OPERATION

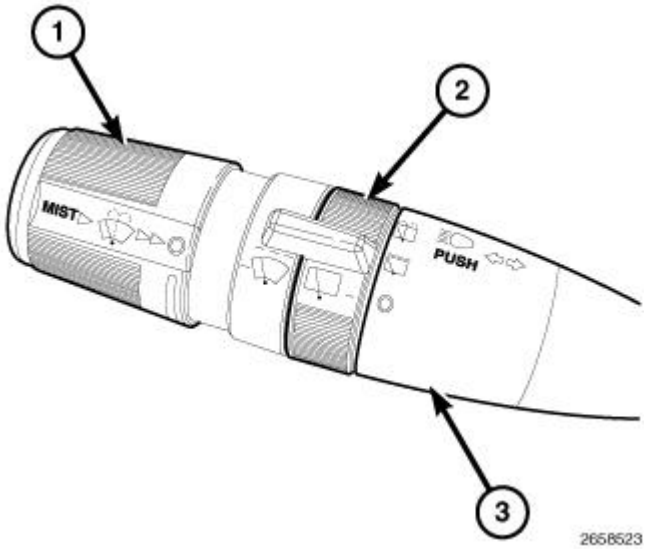

Fig. 1: Identifying Washer System Control Knob
Courtesy of CHRYSLER LLC

The front wiper and washer system is designed to provide the vehicle operator with a convenient, safe, and reliable means of maintaining visibility through the windshield glass. The various components of this system are designed to convert electrical energy produced by the vehicle electrical system into the mechanical action of the wiper blades to wipe the outside surface of the glass, as well as into the hydraulic action of the washer system to apply washer fluid stored in an on-board reservoir to the area of the glass to be wiped. When combined, these components provide the means to effectively maintain clear visibility for the vehicle operator by removing excess accumulations of rain, snow, bugs, mud or other minor debris from the outer surface of the windshield glass that might be encountered while driving the vehicle under numerous types of inclement operating conditions.

The vehicle operator initiates all front and rear wiper and washer system functions with the control knob (1) on the end of the control stalk (3) of the multi-function switch that extends from the left side of the steering column, just below the steering wheel. Rotating the control knob on the end of the control stalk, selects the OFF, DELAY (except with the optional automatic wiper system), AUTO (with the optional automatic wiper system only), LOW, or HIGH front wiper system operating modes. In the DELAY mode, the control knob also allows the vehicle operator to select from one of five intermittent wipe DELAY intervals. In the AUTO mode, the control knob allows the vehicle operator to select from one of five automatic wiper sensitivity levels.

Depressing the control knob towards the steering column to the first detent actuates a momentary switch and selects the MIST mode, which cycles the wiper blades for as long as the switch is held closed then completes the current cycle and parks the blades at the base of the windshield after the switch is released. Depressing the control knob to the second detent actuates the momentary washer system switch, which selects the WASH or WIPE-AFTER-WASH modes, depending upon when and how long the switch is held closed.

The multi-function switch provides hard wired analog and resistor multiplexed inputs to the Steering Control Module (SCM) internal to the multi-function switch housing for all of the wiper and washer system functions. The SCM then sends electronic **wiper** and **washer switch** status messages to the ElectroMechanical Instrument

Cluster (EMIC) (also known as the Cab Compartment Node/CCN) over a Local Interface Network (LIN) data bus. The EMIC responds to the SCM inputs by sending electronic **wiper** and **washer system** request messages to the Totally Integrated Power Module (TIPM) over the Controller Area Network (CAN) data bus requesting the appropriate wiper and washer system operating modes.

Front wiper and washer system operation are completely controlled by the SCM, EMIC and TIPM logic circuits, and that logic will only allow these systems to operate when the ignition switch is in the ACCESSORY or ON positions. The TIPM uses intelligent, high current, self-protected high side and low side drivers to control the wiper on/off and high/low relays in the TIPM, which controls wiper system operation by directing battery current to the proper front wiper motor low or high speed brushes. The TIPM uses front and rear washer relays to control the operation of the reversible washer pump/motor unit. The multi-function switch circuitry receives battery current and a clean ground output from the SCM, then provides analog and multiplexed inputs to the SCM to indicate the selected front wiper and front washer system mode.

The hard wired circuits and components of the front wiper and washer system may be diagnosed using conventional diagnostic tools and procedures. For complete wiring diagrams refer to:

- **SYSTEM WIRING DIAGRAMS** for Town & Country.
- **SYSTEM WIRING DIAGRAMS** for Grand Caravan.

However, conventional diagnostic methods will not prove conclusive in the diagnosis of the front wiper and washer system or the electronic controls or communication between other modules and devices that provide some features of the front wiper and washer system. The most reliable, efficient, and accurate means to diagnose the front wiper and washer system or the electronic controls and communication related to front wiper and washer system operation requires the use of a diagnostic scan tool. Refer to the appropriate Diagnostic Information.

OPERATING MODES

Following are paragraphs that briefly describe the operation of each of the front wiper and washer system operating modes.

AUTOMATIC WIPE MODE

If the vehicle is equipped with the optional automatic wiper system and it is enabled, when the control knob on the control stalk of the multi-function switch is moved to one of the five sensitivity positions, the SCM sends an electronic **wiper switch sensitivity** message to the EMIC over the LIN data bus, then the EMIC relays an electronic **wiper switch sensitivity** request message to the Wireless Ignition Node (WIN) over the CAN data bus, and the WIN relays the message to the Light Rain Sensor Module (LRSM) (also known as the Light Sensor Module/LSM or Rain Sensor Module/RSM) over the LIN data bus. The LRSM monitors an area within the wipe pattern of the windshield glass for the accumulation of moisture. Based upon internal programming and the selected sensitivity level, when sufficient moisture has accumulated the RSM sends the appropriate electronic **wipe command** messages to the WIN over the LIN data bus, which the WIN relays to the TIPM over the CAN data bus, then the TIPM operates the front wiper system accordingly.

As the sensitivity level is set higher, the LRSM is more sensitive to moisture accumulation and will send **wipe commands** more frequently. The third (middle) sensitivity position of the control knob is designed to provide optimal wiper performance for most typical driving requirements. The TIPM logic is also programmed to

provide an immediate wipe cycle each time the control knob on the control stalk of the multi-function switch is moved from the OFF position to one of the five sensitivity positions, and another immediate wipe cycle each time the control knob is moved from a lower sensitivity position to a higher sensitivity position.

Also, if a vehicle is equipped with automatic wipers but the feature has been disabled using the customer programmable features function, when any sensitivity position is selected with the control knob the system will respond in the same manner as in the intermittent wipe mode. The automatic wiper system also has features designed to protect the mechanical components of the wiper system, and will not allow automatic wiper operation under the following conditions:

- **Low Ambient Temperature** - When the ambient temperature is below 0° C (32° F), the automatic wipers will not operate during a new ignition cycle until the wiper switch has been moved to a different position than that which was selected at the moment the current ignition cycle began, or until a vehicle speed input is detected.
- **Transmission In Neutral** - When the transmission gear selector is placed in the NEUTRAL position with the ignition switch in the ON position, the automatic wipers will not operate during the current ignition cycle until the wiper switch has been moved to a different position than that which was selected at the moment the NEUTRAL position was selected, until the vehicle speed is greater than 8 kilometers-per-hour (5 miles-per-hour) or until the transmission gear selector is moved out of the NEUTRAL position, whichever occurs first.

CONTINUOUS WIPE MODE

When the LOW position of the control knob on the control stalk of the multi-function switch is selected the SCM sends an electronic **wiper switch low** status message to the EMIC over the LIN data bus, the EMIC relays an electronic **wiper switch low** request message to the TIPM over the CAN data bus, then the TIPM energizes the wiper on/off relay. This directs battery current through the normally open contacts of the energized wiper on/off relay and the normally closed contacts of the de-energized wiper high/low relay to the low speed brush of the wiper motor, causing the wipers to cycle at low speed.

When the HIGH position of the control knob is selected the SCM sends an electronic **wiper switch high** status message to the EMIC, the EMIC relays an electronic **wiper switch high** request message to the TIPM, then the TIPM energizes both the wiper on/off relay and the wiper high/low relay. This directs battery current through the normally open contacts of the energized wiper on/off relay and the normally open contacts of the energized wiper high/low relay to the high speed brush of the wiper motor, causing the wipers to cycle at high speed.

When the OFF position of the multi-function switch control knob is selected, the SCM sends an electronic **wiper switch off** status message to the EMIC, the EMIC relays an electronic **wiper switch off** request message to the TIPM, then one of two events will occur. The event that occurs depends upon the position of the wiper blades on the windshield at the moment that the control knob OFF position is selected.

If the wiper motor was operating at high speed, the TIPM immediately de-energizes the wiper high/low relay causing the wiper motor to return to low speed operation. If the wiper blades are in the down position on the windshield when the OFF position is selected, the park switch that is integral to the wiper motor is closed to ground and provides a hard wired park switch sense input to the TIPM. The TIPM then de-energizes the wiper on/off relay and the wiper motor ceases to operate. If the wiper blades are not in the down position on the windshield at the moment the OFF position is selected, the park switch is an open circuit and the TIPM keeps the wiper on/off relay energized, which causes the wiper motor to continue running at low speed until the wiper

blades are in the down position on the windshield and the park switch input to the TIPM is again closed to ground.

INTERMITTENT WIPE MODE

The following applies to vehicles not equipped with the optional automatic wiper system, or to vehicles equipped with the automatic wiper system that have disabled the feature using the customer programmable features function.

When the control knob on the control stalk of the multi-function switch is moved to one of the five DELAY interval positions the SCM sends an electronic **wiper switch delay interval** status message to the EMIC, the EMIC relays an electronic **wiper switch delay interval** request message to the TIPM, then the TIPM electronic intermittent wipe logic circuit responds by calculating the correct length of time between wiper sweeps based upon the selected delay interval input.

The TIPM monitors the changing state of the wiper motor park switch through a hard wired park switch sense input. This input allows the TIPM to determine the proper intervals at which to energize and de-energize the wiper on/off relay to operate the wiper motor intermittently for one low speed cycle at a time.

The TIPM logic is also programmed to provide vehicle speed sensitivity to the selected intermittent wipe delay intervals. In order to provide this feature the TIPM monitors electronic **vehicle speed** messages from the Controller Antilock Brake (CAB) and doubles the selected delay interval whenever the vehicle speed is about 16 kilometers-per-hour (10 miles-per-hour) or less.

MIST WIPE MODE

When the control knob on the control stalk of the multi-function switch is depressed to the momentary MIST position, the SCM sends an electronic **wiper mist mode** status message to the EMIC, the EMIC relays an electronic **wiper mist mode** request message to the TIPM, then the TIPM energizes the wiper on/off relay for as long as the switch is held closed, then de-energizes the relay when the state of the switch changes to open, parking the wiper blades near the base of the windshield. The TIPM can operate the front wiper motor in this mode for only one low speed cycle at a time, or for an indefinite number of sequential low speed cycles, depending upon how long the switch is held closed.

WASH MODE

When the control knob on the control stalk of the multi-function switch is depressed to the front momentary WASH position for more than about one-half second with the wiper system operating, the SCM sends an electronic **washer switch** status message to the EMIC, the EMIC relays an electronic **washer switch** request message to the TIPM, then the TIPM energizes the front washer relay, which directs battery current to the washer pump/motor unit while the de-energized rear washer relay provides ground. This will cause the washer pump/motor unit to be energized in the front wash direction for as long as the switch is held closed (up to about 10 seconds) and to be de-energized when the control knob is released.

When the control knob is depressed to the front momentary WASH position while the front wiper system is operating in one of the DELAY interval (or sensitivity level with automatic wipers) positions, the washer pump/motor operation is the same. However, the TIPM also energizes the wiper on/off relay to override the selected delay interval or sensitivity level and operate the front wiper motor in a continuous low speed mode for

as long as the control knob is held in the front momentary WASH position, then de-energizes the relay and reverts to the selected delay interval or sensitivity level several wipe cycles after the control knob is released. If the WASH switch is held closed for more than about 10 seconds, the TIPM will suspend washer pump/motor operation until the control stalk is released for about 2 seconds, then is cycled back to the WASH position.

WIPE-AFTER-WASH MODE

When the control knob on the control stalk of the multi-function switch is depressed to the front momentary WASH position for more than about one-half second while the wiper system is not operating, the SCM sends an electronic **washer switch** status message to the EMIC, the EMIC relays an electronic **washer switch** request message to the TIPM, then the TIPM energizes the front washer relay, which directs battery current to the washer pump/motor unit while the de-energized rear washer relay provides ground to the washer pump/motor and energizes the wiper on/off relay. This will cause the washer pump to operate in the front wash direction and operate the wiper motor in a continuous low speed mode for as long as the switch is held closed (up to about 10 seconds). When the control knob is released, the TIPM de-energizes the washer pump/motor, but allows the wiper motor to operate for two or three additional wipe cycles before it de-energizes the wiper on/off relay and parks the wiper blades near the base of the windshield.

If the control knob is held depressed for more than about 10 seconds, the TIPM will suspend washer pump/motor operation until the stalk is released for about 2 seconds, then is cycled back to the WASH position; however, the wipers will continue to operate for as long as the switch is held closed. The TIPM monitors the changing state of the wiper motor park switch through a hard wired wiper park switch sense circuit input. This input allows the TIPM to count the number of wipe cycles that occur after the control knob is released, and to determine the proper interval at which to de-energize the wiper on/off relay to complete the WIPE-AFTER-WASH mode cycle.

However, conventional diagnostic methods will not prove conclusive in the diagnosis of the headlamp washer system or the electronic controls or communication between other modules and devices that provide some features of the headlamp washer system. The most reliable, efficient, and accurate means to diagnose the headlamp washer system or the electronic controls and communication related to headlamp washer system operation requires the use of a diagnostic scan tool. Refer to the appropriate Diagnostic Information. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the rear wiper and washer system or the electronic controls or communication between other modules and devices that provide some features of the rear wiper and washer system. The most reliable, efficient, and accurate means to diagnose the rear wiper and washer system or the electronic controls and communication related to rear wiper and washer system operation requires the use of a diagnostic scan tool. Refer to the appropriate Diagnostic Information. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the LRSM or the electronic controls or communication between other modules and devices that provide some features of the automatic wiper system. The most reliable, efficient, and accurate means to diagnose the LRSM or the electronic controls and communication related to LRSM operation requires the use of a diagnostic scan tool. Refer to the appropriate Diagnostic Information.

