



MB Companies, Inc. MSV Multi Service Vehicle

Operation, Maintenance Manual



Folding V-Plow Attachment for M-B Companies' MSV

***Attachments Division,
Brush Replacements,
Administration***

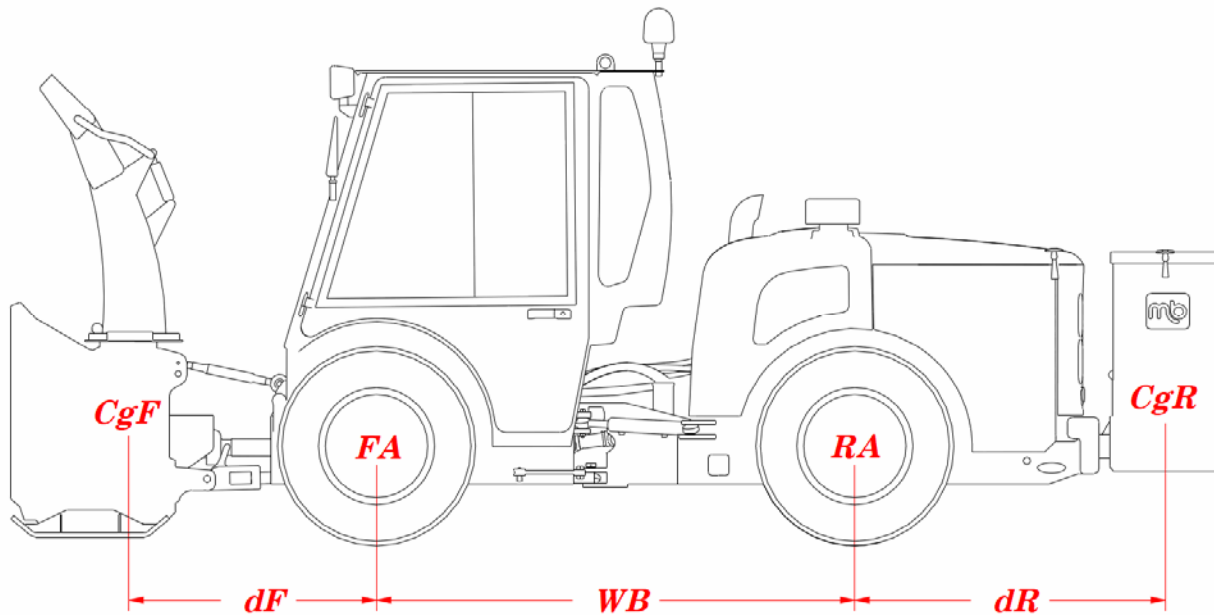
1615 Wisconsin Avenue
P.O. Box 200
New Holstein, WI 53061
Phone: 800-558-5800
Fax: 920-898-4588

Ballast Calculations

Adding Attachments will affect the stability, performance, characteristics, and reduces safe operating grades.

- Never exceed the max rating of the weakest component: GVWR, max axle ratings, or tire capacity.
- All calculations should be verified by weighing the MSV with the attachments on a certified scale.
- Attachments such as sanders and sprayers should be checked when filled with desired particulate.
- A scale must be used to determine axle weights when using a dump body.
- Ballast Types include: Fluid filled tires, wheel weights, or another attachment.
- Never operate with less than 25% of the total load on the front axle.

Caution: Whenever an attachment is mounted to the rear of the vehicle front ballast weight must be added.



CW= Curb Weight for MSV-100501; 6620, Front-2140 lbs, Rear-4480 lbs

TW =FA+RA including attachments and or ballast.

WB = Wheel Base; 81in for MSV

TFA= Total Front Axle Weight

TRA= Total Rear Axle Weight

CgF= Weight at the center of gravity of front attachment or ballast

CgR= Weight at the center of gravity of rear attachment or ballast

FA = Front Axle

RA = Rear Axle

dF = dimension from center of front axle to Center of gravity on front attachment or ballast

dR = dimension from center of rear axle to Center of gravity on rear attachment or ballast

$$TFA= \frac{[CgF \times (DF +WB) + (2140 \times WB) - (CgR \times dR)]}{WB}$$

$$TW= FA + RA$$

$$TRA= TW - TFA$$

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Safety

**WARNING:**

Read this manual and any attachment owner's manuals before using this equipment. Failure to do so can result in serious injury or death. Call your dealer if you have any questions.

Hazard Definitions

For your safety, and to assure the long life of your equipment, be sure you understand the following signal words which will be seen throughout this manual:

- **DANGER:** Alerts you to an immediate hazard, which will always result in severe personal injury and possible death if it is not avoided.
- **WARNING:** Alerts you to a hazard which will result in a serious personal injury or possible death in some cases, if not avoided.
- **CAUTION:** Alerts you to a potential hazard which may result in a serious personal injury if not avoided. It also alerts against an unsafe practice that will permanently damage equipment or property.
- **IMPORTANT:** Points out a proper use that will avoid damage to the machine, and/or will extend the life of its parts.
- **NOTE:** Suggests how to use or adjust the equipment for best product results.



Identification of Safety Labels

Safety labels are strategically located around the attachment to prevent potential hazards. The labels are a permanent part of the equipment. If they become separated from the product or illegible, contact M-B Companies Inc. for no-cost replacements. Understand the information the labels are communicating before operating or maintaining the equipment.

See *Parts List* section for safety labels associated with this equipment.



General Safety

- This manual should be available during operation.
- Extra copies of this manual are available for purchase through the M-B Customer Service Department.
- To avoid serious injury or death, do not modify equipment. Any modifications made to equipment can be dangerous and can void equipment warranty.
- Never defeat a safety device to make a task easier.
- Never deface or remove factory-installed safety labels. If a label ever becomes lost, damaged, or illegible, report this condition to a supervisor and obtain a replacement label from the Customer Service department of M-B Companies, Inc.
- Always wear proper apparel when operating equipment; safety glasses, face shield or goggles, ear protection, and dust mask. Tie hair back. Never wear loose clothing or jewelry that could get caught in moving parts.
- Never operate equipment with covers or guards removed. Rotating parts can cause severe injury. Keep hands, feet, hair, jewelry and clothing away from all moving parts.
- Understand operation of hydraulic and pneumatic controls.
- Understand which adjustments are operator and which are maintenance adjustments.
- Always shut OFF equipment when left unattended.
- Never operate or work around equipment if under the influence of alcohol, drugs or medications.

Pre-Start-up Safety

- Install any covers or guards which may have been removed for shipping purposes.
- Before starting equipment, walk around equipment, making a visual inspection that all safety devices are properly installed and secured.
- Check that all hardware, fasteners, hydraulic fittings, etc. are in good condition and properly fastened. Replace any fatigued or damaged items with proper replacements.
- Personnel who are not required to be in the work area should be kept away. Never start the equipment unless you are absolutely certain that everyone in the area is clear of the machine and aware it is being started.
- Follow the manufacturer's recommended start-up procedure.



Pressurized Systems Safety

- Do not disassemble a pressurized system unless properly trained and equipped with adequate tooling.
- Familiarize yourself with the proper method of relieving pressure from pneumatic or hydraulic systems. Never perform maintenance on, or disassemble, pressurized systems without first locking out power to these systems and then relieving pressure to them.
- Oils and fluids can be very hot under pressure. Use caution and allow the system to cool before beginning maintenance work.
- Never operate or pressurize one of these systems with worn or damaged components. Replace hoses, fittings, valves or other components which appear defective.
- Never adjust pressurized systems beyond recommended levels to achieve higher operating pressures.

The Manual

It is the purpose of this manual to provide complete instructions for service, maintenance disassembly, repair, and installation of the mechanical components for the M-B MSV Angling Plow attachment.

Directional Reference

All reference to left, right, front, or rear are given from the operator in the operator position and facing the direction of your unit.

Required Operator Training

Original purchaser of this unit was instructed by the seller on safe and proper operation. If unit is to be used by someone other than original purchaser; loaned, rented or sold, ALWAYS provide this manual and any needed safety training before operation.

The Operator Must Understand:

- How to operate all controls
- The functions of all controls
- How to STOP in an Emergency
- Speed Ranges

Work Area

- ALWAYS check overhead and side clearances carefully before operation. ALWAYS be aware of traffic when operating along streets and curbs.
- Keep area of operation clear. Stay alert for hidden hazards.
- DO NOT run engine in an enclosed area. Always provide good ventilation.
- Abnormal Vibrations are a warning of trouble. Striking a foreign object can damage unit. Stop unit and engine. Wait for all moving parts to stop. Inspect unit and make any necessary repairs before restart.
- Protect eyes, face, and head from objects that may be thrown from unit. Wear appropriate hearing protection.
- Avoid Sharp Edges. Sharp edges can cause serious injury. Wear gloves to service unit when handling sharp edges.
- ALWAYS keep hands and feet away from all moving parts during operation. Moving parts can cause serious injury or death.
- Be aware of the surroundings. Look for blind spots from which pedestrians or vehicles may suddenly appear.
- Locate the emergency stop on the vehicle.
- Do not operate in crowded pedestrian areas. This equipment may cause serious injury or death if safety rules are not followed.
- The M-B Multiple Service Vehicle (MSV) uses a level gauge. The gauge helps the operator determine the angle or slope of the surface being driven on. The gauge shows percent of grade.



WARNING:

During normal operation the MSV must not exceed 30% grade to either side. Adding any attachment to the MSV will affect the safe maximum grade.



Figure 1



Maintenance Safety

- Do not remove guards while operating. After maintenance work, be sure all guards and other safety devices are installed and in proper working order.
- Never clean, lubricate, or adjust equipment while it is moving, has the potential to move or when engine is running.
- Always release pressure from pressurized systems before disassembling.
- Allow ample time for heated components to cool before working on or working close to them. Use temperature sticks or other appropriate devices to test temperatures.
- ALWAYS maintain unit in safe operation condition.
- Check the conditions of the unit at the end of each day and repair any damage or defects.
- Keep all fasteners properly torqued and in safe operating condition.
- Before maintenance, adjustments, or service (except where specifically recommended), shut off engine, and secure from moving.

Storage

ALWAYS clean and lubricate equipment before extended storage. Clean and lubricate equipment every 6 months during prolonged storage.

General Information

Introduction

Thank you for choosing M-B Companies, Inc. as your equipment manufacturer and supplier. As part of our commitment to total customer satisfaction, we have strived to ensure that the information contained within this manual is complete and representative of the equipment you have purchased. The manual cannot, however, anticipate every possible contingency to be met in the installation, operation and maintenance for your equipment. If you require additional information not included in this manual, please contact our Service Department at:

Customer Service Department
 c/o M-B Companies, Inc.
 1615 Wisconsin Ave.
 PO Box 200
 New Holstein, WI 53061
 Phone: 1-888-558-5801 or 1-800-558-5800
 Fax: 920-898-4588

Machine Identification

Each machine manufactured by M-B Companies, Inc. has an identification plate mounted to it as shown in Figure 2. This plate contains the serial number of your M-B equipment. Copy the information from the plate on your equipment into the appropriate space in Figure 2. This information is important to have available when communicating with M-B.

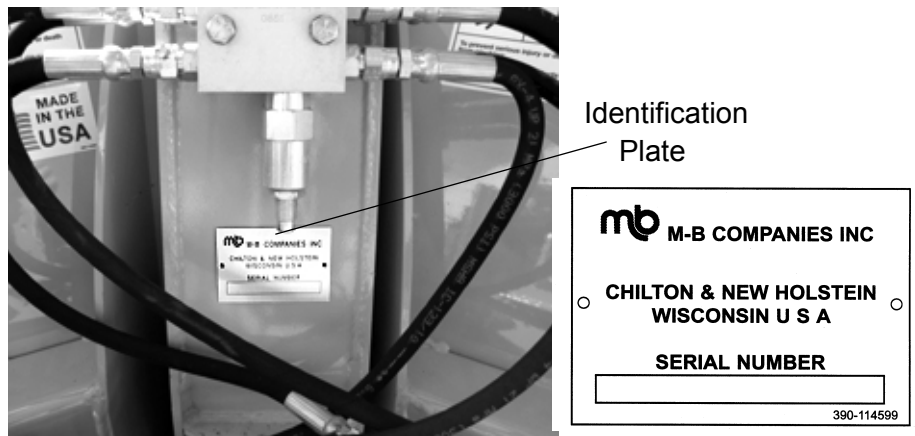


Figure 2



Customer Service

The serial number on your equipment is essential for proper service support. When contacting M-B Companies regarding service support, always provide the product serial number. This number is located on the identification plate mounted on your equipment, and should also have been recorded in the *Machine Identification* section.

Customer Service Department
c/o M-B Companies, Inc.
1615 Wisconsin Ave.
PO Box 200
New Holstein, WI 53061
Phone: 1-888-558-5801 or 1-800-558-5800
Fax: 920-898-4588



Manufacturer's Limited Warranty

The M-B Companies, Inc. warrants all its M-B MSV products to be free from defects in materials and workmanship for 12 months, to begin with the delivery of said product to its original owner. This warranty is not transferable without the written consent of M-B.

M-B will, at its own expense and without expense to the owner, replace all failed parts for and make all repairs that may be required by reason of workmanship or material in any part of the assembly of the product and associated components.

Upon notice in writing, M-B will promptly repair or replace all defective or damaged items delivered under the contract. The batteries, tires, rubber materials, brushes and material normally consumed in operation, and major components such as engines, air compressors, and hydraulic pumps and motors are excluded from this warranty but shall, in any event, be guaranteed by M-B to the extent of any warranty received from its supplier.

Any components replaced under warranty will be warranted for the remainder of the original warranty. Replaced components do not restart the warranty period.

If requested by M-B, products or parts for which a warranty claim is made are to be returned, transportation prepaid, to M-B's factory. Any improper use, operation beyond capacity, or substitution of parts not approved by M-B, or alteration or repair by others in such a manner as in M-B's judgement materially and/or adversely affects the product shall void this warranty.

This warranty does not apply to defects caused by damage or unreasonable use while in the possession of the owner, including but not limited to: failure to provide reasonable and necessary maintenance, normal wear, routine tune-ups or adjustments, improper handling or accidents, operation at speed or load conditions contrary to published specifications, improper or insufficient lubrication, or improper storage.

The M-B Companies, Inc. shall not be liable for consequential damages of any kind, including, but not limited to, consequential labor costs or transportation charges in connection with the replacement or repair of defective parts, or lost time or expense which may have accrued because of said defect.

THE M-B COMPANIES DO NOT MAKE ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE. THE ONLY WARRANTY MADE BY M-B COMPANIES IS AS SET FORTH HEREIN. THIS WARRANTY CANNOT BE EXTENDED, BROADENED OR CHANGED EXCEPT IN WRITING BY AN AUTHORIZED OFFICER OF M-B COMPANIES, INC.

(M-B's total liability hereunder in no event shall exceed the purchase price of the product.)



Vehicle Information

Introduction

This section provides information that is specific to the M-B MSV. Each sub-section describes a component or system to give the reader a reasonable understanding of the topic. If a more in-depth knowledge is needed, contact M-B Companies Customer Support.

Specifications

Model	Folding V-Plow
Length	40 Inches (101 cm)
Blade Height	33 Inches (84 cm)
Clearing Width Straight	60 Inches (152 cm)
Clearing Width Folded	51 inches (129 cm)
Operating weight	650 lbs. (295 kg)

Dimensions

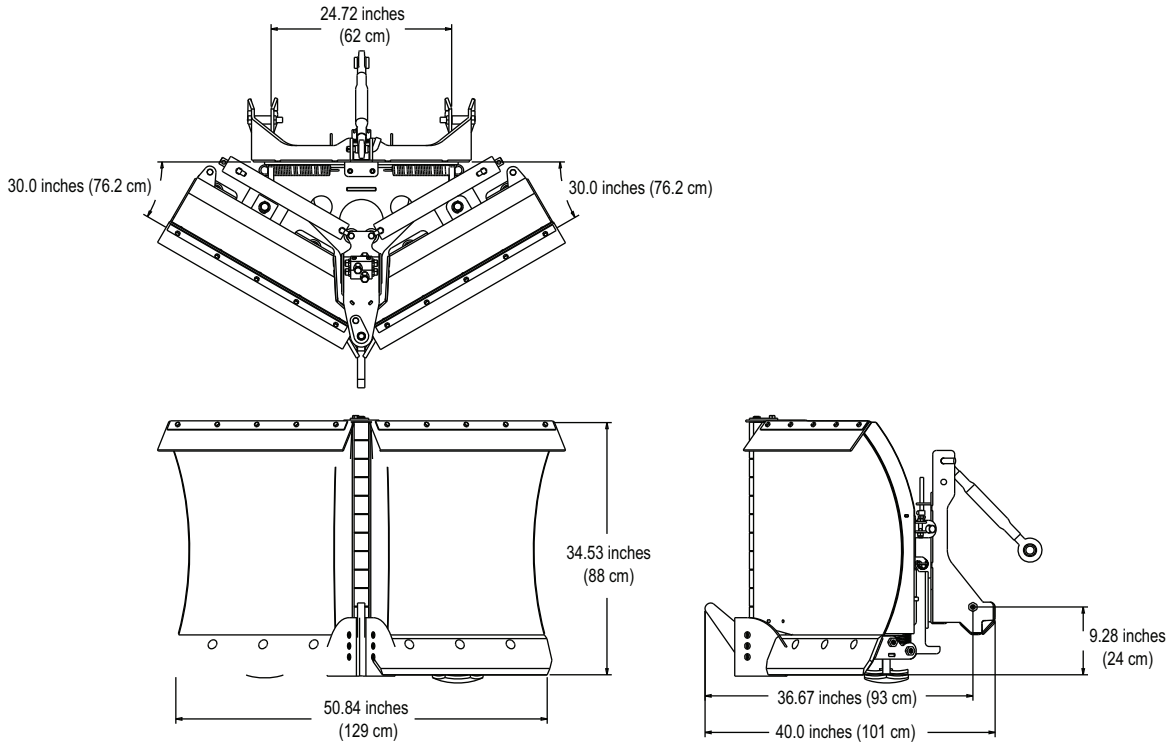
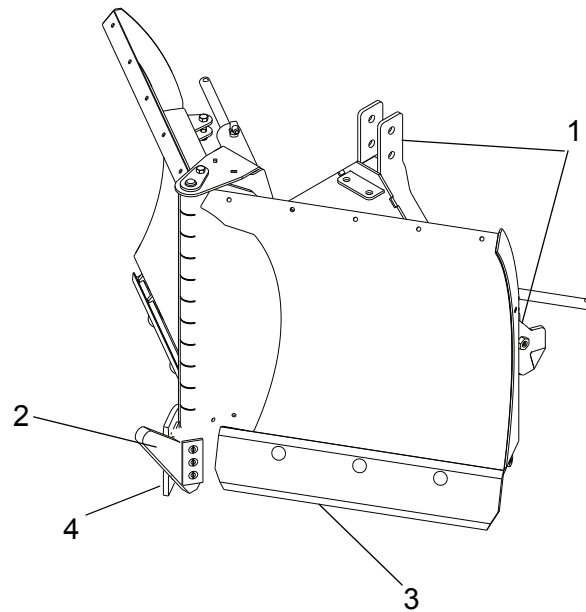


Figure 3

Layout of Machine



- | | |
|-----------------------|---------------------|
| 1. 3 Point Hitch | 3. Cutting Edge |
| 2. Skid Assembly Nose | 4. Rubber Deflector |

Figure 4

Operation

Connecting to the M-B MSV

The Folding V-Plow attachment is connected to the M-B MSV by a three-point hitch. Hydraulic connections are used to position the two moldboards.

Joystick Layout - Folding V-Plow

The joystick layout screen in the attachment section of the MDC is used to display all the joystick functions when the V-Plow attachment is used. Use the Attachment Selection screen to change Default to Yes (Figure 5). The joystick functions will perform as shown in Figure 6.

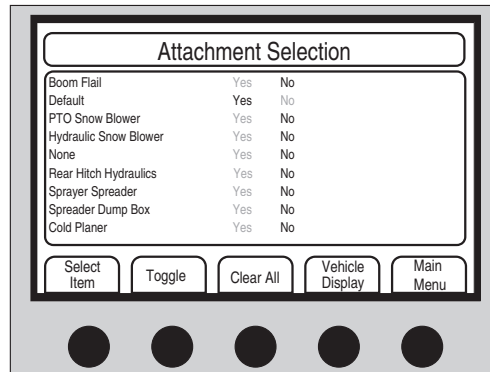


Figure 5

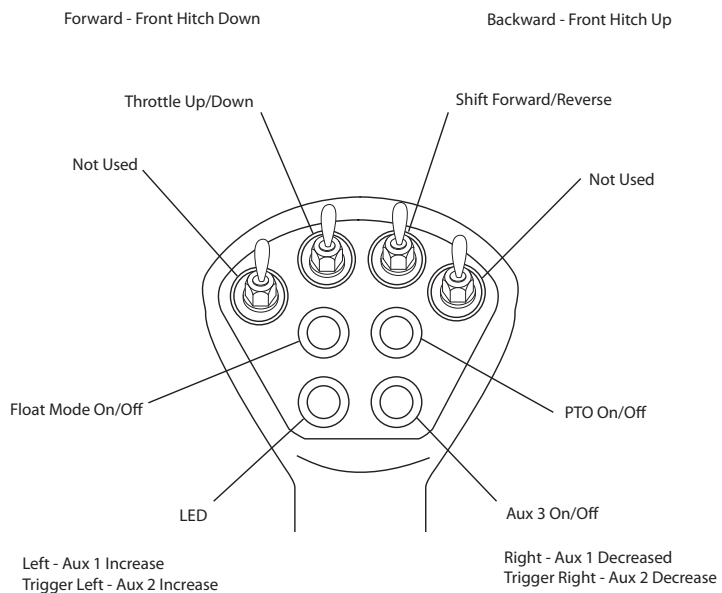


Figure 6

If the Spreader and/or Dump Box attachments will also be mounted on the M-B MSV, other selections may be used. The joystick functions will perform as shown in Figure 7 through Figure 10.

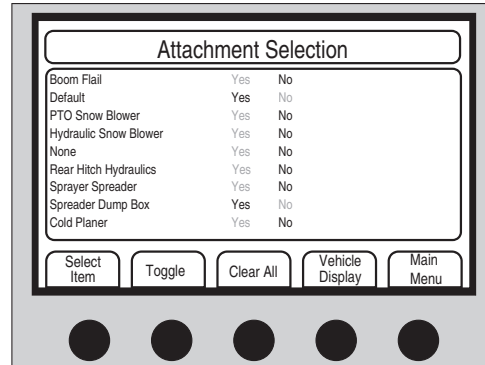


Figure 7

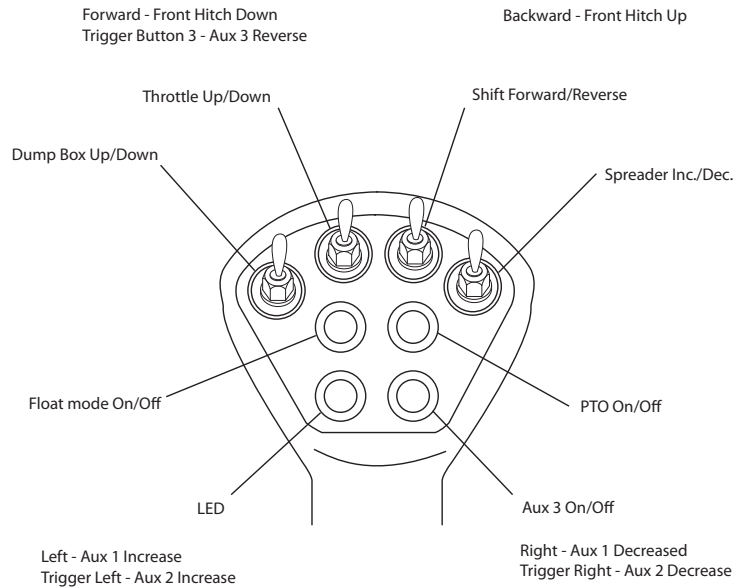


Figure 8



On the Attachment Selection display highlight Default and Rear Hitch Hydraulics. Toggle both to Yes

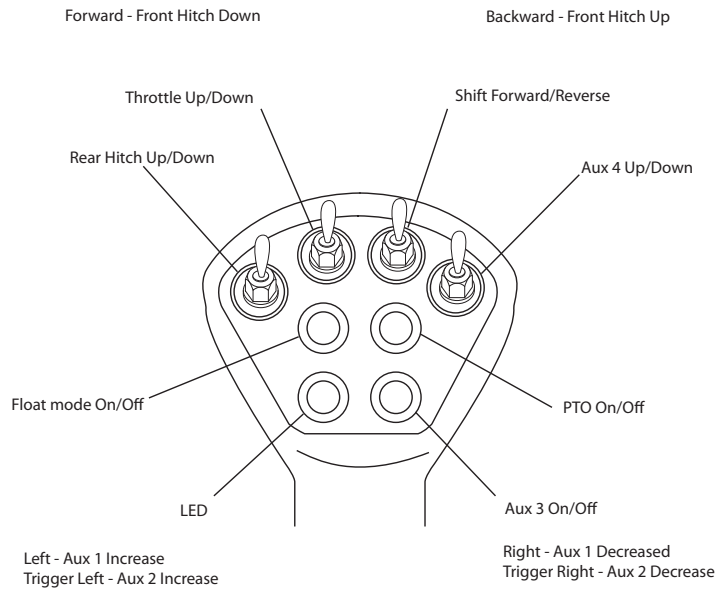


Figure 9

On the Attachment Selection display, highlight Default and Sprayer Spreader. Toggle both to Yes.

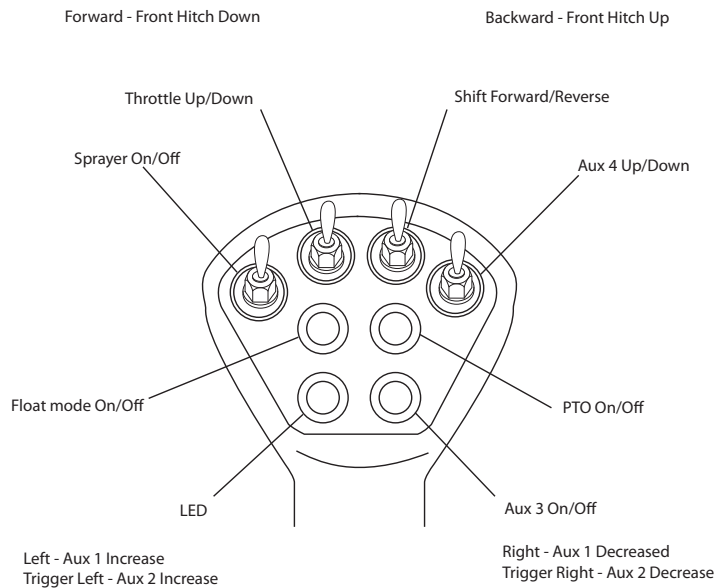


Figure 10

Connecting the Three-point Hitch

The M-B MSV front hitch has two clamps that lock to the two pins of the Plow. Third mounting point is to the adjustable link.

Align the two M-B MSV front hitch clamps with the lower hitch points of the plow. The hitch hooks must be tightened and centered to the vehicle. Open the front hitch clamps by removing safety pin, moving hitch lock to the open position and inserting safety pin. Drive the M-B MSV forward to engage.



CAUTION:

If the Plow is not centered on the vehicle, damage may occur. Keep the hitch hooks tightened in place.

The hydraulic hoses must be kept clear from all interference points.

M-B MSV front hitch clamps may need to be raised or lowered to align properly. Pull back on joystick to raise front hitch clamps and push forward on joystick to lower.

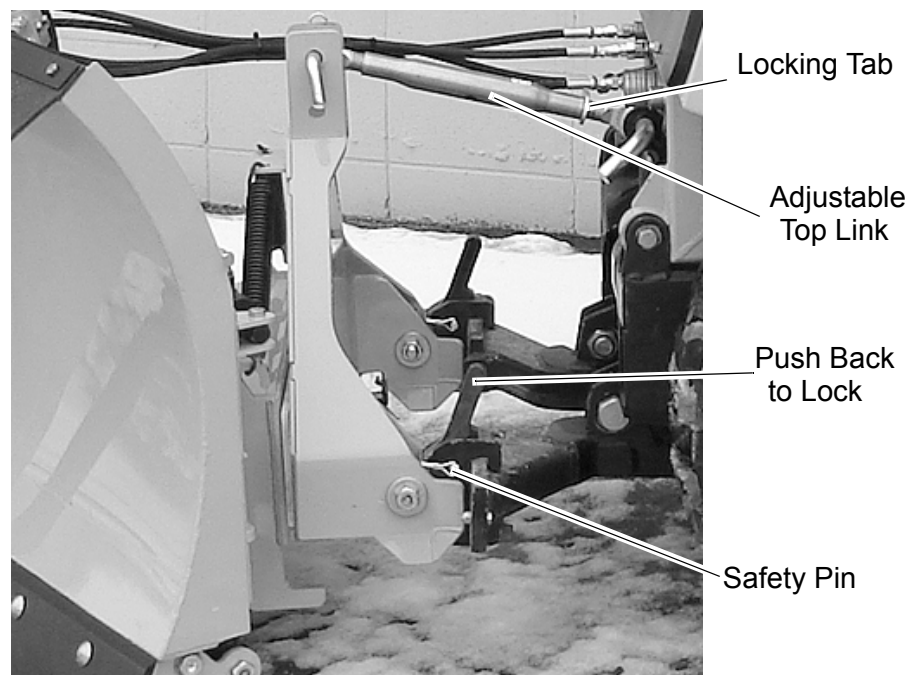


Figure 11

When the plow is properly aligned with the M-B MSV hitch clamps remove the safety pins, push back on the clamps to the lock position and use the appropriate pin and fasteners (Figure 11). Insert the safety pin.



Connect the top link to the M-B MSV hitch.

To attach top link it may be necessary to raise or lower the hitch using the joystick or by changing the top link length. Adjust the link length by turning it to shorten or lengthen.

When the top link is connected to the M-B MSV the Plow attachment should be level. The top link is adjustable and is used to complete the leveling process.

To adjust the top link:

- Determine if the top link should get shorter or longer.
- Break loose the locking tab and screw it away from the body of the link.
- Screw the body of the link in or out as needed. A rod can be inserted into the hole in the body and used as a lever.
- Check the position of the attachment.
- Readjust as needed. Screw the locking tab against the link body. Strike the locking tab to force it into the body.

Connect Hydraulic Hoses

The front of the M-B MSV has several connections for hydraulic hoses. The M-B MSV operator manual has specifications for the quick disconnect fittings.

The controls in the M-B MSV cab will be setup to use the auxiliary connections. Connect the V-Plow to the appropriate connections. See Figure 13.

Left moldboard connects to Aux1.

Right moldboard connects to Aux 2.

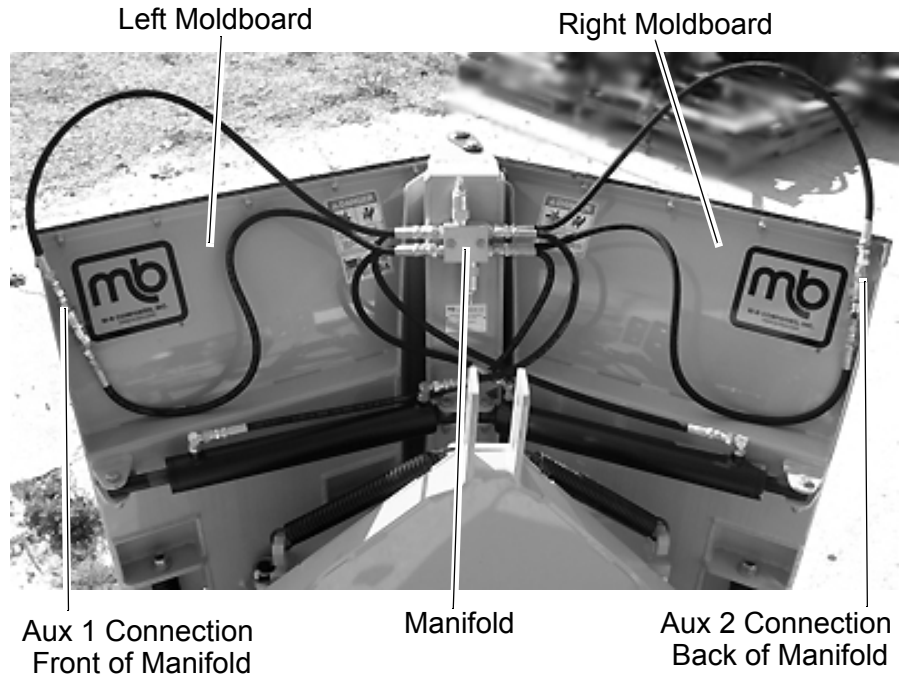


Figure 12

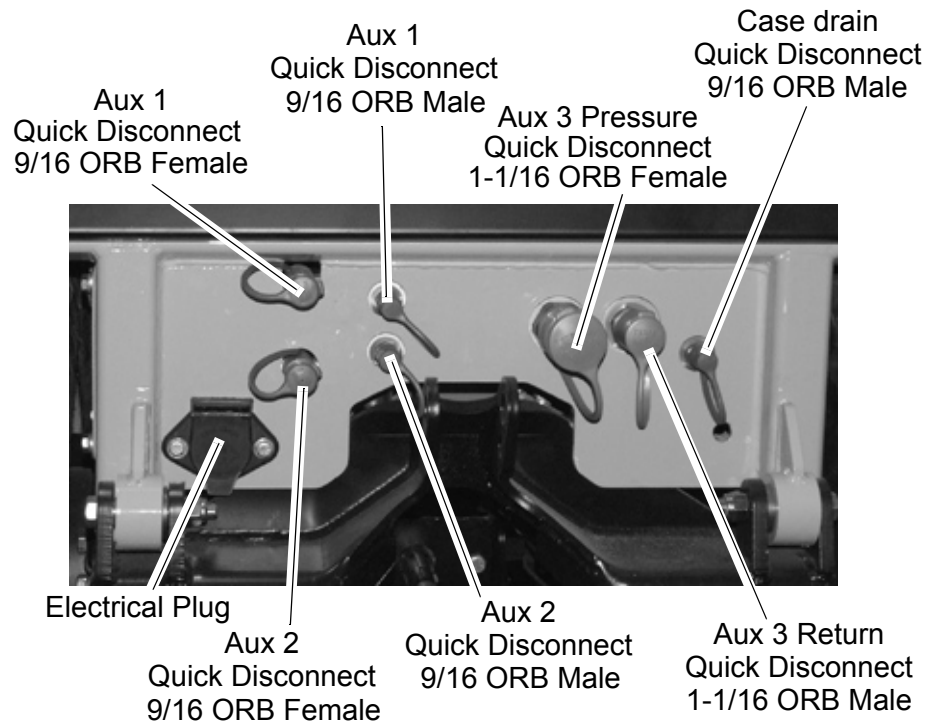


Figure 13



Skid Shoe



WARNING:

When adjusting the skidshoes, the M-B MSV engine must be off if the V-Plow is connected. The preferred method is to disconnect the hydraulic hoses from M-B MSV.

Add spacers
to raise plow

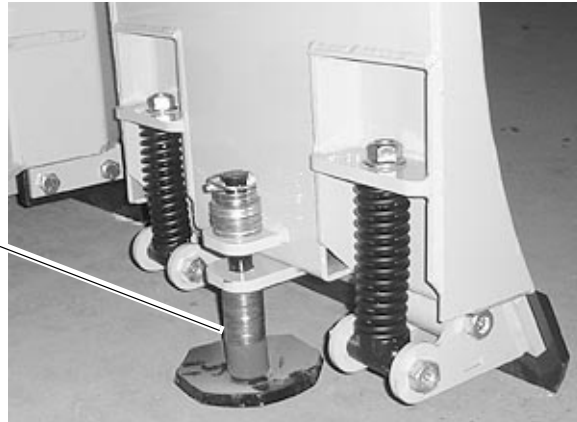


Figure 14

When properly adjusted the plow will rest on the two skid shoes. There will be an even distance between the plow and the ground long the entire length of the cutting edge.

Height adjustment is made by moving spacers between the top and the bottom of the skid shoe mount.

If the plow is on gravel or uneven surfaces, a lower skid shoe position is recommended. This will raise the cutting edge away from the ground and minimize the unwanted scraping of the surface being plowed.

To set the skid shoe height:

- Place shims under the cutting edge. The shims should have a thickness that will provide proper clearance for snow removal. Allow 1/8" (3mm) between cutting edge and hard smooth surface. Allow 1" (25mm) minimum between cutting edge and uneven surface(s).
- Stack washers and spacers on top to lower skid shoe. Re-install quick pin when adjustment is completed. Reverse procedure to raise skid shoes.
- With the unit set-up on a flat level surface adjust the skid shoes so that the Plow cutting edge has even space along the full length of the blade edge.
- Raising the skid shoes away from the ground will create more cutting edge contact and cause more scraping of the ground.

- Once this adjustment is set, it can be confirmed by running the unit forward for about 30 seconds in the operating position. Stop and raise the Plow, then back the unit away. The 'cleaned' portion of the surface should exhibit light ground contact with minimal snow leftover.

Operation of the V-Plow Attachment

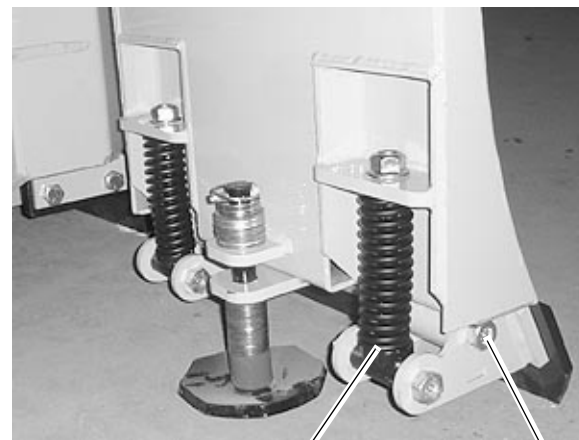
The M-B MSV controls the V-Plow Attachment. The motor diagnose control (MDC) displays screens in the operators cab will display information regarding the operation of the attachment.

Review the *Operation Section* in the *M-B MSV Operators Manual* To become familiar with the controls.

Impact Protection

Hitting a foreign object with the cutting edge causes severe impact to the system. The M-B V-Plow has a feature to help protect the unit during severe impacts.

The cutting edge is mounted on a hinge and is spring loaded. When an object is struck the cutting edge will pivot against the spring to reduce shock.



Compression Spring

Pivot Point

Figure 15



CAUTION:

Impact Protection system is designed for objects less than 2-1/2" high. Plow needs to be raised for objects over 2-1/2" or serious damage could occur.



Starting Procedure

To start using the V-Plow:

- The M-B MSV should be running.
- The M-B MSV should be in either work mode or crawl mode.
- The operator must have the seat belt on.

Operate the V-Plow in the float position so it can follow the surface being plowed.

Lower V-Plow using the float button on joystick of the M-B MSV.

Raise V-Plow by pulling back on the Joystick of the M-B MSV.

To move Left Moldboard, move joystick side-to-side.

To move Right Moldboard, move joystick side-to-side while pulling the trigger.

Maintenance

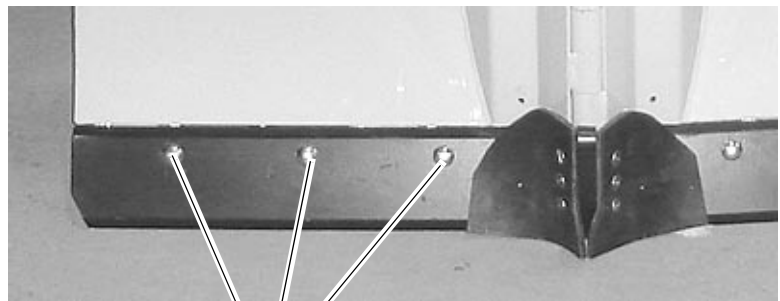
The M-B Folding V-Plow should be kept clean. Pivot points require periodic grease.

**WARNING:**

To prevent serious injury never perform maintenance on the equipment while the MSV engine is running, or the hydraulic hoses are connected.

Replacing the Cutting Edges

Each moldboard has a replaceable cutting edge. The cutting edge is spring loaded to absorb shock. The ability to cushion impact protects the plow and the hitch. The right and left cutting edges are designed differently. Install the appropriate cutting edge to each side.



Remove Bolts

Figure 16

**CAUTION:**

To remove the cutting edge the plow must be supported off the ground. Use support jacks when performing this operation.



To remove the cutting edge:

1. Remove the bolts.

NOTE: The bolts being removed may need to be cut or ground off. If bolts need to be replaced, use high quality grade 8 bolts and nuts.

2. Replace the blade.
3. Add anti-seize to the threads and finger start all the bolts with nuts.
4. Tighten bolts.

When the edge is worn the cutting edge can be turned over and used again.

The V-Plow has a guiding edge. To replace the guiding edge:

1. Remove the bolts.

NOTE: The bolts being removed may need to be cut or ground off. If bolts need to be replaced, use high quality grade 8 bolts and nuts.

2. Replace the blade.
3. Add anti-seize to the threads and finger start all the bolts with nuts.
4. Tighten bolts.

When the edge is worn the guiding edge can be turned over and used again.

Clean The Cutting Edge Pivot

When the blade is supported off the ground and the cutting edge is being replaced it is a good opportunity to inspect and grease the pivot points.

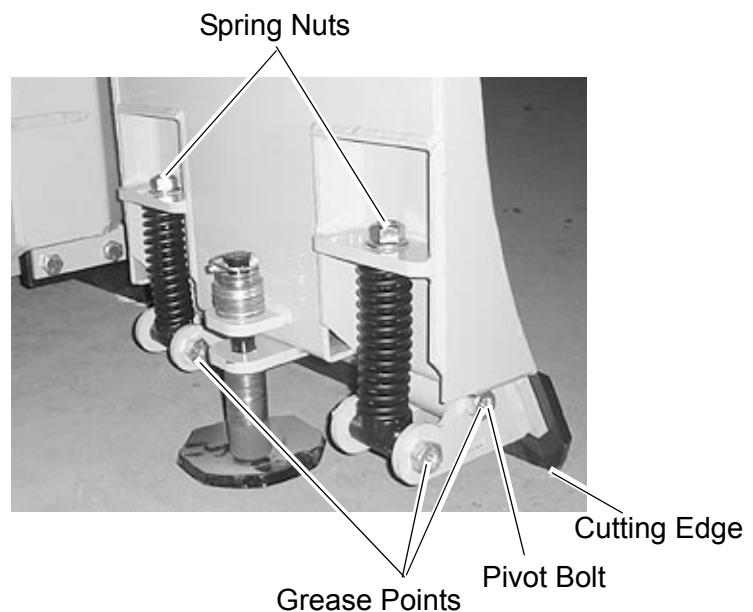


Figure 17

To inspect the movable pivot points the spring load must be removed. Loosen and remove the spring nuts. The springs can be removed and cleaned. The pivot points can be moved by hand and inspected for play and roughness.

If the pivot pins are removed do not replace them with standard bolts. Pins are specially designed with a lube fitting to lubricate the pivot.

Oscillation Plate

The V-Plow is available in two configurations. Your plow may not have the oscillation plate feature. The Folding V-Plow has a joint that enables the moldboards to oscillate with uneven surfaces. The bearing oscillation plates require cleaning and replacement when they have excess wear. To access the plates for replacement the center mast must be removed.

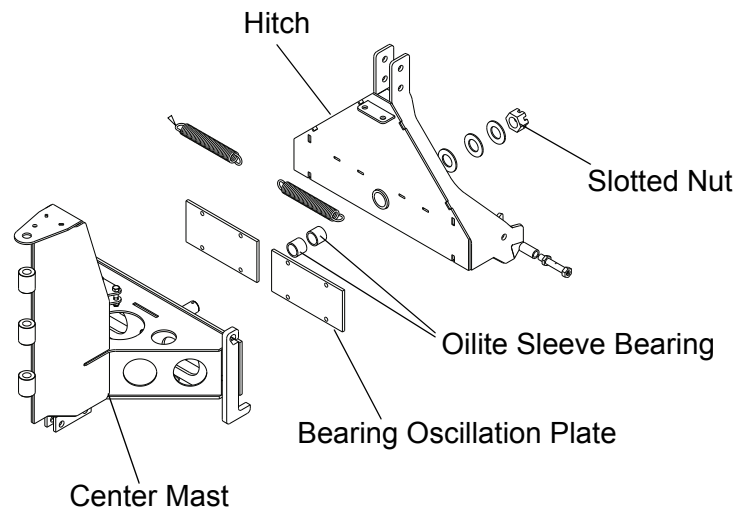


Figure 18

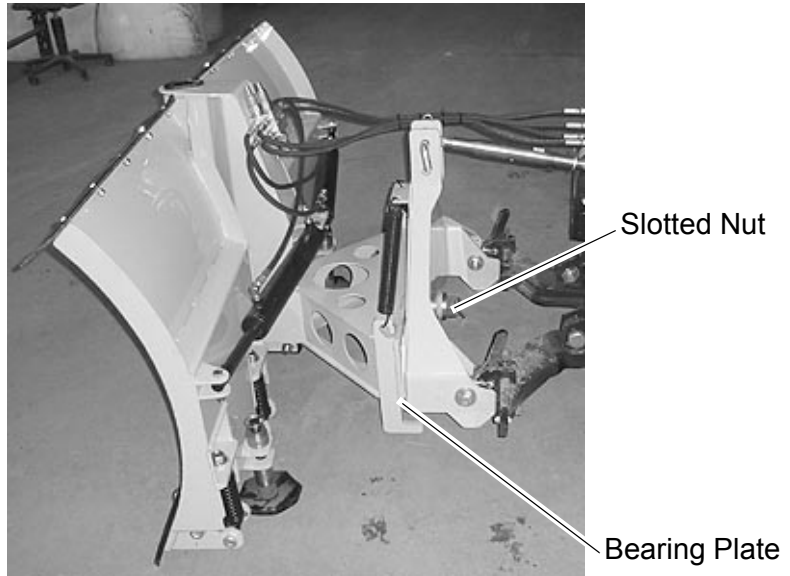


Figure 19



CAUTION:

Support the weight of the moldboard and mast when performing this procedure.



CAUTION:

Springs will contain stored force. Be careful when disconnecting the ends from their mounting point.

To access the bearing oscillation plates:

Spring tension for oscillation joint can be released by rotating the hitch while holding the center mast and plow stationary.

1. When spring tension has been removed disconnect one end of the spring.
2. Slowly allow the second spring to pull the hitch back.
3. When the second spring is relaxed remove both springs
4. Remove the cotter pin and the slotted nut from the shaft.



CAUTION:

The hitch and center mast must be properly supported for disassembly.

5. Pull the hitch away from the center mast and off of the shaft.
6. Inspect and clean the shaft, oilite bearings and washers. Replace if needed.
7. The bearing oscillation plates can be removed/replaced or cleaned as needed.
When reassembling, the shaft and oilite bearings may be coated with light oil.
8. Slide the hitch and oilite bearings onto the shaft. The washers and slotted nut are tightened until the endplay is reduced and the hitch rotation is firm.
9. Replace the springs.



Preventative Maintenance

	Frequency				
	As Required	Before Each Use	Daily	Monthly	Annually
Inspect all hydraulic lines for evidence of leaking, loose fittings, and frayed or damaged hoses.		●			
Check hydraulic cylinders for broken or loose parts, especially cotter pins on the hydraulic cylinders.		●			
Visually inspect for leaks.		●			
Inspect cutting edges and skid assembly.		●			
Check the M-B MSV screen display for faults. Service or repair as needed.		●			

Miscellaneous This section is provided to allow the equipment owner to add additional maintenance tasks.					

Lubrication Points

General Lubrication

IMPORTANT: Wipe Each fitting clean before and after lubrication.

Apply grease to the lube fittings.

Apply oil at all pivot points and pin connections, see Figure 20.

Unit should be lubricated at beginning of season or every 25 operating hours. See *Maintenance Schedule*.

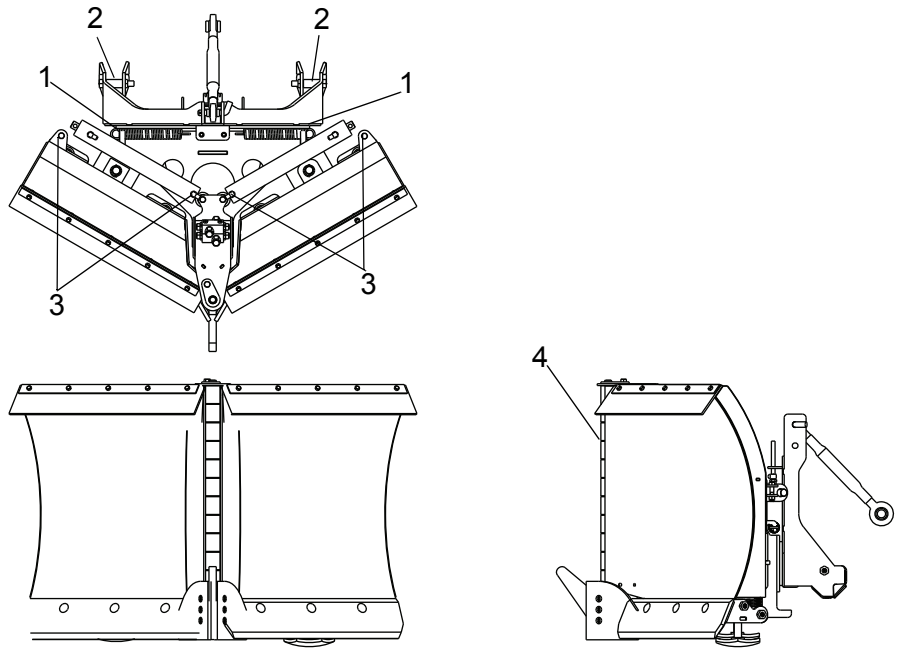


Figure 20

Lubrication Chart

Locations Refer to Figure 20	Number of Locations	Frequency					Beginning of season and every 25 hours of operation	Lubrication Type	
		Before Each Use	Daily	Weekly	Monthly	Annually		MOBILUX EP2 Type Grease	Spray Grease
1. Oscillation Plate	3			x					x
2. Hitch Pins	2						x	x	
3. Pivot Pins	8						x	x	
4. Moldboard Hinge	1					x		x	



Troubleshooting

Operation

Problem	Probable Cause	Corrective Action
No position functions work	Engine is not running MDC Controls Hydraulic tank low on oil	Run engine Review connections to hydraulic AUX fittings and MDC settings Add oil
Some position functions work	Check the M-B MSV electrical signals for each function If electrical present check solenoid Spool assembly bent	Repair electrical signal Replace solenoid if coil is open Replace spool assembly

Hydraulic System

Problem	Probable Cause	Corrective Action
Joystick does not operate any components	Low hydraulic oil level	Add oil
One hydraulic function inoperative	Hydraulic lines not connected	Check connections
Moldboards will not move	Hydraulic lines not connected	Check connections

Replacement Parts

Replacement Parts



390-140501



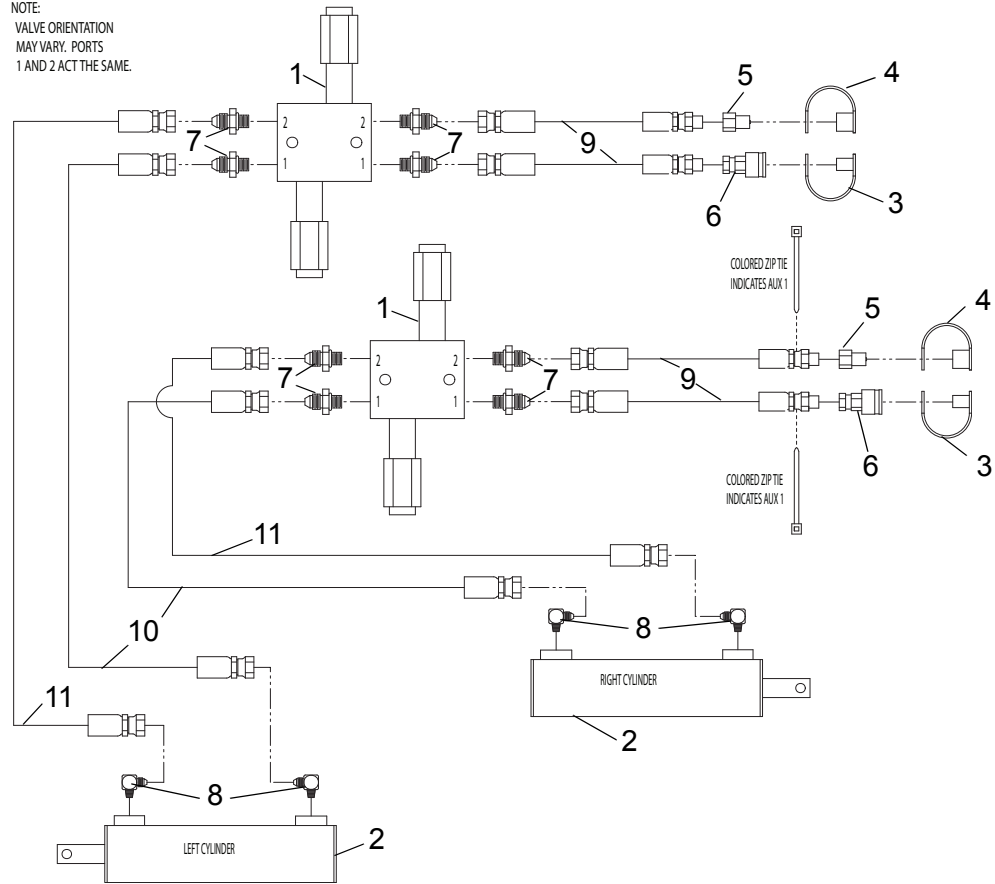
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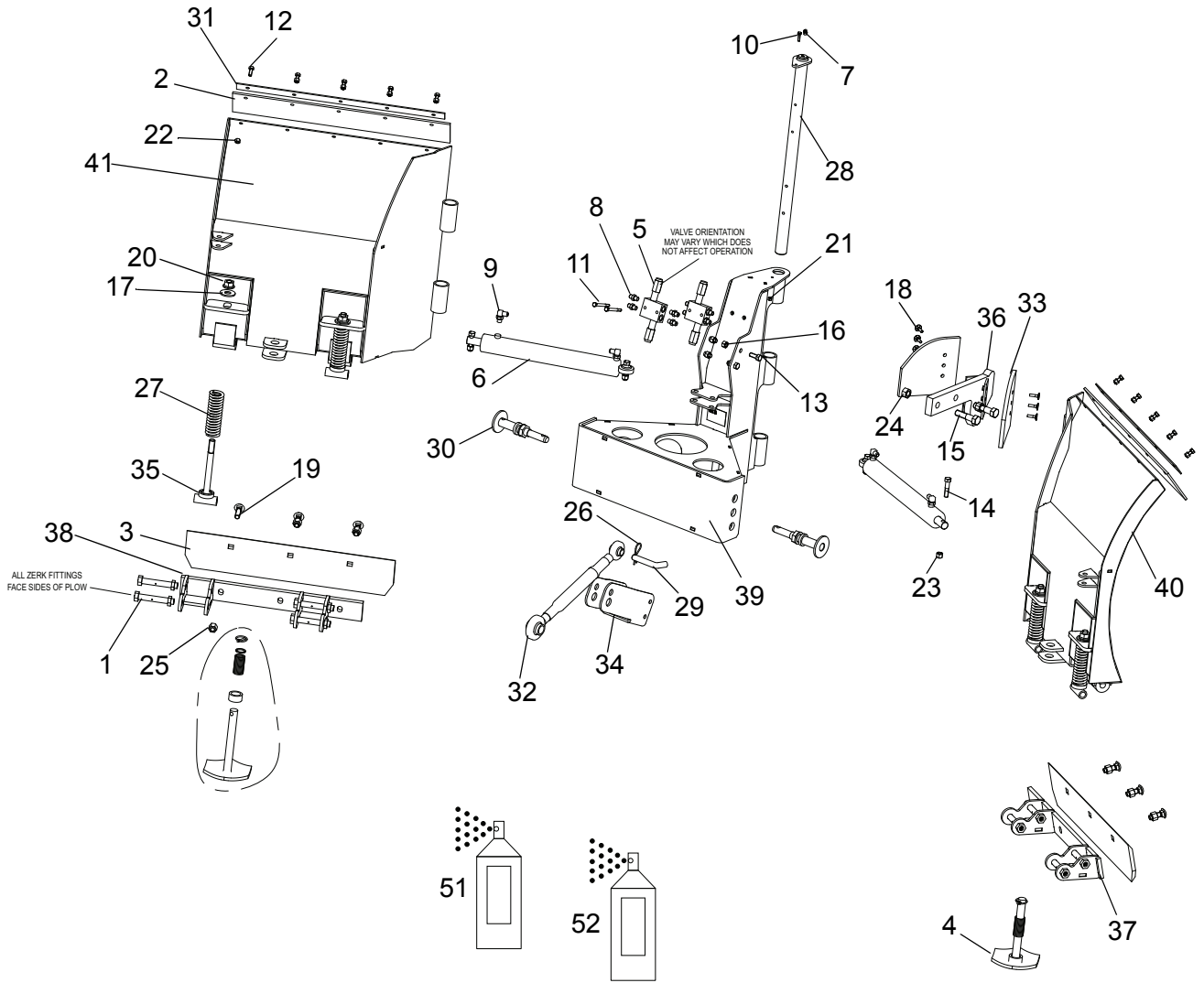


NOTE:
VALVE ORIENTATION
MAY VARY. PORTS
1 AND 2 ACT THE SAME.

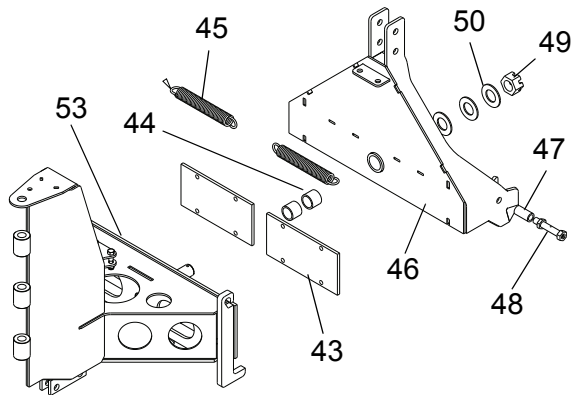


Replacement Parts List			
Item	Part Number	Description	QTY
1	202-152440	Valve, Crossover Relief	2
2	203-133585	Cylinder, Hydraulic	2
3	207-144828	Plug, Dust Female	2
4	207-144830	Plug, Dust Male	2
5	207-157736	QD, 1/4 F NPT, Male Nipple	2
6	207-157737	QD, 1/4 F NPT, Female Coupler	2
7	211-66901	STR ADPT, 9/16 ORB, 9/16 JIC	8
8	211-75436	Elbow 90, 9/16 ORB, 9/16 JIC	4
9	213-157853	Hose Assy, 1/4 x 39"	4
10	213-157854	Hose Assy, 1/4 x 21"	2
11	213-157855	Hose Assy, 1/4 x 33"	2

V-Plow Without Oscillation Hitch



V-Plow Oscillation Hitch





Replacement Parts List			
Item	Part Number	Description	QTY
1	100-132340	Pin, 3/4" x 4-3/4" w/Zirk and Locknut	8
2	See Table 1	Deflector, Rubber	2
3	See Table 1	Cutting Edge	2
4	104-147061	Skid Shoe - Standard	2
5	202-152440	Valve, Crossover Relief #6 SAE Ports	2
6	203-133585	Hydraulic Cylinder V-Plow	2
7	206-81606	Grease Zerk 1/8 NPT, 90°	1
8	211-66901	STR ADPT, Male ORB x JIC 9/16 JIC x 9/16 ORB	8
9	211-75436	Elbow 90, ORB x JIC 9/16 ORB x 9/16 JIC	4
10	311-11000	HHCS .25-20 UNC x 1.000	1
11	311-23250	HHCS .31-18 UNC x 3.250	2
12	311-31000	HHCS 3/8-16 UNC x 1.000	10 or 16
13	311-51250	HHCS .50-13 UNC x 1.250	4
14	311-52250	HHCS .50-13 UNC x 2.250	4
15	311-83000	HHCS .75-10 UNC x 3.000	2
16	361-50000	Nut, Hex, UNC, 1/2-13	4
17	341-80000	Washer, Flat - 3/4 STD Zinc PL	4
18	371-152878	Bolt, Elevator - 5/16	6
19	370-92052	Carriage Bolt 5/8-11 UNC x 2.00	6
20	371-129915	Nut, Flanged GR 8 3/4-10 Plated Locking	4
21	371-81299	Nut, Hex, ESNA, 1/4-20 NC	1
22	371-81297	Nut, Hex, ESNA, 3/8-16 UNC	10 or 16
23	371-81417	Nut, Hex, ESNA, 1/2-13 UNC	4
24	371-82083	CNTR Locknut 3/4-10 UNC	2
25	371-81421	Nut, Hex, ESNA, 5/8-11 UNC	6
26	380-84739	Pin, Hair Clip #11	1
27	382-160051	Spring, Comp 6" 296 LB/IN	4
28	410-157945	Hinge Pin -W.U. V-Plow	1
29	383-122610	Pin, Hitch, Bent Pull 3/4 x 3 1/2 Grip LG	1



Replacement Parts List			
Item	Part Number	Description	QTY
30	410-163036	Weldment, Bottom Hitch Link Pin PV	2
31	See Table 1	Strip, Retainer Deflector	2
32	401-152698	Top Link, MSV CAT 1&2, 12" Body	1
33	401-157287	Rubber Deflector V-Plow Nose	2
34	401-157946	Plate, Top Hitch Power V MSV	1
35	410-157254	Bolt, Hinge Spring	4
36	410-157285	Nose, Skid Assembly	1
37	See Table 1	Edge, Trip Right	1
38	See Table 1	Edge, Trip Left	1
39	410-157925	Mast, Center PV	1
40	See Table 1	Moldboard, W.U. RH Bent	1
41	See Table 1	Moldboard, W.U. LH Bent	1
42	410-157252	Mast Center, MSV V-Plow	1
43	401-157267	Plate, Bearing Oscillation, VHM	2
44	603-75913	Bearing, Oiltite Flange 1.5 BOR	2
45	382-42362	Spring, Tension 1.5 OD x 10.5	2
46	410-157256	Hitch, 3 PT Oscillation	1
47	401-157399	Tube 1-1/8 OD x 3/4 ID x 2-1/4	2
48	100-157398	Pin, 3/4" x 4-1/4" w/Zirk	2
49	371-91932	Slotted Hex Nut 1 1/2-12 NF	1
50	372-91931	FLT-WSHR-SAE 1 1/2	3
51	109-131128	Yellow Touch-up Paint	
52	249-92005	Primer, Aerosol Can	
53	410-157252	Mast Center	1



Table 1: Part Numbers for 60", 66" and 96"

Item Number	Plow	60"	66"	96"
41	LH Moldboard	410-157876	410-169959	410-163008
40	RH Moldboard	410-157875	410-169951	410-163009
38	LH Trip Edge	410-157251	410-169954	410-163010
37	RH Trip Edge	410-157250	101-169963	410-163011
3	Cutting Edge - Standard 1090	101-157234	101-169956	101-163014
3	Cutting Edge - Abrasion Resistant	401-163394	N/A	N/A
31	Retainer	401-144298	401-169958	401-163012
2	Deflector	401-157287	101-169957	101-163013

**Hydraulic Fitting
Installation Torque
Recommendation**

Table 2: For 37° & 45° (Machined or Flared) and MegaSeal®

Size		Steel				Brass			
Dash	Fractional (In.)	Ft-Lbs.		Newton-Meters		Ft-Lbs.		Newton-Meters	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
-4	1/4	10	11	13	15	5	6	6-3/4	9
-5	5/16	13	15	18	20	7	9	10	13
-6	3/8	17	19	23	26	12	15	17	20
-8	1/2	34	38	47	52	20	24	27-2/3	33
-10	5/8	50	56	69	76	34	40	46-1/3	55
-12	3/4	70	78	96	106	53	60	72-1/3	82
-16	1	94	104	127	141	74	82	100-1/2	111
-20	1-1/4	124	138	169	188	75	83	101-1/2	113
-24	1-1/2	156	173	212	235	79	87	107	118
-32	2	219	243	296	329	158	175	214	237

Table 3: For Flat-Face “O” Ring Seal (Steel)

Size		Ft-Lbs.		Newton-Meters	
Dash	Fractional (In.)	Min.	Max.	Min.	Max.
-4	1/4	10	12	14	16
-6	3/8	18	20	24	27
-8	1/2	32	40	43	54
-10	5/8	46	56	60	75
-12	3/4	65	80	90	110
-14	7/8	65	80	90	110
-16	1	92	105	125	240
-20	1-1/4	125	140	170	190
-24	1-1/2	150	180	200	245

Table 4: For SAE O-Ring Boss (Steel) & Gates Adapterless

Size		Ft-Lbs. Working Pressures 4,000 psi (27.5 Mpa) and below		Newton-Meters Working Pressures 4,000 psi (27.5 Mpa) and below		Ft-Lbs. Working Pressures Above 4,000 psi (27.5 Mpa)		Newton-Meters Working Pressures Above 4,000 psi (27.5 Mpa)	
Dash	Fractional (In.)	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
-3	3/16	—	—	—	—	8	10	11	13
-4	1/4	14	16	20	22	14	16	20	22
-5	5/16	—	—	—	—	18	20	24	27
-6	3/8	24	26	33	35	24	26	33	35
-8	1/2	37	44	50	60	50	60	68	78
-10	5/8	50	60	68	81	72	80	98	110
-12	3/4	75	83	101-1/2	113	125	135	170	183
-14	7/8	—	—	—	—	160	180	215	245
-16	1	111	125	150	170	200	220	270	300
-20	1-1/4	133	152	180	206	210	280	285	380
-24	1-1/2	156	184	212	250	270	360	370	490



Table 5: Maximum Recommended Torque for dry NPTF (Tapered) Pipe Threads*

Size	Ft-Lbs.	Newton-Meters
-2	20	25
-4	25	35
-6	35	45
-8	45	60
-12	55	75
-16	65	90
-20	80	110
-24	95	130
-32	120	160

*NOTES:

1. The torque values obtained from tightening pipe threads can vary considerably depending on thread condition. Adequate sealing can occur at values much lower than the maximum values listed above. Only enough torque to achieve adequate sealing should be used.
2. When using a male tapered pipe thread with a female straight or parallel pipe thread, maximum values are 50% of those listed in the table.
3. If threaded sealant is used, maximum values shown should be decreased by 25%

Fastener Torque Recommendation

Table 6: Torque for Standard Fasteners

Nominal Dia. (in.)	Threads per inch	Grade 2			Grade 5			Grade 8			Grade 9		
		Tightening Torque			Tightening Torque			Tightening Torque			Tightening Torque		
		Lubed	Dry Plated	Dry Plain	Lubed	Dry Plated	Dry Plain	Lubed	Dry Plated	Dry Plain	Lubed	Dry Plated	Dry Plain
		K = 0.15	K = 0.17	K = 0.20	K = 0.15	K = 0.17	K = 0.20	K = 0.15	K = 0.17	K = 0.20	K = 0.15	K = 0.17	K = 0.20
Unified Coarse Thread Series													
1/4	20	49 in-lbs	59 in-lbs	66 in-lbs	76 in-lbs	86 in-lbs	101 in-lbs	107 in-lbs	122 in-lbs	143 in-lbs	126 in-lbs	143 in-lbs	168 in-lbs
5/16	18	101	122	135	157	178	209	221	251	295	259	294	346
3/8	16	15 ft-lbs	18 ft-lbs	20 ft-lbs	23 ft-lbs	26 ft-lbs	31 ft-lbs	33 ft-lbs	37 ft-lbs	44 ft-lbs	38 ft-lbs	43 ft-lbs	51 ft-lbs
7/16	14	24	29	32	37	42	49	52	59	70	61	70	82
1/2	13	37	44	49	57	64	75	80	90	106	94	106	125

Table 6: Torque for Standard Fasteners









Nominal Dia.	Threads per inch	 Grade 2			 Grade 5			 Grade 8			 Grade 9		
		Tightening Torque			Tightening Torque			Tightening Torque			Tightening Torque		
		Lubed	Dry Plated	Dry Plain	Lubed	Dry Plated	Dry Plain	Lubed	Dry Plated	Dry Plain	Lubed	Dry Plated	Dry Plain
(in.)		K = 0.15	K = 0.17	K = 0.20	K = 0.15	K = 0.17	K = 0.20	K = 0.15	K = 0.17	K = 0.20	K = 0.15	K = 0.17	K = 0.20
9/16	12	53	63	70	82	92	109	115	130	154	135	153	180
5/8	11	73	87	97	113	126	150	159	180	212	186	211	248
3/4	10	129	155	172	200	227	267	282	320	376	331	375	441
7/8	9	125	160	167	322	365	429	455	615	606	633	604	710
1	8	187	225	250	483	547	644	681	722	909	799	905	1065
1-1/8	7	266	319	354	596	675	794	966	1095	1288	1132	1283	1510
1-1/4	7	375	450	500	840	952	1121	1363	1545	1817	1597	1810	2130
1-1/2	6	652	783	869	1462	1657	1950	2371	2688	3162	2779	3150	3706
Fine Thread Series													
1/4	28	56 in-lbs	68 in-lbs	75 in-lbs	87 in-lbs	99 in-lbs	116 in-lbs	123 in-lbs	139 in-lbs	164 in-lbs	144 in-lbs	163 in-lbs	192 in-lbs
5/16	24	112	135	150	174	197	231	245	278	327	287	325	383
3/8	24	17 ft-lbs	20 ft-lbs	23 ft-lbs	26 ft-lbs	30 ft-lbs	35 ft-lbs	37 ft-lbs	42 ft-lbs	49 ft-lbs	43 ft-lbs	49 ft-lbs	58 ft-lbs
7/16	20	27	32	36	41	47	55	58	66	78	68	78	91
1/2	20	41	49	55	64	72	85	90	102	120	105	120	141
9/16	18	59	71	78	91	103	121	126	146	171	151	171	201
5/8	18	82	99	110	127	144	170	180	204	240	211	239	281
3/4	16	144	173	192	223	253	297	315	357	420	369	418	492
7/8	14	138	165	184	355	403	474	502	568	669	588	666	784
1	14	210	252	280	542	614	722	765	867	1020	896	1016	1195
1-1/8	12	298	357	397	668	757	890	1083	1227	1444	1269	1439	1693
1-1/4	12	415	493	553	930	1055	1241	1509	1710	2012	1768	2004	2358
1-1/2	12	734	880	978	1645	1865	2194	2668	3024	3557	3127	3544	4169
<p>Torque values for 1/4 and 5/16-in series are in inch -pounds. All other torque values are in foot-pounds Torque values calculated from formulas $T=KDF$, where K = 0.15 for "lubricated" conditions K = 0.17 for zinc plated and dry conditions K = 0.20 for plain and dry conditions D = Nominal Diameter F = Clamp Load</p>													



Table 7: Torque-Tension Relationship for Metric Fasteners

Nominal Dia.	Pitch	 Class 4.6			 Class 8.8			 Class 10.9			 Class 12.9	
		Tightening Torque			Tightening Torque			Tightening Torque			Tightening Torque	
		Lubed	Dry Plated	Dry Plain	Lubed	Dry Plated	Dry Plain	Lubed	Dry Plated	Dry Plain	Lubed	Dry Plain
(mm)		K = 0.15 (ft-lbs)	K = 0.17 (ft-lbs)	K = 0.20 (ft-lbs)	K = 0.15 (ft-lbs)	K = 0.17 (ft-lbs)	K = 0.20 (ft-lbs)	K = 0.15 (ft-lbs)	K = 0.17 (ft-lbs)	K = 0.20 (ft-lbs)	K = 0.15	K = 0.20
3	0.5	0.28	0.32	0.38	0.73	0.82	0.97	1.0	1.2	1.4	1.2	1.6
3.5	0.6	0.44	0.50	0.59	1.1	1.3	1.5	1.6	1.9	2.2	1.9	2.5
4	0.7	0.66	0.74	0.87	1.7	1.9	2.3	2.4	2.7	3.2	2.8	3.8
5	0.8	1.3	1.5	1.8	3.4	3.9	4.5	4.9	5.5	6.5	5.7	7.6
6	1	2.3	2.6	3.0	5.8	6.6	7.7	8.3	9.4	11	9.7	13
6	1.25	2.1	2.3	2.7	5.3	6.0	7.0	7.6	8.6	10	8.8	12
7	1	3.8	4.3	5.0	9.7	11	13	14	16	19	16	22
8	1	5.9	6.6	7.8	15	17	20	22	24	29	25	34
8	1.25	5.5	6.2	7.3	14	16	19	20	23	27	24	31
10	1.25	11	13	15	29	33	39	42	48	56	49	66
10	1.5	11	12	14	28	32	37	40	45	53	47	62
12	1.25	21	23	28	53	60	71	76	86	101	89	119
12	1.5	20	22	26	51	58	68	73	82	97	85	113
12	1.75	19	21	25	49	55	65	70	79	93	81	108
14	1.25	26	29	34	66	75	89	95	106	127	111	148
14	1.5	28	32	37	72	82	96	103	117	138	121	161
14	2	30	34	40	78	88	104	111	126	148	130	173
16	1.5	50	57	67	129	146	171	184	208	245	215	287
16	2	47	53	62	121	137	161	173	196	230	202	269
18	1.5	73	82	97	187	212	249	266	303	357	313	417
18	2.5	65	73	86	167	189	222	239	270	318	279	372
20	2.5	91	104	122	236	267	314	337	382	449	394	525

Clamp load calculated as 75% of the proof load for specified bolts.
 All Torque values are listed in foot-pounds
 Torque values calculated from formulas T=KDF, where
 K = 0.15 for "lubricated" conditions
 K = 0.17 for zinc plated and dry conditions
 K = 0.20 for plain and dry conditions
 D = Nominal Diameter
 F = Clamp Load



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