Operation Manual

For M-B Companies’
Multi-Service Vehicle (MSV)
For units built with Serial Numbers 9-2001 to 9-2051

QUALITY YOU CAN SEE, PEOPLE YOU CAN TRUST™
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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 vehicle 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.
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 the 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 or maintenance.
- 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 the operation of the M-B Multi-Service Vehicle.

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 (M-B 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.

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.

WARNING:

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

Figure 1
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.

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 warrantied 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.)
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.
INTRODUCTION
This section of the manual describes the function of the controls typically provided with the MSV. Because of the unique and complex nature of this equipment, this document may not be an exact representation of the controls on your equipment.

Controls which are not part of the standard or optional M-B controls package, but which are unique to an individual attachment may not be listed. Separate manuals are created for attachments.

M-B Companies Inc. reserves the right to modify the function or location of the operator controls. Please call our Customer Service Department before operating the machinery if you have any questions regarding the controls on your MSV.

OPERATOR CAB CONTROLS
The operator cab has several controls that are used to operate the M-B MSV. This section details the controls that the operator uses to provide comfort and safety. The joystick and the MDC interface are described in another section.

Operator Seat
The seat is cushioned by an airbag that absorbs bumps and vibration. The firmness of the cushion is adjusted using a knob located at the front of the seat and below the operator's legs (Figure 3).

When the engine is running the firmness is adjusted by rotating the knob up for firmer or down for less firm. When the engine is off rotating the knob down releases air.

Two levers on the side of the seat control forward/back and seat back position.

Move the front lever to release the seat and move the seat to the new position. Release the lever to lock.

Lift the rear lever to release the seat back. Reposition the seat back and release the lever to lock.

The cab also has a cup holder, document storage compartments and a flip down armrest (Figure 4).

Air Vents
There are several air vents throughout the cab. The vents can be rotated and the blades move to direct airflow (Figure 5).
Sunroof

The sunroof can be opened by flipping the rear latch and pushing up on the back half of the window (Figure 6).

Figure 6

The window can be removed completely. The two front latches are opened by pulling down on the center piece (Figure 7).

Figure 7

Open the rear latch. Pull down sharply on the end attached to the roof. The latch will pull free from the connection leaving the post (Figure 8).

Figure 8

Remove the window and store in a safe place.

To replace the window, position it on top of the opening seal.

**CAUTION:**

The seal must be in proper location or it will leak.

Move the latches into position. Secure the front two by snapping the levers into the hinge point. The rear latch should be positioned so the open clip is over the post. Then push that end onto the post.

Open the window and inspect the seal. The front edge of the window must lay flat on the seal (Figure 9).

Figure 9

With the window open the seal can be pulled into position.
STEERING COLUMN

Several controls are located on the steering column. The right side has controls for; windshield squirter, horn, wiper, headlight high beams and the key switch (Figure 10).

The left side and the top end of the column have controls for; fan, steering wheel tilt, lights, hazard lights and air conditioning (Figure 11).

Key Switch

Very similar to an automotive key switch. There are three positions; OFF, ON, and START. When the key switch is OFF, all vehicle functions except the horn are off. After the engine is started the key switch releases to ON (run).

**IMPORTANT:** The engine will not start unless the MDC is ready. Turn the key to ON and wait for the MDC to start up. If the key is turned to START before the MDC is ready, the key must be reset. Turn the key to OFF and back to ON. When the MDC is ready the engine preheater will be ready. The engine can then be started.

To start the engine the operator must be in the seat and the seat belt must be fastened. The MDC must be showing the main operating screen.

Windshield Squirter

The ring at the end of the lever activates the windshield squirter. Press in on the ring. Water will be pumped as long as the ring is pressed. The wipers will not start moving when the ring is pressed. See Figure 10.

Horn

The horn will work regardless of the key switch position. Press in on the button at the end of the lever. See Figure 10.

Wiper

Rotating the barrel of the lever will activate the wipers. From the off position rotate the barrel up (clockwise) one notch for low speed. Rotate two notches for high speed wipers. Rotate the barrel down (counterclockwise) for intermittent wipers. See Figure 10.

Headlight High Beams

When the headlights are on, push down on the lever to change between low and high beam settings. See Figure 10.

Fan

The fan pulls air through the filter cartridge and into the cab. Rotating vents distribute the air. The switch has four positions; OFF, LOW, MEDIUM, and HIGH. See Figure 11.

Steering Column Tilt

The steering column can be tilted toward or away from the operator. Hold the steering wheel with one hand. Move the lever to unlock the tilt. Release the lever to lock the column in the new position. See Figure 11.
Switches
There are switches for the exterior lights, hazard flashers and air conditioning. These rocker switches are located at the top of the steering column. See Figure 11.

- Air Conditioning - On/Off
- Hazard Flashers - On/Off
  When the lights are flashing, the turn signal arrows on the MDC display will flash.
- Exterior Lights - Off/Running/Headlights
  When the switch is moved to a position it will stay until it is pushed again.

Radio Console
The radio is on the right side of the steering column. An LED below the radio is labeled "Wait to Start". This LED is on when the MDC is starting up. It is a reminder to not turn the key until the MDC is ready. Another feature is a 12 volt power point socket. It is similar to an automotive outlet. Accessories can be plugged in. See Figure 12.

Circuit Breakers (on some vehicles).
Located under the right armrest are push-to-reset circuit breakers (Figure 13).

If a circuit breaker trips or trips repeatedly, maintenance personnel should be notified. A circuit breaker that needs to be reset more than once is an indication of an electrical problem that requires repair.
Heater Bypass

In front of the joystick is an adjustment for bypassing the heater. When this knob is rotated the temperature of incoming air is raised or lowered. Opening the valve increases heat.

**IMPORTANT:** This adjustment should be closed when the air conditioning is on.

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**MONITOR DIAGNOSE-CONTROL (MDC)**

![Figure 15 - Start Up Screen](image)

The start up screen (Figure 15 - Start Up Screen) is displayed when the control is beginning operation. When the MSV is ready for operation the main operating screen will display (Figure 16).

![Figure 16](image)

This is the main operational screen that is displayed while the vehicle is in use. After the power up sequence, this is the screen that is automatically displayed. Refer to the table below for descriptions of callouts.
<table>
<thead>
<tr>
<th>Item #</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Left Signal Indicator</td>
<td>Displays status of left turn signal.</td>
</tr>
<tr>
<td>2</td>
<td>Headlight High Beam Indicator</td>
<td>Becomes bright when headlight high beams are on.</td>
</tr>
<tr>
<td>3</td>
<td>Vehicle Drive Status</td>
<td>Displays status of drive wheels: N = Neutral, L = Low, H = High S = All safety locks are not engaged.</td>
</tr>
<tr>
<td>4</td>
<td>Right Signal Indicator</td>
<td>Displays status of right turn signal.</td>
</tr>
<tr>
<td>5</td>
<td>Fuel Gauge</td>
<td>When fuel is low changes to red.</td>
</tr>
<tr>
<td>6</td>
<td>Hour Meter</td>
<td>Displays hours in operation.</td>
</tr>
<tr>
<td>7</td>
<td>Engine RPM Analog Display</td>
<td>Displays engine RPM.</td>
</tr>
<tr>
<td>8</td>
<td>Vehicle Speed Analog Display</td>
<td>Displays vehicle speed in MPH.</td>
</tr>
<tr>
<td>9</td>
<td>PTO Enabled Indicator</td>
<td>Turns red when PTO is enabled.</td>
</tr>
<tr>
<td>10</td>
<td>Aux Hydraulic Indicator</td>
<td>Displays actual gpm of hydraulic fluid at the current engine speed.</td>
</tr>
<tr>
<td>11</td>
<td>Engine RPM Display</td>
<td>Readout of the engine RPM.</td>
</tr>
<tr>
<td>12</td>
<td>Engine Coolant Temp Indicator</td>
<td>Displays engine coolant temperature, 120 to 240°F (49 to 115°C).</td>
</tr>
<tr>
<td>13</td>
<td>Engine Oil Pressure</td>
<td>Displays engine oil pressure.</td>
</tr>
<tr>
<td>14</td>
<td>Battery Voltage Indicator</td>
<td>Displays current battery voltage, 9 to 16 volts.</td>
</tr>
<tr>
<td>15</td>
<td>Hyd Oil Temp Indicator</td>
<td>Displays temperature of the hydraulic fluid, 32 to 200°F (0 to 93°C).</td>
</tr>
<tr>
<td>16</td>
<td>Vehicle Speed Display</td>
<td>Displays vehicle speed in MPH.</td>
</tr>
<tr>
<td>17</td>
<td>Alarms Display</td>
<td>Displays control and engine ECM alarms.</td>
</tr>
<tr>
<td>18</td>
<td>Creep (Button #1)</td>
<td>Displays the status of creep mode. When on, the ground speed is decreased.</td>
</tr>
<tr>
<td>19</td>
<td>Cruise (Button #2)</td>
<td>Displays the status of the cruise control. When on, ground speed is locked until button is pushed again or brake pedal is pushed.</td>
</tr>
<tr>
<td>20</td>
<td>Parking Brake On/Off (Button #3)</td>
<td>Displays status of the parking brake.</td>
</tr>
<tr>
<td>21</td>
<td>Vehicle Ground Drive (Button #4)</td>
<td>Displays vehicle mode. &lt;br&gt;Transport - Engine RPM 1900 max and no attachments. &lt;br&gt;Work Mode - Engine RPM 2200 to 2700 and attachments are operational.</td>
</tr>
<tr>
<td>22</td>
<td>Main Menu (Button #5)</td>
<td>Press button to return to main menu.</td>
</tr>
<tr>
<td>23</td>
<td>Front Hitch</td>
<td>Indicates hitch function: &lt;br&gt;On = Full use, Off = Fixed position, Float = Float button on joystick was pressed.</td>
</tr>
<tr>
<td>24</td>
<td>HP Draw</td>
<td>Displays actual engine horse power.</td>
</tr>
<tr>
<td>25</td>
<td>Attachment Selected</td>
<td>Indicates which attachment was selected using the MDC.</td>
</tr>
<tr>
<td>26</td>
<td>Amber Engine Fault</td>
<td>Non critical fault. Service the engine as soon as possible.</td>
</tr>
<tr>
<td>27</td>
<td>Red Engine Fault</td>
<td>Critical engine fault. Turn engine off and service it before any further operation.</td>
</tr>
</tbody>
</table>
The Main Menu screen (Figure 17) is the primary screen from which the operator will navigate to other functional screens. The operator must go through this screen to get to all other screens. All other screens will return to this screen.

Figure 17

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Menu</td>
<td>Title block for this screen.</td>
</tr>
<tr>
<td>Select</td>
<td>When button is pressed the screen changes to display the screen that is highlighted (chosen) by scrolling with the UP/DOWN buttons.</td>
</tr>
<tr>
<td>Down Arrow</td>
<td>Button is pressed to navigate through screen options.</td>
</tr>
<tr>
<td>Up Arrow</td>
<td>Button is pressed to navigate through screen options.</td>
</tr>
<tr>
<td>Vehicle Display</td>
<td>Press this button to display the Vehicle Display Screen.</td>
</tr>
<tr>
<td>Error History</td>
<td>When this button is pressed the screen shows the error history. The last 50 errors will be displayed. The error, current status and engine hour when it occurred are shown.</td>
</tr>
<tr>
<td>Joystick Diagnostics</td>
<td>When JOYSTICK DIAGNOSTICS is highlighted, pressing the SELECT button will transport to that screen.</td>
</tr>
<tr>
<td>Lighting/Electrical</td>
<td>When LIGHTING/ELECTRICAL is highlighted, pressing the SELECT button will transport to that screen.</td>
</tr>
<tr>
<td>System Hydraulics</td>
<td>When SYSTEM HYDRAULICS is highlighted, pressing the SELECT button will transport to that screen.</td>
</tr>
<tr>
<td>Engine Diagnostics</td>
<td>When ENGINE DIAGNOSTICS is highlighted, pressing the SELECT button will transport to that screen.</td>
</tr>
<tr>
<td>Attachment Selection</td>
<td>When ATTACHMENT SELECTION is highlighted, pressing the SELECT button will transport to that screen.</td>
</tr>
<tr>
<td>Setup</td>
<td>When SETUP is highlighted, pressing the SELECT button will transport to that screen.</td>
</tr>
<tr>
<td>Vehicle Diagnostics</td>
<td>When VEHICLE DIAGNOSTICS is highlighted, pressing the SELECT button will transport to that screen.</td>
</tr>
<tr>
<td>Joystick Layout</td>
<td>When JOYSTICK LAYOUT is highlighted, pressing the SELECT button will transport to that screen.</td>
</tr>
</tbody>
</table>
JOYSTICK DIAGNOSTICS

The Joystick Diagnostics screen allows the operator the ability to activate or test joystick functions without the joystick.

Using the up/down arrows the operator selects the function they want to test. The operator then presses SELECT ITEM to toggle between joystick functions. When a function is selected, the legends above button 2 and button 3 changes to reflect the function being tested.

When testing a function, the screen input has precedence over the joystick for that function only. All other non-selected joystick functions are still controlled by the joystick. If no function is selected for test, the currently highlighted function text line changes based on changes made at the joystick. As an example, the text line for the PTO is PTO ON/OFF. When the PTO is on the word ON is bold and OFF is dim. Pressing the button on the joystick that toggles the PTO on and off will cause the screen display to change from PTO ON/OFF (ON bold) to PTO ON/OFF (OFF bold).

Joystick diagnostics should be accessed and used only by the qualified maintenance personnel. Operators of the MSV cannot effect vehicle performance using these functions.
The Lighting/Electrical screen is the screen used to enable/disable any vehicle lighting and electrical control outputs that is not otherwise controlled through a column switch or other operator interface. This screen is used to enable/disable the outputs on the Front and Rear connectors. The operator selects this screen from the Main Menu screen. Exiting from this screen returns to the Main Menu.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting/Electrical</td>
<td>Title block for this screen. Cannot be accessed by scrolling with UP/DOWN arrow buttons.</td>
</tr>
<tr>
<td>Backlight</td>
<td>Displays the status of the backlight setting. Button 2 selects DAY backlighting and button 3 selects NIGHT. Pressing the SELECT ITEM button leaves the input in the currently selected state and scrolls to the next listed function.</td>
</tr>
<tr>
<td>Beacon</td>
<td>Displays the status of the Beacon setting. Button 2 selects ON and button 3 selects OFF. Pressing the SELECT ITEM button leaves the output in the currently selected state and scrolls to the next listed function.</td>
</tr>
<tr>
<td>Front End Connector 1-6</td>
<td>Displays the status of the Front End Connector pin outputs. Button 2 selects ON and button 3 selects OFF. Pressing the SELECT ITEM button leaves the output in the currently selected state and scrolls to the next listed function.</td>
</tr>
<tr>
<td>Rear End Connector 1-6</td>
<td>Displays the status of the Rear End Connector pin outputs. Button 2 selects ON and button 3 selects OFF. Pressing the SELECT ITEM button leaves the output in the currently selected state and scrolls to the next listed function.</td>
</tr>
<tr>
<td>Select Item (Button #1)</td>
<td>When button is pressed the highlighted function is selected. Pressing the button repeatedly toggles through the listed functions.</td>
</tr>
<tr>
<td>Changing Legend (Button #2)</td>
<td>When button is pressed the selected function can be controlled using this button. The legend above the button changes dependent on the function selected.</td>
</tr>
<tr>
<td>Changing Legend (Button #3)</td>
<td>When button is pressed the selected function can be controlled using this button. The legend above the button changes dependent on the function selected.</td>
</tr>
<tr>
<td>Vehicle Display (Button #4)</td>
<td>When this button is pressed the screen changes to display the Vehicle Display Screen.</td>
</tr>
<tr>
<td>Main Menu (Button #5)</td>
<td>When this button is pressed the screen changes to the Main Menu Screen.</td>
</tr>
</tbody>
</table>
ATTACHMENT SELECTION

The Attachment Selection screen is the screen used to select or define the attachment to be used on the vehicle. Attachments should be changed and configured only by qualified maintenance personnel. Operators of the MSV should not enter into the attachment selection.

The operator should be aware that the use of attachments will limit the speed of the vehicle and the RPM of the engine.

When an attachment is selected and made active the joystick function will change. The following screens show the selection of an attachment and the functions of the joystick.

Selection of Boom Flail

When Boom Flail is set to Yes (Figure 20), the joystick functions will become as shown (Figure 21).

Selection of Default

When Default is set to Yes (Figure 22), the joystick functions will become as shown (Figure 23).
Selection of PTO Snow Blower
When PTO Snow Blower is set to Yes (Figure 24), the joystick functions will become as shown (Figure 25).

![Figure 24: PTO Snow Blower Selection](image)

![Figure 25: Joystick Functions](image)

Selection of Hydraulic Snow Blower
When Hydraulic Snow Blower is set to Yes (Figure 26), the joystick functions will become as shown (Figure 27).

![Figure 26: Hydraulic Snow Blower Selection](image)

![Figure 27: Joystick Functions](image)
Selection of None

When None is set to Yes (Figure 28), the joystick functions will become as shown (Figure 29).

![Attachment Selection Table]

<table>
<thead>
<tr>
<th>Attachment</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom Flail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Default</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTO Snow Blower</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydraulic Snow Blower</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rear Hitch Hydraulics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sprayer Spreader</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spreader Dump Box</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cold Planer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Figure 28]

- Forward - Front Hitch Down
- Backward - Front Hitch Up
- Throttle Up/Down
- Shift Forward/Reverse
- Left - Aux 1 Increased
- Trigger Left - Aux 2 Increased
- Right - Aux 1 Decreased
- Trigger Right - Aux 2 Decreased
- Float mode On/Off
- LED
- PTO On/Off
- Aux 3 On/Off

![Figure 29]
The System Hydraulics screen (Figure 30) allows the operator to see the hydraulic setpoints for the attachment being used. Certain setpoints may be adjusted over a defined range on this screen.

The hydraulic flow displayed is for reference only.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Hydraulics</td>
<td>Title block for this screen. Cannot be accessed by scrolling with UP/DOWN arrow buttons.</td>
</tr>
<tr>
<td>Aux 3 Flow</td>
<td>Displays the hydraulic flow setpoint for the Aux 3 hydraulic output. Button 2 and button 3 change to INCREASE and DECREASE respectively when this function is chosen. Pressing button 2 increases the flow setpoint which will be achieved at 2200 RPM, while pressing button 3 decreases that flow. Pressing the SELECT ITEM button leaves the control in the currently selected state and scrolls to the next listed function.</td>
</tr>
<tr>
<td>Select Item</td>
<td>When button is pressed the highlighted function is selected. Pressing the button repeatedly toggles through the listed functions.</td>
</tr>
<tr>
<td>Increase</td>
<td>Press this button to increase the flow setpoint.</td>
</tr>
<tr>
<td>Decrease</td>
<td>Press this button to decrease the flow setpoint.</td>
</tr>
<tr>
<td>Vehicle Display</td>
<td>When this button is pressed the screen changes to display the Vehicle Display screen.</td>
</tr>
<tr>
<td>Main Menu</td>
<td>When this button is pressed the screen changes to the Main Menu screen.</td>
</tr>
</tbody>
</table>
VEHICLE DIAGNOSTICS

The Vehicle Diagnostics screen (Figure 31) allows the maintenance technician to view any faults sensed by the MDC Control.

INPUT/OUTPUT DIAGNOSTICS

The Input/Output Diagnostics screens (Figure 32 and Figure 33) are the primary screens used by maintenance technicians for electronic/systems troubleshooting. These are viewable screens only. No capability to enter or modify values are provided.

VEHICLE DISPLAY

The vehicle display screens should be accessed only by qualified maintenance personnel.
The Engine Diagnostics screen (Figure 34) allows the operator or a technician to view any faults sensed by the ECM.

**Figure 34**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine Diagnostics</td>
<td>Title block for this screen. Colors and font to be defined. Cannot be accessed by scrolling with UP/DOWN arrow buttons.</td>
</tr>
<tr>
<td>Number of Sensed Faults</td>
<td>Displays the current number of active faults currently sensed by the ECM. Display only, no ability to enter or change data.</td>
</tr>
<tr>
<td>Active Fault Codes</td>
<td>Text that defines the list of following faults as currently active.</td>
</tr>
<tr>
<td>Vehicle Display</td>
<td>When this button is pressed the screen changes to display the Vehicle Display screen.</td>
</tr>
<tr>
<td>Main Menu</td>
<td>When this button is pressed the screen changes to the Main Menu screen.</td>
</tr>
</tbody>
</table>
ADVANCED ENGINE DIAGNOSTICS
The engine has diagnostic information that can be viewed using the MDC displays. The engine manufacturer provides a second level of diagnostic information. Refer to the engine documentation for hardware requirements and access to that level. The communication port is located below the right side arm rest (Figure 35).

JOYSTICK LAYOUT
The Joystick Layout screen is used to display all current joystick functions. Some functions will change depending on the Attachments selected. The layout shown results when None is selected in the Attachment Selection screen.

- **Forward - Front Hitch Down**
- **Backward - Front Hitch Up**
- **Throttle Up/Down**
- **Shift Forward/Reverse**
- **Not Used**
- **Not Used**
- **Float mode On/Off**
- **PTO On/Off**
- **LED**
- **Aux 3 On/Off**
- **Aux 1 Decrease**
- **Trigger Right - Aux 2 Decrease**
- **Left - Aux 1 Increase**
- **Trigger Left - Aux 2 Increase**

Figure 36

SETUP
The Setup screen is accessed and used by qualified maintenance personnel. It lists important information about the vehicle including installed options, the revision of the installed software, and any data that will need to be referenced for service or warranty reasons. Options can be enabled from this screen. Changes require the use of a password.

PRE-START UP

**WARNING:**
Before performing any of the following inspections, make sure that the vehicle engine is shut down, the ignition key is removed, and all personnel in the work area are aware that the equipment is being inspected and must not be started.

Never check for hydraulic leaks by hand. Hydraulic fluid under pressure can penetrate skin.

- 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.
- Check the hydraulic oil level. A sight gauge is located on the side of the reservoir for this purpose. Add fluid as necessary.
- All access doors are secured in place.
- Visually inspect for fluid leaks under the vehicle.
- Check engine fluids.
- Check for faults on screen.
- Inspect attachments for damage and proper connection.
START-UP PROCEDURE

Key Switch
The key switch on the steering column is used to initialize the MDC controller and start the engine. The engine will not start until the MDC has booted up and until intake manifold heater has properly warmed.

To start the MSV the operator must be seated. Turn the key switch to the on position. Watch the screen on the MDC. After an M-B splash screen the start up screen will appear. Turn the key to start the engine.

Important: Do not turn the key to engage the starter until the start up screen is showing. If this happens the engine will not start. The key must be returned to the off position and then moved back to start the MDC software.

Trying to start the engine prior to the Startup screen appearing may cause delays. Engine will not crank until manifold heater is at starting temperature. Colder temps will cause delays.

1. Start the engine.
2. Use the MDC to determine if the correct attachments are configured in the controls.
3. With the engine idling, operate the attachments until the system warms up.
4. Return to the main screen for operation.

COLD WEATHER STARTING

Before Starting the Engine

NOTE: Do not use a torch to heat a compartment. This causes fires, burns wiring, gaskets and seals, or melts protective plastic. When using canvas covers, do not install them near exhaust systems. This helps to prevent fires.

Manually Sprayed Ether Starting Aids

DANGER:
Do not use manually sprayed Ether starting aids. Using a spray type starting aid may cause the air intake to explode and cause personal injury.

Intake Air Heater
The engine has a grid heater in the air intake tube just before the intake manifold. This heater is controlled as needed by the engine electronics. Do not bypass or force the heater on.

Starting with Jump Start Cables

WARNING:
Batteries give off flammable fumes that can explode resulting in personal injury. Prevent sparks near the batteries. They could cause vapors to explode. Do not allow the jump start cable ends to contact each other or the machine.

Do not smoke when checking battery electrolyte levels.

Electrolyte is an acid and can cause personal injury if it contacts skin or eyes.

Always wear eye protection when starting a machine with jump start cables.

Improper jump start procedures can cause an explosion resulting in personal injury.

Always connect the battery positive (+) to battery position (+) and battery negative (-) to battery negative (-).

Jump start only with an energy source with the same voltage as the stalled machine.

Turn off all lights and accessories on the stalled machine. Otherwise, they will operate when the energy source is connected.

NOTE: When starting from another machine, make sure the machines do not touch. This could prevent damage to engine bearings and electrical outlets.

Severely discharged maintenance free batteries do not fully recharge from the alternator after jump starting. The batteries must be charged to proper voltage with a battery charger. Many batteries thought to be unusable are still rechargeable.

Use only equal voltage for starting. Check the battery and starter voltage rating of your machine. Use only the same voltage for jump starting.
AFTER STARTING ENGINE

Whenever a machine has been parked for a long period of time, some of the systems will cool to below normal operating temperatures. Always warm the machine systems before operating the machine at full operation.

Damage to engine valve control components can result from engine operation for short intervals during operation in very cold weather conditions. If the engine is not allowed to warm completely, the engine can be damaged by repeated starting and stopping.

To avoid damage, always run the engine until the coolant temperature is at least 180°F (82°C).

After the engine is warm, warm up the other systems. Start with the hydraulics. Run the engine at less than one-third throttle, and slowly move the control lever to lift the attachment. Initially, lift the control lever for a few inches (centimeters). Lower the attachment slowly. Continue the sequence: raising, lowering, extending, and retracting. Extend the travel during each cycle. Perform this operation for all hydraulic circuits. Alternate between all of the attachments.

Exercise the transmission and the power train. If you cannot move the control for the transmission, perform the following steps:

- Engage the parking brake or apply the brake pedal.
- Run the engine slightly above LOW IDLE.
- Shift the transmission several times from FORWARD to REVERSE.

Release the brake. Move the equipment forward and backward for several feet (meters). Exercise the machine for several minutes.

To reduce the total warm up time, start exercising the entire machine before you complete the hydraulic warm up time.

Operate under light load until the systems reach normal operating temperatures.

If the engine temperature is not high enough enclose the engine and block the radiator. A thermostat that opens at a higher temperature will not increase the engine temperature if the engine is not under load.

To prevent seal damage and gasket damage, keep the engine crankcase breather pipe clear of blockage.

In extreme conditions, use a canvas over the engine compartment. Heat the engine area with a space heater. This will aid in starting the engine. Extending the canvas over the hydraulic components will provide initial warming of the components.

Multigrade lubricants (10W30) may be used successfully at ambient temperatures below the pour point of the oil. However, in order to use this oil, you must leave the engine running at low idle. This helps keep lubricants and compartments warm for the engine and for the transmission. Running the engine at low idle will not keep the hydraulic systems warm.

SAFETY LINK

The chassis for the MSV articulates or pivots in the middle. This is used to help maneuver the MSV and provides a smaller turning radius.

During maintenance it is advisable to lock-out the articulation of the chassis.

To lock the Chassis:

1. Pull straight ahead to align the chassis.
2. Locate the safety link on the frame behind the cab (Figure 37 Safety Link Open).
3. Pull out the removable pin (Figure 38).
4. Swing the link to meet the back half and insert the pin (Figure 39 Pivot Lock Closed).

When the safety link is not in use, it should be stored against the front frame.
FRONT ATTACHMENT CONNECTIONS

Front Hitch Connections
The attachment hitch has two hooks with hitch clamps. Up and down movement is supplied by two hydraulic cylinders.

The hitch hooks will slide side-to-side to align with various attachments.

![Figure 39 Pivot Lock Closed](image)

**CAUTION:**
If the attachment 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.

![Figure 40](image)

To connect an attachment:
1. Pull the MSV close to the attachment.
2. Adjust the hooks side-to-side as needed using the locking bolt on the back side. Open the clamp locks (Figure 41).

![Figure 41](image)

3. Drive the MSV forward with the hooks lowered.
4. The hooks should fit into the arms of the attachment (Figure 42).
5. Lift the hitch in position so the hooks engage and lift the attachment.
6. Push the clamp locks back completely.
7. Insert the safety pins. Most attachments will have a top link as a third connecting point. This link is normally used to level the attachment.

![Figure 42](image)

Some attachments may be different. Review the instructions with each attachment. Hydraulic, PTO, and electrical connections may also be needed for proper attachment use.
Front Power Take Off (PTO)
The front attachment PTO is accessed thru a panel under the operators feet (Figure 43).

**WARNING:**
Turn the engine off before opening the access panel.

Remove the panel.

The drive spline is visible

**NOTE:** The spline (Figure 44) should have a coating of grease before attaching the PTO shaft.

Replace the access panel before starting the engine.

**Hydraulic Connections**
At the front of the MSV there are three pair of connections. Each pair has a line out and a line in. The connections are matched for each pair. Attachments are connected and the MDC controls are set to control the proper auxiliary ports. See Attachment Manual for proper connections. Also refer to MDC Controls section in this manual.
Rear Hydraulic Connections (Optional)
The back of the MSV has two pair of hydraulic connections (Figure 48). Each pair has a line out and a line in. Attachments are connected and the MDC controls are set to control the proper auxiliary ports (See Monitor Diagnose-Control (MDC)).

Figure 48
Preventative maintenance is a daily responsibility. The following charts provide a checklist of areas that should be inspected on a regular schedule.

### PREVENTATIVE MAINTENANCE

<table>
<thead>
<tr>
<th>Frequency</th>
<th>As Required</th>
<th>Before Each Use</th>
<th>Daily</th>
<th>Monthly</th>
<th>Annually</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engine</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean cooler intake</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect fuel filters; replace as necessary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drain moisture from fuel/water separator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check engine oil</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect air filter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hydraulic System</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check hydraulic fluid level; add fluid as required</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ground Drive</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check tire pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check connections for fluid leaks</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>As Required</td>
<td>Before Each Use</td>
<td>Daily</td>
<td>Monthly</td>
<td>Annually</td>
</tr>
<tr>
<td>Check battery terminals for corrosion.</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical guards in place.</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect vehicle for loose or damaged wires</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Replacement Parts

For a complete listing of replacement parts, refer to the Parts Manual 904-162429.