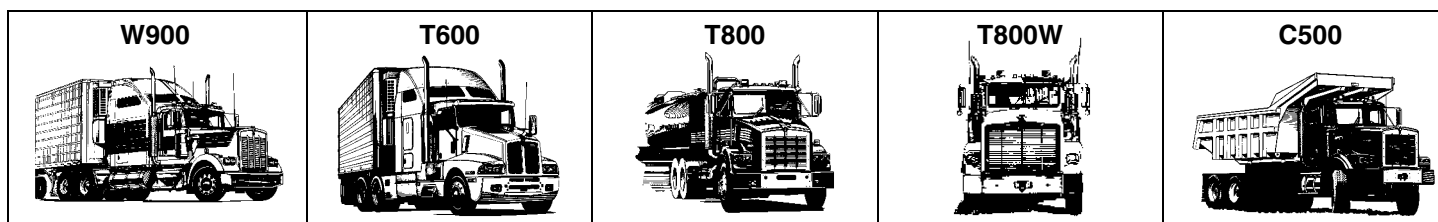


Service Manual

Department	Customer Service
Category	Service Manual
Section	Electrical
Title	Turn Signal Stalk / Turn Stalk Module (TSM) - 2005 Interior
Number	KM815060
Date	07/13/05
Model	W900, T600, T800, C500
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Turn Signal Stalk / Turn Stalk Module (TSM) - 2005 Interior



Electrical: Turn Signal Stalk / Turn Stalk Module (TSM) - 2005 Interior

Interior Identification

Kenworth began production of the 2005 interior on 06/27/2005 (some pilot trucks were built prior to this date). Chassis with this new interior can be identified either

- by appearance



- by searching ECAT for the instrument panel control unit, Q21-1029

Introduction

This manual provides service information covering Kenworth T600, T800, W900 and C500 models equipped with the Turn Signal Stalk and Turn Stalk Module (TSM). Before attempting to make service repairs, the technician should be knowledgeable about the system design, components, operation and troubleshooting procedures for diagnosing turn signal and external lighting problems.

Functional Description

The new multi-function turn signal stalk and turn stalk module control the following functions:

- Headlamps (high & low beam)
- Headlamp Flash
- Left & Right Turn Indicators
- Hazard Flashers
- Marker/ID Lamp Flash
- Tractor Stop Lamps
- Windshield Wipers (off/intermittent levels and low speed)
- Windshield Washer Pump
- Daytime Running Lamps (optional)



NOTE: The turn signal and hazard flashers are integral to the TSM. There are no separate flashers. The high speed wipers are controlled by a relay in the Power Distribution Box and not the TSM.



Figure 15-1

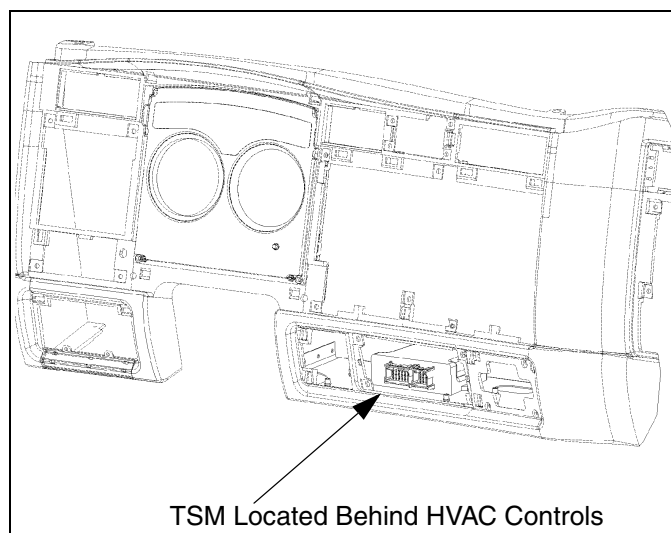


Figure 15-2

Electrical: Turn Signal Stalk / Turn Stalk Module (TSM) - 2005 Interior

Exterior Lighting Circuit Limits

The TSM is designed to operate within specific current limits for

- headlamps
- vehicle stop/turn signal lamps
- trailer turn/vehicle forward side facing turn signal lamps

If the current limits for any of these circuits are exceeded, the TSM will default to a protection mode (see [“TSM Failure Management” on page 4](#)), causing the lamps to not function properly but still providing sufficient lighting for safe operation of the vehicle.

The vehicle can exceed current ratings on a particular circuit in two ways

- Installing too many lamps on a circuit
- Using bulbs of too high a wattage

The following table is a recommended guideline to avoid exceeding the current limits of the TSM.

Circuit	TSM Current Limit	General Lamp Limits
Low Beam Headlamps	11.5A for both low beams	(1) 65W bulb each side maximum*
High Beam Headlamps	14A for both high beams	(1) 65W bulb each side maximum*
Left Turn / Left Trailer Turn Lamps	20A combined between left turn & left trailer turn	(9) #1156 or #1157 bulbs on left side of truck and trailer combined**
Right Turn / Right Trailer Turn Lamps	20A combined between right turn & right trailer turn	(9) #1156 or #1157 bulbs on right side of truck and trailer combined**
Left Stop / Turn Combination Lamps	5A for left side	(2) #1156 or #1157 bulbs per side**
Right Stop / Turn Combination Lamps	5A for right side	(2) #1156 or #1157 bulbs per side**

i **NOTE:** * A maximum wattage of 65W should not be exceeded for either low or high beam headlamps.

i **NOTE:** ** The maximum number of lamps can be exceeded if LED lamps are used in place of incandescent bulbs. LED type lamps draw far less current, but in any case, all lamps must not exceed the TSM current limits.

Electrical: Turn Signal Stalk / Turn Stalk Module (TSM) - 2005 Interior

TSM Failure Management

The TSM is designed with a failure management software. For example, in the case of a headlamp circuit failure, the TSM will attempt to protect itself as well as maintain enough forward lighting for a driver to safely pull the vehicle off the road. The following failure management features are included within the module.



NOTE: The information below only deals with the failure management features of the TSM. Other types of failures (i.e. wiring open/shorts, burned out bulbs, failed components) can still occur.

Symptom	TSM Fault	TSM Response	Possible Repair Solutions	Notes
<ul style="list-style-type: none"> Low beams should be active but the high beams and low beams are cycling on their own. 	<ul style="list-style-type: none"> The TSM has detected an over-current >110% of rated current on the low beam circuits. The TSM has detected an internal error on the low beam output circuitry. 	<ul style="list-style-type: none"> After approximately 1 second of overcurrent, the TSM will switch to high beams at 50% intensity for 1 second. It will then attempt to activate the low beams (while leaving the high beams on). If fault isn't cleared, it will attempt 5 times before switching low beams off and remaining on high beams at 50% intensity. 	<ul style="list-style-type: none"> Low beam bulbs >65W Low beam circuit powering too many bulbs Partial short circuit in low beam circuit Defective TSM 	<ul style="list-style-type: none"> A full short to ground will open the fuse before the TSM goes into failure management mode Fault mgmt behavior will be repeated if headlamp input is cycled
<ul style="list-style-type: none"> High beams should be active but they shut off on their own and cycle on and off 	<ul style="list-style-type: none"> The TSM has detected an over-current >110% of rated current on the high beam circuits. The TSM has detected an internal error on the high beam output circuitry. 	<ul style="list-style-type: none"> The TSM will switch the high beams off. It will reattempt the high beams every 5 seconds until the fault is removed or the input is deactivated 	<ul style="list-style-type: none"> High beam bulbs >65W High beam circuit powering too many bulbs Partial short circuit on high beam circuit Defective TSM 	<ul style="list-style-type: none"> A full short to ground will open the fuse before the TSM goes into failure management mode Fault mgmt behavior will be repeated if headlamp input is cycled

Electrical: Turn Signal Stalk / Turn Stalk Module (TSM) - 2005 Interior

Symptom	TSM Fault	TSM Response	Possible Repair Solutions	Notes
<ul style="list-style-type: none"> Turn lamps do not blink normally. They briefly blink every 5 seconds 	<ul style="list-style-type: none"> The TSM has detected an over-current on the turn signal circuit The TSM has detected an internal error on the turn signal output circuitry. 	<ul style="list-style-type: none"> The TSM will switch the turn lamps off after 200ms of overcurrent. It will reattempt the turn signals every 5 seconds until the fault is removed or the input is deactivated 	<ul style="list-style-type: none"> Too many bulbs attached to the circuit (either on the truck or the trailer) Partial short on the turn circuit Defective TSM 	<ul style="list-style-type: none"> A full short to ground will open the fuse before the TSM goes into failure management mode Fault mgmt behavior will be repeated if turn input is cycled
<ul style="list-style-type: none"> Turn/Stop combination lamps do not blink normally. They briefly blink every 5 seconds Stop lamps do not stay lit. They briefly light then go off (assumes not holding your foot on the brake for 5 seconds or longer) Stop lamps do not stay lit. They briefly light then briefly blink every 5 seconds if I hold my foot on the brake 	<ul style="list-style-type: none"> The TSM has detected an over-current on the turn/stop signal circuit The TSM has detected an internal error on the turn/stop signal output circuitry. 	<ul style="list-style-type: none"> The TSM will switch the turn lamps off after 200ms of overcurrent. It will reattempt the turn/stop lamps every 5 seconds until the fault is removed or the input is deactivated 	<ul style="list-style-type: none"> Too many bulbs attached to the circuit Partial short on the turn circuit Defective TSM 	<ul style="list-style-type: none"> A full short to ground will open the fuse before the TSM goes into failure management mode Fault mgmt behavior will be repeated if turn input is cycled
<ul style="list-style-type: none"> Turn lamps seem to blink at normal rate but they do not stay on as long as normal 	<ul style="list-style-type: none"> TSM detects voltage greater than 16V but not greater than 24V 	<ul style="list-style-type: none"> TSM will reduce duty cycle of blinking turn lamps from 50% to 35% TSM will return to normal operation once voltage falls below 16V 	<ul style="list-style-type: none"> Determine cause of voltage greater than 16V either at the TSM or on the truck in general 	
<ul style="list-style-type: none"> Washer pump does not operate 	<ul style="list-style-type: none"> TSM detects a voltage greater than 16V 	<ul style="list-style-type: none"> TSM will deactivate the washer pump above 16V 	<ul style="list-style-type: none"> Determine cause of voltage greater than 16V at the TSM Defective washer pump 	

Electrical: Turn Signal Stalk / Turn Stalk Module (TSM) - 2005 Interior

Symptom	TSM Fault	TSM Response	Possible Repair Solutions	Notes
<ul style="list-style-type: none"> None of the TSM controlled lighting, wiper, or washer functions will activate 	<ul style="list-style-type: none"> Fuses open to TSM Voltage at the unit is either less than 7.5V or greater than 24V 	<ul style="list-style-type: none"> TSM cannot activate outputs at less than 7.5V, it will work normally once voltage is greater than 7.5V TSM will shut off if voltage at unit is greater than 24V or until voltage falls below 16V 	<ul style="list-style-type: none"> Check fuses to TSM and determine cause if they are open Determine cause of voltage less than 7.5V or greater than 24V either at the TSM or on the truck in general 	
<ul style="list-style-type: none"> Low Speed and Intermittent wiper setting only operate the wipers once every 5 seconds 	<ul style="list-style-type: none"> The TSM has detected an internal error on the wiper output circuitry. 	<ul style="list-style-type: none"> The TSM will switch the wipers off and will reattempt to activate them every 5 seconds until the fault is removed or the input is deactivated 	<ul style="list-style-type: none"> Wiper output is shorted to ground Defective wiper motor Defective wiper relay Defective TSM 	

Before assuming the Turn Signal Stalk or TSM is the source of a lighting problem, check to make sure the vehicle exterior lighting circuit limits have not been exceeded. See [“Exterior Lighting Circuit Limits” on page 3](#). The TSM is designed to protect itself under these conditions and could result in the headlamps, turn signals or stop lamps to operate differently than normal.

If the customer complaint is the same as described in the **TSM Failure Management** table above, the problem could be the circuit limits for the exterior lighting circuit in question have been exceeded. In these cases, the turn signal stalk or TSM is probably not the problem.

To check for a defective Turn Signal Stalk or TSM, use the [“Turn Signal Stalk Functionality Check” on page 7](#) and the [“Turn Stalk Module \(TSM\) Functionality Check” on page 8](#).

Electrical: Turn Signal Stalk / Turn Stalk Module (TSM) - 2005 Interior

Turn Signal Stalk Functionality Check

The multi-function turn signal stalk can easily be checked to determine if part of the switch is defective by performing resistance and/or continuity checks for specific switch positions.

Test Procedure

1. Remove gauge dash panel to right of steering column to access turn stalk harness behind dash. See [Dash - 2005 Interior](#) Service Manual (KM811055) for R & R procedure.
2. Disconnect the turn signal stalk pigtail harness connector from the instrument panel harness behind the dash. See [Figure 15-3](#).
3. Using a multimeter, connect the meter negative (-) lead to Pin 12 (Common) on the turn signal stalk harness connector.
4. Select the desired switch position/function to be tested. At the same time, connect the multimeter positive (+) lead on the harness connector terminal pin that corresponds to the switch function being

tested. Record the resistance and/or continuity values. The values should be approximately the same as in the table below.

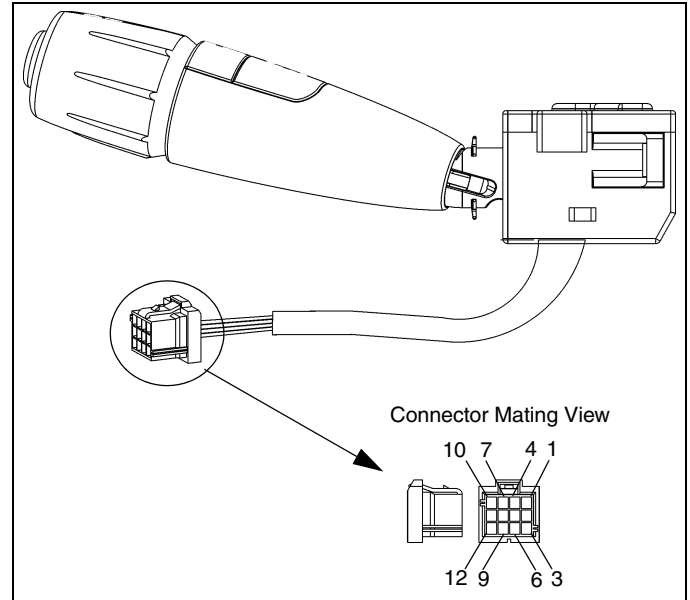


Figure 15-3

Turn Signal Stalk Harness Connector Pinouts			
Pin	Wire Color	Switch Position	Approximate Resistance Values
1	-		
2	YELLOW	TURN SIGNAL LEFT/RIGHT	LEFT 909Ω RIGHT 300Ω
3	-		
4	BLUE	HEADLAMP HIGH/LOW	143Ω
5	RED/BLUE	HEADLAMP FLASH	143Ω
6	BLACK	MARKER LAMP FLASH	CHECK FOR CONTINUITY
7	BLACK/GREEN	WIPER LOW/ INTERMITTENT	CYCLE PERIOD (seconds)
			INT #1 1194Ω 20
			INT #2 479Ω 12
			INT #3 239Ω 7
			INT #4 119Ω 4
			LOW 47.5Ω
8	GREEN	WIPER FAST	CHECK FOR CONTINUITY
9	BLUE/YELLOW	WASHER PUMP	CHECK FOR CONTINUITY
10	-		
11	-		
12	WHITE	COMMON (RETURN)	

Test Results

1. If the resistance values recorded for a specific switch function is "out of range" or there is no continuity, replace the turn signal stalk assembly.
2. If the resistance values for a specific switch function is approximately the same as in the table above, or there is continuity per the table above, the problem is **not** a defective turn signal stalk.
 - Additional testing must be done to determine if the problem could be a defective Turn Stalk Module (TSM), a failed component (i.e. wiper motor), or a circuit wiring problem.

Electrical: Turn Signal Stalk / Turn Stalk Module (TSM) - 2005 Interior

Turn Stalk Module (TSM) Functionality Check

The TSM receives input signals from the turn signal stalk for several lighting and wiper functions, based on the switch position selected. Hazard ON and Headlamps ON inputs are controlled by simple open/closed dash mounted switches. When the TSM sees the selected input, the TSM then sends output voltage to the component(s). The control module can be checked to determine if part of the module is defective by checking input/output voltages and/or continuity on specific connector pinouts.

Test Procedure

1. Remove the gauge dash panel to the right of the steering column to access the Turn Stalk Module (TSM). The module is located inside the lower dash behind the HVAC controls. See [Dash - 2005 Interior Service Manual \(KM811055\)](#) for the R&R procedures.

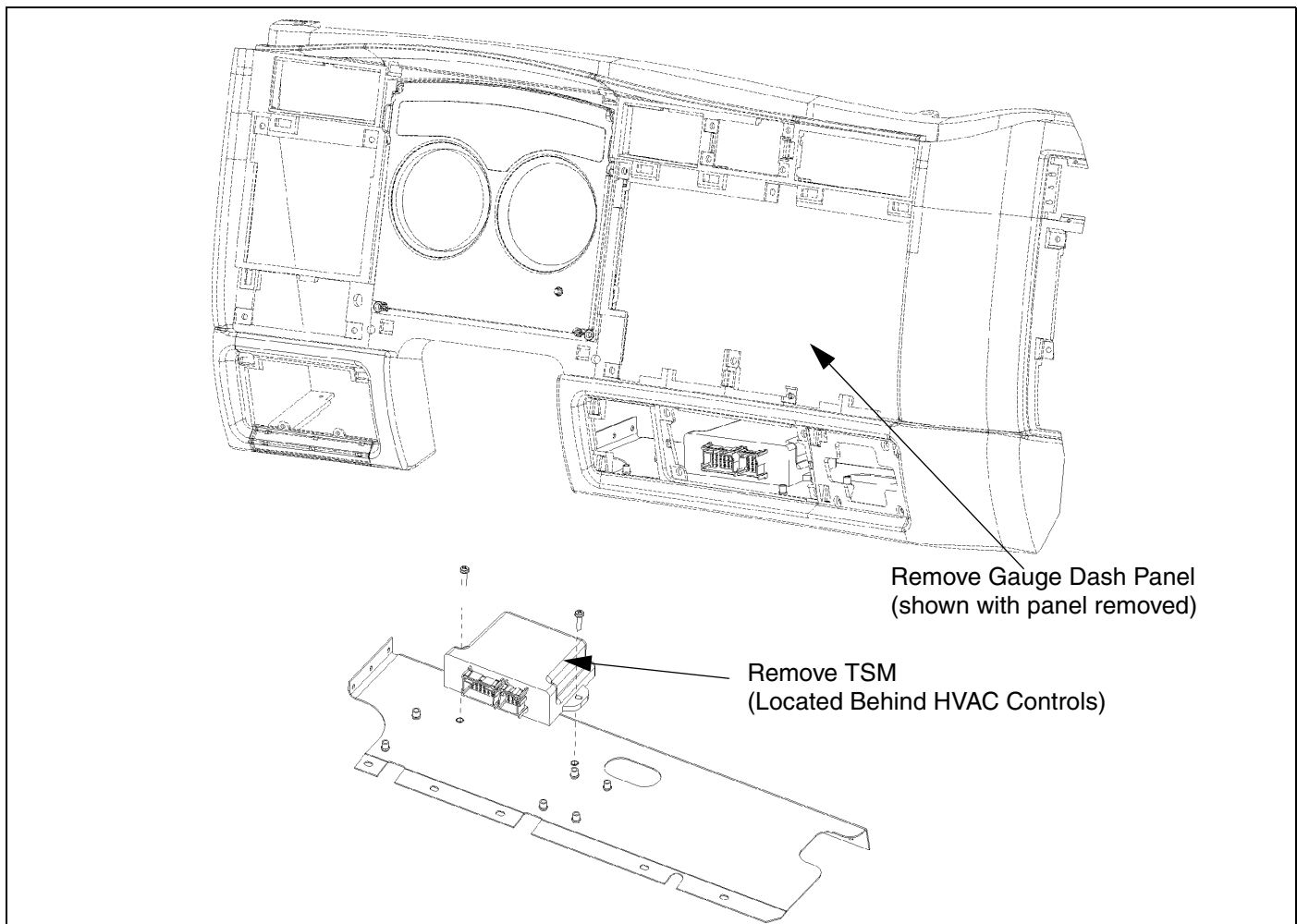


Figure 15-4

Electrical: Turn Signal Stalk / Turn Stalk Module (TSM) - 2005 Interior

- Remove 2 fasteners securing the TSM to the lower dash support tray. Move the module up and out to gain access to the harness connectors. See [Figure 15-4](#) and [Figure 15-5](#).

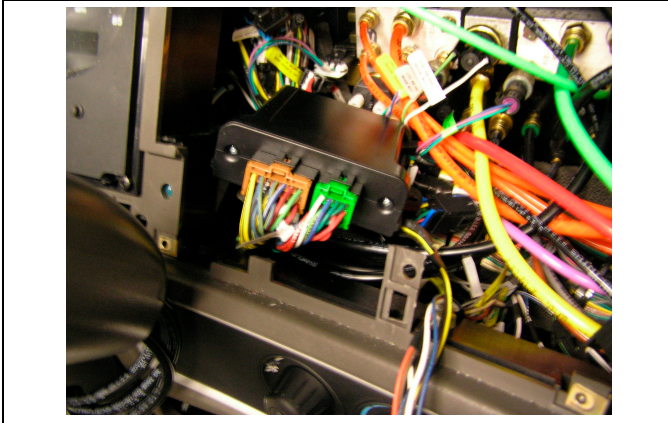


Figure 15-5

i *NOTE: All output voltage or input signal continuity checks must be performed with both harness connectors plugged into the module.*

- Using a multimeter, connect the meter negative (-) lead to either Pin 20 (on 21-way harness connector) or Pin 1 (on 12-way harness connector). See [Figure 15-6](#).
- Turn ignition switch to On position. If applicable, also switch the headlamp and/or hazard warning dash switches to the On position.
- Select the turn signal stalk switch position/function to be tested. At the same time, connect the multimeter positive (+) lead to the harness connector terminal pin that corresponds to the switch position selected. See [Figure 15-6](#).
- Record the input and output signal voltage. They should be approximately the same as in the tables below. See ["Turn Stalk Module \(TSM\) 21-Way Connector Pinouts"](#) on page 10 and ["Turn Stalk Module \(TSM\) 12-Way Connector Pinouts"](#) on page 10.

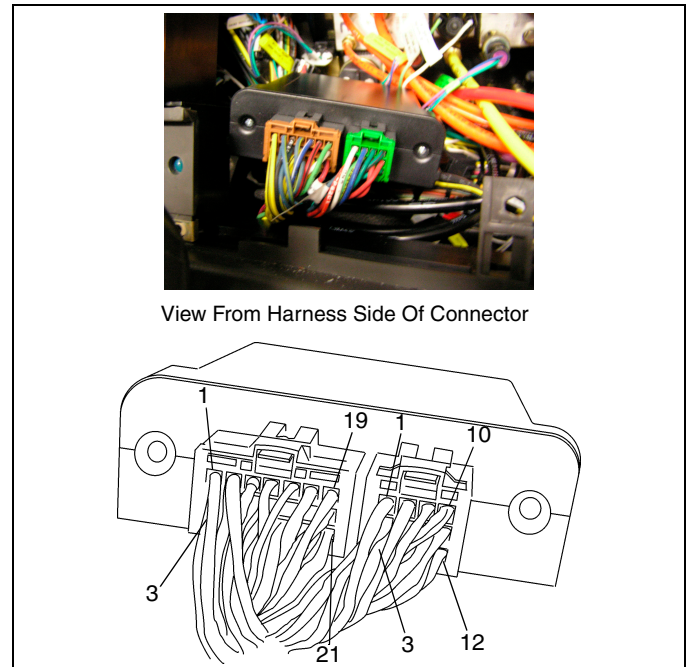


Figure 15-6

Electrical: Turn Signal Stalk / Turn Stalk Module (TSM) - 2005 Interior

Turn Stalk Module (TSM) 21-Way Connector Pinouts						
Pin	Circuit	Wire Color	Wire #	Function	Input / Output	Expected Values
1	L33LT3	YEL/BLK	1408	TURN/HAZARD - LEFT	O	+12V
2	L33LT3	YEL/BLK	0473	TURN/HAZARD - LEFT	O	+12V
3	P33LT1	YEL/BLK	1414	BATTERY SUPPLY – LEFT TURN / HAZ- ARD / STOP	I	+12V
4	P20WW	LT BLU/YEL	1334	WIPER/WASHER PUMP SUPPLY	I	+12V
5	E5HL	LT BLU	1192	HEADLAMP ON/OFF	I	CHECK FOR CONTINUITY
6	P33LT1	YEL/BLK	1413	BATTERY SUPPLY – LEFT TURN / HAZ- ARD / STOP	I	+12V
7	E71LW	BLK/GRN	0765	WIPER LOW / INTERMITTENT	I	CYCLE PERIOD (seconds) INT #1 1194Ω 20 INT #2 479Ω 12 INT #3 239Ω 7 INT #4 119Ω 4 LOW 47.5Ω
8	E5FS	LT BLU	1179	HEADLAMP FLASH	I	143Ω
9	L35LT	YEL	0161	TURN / HAZARD / STOP - LEFT	O	+12V
10	C20WW	LT BLU/YEL	1177	WASHER PUMP	O	+12V
11	E33LT	YEL/BLK	0768	TURN SIGNAL	I	LEFT 909Ω RIGHT 300Ω
12	E20WW	LT BLU/YEL	0766	WASHER PUMP	I	CHECK FOR CONTINUITY
13	L7HB	BLU/WHT	1405	HEADLAMP HIGH BEAM	O	+12V
14				< SPARE >	N/A	N/A
15	E70HZ	YEL/GRN	1187	HAZARD	I	CHECK FOR CONTINUITY
16	L6LB	RED/BLK	1327	HEADLAMP LOW BEAM	O	+12V
17				< SPARE >	N/A	N/A
18	P18WL2	LT GRN	1320	IGNITION STATUS	I	+12V
19	P6LB	LT GRN	1176	BATTERY SUPPLY – HEADLAMPS LOW	I	+12V
20	GND	WHT	1415	MODULE GROUND		CHECK FOR CONTINUITY
21	E69CT	RED/LT BLU	1181	INPUT COMMON	I	CHECK FOR CONTINUITY

Turn Stalk Module (TSM) 12-Way Connector Pinouts						
Pin	Circuit	Wire Color	Wire #	Function	Input / Output	Expected Values
1	GND	WHT	1171	MODULE GROUND		CHECK FOR CONTINUITY
2	P82CT	ORN/RED	1210	BATTERY SUPPLY - MODULE	I	+12V
3	E5DS	LT BLU	1324	HEADLAMP HIGH/LOW CYCLE	I	143Ω
4	P7HB	BLU/WHT	1411	BATTERY SUPPLY – HEADLAMPS HIGH	I	+12V
5	C125PB	LT GRN/YEL	1228	PARK BRAKE SET	I	CHECK FOR CONTINUITY
6	L2STG	RED	0472	SERVICE BRAKE SWITCH	I	CHECK FOR CONTINUITY
7	L34RT3	GRN/BLK	1409	TURN / HAZARD - RIGHT	O	+12V
8	P2ST	RED	1326	BATTERY SUPPLY – RIGHT TURN / HAZ- ARD / STOP	I	+12V
9	R71LW	BLK/GRN	1298	WIPER LOW	O	CHECK FOR CONTINUITY
10	L34RT3	GRN/BLK	0474	TURN / HAZARD - RIGHT	O	+12V
11	P2ST	RED	1325	BATTERY SUPPLY – RIGHT TURN / HAZ- ARD / STOP	I	+12V
12	L36RT	GRN	0162	TURN / HAZARD / STOP – RIGHT	O	+12V

Test Results

1. If the voltage or resistance values recorded for a specific switch function is “out of range” or there is no continuity, replace the TSM.
2. If the voltage or resistance values for a specific switch function is approximately the same as in the table above, and/or there is continuity per the table above, the problem is **not** a defective TSM.
 - Additional testing must be done to determine if the problem could be a failed component (i.e. wiper motor), or a circuit wiring problem.