



PART NO. 95-9121

# OPERATOR'S MANUAL

## SONIC BOOM™ Replacement Kit for the WORKMAN® and MULTI PRO® SPRAYERS

To assure maximum safety, optimum performance, and to gain knowledge of the product, it is essential that you or any other operator of this equipment read and understand the contents of this manual before the vehicle engine is ever started. Pay particular attention to the **SAFETY INSTRUCTIONS** highlighted by the triangular safety alert symbol.



The safety alert symbol means **CAUTION, WARNING, or DANGER** — personal safety instruction. Failure to comply with the instruction may result in personal injury.

## SAFETY INSTRUCTIONS

Keep this Operator's Manual in the plastic tube behind the operator seat.

It is very important that all persons operating this equipment have easy access to these instructions at all times.

Carefully read and follow the Installation Instructions that are provided with this equipment and the Safety Instructions in the Vehicle Operator's Manual.



### RECOGNIZE SAFETY INFORMATION

This safety-alert symbol is used to call attention to a **dangerous** situation, which could result in serious injury or death to the operator or a bystander.

Safety, mechanical and some general information in this manual are emphasized. **DANGER, WARNING and CAUTION** identify safety messages. Whenever the triangular safety symbol appears, it is followed by a safety message that must be read and understood. For more details concerning safety, read the Safety Instructions that follow. **IMPORTANT** identifies special mechanical information and **NOTE** identifies general information worthy of special attention.

These instructions are provided as a guide for the safe operation and maintenance of this equipment. However, the operator's personal safety, as well as those persons in the work area, will depend on the careful actions and good judgement of the operator. **To reduce the potential for injury or death, comply with the following safety instructions.**

### BEFORE OPERATING:

1. Operate this accessory only after reading and understanding the contents of this manual. A replacement manual is available by sending complete model and serial number to: Hahn Equipment Co., A subsidiary of The Toro Company, 1625 N. Garvin, Evansville, IN 47711-4596.

2. Learn how to operate the Sonic Boom™ and how to use the controls properly. Do NOT let anyone operate this equipment without first receiving thorough instructions.

3. Keep all shields, safety devices, and decals in place. If a shield, safety device, or decal is malfunctioning, illegible or damaged, repair or replace it before operating the machine.

4. Chemicals can injure persons, animals, plants, soils or other property. To eliminate environmental damage and personal injury:

A. Select the proper chemical for the job.

B. Follow the manufacturer's instructions on chemical container labels. Apply and handle chemicals as recommended.

C. Handle and apply chemicals with care. Wear goggles and other necessary protective equipment. Handle chemicals in well ventilated areas. Never smoke while handling chemicals.

D. Properly dispose of chemical container and unused chemicals.

# SAFETY INSTRUCTIONS AND DECALS

## WHILE OPERATING:

5. Make certain everyone is clear of the machine before starting the engine.
6. If equipment begins to vibrate abnormally, stop **immediately**. Shut off the vehicle engine and disengage all power. Repair all damage before commencing operation.

**⚠ CAUTION**

**This accessory will raise the Booms during operation, adding to the overhead clearance needed to operate the vehicle safely.**

- In order to avoid electric shock, inspect the area overhead for wires before raising Booms.
- Always use caution while operating the Booms near low clearance areas.



✔ IMPORTANT

SENSOR MAY BE DAMAGED BY PRESSURIZED WASHING.

DO NOT WASH SENSOR/MOUNT WITH PRESSURIZED SPRAY.

TO CLEAN, WIPE WITH DAMP CLOTH. SEE OPERATOR'S MANUAL

94-8576

**Part No. 94-8576; Located on the Sensor Bracket on Workman® and MULTI PRO® Sprayers**

INPUT POWER

5 AMP

94-8584

**Part No. 94-8584; Located at the Fuse Block of Workman® and MULTI PRO® Sprayers**

OUTPUT POWER

10 AMP

94-8585

**Part No. 94-8585; Located at the Fuse Block of Workman® and MULTI PRO® Sprayers**

**⚠ CAUTION**




TO AVOID ELECTRIC SHOCK AND PERSONAL INJURY TO BYSTANDERS

- INSPECT AREA OVERHEAD FOR WIRES BEFORE RAISING BOOMS.
- KEEP BYSTANDERS AWAY WHILE RAISING AND LOWERING BOOMS.

**Part No. 87-0570; Located on both corners of Rear Tank Band on Workman® and MULTI PRO® Sprayers**

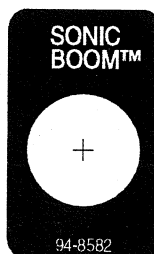
7. **Before** servicing or making any adjustments to the Sonic Boom™:

- A. Stop the vehicle and set the parking brake.
- B. Shut off the vehicle's engine and remove key from ignition.
- C. Disengage all power and wait until all moving parts have stopped.

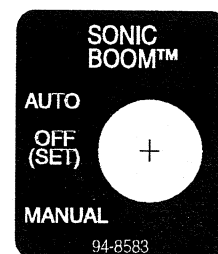
8. Keep all nuts, bolts and other fasteners tightened securely. Replace any shields removed during servicing or adjustments.

9. Safety and instruction decals are installed on this equipment. If any become damaged or illegible, replace them. Decal part numbers are listed below. Order replacements from your Authorized Toro Distributor.

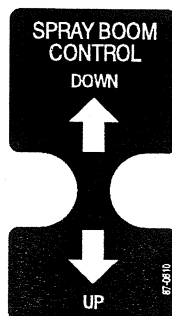
10. To be sure of optimum performance and safety, always purchase genuine TORO replacement parts and accessories. Replacement parts and accessories made by other manufacturers could be dangerous. Altering this equipment in any manner may affect the machine's operation, performance, durability or its use may result in injury or death. Such use could void the product warranty of the TORO Company.



**Part No. 94-8582; Located on the Dash of Workman® and MULTI PRO® Sprayers**



**Part No. 94-8583; Located on Switch Mounting Bracket of Workman® and on Console Control Panel on MULTI PRO® 1100 Sprayers**



**Part No. 87-0610; Located on left Control Panel of MULTI PRO® 1100 Sprayers**



**Part No. 92-2660; Located on the Dash Bracket of the Workman® Sprayers**

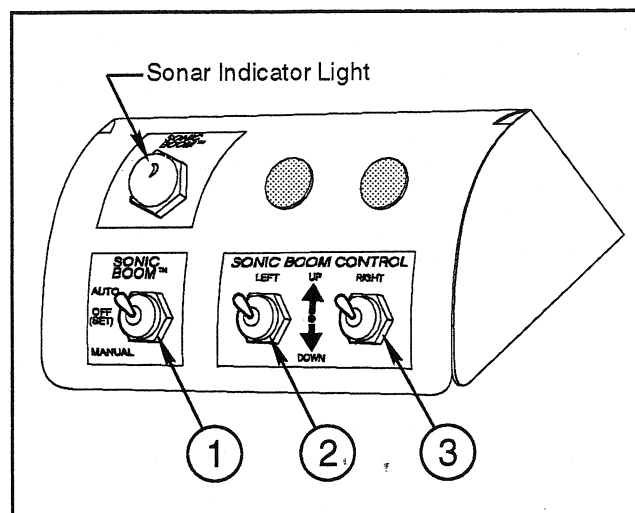
## CONTROLS

**1. Sonic Boom™ Mode Switch:** Toggles the boom lift control between OFF, automatic operation, and manual operation.

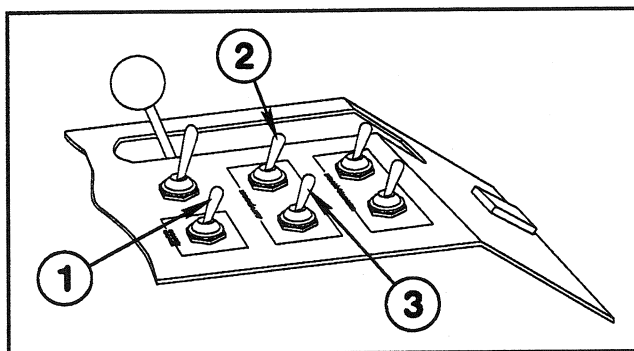
**2. Left Boom UP/DOWN Switch:** Controls the up and down motion of the Left Boom.

**3. Right Boom UP/DOWN Switch:** Controls the up and down motion of the Right Boom.

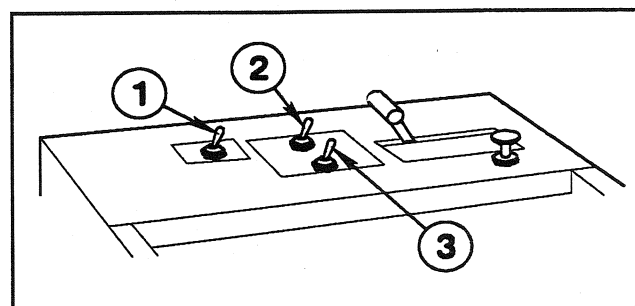
**Sonar Indicator Light:** Located on Front Instrument Panel (Dash). Remains on when system is functioning correctly in Auto or Manual mode. Flashes when in Calibrate mode, when a Boom is manually overridden in Auto mode, when sensor is not detecting a Boom height signal, or when a Boom does not reach target within 5 seconds.



WORKMAN®



MULTI PRO® 5500



MULTI PRO® 1100

## OPERATION

**NOTE:** On the MULTI PRO® 5500 Sprayer, the ignition must be ON for the Sonic Boom™ Controller to receive power.

### MANUAL OPERATION:

1. Turn Sonic Boom™ Switch to "Manual" position. Sonic Boom™ indicator light will come on.
2. Use the Left and Right Boom switches to raise or lower the individual Boom extensions.

### CAUTION

Making contact with the Booms to overhead power lines could produce an electrical shock resulting in personal injury or death.

- When activating the Booms, always be aware of your surroundings. Do not risk contact with bystanders, overhead power lines, or other equipment.

# OPERATION

## AUTOMATIC (SONAR) OPERATION:

Before using the Boom in automatic operation, the controller must be calibrated to return the Booms to a level position. This is a one-time step that stores a reading into the memory of the controller and should not have to be repeated unless service is performed on the controller, or Boom height is changed.

### Controller Calibration:

1. Turn Sonic Boom™ Switch to the OFF position.
2. Actuate either the left or right Boom Switch in either direction and hold. Place Sonic Boom™ Switch in Auto position. The indicator light will flash rapidly indicating that the system is in Calibration mode. Release the Boom Switch.
3. Use left and right Boom Switches to actuate Booms to a level position. The system allows 20 seconds in Calibrate Mode to perform the necessary adjustments. When 20 seconds have expired, the light will stop flashing and remain on. The system is now in auto mode and should provide automatic control of the Boom extensions.

## MANUAL OVERRIDE IN AUTO MODE:

To manually override the automatic Boom leveling, use the Left and Right Boom Switches to raise or lower the Boom extensions. If only one Boom is overridden, the opposite Boom will continue to function in automatic operation. In override mode, the light will flash at a moderate speed to indicate the automatic override. In automatic mode, manually overriding the Boom in the "raise" direction will deactivate the automatic operation for that Boom when the switch is released. The indicator light will flash to show this condition. This will allow the Boom extension to remain in a raised position without holding the switch. To restore automatic operation to the Boom, actuate its corresponding switch to the "lower" direction until the Boom is about half way down, and release the switch.

**IMPORTANT: DO NOT MANUALLY OVERRIDE THE BOOMS PAST THE TRAVEL LIMIT (IDENTIFIED BY RATCHETING SOUND) FOR EXTENDED PERIODS. THIS WILL ADVERSELY AFFECT THE MOTOR LIFE OF THE ACTUATORS.**

# SYSTEM ERROR DETECTION

Two main system errors that are detected by the software are "Boom Not Tracking" and "Loss Of Sensor Data". For each error, the indicator light will flash slowly and automatic control is disabled for the boom with the error.

In addition to the flashing indicator light, the errors can be identified by using the Diagnostic ACE Tool with the Sonic Boom™ template provided. This tool will identify a system error and indicate which Boom has the problem. The tool can also verify the operation of each input and output of the controller.

The "Boom Not Tracking" error occurs when the controller attempts to move the boom to a level position but does not reach its target within 5 seconds. Some causes for this condition would be a failure of one of the H-bridge relays or an actuator motor, erroneous sensor data, and a failure of the ECU outputs for motor or direction. It is possible, but unlikely, that rapidly changing terrain could cause the error in normal operation. This error can be cleared in several ways: switch the system OFF then return to AUTO or actuate the Manual Boom Switch for the boom with the error.

The "Loss Of Sensor Data" error occurs when the boom sensor has not provided a boom height reading in the last tenth of a second. Some causes for this error would be sensor cable not connected or connected improperly, blocked sensor signal, sensor failure, or ECU failure. Only manual control of the booms is available until the sensor begins providing data to the controller.

# TROUBLESHOOTING

Trouble shooting of the Sonic Boom™ can be done with or without the Diagnostic ACE display tool. A problem is identified by observation of incorrect response of the system. The schematic diagram should be reviewed to understand the electrical circuit.

## Using the Diagnostic ACE display tool for troubleshooting:

The following steps should be followed to set-up and use the Diagnostic ACE display:

1. Turn off the Sonic Boom™ power by placing the SONIC BOOM™ MODE switch to the OFF position.

2. Locate the looped back connector in the wire harness near the electronic controller. Carefully disconnect the looped back connector from the harness connector.

3. Connect the Diagnostic ACE display connector to the harness connector. Make sure the correct overlay decal is positioned on the Diagnostic ACE display.

4. Apply power to the Sonic Boom™ system by placing the SONIC BOOM™ MODE switch in the "manual" or "Auto" position.

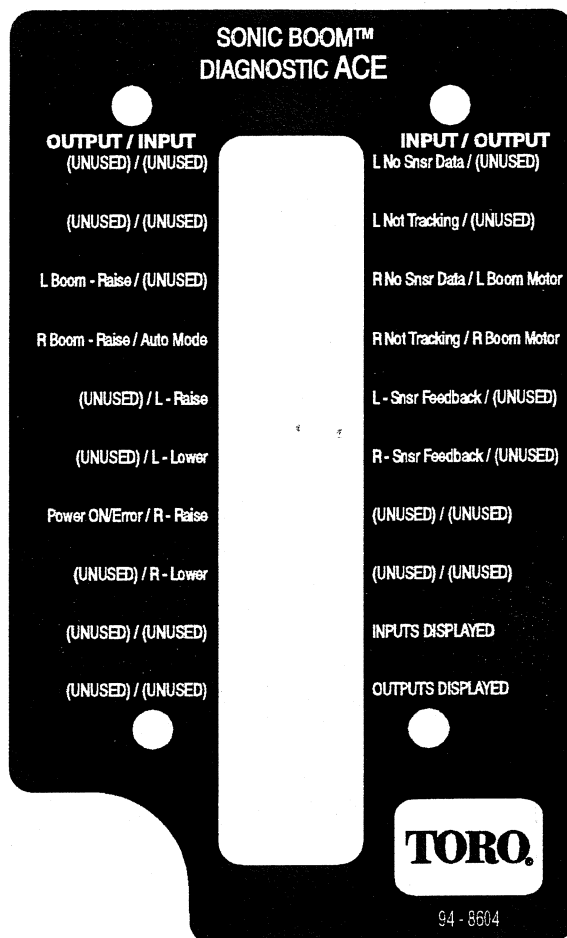
5. Each LED on the display can represent an output or input to the electronic controller. One of the two LEDs on the lower right column of the display will identify if inputs or outputs are displayed. If in input mode, the LED labeled "Inputs" will be on. If in output mode the LED labeled "Outputs" will be on. The switch in the bottom center of the display will switch between input and output modes.

6. The remaining LEDs represent the various input and outputs to the controller. An LED that is on, indicates that input or output is active.

**NOTE: The green text on the overlay decal refers to outputs to the system. The red text refers to the inputs to the system. An exception to this is that four unused inputs are used to report system errors detected by the electronic controller. These errors include "Loss of sensor data" and "Boom not tracking" for the right and left Booms.**

## Troubleshooting without the diagnostic ACE display:

Failures in the Sonic Boom™ system can be isolated using a multimeter and electrical schematic. The failure mode of the system will give an indication of which part of the circuit to



check. Checking voltages and continuity in the suspect circuit will lead to the faulty connection or component.

## One or both Booms malfunction in Auto Mode:

In auto mode, the Booms will constantly adjust height to a predetermined level. If the Booms stop adjusting automatically, follow the following steps to isolate the malfunction:

1. Check state of Indicator Light.

- A. If light is OFF (system is not powered): check fuses, check for burned out lamp, verify voltage at electronic controller power input, verify wiring connections. If light is flashing slowly, system error has been detected.

- B. If light is flashing, system error has been detected. Activate the Boom lower switch for the failed Boom to clear the error. No isolation of this problem is required unless the problem persists. (See step 2 for isolation of persistent error)

- C. If the light is on solid, the system is powered up and running normally.

# TROUBLESHOOTING

2. If Indicator Light flashes after repeated manual correction of the error condition, the problem may be at the Sensor.

A. Ensure that the Sensor Filter is clean.

B. Verify that the Sensor has power applied. If the Sensor is powered, the LED at the end of Sensor will be flashing.

C. Verify that Sensor output is functioning. This can be done by swapping Boom Sensors to see if the problem follows the Sensors. If the problem follows the Sensor, replace defective Sensor.

3. Verify that Boom Motor is getting voltage. This can be done by manually manipulating motor. If the Boom does not move manually, check the circuit between the electronic controller, and the Boom Actuator to identify possible component or wiring problems. Also, verify that the 10 amp fuses in the fuse block are not burned out. If the motor is getting 12V power with the manual switch engaged, replace the boom actuator.

4. If Boom moves only in one direction, check the H-bridge circuitry for faulty wiring or components.

## One or both Booms malfunction in Manual Mode:

In manual mode, the Booms will only move in response to inputs from the manual control switches. To isolate the source of manual mode malfunctions, follow these steps:

1. Verify that the system has power. If the system does not have power the Indicator Light will not be on. Check fuses, check for burned out lamp, verify voltage at electronic controller power input, verify wiring connections for this circuit.

2. Switch to Auto Mode. If the problem exists in Auto Mode, follow Auto Mode steps 3 and 4.

3. If the boom does not move as a result of manipulating a Manual Boom switch, verify switch manipulation causes an appropriate change in voltage at the electronic controller at inputs. If the voltage at the controller is correct, the controller is malfunctioning. If the voltage at the controller is incorrect, verify the wiring of this input circuit and check for faulty switch.

# CLEANING/MAINTENANCE

**IMPORTANT:** Do not spray wash sensor components of Sonic Boom™. Cover sensors completely to protect them from spray when power washing boom. Pressurized spray may penetrate sensor housing and cause a malfunction.

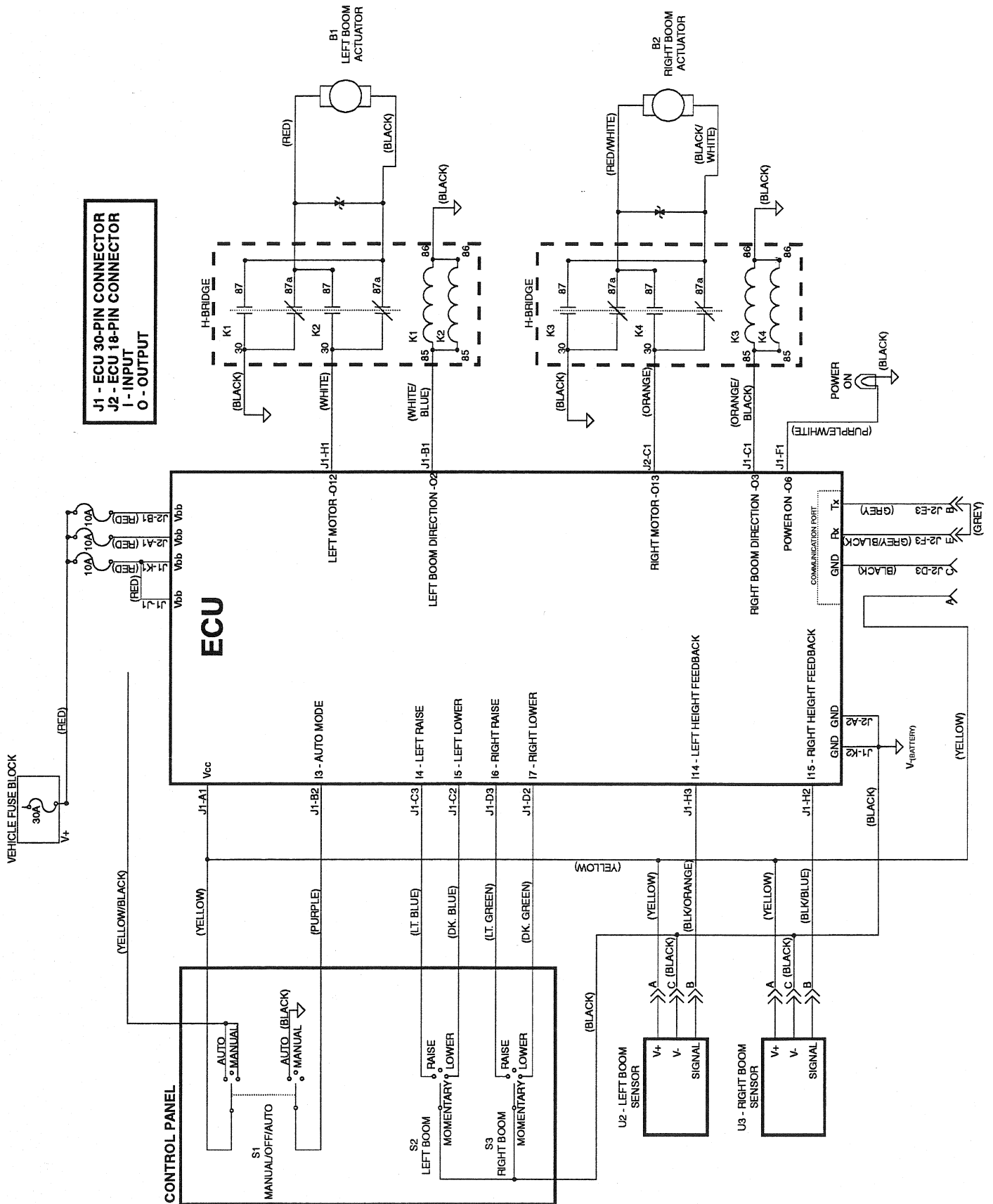
1. Clean sensors with a clean damp cloth only.
2. Periodically inspect sensor filter assembly for damage and replace if necessary.

## CAUTION

Chemicals are hazardous and can cause personal injury!

- Properly dispose of rags contaminated with chemical.
- Follow chemical Manufacturers recommendations on container labels.

## FUNCTIONAL SCHEMATIC



**The Toro 90 Day Parts Warranty applies to this kit.**