DTC	**P0705/571**	**TRANSMISSION RANGE SENSOR CIRCUIT**
DTC	**P0705/572**	**TRANSMISSION RANGE SENSOR CIRCUIT**
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DTC	**P0705/576**	**TRANSMISSION RANGE SENSOR CIRCUIT**
DTC	**P0705/577**	**TRANSMISSION RANGE SENSOR CIRCUIT**
DTC	**P0705/578**	**TRANSMISSION RANGE SENSOR CIRCUIT**
DTC	**P0705/595**	**TRANSMISSION RANGE SENSOR CIRCUIT**
DTC	**P0705/596**	**TRANSMISSION RANGE SENSOR CIRCUIT**

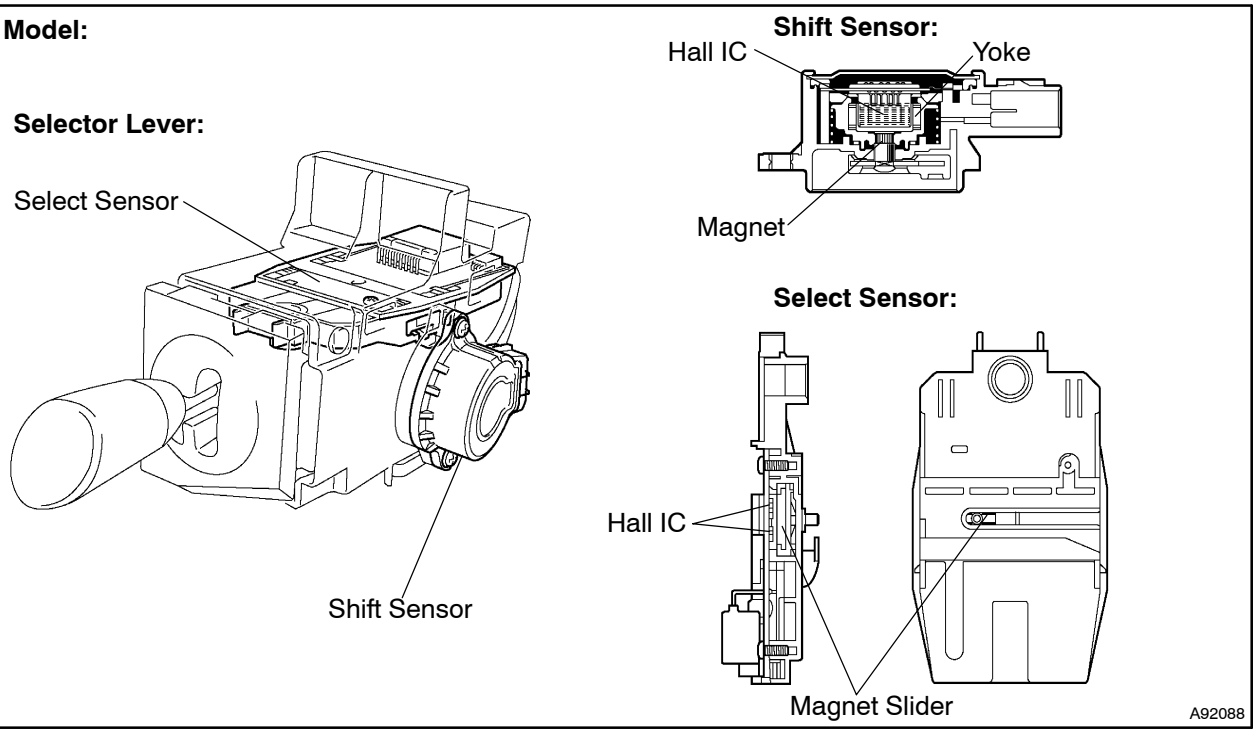
CIRCUIT DESCRIPTION

HINT:

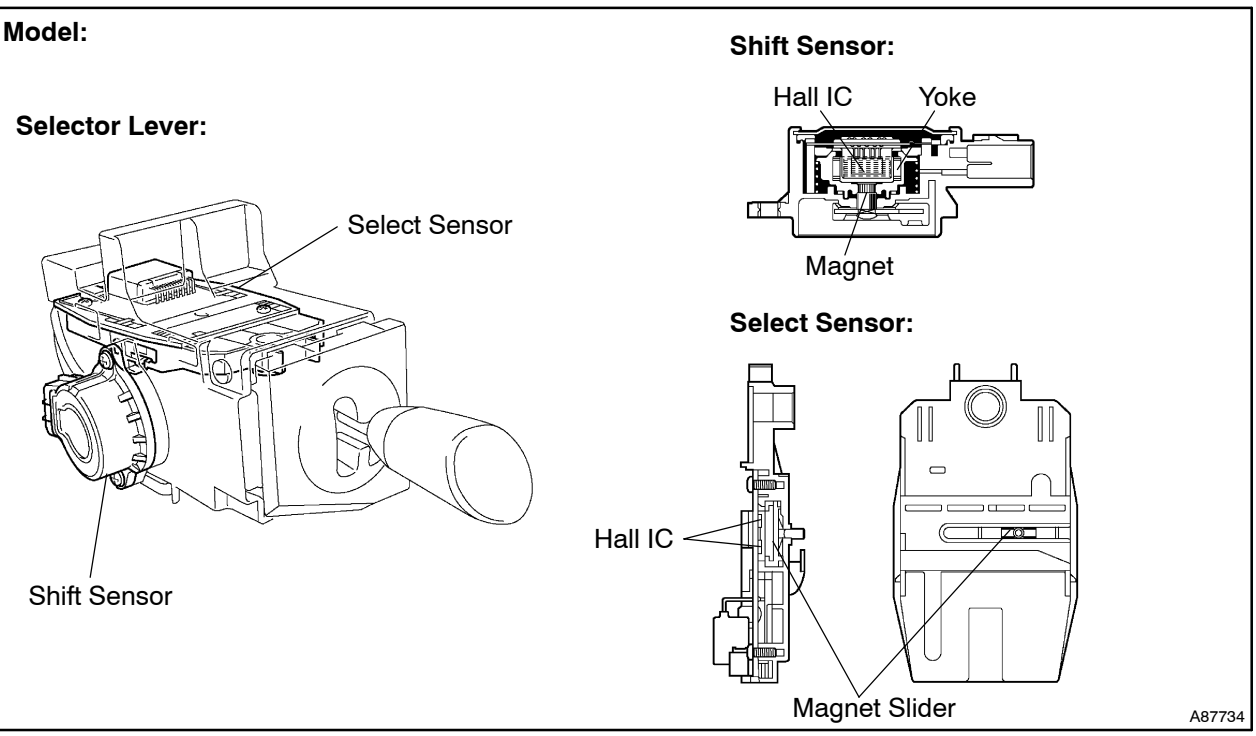
- The shift control system is a linkless type that does not use a shift cable.
- The shift and select sensors are non–contact type.

The selector lever is a momentary type, which returns to its home position by spring reaction as the driver's hand is released from the selector lever after shifting. The selector lever contains a shift sensor and a select sensor to detect the selector lever position (R, N, D or B). Because both sensors are controlled electrically by Hall elements, they can accurately detect shift positions in a reliable manner. Both sensors contain two systems of detection circuits, main and sub.

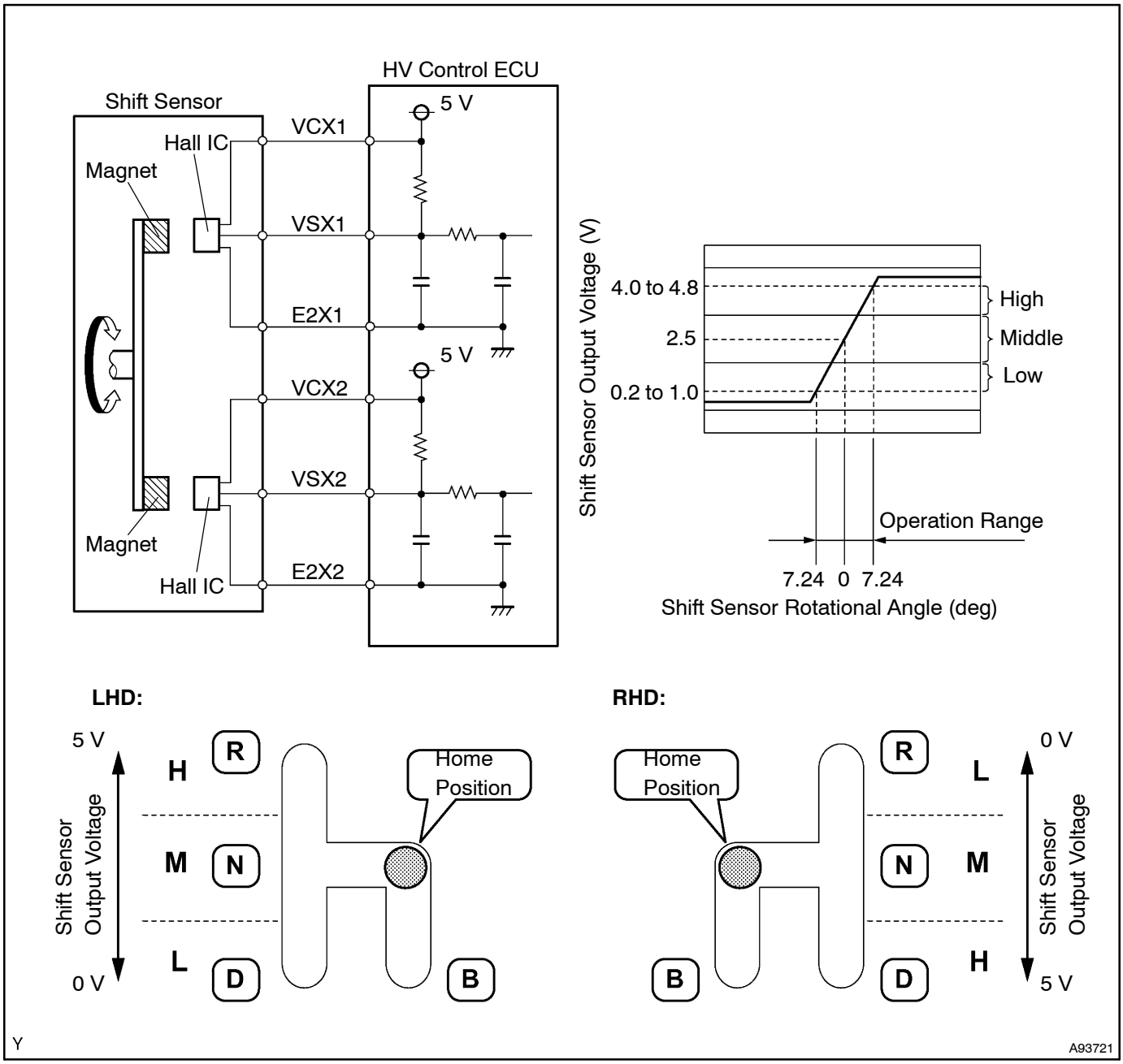
RHD Model:



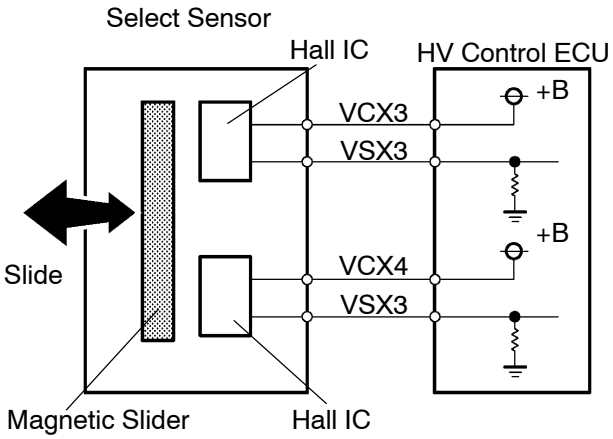
LHD Model:



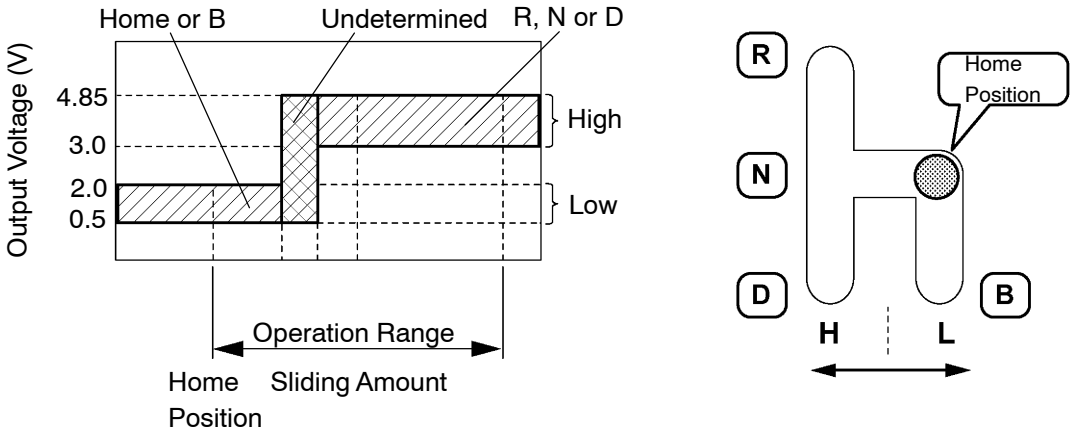
The shift sensor outputs voltage, which varies between 0 and 5 V in accordance with the vertical movement of the selector lever, to the HV control ECU. On a right–hand drive (RHD) model, the HV control ECU interprets low level voltage input from the shift sensor as the R position, middle level voltage as the home or N position, and high level voltage as the D or B position. On a left–hand drive (LHD) model, low level voltage is interpreted as the D or B position, middle level voltage as the home or N position, and high level voltage as the R position.



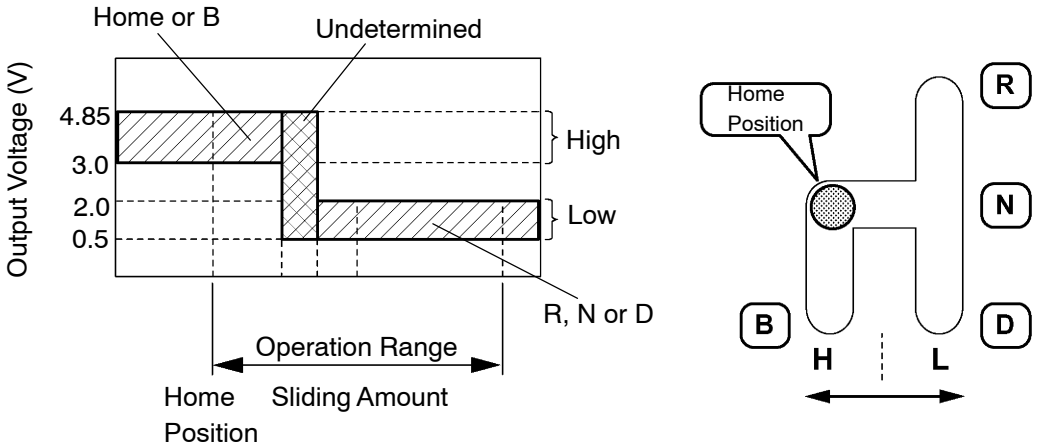
The select sensor outputs voltage, which varies between 0 and 5 V in accordance with the horizontal movement of the selector lever, to the HV control ECU. On a right–hand drive (RHD) model, the HV control ECU interprets low level voltage input from the select sensor as the R, N, or D position, and high level voltage as the home or B position. On a left–hand drive (LHD) model, low level voltage is interpreted as the home or B position, and high level voltage as the R, N or D position.
The HV control ECU determines the position of the selector lever in accordance with the combination of the signals from the shift sensor and select sensor.



LHD:



RHD:



Y

A93720

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0705	571	Open or GND short in shift main sensor circuit	• Wire harness or connector • Selector lever • HV control ECU
P0705	572	+B short in shift main sensor circuit	• Wire harness or connector • Selector lever • HV control ECU
P0705	573	Open or GND short in shift sub sensor circuit	• Wire harness or connector • Selector lever • HV control ECU
P0705	574	+B short in shift sub sensor circuit	• Wire harness or connector • Selector lever • HV control ECU
P0705	575	Open or GND short in select main sensor circuit	• Wire harness or connector • Selector lever • HV control ECU
P0705	576	+B short in select main sensor circuit	• Wire harness or connector • Selector lever • HV control ECU
P0705	577	Open or GND short in select sub sensor circuit	• Wire harness or connector • Selector lever • HV control ECU
P0705	578	+B short in select sub sensor circuit	• Wire harness or connector • Selector lever • HV control ECU
P0705	595	Difference between shift main sensor value and shift sub sensor value is large	• Wire harness or connector • Selector lever • HV control ECU
P0705	596	Difference between select main sensor value and select sub sensor value is large	• Wire harness or connector • Selector lever • HV control ECU

HINT:

After confirming DTC P0705 (INF 571, 572, 573, or 574), confirm Shift Sensor Main and Sub voltages using the intelligent tester II.

Shift Sensor Main and Sub

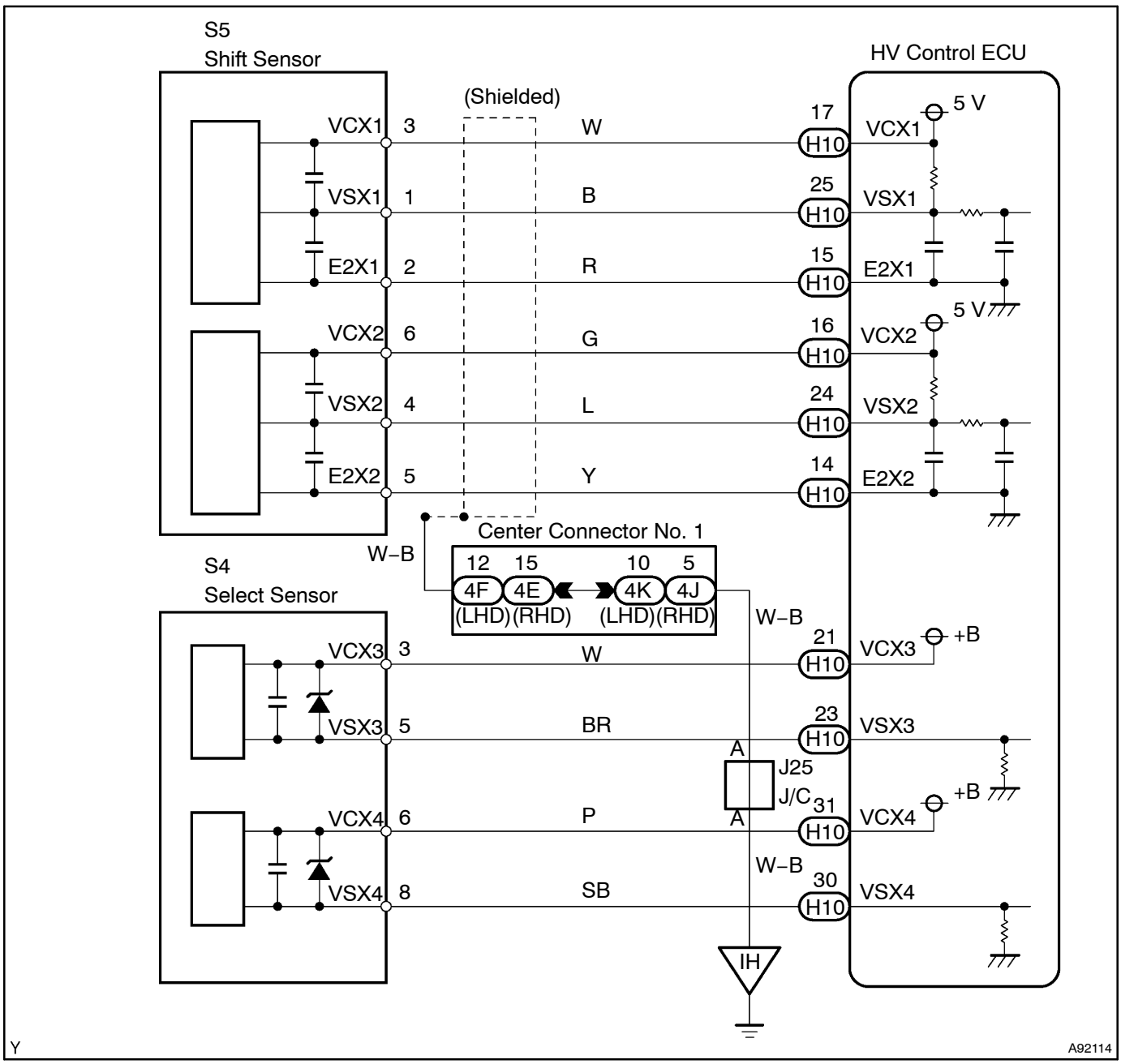
R Position (Main)	Home or N Position (Main)	D or B Position (Main)	R Position (Sub)	Home or N Position (Sub)	D or B Position (Sub)	Trouble Area
0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	RHD: 0.2 to 1.0 V LHD: 4.0 to 4.8 V	2.0 to 3.0 V	RHD: 4.0 to 4.8 V LHD: 0.2 to 1.0 V	Open in VCX1 circuit
RHD: 0.2 to 1.0 V LHD: 4.0 to 4.8 V	2.0 to 3.0 V	RHD: 4.0 to 4.8 V LHD: 0.2 to 1.0 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	Open in VCX2 circuit
0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	RHD: 0.2 to 1.0 V LHD: 4.0 to 4.8 V	2.0 to 3.0 V	RHD: 4.0 to 4.8 V LHD: 0.2 to 1.0 V	Open or short in VSX1 circuit
RHD: 0.2 to 1.0 V LHD: 4.0 to 4.8 V	2.0 to 3.0 V	RHD: 4.0 to 4.8 V LHD: 0.2 to 1.0 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	Open or short in VSX2 circuit
4.8 to 5.0 V	4.8 to 5.0 V	4.8 to 5.0 V	RHD: 0.2 to 1.0 V LHD: 4.0 to 4.8 V	2.0 to 3.0 V	RHD: 4.0 to 4.8 V LHD: 0.2 to 1.0 V	Open in E2X1 circuit
RHD: 0.2 to 1.0 V LHD: 4.0 to 4.8 V	2.0 to 3.0 V	RHD: 4.0 to 4.8 V LHD: 0.2 to 1.0 V	4.8 to 5.0 V	4.8 to 5.0 V	4.8 to 5.0 V	Open in E2X2 circuit

HINT:
After confirming DTC P0705 (INF 575, 576, 577, or 578), confirm Shift Sensor Select Main and Select Sub voltages using the intelligent tester II.

Shift Sensor Select Main and Select Sub

R, N or D Position (Select Main)	Home or B Position (Select Main)	R, N or D Position (Select Sub)	Home or B Position (Select Sub)	Trouble Area
0 to 0.5 V	0 to 0.5 V	RHD: 0.5 to 2.0 V LHD: 3.0 to 4.85 V	RHD: 3.0 to 4.85 V LHD: 0.5 to 2.0 V	Open or GND short in VCX3 or VSX3 circuit
RHD: 0.5 to 2.0 V LHD: 3.0 to 4.85 V	RHD: 3.0 to 4.85 V LHD: 0.5 to 2.0 V	0 to 0.5 V	0 to 0.5 V	Open or GND short in VCX4 or VSX4 circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE OF INTELLIGENT TESTER II(SHIFT SENSOR MAIN AND SUB)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Data List.
(e) Read the Shift Sensor Main and Sub voltage values on the intelligent tester II.

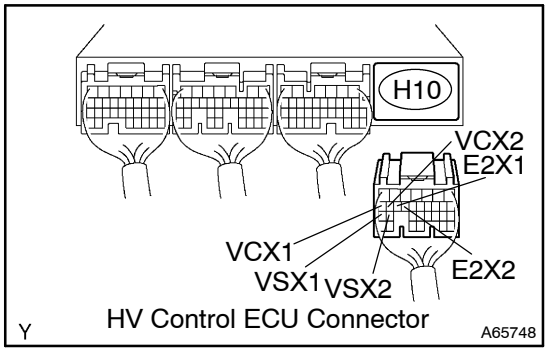
Result:

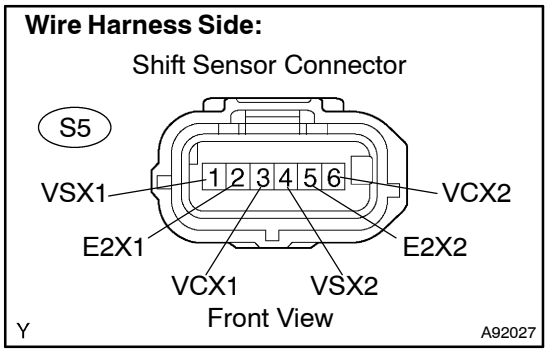
Shift Position	Shift Sensor Main	Shift Sensor Sub
R position	RHD: 0.2 to 1.0 V LHD: 4.0 to 4.8 V	RHD: 0.2 to 1.0 V LHD: 4.0 to 4.8 V
Home or N position	2.0 to 3.0 V	2.0 to 3.0 V
D or B position	RHD: 4.0 to 4.8 V LHD: 0.2 to 1.0 V	RHD: 4.0 to 4.8 V LHD: 0.2 to 1.0 V

OK → **Go to step 4**

NG

2	CHECK HARNESS AND CONNECTOR(HYBRID VEHICLE CONTROL ECU – SHIFT SENSOR)





(a) Disconnect the H10 HV control ECU connector.
(b) Disconnect the S5 shift sensor connector.
(c) Turn the power switch ON (IG).
(d) Measure the voltage between the terminals of the HV control ECU connector and body ground.

Standard:

Tester Connection	Specified Condition
VCX1 (H10–17) – Body ground	Below 1 V
VSX1 (H10–25) – Body ground	Below 1 V
E2X1 (H10–15) – Body ground	Below 1 V
VCX2 (H10–16) – Body ground	Below 1 V
VSX2 (H10–24) – Body ground	Below 1 V
E2X2 (H10–14) – Body ground	Below 1 V

(e) Turn the power switch OFF.
(f) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VCX1 (H10–17) – VCX1 (S5–3)	Below 1 Ω
VSX1 (H10–25) – VSX1 (S5–1)	Below 1 Ω
E2X1 (H10–15) – E2X1 (S5–2)	Below 1 Ω
VCX2 (H10–16) – VCX2 (S5–6)	Below 1 Ω
VSX2 (H10–24) – VSX2 (S5–4)	Below 1 Ω
E2X2 (H10–14) – E2X2 (S5–5)	Below 1 Ω

Standard (Check for short):

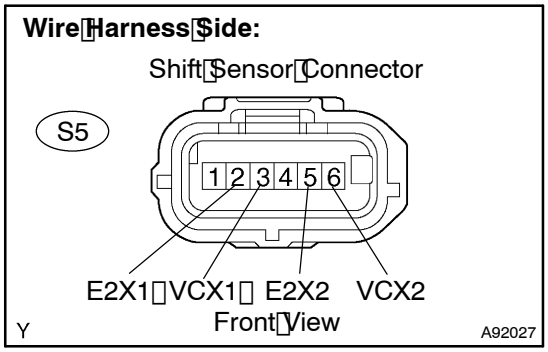
Tester Connection	Specified Condition
VCX1 (H10–17) or VCX1 (S5–3) – Body ground	10 kΩ or higher
VSX1 (H10–25) or VSX1 (S5–1) – Body ground	10 kΩ or higher
E2X1 (H10–15) or E2X1 (S5–2) – Body ground	10 kΩ or higher
VCX2 (H10–16) or VCX2 (S5–6) – Body ground	10 kΩ or higher
VSX2 (H10–24) or VSX2 (S5–4) – Body ground	10 kΩ or higher
E2X2 (H10–14) or E2X2 (S5–5) – Body ground	10 kΩ or higher

(g) Reconnect the shift sensor connector.
(h) Reconnect the HV control ECU connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	INSPECT HYBRID VEHICLE CONTROL ECU(VCX1 AND VCX2 VOLTAGE)



(a) Disconnect the S5 shift sensor connector.
(b) Turn the power switch ON (IG).
(c) Measure the voltage between the terminals of the shift sensor connector.

Standard:

Tester Connection	Specified Condition
VCX1 (S5–3) – E2X1 (S5–2)	4.5 to 5.5 V
VCX2 (S5–6) – E2X2 (S5–5)	4.5 to 5.5 V

(d) Reconnect the shift sensor connector.

OK ⇨ **Go to step 7**

NG

REPLACE HYBRID VEHICLE CONTROL ECU (See page 21–128)

4	READ VALUE OF INTELLIGENT TESTER II(SHIFT SENSOR SELECT MAIN AND SUB)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Data List.
(e) Read the Shift Sensor Select Main and Sub voltage values on the intelligent tester II.

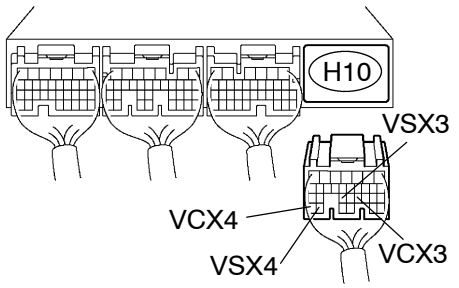
Result:

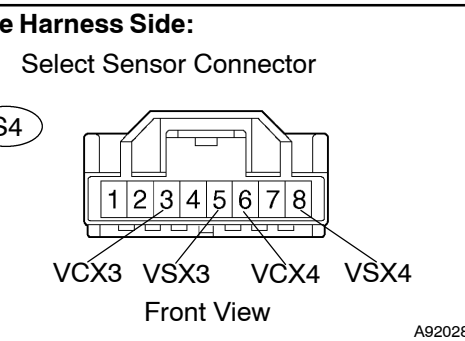
Shift Position	Shift Sensor Select Main	Shift Sensor Select Sub
R, N or D position	RHD: 0.5 to 2.0 V LHD: 3.0 to 4.85 V	RHD: 0.5 to 2.0 V LHD: 3.0 to 4.85 V
Home or B position	RHD: 3.0 to 4.85 V LHD: 0.5 to 2.0 V	RHD: 3.0 to 4.85 V LHD: 0.5 to 2.0 V

OK ⇨ **Go to step 7**

NG

5	CHECK HARNESS AND CONNECTOR(HYBRID VEHICLE CONTROL ECU – SELECT SENSOR)





(a) Disconnect the H10 HV control ECU connector.
(b) Disconnect the S4 select sensor connector.
(c) Turn the power switch ON (IG).
(d) Measure the voltage between the terminals of the HV control ECU connector and body ground.

Standard:

Tester Connection	Specified Condition
VCX3 (H10–21) – Body ground	Below 1 V
VSX3 (H10–23) – Body ground	Below 1 V
VCX4 (H10–31) – Body ground	Below 1 V
VSX4 (H10–30) – Body ground	Below 1 V

(e) Turn the power switch OFF.
(f) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VCX3 (H10–21) – VCX3 (S4–3)	Below 1 Ω
VSX3 (H10–23) – VSX3 (S4–5)	Below 1 Ω
VCX4 (H10–31) – VCX4 (S4–6)	Below 1 Ω
VSX4 (H10–30) – VSX4 (S4–8)	Below 1 Ω

Standard (Check for short):

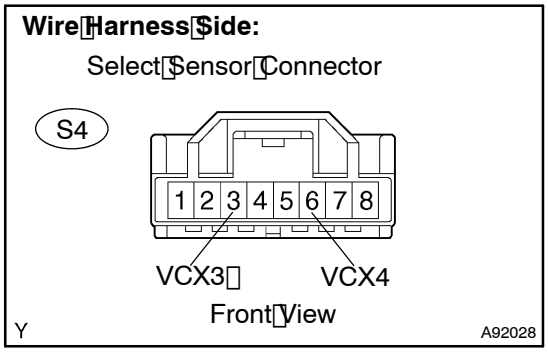
Tester Connection	Specified Condition
VCX3 (H10–21) or VCX3 (S4–3) – Body ground	10 kΩ or higher
VSX3 (H10–23) or VSX3 (S4–5) – Body ground	10 kΩ or higher
VCX4 (H10–31) or VCX4 (S4–6) – Body ground	10 kΩ or higher
VSX4 (H10–30) or VSX4 (S4–8) – Body ground	10 kΩ or higher

(g) Reconnect the select sensor connector.
(h) Reconnect the HV control ECU connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6 INSPECT HYBRID VEHICLE CONTROL ECU(VCX3 AND VCX4 VOLTAGE)



(a) Disconnect the S4 select sensor connector.
(b) Turn the power switch ON (IG).
(c) Measure the voltage between the terminals of the select sensor connector and body ground.
Standard:

Tester Connection	Specified Condition
VCX3 (S4–3) – Body ground	9 to 14 V
VCX4 (S4–6) – Body ground	9 to 14 V

(d) Reconnect the select sensor connector.

NG → **REPLACE HYBRID VEHICLE CONTROL ECU (See page 21–128)**

OK

7 REPLACE SELECTOR LEVER

GO

8 READ OUTPUT DTC(DTC P0705 IS NOT OUTPUT AGAIN)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC / Clear.
(e) Perform a simulation test.
(f) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(g) Read DTCs.
Result: DTC P0705 is not output again

YES → **SYSTEM OK**

NO

REPLACE HYBRID VEHICLE CONTROL ECU (See page 21–128)