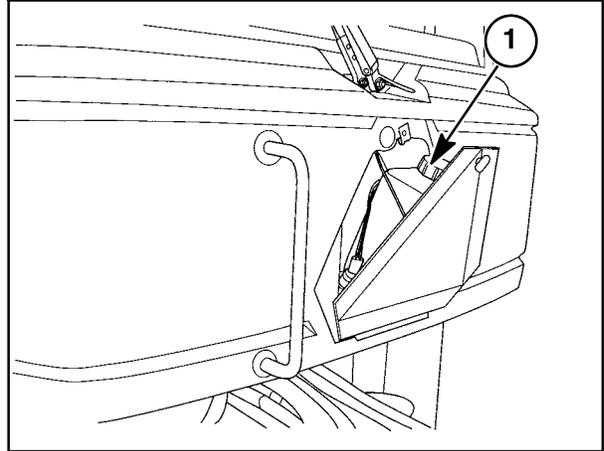


Figure 3-118

OPERATION 71**Change the Windshield Wiper Blades**

The front and rear windshield wiper blades can be changed using the following procedure:

Pivot the wiper arm outward away from the window. Remove the blade bolt, 1, from the center of the blade. Install the new blade and reinstall the center bolt.

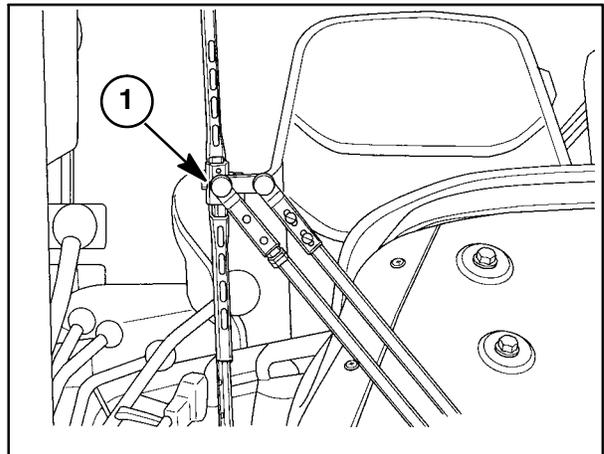


Figure 3-119

The front windshield wiper blade is 457 mm (18") long and the rear wiper blade is 660 mm (26") long.

The small screws, 1, can be loosened to adjust the blade angle, which should be parallel to the edge of the window. Retighten the screws when the blade is adjusted properly.

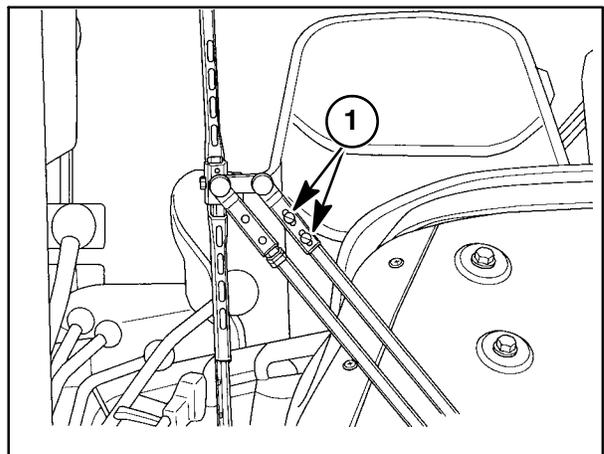


Figure 3-120

AS REQUIRED**OPERATION 72****Change the Brake Fluid**

The brake fluid should normally not require changing except in the case where contamination of the brake system has occurred. To change the brake fluid and bleed the air from the brake system, use the following procedure:

Shut the tractor off, chock the wheels, and install the articulation lock.

Remove the small clamp and hose from the side of the brake reservoir and allow the fluid to drain. Reinstall the hose and clamp.

Loosen the supply tube, 1, at the caliper and allow the oil trapped in the tube and caliper to drain out. Reinstall the tube to the caliper and tighten.

Refill the reservoir with brake fluid. Have an assistant sit in the operator's seat and slowly pump the brake pedal several times. After the assistant pumps the brake pedal, apply a steady downward pressure on the pedal.

While the assistant holds the brake pedal down, loosen the brake bleeders, 1, and allow any air and fluid to escape from the caliper pistons. There is a front and rear bleeder on the caliper; alternate loosening the bleeders to purge any air from the system. **Make sure the assistant keeps steady downward pressure on the brake pedal anytime the bleeders are open.** The pedal will bottom out during each bleeding operation; close the bleeder and repeat the process until the system is purged of all air and the pedal is firm when pressed.

Use DOT 3 brake fluid which may be obtained from your Buhler Versatile dealer.

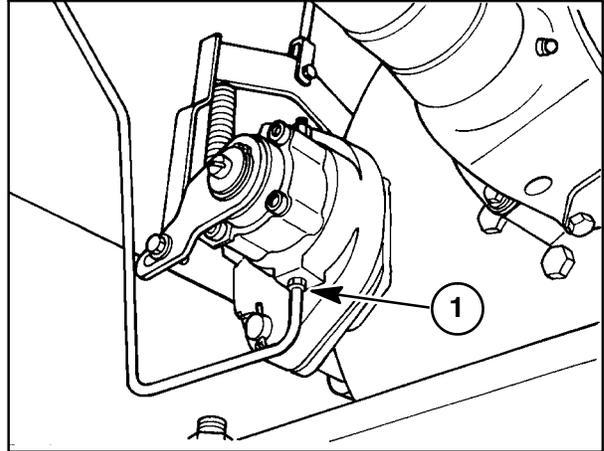


Figure 3-121

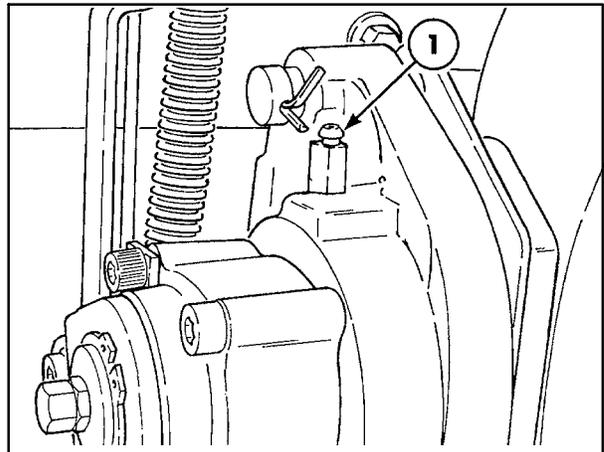
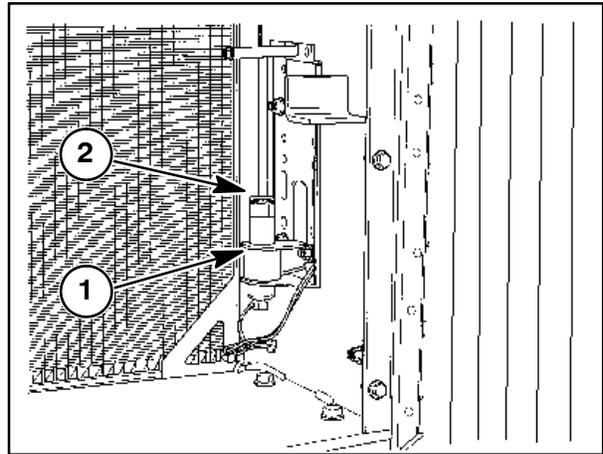


Figure 3-122

AS REQUIRED**OPERATION 73****Change the Ether Canister**

The cold start solenoid is located between the oil cooler/condenser and the radiator in the front nosepiece on the 2360 and 2425 tractors (shown in illustration). Access the oil cooler/condenser by unlatching the front grille of the tractor and swinging it out to the side.

To release the oil cooler/condenser assembly, pull the release handle to a flat position (90°) and pull the assembly toward you. It will swing the opposite direction of the grille. The cold start solenoid valve assembly, 1, is located on the left-hand wall of the tractor front nosepiece (your right as you look toward the radiator from the front of the tractor).

**Figure 3-123**

The cold start solenoid is located at the left hand rear hood support on the 2290, 2335 and 2375 tractors.

Remove the protective yellow cap, 2, or the empty ether canister from the top of the solenoid valve, but not the gasket. Lubricate the gasket with a light film of clean oil.

Remove the protective cap from the new ether canister.

AS REQUIRED

Lower the ether canister, 1, into the top of the solenoid valve, 2; screw it in clockwise.

Tighten the ether canister hand tight only.

Once the ether canister is screwed into the solenoid valve, secure the canister firmly by attaching the hose clamp, 3, to the bracket and around the canister. Tighten the hose clamp.



CAUTION: STARTING FLUID IS HIGHLY FLAMMABLE. DO NOT USE NEAR FIRE, SPARKS, OR FLAMES. BE SURE ALL OPERATORS READ THE CAUTIONARY INFORMATION ON THE CANISTER.

CAUTION: THE ETHYL ETHER USED AS COLD START FLUID IS EXTREMELY FLAMMABLE, TOXIC, AND FATAL IF SWALLOWED. AVOID CONTACT WITH EYES OR SKIN. AVOID BREATHING THE FUMES.

IF SWALLOWED, DO NOT INDUCE VOMITING. CALL DOCTOR IMMEDIATELY.

IF COLD START FLUID ENTERS EYES OR FUMES IRRITATE EYES, WASH EYES WITH LARGE QUANTITIES OF CLEAN WATER FOR 15 MINUTES. CONTACT A DOCTOR, PREFERABLY AN EYE SPECIALIST, IMMEDIATELY.

OPERATION 74**Drain the Fuel Tanks**

The fuel tanks can be drained by opening the petcock, 1, located on the inside of each tank. Allow the diesel fuel to drain and retighten the petcock. Dispose of the fuel (if necessary) according to local laws and regulations.

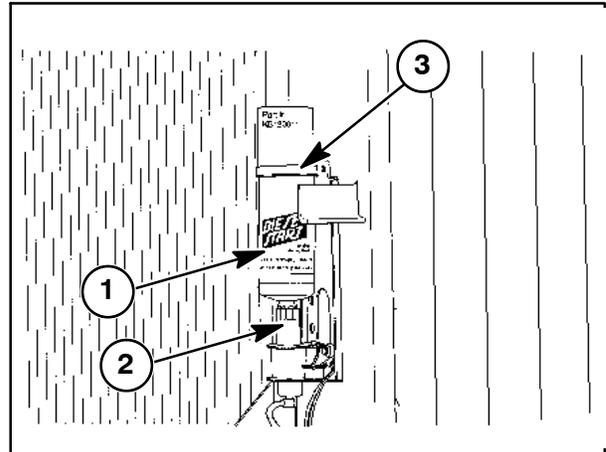


Figure 3-124

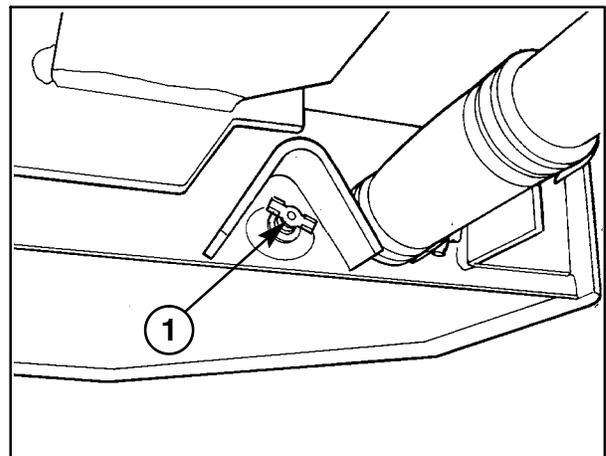


Figure 3-125

AS REQUIRED

OPERATION 75

WHEEL INSTALLATION

Articulation Blocks

IMPORTANT: Install the proper articulation blocks on the tractor before the single, dual, or triple wheels are installed on the unit to prevent any accidental damage from occurring.

Articulation blocks are required for many tire sizes and configurations. Determine the articulation blocks to be used for your tractor and tires from the tire configuration charts in Section 1.

Use the following procedures to obtain the desired setting.



WARNING: IMPROPER ASSEMBLY OF THE ARTICULATION BLOCKS CAN CAUSE THE TRACTOR WHEELS TO CONTACT THE FUEL TANK WHEN TURNING, LIMITING TURNING ABILITY AND CONTROL OF THE TRACTOR.

42° - The maximum turning angle allowed by the steering cylinders is 42°. If your tire size allows an angle of 42°, no articulation blocks are required.

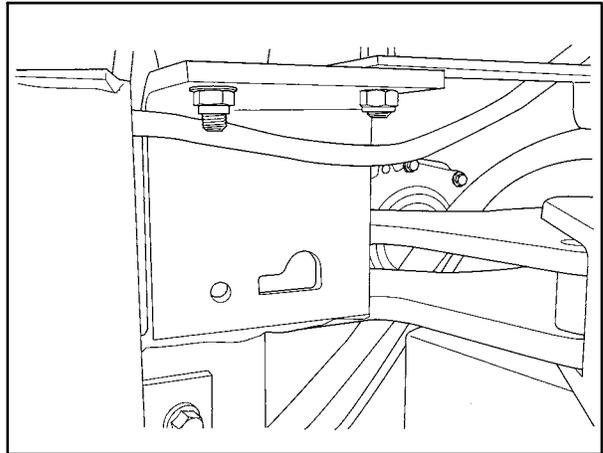


Figure 3-126

AS REQUIRED

38° - To limit the articulation angle to 38°, use the articulation blocks with the thin portion toward the inside. Torque the mounting bolt to 177 N·m (137 ft. lbs.).

NOTE: Any tractor that is equipped with a PTO option requires a 38° articulation block kit be installed on it. If the tire size of the tractor requires a 33° or 31° articulation kit, use those kits instead of the 38° kit for a PTO option.

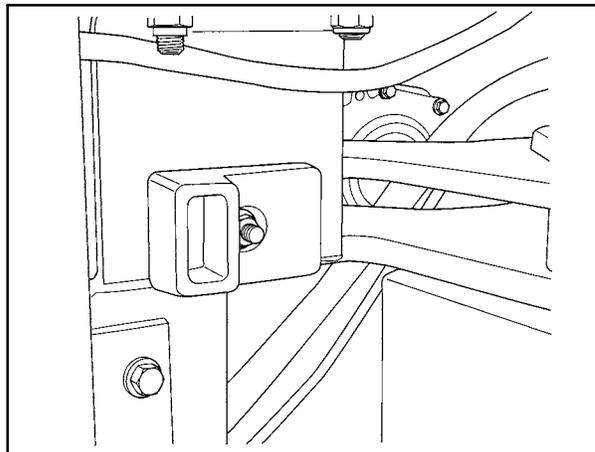


Figure 3-127

33° - To limit the articulation angle to 33°, use the articulation blocks with the thick portion to the inside. Torque the mounting bolt to 177 N·m (137 ft. lbs.).

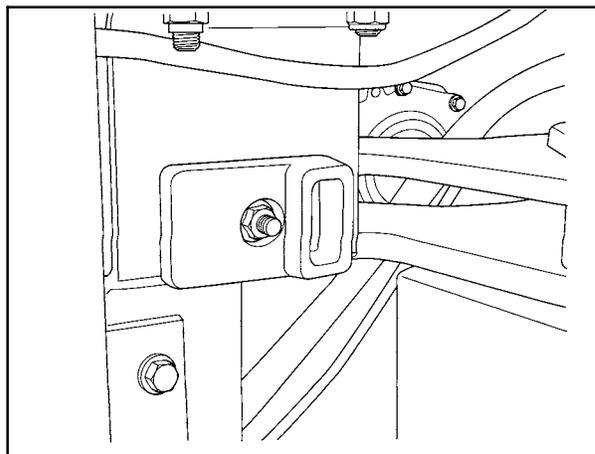


Figure 3-128

31° - To limit the articulation angle to 31°, use the articulation blocks in conjunction with the backing plate. The articulation block should have the thick portion toward the inside. Torque the mounting bolt to 177 N·m (137 ft. lbs.).

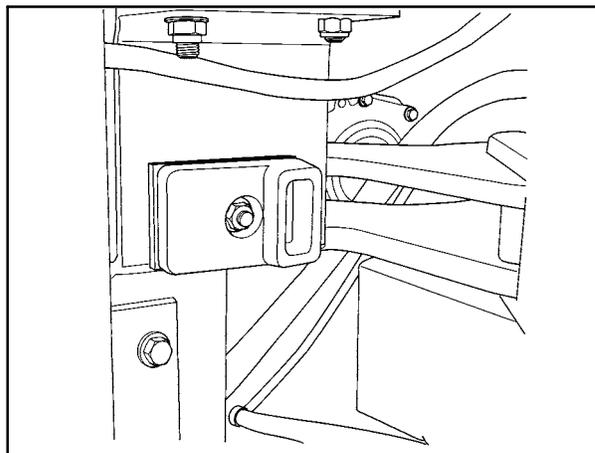


Figure 3-129

AS REQUIRED

Rear Fender Height Adjustment

Rear fender height can be adjusted to two positions by removing the four bolts, 1, that attach the fenders to the rear frame. Move the fender to the desired height and reinstall the bolts. Torque the bolts to 165 N·m (125 ft. lbs.).

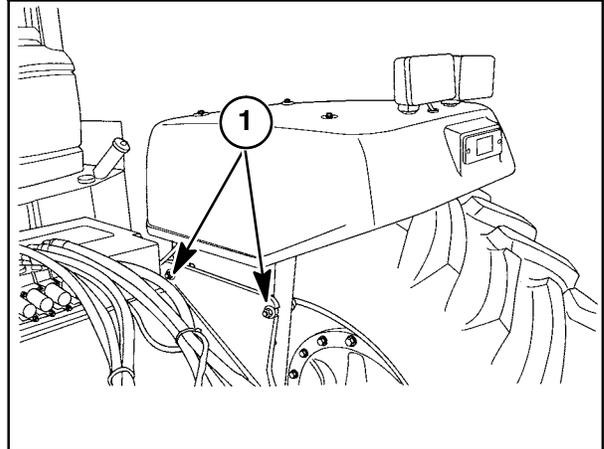


Figure 3-130

AS REQUIRED**SINGLE, DUAL AND TRIPLE WHEEL
INSTALLATION**

The tire configuration charts detail single, dual and triple tire configurations by model. Find the tire size and configuration to be used on the tractor. Determine the proper installation procedure from the five methods of wheel installation detailed below.



CAUTION: USE EXTREME CAUTION WHEN REMOVING AND HANDLING WHEELS. USE A CARRIER FOR HANDLING WHEELS.

CAUTION: STOP THE ENGINE AND ENGAGE THE PARK BRAKE AND ARTICULATION LOCK BEFORE WORKING ON TIRE INSTALLATION.

CAUTION: BLOCK THE WHEELS OF THE TRACTOR WHEN JACKING UP THE AXLES.

1. Single wheels

Tire configurations approved for single wheel use (both a tie rod style rim and a drum-style rim) may be positioned with the dish of the wheel inset or outset depending upon the operator's choice.



CAUTION: WITH THE WHEEL INSET, THE TRACTOR WILL BE LESS STABLE ON HILLSIDES. FOR HILLY TERRAIN, IT IS RECOMMENDED THAT THE TIRES BE OUTSET.

Torque the wheel mounting nuts, 1, to 710 N·m (525 ft. lbs.).

REMINDER

All wheel mounting hardware should be re-tightened to the specified torque after the first hour of operation, then after every three hours of operation for the first day. Re-tighten to the specified torque daily until wheel hardware maintains specified torque.

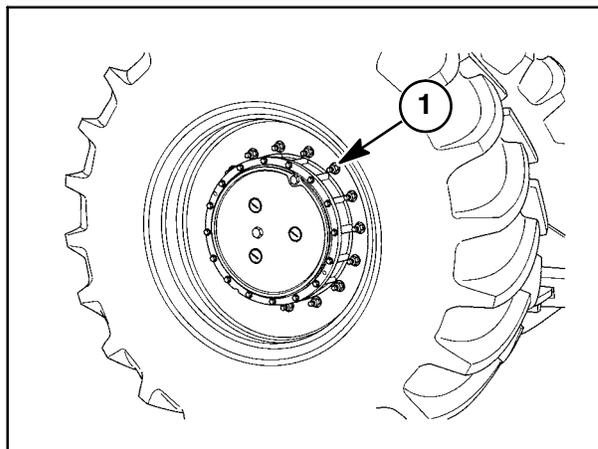


Figure 3-131

AS REQUIRED**Special Tie Rod style dual wheels
(32") dual wheels)**

- a. **It is only permissible to install the inner wheel with the rim inset** (narrow tread width). Do not torque the wheel lug nuts at this time.
- b. Place a jack under the axle housing and raise one side. Remove every second wheel mounting stud, 1, from the wheel rim. Be sure a stud is removed on both sides of the positioning lugs.

NOTE: Try not to remove a stud which is aligned with the tube valve stem. Valve stem access will then be hampered by a dual rod later.

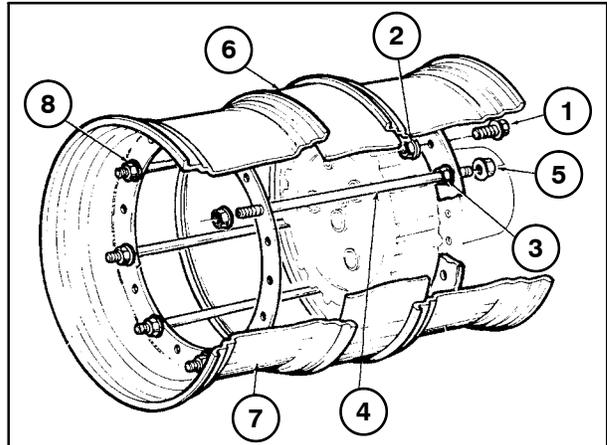


Figure 3-132

- c. Check and retorque all remaining wheel mounting nuts, 2, to 710 N·m (525 ft. lbs.).
- e. Install the tie rod flanged backing nut assembly into the holes in the inner wheel. Secure each tie rod with an inner tie rod flanged locknut, 5. Do not torque.
- f. Install a spacer, 6, into the inside of the inner wheel rim. Be sure the positioning lugs on the inner wheel (one lug) and the spacer (two lugs) interlock.
- g. Lightly tap the spacer for a snug fit to the inner wheel.
- h. Rotate the outer wheel so that the positioning lugs lock together - one lug on the inside of the outer rim and two on the spacer. All tie rods must protrude through the holes provided on the outer wheel, 7.

NOTE: The outer wheel must be inset the same as the inner wheel when installed.

NOTE: Install the wheels so that both inner and outer treads face the same direction.

AS REQUIRED

- i. Draw in the wheels by gradually cross-torquing the outer wheel flanged nuts, 8, to 300 N·m (220 ft. lbs.). Do not overtighten the bolts or thread damage may result.

IMPORTANT: Do not lubricate the threads of the tie rods with any type of grease, oil, or lubricating spray.

NOTE: Special tool BLR20025 deep well socket is available to assist in tightening the outer wheel nuts. Order the tool from SPX/OTC tool company.

- j. Be sure that the spacer is entering the diameter of the inner and outer wheels evenly and without any distortion of the spacer or wheels.
- k. Be sure the flanged backing nut, 3, is against the inner wheel disc. Hold the tie rod with a pipe wrench or vise grip pliers to prevent rotation during the torquing procedure. Torque the flanged backing nuts, 3, to 440 N·m (325 ft. lbs.). The inner tie rod flanged locknut should not need torquing. It will be drawn up tight when the backing nut is torqued.

NOTE: Special crowfoot wrench BLR20027 is available to torque the backing nuts. Order the tool from SPX/OTC tool company.

- l. Install jam nuts (not shown) on top of the outer wheel nuts, 8, and torque them to 320 N·m (235 ft. lbs.).
- m. Repeat the above procedure for the remaining three sets of duals.
- n. Drive the tractor steering from lock to lock. Park the tractor and recheck the torques on the outer wheel nuts as detailed in Steps i and l.

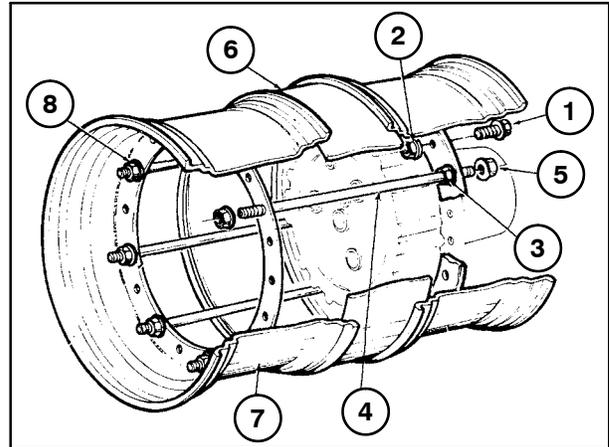


Figure 3-133

REMINDER

All wheel mounting hardware should be re-tightened to the specified torque after the first hour of operation, then after every three hours of operation for the first day. Re-tighten to the specified torque daily until wheel hardware maintains specified torque.

AS REQUIRED**3. Standard Tie Rod Style Dual Wheels**

- a. **It is only permissible to install the inner wheel with the rim inset** (narrow tread width). There is no drive lug on the outset side of the wheel.
- b. Place a jack under one side of the axle housing. Raise the side and torque the inner wheel mounting nuts, 1, to 710 N·m (525 ft. lbs.).

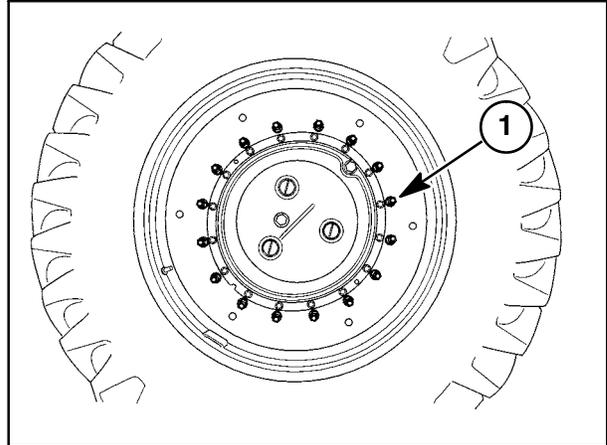


Figure 3-134

- c. Place two tie rods, 1, in the outer holes, 2, of the inner wheel 180° apart. Place a flange nut on the back side of the inner wheel disc on each tie rod. The two tie rods will help align the inner and outer wheels during initial assembly.

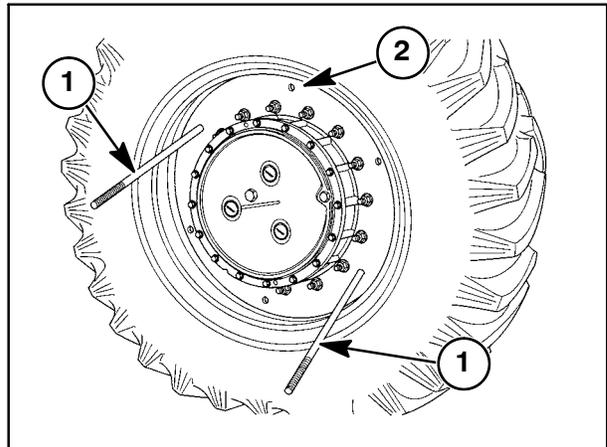


Figure 3-135

- d. Install a spacer, 1, into the inside of the inner wheel rim. Be sure the positioning lugs on the inner wheel (one tab) and the spacer (two tabs) interlock.
- e. Lightly tap the spacer for a snug fit to the inner wheel. Push the two tie rods in toward the frame so they do not protrude through the spacer.

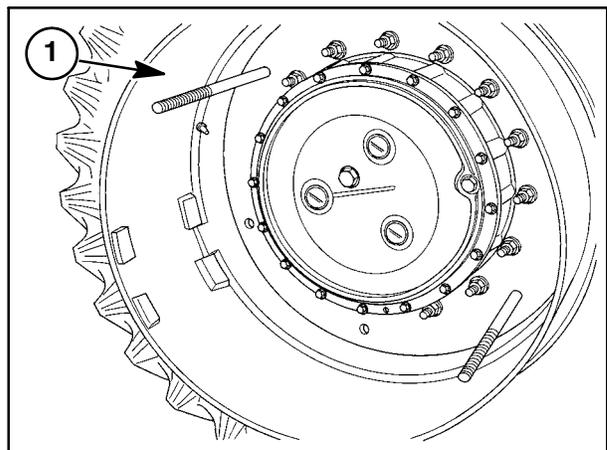


Figure 3-136

AS REQUIRED

- f. Rotate the outer wheel so the lugs lock together, one on the inside of the rim and two on the spacer. Raise the axle of the tractor up or lower it down to assist the spacer in entering the diameter of the outer wheel. Once the outer wheel is positioned on the spacer, pull the two tie rods through the brackets, 1, on the outer wheel rim. Install a flat washer and flanged nut on each of the two tie rods and snug the nuts to hold the assembly in place. Install the remaining tie rods with flange nuts on the inner wheel and through the outer wheel brackets.

NOTE: The outer wheel must be inset (narrow tread width) the same as the inner wheel when installed.

NOTE: Install the wheels so that both inner and outer treads face the same direction.

- g. Install remaining outer flanged wheel nuts, 1, and washers, 2, onto the ends of each tie rod. Tighten the outer wheel nuts to draw the wheels together by gradually cross-torquing to 300 N·m (220 ft. lbs.) on the outer flanged wheels. Do not overtighten the bolts or thread damage may result. Be sure that the spacer is entering the diameter of the inner and outer wheels evenly and without any distortion of the spacer or wheels.

NOTE: Special tool BLR20025 deep well socket is available to assist in tightening the outer wheel nuts. Order the tool from SPX/OTC tool company.

IMPORTANT: Do not lubricate the threads of the tie rods with any type of grease, oil, or lubricating spray.

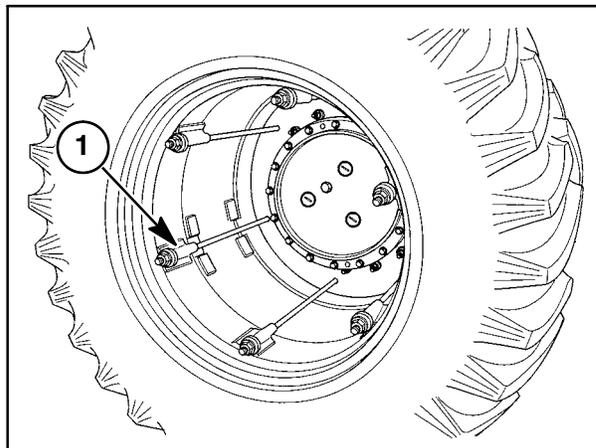


Figure 3-137

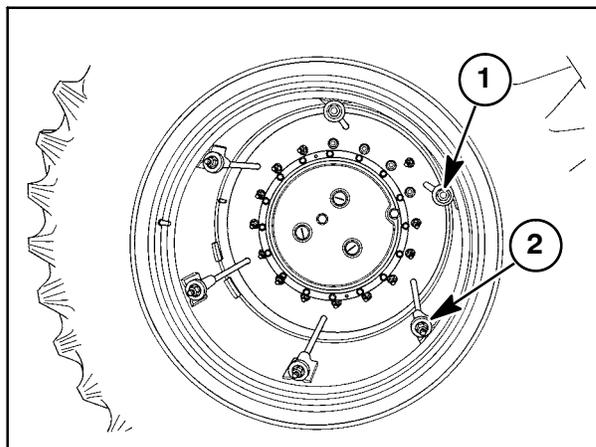


Figure 3-138

AS REQUIRED

- h. Add a jam nut, 1, to both ends of the tie rod and torque the jam nut to 320 N·m (235 ft. lbs.).
- i. Repeat the above procedure for the remaining three sets of duals.
- j. Drive the tractor steering from lock to lock. Park the tractor and recheck the torques on the outer wheel nuts as detailed in Step g.

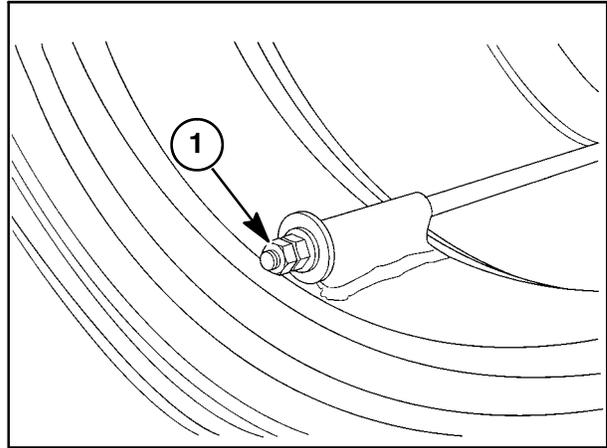


Figure 3-139

- 4. Standard and row crop drum style dual wheels.
 - a. Standard and row crop drum style duals are assembled the same way. Row crop drum duals have a longer drum on the outer wheel to give proper spacing for 30" row crops. Follow the listed procedure for both styles of duals.
 - b. Put 51 mm - 76 mm (2" - 3") wood blocking under the wheel to be dualled.
 - c. There are 16 nuts, 1, that retain the inner wheel to the planetary hub. Remove 14 of the 16 nuts from the wheel, leaving two nuts, 2, 180° apart on the wheel as shown. This will retain the rim to the hub and fit into the notches on the outside duals rim. Choose the two remaining nuts carefully so that the valve stem of both wheels will align for easier tire inflation pressure maintenance later.

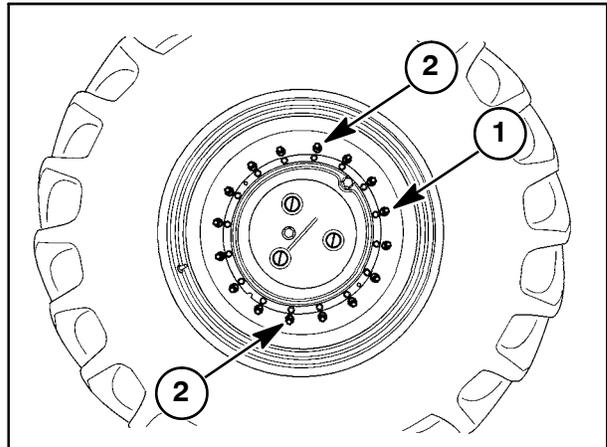


Figure 3-140

AS REQUIRED

- d. Using an appropriate lifting device, lift the outside wheel rim and pilot it onto the planetary studs. Make sure that the two slots in the outer wheel rim align with the two nuts remaining on the inner wheel rim.



DANGER: THE DRUM-STYLE DUAL WHEELS ARE EXTREMELY HEAVY AND WILL EASILY TIP TOWARD THE DRUM END OF THE WHEEL. USE AN APPROPRIATE LIFTING DEVICE AND SAFETY CHAINS WHEN HANDLING DRUM-STYLE WHEELS.

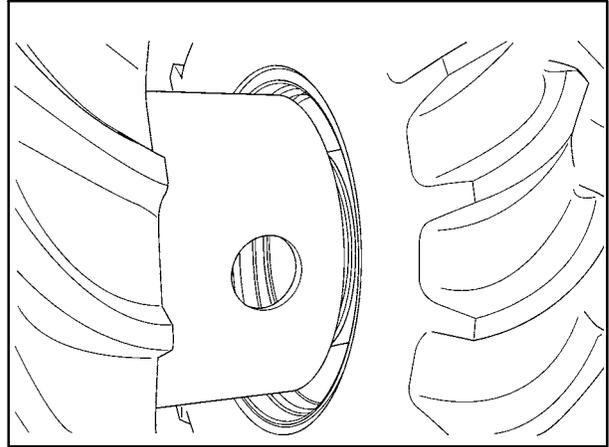


Figure 3-141

- e. Reinstall the 14 nuts, 1, removed in Step 1.
- f. Torque the wheel nuts to 710 N·m (525 ft. lbs.).
- g. Repeat the above procedure for the other remaining wheels.
- h. Drive the tractor steering lock to lock. Park the tractor and recheck the torques on the wheel nuts as described in Step f.

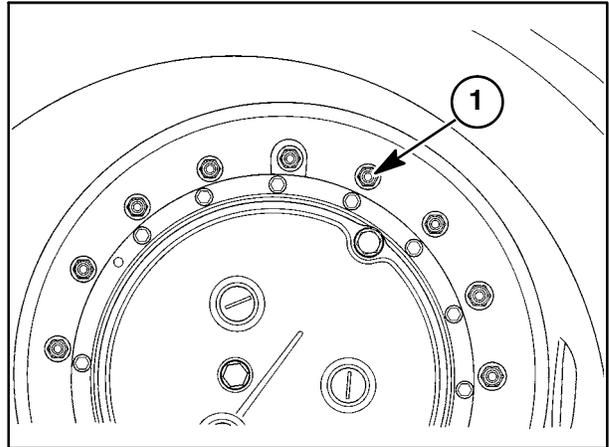


Figure 3-142

REMINDER

All wheel mounting hardware should be re-tightened to the specified torque after the first hour of operation, then after every three hours of operation for the first day. Re-tighten to the specified torque daily until wheel hardware maintains specified torque.

AS REQUIRED

5. Standard Drum-Style Triple Wheels

- a. For triple tire configuration, it is only permissible to install the inner wheel with the rim inset (narrow tread width).
- b. Put a 51 mm - 76 mm (2"-3") wood block under the wheel to be tripled.
- c. There are sixteen nuts, 1, that retain the inner wheel to the planetary hub. Remove fourteen of the sixteen nuts from the wheel, leaving two nuts, 2, 180° apart on the wheel as shown. This will retain the rim to the hub and fit into the notches on the center wheel's rim. Choose the two remaining nuts carefully so that the valve stem of all wheels will align for easier tire inflation later.

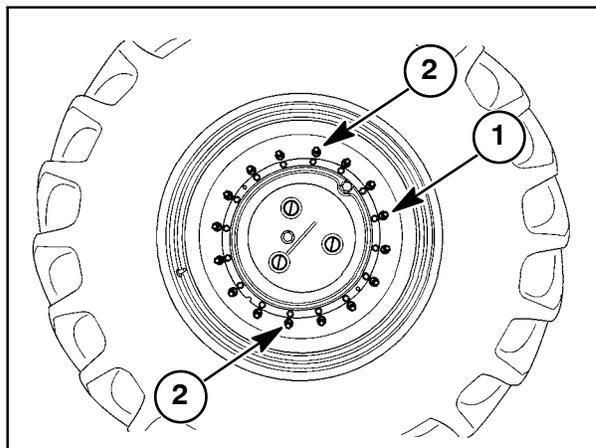


Figure 3-143

- d. Using an appropriate lifting device, lift the center wheel rim and pilot it onto the planetary studs. Make sure that the two slots in the center wheel rim align with the two nuts remaining on the inner wheel rim.



DANGER: THE DRUM-STYLE DUAL WHEELS ARE EXTREMELY HEAVY AND WILL EASILY TIP TOWARD THE DRUM END OF THE WHEEL. USE AN APPROPRIATE LIFTING DEVICE AND SAFETY CHAINS WHEN HANDLING DRUM-STYLE WHEELS.

NOTE: Do not mix up the center wheel with the outer wheel. The center wheel has a dish welded in the inner diameter to bolt the outside drum to.

NOTE: Install the wheels so that both inner and center treads face the same direction.

NOTE: Install the center wheel so that the valve stem is in line with the inner and outer wheels.

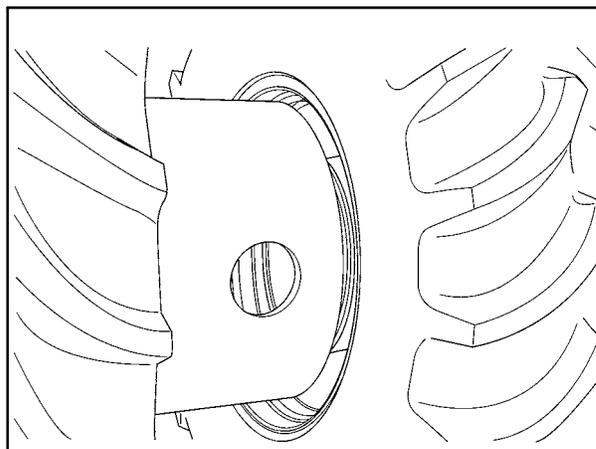


Figure 3-144

AS REQUIRED

- e. Reinstall the fourteen nuts, 1, removed in Step c. Torque the wheel nuts to 710 N·m (525 ft. lbs.).

REMINDER

All wheel mounting hardware should be re-tightened to the specified torque after the first hour of operation, then after every three hours of operation for the first day. Re-tighten to the specified torque daily until wheel hardware maintains specified torque.

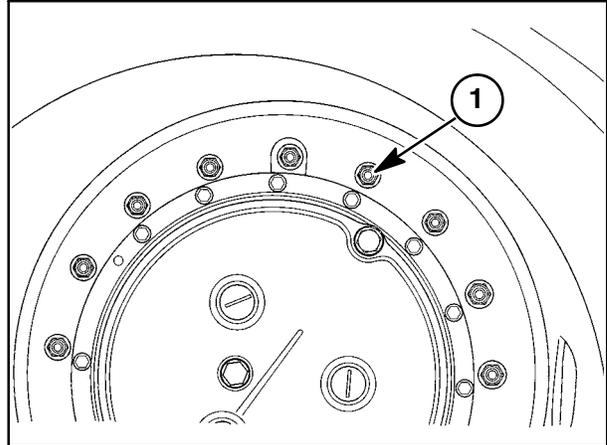


Figure 3-145

- f. Using an appropriate lifting device, lift the outer wheel and pilot it into the center wheel. Line up the holes in the center wheel dish with the holes in the outer wheel drum.

NOTE: Install the wheels so that both center and outer treads face the same direction.

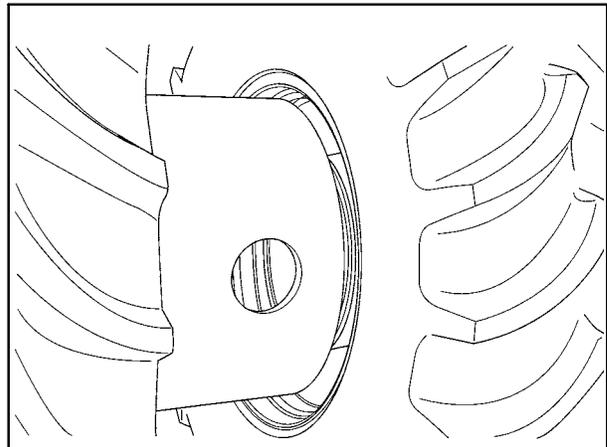


Figure 3-146

- g. Install the fourteen cap screws through the holes in the wheels and place the fourteen nuts, 1, onto the cap screws. Torque the nuts to 710 N·m (525 ft. lbs.).

NOTE: The drums on the center and outer wheels have large cutouts in them to assist in installing the drum hardware.

- h. Repeat the above procedure for the other three sets of triple wheels.
- i. Drive the tractor steering from lock to lock. Park the tractor and recheck the torques on the inner and outer wheel nuts as detailed in Steps g and e.

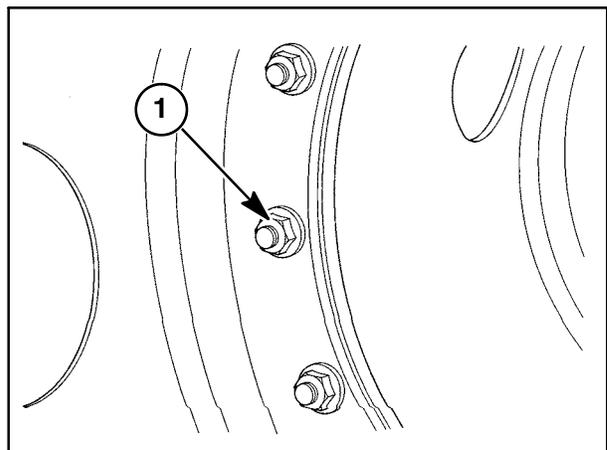


Figure 3-147

AS REQUIRED

Wide Transport Marker Lights

Wide transport marker lights are required with some dual and triple wheel configurations.

The lights are adjustable to the width of the tractor, increasing tractor visibility to oncoming traffic. In some areas this is required for over width vehicles. See your local authorities to confirm compliance with local regulations.

Operating Position

The tube has three settings, depending on the width of the tires used. It is recommended that the tube be adjusted so the outside edge does not extend beyond the tire edge. Remove the bolt, 1, and slide the tube, 2, to one of the three positions. Reinstall the bolt and tighten.

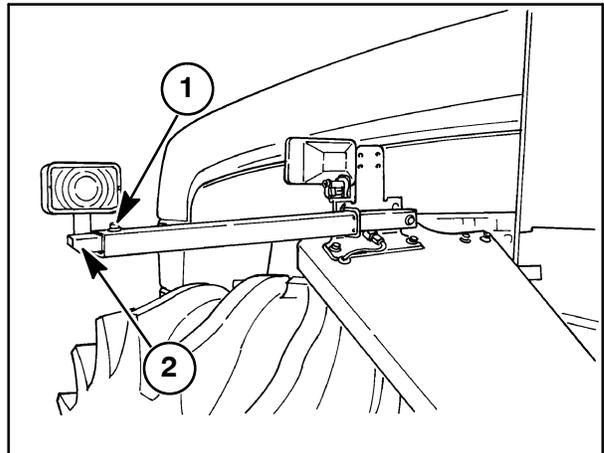


Figure 3-148

Single Wheel Transport Position

When single wheels are used, the wide transport marker lights should be moved to the up position.

Loosen or remove bolt, 1, and remove the U-bolt, 2.

Swing the arm assembly up approximately 70°-90° depending on model. Reinsert U-bolt, 2, and tighten bolt, 1.

NOTE: Tractors with Tier III compliant engines do not have an up position. Lights should be placed in the inner position for single tire configuration.

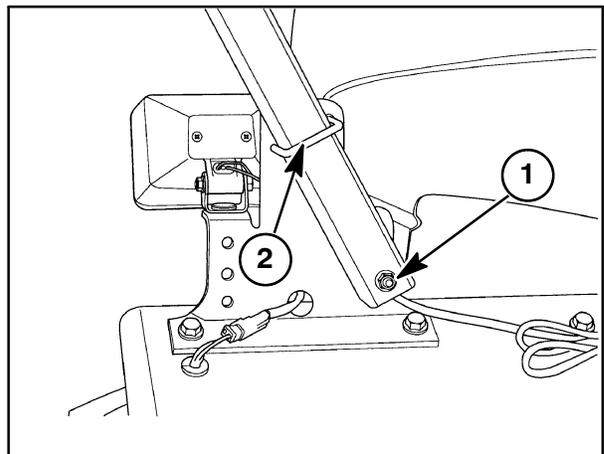


Figure 3-149

AS REQUIRED

OPERATION 76

Storing the Tractor

NOTE: Storage refers to periods of approximately six months or greater.

Preparation:

Change the hydraulic oil.

Change the transmission oil.

Change the engine coolant.

Drain and flush the oil from the differentials and planetary housings. Fill with new oil.

Change the engine oil and filter.

Start the engine. While the engine is warming up, operate the transmission, hydraulic system, steering and differentials to distribute new lubricant to components. Warm engine to at least 70°C (160°F). Stop the engine.

Clean the tractor of all debris, dirt, and accumulated grease.

Drive the tractor to the storage location.

Relieve tension on the alternator, compressor, water pump, and fan belt.

Coat all exposed hydraulic cylinder shaft areas with grease or a rust preventive.

Fill the fuel tanks with fuel.

Storing:

Use plastic bags or tape to seal the following openings: muffler, fuel tank breather, air intake filter, and engine crankcase breather.

Touch up all scratches or chips.

Block up the tractor to remove weight from the tires.

Cover the tires if they will be exposed to heat or direct sunlight.

If the tractor is to be stored outside, cover it with a waterproof canvas or other protective material.

Remove the batteries from the tractor and store them in a cool, dry, weatherproof area. Do not store on a concrete floor.

Removal from Storage

Remove the protective covering from the tractor tires and seals from the air intake filter, muffler, fuel tank and engine crankcase breather.

Remove the blocks. Lower the tractor onto the tires.

Correct any leaks.

Inflate the tires to the recommended pressure.

Install fully charged batteries. Tighten the battery connections.

Tension the alternator, compressor, water pump and fan belt.

Check the fluid level of the engine crankcase, differentials, planetaries, transmission, hydraulic reservoir, brake cylinder reservoir and engine cooling system.

If the fuel filter is changed during or after storage, be sure that the filter, pump and lines are primed.

Drain sediment from the fuel tanks.

AS REQUIRED

Initial Engine Start-up

Initial engine start-up after long periods of storage can place abnormal loads on the cranking system. Do not crank the engine longer than 30 seconds. Allow at least two minutes between cranking cycles to permit the starting motor to cool and the batteries to recover.

IMPORTANT: On initial start of engine, do not increase speed above 1000 RPM, unless necessary to prevent stalling, until the engine oil pressure is normal.

See “Engine Starting” and “Cold-Weather Starting” in Section 2.

If the engine does not start after 30 seconds, prime the fuel system using the following procedure:

Remove the fuel filter and fill it with clean filtered fuel.

IMPORTANT: Fuel poured directly into the filter will not be cleaned by the filter and will go directly into the fuel pump. Be sure that the fuel is clean.

Remove the suction line from the fuel injection pump and squirt clean filtered fuel into the pump.

Start the engine. If the engine still does not start, consult your Buhler Versatile dealer.

SECTION 4

TROUBLESHOOTING

The troubleshooting charts in this section list possible problems, their cause(s), and corrective action(s). The systems are presented in the following order:

TROUBLESHOOTING CHART	PAGE
Engine	4-2
Transmission	4-5
Electrical System	4-7
Hydraulic System	4-9
3-Point Hitch	4-10
Brakes	4-10
Cab	4-11
Tractor Performance Monitor	4-12
Electronic Instrument Control System	4-13
Power Take-Off (PTO)	4-14
Operation	4-14

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ENGINE

PROBLEM	POSSIBLE CAUSE	CORRECTION
Engine will not start, or starts hard	<p>Incorrect starting procedure.</p> <p>Low or no fuel.</p> <p>Air in fuel lines.</p> <p>Incorrect engine oil viscosity.</p> <p>Incorrect fuel for operating temperature.</p> <p>Contaminated fuel system.</p> <p>Clogged fuel filter.</p> <p>Malfunctioning fuel injector(s).</p> <p>Malfunctioning fuel solenoid or solenoid relay.</p> <p>Clogged air filter.</p>	<p>Review starting procedures.</p> <p>Check fuel level.</p> <p>Bleed fuel system.</p> <p>Use correct viscosity oil.</p> <p>Use correct type fuel for temperature conditions.</p> <p>Clean system.</p> <p>Replace filter element.</p> <p>Contact Buhler Versatile dealer.</p> <p>Contact Buhler Versatile dealer.</p> <p>Clean or replace air filter.</p>
Engine runs rough and/or stalls	<p>Clogged fuel filter.</p> <p>Clogged air filter.</p> <p>Engine cylinder temperature too low for clean fuel burn.</p> <p>Contaminated fuel system.</p> <p>Fuel solenoid not properly adjusted.</p> <p>Malfunctioning fuel injector(s).</p>	<p>Replace filter.</p> <p>Clean or replace air filter.</p> <p>Refer to "Cold-Weather Starting" (Section 2).</p> <p>Clean system.</p> <p>Contact Buhler Versatile dealer.</p> <p>Contact Buhler Versatile dealer.</p>
Engine does not appear to develop full power	<p>Engine overloaded.</p> <p>Air cleaner restricted.</p> <p>Clogged fuel filter.</p> <p>Incorrect type of fuel.</p> <p>Engine overheated.</p> <p>Low engine operating temperature.</p> <p>Implement incorrectly adjusted.</p> <p>Malfunctioning fuel injector(s).</p> <p>High idle speed is low.</p> <p>Engine Power Derate</p>	<p>Shift to lower gear or reduce load.</p> <p>Service air cleaner.</p> <p>Replace filter.</p> <p>Use correct fuel.</p> <p>See "Engine Overheats" (later in this chart).</p> <p>Contact Buhler Versatile dealer.</p> <p>See implement operator's manual.</p> <p>Contact Buhler Versatile dealer.</p> <p>Contact Buhler Versatile dealer.</p> <p>Refer to EICS operation Section 2. Contact Buhler Versatile dealer.</p>

SECTION 4 - TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	CORRECTION
Engine knocks	Low oil level. Low oil pressure. Engine overheated.	Add correct grade and amount of oil. Contact Buhler Versatile dealer. See "Engine Overheats" (later in this chart).
Low engine operating temperature	Engine temperature gauge faulty. Malfunctioning thermostat(s). Tractor used on very light loads.	Contact Buhler Versatile dealer. Contact Buhler Versatile dealer. Contact Buhler Versatile dealer.
Low oil pressure	Low oil level. Oil pressure gauge faulty. Wrong grade or viscosity oil. Engine component failure.	Add oil as required. Contact Buhler Versatile dealer. Drain and refill with correct grade and viscosity oil. Contact Buhler Versatile dealer.
Excessive oil consumption	Engine oil level too high. Incorrect viscosity oil. External oil leaks. Plugged breather tube vent filter.	Reduce oil level. Use correct viscosity. Contact Buhler Versatile dealer. Contact Buhler Versatile dealer.
Engine overheats	Restricted cooling system fins. Excessive engine load. Low engine oil level. Low coolant level. Faulty radiator cap. Loose or worn fan belt. Cooling system plugged. Malfunctioning thermostat(s). Hose connection leaking. Malfunctioning temperature gauge.	Clean. Shift to a lower gear or reduce load. Add oil as required. Fill cooling system. Check for leaks. Replace cap. Check automatic tensioner. Replace belt if worn. Flush cooling system. Contact Buhler Versatile dealer. Tighten hose connection. Contact Buhler Versatile dealer.

SECTION 4 - TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	CORRECTION
Air filter restricted	Clogged air filter. Aspirator malfunction.	Clean or replace filter. Contact Buhler Versatile dealer.
Excessive fuel consumption	Incorrect type of fuel. Clogged or dirty air cleaner. Engine overloaded. Implement incorrectly adjusted. Low engine temperature. Excessive ballast. Fuel injection nozzles dirty. External leaks. Fuel pump calibration changed.	Use correct fuel. Service air cleaner. Shift to lower gear or reduce load. See implement operator's manual. Contact Buhler Versatile dealer. Adjust ballast. Contact Buhler Versatile dealer. Repair leaks. Contact Buhler Versatile dealer.

TRANSMISSION

12x2 POWERSHIFT TRANSMISSION

The following list of error codes are shown on the gear display of the tractor if a fault is present. Listed with the error codes are their possible causes, effects, and the corrective measures required. Detailed trouble shooting information may be obtained by contacting a Buhler Versatile Dealer.

If the cause of the error code cannot be corrected by the measures suggested, contact your Buhler Versatile dealer.

NOTE: Repairs and adjustments to the powershift control system require special service tools and procedures to be performed by qualified technicians only; contact your Buhler Versatile dealer.

ERROR CODE	CAUSE	TO CLEAR CODE
PP	Input power has dropped below 10.4 volts for more than 0.1 seconds.	Low battery voltage Loose connection Bad ground Bad power relay contacts Contact Buhler Versatile dealer.
I1, I2, I3, I4, I5	Internal control problem	Contact Buhler Versatile dealer.
TA	Output speed signal missing transmission shifts to neutral if clutch pedal depressed - 1 st engaged when clutch is released.	Contact Buhler Versatile dealer.
T2	Range selector switch combination invalid.	Contact Buhler Versatile dealer.
T3	Clutch pedal signal out of range or bottom pedal switch error.	Contact Buhler Versatile dealer.
T5	Engine load signal out of proper range.	Contact Buhler Versatile dealer.
T6	Input speed sensor circuit shorted or open.	Contact Buhler Versatile dealer.
T7	Output speed sensor circuit shorted or open.	Contact Buhler Versatile dealer.
S1, S2, S3, S4, S5, S6, S7, S8, S9	Designated solenoid shorted or open.	Contact Buhler Versatile dealer.

SECTION 4 - TROUBLESHOOTING

12x4 QUAD SHIFT III AND 12x2 POWERSHIFT

The following troubleshooting guide pertains to both the 12x4 Quad Shift III and 12x2 powershift transmissions.

PROBLEM	POSSIBLE CAUSE	CORRECTION
Tractor does not move	Transmission out of oil.	Check oil level and fill as necessary.
	Failure of input driveline or engine coupler.	Contact Buhler Versatile dealer.
	Park brake engaged.	Disengage park brake.
	Clutch cable stuck.	Contact Buhler Versatile dealer.
Low transmission lube pressure	Transmission out of oil.	Check oil level and fill as necessary.
	Defective sensor circuit.	Contact Buhler Versatile dealer.
	Restricted transmission filter.	Replace filter.
	Pressure sender failure.	Contact Buhler Versatile dealer.
Transmission lubrication filter bypass	Filter is restricted.	Replace filter.
	Extremely cold temperature.	Run tractor at low idle for 30 minutes to warm up system. If light is still illuminated, contact Buhler Versatile dealer.
	Sensor circuit failure.	Contact Buhler Versatile dealer.
	Sensor failure.	Contact Buhler Versatile dealer.

ELECTRICAL SYSTEM

PROBLEM	POSSIBLE CAUSE	CORRECTION
Electrical system is inoperative	Loose or corroded battery connections. Sulfated batteries. Fuse or relay failure. Ignition switch failure.	Clean and tighten connections. Check each battery open circuit voltage for 12.6 volts minimum. Check electrolyte level and specific gravity. Check fuse panel. Contact Buhler Versatile dealer.
Starter speed low and engine cranks slowly	Loose or corroded connections. Low battery output. Incorrect viscosity engine oil. Defective starter.	Clean and tighten connections. Check each battery open circuit voltage for 12.6 volts minimum. Check electrolyte level and specific gravity of each battery. Use correct viscosity oil for temperature conditions. Contact Buhler Versatile dealer.
Starter inoperative	Transmission speed lever in gear. Park brake not engaged. Loose or corroded connections. Dead batteries. PTO (option) switch on. Incorrect ignition operation. Neutral start switch or PTO switch malfunction.	Place shift lever in neutral. Engage park brake. Clean and tighten loose connections. Charge or replace batteries. Turn switch off. Turn ignition to "OFF," then to "START" position. Contact Buhler Versatile dealer.
Charge indicator lamp stays on with engine running	Low engine idle speed. Loose belt. Malfunctioning battery(ies). Malfunctioning alternator.	Increase idle speed. Check automatic belt tensioner. Check each battery open circuit voltage for 12.6 volts minimum. Check electrolyte level and specific gravity. Contact Buhler Versatile dealer.

SECTION 4 - TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	CORRECTION
Tractor runs for a short time and shuts off	Automatic shutdown mode activated. Partially restricted fuel line.	Check audio and visual indicators for cause of shutdown. Contact Buhler Versatile dealer. Contact Buhler Versatile dealer.
Electronic monitor rotary select switch failure ("SEL" "OPEN")	Open circuit on rotary select switch for electronic instrument control system.	Reconnect plug on back of switch. Replace faulty switch.
Transmission speed sensor "OPEN" or "SHCR"	Malfunction in sensor or sensor wiring.	Sensor is unplugged, reconnect. Sensor wiring is damaged, repair wiring. Contact Buhler Versatile dealer.
Engine speed sensor "OPEN" or "SHCR"	Malfunction in sensor or sensor wiring.	Sensor is unplugged, reconnect. Sensor wiring is damaged, repair wiring. Contact Buhler Versatile dealer.
Electrical system high/low voltage	Loose or corroded terminal connections. Shorted out electrical system. Sulfated batteries. Loose or worn belt.	Clean and tighten connections. Contact Buhler Versatile dealer. Check each battery open circuit voltage for 12.6 volts minimum. Check electrolyte level and specific gravity. Check alternator belt tension. Replace belt if required.
Batteries will not charge	Loose or corroded terminal connections. Sulfated batteries. Loose or worn belt.	Clean and tighten connections. Check each battery open circuit voltage for 12.6 volts minimum. Check electrolyte level and specific gravity. Check alternator belt tension. Replace belt if required.

HYDRAULIC SYSTEM

PROBLEM	POSSIBLE CAUSE	CORRECTION
Complete hydraulic system does not operate	Low oil level. Restricted hydraulic filter. Restricted reservoir suction screen. Malfunctioning hydraulic system.	Fill system. Replace hydraulic filter. Clean screen. Contact Buhler Versatile dealer.
Hydraulic oil overheats	Oil level low or high. Oil cooler or radiator plugged. Blocked oil filter element. Flow control improperly adjusted. Hydraulic load or orbit motor system not matched to tractor.	Adjust oil level. Clean oil cooler and radiator. Replace filter. Adjust flow control to lower flow position. Contact Buhler Versatile dealer.
Hoses will not uncouple	Hoses being pulled at 15° angle or greater.	Pull straight back on hoses.
Hoses will not couple	Incorrect male connectors.	Replace connectors with ISO-(1/2") standard connectors available from your Buhler Versatile dealer.
Detent disengages prematurely	Detent release pressure set too low.	Contact Buhler Versatile dealer.
Remote attachment operates too fast or too slow	Flow control not properly adjusted.	Adjust flow control.
Hydraulic filter bypass	Clogged filter.	Replace filter.
Remote attachment does not operate	Hoses not completely connected. Load exceeds system capacity. Lever lock restricts control lever movement.	Attach hoses correctly. Reduce load or increase cylinder size. Reposition lock.

3-POINT HITCH

PROBLEM	POSSIBLE CAUSE	CORRECTION
Hitch will not raise	Low oil level. Loose electrical connections. Blown fuse.	Check and fill hydraulic reservoir. Check connections at electrohydraulic valve and controls. Replace fuse.
Hitch raises too slowly or quickly	Rate of raise adjustment incorrectly set.	Adjust flow control on 3-point hitch valve section.
Hitch drops too slowly or quickly	Lowering rate adjustment incorrectly set.	Adjust rate of lowering flow control knob.
Hitch overstrokes during raise or lower and puts the pump into high pressure standby	Feedback potentiometer incorrectly adjusted.	Adjust potentiometer.

BRAKES

PROBLEM	POSSIBLE CAUSE	CORRECTION
Park brake inoperative	Worn brake pads. Broken park brake cable. Brake out of adjustment.	Replace brake pads. Replace broken cable. Operate park brake lever several times to automatically adjust brakes. If no result, contact your Buhler Versatile dealer.
Pedal bottoms out or feels mushy	Brake piston seal leaking. Worn brake pads. Brake bleeder not sealing. Leakage in brake valve. Air in system. Reservoir level low. Brakes out of adjustment.	Contact Buhler Versatile dealer. Replace brake pads. Tighten bleeder. Contact Buhler Versatile dealer. Bleed brake system. Fill reservoir with proper brake fluid. Operate park brake lever several times to automatically adjust. If no result, contact Buhler Versatile dealer.

SECTION 4 - TROUBLESHOOTING

CAB

PROBLEM	POSSIBLE CAUSE	CORRECTION
Dust enters the cab	Improper seal around filter element. Plugged filter. Defective filter. Excessive air leak(s) in cab floor, windows, or door.	Check seal condition. Clean or replace filter. Replace filter. Seal air leak(s).
Pressurizer air flow low	Plugged filter. Heater core or evaporator core plugged.	Clean or replace filter. Contact Buhler Versatile dealer.
Cab windows fog up	Excessive moisture in cab air system.	Position air vents toward windows. Use air-conditioner system and recirculation control along with the heating system to dehumidify cab air. Check air-conditioner drain hoses for restriction.
Heating system does not heat	Defective engine thermostats. Heater core plugged. Heater valve shut off at engine.	Contact Buhler Versatile dealer. Contact Buhler Versatile dealer. Turn on heater valve at engine and adjust temperature control knob to the heat position.
Air-conditioner does not cool	Condenser plugged. Low refrigerant. Compressor belt slipping or damaged. Heater control turned on.	Clean radiator, oil cooler, and condenser. Check sight glass for bubbles. Contact your Buhler Versatile dealer. Check belt tension and belt condition. Turn temperature control knob fully counterclockwise for maximum cooling. Shut off heater hose valve at engine.

TRACTOR PERFORMANCE MONITOR

PROBLEM	POSSIBLE CAUSE	CORRECTION
Display blank	Loss of +12 VDC power	Replace fuse for TPM (3-amp instrumentation fuse).
"Err" displayed	Recent loss of +12 VDC power	Reprogram the time of day function.
	Selected function is detected to contain an invalid number	Reprogram the indicated function.
No AREA accumulation or AREA/HR prediction	Incorrect installation of implement status switch	Turn tractor ignition switch to ON, performance monitor should power-up. Press RESET (AREA) switch, with AREA displayed; if UP message was displayed, it should clear. The UP message should alternate on and off each time the switch is pressed. If so, check installation of the implement status switch. Be sure the trip spring to implement status switch is correctly stretched. If no implement status switch is being used, be sure the "UP" indicator does not show on the display.
	Implement status switch input inhibited due to broken or damaged cable or because implement status switch is defective	Visually inspect the implement status switch cable for damage. If damage is found, replace the cable.
No wheel slip indication	No axle speed input	Use the electronic instrument cluster to check out the operation of the transmission output speed sensor. If the dash will not indicate a ground speed, contact your Buhler Versatile dealer.
	No radar speed input	Use the distance measuring feature of the performance monitor to determine if the radar is functioning. If not, contact your Buhler Versatile dealer.

ELECTRONIC INSTRUMENT CONTROL SYSTEM

PROBLEM	POSSIBLE CAUSE	CORRECTION
Lower portion of module reverts to ground speed automatically when monitoring other functions	Tractor moving over 20 km/h (12.5 MPH).	Normal operation. See Section 2 - "Normal Operation of the Electronic Instrument Control System."
Lower portion of display flashes the service interval one or two indicator	Accrued hours approaching (within 10 hours) or have reached preset service interval value.	Normal operation. See Section 2 - "Normal Operation of the Electronic Instrument Control System."
Upper portion of module has the words "SET" and "UP" displayed and system functions erratically	System is in the calibrate mode.	Turn ignition switch to "OFF" position and back to "RUN" to enter the normal operation mode.
Ground speed displayed on lower portion of module inaccurate (tractors less TPM option only)	Values entered into the calibrate mode are incorrect.	Recalibrate system. See "Electronic Instrument Control System" in Section 2.
Values displayed in lower portion of module are inaccurate	Units of measure are incorrect (English or metric).	Recalibrate system. See "Electronic Instrument Control System" in Section 2.
Display is blank	Loss of +12V power.	Replace instrumentation fuse. Contact Buhler Versatile dealer.
Engine Warning Lights (Red or Yellow) illuminated	Critical (red) or non-critical (yellow) failure in electronic engine control circuit.	Contact Buhler Versatile dealer.
Engine Warning Light (red) illuminated	Engine overspeed.	Reduce engine speed (below 2630 RPM)
Display flashed "EXT ALR" when turning or at certain times of the day (TPM equipped tractors only)	Slip or time of day feature of TPM reacting.	See TPM in Section 2 of this manual.

POWER TAKE-OFF (PTO)

PROBLEM	POSSIBLE CAUSE	CORRECTION
PTO will not engage	Engine speed above 1400 RPM.	Lower engine speed to below 1340 RPM and engage PTO.
PTO slips under load	Malfunction in the PTO system.	Contact Buhler Versatile dealer.
PTO turns when in the off position	Malfunction in the PTO system.	Contact Buhler Versatile dealer.

OPERATION

PROBLEM	POSSIBLE CAUSE	CORRECTION
Tractor rides rough	Incorrect seat adjustments. Faulty seat suspension. Incorrect ballast. Tire inflation pressure too high. Implement mismatched with tractor. Implement adjusted incorrectly.	Adjust seat ride and dampener. Contact Buhler Versatile dealer. Ballast tractor correctly. Inflate tires correctly. Remove implement from tractor. Adjust implement per implement operator's manual.
Tractor "hops" or bounces during operation	Incorrect ballast. Incorrect tire pressure. Incorrect tire size, configuration or type.	Ballast tractor correctly. Inflate tires correctly. Contact Buhler Versatile dealer.

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SECTION 5

SPECIFICATIONS

The specifications on the following pages are given for your information and guidance. For further information concerning the tractor, consult your authorized Buhler Versatile dealer.

All data given in this book is subject to production variations. Dimensions and weights are approximate only. For exact information about any particular tractor, please consult your authorized Buhler Versatile dealer.

Our policy is one of continuous improvement, and the right to change prices, specifications, or equipment at any time without notice is reserved.

GENERAL DIMENSIONS

Length

	2290	2335	2360	2375	2425
Wheelbase - Center of axle to center of axle	3380 mm (133")				
Overall Length - Front nose to end of drawbar (no weight kits)	6750 mm (266")				
Center of front axle to nose of tractor (no weight kit)	2160 mm (85")				
Center of rear axle to end of drawbar	1210 mm (47.5")				

SECTION 5 - SPECIFICATIONS

Heights

The overall height of the tractor will be determined by the tire size chosen. Single, dual, or triple tire configuration will not affect height. The following dimensions are for all model tractors based on tire size.

Tire Size				Height To Top Of Exhaust	Height To Top Of Cab	Height To Top Of Drawbar
24.5	R32	R1	Bias	3667 mm (144.4")	3422 mm (134.7")	448 mm (17.6")
24.5	R32	R1	Radial	3632 mm (143.0")	3387 mm (133.3")	413 mm (16.3")
30.5	R32	R1	Bias	3667 mm (144.4")	3422 mm (134.7")	448 mm (17.6")
30.5	R32	R2	Bias	3682 mm (145.0")	3437 mm (135.3")	463 mm (18.2")
30.5	R32	R1	Radial	3634 mm (143.1")	3389 mm (133.4")	415 mm (16.3")
800/65	R32	R1W	Radial	3678 mm (144.8")	3432 mm (135.1")	457 mm (18.0")
18.4	R38	R1	Bias	3660 mm (144.1")	3414 mm (134.4")	441 mm (17.4")
18.4	R38	R2	Bias	3661 mm (144.1")	3416 mm (134.5")	442 mm (17.4")
18.4	R38	R1	Radial	3638 mm (143.2")	3393 mm (133.6")	419 mm (16.5")
20.8	R38	R1	Bias	3684 mm (145.0")	3439 mm (135.4")	465 mm (18.3")
20.8	R38	R2	Bias	3697 mm (145.6")	3452 mm (135.9")	478 mm (18.8")
20.8	R38	R1	Radial	3671 mm (144.5")	3426 mm (134.9")	452 mm (17.8")
20.8	R38	R1W	Radial	3674 mm (144.6")	3429 mm (135.0")	455 mm (17.9")
650/65	R38	R1W	Radial	3670 mm (144.5")	3424 mm (134.8")	450 mm (17.7")
700/65	R38		Special	3697 mm (145.6")	3452 mm (135.9")	478 mm (18.8")
710/70	R38	R1	Radial	3700 mm (145.7")	3455 mm (136.0")	481 mm (18.9")
710/70	R38	R1W	Radial	3705 mm (145.9")	3460 mm (136.2")	486 mm (19.1")
750/65	R38		Special	3743 mm (147.4")	3498 mm (137.7")	524 mm (20.6")
850/60	R38		Special	3743 mm (147.4")	3498 mm (137.7")	524 mm (20.6")
18.4	R42	R1	Bias	3713 mm (146.2")	3468 mm (136.5")	494 mm (19.4")
18.4R	R42	R1	Radial	3692 mm (145.4")	3447 mm (135.7")	473 mm (18.6")
20.8	R42	R1	Bias	3738 mm (147.2")	3493 mm (137.5")	519 mm (20.4")
20.8	R42	R2	Radial	3763 mm (148.1")	3518 mm (138.5")	544 mm (21.4")
20.8	R42	R1	Radial	3721 mm (146.5")	3476 mm (136.9")	502 mm (19.8")
20.8	R42	R1W	Radial	3724 mm (146.6")	3479 mm (137.0")	505 mm (19.9")
520/85	R42	R1W	Radial	3724 mm (146.6")	3477 mm (136.9")	503 mm (19.8")
900/50	R42	R1W	Radial	3719 mm (146.4")	3472 mm (136.7")	498 mm (19.6")
18.4	R46	R1	Radial	3741 mm (147.3")	3496 mm (137.6")	522 mm (20.6")

SECTION 5 - SPECIFICATIONS

OVERALL WIDTHS

The overall width of the tractor will be determined by the tire size chosen. Single, dual, or triple tire configuration will also affect machine widths. The following chart details overall widths by tire size, configuration, and tractor model. **Width is outside of outer tire to outside of outer tire.**

Tire Size	Configuration	2290	2335	2375	2360	2425
24.5 R32 R1 Radial	Singles-Tie Rod	2456 mm (96.7") Inset				N/A
		2659 mm (104.7") Outset				N/A
30.5 R32 R1	Singles-Tie Rod	2621 mm (103.2") Inset			N/A	
		2824 mm (111.2") Outset				
30.5 R32 R2	Singles-Tie Rod	2602 mm (102.4") Inset				
		2805 mm (110.4") Outset				
20.8 R38 R1W Radial	Singles - Drum	2368 mm (93.2") Inset				
		2571 mm (101.2") Outset				
700/65 R38 Special	Singles - Drum	2617 mm (103.0") Inset	N/A			
710/70 R38 R1 Radial	Singles - Drum	2628 mm (103.5") Inset				
710/70 R38 R1W Radial	Singles - Drum	N/A	2628 mm (103.5") Inset			
750/65 R38 Special	Singles - Drum	2667 mm (105") Inset				
850/60 R38 Special	Singles - Drum	2908 mm (114.5") Inset				
20.8 R42 R1W Radial	Singles - Drum	2368 mm (93.2") Inset				
		2571 mm (101.2") Outset				
24.5 R32 R1	Duals - Tie Rod	4028 mm (158.6")				
24.5 R32 R1 Radial	Duals - Tie Rod	4017 mm (158.1")				
30.5 R32 R2	Duals - Tie Rod	N/A	4685 mm (184.4")			
30.5 R32 R1 Radial	Duals - Tie Rod	4704 mm (185.2")				
800/65 R32 R1W Radial	Duals - Tie Rod	4785 mm (188.4")				
18.4 R38 R1	Duals - Tie Rod	3672 mm (144.6")			N/A	
18.4 R38 R2	Duals - Tie Rod	3658 mm (144.0")			N/A	
18.4 R38 R1 Radial	Duals - Tie Rod	3668 mm (144.4")			N/A	
20.8 R38 R1	Duals - Tie Rod	3820 mm (150.4")			N/A	
20.8 R38 R2	Duals - Tie Rod	3806 mm (149.8")			N/A	
20.8 R38 R1 Radial	Duals - Tie Rod	3821 mm (150.4")			N/A	
20.8 R38 R1W Radial	Duals - Tie Rod	N/A	3821 mm (150.4")			
650/65 R38 R1W Radial	Duals - Tie Rod	4475 mm (176.2")				
18.4 R42 R1	Duals - Tie Rod	N/A	3666 mm (144.3")	N/A		
18.4 R42 R1 Radial	Duals - Tie Rod	N/A	3666 mm (144.3")	N/A		
20.8 R42 R1	Duals - Tie Rod	3826 mm (150.6")				
20.8 R42 R1W Radial	Duals - Tie Rod	N/A	3821 mm (150.4")			
20.8 R42 R1W Radial	Duals - Tie Rod	3821 mm (150.4")				
520/85 R42 R1W Radial	Duals - Tie Rod	4262 mm (167.8")				
20.8 R42 R2 Radial	Duals - Tie Rod	3812 mmX (150.1")				
20.8 R38 R1W Radial	Duals - Drum	3825 mm (150.6")				

SECTION 5 - SPECIFICATIONS

OVERALL WIDTHS - Continued

Tire Size	Configuration	2290	2335	2375	2360	2425
700/65 R38 Special	Duals - Drum	4625 mm (182.1")				
710/70 R38 R1 Radial	Duals - Drum	N/A	4636 mm (182.5")			
710/70 R38 R1W Radial	Duals - Drum	N/A	4636 mm (182.5")	N/A		
750/65 R38 Special	Duals - Drum	4675 mm (184.1")				
850/60 R38 Special	Duals - Drum	N/A		5075 mm (199.8")		
20.8 R42 R1	Duals - Drum	3819 mm (150.4")				
20.8 R42 R1 Radial	Duals - Drum	3814 mm (150.2")				
520/85 R42 R1W Radial	Duals - Drum	3846 mm (151.4")				
900/50 R42 R1W Radial	Duals - Drum	N/A		4486 mm (176.6")		
20.8 R42 R2 Radial	Duals - Drum	3805 mm (149.8")				
18.4 R46 R1 Radial	Duals - Drum	3651 mm (143.7")				N/A
18.4 R38 R1	Duals - Drum Row Crop	3532 mm (139.1")			N/A	
18.4 R38 R1 Radial	Duals - Drum Row Crop	3528 mm (138.9")			N/A	
18.4 R42 R1	Duals - Drum Row Crop	3526 mm (138.8")			N/A	
18.4 R42 R1 Radial	Duals - Drum Row Crop	3529 mm (138.9")			N/A	
18.4 R46 R1 Radial	Duals - Drum Row Crop	3526 mm (138.8")				
20.8 R42 R1	Triples - Drum	N/A			5271 mm (207.5")	
20.8 R42 R1 Radial	Triples - Drum	N/A			5266 mm (207.3")	
520/85 R42 R1W Radial	Triples - Drum	N/A		5296 mm (208.5")		
20.8 R42 R2 Radial	Triples - Drum	N/A			5266 mm (207.3")	
18.4 R46 R1 Radial	Triples - Drum	N/A			5062 mm (199.3")	

SECTION 5 - SPECIFICATIONS

WHEEL TREAD WIDTH

The wheel tread width of the tractor will be determined by the tire size chosen. Single, dual, or triple tire configuration will also affect wheel tread width. The following chart details overall width by tire size, configuration, and tractor model. **Tread width is shown from center of inner wheel to center of inner wheel, and center of outer wheel to center of outer wheel. (Center of middle wheel to center of middle wheel also shown for triple option.)**

Tire Size	Configuration	2290	2335	2375	2360	2425
24.5 R32 R1 Radial	Singles - Tie Rod	1829 mm (72") Inset				N/A
		2032 mm (80") Outset				N/A
30.5 R32 R1	Singles - Tie Rod	1829 mm (72") Inset			N/A	
		2032 mm (80") Outset			N/A	
30.5 R32 R2	Singles - Tie Rod	1829 mm (72") Inset				
		2032 mm (80") Outset				
20.8 R38 R1W Radial	Singles - Drum	1829 mm (72") Inset				
		2032 mm (80") Outset				
700/65 R38 Special	Singles - Drum	1917 mm (75.5") Inset		N/A		
710/70 R38 R1 Radial	Singles - Drum	1917 mm (75.5") Inset				
710/70 R38 R1W Radial	Singles - Drum	N/A	1917 mm (75.5") Inset			
750/65 R38 Special	Singles - Drum	1917 mm (75.5") Inset				
850/60 R38 Special	Singles - Drum	N/A	2058 mm (81") Outset			
20.8 R42 R1W Radial	Singles - Drum	1829 mm (72") Inset				
		2032 mm (80") Outset				
24.5 R32 R1	Duals - Tie Rod	1829 mm (72") Inner				
		3390 mm (133.5") Outer				
24.5 R32 R1 Radial	Duals - Tie Rod	1829 mm (72") Inner				
		3390 mm (133.5") Outer				
30.5 R32 R2	Duals - Tie Rod	N/A	1829 mm (72") Inner			
		N/A	3912 mm (154") Outer			
30.5 R32 R1 Radial	Duals - Tie Rod	1829 mm (72") Inner				
		3912 mm (154") Outer				
800/65 R32 R1W Radial	Duals - Tie Rod	1869 mm (73.6") Inner				
		3952 mm (155.6") Outer				
18.4 R38 R1	Duals - Tie Rod	1829 mm (72") Inner			N/A	
		3188 mm (125.5") Outer			N/A	
18.4 R38 R2	Duals - Tie Rod	1829 mm (72") Inner			N/A	
		3188 mm (125.5") Outer			N/A	
18.4 R38 R1 Radial	Duals - Tie Rod	1829 mm (72") Inner			N/A	
		3188 mm (125.5") Outer			N/A	
20.8 R38 R1	Duals - Tie Rod	1829 mm (72") Inner			N/A	
		3282 mm (129.2") Outer			N/A	
20.8 R38 R2	Duals - Tie Rod	1829 mm (72") Inner				
		3282 mm (129.2") Outer				

SECTION 5 - SPECIFICATIONS

WHEEL TREAD WIDTH - Continued

Tire Size	Configuration	2290	2335	2375	2360	2425
20.8 R38 R1 Radial	Duals - Tie Rod	1829 mm (72") Inner			N/A	
		3282 mm (129.2") Outer			N/A	
20.8 R38 R1W Radial	Duals - Tie Rod	1829 mm (72") Inner				
		3282 mm (129.2") Outer				
650/65 R38 R1W Radial	Duals - Tie Rod	1600 mm (63") Inner				
		3683 mm (145") Outer				
18.4 R42 R1	Duals - Tie Rod	1829 mm (72") Inner	N/A			
		3188 mm (125.5") Outer	N/A			
18.4 R42 R1 Radial	Duals - Tie Rod	1829 mm (72") Inner			N/A	
		3188 mm (125.5") Outer			N/A	
20.8 R42 R1	Duals - Tie Rod	1829 mm (72") Inner				
		3282 mm (129.2") Outer				
20.8 R42 R1 Radial	Duals - Tie Rod	1829 mm (72") Inner				
		3282 mm (129.2") Outer				
20.8 R42 R1W Radial	Duals - Tie Rod	N/A	1829 mm (72") Inner			
		N/A	3282 mm (129.2") Outer			
520/85 R42 R1W Radial	Duals - Tie Rod	1387 mm (54.6") Inner				
		3470 mm (136.6") Outer				
20.8 R42 R2 Radial	Duals - Tie Rod	1829 mm (72") Inner				
		3282 mm (129.2") Outer				
20.8 R38 R1W Radial	Duals - Drum	1829 mm (72") Inner				
		3275 mm (129") Inner				
700/65 R38 Special	Duals - Drum	1917 mm (75.5") Inner				
		3925 mm (154.5") Outer				
710/70 R38 R1 Radial	Duals - Drum	N/A	1917 mm (75.5") Inner			
		N/A	3925 mm (154.5") Outer			
710/70 R38 R1W Radial	Duals - Drum	N/A	1917 mm (75.5") Inner	N/A		
		N/A	3925 mm (154.5") Outer	N/A		
750/65 R38 Special	Duals - Drum	1917 mm (75.5") Inner				
		3925 mm (154.5") Outer				
850/60 R38 Special	Duals - Drum	N/A		2058 mm (81") Inner		
		N/A		4125 mm (162.4") Outer		
20.8 R42 R1	Duals - Drum	1829 mm (72") Inner				
		3275 mm (128.9") Outer				
20.8R R42 R1 Radial	Duals - Drum	1829 mm (72") Inner				
		3275 mm (128.9") Outer				

SECTION 5 - SPECIFICATIONS

WHEEL TREAD WIDTH - Continued

Tire Size	Configuration	2290	2335	2375	2360	2425
20.8 R42 R1W Radial	Duals - Drum	1829 mm (72") Inner				
		3275 mm (129") Inner				
20.8 R42 R2 Radial	Duals - Drum	1829 mm (72") Inner				
		3275 mm (128.9") Outer				
520/85 R42 R1W Radial	Duals - Drum	1859 mm (73.2") Inner				
		3305 mm (130.1") Outer				
900/50 R42 R1W Radial	Duals - Drum	N/A		2499 mm (98.4")		
				3945 mm (155.3")		
18.4 R46 R1 Radial	Duals - Drum	1829 mm (72") Inner				N/A
		3173 mm (124.9") Outer				N/A
18.4 R38 R1	Duals - Drum Row Crop	1600 mm (63") Inner			N/A	
		3048 mm (120") Outer			N/A	
18.4 R38 R1 Radial	Duals - Drum Row Crop	1600 mm (63") Inner			N/A	
		3048 mm (120") Outer			N/A	
18.4 R42 R1	Duals - Drum Row Crop	1600 mm (63") Inner			N/A	
		3048 mm (120") Outer			N/A	
18.4 R42 R1 Radial	Duals - Drum Row Crop	1600 mm (63") Inner			N/A	
		3048 mm (120") Outer			N/A	
18.4 R46 R1 Radial	Duals - Drum Row Crop	1600 mm (63") Inner				
		3048 mm (120") Outer				
20.8 R42 R1	Triples - Drum	N/A	N/A		1825 mm (71.9") Inner	
		N/A	N/A		3276 mm (129") Center	
		N/A	N/A		4727 mm (186.1") Outer	
20.8 R42 R1 Radial	Triples - Drum	N/A	N/A		1825 mm (71.9") Inner	
		N/A	N/A		3276 mm (129") Center	
		N/A	N/A		4727 mm (186.1") Outer	
520/85 R42 R1W Radial	Triples - Drum	N/A		1857 mm (73.1") Inner		
				3307 mm (130.2") Center		
				4757 mm (187.3") Outer		
20.8 R42 R2 Radial	Triples - Drum	N/A	N/A		1825 mm (71.9") Inner	
		N/A	N/A		3276 mm (129") Center	
		N/A	N/A		4727 mm (186.1") Outer	
18.4 R46 R1 Radial	Triples - Drum	N/A			1598 mm (62.9") Inner	
					3048 mm (120") Center	
					4572 mm (180") Outer	

TURNING GEOMETRY

Turnaround diameter is measured from the center point of the front axle and is a measurement of how far a tractor will move with each turn. **The turnaround diameter is based solely on articulation angle and is not a function of tire size or configuration.**

Articulation Angle	Turnaround Diameter
42°	8.69 m (342")
38°	9.73 m (383")
33°	11.33 m (446")
31°	11.73 m (462")

MAXIMUM ALLOWABLE MACHINE WEIGHT

The following table shows the maximum allowable weight of each tractor model.

Model	Maximum Weight
2290	13,154 kg (33,000 lbs.)
2335	14,545 kg (36,000 lbs.)
2360	15,422 kg (38,000 lbs.)
2375	17,273 kg (39,000 lbs.)
2425	19,958 kg (44,000 lbs.)

TRACTOR SHIPPING WEIGHT

Shipping weight of a tractor can be calculated based on the standard equipment and options ordered (or dealer installed) before any liquid ballast is added to the tractor. To calculate the shipping weight, pick the appropriate front, rear, and total weight values from the following tables (A-F). Once the shipping weight is found, the tractor can be ballasted and the tire air pressure set. See “Ballasting” in Section 2. Example:

Tractor: 2375 tractor with powershift transmission, 20.8 x 42 R1 drum-style duals, PTO, 1/2 tank of fuel.

Table Info	Front Axle Weight kg (lbs.)	Rear Axle Weight kg (lbs.)	Total Weight kg (lbs.)
A	5,924 (13,059)	2,624 (5,785)	8,548 (18,844)
B	1,521 (3,354)	1,521 (3,354)	3,043 (6,708)
C	N/A	N/A	N/A
D	227 (500)	227 (500))	453.6 (1,000)
E	(-41) (-90))	494 (1,090)	454 (1,000)
F	226 (498)	164 (361)	390 (859)
Totals	7,857 (17,321)	5,030 (11,090)	12,887 (28,411)

NOTE: The weights shown in tables A-F are calculated values. Exact weights are only obtainable by putting the tractor on a scale.

SECTION 5 - SPECIFICATIONS

A. Base Tractor Weight

A base tractor is considered to be with the 12x4 Quad Shift III mechanical transmission, no tires or rims, a standard drawbar, no fuel in the fuel tanks, no operator, no special added equipment, and no ballast (dry or liquid).

Tire Size	2290	2335	2375	2360	2425
Front Axle Weight	5923.6 kg (13059 lbs.)			6129.5 kg (13513 lbs.)	6242.9 kg (13763 lbs.)
Rear Axle Weight	2624.1 kg (5785 lbs.)			2836.8 kg (6217 lbs.)	2950.9 kg (6467 lbs.)
Total Base Tractor Weight	8547.6 kg (18844 lbs.)			9002.8 kg (19730 lbs.)	9230.9 kg (20230 lbs.)

B. Tire Weights

The following chart lists the weight of the tire, tube, rim and spacer (for tie rod duals) by tire size and wheel configuration.

Buhler Versatile offers a choice of Goodyear, Trelleborg, Firestone, and Titan tires. The chart is based on an average tire weight of the brand offered for a particular tire size. The weights shown are for front and rear axle and overall weight by configuration.

Tire Size	Configuration	Front Axle kg (lbs.)	Rear Axle kg (lbs.)	Total Tire Weight kg (lbs.)
24.5	R32 R1 Radial .. Singles - Tie Rod	659.1 (1453)	659.1 (1453)	1317.7 (2905)
30.5	R32 R1 10 Ply .. Singles - Tie Rod	706 (1553)	706 (1553)	1412 (3107)
30.5	R32 R2 10 Ply .. Singles - Tie Rod	851.5 (1873)	851.5 (1873)	1701.7 (3746)
20.8	R38 R1W Radial ... Singles - Drum	654.5 (1440)	654.5 (1440)	1309.1 (2880)
20.8	R42 R1W Radial ... Singles - Drum	720.9 (1586)	720.9 (1586)	1442.3 (3173)
700/65	R38 R1 8 Ply Singles - Drum	936.2 (2064)	936.2 (2064)	1872.5 (4128)
710/70	R38 R1 Radial ... Singles - Drum	927.2 (2044)	927.2 (2044)	1854.3 (4088)
710/70	R38 R1W Radial ... Singles - Drum	1012.7 (2228)	1012.7 (2228)	2025.5 (4456)
750/65	R38 R1 8 Ply Singles - Drum	1400.9 (3082)	1400.9 (3082)	2801.8 (6164)
850/60	R38 R1 8 Ply Singles - Drum	1670 (3674)	1670 (3674)	3340 (7348)
24.5	R32 R1 10 Ply .. Duals - Tie Rod	1250.6 (2757)	1250.6 (2757)	2501.2 (5514)
24.5	R32 R1 Radial* .. Duals - Tie Rod	1408.4 (3105)	1408.4 (3105)	2816.9 (6210)
30.5	R32 R2 10 Ply .. Duals - Tie Rod	1793.6 (3946)	1793.6 (3946)	3587.3 (7892)
30.5	R32 R1 Radial .. Duals - Tie Rod	1503.2 (3307)	1503.2 (3307)	3006.4 (6614)
800/65	R32 R1W Radial .. Duals - Tie Rod	1651 (3640)	1651 (3640)	3302 (7280)
18.4	R38 R1 6 Ply ... Duals - Tie Rod	932.1 (2055)	932.1 (2055)	1864.3 (4110)
18.4	R38 R2 6 Ply ... Duals - Tie Rod	1108.1 (2443)	1108.1 (2443)	2216.3 (4886)
18.4	R38 R1 Radial* .. Duals - Tie Rod	1090.5 (2404)	1090.5 (2404)	2180.9 (4808)
18.4	R42 R1 6 Ply Duals - Tie Rod	1144.5 (2518)	1144.5 (2518)	2289.0 (5036)
18.4	R42 R1 10 Ply .. Duals - Tie Rod	1190 (2618)	1190 (2618)	2380 (5236)
18.4	R42 R1 Radial .. Duals - Tie Rod	1275 (2805)	1275 (2805)	2550 (5610)
20.8	R38 R1 8 Ply ... Duals - Tie Rod	1114.9 (2458)	1114.9 (2458)	2229.9 (4916)
20.8	R38 R2 8 Ply ... Duals - Tie Rod	1276.9 (2815)	1276.9 (2815)	2553.8 (5630)
20.8	R38 R1 Radial* .. Duals - Tie Rod	1242.4 (2739)	1242.4 (2739)	2484.8 (5478)
20.8	R38 R1W Radial .. Duals - Tie Rod	1295.5 (2850)	1295.5 (2850)	2590.9 (5700)
650/65	R38 R1W Radial .. Duals - Tie Rod	1499 (3305)	1499 (3305)	2998 (6610)
20.8	R42 R1 10 Ply .. Duals - Tie Rod	1341.7 (2958)	1341.7 (2958)	2683.5 (5916)
20.8	R42 R1 Radial** .. Duals - Tie Rod	1425.7 (3143)	1425.7 (3143)	2851.3 (6286)
20.8	R42 R1W Radial .. Duals - Tie Rod	1428.2 (3142)	1428.2 (3142)	2856.4 (6283)
20.8	R42 R2 Radial** .. Duals - Tie Rod	1595.5 (3510)	1595.5 (3510)	3191.0 (7020)
520/85	R42 R1W Radial .. Duals - Tie Rod	1463 (3225)	1463 (3225)	2926 (6450)
20.8	R38 R1W Radial ... Duals - Drum	1478.2 (3252)	1478.2 (3252)	2956.4 (6504)
700/65	R38 R1 8 Ply Duals - Drum	2108.2 (4638)	2108.2 (4638)	4216.4 (9276)
710/70	R38 R1 Radial** ... Duals - Drum	2094.7 (4618)	2094.7 (4618)	4189.4 (9236)
710/70	R38 R1W Radial Duals - Drum	4894 (2224.5)	4894 (2224.5)	9788 (4449.1)

SECTION 5 - SPECIFICATIONS

B. Tire Weights - Continued

750/65	R38 R1	8 Ply	....	Duals - Drum	.....	2620 (5764)	....	2620 (5764)	....	5240 (11,528)
850/60	R38 R1	8 Ply	....	Duals - Drum	.....	2997.3 (6594)	...	2997.3 (6594)	...	5994.5 (13,188)
20.8	R42 R1	10 Ply	...	Duals - Drum	.....	1521.4 (3354)	...	1521.4 (3354)	...	6708 (3042.7)
20.8	R42 R1	Radial***	..	Duals - Drum	.....	1605.3 (3539)	...	1605.3 (3539)	...	3210.6 (7078)
20.8	R42 R1W	Radial	...	Duals - Drum	.....	1630.5 (3587)	...	1630.5 (3587)	...	3260.9 (7174)
20.8	R42 R2	Radial**	..	Duals - Drum	.....	1775.5 (3906)	...	1775.5 (3906)	...	7812 (3551.0)
520/85	R42 R1W	Radial	....	Duals - Drum	.....	1651 (3640)	....	1651 (3640)	....	3302 (7280)
900/50	R42 R1W	Radial	....	Duals - Drum	.....	2926 (6450)	....	2926 (6450)	...	5851 (12,900)
18.4	R46 R1	Radial***	..	Duals - Drum	.....	1586.2 (3497)	...	1586.2 (3497)	...	3172.5 (6994)
18.4	R38 R1	6 Ply	.....	Duals	.....	1136.3 (2505)	...	1136.3 (2505)	...	2272.5 (5010)
				Drum Row Crop						
18.4	R38 R1	Radial*	.....	Duals	.....	1294.6 (2854)	...	1294.6 (2854)	...	2589.1 (5708)
				Drum Row Crop						
18.4	R42 R1	8 Ply	.....	Duals	.....	1279.2 (2820)	...	279.2 (2820)	...	2558.8 (5641)
				Drum Row Crop						
18.4	R42 R1	Radial**	.....	Duals	.....	1425.7 (3143)	...	1425.7 (3143)	...	2851.3 (6286)
				Drum Row Crop						
18.4	R46 R1	Radial***	.....	Duals	.....	1624.3 (3581)	...	1624.3 (3581)	...	3248.7 (7162)
				Drum Row Crop						
20.8	R42 R1	10 Ply	...	Triples - Drum	.....	2512.0 (5538)	...	2512.0 (5538)	...	5024.1 (11,076)
20.8	R42 R1	Radial**	...	Triples - Drum	.....	2638.1 (5816)	...	2638.1 (5816)	...	11,631 (5275.8)
20.8	R42 R2	Radial**	...	Triples - Drum	.....	2893.6 (6366)	...	2893.6 (6366)	...	5787.3 (12,732)
520/85	R42 R1W	Radial	....	Triples - Drum	.....	2703 (5960)	....	2703 (5960)	....	5407 (11,920)
18.4	R46 R1	Radial	...	Triples - Drum	.....	2665 (5863)	....	2665 (5863)	....	5330 (11,726)

SECTION 5 - SPECIFICATIONS

C. Weight Packages Adding a front or rear weight package to a tractor affects the weight distribution per axle as well as the total tractor weight. In addition, the actual weight effect applied to the axle is amplified by the distance the weight is hung away from the axle center line. **The following chart shows the gross weight of each weight kit and the net result of adding the kit on the front and rear axle.**

	Total Weight of Kit kg (lbs.)	Effect on Front Axle kg (lbs.)	Effect on Rear Axle kg (lbs.)
Rear Weight Kit - 40.8 kg (90 lbs.) bracket with 33 x 30 kg (67 lbs.) weights	1030 (2301)	Removes 185 (414)	Adds 1216 (2715)
Auxiliary Rear Weight Kit - 18.2 kg (40 lbs.) brackets with 24 x 30 kg (67 lbs.) weights	738 (1648)	Removes 118 (264)	Adds 856 (1912)
Front Weight Kit - 59 kg (130 lbs.) bracket with 12 x 30 kg (67 lbs.) weights	419 (934)	Adds 716 (1597)	Removes 297 (663)
Front Weight Kit - 59 kg (130 lbs.) bracket with 39 x 30 kg (67 lbs.) weights	1229 (2743)	Adds 2102 (4691)	Removes 873 (1947)
Midmount Weight Kit - 314 kg (692 lbs.) frame with 30 x 30 kg (67 lbs.) weights	1214 (2702)	Adds 147 (324)	Adds 1067 (2378)
Total Effect of Putting a Complete Front, Rear, Midmount and Auxiliary Rear Weight Kit on a Tractor	4211 (9394)	Adds 1946 (4337)	Adds 2266 (5058)

Multiply every pound of weight added to the front weight kit by 171% and add this figure to the front axle. Multiply every pound of weight added to the front weight kit by 71% and subtract this figure from the rear axle weight. The total effect on the tractor should be the sum of the front effect less the rear effect and should equal the weight added.

Multiply every pound of weight added to the rear weight kit by 118% and add this figure to the rear axle. Multiply every pound of weight added to the rear weight kit by 18% and subtract this figure from the front axle weight. The total effect on the tractor should be the sum of the front effect less the rear effect and should equal the weight added.

Multiply every pound of weight added to the auxiliary rear weight kit by 116% and add this figure to the rear axle. Multiply every pound of weight added to the auxiliary rear weight kit by 16% and subtract this figure from the front axle weight. The total effect on the tractor should be the sum of the front effect less the rear effect and should equal the weight added.

D. Optional Transmission and Axle Weights

Adding an axle or transmission option to a tractor will affect the weight on the front and rear axle based on the option selected and the model tractor. The following chart shows the effect on the axle by option and model. **(The 2290 and 2335 have no axle options available.)**

Model	Option	Effect on Front Axle kg (lbs.)	Effect on Rear Axle kg (lbs.)	Total Weight Change kg (lbs.)
2290	Powershift Trans.	Adds 227 (500)	Adds 227 (500)	Adds 454 (1000)
2335	Powershift Trans.	Adds 227 (500)	Adds 227 (500)	Adds 454 (1000)
2375	Powershift Trans.	Adds 227 (500)	Adds 227 (500)	Adds 454 (1000)
2360/2375	Quad Shift III Trans. and Heavy-Duty Axles	Adds 113 (250)	Adds 113 (250)	Adds 226 (500)
	Powershift Trans.	Adds 272 (600)	Adds 181 (400)	Adds 453 (1000)
	Powershift Trans. and Heavy-Duty Axles	Adds 387 (850)	Adds 296 (650)	Adds 680 (1500)
2425	Powershift Trans.	Adds 227 (500)	Adds 227 (500)	Adds 454 (1000)

E. Optional Equipment Adding an option to the tractor will affect the axle weight of a unit. The following chart details the three major options available for Buhler Versatile 4WD tractors and their effect on axle and total weight when installed on a tractor.

Option	Effect on Front Axle kg (lbs.)	Effect on Rear Axle kg (lbs.)	Total Weight Added kg (lbs.)
PTO	Removes 41 (90)	Adds 494 (1090)	Adds 454 (1000)
3-Point Hitch	Removes 128 (283)	Adds 842 (1856)	Adds 714 (1573)
Quick-Attach Coupler	Removes 73 (160)	Adds 254 (560)	Adds 181 (400)

F. Diesel Fuel

Fuel added to the fuel tanks has to be factored in to the base tractor weight. To do this, use the following equation:

$$\text{liters of fuel} \times 0.84 \text{ kg/L} = \text{fuel weight (kg)}$$

$$(\text{Gallons of fuel} \times 7.01 \text{ lbs./gal.}) = \text{fuel weight (lbs.)}$$

The effect on the front and rear axle must also be calculated. Multiply the total fuel weight by 0.58 for the front axle and 0.42 for the rear axle.

Example:

$$100 \text{ L fuel added}$$

$$100 \text{ L} \times 0.84 \text{ kg/L} = 84 \text{ kg}$$

$$84 \text{ kg} \times 0.58 = 49 \text{ kg added to front axle}$$

$$84 \text{ kg} \times 0.42 = 35 \text{ kg added to rear axle}$$

$$100 \text{ gal. fuel added}$$

$$100 \text{ gal.} \times 7.01 \text{ lbs./gal.} = 701 \text{ lbs.}$$

$$701 \text{ lbs.} \times 0.58 = 407 \text{ lbs. added to front axle}$$

$$701 \text{ lbs.} \times 0.42 = 294 \text{ lbs. added to rear axle}$$

SECTION 5 - SPECIFICATIONS

ENGINE

	2290	2335	2375
Manufacturer	Cummins Engine Co.		
Engine Model	QSM11		
Maximum Horsepower Rating kW (BHP @ 2100 RPM) SAE J 1995	216 (290)	250 (335)	280 (375)
Type	6-cylinder, 4-cycle, In-Line, Overhead 4 Valve per cylinder Diesel Engine		
Aspiration	Turbocharged & Aftercooled		
Bore x Stroke - mm (in.)	125x147 (4.921x5.79)		
Displacement - L (in ³)	10.8 (659)		
Compression Ratio	16.3:1		
Firing Order	1-5-3-6-2-4		
Lubrication System: Pressure @ Idle kPa (PSI)	103 (15)		
Pressure @ Rated Speed kPa (PSI)	241 (35)		
Maximum Fuel Consumption: @ Maximum Rated Output & Speed - gm/kw•hr (lbs/hp-hr) *	203 (0.33)		
Low Idle Speed - RPM	875		
High Idle Speed - RPM	2225		
Engine Torque @ Rated Speed (2100 RPM) ft.lbs. (N·m)	983 (725)	1136 (838)	1272 (938)
Peak Engine Torque @ listed Engine Speed - N·m (ft.lbs.) @ RPM	1478 (1090) @ 1400	1702 (1255) @ 1400	1898 (1400) @ 1400
Torque Rise - %	50	50	49
CPL # (Control Parts Listing)	8409-SC3	2828-SC2	2829-SC1

* - 1 Liter of diesel fuel weighs approximately 0.84 Kg.

* - 1 gallon (US) of diesel fuel weighs approximately 7.01 lbs.

SECTION 5 - SPECIFICATIONS

ENGINE - Continued

	2360	2425
Manufacturer	Cummins Engine Co.	
Engine Model	N14	
Maximum Horsepower Rating kW (BHP @ 2100 RPM) SAE J 1995	268 (360)	317 (425)
Type	6-cylinder, 4-cycle, In-Line, Overhead Valve Diesel Engine	
Aspiration	Turbocharged & Aftercooled	
Bore x Stroke - mm (in.)	140x152 (5.50x6.00)	
Displacement - L (in ³)	14 (855)	
Compression Ratio	16.5:1	
Firing Order	1-5-3-6-2-4	
Lubrication System: Pressure @ Idle kPa (PSI)	69 (10)	
Pressure @ Rated Speed kPa (PSI)	207 - 345 (30 - 50)	
Maximum Fuel Consumption: @ Maximum Rated Output & Speed - kg/hr (lbs/hr) *	54 (120)	66 (146)
Low Idle Speed - RPM	850 - 900	
High Idle Speed - RPM	2225 ± 20	
Engine Torque @ Rated Speed (N·m)(2100 RPM) ft.lbs.	1220 (900)	1441 (1063)
Peak Engine Torque @ listed Engine Speed - N·m (ft.lbs.) @ RPM	1649 (1215) @ 1400	1899 (1400) @ 1400
Torque Rise - %	35	32
CPL # (Control Parts Listing)	2403	

* - 1 Liter of diesel fuel weighs approximately 0.84 Kg.

* - 1 gallon (US) of diesel fuel weighs approximately 7.01 lbs.

SECTION 5 - SPECIFICATIONS

ENGINE AIR INTAKE AND EXHAUST

	2290	2335	2375	2360	2425
AIR INTAKE Precleaning	Exhaust Aspirated w/ Precleaner				
Air Filter Configuration	Primary (Outer) Secondary (Inner)				
Air Flow - L/S (CFM) @ 2100 RPM	382 (810)	413 (875)	414 (878)	507 (1075)	519 (1100)
EXHAUST OUTLET MufflerType	Perforated tube and center plug with venturi for intake. Precleaner aspiration.				
Air Flow - L/S (CFM) @ 2100 RPM	798 (1690)	873 (1850)	414 (878)	1132 (2400)	1261 (2675)

FUEL SYSTEM

	2290	2335	2375	2360	2425
Fuel Tanks: Total Capacity - L (gal.)	927 (245)				
Usable Capacity - L (gal.)	871 (230)				
Vented	Both Tanks				
Fuel Filter	Single Element				
Cold Start	Measured 4.8 cc shot of fluid at each switch activation. Thermoguard protected above 27°C (81°F)				
Fuel Flow	Drawn from left tank, passes through the engine fuel system. Return fuel goes through the fuel cooler back to the right tank. Crossover pipe between the two tanks. Separate fill spout and drain on each tank.				

COOLING SYSTEM

	2290	2335	2375	2360	2425
Coolant capacity - L (gal.)	59 (15.6)			60 (15.9)	60 (15.9)
Radiator Core Size (LxW) - mm (in.)	978 x 894 (38.5 x 35.2)				
Fins per Inch	9				
Number of Rows	6	6	7	6	7
Fan Diameter - mm (in.) x Blade Pitch Width - mm (in.)	813 (32) x 89 (3.5)		838 (33) x 89 (3.5)	813 (32) x 89 (3.5)	838 (33) x 89 (3.5)
Number of Blades	8				
Pressure Cap Setting - kPa (PSI)	97 (14)				
Thermostat Opens	82°C (180°F)				
Thermostat Full Open	93°C (200°F)				
Type of System	Pressurized recirculating full flow bypass with filter and corrosion inhibitor.				

SECTION 5 - SPECIFICATIONS

DRIVELINES

COMPONENT	2290 PS	2290 QS	2235 PS	2335 QS	2360 PS	2360 QS	2375 PS	2425 QS	2425 PS
Torsional coupler @ engine torque rating N·m (in.lbs.)	1412 (12,500)							2270 (20,000)	
Engine To Transmission Drive Shaft									
Size	1610							7C	
Cross and bearing lube - interval hrs.	250							NR	
Slip yoke lube - interval hrs.	250							250	
Transmission to Front Axle Drive Shaft									
Size	1610							8C	
Cross and bearing lube - interval hrs	250							NR	
Slip yoke lube - interval hrs	250							250	
Articulation Drive Shaft									
Size	1610							8C	
Cross and bearing lube - interval hrs	250							NR	
Slip yoke lube - interval hrs	250							250	
Rear Axle Drive Shaft									
Size	1610							8C	
Cross and bearing lube - interval hrs	250							NR	
Slip yoke lube - interval hrs	250							250	
PTO Articulation Drive Shaft (Optional)									
Size						1550			
Cross and bearing lube - interval hrs						NR			
Slip yoke lube - interval hrs						250			
PTO Rear Drive Shaft (Optional)									
Size						1550			
Cross and bearing lube - interval hrs						NR			
Slip yoke lube - interval hrs						250			

NR - Not Required

SECTION 5 - SPECIFICATIONS

3-POINT HITCH (Optional)

Linkage	Category IV N / III
Maximum lift capacity @ 610 mm (24") behind lower links	5897 kg (13,000 lbs.)
Cylinder	
Diameter	104.6 mm (4")
Stroke	330.2 mm (13")
Drawbar	3-position swinging
Maximum drawbar offset	214 mm (8.4")

DRAWBAR

Hitch pin	
Standard	2290, 2335, 2360, 2375 - 38 mm (1-1/2") Class 4 - 51 mm (2") optional 2425 - 51 mm (2") Class 4 - 38 mm (1-1/2") optional
Type	one-piece 5-position w/ replaceable wear block (3-point hitch - 3-position)
Clevis	bolt-on w/ safety latch bolt-on bottom lowers hitch point 90 mm (3.5")
Clevis throat opening	90 mm (3.5")
Height to top of drawbar	419 to 522 mm (16.5" to 20.6") (depending on tire size)
Maximum offset	366 mm (14.4")

BRAKES

Type	single dry disc
Disc diameter	508 mm (20")
Disc thickness	19 mm (0.75")
Service brake	hydraulic-actuated foot pedal
Park brake	cable-operated mechanically-actuated
Caliper	single w/dual pads

STEERING

Pump	open center gear pump
Maximum pressure	17.2 bar (2500 PSI)
Flow at rated engine speed	
2290, 2335, 2375	102 L/min (27 GPM)
2360, 2425	114 L/min (30 GPM)
Cylinder diameter	89 mm (3.5")
Cylinder stroke	419 mm (16.5")
Maximum articulation angle (no blocks)	42°
Steering column	
Tilt	45°
Telescope	100 mm (3.88")
Steering wheel	
Diameter	406 mm (16")
Turning effort (engine idle)	1.7 N-m (1.25 ft. lbs.)

SECTION 5 - SPECIFICATIONS

ELECTRICAL

	2290	2335	2375	2360	2425
Batteries	12V Low Maintenance			12V Low Maintenance	
Power (SAE Group 31)	625 CCA			950 CCA	
Qty	3			3	
Alternator	12V - 130-amp Maximum Voltage - 13.8 V				
Starter	12V Negative Ground				
Lights	55W Quartz Halogen Sealed Beam				
Qty	4 - 3x5, 6 - 4x6				
Optional	4 - 3x5 Roof Mounted				
Wide Transport Marker Lights	2 - Extendable arm mounted lights				
Safety	4 - Amber Roof Mounted Flashers				
	2 - Stop/Tail Rear Fender Mounts				

AIR-CONDITIONING SYSTEM/HEATING SYSTEM

Refrigerant R-134A
 Refrigerant charge 2.27± 0.1 kg (5.0± 0.25 lbs.)
 Cooling capacity 24,000 btu/hr
 Heating capacity 23,250 btu/hr
 Fan volume 14.2 mm³/min (500 cfm)
 Filter area 1716 cm² (266 in²)
 Compressor
 Oil capacity 310 ml (10.4 oz)
 Number of pistons 7
 Displacement 154.9 cc per rev (9.5 cu in per rev)
 Clutch electromagnetic actuation

SECTION 5 - SPECIFICATIONS

CAPACITIES

Component	2290	2335	2375	2360	2425
Fuel Tanks					
Total Capacity - L (gal)	927 (245)				
Usable Capacity - L (gal)	871 (230)				
Hydraulic					
Reservoir - L (gal)	75.7 (20)				
Total System w/o 3-Point Hitch - L (gal)	117 (31)				
Total System w/ 3-Point Hitch - L (gal)	123.7 (33)				
Axle/Differential					
Differential Housing - L (gal)	26.9 (7.1)		26.9 (7.1)		26.9 (7.1)
Planetary Hubs (each) - L (gal)	7.6 (2)		HD Axle - 12 (3.2)		12 (3.2)
Total System (one axle) - L (gal)	42 (11.1)		HD Axle 51 (13.5)		51 (13.5)
Engine					
Engine Crankcase - L (gal)	34 (9.0)				
Oil Filter - L (gal)	2.7 (0.7)				
Cooling System - L (gal)	55 (14.5)		59 (15.6)	60 (15.9)	60 (15.9)
Air-Conditioning System					
Refrigerant - kg (lbs)	2.3±.1 (5.0±.25)				
Refrigerant Oil Capacity - ml (oz)	307.5 (10.4)				
Windshield Washer					
Reservoir - L (qt)	3.3 (3.5)				
Brake System					
Reservoir - ml (oz)	296 (10)				
Total System - ml (oz)	896 (30.3)				
Transmission System					
w/o PTO - L (gal)	QS Trans. - 37.9 (10) PS Trans. - 47.4 (12.5)				
w/ PTO - L (gal)	QS Trans. - 41.6 (11) PS Trans. - 51.2 (13.5)				

SECTION 5 - SPECIFICATIONS

LUBRICANTS/FLUIDS

Component	Specification
Engine Oil	15W40 API CI4
Transmission Oil Quad Shift III	See Note 1 below
Powershift	See Note 1 below
Hydraulic Oil	See Note 1 below
Differential Oil	85W140 GL5 - ABOVE 0°C (32°F) 80W90 GL5 - BELOW 0°C (32°F)
Planetary Hub Oil	85W140 GL5 - ABOVE 0°C (32°F) 80W90 GL5 - BELOW 0°C (32°F)
Brake Fluid	DOT 3
Grease - Severe service for the articulation / drag link bearings	LITHIUM BASE EP HIGH TEMPERATURE WITH MOLY
Engine Coolant (Includes DCA4 Additive)	FACTORY FILLED - FULLY FORMULATED (PINK IN COLOR)
Fuel	2-D - ABOVE -7°C (20°F) 1-D - BELOW -7°C (20°F)
A/C Refrigerant	R134A

Note 1:

Lubricant brand equivalency chart for the transmission/hydraulic systems:

BRAND	Imperial Oil Esso	Shell	Texaco	Amoco	Petro-Canada	Exxon Mobil
SPECIFICATION	Hydraul 56	Donax TD	TDH	2016 (USA) 01055 (Can)	Duratran	424

SPEED CHART

SPEEDS AT 2100 ENGINE RPM - Km/h (MPH)

TRANSMISSION	TRACTOR MODELS	TIRE GROUP	LOW RANGE				MEDIUM RANGE				HIGH RANGE				REVERSE			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
12 X 4 QUAD SHIFT III	2290	A	4.2 (2.6)	5.0 (3.1)	5.8 (3.6)	6.7 (4.2)	7.7 (4.8)	9.0 (5.6)	10.4 (6.5)	12.2 (7.6)	15.8 (9.9)	18.4 (11.5)	21.4 (13.4)	25.1 (15.7)	5.4 (3.4)	6.4 (4.0)	7.4 (4.6)	8.6 (5.4)
	2335		4.3 (2.7)	5.1 (3.2)	5.9 (3.7)	7.0 (4.4)	8.0 (5.0)	9.3 (5.8)	10.9 (6.8)	12.6 (7.9)	16.5 (10.3)	19.4 (12.1)	22.6 (14.1)	26.2 (16.4)	5.8 (3.6)	6.7 (4.2)	7.8 (4.9)	9.1 (5.7)
	2360	C	4.6 (2.9)	5.3 (3.3)	6.2 (3.9)	7.2 (4.5)	8.3 (5.2)	9.8 (6.1)	11.4 (7.1)	13.3 (8.3)	17.3 (10.8)	20.2 (12.6)	23.5 (14.7)	27.4 (17.1)	5.9 (3.7)	6.9 (4.3)	8.2 (5.1)	9.6 (6.0)
	2375		3.7 (2.3)	4.5 (2.8)	5.3 (3.3)	6.4 (4.0)	7.7 (4.8)	9.1 (5.7)	10.7 (6.7)	12.8 (8.0)	15.2 (9.5)	18.2 (11.4)	21.9 (13.7)	25.9 (16.2)	4.6 (2.9)	5.1 (3.2)	5.8 (3.6)	6.6 (4.1)
	2425		4.0 (2.5)	4.6 (2.9)	5.6 (3.5)	6.7 (4.2)	8.0 (5.0)	9.6 (6.0)	11.2 (7.0)	13.4 (8.4)	15.8 (9.9)	19.0 (11.9)	23.0 (14.4)	27.2 (17.0)	4.9 (3.1)	5.5 (3.4)	6.2 (3.9)	7.1 (4.4)
			4.1 (2.6)	5.0 (3.1)	5.8 (3.6)	7.0 (4.4)	8.3 (5.2)	9.9 (6.2)	11.7 (7.3)	14.1 (8.8)	16.6 (10.4)	19.8 (12.4)	24.0 (15.0)	28.3 (17.7)	5.1 (3.2)	5.8 (3.6)	6.6 (4.1)	7.6 (4.7)
12 X 2 POWERSHIFT	2290	A	3.7 (2.3)	4.5 (2.8)	5.3 (3.3)	6.4 (4.0)	7.7 (4.8)	9.1 (5.7)	10.7 (6.7)	12.8 (8.0)	15.2 (9.5)	18.2 (11.4)	21.9 (13.7)	25.9 (16.2)	4.6 (2.9)	5.1 (3.2)	5.8 (3.6)	6.6 (4.1)
	2335		4.0 (2.5)	4.6 (2.9)	5.6 (3.5)	6.7 (4.2)	8.0 (5.0)	9.6 (6.0)	11.2 (7.0)	13.4 (8.4)	15.8 (9.9)	19.0 (11.9)	23.0 (14.4)	27.2 (17.0)	4.9 (3.1)	5.5 (3.4)	6.2 (3.9)	7.1 (4.4)
	2360	C	4.1 (2.6)	5.0 (3.1)	5.8 (3.6)	7.0 (4.4)	8.3 (5.2)	9.9 (6.2)	11.7 (7.3)	14.1 (8.8)	16.6 (10.4)	19.8 (12.4)	24.0 (15.0)	28.3 (17.7)	5.1 (3.2)	5.8 (3.6)	6.6 (4.1)	7.6 (4.7)
	2375		3.7 (2.3)	4.5 (2.8)	5.3 (3.3)	6.4 (4.0)	7.7 (4.8)	9.1 (5.7)	10.7 (6.7)	12.8 (8.0)	15.2 (9.5)	18.2 (11.4)	21.9 (13.7)	25.9 (16.2)	4.6 (2.9)	5.1 (3.2)	5.8 (3.6)	6.6 (4.1)
	2425		4.0 (2.5)	4.6 (2.9)	5.6 (3.5)	6.7 (4.2)	8.0 (5.0)	9.6 (6.0)	11.2 (7.0)	13.4 (8.4)	15.8 (9.9)	19.0 (11.9)	23.0 (14.4)	27.2 (17.0)	4.9 (3.1)	5.5 (3.4)	6.2 (3.9)	7.1 (4.4)
			4.1 (2.6)	5.0 (3.1)	5.8 (3.6)	7.0 (4.4)	8.3 (5.2)	9.9 (6.2)	11.7 (7.3)	14.1 (8.8)	16.6 (10.4)	19.8 (12.4)	24.0 (15.0)	28.3 (17.7)	5.1 (3.2)	5.8 (3.6)	6.6 (4.1)	7.6 (4.7)

TIRE GROUP A	Rolling Radius	TIRE GROUP B	Rolling Radius	TIRE GROUP C	Rolling Radius
24.5 R32 R1 Radial	785 mm (30.9")	20.8 x 38 R1 Bias	836 mm (32.9")	20.8 R42 Radial	874 mm (34.4")
30.5 R32 R1 Radial	787 mm (31.0")	30.5 x 32 R2 Bias	836 mm (32.9")	20.8 R42 R1W Radial	876 mm (34.5")
18.4 R38 Radial	790 mm (31.1")	18.4 R42 Radial	843 mm (33.2")	20.8 x 42 R1 Bias	889 mm (35.0")
18.4 x 38 R1 Bias	813 mm (32.0")	700/65 x 38 Special	848 mm (33.4")	750/65 x 38 Special	894 mm (35.2")
24.5 x 32 R1 Bias	820 mm (32.3")	20.8 x 38 R2 Bias	848 mm (33.4")	850/60 x 38 Special	894 mm (35.2")
18.4 x 38 R2 Bias	820 mm (32.3")	710/70 R38 Radial	851 mm (33.5")	18.4 R46 Radial	894 mm (35.2")
20.8 R38 Radial	823 mm (32.4")	710/70 R38 R1W Radial	856 mm (33.7")	20.8 R42 R2 Radial	914 mm (36.0")
20.8 R38 R1W Radial	826 mm (32.5")	18.4 R42 Radial	866 mm (34.1")		
30.5 x 32 R1 Bias	820 mm (32.3")				

To calculate ground speed at an engine speed other than 2100 RPM, use the following formula:

$$\left(\frac{\text{DESIRED ENGINE SPEED}}{2100 \text{ RPM}} \right) \times \text{CHART SPEED} = \text{GROUND SPEED}$$

LIQUID BALLAST TABLE

The following table provides data on the filling of tractor tires with water or calcium chloride solution based on valve level 75% full.

Tire Size	Weight of Water	Weight of 1.6 kg (3-1/2 lbs.) CaCl ₂	Weight of 2.3 kg (5 lbs.) CaCl ₂	Total Solution in Tire @ 75% Fill
18.4 R38	416kg (917 lbs.)	505 kg (1113 lbs.)	539 kg (1187 lbs.)	416 L (110 gals.)
18.4 R42	435 kg (959 lbs.)	527 kg (1160 lbs.)	563 kg (1240 lbs.)	435 L (115 gals.)
18.4 R46	488 kg (1075 lbs.)	596 kg (1314 lbs.)	635 kg (1400 lbs.)	488 L (129 gals.)
20.8 R38	530 kg (1168 lbs.)	645 kg (1421 lbs.)	690 kg (1521 lbs.)	530 L (140 gals.)
20.8 R42	560 kg (1234 lbs.)	682 kg (1503 lbs.)	726 kg (1600 lbs.)	560 L (148 gals.)
24.5 R32	643 kg (1418 lbs.)	785 kg (1729 lbs.)	835 kg (1841 lbs.)	644 L (170 gals.)
30.5 R32	821 kg (1809 lbs.)	999 kg (2202 lbs.)	1065 kg (2347 lbs.)	821 L (217 gals.)
480/80 R46	488 kg (1075 lbs)	596 kg (1314 lbs)	617 kg (1360 lbs)	488 L (129 gals.)
520/85 R42	560 kg (1234 lbs)	682 kg (1503 lbs)	726 kg (1600 lbs)	560 L (148 gals.)
650/65 R38	609 kg (1343 lbs)	741 kg (1634 lbs)	787 kg (1734 lbs)	609 L (161 gals.)
700/65 R38	695 kg (1532 lbs.)	848 kg (1858 lbs.)	901 kg (1987 lbs.)	695 L (184 gals.)
710/70 R38	760 kg (1676 lbs.)	924 kg (2036 lbs.)	986 kg (2174 lbs.)	761 L (201 gals.)
750/65 R38	880 kg (1936 lbs.)	1071 kg (2356 lbs.)	1141 kg (2511 lbs.)	878 L (232 gals.)
800/65 R32	847 kg (1868 lbs)	1031 kg (2273 lbs)	1095 kg (2415 lbs)	848 L (224 gals.)
850/60 R38	995 kg (2188 lbs.)	1210 kg (2662lbs.)	1290 kg (2837 lbs.)	992 L (262 gals.)
900/50 R42	857 kg (1893 lbs)	1047 kg (2309 lbs)	1114 kg (2455 lbs)	1060 L (280 gals.)

3.8 liter (1 gallon) of water weighs 3.8 Kg (8.3 lbs).

3.8 liter (1 gallon) of 1.6 Kg (3-1/2 lbs). CaCl₂ weighs 4.6 Kg (10.1 lbs).

3.8 liter (1 gallon) of 2.3 Kg (5 lbs). CaCl₂ weighs 4.9 Kg (10.8 lbs).

SECTION 5 - SPECIFICATIONS

TIRE LOAD AND INFLATION TABLES

Use the following chart and guidelines to determine the proper inflation pressure for tires on a given axle. Divide the axle weight by the number of tires on an axle to determine the load to be carried by each tire. **The values shown in the shaded areas are for bias ply tires.**

U.S. Measure

Inflation Pressure (PSI)	8	9	10	12	14	16	18	20	22	24
18.4 R38										
Singles - lbs.	3500	3760	3980	4440	4860	5260	5680	5980	6330	6660
Duals - lbs.	3080	3310	3500	3910	4280	4630	5000	5260	5570	5860
18.4 R42										
Singles - lbs.	3700	3960	4200	4680	5120	5540	6000	6310	6670	7020
Duals - lbs.	3700	3960	4200	4680	5120	5540	6000	6310	6670	7020
18.4 R46										
Singles - lbs.	3880	4160	4420	4920	4920	5820	6150			
Duals - lbs.	3410	3660	3890	4330	4330	5120	5410			
Triples - lbs.	3170	3430	3610	4050	4400	4790	5040			
20.8 R38										
Singles - lbs.	4240	4540	4840	5380	5880	6350	6800	7250	7670	8070
Duals - lbs.	3730	4000	4260	4730	5170	5590	5980	6380	6750	
20.8 R42										
Singles - lbs.	4480	4800	5100	5680	6200	6700	7150	7650	8090	
Duals - lbs.	3940	4220	4490	5000	5460	5900	6290	6730	7120	
Triples - lbs.	3670	3940	4180	4660	5080	5490	5860	6730	7120	
24.5 R32										
Singles - lbs.	5100	5460	5800	6450	7050	7650	8250	8700	9200	9680
Duals - lbs.	4490	4800	5100	5680	6200	6730	7260	7660	8100	8520
30.5 R32										
Singles - lbs.	6150	6600	6950	7600	8550	9100	9650			
Duals - lbs.	5410	5810	6120	6690	7520	8010	8490			
480/80 R46										
Singles - lbs.	4050	4300	4550	5080	5450	6000	7150	7150	7650	8000
Duals - lbs.	3600	3780	4000	4470	4800	5850	6300	6290	6700	7050
Triples - lbs.	3350	3530	3700	4170	4500	5450	5850	5860	6550	6550
520/85 R42										
Singles - lbs.	4650	5200	5675	6275	7000	7700	8250	8825		
Duals - lbs.	4100	4575	5000	5525	6150	6775	7250	7750		
Triples - lbs.	3825	4250	4650	5150	5750	6325	6775	7225		
650/65 R38										
Singles - lbs.	4780	5340	5840	6450	7200	7840	8250	8800		
Duals - lbs.	4215	4700	5150	5675	6350	6900	7250	7750		
700/65 R38*										
Singles - lbs.	5600	5900	6450	6980	7950	8400				
Duals - lbs.	4930	5190	5675	6140	6995	7390				

SECTION 5 - SPECIFICATIONS

710/70 R38									
Singles - lbs.	6400	6950	7400	8050	8550	9650	10700		
Duals - lbs.	5620	6110	6500	7080	7520	8490	9460		
750/65 R38*									
Singles - lbs.	5969	6509	7048	7599	8084	9020			
Duals - lbs.	5253	5728	6203	6687	7114	7937			
800/65 R32									
Singles - lbs.	6200	6940	7600	8375	9225	10000	10700	11550	
Duals - lbs.	5460	6120	6675	7375	8100	8800	9425	10175	
850/60 R38*									
Singles - lbs.	6564	7169	7753	8260	8877	9912			
Duals - lbs.	5776	6300	6823	7269	7811	8722			
900/50 R42									
Singles - lbs.	6425	7150	7850	8650	9650	10625	11400	12000	
Duals - lbs.	5650	6275	6900	7625	8500	9350	10025	10560	

Minimum tire pressure for radial tires: 8 PSI (55 kPa) (singles, duals, or triples)

Minimum tire pressure for bias tires: Singles: 16 PSI (110 kPa)

Duals: 12 PSI (83 kPa)

Triples: 12 PSI (83 kPa)

*These special tire sizes have a minimum inflation pressure of 8 PSI (55 kPa) (singles, duals, or triples).

SECTION 5 - SPECIFICATIONS

Metric Measure

Inflation Pressure (kPa)	55	62	69	83	97	110	124	138	152	166
18.4 R38										
Singles - kg	1597	1716	1816	2026	2218	2400	2592	2729	2888	3039
Duals - kg	1405	1510	1597	1784	1953	2113	2282	2400	2542	2674
18.4 R42										
Singles - kg	1688	1807	1916	2135	2336	2528	2738	2879	3044	3203
Duals - kg	1488	1588	1688	1880	2058	2227	2409	2532	2678	2820
18.4 R46										
Singles - kg	1770	1898	2017	2245	2245	2656	2806			
Duals - kg	1556	1670	1775	1976	1976	2336	2469			
Triples - kg	1435	1560	1640	1835	1995	2175	2295			
20.8 R38										
Singles - kg	1935	2072	2208	2455	2683	2898	3103	3308	3500	3682
Duals - kg	1702	1825	1944	2158	2359	2551	2729	2911	3080	
20.8 R42										
Singles - kg	2044	2190	2327	2592	2829	3057	3263	3491	3691	
Duals - kg	1798	1926	2049	2282	2491	2692	2870	3071	3249	
Triples - kg	1675	1798	1907	2126	2318	2505	2674	3071	3249	
24.5 R32										
Singles - kg	2327	2491	2647	2943	3217	3491	3764	3970	4198	4417
Duals - kg	2049	2190	2327	2592	2829	3071	3313	3495	3696	3888
30.5 R32										
Singles - kg	2800	3000	3150	3450	3875	4125	4375			
Duals - kg	2465	2640	2770	3035	3410	3630	3850			
480/80 R45										
Singles - kg	1837	1950	2064	2304	2472	2722	3243	3243	3470	3629
Duals - kg	1633	1715	1814	2028	2177	2654	2858	2853	3039	3198
Triples - kg	1520	1601	1678	1894	2041	2472	2654	2658	2971	2971
520/85 R42										
Singles - kg	2109	2359	2574	2846	3175	3493	3742	4003		
Duals - kg	1860	2075	2268	2506	2790	3073	3289	3515		
Triples - kg	1734	1927	2109	2336	2608	2868	3073	3277		
650/65 R38										
Singles - kg	2168	2422	2648	2925	3266	3556	3742	3992		
Duals - kg	1912	2132	2336	2574	2880	3130	3289	3515		
700/65x38*										
Singles - kg	2554	2690	2941	3183	3625	3830				
Duals - kg	2248	2367	2588	2800	3190	3370				
710/70 R38										
Singles - kg	2920	3171	3377	3673	3901	4403	4882			
Duals - kg	2564	2788	2966	3231	3431	3874	4317			

SECTION 5 - SPECIFICATIONS

750/65 R38*									
Singles - kg	2708	2953	3197	3447	3667	4091			
Duals - kg	2383	2599	2814	3033	3227	3600			
800/65 R32									
Singles - kg	2812	3148	3447	3799	4184	4536	4853	5239	
Duals - kg	2477	2776	3028	3345	3674	3992	4275	4615	
850/60 R38									
Singles - kg	2977	3247	3517	3747	4027	4496			
Duals - kg	2620	2858	3095	3298	3543	3957			
900/50 R42									
Singles - kg	2914	3243	3561	3924	4377	4819	5171	5443	
Duals - kg	2563	2846	3130	3459	3856	4241	4547	4790	

Minimum tire pressure for radial tires: 55 kPa (8 PSI) (singles, duals, or triples)

Minimum tire pressure for bias tires: Singles: 110 kPa (16 PSI)
 Duals: 83 kPa (12 PSI)
 Triples: 83 kPa (12 PSI)

*These special tire sizes have a minimum inflation pressure of 55 kPa (8 PSI) (singles, duals, or triples).

TIRE LOADED RADIUS

The loaded radius by tire size is shown in the following table. Radius is from the center of the axle to the ground at moderate inflation pressure.

Tire Size	Radius
24.5 R32 R1 Bias	819 mm (32.2")
24.5 R32 R1 Radial	784 mm (30.9")
30.5 R32 R1 Bias	820 mm (32.3")
30.5 R32 R2 Bias	836 mm (32.9")
30.5 R32 R1 Radial	787 mm (31.0")
800/65 R32 R1W Radial	831 mm (32.7")
18.4 R38 R1 Bias	813 mm (32.0")
18.4 R38 R2 Bias	818 mm (32.2")
18.4 R38 R1 Radial	790 mm (31.1")
20.8 R38 R1 Bias	836 mm (32.9")
20.8 R38 R2 Bias	849 mm (33.4")
20.8 R38 R1 Radial	823 mm (32.4")
20.8 R38 R1W Radial	826 mm (32.5")
650/65 R38 R1W Radial	823 mm (32.4")
700/65 R38 Special	849 mm (33.4")
710/70 R38 R1 Radial	852 mm (33.5")
710/70 R38 R1W Radial	856 mm (33.7")
750/65 R38 Special	894 mm (35.2")
850/60 R38 Special	894 mm (35.2")
18.4 R42 R1 Bias	865 mm (34.1")
18.4 R42 R1 Radial	844 mm (33.2")
20.8 R42 R1 Bias	890 mm (35.0")
20.8 R42 R1 Radial	873 mm (34.4")
20.8 R42 R1W Radial	876 mm (34.5")
20.8 R42 R2 Radial	915 mm (36.0")
520/85 R42 R1W Radial	876 mm (34.5")
900/50 R42 R1W Radial	871 mm (34.3")
18.4 R46 R1 Radial	893 mm (35.2")
480/80 R46 R1W Radial	899 mm (35.4")

SECTION 5 - SPECIFICATIONS

Part Numbers For High Usage Items

Component	2290	2335	2375	2360	2425
Belt, A/C Compressor	9707241				
Belt, Alternator	See fan belt			86020846	
Belt, Fan	86030708			86020845	
Belt, Water Pump	N/A			V57260	
Block Heater	86030710			86013631	
Block Heater Cord	9706670			9706671	
Ether, Canister	V30347				
Filter, Cab	9707323				
Filter, Engine Air (Inner)	86029149				
Filter, Engine Air (Outer)	86033101			86029150	
Filter, Engine Fuel (Primary Electronic)	86029143				
Filter, engine fuel water separator	86029143				
Filter, Engine Oil	86030711			86029144	
Filter, Engine Water	9672301				
Filter, Hydraulic	86029146				
Filter, Transmission	86029146				
Flasher	86000362				
Fuse 3-amp	61118				
Fuse 5-amp	9623775				
Fuse 10-amp	V61120				
Fuse 15-amp	9623774				
Fuse 20-amp	9804895				
Fuse 25-amp	9846342				
Fuse 30-amp	92277				
Fuse Puller	86000363				
Key, Ignition	86502201				

Replacement Bulbs

Description	BVI Bulb Number
Fuel Gauge Lamp	N/A (IND. STD. NO. 1893)
Dash Warning Lamp	86000318
Trouble Lamp	N/A (IND. STD. NO.232)
RH Console Lamp	86000527
Cab Interior Lamp	470016
RH Head Lamps	86001156
LH Head Lamps	86001156
Fender-Mount Worklamps	N/A (IND. STD. NO.4929415)
RH Roof-Mount Worklamps	86001156
LH Roof-Mount Worklamps	86001156
Stop/Tail Lamps	86537133
Wide Transport Marker Lights	529068
TPM Lamp	N/A (IND. STD. NO. 194)
Roof Warning Lamps	529068

SECTION 5 - SPECIFICATIONS

Paint (Spray Cans)

Color	Part Number
Red	86029274
Cream	86029270

OPTIONAL EQUIPMENT

The following chart lists the optional field- and factory installed accessories that are available for 2290, 2335, 2360, 2375 and 2425 tractors. Not all kits are available for all models. Consult your Buhler Versatile dealer for option availability.

KIT PART NUMBER	DESCRIPTION	INSTALLATION TIME (Hours)	INSTALLATION INSTRUCTIONS PUBLICATION NUMBER
86030576	Front Weight Kit (12 weights)	2.0	89002203
86027842	Front Weight Kit (39 weights)	2.0	89002203
86027840	Rear Weight Kit (not compatible with 3PTO or 3-point hitch)	2.0	89002203
86070707	3-Point Hitch w/PTO (not compatible with Rear Weight Kit)	12.0	89002215
86070706	3-point Hitch w/o PTO (not compatible with Rear Weight Kit)	12.0	89002215
86070703	33° and 38° Articulation Block Kit	0.5	89002200
86070702	31° Articulation Block Kit	0.5	89002200
109029	Transmission Sump Heater (12 X 4 Quadshift III Non-PTO Only)	2.0	89002208
V59624	Trailer 7 Pin Electrical Connector	0.5	N/A
86027919	Quick Hitch Kit (3-Point Hitch equipped tractors only)	0.5	89002202
9707118	Roof-Mounted Front and Rear Worklight Kit	1.5	89002204
86030679	(1.5") Diameter Hitch Pin Kit (Auto ASN 300918)	0.5	89002201
86010513	(3/4") Coupler Kit (Blue Tractor)	1.5	89002206
86030999	(3/4") Coupler Kit (Red Tractor)	1.5	89002206
86027940	(1.5") Diameter Pin Kit (Manual BSN 300919)	0.5	89002201
86029617	Control Monitor Bracket Kit	0.5	89002216
86030428	Tractor Performance Monitor (TPM) Kit	2.0	89002222
89029081	PTO Kit 12-speed Transmission (not compatible with Rear Weight Kit)	18.0	89002212
86029082	PTO Kit Powershift Transmission (not compatible with Rear Weight Kit)	18.0	89002212
86001101	Implement Status Switch Harness Extension (TPM)	0.5	89002210
86032122	Auxiliary 3-Pin Connector Kit	0.5	89002205
9702509	Implement Status Switch (TPM only)	1.0	89002211
86027838	Auxiliary Rear Weight Kit (not compatible with 3-point hitch)	2.0	89002203
86027932	Debris/Mud Kit	10.0	89002207
86029318	Deluxe Radio-with Cassette/Weather Band	0.5	N/A

SECTION 5 - SPECIFICATIONS

OPTIONAL EQUIPMENT

The following chart lists the optional field- and factory installed accessories that are available for 2290, 2335, 2360, 2375 and 2425 tractors. Not all kits are available for all models. Consult your Buhler Versatile dealer for option availability.

86029319	Deluxe Radio with Premium Cassette/Weather Band	0.5	N/A
86029320	Deluxe Radio with Compact Disc Player/Weather Band	0.5	N/A
86029940	Deluxe External Mirror Kit	2.0	89002220
9707116	French Canadian Decal Kit	0.5	89002224
86513451	Radar "Y" Adapter Harness	0.2	N/A
86031188	Backup Alarm Kit (Powershift Equipped Tractors)	1.0	89002226
86031297	Motorized Hydraulic Flow Control Kit	2.5	89002233
86030510	Monitor Bracket/Power Bar Kit	1.2	89002234
86033740	Cigar lighter power adapter kit	0.1	N/A
86027840	Rear Weight Kit (not compatible with 3PTO or 3-point hitch)	2.0	89002203
86034113	Drawbar Support Kit (less 3pt hitch)	0.8	89002250
86031163	Rotating Beacon Kit	2.5	89002229

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HARDWARE TORQUE VALUES

Check the tightness of hardware periodically.

Use the following charts to determine the correct torque when checking, adjusting or replacing hardware on the tractor.

IMPORTANT: DO NOT use the values listed in the charts if a different torque value or tightening procedure is specified in this manual for a specific application. Torque values listed are for general use only.

Make sure fastener threads are clean and not damaged

NOTE: A torque wrench is necessary to properly tighten hardware.

MINIMUM HARDWARE TIGHTENING TORQUES

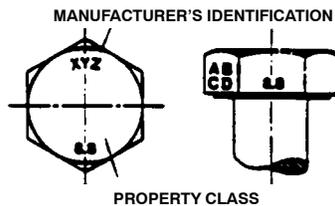
IN FOOT POUNDS (NEWTON-METERS) FOR NORMAL ASSEMBLY APPLICATIONS

METRIC HARDWARE AND LOCKNUTS

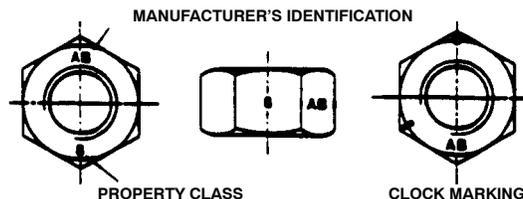
NOMINAL SIZE	CLASS 5.8		CLASS 8.8		CLASS 10.9		LOCKNUT CL.8 w/CL8.8 BOLT
	UNPLATED	PLATED w/ZnCr	UNPLATED	PLATED w/ZnCr	UNPLATED	PLATED w/ZnCr	
M4	15* (1.7)	19* (2.2)	23* (2.6)	30* (3.4)	33* (3.7)	42* (4.8)	16* (1.8)
M6	51* (5.8)	67* (7.6)	79* (8.9)	102* (12)	115* (13)	150* (17)	56* (6.3)
M8	124* (14)	159* (18)	195*(22)	248* (28)	274* (31)	354* (40)	133* (15)
M10	21 (28)	27 (36)	32 (43)	41 (56)	45 (61)	58 (79)	22 (30)
M12	36 (49)	46 (63)	55 (75)	72 (97)	79 (107)	102 (138)	39 (53)
M16	89 (121)	117 (158)	137 (186)	177 (240)	196 (266)	254 (344)	97 (131)
M20	175 (237)	226 (307)	277 (375)	358 (485)	383 (519)	495 (671)	195 (265)
M24	303 (411)	392 (531)	478 (648)	619 (839)	662 (897)	855 (1160)	338 (458)

NOTE: Torque values shown with * are inch pounds.

IDENTIFICATION HEX CAP SCREWS AND CARRIAGE BOLTS CLASSES 5.6 AND UP.



HEX NUTS AND LOCKNUTS CLASSES 05 AND UP.



MINIMUM HARDWARE TIGHTENING TORQUES IN FOOT POUNDS (NEWTON-METERS) FOR NORMAL ASSEMBLY APPLICATIONS

INCH HARDWARE AND LOCKNUTS

NOMINAL SIZE	SAE GRADE 2		SAE GRADE 5		SAE GRADE 8		LOCKNUTS		NOMINAL SIZE
	UNPLATED or PLATED SILVER	PLATED w/ZnCr GOLD	UNPLATED or PLATED SILVER	PLATED w/ZnCr GOLD	UNPLATED or PLATED SILVER	PLATED w/ZnCr GOLD	GR.B w/GR5 BOLT	GR.C w/GR8 BOLT	
1/4	55* (6.2)	7.2* (8.1)	86* (9.7)	112* (13)	121* (14)	157* (18)	61* (6.9)	86* (9.8)	1/4
5/16	115* (13)	149* (17)	178* (20)	229* (26)	250* (28)	324* (37)	125* (14)	176* (20)	5/16
3/8	17 (23)	22 (30)	26 (35)	34 (46)	37 (50)	48 (65)	19 (26)	26 (35)	3/8
7/16	27 (37)	35 (47)	42 (57)	54 (73)	59 (80)	77 (104)	30 (41)	42 (57)	7/16
1/2	42 (57)	54 (73)	64 (87)	83 (113)	91 (123)	117 (159)	45 (61)	64 (88)	1/2
9/16	60 (81)	77 (104)	92 (125)	120 (163)	130 (176)	169 (229)	65 (88)	92 (125)	9/16
5/8	83 (112)	107 (145)	128 (174)	165 (224)	180 (244)	233 (316)	90 (122)	127 (172)	5/8
3/4	146 (198)	189 (256)	226 (306)	293 (397)	319 (432)	413 (560)	160 (217)	226 (306)	3/4
7/8	142 (193)	183 (248)	365 (495)	473 (641)	515 (698)	667 (0904)	258 (350)	364 (494)	7/8
1	213 (289)	275 (373)	547 (742)	708 (960)	773 (1048)	1000 (1356)	386 (523)	545 (739)	1

NOTE: Torque values shown with * are inch pounds.

IDENTIFICATION CAP SCREWS AND CARRIAGE BOLTS



GRADE 2 SAE



GRADE 5 SAE



GRADE 8 SAE



REGULAR NUTS

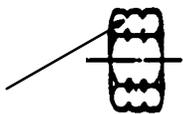


SAE GRADE 5
HEX NUTS



SAE GRADE 6
HEX NUTS

LOCKNUTS



GRADE IDENTIFICATION

GRADE A NO NOTCHES

GRADE B ONE CIRCUMFERENTIAL NOTCH

GRADE C TWO CIRCUMFERENTIAL NOTCHES



GRADE IDENTIFICATION

GRADE A NO MARKS

GRADE B THREE MARKS

GRADE C SIX MARKS

MARKS NEED NOT BE LOCATED AT CORNERS



GRADE IDENTIFICATION

GRADE A NO MARK

GRADE B LETTER B

GRADE C LETTER C

INDEX

Adding diesel fuel	3-4	Engine air intake and exhaust specifications	5-15
Additional cab controls	1-23	Engine block heater	2-24
Additional features, Electronic instrument control system	2-94	Engine break-in	2-166
Air conditioning system specifications	5-20	Engine coolant temperature gauge	2-15
Articulation blocks	2-154	Engine diagnostics	2-100
Articulation lock	2-20	Engine identification	1-6
Ashtray and cigarette lighter	2-12	Engine oil pressure gauge	2-15
Audible/Visual Alarms of the electronic instrument control system	2-72	Engine overspeed condition	2-91
Axles / differentials specifications	5-18	Engine side covers	1-10
Ballasting	2-156	Engine specifications	5-13
Base tractor weight	5-9	Engine starting	2-21
Battery access	3-6	Entering the cab	2-3
Battery charging precautions	1-34	Ether aid button	2-12
Battery cover	1-10	External lighting	1-18
Bleeding remote cylinders	2-132	Feedback potentiometer	2-147
Brakes specifications	5-19	First 50-hour service	3-1
Braking system	2-33	Flexible maintenance intervals	3-1
Break-in period	2-166	Flow control adjustment	2-128
Break-in periods	2-166	Fluids specifications	5-22
Cab	2-3	Foot and floor controls	1-22
Cab controls, additional	1-20	Foot Brake	2-33
Cab dome light	2-45	Forward operator controls	1-21
Cab-mounted accessories	1-28	Front and rear axle identification	1-9
Installation	1-28	Front and rear windshield washer switch	2-14
Calculation of ballast	2-159	Front grill	3-6
Calibrating the electronic instrument control system	2-61	Front windshield wiper switch	2-13
Capacities	5-21	Fuel level	2-86
Center PTO articulation drive shaft	1-11	Fuel requirements	3-3
Cold weather starting	2-22	Fuel storage	3-2
Combination horn, turn signal, and headlight dimmer switch lever	2-13	Fuel system specifications	5-15
Control console	2-102	Fueling the tractor	3-2
Controls and instrument overview	1-20	Gear shifting within a range	2-36
Cooling system specifications	5-15	General dimensions	5-1
Coupler connection	2-130	General information	1-1
Cruise control operation	2-26	Horn	2-13
Setting	2-26	Hardware torque values	5-34
Alternate engine speed overrun	2-27	Hauling the tractor on a transporter	1-36
Deceleration (manual or pedal)	2-28	Headlights (high/low beam)	2-13
Exiting cruise mode	2-28	Headlight flash	2-13
Decelerator Pedal	2-40	Heating system specifications	5-20
Delivery Reports	5-39	High engine coolant temperature	2-81
Differential lock	2-40	Hitch adjustments	2-139
Drawbar assembly	2-111	Hood panels, opening	3-5
Manual hitch pin	2-111, 2-113	Hood panels, removing	3-5
Automatic hitch pin	2-111, 2-114	Hydraulic motor applications	2-134
Drawbar loading	2-116	Hydraulic system	2-123, 5-18
Drawbar pin kit	2-115	Hydraulic system filter bypass	2-74
Drawbar positioning	2-142	Hydraulic system operation	2-123
Drawbar specifications	5-19	Identification numbers	1-5
Drivelines	5-17	Ignition switch	2-11
Driving the tractor	2-41	Implement CB radio and cellular phone	1-28
Electrical specifications	5-20	Implement connection	2-146
Electrical system high/low voltage	2-84	Implement disconnect	2-146
Electronic instrument control system	2-49	Implement gauges	1-28
Emissions warranty	0-2	Implement hook-up	2-149
Engine access	3-5	Implement monitor boxes	1-28
		Implement safety chains	2-116
		Implement status switch	2-103, 2-110
		Implement transport	2-117
		Inch Hardware and locknuts chart	5-35

Introduction	1-1	Precautionary statements	0-5, 2-2
Liquid ballast table	5-24	Pre-operation checklist	1-37
Lockout levers	2-127	Pressure release detent adjustment	2-129
Low coolant level	2-79	Prestart Inspection	2-21
Low engine oil pressure	2-75	Preventing system contamination	3-1
Lubricants specifications	5-22	Programming and calibrating	2-106
Lubrication	3-1	Proper Tire selection	2-153
Lubrication and maintenance chart	3-8	PTO operation	2-118
Lubrication and maintenance, as required	3-67	Quick couplers	2-130
Lubrication and maintenance, every 10 hours or daily	3-10	Quad Shift III 12x4 operation	2-34
Lubrication and maintenance, every 50 hours	3-28	Quad Shift III shifting	2-35
Lubrication and maintenance, every 250 hours	3-33	Quick hitch operation (optional)	2-145
Lubrication and maintenance, every 500 hours	3-42	Radar ground speed sensor	2-102
Lubrication and maintenance, every 1000 hours	3-51	Radio (optional equipment)	2-32
Lubrication and maintenance, every 1500 hours or yearly	3-54	Rear window wiper switch	2-14
Lubrication and maintenance, every 2000 hours or 2 years	3-62	Remote control operation	2-126
Lubrication and maintenance, indicated by warning light	3-65	Remote valve access	3-6
Lubrication and maintenance	3-1	Removing the hood panels	3-5
Master PTO shield	1-11	Removing the shielding to gain access to components for inspection and maintenance	3-5
Maximum allowable machine weight	5-8	Replacement bulbs	5-30
Metric hardware and locknuts chart	5-34	Right console	2-18
Midmount weight kit	5-11	Right rear window	2-5
Mirror	2-32	Right side console controls	1-23
Normal operation of the electronic instrument control system	2-53	Roof-mounted work lights	2-47
Opening the hood panels	3-5	Safety	0-4
Operating continuous flow hydraulic equipment	2-132	Safety decals	0-11
Operating remote equipment, simultaneously	2-134	Seat adjustments	2-7
Operation	2-1	Seat belt	2-6
Operator seat controls	1-27	Shield, removing	3-5
Operator's control console	2-10	Shielding	1-10
Operator's controls	2-103	Specifications	5-1
Operator's manual holder	1-1	Speed chart	5-23
Operator's seat	2-6	Starter solenoid shield	1-10
Optional equipment	5-31	Steering specifications	5-19
Optional hydraulic equipment	2-135	Steering wheel and column	2-9
Optional transmission and axle weights	5-12	Stopping the tractor	2-29
Overall description	1-3	Storage tray	2-165
Overall heights	5-2	3-Point hitch (optional)	2-135
Overall widths	5-3	3-Point hitch description	2-135
Overhead climate controls	2-29	3-Point hitch controls	2-136
Air conditioning	2-30	Automatic raise/lower switch	2-136
Heater	2-29	Manual raise/lower switch	2-137
Pressurizer vents	2-31	Rotary depth control knob	2-137
Overhead controls	1-22	Rotary lowering rate control knob	2-138
Overview, controls and instruments	1-19	Rate of hitch raise adjustments	2-138
Park brake alert	2-89	3-Point hitch operation	2-150
Park Brake	2-33	3-Point Hitch (optional) specifications	5-19
Part numbers for high usage items	5-30	Throttle	2-26
Power take-off (optional) specifications	5-18	Tire configuration	1-12
Powershift transmission operation	2-37	Tire load and inflation table	5-25
Powershift transmission shifting	2-37	Tire load radius	5-29
		Tires and articulation blocks	2-153
		Tire weights	5-9
		Toolbox	2-165
		Towing the tractor	1-35
		TPM switch & ICMS	2-104
		Tractor boosting	2-25
		Tractor identification	1-6
		Tractor identification data	1-5

Tractor lighting	2-42	Troubleshooting, electronic instrument control system	4-14
Tractor orientation	1-3	Troubleshooting, engine	4-3
Tractor performance monitor (optional)	2-101	Troubleshooting, hydraulic system	4-10
Tractor shipping weight	5-8	Troubleshooting, operation	4-15
Tractor start-up and engine operation	2-21	Troubleshooting, power take-off (PTO)	4-15
Tractor statement of use	1-2	Troubleshooting, 3-point hitch	4-11
Tractor Terminology	1-3	Troubleshooting, tractor performance monitor	4-13
Trailer socket	2-47	Troubleshooting, transmission	4-6
Transmission identification	1-8	Turn signals	2-13
Transmission lubrication filter bypass	2-73	Turning geometry	5-8
Transmission operation	2-34	Vehicle identification plate	1-5
Transmission speed sensor failures	2-88	Warning light bar	2-16
Transmission specifications	5-16	Warranty statement	0-1
Trouble light	2-45	Weight packages	5-11
Troubleshooting	4-1	Welding and battery charging	1-34
Troubleshooting, 12x2 powershift transmission	4-6	Welding precautions	1-34
Troubleshooting, 12x4 Quad Shift III and 12x2 powershift transmission	4-7	Wide transport marker lights	2-46
Troubleshooting, brakes	4-11	Wheel tread width	5-5
Troubleshooting, cab	4-12	Yellow and red engine warning lights	2-92
Troubleshooting, electrical system	4-8		

DELIVERY REPORT

2290, 2335, 2360, 2375, 2425 TRACTORS

Delivery Date _____

Owner's Name _____

Address _____

Dealer's Name _____

Address _____

Tractor: Model No. _____ Serial No. _____

Engine: Model No. _____ Serial No. _____

Using the Operator's Manual as a guide, instruction was given as indicated by the check marks.

- Safety precautions and practice
- Lubrication points and schedule
- Use of optional equipment
- Operation of all controls
- Preseason service
- All safety shielding is installed
- End-of-season service
- Warranty coverage
- Proper use of operator's manual
- Customer given operator's manual
- Local Cummins Dealer/Distributor contacted with engine information

Dealer Representative's Signature _____

"I have been instructed in the operation, maintenance, and safety features of this machine as detailed in the operator's manual."

Owner's Signature _____





DELIVERY REPORT

2290, 2335, 2360, 2375, 2425 TRACTORS

Delivery Date _____

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- Customer given operator's manual
- Local Cummins Dealer/Distributor contacted with engine information

Dealer Representative's Signature _____

"I have been instructed in the operation, maintenance, and safety features of this machine as detailed in the operator's manual."

Owner's Signature _____



FIRST 50-HOUR SERVICE

CHECK AND ADJUST, AS REQUIRED

DESCRIPTION	OK	DESCRIPTION	OK
STATIONARY CHECKS - ENGINE OFF:			
Check engine coolant level.		Lubricate the lower articulation pin.	
Check engine fan belt tension.		Lubricate the front steering cylinder.	
Check engine water pump belt tension (2360 and 2425 only).		Lubricate the rear steering cylinder pin.	
		Lubricate the upper articulation pin.	
Check air conditioner compressor belt tension.		Lubricate the front drag link pin.	
Check alternator drive belt tension.		Lubricate the rear drag link pin.	
Check the air cleaner connections.		Lubricate the rear axle drive shaft steady bearing.	
Change the fuel Filter(s).		Lubricate rear axle drive shaft articulation slip yoke.	
Change the engine oil.		Lubricate the PTO articulation drive shaft slip yoke (option).	
Change the engine oil filter.			
Change the engine coolant system filter.		Lubricate the PTO drive shaft rear slip yoke (option).	
Check the level of DCA4 coolant additive.		Lubricate the input driveline slip yoke.	
Check the battery connections at the starter.		Lubricate the front output driveline slip yoke.	
Check the radiator, heater hoses and connections.		Lubricate the transmission input cross and bearing (2290, 2335, 2360*, 2375* only). *When equipped with standard axles option.	
Clean the engine air cleaner outer element.			
Check brake reservoir level.		Lubricate the rear axle cross and bearing (2290, 2335, 2360*, 2375* only). *When equipped with standard axles option.	
Adjust the brakes.			
Check tire air pressure according to ballast on axle.		Lubricate the rear axle articulation cross and bearing (2290, 2335, 2360*, 2375* only). *When equipped with standard axles option.	
Clean the cab outer air filter.			
Check the air conditioner sight glass.		Lubricate the transmission rear output cross and bearing (2290, 2335, 2360*, 2375* only). *When equipped with standard axles option.	
Check the battery connections at the battery.			
Check the battery electrolyte level.		Lubricate the front output cross and bearing (2290, 2335, 2360*, 2375 *only). *When equipped with standard axles option.	
Check the windshield washer fluid level.			
Check the seat for proper operation.		Lubricate the front axle cross and bearing (2290, 2335, 2360*, 2375* only). *When equipped with standard axles option.	
Change the planetary hub oil.			
Change the differential oil.		Check all wheel hardware torque.	
Check the transmission oil level.		Check all optional weight kit hardware torque.	
Change the transmission filter.			
Change the hydraulic oil.		Check the axle mounting bolt torque.	
Change the hydraulic filter.			
Lubricate the 3-point hitch (option).		Check cab mount hardware torque.	



DESCRIPTION	OK	DESCRIPTION	OK
SAFETY ITEMS CHECKS:		PERFORMANCE SERVICE CHECKS:	
Seat belt operation.		Road test engine operation including throttle and governor operation.	
All safety shields installed.			
Neutral start switch(es) operative.		Transmission.	
Parking brake operation and adjustment.		Steering control.	
Articulation lock operation.		Differential lock engagement and disengagement.	
STATIONARY CHECKS - ENGINE RUNNING:		Brake action.	
All operative checks are to be performed with the tractor at normal operating temperature.			
Lights and instruments for proper operation.			
Maximum no-load and idle speed adjustments.			
Hydraulic system.			
Remote control valves and lockout levers.			
Flow control operation.			
3-point hitch operation (option).			
Transmission shifting and gear selection.			
PTO operation and brake (option).			

SERVICE PERFORMED

TRACTOR MODEL NO. _____ TRACTOR SERIAL NO. _____

OWNER'S SIGNATURE _____ DATE _____

DEALER'S SIGNATURE _____ DATE _____

FIRST 50-HOUR SERVICE

CHECK AND ADJUST, AS REQUIRED

DESCRIPTION	OK	DESCRIPTION	OK
STATIONARY CHECKS - ENGINE OFF:			
Check engine coolant level.		Lubricate the lower articulation pin.	
Check engine fan belt tension.		Lubricate the front steering cylinder.	
Check engine water pump belt tension (2360 and 2425 only).		Lubricate the rear steering cylinder pin.	
		Lubricate the upper articulation pin.	
Check air conditioner compressor belt tension.		Lubricate the front drag link pin.	
Check alternator drive belt tension.		Lubricate the rear drag link pin.	
Check the air cleaner connections.		Lubricate the rear axle drive shaft steady bearing.	
Change the fuel Filter(s).		Lubricate rear axle drive shaft articulation slip yoke.	
Change the engine oil.		Lubricate the PTO articulation drive shaft slip yoke (option).	
Change the engine oil filter.			
Change the engine coolant system filter.		Lubricate the PTO drive shaft rear slip yoke (option).	
Check the level of DCA4 coolant additive.		Lubricate the input driveline slip yoke.	
Check the battery connections at the starter.		Lubricate the front output driveline slip yoke.	
Check the radiator, heater hoses and connections.		Lubricate the transmission input cross and bearing (2290, 2335, 2360*, 2375* only). *When equipped with standard axles option.	
Clean the engine air cleaner outer element.			
Check brake reservoir level.		Lubricate the rear axle cross and bearing (2290, 2335, 2360*, 2375* only). *When equipped with standard axles option.	
Adjust the brakes.			
Check tire air pressure according to ballast on axle.		Lubricate the rear axle articulation cross and bearing (2290, 2335, 2360*, 2375* only). *When equipped with standard axles option.	
Clean the cab outer air filter.			
Check the air conditioner sight glass.		Lubricate the transmission rear output cross and bearing (2290, 2335, 2360*, 2375* only). *When equipped with standard axles option.	
Check the battery connections at the battery.			
Check the battery electrolyte level.		Lubricate the front output cross and bearing (2290, 2335, 2360*, 2375 *only). *When equipped with standard axles option.	
Check the windshield washer fluid level.			
Check the seat for proper operation.		Lubricate the front axle cross and bearing (2290, 2335, 2360*, 2375* only). *When equipped with standard axles option.	
Change the planetary hub oil.			
Change the differential oil.		Check all wheel hardware torque.	
Check the transmission oil level.		Check all optional weight kit hardware torque.	
Change the transmission filter.			
Change the hydraulic oil.		Check the axle mounting bolt torque.	
Change the hydraulic filter.			
Lubricate the 3-point hitch (option).		Check cab mount hardware torque.	

DESCRIPTION	OK	DESCRIPTION	OK
SAFETY ITEMS CHECKS:		PERFORMANCE SERVICE CHECKS:	
Seat belt operation.		Road test engine operation including throttle and governor operation.	
All safety shields installed.			
Neutral start switch(es) operative.		Transmission.	
Parking brake operation and adjustment.		Steering control.	
Articulation lock operation.		Differential lock engagement and disengagement.	
STATIONARY CHECKS - ENGINE RUNNING:		Brake action.	
All operative checks are to be performed with the tractor at normal operating temperature.			
Lights and instruments for proper operation.			
Maximum no-load and idle speed adjustments.			
Hydraulic system.			
Remote control valves and lockout levers.			
Flow control operation.			
3-Point hitch operation (option).			
Transmission shifting and gear selection.			
PTO operation and brake (option).			

SERVICE PERFORMED

TRACTOR MODEL NO. _____ TRACTOR SERIAL NO. _____

OWNER'S SIGNATURE _____ DATE _____

DEALER'S SIGNATURE _____ DATE _____

PUBLICATIONS ORDER FORM

Date _____

Attn: _____

Name _____

Address _____

City _____

State _____ Zip _____ Phone _____

Dealer Order Only:

Authorized

Dealer Signature _____ Phone: (____) _____

Dealer Code _____ Zone _____ Fax: (____) _____

Dealer: If manuals are for resale, check box

and provide sales tax registration no. _____ .

MANUAL NO.	QTY.	DESCRIPTION	PRICE EA.	TOTAL AMOUNT
89002105		2290, 2335, 2360, 2375, 2425 Tractor Operator's Manual	***	
89002000		2240, 2270, 2310, 2360, 2425 Tractor Repair Manual (set of 13 volumes)	***	
89002108		2290, 2335, 2360, 2375, 2425 Tractor Assembly Manual	***	
89002107		Model 1407 Powershift Detailed Operator's Manual	***	
89002014		Model 1400 Series Powershift Service Manual	***	

***Please see your Buhler Versatile Dealer to confirm catalog numbers and prices.

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Buhler Versatile Inc.
1260 Clarence Avenue, Box 7300
Winnipeg, MB R3C 4E8

Total Order (U.S. \$) \$ _____

Add Appropriate

State or Provincial

Sales Tax * \$ _____

Shipping & Handling \$ 5.00**

04000000

GRAND TOTAL \$ _____

* Tax exempt customers must provide copy of tax exempt certificate.

** Does not apply to dealer orders.

I. DEALER ORDER INFORMATION

Service Publications will be charged to the Dealer Open Account. Please include both your Dealer Code and Zone Number.

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Fax # (204) 477-2325

Telephone Hours: 8:00 AM to 4:30 PM CST

Fax Hours: 24 Hours-A-Day

Please allow one week for order processing plus shipping time. Express order processing (next day air, second day air, etc.) is available; however, please be aware that you will be charged additional freight and handling fees for this service. Please call the Buhler Versatile Service/Parts Department at (204) 284-6100 for specific fee information.

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If you need further information about Buhler Versatile's service publications*, please contact your Buhler Versatile Dealer.

MAKE CHEQUE OR MONEY ORDER PAYABLE TO: Buhler Versatile Inc. 1260 Clarence Avenue, Box 7300 Winnipeg, MB R3C 4E8

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.

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.

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