SECTION 03-404.02
WINSHIELD WIPERS AND WASHER FLUID

DESCRIPTION

The Nova LFS vehicle is equipped with a windshield wiper system that meets the strictest standards for windshield wiper and washer systems on vehicles weighing more than 10,000 lb (4,500 kg).

The windshield wiper system ensures that the operator has an unobstructed view in all weather conditions. All controls are within easy reach of the operator. The main components are two wiper blades, left and right arms, two shafts, two linkages attached to the wiper motor, a pivot, an electric windshield wiper motor and a wiper motor mount. See Figure 1.

The washer system consists of a reservoir, which contains windshield washer fluid, a pneumatic pump, hoses, and washer nozzles installed on the windshield wiper arms. A pneumatic pump pumps cleaning fluid through a hose to the washer nozzles.

The windshield washer fluid reservoir is a plastic container, located in the front driver’s side of the bus. The level of washer fluid can be observed through the container. See Figure 2.

OPERATION

When the wiper switch is turned on, the motor moves the linkage system back and forth, which in turn moves a set of wiper arms on the outside of the windshield. Wiper blades attached to the arms move back and forth across the windshield. The speed of the wiper sweep is adjustable and is controlled by the operator. See Figure 1.

The windshield wipers are controlled by a knob on the control panel. The knob has four positions; STOP, INTERMITTENT, SLOW and FAST. In INTERMITTENT mode, the cycle speed can be adjusted by turning the knob.

For windshield washing, the operator pushes the wiper switch to start the washer system. A pneumatic pump pumps cleaning fluid out of the reservoir through a hose to the washer nozzles. The nozzles direct the spray onto the windshield. When the washer is activated, the wipers are also activated and the wiper blades move the fluid across the windshield to clean it. See Figure 2.
CAUTION:

If the electric motor starts racing, it is equipped with an automatic motor shutoff system. Be aware that the motor may restart without warning.

See Figure 3.

The electric wiper motor is located under the dashboard and is attached to a mounting bracket by three bolts. To replace the motor, perform the following steps:

1. Unplug the electrical connector.
2. Remove the two screws attaching the upper right part of the dashboard and gently lift off the dashboard to facilitate access to the mounting nuts. If possible, re-use the same mount if it is not damaged.
3. Remove the retaining ring that holds the rods to the motor arm, and remove the rod.
4. Remove the motor mount by unscrewing the two upper and the two lower bolts holding the mount to the vehicle body.
5. Remove the three bolts holding the motor to the mount.
6. To install the replacement motor, perform steps 1 to 5 in reverse order. Apply the torque values indicated in Figure 3.

WIPER LINKAGE REPLACEMENT

REMOVAL

1. Remove the right toe shield.
2. Remove the heater control console.
3. Remove the center dash panel.
4. Remove the right dash panel.
5. Gain access through the center dash panel, then remove the locknut, retaining ring and washer (between the front shell and the wiper motor) at the wiper motor, for free movement of the wiper linkage.
6. Place the left and right arms in a horizontal position.
7. Use a narrow blade screwdriver to remove the curbside wiper nut, retaining ring and washer at the center pivot assembly. (Gain access through the center dash panel).
8. Place the left and right arms in a vertical position.
9. Use a narrow blade screwdriver to remove the driver’s side wiper nut, retaining ring and washer at the center pivot assembly. (Gain access through the center dash panel).
10. Remove the curbside headlamp and housing assembly and the driver’s side directional lamp, to be able to remove the nut, retaining ring and washer at the wiper pivot assembly.
   See section 16: ELECTRICAL SYSTEM, in this manual.
11. Remove the three bolts (two on the bottom and one on the top) that attach the center pivot assembly to the vehicle structure. Use the center dash panel area to access the bolts.
12. Remove the link arm and the center pivot assembly.
INSTALLATION
1. Place the link arm and the center pivot assembly in position on the vehicle.
2. Use the three bolts to attach the center pivot assembly to the vehicle structure, torque bolts to the values indicated in Figure 4. Gain access through the center dash panel area.
3. Install the locknut, retaining ring and washer at the wiper pivot assembly.
4. Install the curbside headlamp and housing assembly and also the driver’s side directional lamp. See section 16: ELECTRICAL SYSTEM, in this manual.
5. Place the left and right arms in vertical position.
6. Use a narrow blade screwdriver to install the driver’s side wiper linkage locknut, retaining ring and washer at the center pivot assembly.
7. Place the left and right arm in a horizontal position.
8. Use a narrow blade screwdriver to install the curbside wiper linkage locknut, retaining ring and washer at the center pivot assembly.
9. Gain access through the center dash panel, then install the locknut, retaining ring and washer (between the front shell and the wiper motor) at the wiper motor.
10. Install the right dash panel.
11. Install the center dash panel.
12. Install the heater control console.
13. Install the right toe shield.

WIPER ARMS
REPLACEMENT
1. Remove the crown nut and the screw that holds the wiper arm bracket at the end of the arm. See Figure 4.
2. Remove and discard the nylon insert nut.
3. Disconnect the washer hose from the nozzle attached to the front shell.
4. Place a new windshield wiper in the arm bracket. Align the arm and bracket holes.
5. Install a new nylon insert nut, the screw and the crown nut. Do not overtighten the crown nut. Use the torque values specified in Figure 4.
6. Reconnect the washer hose to the nozzle on the front shell.

NOTE:
To operate the wiper arm properly, the arm must have some play in its bracket.
VERIFICATION

1. Ensure the control switch is at the **STOP** position.
2. Make a mark with a grease pencil 1" from the rubber edge of the windshield, or use a 1"(25 mm)-wide piece of masking tape stuck on the rubber windshield liner. See Figure 4.
3. Ensure the windshield wipers conform to the shape of the windshield.
4. Wet the windshield with windshield washer fluid by pressing on the control switch.
5. Activate the windshield wipers by turning the control switch.
6. Check whether the windshield wipers reach and do not exceed the pencil marks or the masking tape.
7. If the windshield wipers do not reach, or if they surpass the pencil marks or the masking tape, readjust the wiper arms by repositioning the arms on the pivots and restart the inspection procedures.

WIPER SHAFT PIVOTS

REPLACEMENT

1. Remove the windshield wiper arm, as indicated in the procedure **WIPER ARMS**, earlier in this document.
2. Remove the wiper linkage, as indicated in the procedure **LINKAGE**, elsewhere in this document.
3. Remove the nut holding the wiper shaft pivot to the front shell of the bus. Remove the pivot by withdrawing it from behind the front shell.
4. To install the replacement wiper shaft pivot, perform steps 1 to 3 in the reverse order. Apply the torque value as indicated in Figure 4.

WIPER BLADES

REPLACEMENT

1. Remove the two plastic caps at either end of the wiper.
2. Remove the rubber blade by sliding gently outward.
3. Replace with a new blade.
4. Replace the two plastic caps at either end of the wiper.

WIPER BLADE HOLDERS

REPLACEMENT

1. Remove the bolt holding the wiper blade holder to the wiper blade arm. See Figure 6.
2. Remove the wiper blade holder.
3. Replace with a new wiper blade holder.
4. Replace the bolt holding the wiper blade holder to the wiper blade arm.

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**Figure 5 - Windshield Wiper Indicators**

**Figure 6 - Removal of Wiper Blade Holder**
WINDSHIELD WASHER ELECTRONIC VALVE

REPLACEMENT

See Figure 7.

The windshield washer electronic valve is located under the front of the vehicle, attached to the rear of the front chassis plate and is held in place by two bolts. To replace the valve, perform the following removal steps:

1. Make sure the motor is off.
2. Remove the protective panel under the front of the vehicle.
3. Disconnect the tubing from the air line.
4. Unplug the electrical connection.
5. Remove the two valve retaining nuts.
6. Replace the valve with a new valve.
7. To install the new valve, perform steps 1 to 6, but in the reverse order.

NOZZLES

REPLACEMENT

See Figure 8.

REMOVAL

1. Slowly remove the flexible tube from the nozzle housing.
2. Unscrew and remove the maintaining screw of the double nozzle.
3. Remove and discard defective or broken nozzle and replace with a new nozzle.

INSTALLATION

1. Reinstall the new nozzle, taking care to put the tube properly all the way on the connector.
2. Before replacing the new nozzle, rotate the flexible tube (about 10 turns) clockwise to properly seat the tube when tightening.
3. Tighten the nozzle in its housing. Tighten the assembly firmly. Use thread locker - medium strength.

ADJUSTMENT

1. Adjust the screws to an angle of 45° on each side, using a flat screwdriver, in order to cover most of the windshield. See Figure 9.
2. Press on the control knob and hold it in this position until there is sufficient spray on the windshield.

NOTE:
Make sure the system pressure is at least 80 psi (552 kPa).

3. Check the sprayed surface and readjust if necessary.
**PREVENTIVE MAINTENANCE**

One of the recommended ways to prevent problems with the windshield wiper system is to operate the windshield wiper system at least once each day. This allows the components to stay well lubricated and prevents rapid wear.

Wiper blades should be inspected regularly and replaced when they are worn out. The windshield washer fluid reservoir should also be inspected regularly and refilled when necessary.

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**SPECIFICATIONS**

**WINDSHIELD WIPER AND MOTOR**

- Manufacturer: Sprague Devices Inc.
- Model: See Parts Manual

**CYCLES PER MINUTE**

(wet glass).............. $115 \pm 5$ (maximum speed)
# WINDSHIELD WIPERS TROUBLESHOOTING GUIDE

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The motor does not work. (If the motor is racing, wait a while for it to cool.)</td>
<td>a. Control switch in the STOP position. b. No current. c. Seized motor. d. Damaged motor. e. Electronic control module in the switch damaged.</td>
<td>a. Move the control switch to the RUN position. b. Check the connections. Replace damaged wires. c. Check the couplings and replace if necessary. d. Replace. e. Replace.</td>
</tr>
<tr>
<td>2. The motor axle turns, but no movement results.</td>
<td>a. The couplings.</td>
<td>a. Try to thoroughly clean the couplings and drive axle and retighten. Replace if necessary.</td>
</tr>
<tr>
<td>3. The system works, but there is no movement of the arms.</td>
<td>a. The wiper arm pivot is loose. b. The arm is loose or broken.</td>
<td>a. Tighten the components well and change if necessary. b. Retighten the components. Replace parts if necessary.</td>
</tr>
<tr>
<td>5. The motor runs irregularly.</td>
<td>a. Irregular voltage. b. Broken control switch. c. Broken or damaged wire.</td>
<td>a. Check and repair the electrical system. b. Replace the control switch. c. Repair or replace the wire if necessary.</td>
</tr>
<tr>
<td>6. The motor runs too fast.</td>
<td>a. The electrical system voltage is too high. b. System components are broken. c. Components of the pivot assembly are broken or damaged. d. Worn or damaged windshield wiper components. e. The motor assembly is loose.</td>
<td>a. Repair and revise the electrical system. b. Replace. c. Replace. d. Replace. e. Replace.</td>
</tr>
<tr>
<td>7. Wiper arm does not return to its initial position.</td>
<td>a. Damaged motor.</td>
<td>a. Replace.</td>
</tr>
<tr>
<td>8. Wiper arms surpass the windshield area and hit the windshield moulding.</td>
<td>a. The wiper arm pivot is loose (loss of torque on bolt).</td>
<td>a. Tighten the components well and replace if badly worn.</td>
</tr>
</tbody>
</table>

*Table 1 - Troubleshooting Windshield Wipers*
WINDSHIELD WASHER FLUID RESERVOIR

NOTE:
Left and right are in reference to viewing the vehicle from the outside, operator’s side.

See Figure 10.

The plastic windshield fluid reservoir is located in a compartment at the front operator’s side of the vehicle. The reservoir can vary in shape and size, depending on model. See Figure 10 for the different configurations.

NOTE:
It is not necessary to remove the reservoir to gain access to the washer fluid pump. Make sure that the tubes leading to NOZZLE and FROM CONTROL VALVE are unplugged on the reservoir cover (33 liter reservoir only).

To facilitate dismantling and assembly, mark the tubing beforehand.

REPLACEMENT

REMOVAL
1. Remove the first TRIAX panel located at the front street-side of the vehicle. See panel replacement in section 01: BODY in this manual.
2. Remove the reservoir cover. Make sure that the tubes leading TO NOZZLE and FROM CONTROL VALVE are unplugged on the reservoir cover (33-liter reservoir only).
3. a). 33-liter reservoir
   Detach the reservoir-retaining belt from its attachment points.
   b). 40-liter reservoir
   Remove the retaining bolts that attach the reservoir to the chassis.
4. Swivel the tank in order to maneuver it through the TRIAX opening.

INSTALLATION
1. Follow steps 1 through 4 of the removal procedure above, but in the reverse order.
2. Install the TRIAX panel according to the bonding and sealing procedures in section 01: BODY.

CLEANING AND EXAMINATION
1. Wash and clean all parts in alcohol and dry with compressed air.
2. Replace damaged or worn parts.
3. Lubricate the o-ring with MPG lubricant (33-liter reservoir only).

DISMANTLING THE WASHER FLUID COVER
(33 LITER RESERVOIR ONLY)
1. Remove the reservoir cover.
2. Unplug the tubes, two tubes linking the cover to the diaphragm and two tubes linking the air feed tubing to the washer fluid nozzle. The nozzle can now be separated from the cover.

REMTOUNTING THE WASHER FLUID COVER
To remount the washer fluid cover and valve, repeat the procedure described under the heading DISMANTLING THE WINDSHIELD WASHER RESERVOIR COVER AND VALVE, in the reverse order.

SPECIFICATIONS

WINDSHIELD WASHER RESERVOIR:
8.71 U.S. GALLONS (33 LITERS), OR
10.56 U.S. GALLONS (40 LITERS)
Manufacturer ........................................ Novabus
Model ....................................................... See Parts Manual

PUMP
Manufacturer ........................................ Sprague Devices Inc.
Model ....................................................... See Parts Manual
Figure 10 - Types of Windshield Washer Reservoir

33 LITRES (8.71 US GALLONS)

40 LITRES (10.56 US GALLONS)
## WINDSHIELD WASHER SYSTEM TROUBLESHOOTING GUIDE

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<th>PROBLEM</th>
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| 1. No washer fluid squirting out of nozzle. | a. Empty reservoir.  
   b. If the temperature is below 32°F (0°C), inappropriate fluid.  
   c. Blockage of nozzles.  
   d. Damaged, bent or disconnected tube.  
   e. Pneumatic system pressure too low.  
   f. The air pressure at the valve exit is below 35 psi (240 kPa).  
   g. No signal from control module to the valve.  
   h. The electronic air pressure valve is defective. | a. Add fluid.  
   b. Bring the vehicle into a heated location. Purge the fluid from the reservoir. Fill the reservoir with an appropriate washer fluid.  
   c. Remove the nozzles and clean with compressed air. Change the nozzles if necessary.  
   d. Realign the tube and replace if necessary.  
   e. Set the minimum pressure at 90 psi (620 kPa).  
   f. If the air pressure is correct, check whether the valve is blocked. If the valve is not blocked, replace the electronic valve.  
   g. Replace the control module.  
   h. Replace the valve. |
| 2. Electronic washer fluid valve is functional, but the nozzle does not spray. | a. The diaphragm is damaged. | a. Replace the diaphragm |
| 3. The nozzle does not spray enough. | a. tube or the diaphragm is blocked or damaged. | a. Check and clean the tube and the diaphragm as needed. |
| 4. The nozzles do not spray in the right place. | a. The nozzles are not correctly adjusted. | a. Reposition the nozzles. |
| 5. The diaphragm does not return to its initial position. | a. Damaged diaphragm.  
   b. Problem with the electronic washer fluid valve. | a. Replace the diaphragm.  
   b. Replace the electronic washer fluid valve. |

Table 2 - Troubleshooting Windshield Washer System