

SIL 29-EP-15
December, 2015
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SUBJECT: TS5812EN 2014 Corrections for P1 and P2 Motor Sensor Codes

MODELS AFFECTED: H 40/50 EP System™ Transmissions

SERIAL NUMBERS AFFECTED: ALL

Introduction:

This SIL contains page replacement corrections for the H 40/50 EP TS5812EN 2014 Troubleshooting Manual. These corrections have been made to wiring schematics and the troubleshooting steps that have been determined to be incorrect.

The chart in [Table 1](#) shows which DTCs require page replacement.

Table 1. DTCs Requiring Page Replacement

DTC 73-02 Pages 5-425 through 5-430	DTC 73-06 Pages 5-437 through 5-443	DTC 73-35 Pages 5-523 through 5-529	DTC 73-36 Pages 5-530 through 5-537	DTC 73-37 Pages 5-537 through 5-543.	DTC 73-38 Pages 5-544 through 5-550.
DTC 73-39 DPIM1 Pages 5-551 through 5-557	DTC 73-39 DPIM2 Pages 5-558 through 5-564	DTC 73-41 DPIM1 Pages 5-570 through 5-576	DTC 73-41 DPIM2 Pages 5-577 through 5-583	DTC 73-73 Page 5-662	DTC 73-95 Pages 5-689 through 5-696



NOTE: The pages attached to this SIL will need to be printed on a copier that is capable of printing both sides of a single page. If this is not possible, the pages can be printed on one side and both copies attached. The pages will need to be hole punched and added in place of the old pages.

RL / SL7737EN

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THIS PAGE IS FOR PROPER PRINTING OF THE FOLLOWING PAGES. IF THIS
PAGE IS NOT INCLUDED THE DTC PAGES WILL NOT BE PROPERLY COLLATED.

DTC 73-02 Inverter A Encoder B Power Supply Out-of-Range High

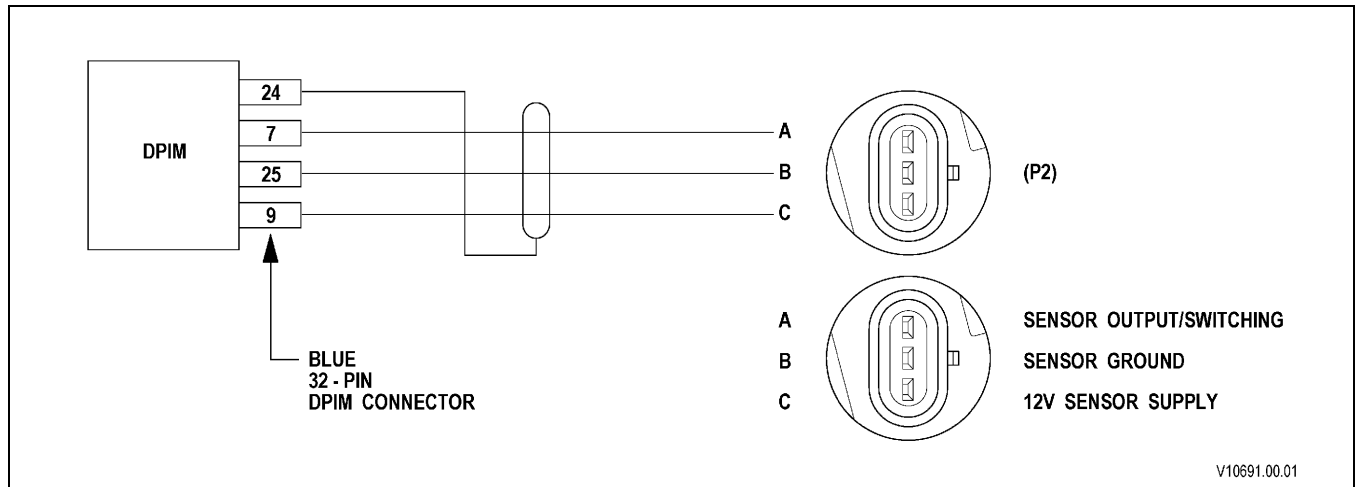


Figure 5-24.

Overview:

The DPIM encoders are used to measure motor speed/direction and are required for motor operation. DPIM2 uses separate power supplies for each of the encoders. This code is specific to the P2 sensor power supply. The power supplied to this sensor is monitored to detect sensor/harness issues.

Action Taken When DTC Sets:

- None

Possible Causes:

- Short to 12V or 24V power
- Internal DPIM short

Tool Requirements:

- J-39700 Universal Breakout Box
- J-46711 TCM/VCM/DPIM Breakout Harness
- J-50165 DPIM2 Adapter Harness
- J-46708 Multimeter
- J-39197 Jumper Wire Kit
- Universal Allison DOC®



NOTE: DPIM2 has a blue Motor A Terminal Protection Assurance (TPA) key and J-46711, TCM/VCM/DPIM Breakout Harness, has a red Motor A TPA key. When servicing a DPIM2, use J-50165, Adapter Harness, with J-46711, TCM/VCM/DPIM Breakout Harness. This will convert the J-46711's red connector TPA key to a blue connector TPA key and allow it to connect to a DPIM2.

Step	Action	Value(s)	Yes	No
1	Are codes 13-23 and/or 13-24 set along with this code?		<i>Troubleshoot these codes first.</i>	<i>Go to Step 2</i>

DTC 73-02 Inverter A Encoder B Power Supply Out-of-Range High (cont'd)

Step	Action	Value(s)	Yes	No
2	1. Install Universal Allison DOC®. 2. Start the engine. 3. Record the DTC snapshot. 4. Monitor TCM ignition voltage. Is the voltage within the specified values?	9-18V	Go to Step 3	Resolve voltage problem. Go to Step 20
3	Is code 73-02 active?		Go to Step 5	Go to Step 4
4	1. Clear the DTC. 2. Attempt to duplicate the conditions in the failure record (mode, temperature, etc.). Does code 73-02 return?		Go to Step 5	System OK
5	Perform a visual inspection of the blue 32-way connector at the Dual Power Inverter Module (DPIM) and at the P2 speed sensor. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is there any water intrusion, damaged wiring, etc. that may cause a loss and/or corruption of signal?		Make repairs as necessary and go to Step 20	Go to Step 6
6	1. Turn OFF the ignition. 2. Install J-39700, Universal Breakout Box, to the DPIM 24-way and the OEM 24-way connectors using J-46711, TCM/VCM/DPIM Breakout Harness. 3. Turn ON the ignition. Is the harness connected and the ignition turned back ON ?		Go to Step 7	
7	At J-46711-1, DPIM Overlay, measure battery supply voltage on pins 1, 2, 5, and 6 of the DPIM 24-way connector. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is the voltage within the specified range?	10.5-16V	Go to Step 8	Open or short in vehicle harness. Repair as necessary and go to Step 20
8	At J-46711-1, DPIM Overlay, measure wakeup signal voltage on pins 3 and 4 of the 24-way connector. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is the voltage within the specified range?	9-16V	Go to Step 9	Open or short in vehicle harness. Repair as necessary and go to Step 20

Section 5—DIAGNOSTIC CODES

DTC 73-02 Inverter A Encoder B Power Supply Out-of-Range High *(cont'd)*

Step	Action	Value(s)	Yes	No
9	<p>At J-46711-1, DPIM Overlay, measure torque enable voltage on pins 16 (Inverter B Torque Enable) and 17 (Inverter A Torque Enable) of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9-16V	Go to Step 10	Open or short in vehicle harness. Repair as necessary and go to Step 20
10	<ol style="list-style-type: none"> Turn OFF the ignition. Disconnect the J-46711, TCM/VCM/DPIM Breakout Harness, from the DPIM 24-way connector. Leave the OEM 24-way connector mated to the J-46711. At J-46711-1, DPIM Overlay, measure resistance to ground on 12V battery return pins 18, 19, 20, and 21 of the DPIM 24-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 11	Open or short in vehicle harness. Repair as necessary and go to Step 20
11	<ol style="list-style-type: none"> Leave the ignition OFF. Disconnect the DPIM 24-way and OEM 24-way connectors from the J-46711, TCM/VCM/DPIM Breakout Harness. Connect the OEM 24-way connector to the DPIM 24-way connector. Disconnect the blue OEM 32-way connector from the DPIM. Connect the blue DPIM 32-way connector of the J-46711, TCM/VCM/DPIM Breakout Harness, using J-50165 , DPIM2 Adapter Harness, to the DPIM connector ONLY. Leave the J-46711 disconnected from the blue OEM 32-way connector. Turn ON the ignition. At J-50165-3, DPIM2 Overlay, measure the speed sensor supply Open Circuit Voltage (OCV) at the blue 32-way connector by measuring the voltage between pin 9 and pin 25 of the blue 32-way DPIM connector. <p>Is the voltage within the specified range?</p>	7.5-18V (nominal ~12V)	Go to Step 12	Go to Step 19

DTC 73-02 Inverter A Encoder B Power Supply Out-of-Range High (cont'd)

Step	Action	Value(s)	Yes	No
12	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the J-50165, DPIM2 Adapter Harness, from the blue DPIM 32-way connector. 3. Connect the J-50165, DPIM2 Adapter Harness, to the blue OEM 32-way connector ONLY. 4. Turn ON the ignition. 5. At J-50165-3, DPIM2 Overlay, measure for voltage on pins 7, 9, 24, and 25. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was voltage measured on any of the pins?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 13
13	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the P2 encoder connector. 3. At J-50165-3, DPIM2 Overlay, measure for shorts-to-ground on pins 7, 9, and 25. 4. At J-50165-3, DPIM2 Overlay, measure for shorts to other wires on pins 7, 9, 24, and 25. <p>NOTE: There will be continuity between pins 8 and 24 of the blue 32-way connector because all motor speed sensor shield wires are spliced together.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were any shorts-to-ground or shorts to any other wires found?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 14
14	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Connect the J-50165, DPIM2 Adapter Harness, to the blue DPIM 32-way connector. Leave it connected to the blue OEM 32-way connector and leave the P2 encoder connector disconnected. 3. Turn ON the ignition. 4. Measure sensor supply voltage at the P2 encoder connector on pin C. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	7.5-18V (nominal ~12V)	Go to Step 15	Open or short in vehicle harness. Repair as necessary and go to Step 20

Section 5—DIAGNOSTIC CODES

DTC 73-02 Inverter A Encoder B Power Supply Out-of-Range High *(cont'd)*

Step	Action	Value(s)	Yes	No
15	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Leave the P2 encoder connector disconnected. 3. Use J-39197, Jumper Wire Kit, to measure resistance to ground on pin B of the encoder connector. <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 16	Open or short in vehicle harness. Repair as necessary and go to Step 20
16	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P2 encoder connector disconnected. 3. Use J-39197, Jumper Wire Kit, to jumper pins A and C on the P2 encoder connector. 4. Disconnect the blue DPIM 32-way connector from J-50165, DPIM2 Adapter Harness, leaving J-50165 mated to the blue OEM 32-way connector. 5. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 7 and 9 of the blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 17	Open or short in vehicle harness. Repair as necessary and go to Step 20
17	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P2 encoder connector disconnected. 3. Remove the jumper wire from the P2 encoder connector. 4. Use J-39197, Jumper Wire Kit, to jumper pins A and B on the P2 encoder connector. 5. Leave the J-50165, DPIM2 Adapter Harness, mated to the blue OEM 32-way connector ONLY. 6. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 7 and 25 of the blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 18	Open or short in vehicle harness. Repair as necessary and go to Step 20
18	<p>Replace the P2 speed sensor.</p> <p>Has the speed sensor been replaced?</p>		Go to Step 20	

DTC 73-02 Inverter A Encoder B Power Supply Out-of-Range High (cont'd)

Step	Action	Value(s)	Yes	No
19	<p>NOTE: In most cases, the Dual Power Inverter Module (DPIM) is not at fault. Investigate thoroughly before replacing the DPIM.</p> <p>Replace DPIM. Contact Technical Assistance Center (TAC) at 1-800-252-5283 for DPIM replacement authorization. TAC will require a snapshot.</p> <p>Is the replacement of the DPIM complete?</p>		Go to Step 20	
20	<p>In order to verify your repair:</p> <ol style="list-style-type: none"> 1. Clear the DTC. 2. Operate the vehicle under normal driving conditions. <p>Did the DTC return?</p>		<p>Begin the diagnosis again.</p> <p>Go to Step 1</p>	System OK

DTC 73-06 Inverter A Encoder B Power Supply Out-of-Range Low

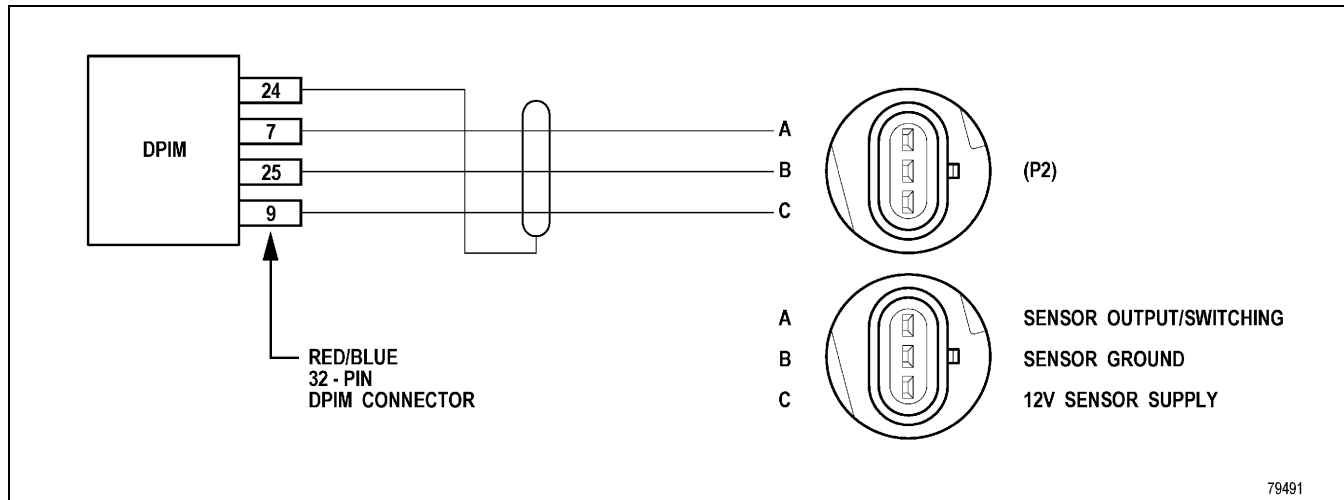


Figure 5-25.

Overview:

The DPIM encoders are used to measure motor speed/direction and are required for motor operation. DPIM2 uses separate power supplies for each of the encoders. This code is specific to the P2 sensor power supply. The power supplied to this sensor is monitored to detect sensor/harness issues.

Action Taken When DTC Sets:

- **MIL** light illuminates
- **Check System** light illuminates

Possible Causes:

- 12V power supply issues (battery/charging)
- Short or open in 12V power supply wiring
- Internal DPIM fault

Tool Requirements:

- J-39700 Universal Breakout Box
- J-46711 TCM/VCM/DPIM Breakout Harness
- J-50165 DPIM2 Adapter Harness
- J-46708 Multimeter
- J-39197 Jumper Wire Kit
- Universal Allison DOC®



NOTE: DPIM2 has a blue TPA (Terminal Protection Assurance) key and J-46711, TCM/VCM/DPIM Breakout Harness, has a red TPA key. When servicing a DPIM2, use J-50165, DPIM2 Adapter Harness, with J-46711. This will convert the J-46711's red connector TPA key to a blue connector TPA key and allow it to connect to a DPIM2.

DTC 73-06 Inverter A Encoder B Power Supply Out-of-Range Low (cont'd)

Step	Action	Value(s)	Yes	No
1	Are codes 13-12, 13-13 and/or 13-15 set along with this code?		<i>Troubleshoot these codes first</i>	<i>Go to Step 2</i>
2	1. Install Universal Allison DOC®. 2. Start the engine. 3. Record the DTC snapshot. 4. Monitor TCM ignition voltage. Is the voltage within the specified values?	9-18V	<i>Go to Step 3</i>	<i>Resolve voltage problem. Go to Step 20</i>
3	Is code 73-06 active?		<i>Go to Step 5</i>	<i>Go to Step 4</i>
4	1. Clear the DTC. 2. Attempt to duplicate the conditions in the failure record (mode, temperature, etc.). Does code 73-06 return?		<i>Go to Step 5</i>	<i>System OK</i>
5	Perform a visual inspection of the blue 32-way connector at the Dual Power Inverter Module (DPIM) and at the P2 speed sensor. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is there any water intrusion, damaged wiring, etc. that may cause a loss and/or corruption of signal?		<i>Make repairs as necessary and go to Step 20</i>	<i>Go to Step 6</i>
6	1. Turn OFF the ignition. 2. Install J-39700, Universal Breakout Box, to the DPIM 24-way and the OEM 24-way connectors using J-46711, TCM/VCM/DPIM Breakout Harness. 3. Turn ON the ignition. Is the harness connected and the ignition turned back ON ?		<i>Go to Step 7</i>	
7	At J-46711-1, DPIM Overlay, measure battery supply voltage on pins 1, 2, 5, and 6 of the DPIM 24-way connector. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is the voltage within the specified range?	10.5-16V	<i>Go to Step 8</i>	<i>Open or short in vehicle harness. Repair as necessary and go to Step 20</i>

Section 5—DIAGNOSTIC CODES

DTC 73-06 Inverter A Encoder B Power Supply Out-of-Range Low *(cont'd)*

Step	Action	Value(s)	Yes	No
8	<p>At J-46711-1, DPIM Overlay, measure wakeup signal voltage on pins 3 and 4 of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9-16V	Go to Step 9	Open or short in vehicle harness. Repair as necessary and go to Step 20
9	<p>At J-46711-1, DPIM Overlay, measure torque enable voltage on pins 16 (Inverter B Torque Enable) and 17 (Inverter A Torque Enable) of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9-16V	Go to Step 10	Open or short in vehicle harness. Repair as necessary and go to Step 20
10	<ol style="list-style-type: none"> Turn OFF the ignition. Disconnect the J-46711, TCM/VCM/DPIM Breakout Harness, from the DPIM 24-way connector. Leave the OEM 24-way connector mated to the J-46711. At J-46711-1, DPIM Overlay, measure resistance to ground on 12V battery return on pins 18, 19, 20, and 21 of the DPIM 24-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 11	Open or short in vehicle harness. Repair as necessary and go to Step 20

DTC 73-06 Inverter A Encoder B Power Supply Out-of-Range Low (cont'd)

Step	Action	Value(s)	Yes	No
11	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Disconnect the DPIM 24-way and OEM 24-way connectors from the J-46711, TCM/VCM/DPIM Breakout Harness. 3. Connect the OEM 24-way connector to the DPIM 24-way connector. 4. Disconnect the blue OEM 32-way connector from the DPIM. 5. Connect the blue DPIM 32-way connector of the J-46711, TCM/VCM/DPIM Breakout Harness, to the DPIM connector ONLY, using J-50165, DPIM2 Adapter Harness. Leave the J-46711 disconnected from the blue OEM 32-way connector. 6. Turn ON the ignition. 7. At J-50165-3, DPIM2 Overlay, measure the speed sensor supply Open Circuit Voltage (OCV) at the blue 32-way connector by measuring the voltage between pin 9 and pin 25 of the blue 32-way DPIM connector. <p>Is the voltage within the specified range?</p>	7.5-18V (nominal ~12V)	Go to Step 12	Go to Step 19
12	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the J-50165, DPIM2 Adapter Harness, from the blue DPIM 32-way connector. 3. Connect the J-50165, DPIM2 Adapter Harness, to the blue OEM 32-way connector ONLY. 4. Turn ON the ignition. 5. At J-50165-3, DPIM2 Overlay, measure for voltage on pins 7, 9, 24, and 25. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was voltage measured on any of the pins?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 13

Section 5—DIAGNOSTIC CODES

DTC 73-06 Inverter A Encoder B Power Supply Out-of-Range Low *(cont'd)*

Step	Action	Value(s)	Yes	No
13	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the P2 encoder connector. 3. At J-50165-3, DPIM2 Overlay, measure for shorts to ground on pins 7, 9, and 25. 4. At J-50165-3, DPIM2 Overlay, measure for shorts to other wires on pins 7, 9, 24, and 25. <p>NOTE: There will be continuity between pins 8 and 24 of the blue 32-way connector because all motor speed sensor shield wires are spliced together.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were any shorts-to-ground or shorts to any other wires found?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 14
14	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Connect the J-46711, TCM/VCM/DPIM Breakout Harness, to the blue DPIM 32-way connector using J-50165, DPIM2 Adapter Harness. Leave it connected to the blue OEM 32-way connector and leave the P2 encoder connector disconnected. 3. Turn ON the ignition. 4. Check sensor supply voltage at the P2 encoder connector on pin C. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	7.5-18V (nominal ~12V)	Go to Step 15	Open or short in vehicle harness. Repair as necessary and go to Step 20
15	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Leave the P2 encoder connector disconnected. 3. Use J-39197, Jumper Wire Kit, to measure resistance to ground on pin B of the encoder connector. <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 16	Open or short in vehicle harness. Repair as necessary and go to Step 20

DTC 73-06 Inverter A Encoder B Power Supply Out-of-Range Low (cont'd)

Step	Action	Value(s)	Yes	No
16	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P2 encoder connector disconnected. 3. Use J-39197, Jumper Wire Kit, to jumper pins A and C on the P2 encoder connector. 4. Disconnect the blue DPIM 32-way connector from J-50165, DPIM2 Adapter Harness, leaving J-50165 mated to the blue OEM 32-way connector. 5. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 7 and 9 of the blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 17	Open or short in vehicle harness. Repair as necessary and go to Step 20
17	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P1 encoder connector disconnected. 3. Remove the jumper wire from the P2 encoder connector. 4. Use J-39197, Jumper Wire Kit, to jumper pins A and B on the P1 encoder connector. 5. Leave the J-50165, DPIM2 Adapter Harness, mated to the blue OEM 32-way connector ONLY. 6. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 7 and 25 of the blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 18	Open or short in vehicle harness. Repair as necessary and go to Step 20
18	Replace the P2 speed sensor. Has the speed sensor been replaced?		Go to Step 20	
19	<p>NOTE: In most cases, the Dual Power Inverter Module (DPIM) is not at fault. Investigate thoroughly before replacing the DPIM.</p> <p>Replace DPIM. Contact Technical Assistance Center (TAC) at 1-800-252-5283 for DPIM replacement authorization. TAC will require a snapshot.</p> <p>Is the replacement of the DPIM complete?</p>		Go to Step 20	

Section 5—DIAGNOSTIC CODES

DTC 73-06 Inverter A Encoder B Power Supply Out-of-Range Low *(cont'd)*

Step	Action	Value(s)	Yes	No
20	In order to verify your repair: 1. Clear the DTC. 2. Operate the vehicle under normal driving conditions. Did the DTC return?		<i>Begin the diagnosis again.</i> <i>Go to Step 1</i>	<i>System OK</i>

DTC 73–35 Inverter A Primary Encoder Signal Lost

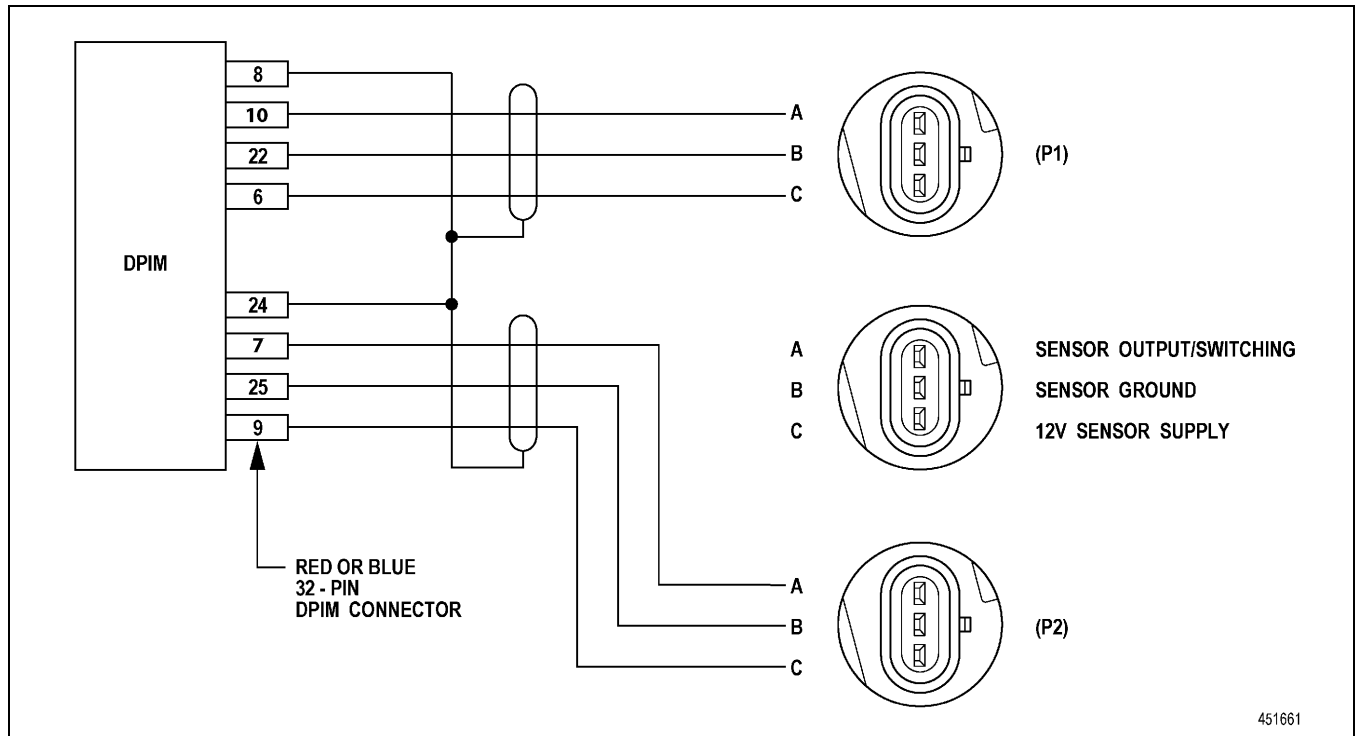


Figure 5–43.

Overview:

DTC 73–35 is logged when the speed signal is lost or intermittent from the P2 motor speed sensor.

Action Taken When DTC Sets:

When DTC 73–35 is active, the following conditions will occur:

- **MIL** light illuminates
- **Check System** light illuminates
- Disable Inverter A
 - Inverter A CAN enable will be removed. Vehicle can limp home on one motor only
- Disable special mode
 - HUSH™ mode will be disabled

Possible Causes:

- Open/break in 12V supply or signal harness
- Loss of sensor ground
- Bad sensor
- Internal DPIM fault

Tool Requirements:

- Universal Allison DOC®
- J-39700 Universal Breakout Box

DTC 73–35 Inverter A Primary Encoder Signal Lost (cont'd)

- J-46711 TCM/VCM/DPIM Breakout Harness
- J-50165 DPIM2 Adapter Harness
- J-46708 Multimeter
- J-39197 Jumper Wire Kit



NOTE: DPIM2 has a blue Motor A Terminal Protection Assurance (TPA) key and J-46711, TCM/VCM/DPIM Breakout Harness, has a red Motor A TPA key. When servicing a DPIM2, use J-50165, Adapter Harness, with J-46711, TCM/VCM/DPIM Breakout Harness. This will convert the J-46711's red connector TPA key to a blue connector TPA key and allow it to connect to a DPIM2.

Step	Action	Value(s)	Yes	No
1	Are any 13-XX series codes set along with this code?		<i>Troubleshoot these codes first.</i>	<i>Go to Step 2</i>
2	1. Install Universal Allison DOC®. 2. Start the engine. 3. Record the DTC snapshot. 4. Monitor TCM ignition voltage. Is the voltage within the specified values?	9-18V	<i>Go to Step 3</i>	<i>Resolve voltage problem. Go to Step 20</i>
3	Is code 73-35 active?		<i>Go to Step 5</i>	<i>Go to Step 4</i>
4	1. Clear the DTC. 2. Attempt to duplicate the conditions in the failure record (mode, temperature, etc.). Does code 73-35 return?		<i>Go to Step 5</i>	<i>System OK</i>
5	Perform a visual inspection of P2 sensor OR both P1 and P2. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is there any water intrusion, damaged wiring, etc. that may cause a loss and/or corruption of signal?		<i>Make repairs as necessary and go to Step 20</i>	<i>Go to Step 6</i>
6	1. Turn OFF the ignition. 2. Install J-39700, Universal Breakout Box, to the DPIM 24-way and the OEM 24-way connectors using J-46711, TCM/VCM/DPIM Breakout Harness. 3. Turn ON the ignition. Is the harness connected and the ignition turned back ON ?		<i>Go to Step 7</i>	

Section 5—DIAGNOSTIC CODES

DTC 73–35 Inverter A Primary Encoder Signal Lost *(cont'd)*

Step	Action	Value(s)	Yes	No
7	<p>At J-46711-1, DPIM Overlay, measure battery supply voltage on pins 1, 2, 5, and 6 of the DPIM 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	10.5-16V	Go to Step 8	Open or short in vehicle harness. Repair as necessary and go to Step 20
8	<p>At J-46711-1, DPIM Overlay, measure wakeup signal voltage on pins 3 and 4 of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9-16V	Go to Step 9	Open or short in vehicle harness. Repair as necessary and go to Step 20
9	<p>At J-46711-1, DPIM Overlay, measure torque enable voltage on pins 16 (Inverter B Torque Enable) and 17 (Inverter A Torque Enable) of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9-16V	Go to Step 10	Open or short in vehicle harness. Repair as necessary and go to Step 20
10	<ol style="list-style-type: none"> Turn OFF the ignition. Disconnect the J-46711, TCM/VCM/DPIM Breakout Harness, from the DPIM 24-way connector. Leave the OEM 24-way connector mated to the J-46711. At J-46711-1, DPIM Overlay, measure resistance to ground on 12V battery return pins 18, 19, 20, and 21 of the DPIM 24-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 11	Open or short in vehicle harness. Repair as necessary and go to Step 20

DTC 73–35 Inverter A Primary Encoder Signal Lost (cont'd)

Step	Action	Value(s)	Yes	No
11	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Disconnect the DPIM 24-way and OEM 24-way connectors from the J-46711, TCM/VCM/DPIM Breakout Harness. 3. Connect the OEM 24-way connector to the DPIM 24-way connector. 4. Disconnect the red/blue OEM 32-way connector from the DPIM. 5. Connect the red/blue DPIM 32-way connector of the J-46711, TCM/VCM/DPIM Breakout Harness, using J-50165, DPIM2 Adapter Harness, to the DPIM connector ONLY. Leave the J-46711 disconnected from the red/blue OEM 32-way connector. 6. Turn ON the ignition. 7. At J-50165-3, DPIM2 Overlay, measure the speed sensor supply Open Circuit Voltage (OCV) at the red/blue 32-way connector by measuring the voltage between pin 9 and pin 25 of the red/blue 32-way DPIM connector. <p>Is the voltage within the specified range?</p>	<p>DPIM1 10-13V</p> <p>DPIM2 7.5-18V (nominal ~12V)</p>	Go to Step 12	Go to Step 19
12	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the J-50165, DPIM2 Adapter Harness, from the red/blue DPIM 32-way connector. 3. Connect the J-50165, DPIM2 Adapter Harness, to the red/blue OEM 32-way connector ONLY. 4. Turn ON the ignition. 5. At J-50165-3, DPIM2 Overlay, measure for voltage on pins 7, 9, 24, and 25. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was voltage measured on any of the pins?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 13

Section 5—DIAGNOSTIC CODES

DTC 73–35 Inverter A Primary Encoder Signal Lost *(cont'd)*

Step	Action	Value(s)	Yes	No
13	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the P2 encoder connector. 3. At J-50165-3, DPIM2 Overlay, measure for shorts-to-ground on pins 7, 9, 24 and 25. 4. At J-50165-3, DPIM2 Overlay, measure for shorts to other wires on pins 7, 9, 24, and 25. <p>NOTE: There will be continuity between pins 8 and 24 of the red/blue 32-way connector because all motor speed sensor shield wires are spliced together.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were any shorts-to-ground or shorts to any other wires found?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 14
14	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Connect the J-50165, DPIM2 Adapter Harness, to the red/blue DPIM 32-way connector. Leave it connected to the red/blue OEM 32-way connector and leave the P2 encoder connector disconnected. 3. Turn ON the ignition. 4. Measure sensor supply voltage at the P2 encoder connector on pin C. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	DPIM1 10-13V DPIM2 7.5-18V (nominal ~12V)	Go to Step 15	Open or short in vehicle harness. Repair as necessary and go to Step 20
15	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Leave the P2 encoder connector disconnected. 3. Use J-39197, Jumper Wire Kit, to measure resistance to ground on pin B of the P2 encoder connector. <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 16	Open or short in vehicle harness. Repair as necessary and go to Step 20

DTC 73–35 Inverter A Primary Encoder Signal Lost (cont'd)

Step	Action	Value(s)	Yes	No
16	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P2 encoder connector disconnected. 3. Use J-39197, Jumper Wire Kit, to jumper pins A and C on the P2 encoder connector. 4. Disconnect the red/blue DPIM 32-way connector from J-50165, DPIM2 Adapter Harness, leaving J-50165 mated to the red/blue OEM 32-way connector. 5. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 9 and 7 of the red/blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 17	Open or short in vehicle harness. Repair as necessary and go to Step 20
17	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P2 encoder connector disconnected. 3. Remove the jumper wire from the P2 encoder connector. 4. Use J-39197, Jumper Wire Kit, to jumper pins A and B on the P2 encoder connector. 5. Leave the J-50165, DPIM2 Adapter Harness, mated to the red/blue OEM 32-way connector ONLY. 6. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 7 and 25 of the red/blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 18	Open or short in vehicle harness. Repair as necessary and go to Step 20
18	<p>Replace the P2 speed sensor.</p> <p>Has the speed sensor been replaced?</p>		Go to Step 20	
19	<p>NOTE: In most cases, the Dual Power Inverter Module (DPIM) is not at fault. Investigate thoroughly before replacing the DPIM.</p> <p>Replace DPIM. Contact Technical Assistance Center (TAC) at 1-800-252-5283 for DPIM replacement authorization. TAC will require a snapshot.</p> <p>Is the replacement of the DPIM complete?</p>		Go to Step 20	

Section 5—DIAGNOSTIC CODES

DTC 73–35 Inverter A Primary Encoder Signal Lost *(cont'd)*

Step	Action	Value(s)	Yes	No
20	In order to verify your repair: 1. Clear the DTC. 2. Operate the vehicle under normal driving conditions. Did the DTC return?		<i>Begin the diagnosis again.</i> <i>Go to Step 1</i>	<i>System OK</i>

DTC 73-36 Inverter A Encoder Signals Loss of Quadrature

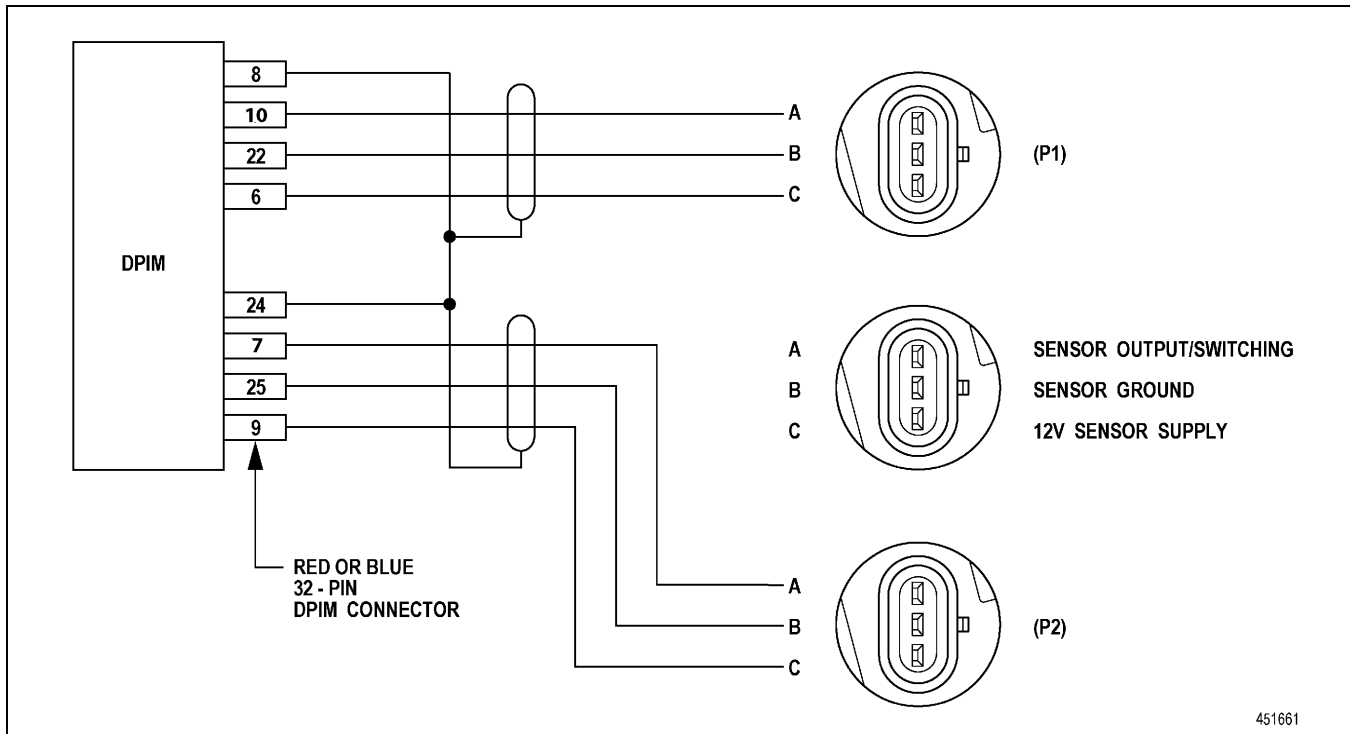


Figure 5-44.

Overview:

DTC 73-36 is logged when the encoder signals do not meet the 90 degree phase difference requirement.

Action Taken When DTC Sets:

When DTC 73-36 is active, the following conditions will occur:

- **MIL** light illuminates
- **Check System** light illuminates
- Disable Inverter A
 - Inverter A CAN enable will be removed. Vehicle can limp home on one motor only.
- Disable special mode
 - HUSH™ mode will be disabled

Tool Requirements:

- Universal Allison DOC®
- J-39700 Universal Breakout Box
- J-46711 TCM/VCM/DPIM Breakout Harness
- J-50165 DPIM2 Adapter Harness
- J-46708 Multimeter
- J-39197 Jumper Wire Kit

Section 5—DIAGNOSTIC CODES

DTC 73-36 Inverter A Encoder Signals Loss of Quadrature *(cont'd)*



NOTE: DPIM2 has a blue Motor A Terminal Protection Assurance (TPA) key and J-46711, TCM/VCM/DPIM Breakout Harness, has a red Motor A TPA key. When servicing a DPIM2, use J-50165, Adapter Harness, with J-46711, TCM/VCM/DPIM Breakout Harness. This will convert the J-46711's red connector TPA key to a blue connector TPA key and allow it to connect to a DPIM2.

Step	Action	Value(s)	Yes	No
1	Are any 13-XX series DTCs set along with this code?		<i>Troubleshoot these H 40/50 EP Drive Unit first.</i>	<i>Go to Step 2</i>
2	1. Install Universal Allison DOC®. 2. Start the engine. 3. Record the DTC snapshot. 4. Monitor TCM ignition voltage. Is the voltage within the specified values?	9–18V	<i>Go to Step 3</i>	<i>Resolve voltage problem. Go to Step 20</i>
3	Is DTC 73-36 active?		<i>Go to Step 5</i>	<i>Go to Step 4</i>
4	1. Clear the DTC. 2. Attempt to duplicate the conditions in the failure record (mode, temperature, etc.). Does DTC 73-36 return?		<i>Go to Step 5</i>	<i>System OK</i>
5	Perform a visual inspection of the red/blue 32-way connector at the Dual Power Inverter Module (DPIM), the P1 speed sensor, and the P2 speed sensor. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is there any water intrusion, damaged wiring, etc. that may cause a loss and/or corruption of signal?		<i>Make repairs as necessary and go to Step 20</i>	<i>Go to Step 6</i>
6	1. Turn OFF the ignition. 2. Install J-39700, Universal Breakout Box, to the DPIM 24-way and the OEM 24-way connectors using J-46711, TCM/VCM/DPIM Breakout Harness. 3. Turn ON the ignition. Is the harness connected and the ignition turned back ON ?		<i>Go to Step 7</i>	

DTC 73–36 Inverter A Encoder Signals Loss of Quadrature (cont'd)

Step	Action	Value(s)	Yes	No
7	<p>At J-46711-1, DPIM Overlay, measure battery supply voltage on pins 1, 2, 5, and 6 of the DPIM 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	10.5–16V	Go to Step 8	Open or short in vehicle harness. Repair as necessary and go to Step 20
8	<p>At J-46711-1, DPIM Overlay, measure wakeup signal voltage on pins 3 and 4 of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9–16V	Go to Step 9	Open or short in vehicle harness. Repair as necessary and go to Step 20
9	<p>At J-46711-1, DPIM Overlay, measure torque enable voltage on pins 16 (Inverter B Torque Enable) and 17 (Inverter A Torque Enable) of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9–16V	Go to Step 10	Open or short in vehicle harness. Repair as necessary and go to Step 20
10	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the J-46711, TCM/VCM/ DPIM Breakout Harness, from the DPIM 24-way connector. Leave the OEM 24-way connector mated to the J-46711. 3. At J-46711-1, DPIM Overlay, measure resistance to ground on 12V battery return pins 18, 19, 20, and 21 of the DPIM 24-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 11	Open or short in vehicle harness. Repair as necessary and go to Step 20

Section 5—DIAGNOSTIC CODES

DTC 73–36 Inverter A Encoder Signals Loss of Quadrature *(cont'd)*

Step	Action	Value(s)	Yes	No
11	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Disconnect the DPIM 24-way and OEM 24-way connectors from the J-46711, TCM/VCM/DPIM Breakout Harness. 3. Connect the OEM 24-way connector to the DPIM 24-way connector. 4. Disconnect the red/blue OEM 32-way connector from the DPIM. 5. Connect the red/blue DPIM 32-way connector of the J-46711, TCM/VCM/DPIM Breakout Harness, using J-50165, DPIM2 Adapter Harness, to the DPIM connector ONLY. Leave the J-46711 disconnected from the red/blue OEM 32-way connector. 6. Turn ON the ignition. 7. At J-50165-3, DPIM2 Overlay, measure the speed sensor supply Open Circuit Voltage (OCV) at the red/blue 32-way connector by measuring the voltage between pin 6 and pin 22 of the red/blue 32-way DPIM connector. 8. At J-50165-3, DPIM2 Overlay, measure the speed sensor supply Open Circuit Voltage (OCV) at the red/blue 32-way connector by measuring the voltage between pin 9 and pin 25 of the red/blue 32-way DPIM connector. <p>Were both voltages within the specified range?</p>	<p>DPIM1 10-13V</p> <p>DPIM2 7.5-18V (nominal ~12V)</p>	Go to Step 12	Go to Step 19
12	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the J-50165, DPIM2 Adapter Harness, from the red/blue DPIM 32-way connector. 3. Connect the J-50165, DPIM2 Adapter Harness, to the red/blue OEM 32-way connector ONLY. 4. Turn ON the ignition. 5. At J-50165-3, DPIM2 Overlay, measure for voltage on pins 6, 7, 8, 9, 10, 22, 24, and 25. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was voltage measured on any of the pins?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 13

DTC 73–36 Inverter A Encoder Signals Loss of Quadrature (cont'd)

Step	Action	Value(s)	Yes	No
13	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the P1 and P2 encoder connectors. 3. At J-50165-3, DPIM2 Overlay, measure for shorts-to-ground on pins 6, 7, 9, 10, 22, and 25. 4. At J-50165-3, DPIM2 Overlay, measure for shorts to other wires on pins 6, 7, 8, 9, 10, 22, 24, and 25. <p>NOTE: There will be continuity between pins 8 and 24 of the red/blue 32-way connector because all motor speed sensor shield wires are spliced together.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were any shorts-to-ground or shorts to any other wires found?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 14
14	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Connect the J-50165, DPIM2 Adapter Harness, to the red/blue DPIM 32-way connector. Leave it connected to the red/blue OEM 32-way connector and leave the P1 and P2 encoder connectors disconnected. 3. Turn ON the ignition. 4. Measure sensor supply voltage at the P1 encoder connector on pin C. 5. Measure sensor supply voltage at the P2 encoder connector on pin C. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were both voltages within the specified range?</p>	DPIM1 10-13V DPIM2 7.5-18V (nominal ~12V)	Go to Step 15	Open or short in vehicle harness. Repair as necessary and go to Step 20
15	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Leave the P1 and P2 encoder connectors disconnected. 3. Use J-39197, Jumper Wire Kit, to measure resistance to ground on pin B of the P1 encoder connector. 4. Use J-39197, Jumper Wire Kit, to measure resistance to ground on pin B of the P2 encoder connector. <p>Were the measured resistance values within specification?</p>	Less than 4 Ohms	Go to Step 16	Open or short in vehicle harness. Repair as necessary and go to Step 20

Section 5—DIAGNOSTIC CODES

DTC 73–36 Inverter A Encoder Signals Loss of Quadrature *(cont'd)*

Step	Action	Value(s)	Yes	No
16	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P1 and P2 encoder connectors disconnected. 3. Use J-39197, Jumper Wire Kit, to jumper pins A and C on the P1 encoder connector. 4. Use J-39197, Jumper Wire Kit, to jumper pins A and C on the P2 encoder connector. 5. Disconnect the red/blue DPIM 32-way connector from J-50165, DPIM2 Adapter Harness, leaving J-50165 mated to the red/blue OEM 32-way connector. 6. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 6 and 10 of the red/blue OEM 32-way connector. 7. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 7 and 9 of the red/blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were the measured resistance values within specification?</p>	Less than 4 Ohms	Go to Step 17	Open or short in vehicle harness. Repair as necessary and go to Step 20
17	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P1 and P2 encoder connectors disconnected. 3. Remove the jumper wire from the P1 and P2 encoder connectors. 4. Use J-39197, Jumper Wire Kit, to jumper pins A and B on the P1 encoder connector. 5. Use J-39197, Jumper Wire Kit, to jumper pins A and B on the P2 encoder connector. 6. Leave the J-50165, DPIM2 Adapter Harness, mated to the red/blue OEM 32-way connector ONLY. 7. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 10 and 22 of the red/blue OEM 32-way connector. 8. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 7 and 25 of the red/blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were the measured resistance values within specification?</p>	Less than 4 Ohms	Go to Step 18	Open or short in vehicle harness. Repair as necessary and go to Step 20
18	<p>Replace the P1 and P2 speed sensors.</p> <p>Have the speed sensors been replaced?</p>		Go to Step 20	Replace the speed sensor. Go to Step 20

DTC 73–36 Inverter A Encoder Signals Loss of Quadrature (cont'd)

Step	Action	Value(s)	Yes	No
19	<p>NOTE: In most cases, the Dual Power Inverter Module (DPIM) is not at fault. Investigate thoroughly before replacing the DPIM.</p> <p>Replace DPIM. Contact Technical Assistance Center (TAC) at 1-800-252-5283 for DPIM replacement authorization. TAC will require a snapshot.</p> <p>Is the replacement of the DPIM complete?</p>		Go to Step 20	
20	<p>To verify the repair:</p> <ol style="list-style-type: none"> 1. Clear the DTC. 2. Operate the vehicle under normal driving conditions. <p>Did the DTC return?</p>		<p>Begin the diagnosis again.</p> <p>Go to Step 1</p>	System OK

DTC 73–37 Inverter A Loss of Both Encoder Signals

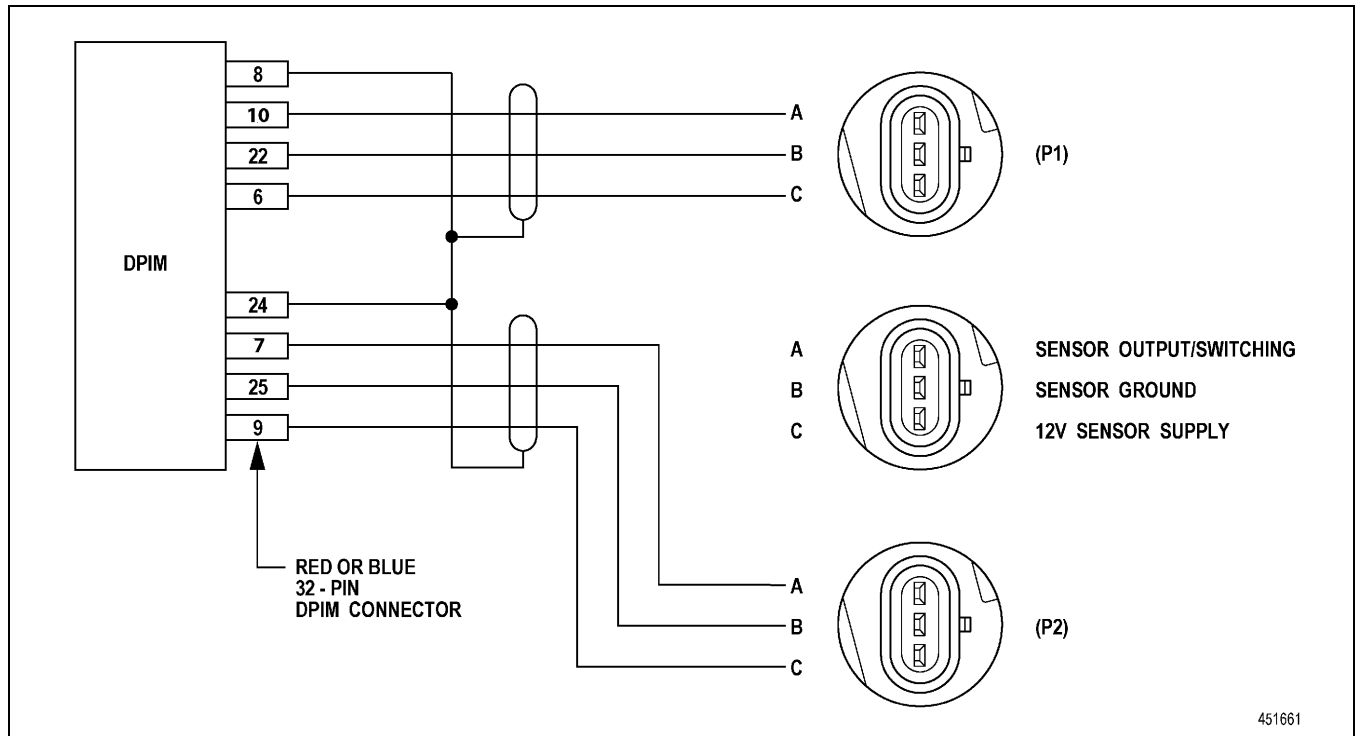


Figure 5–45.

Overview:

This DTC is logged when both signals are lost, and is often associated with a loss of power to the speed sensors. This DTC is typically caused by a low resistance short-to-ground on the speed sensor supply circuit.

Action Taken When DTC Sets:

When DTC 73-37 is active, the following conditions will occur:

- **MIL** light illuminates
- **Check System** light illuminates
- Disable Inverter A
 - Inverter A CAN enable will be removed. Vehicle can limp home on one motor only.
- Disable special mode
 - HUSH™ mode will be disabled

Tool Requirements:

- Universal Allison DOC®
- J-39700 Universal Breakout Box
- J-46711 TCM/VCM/DPIM Breakout Harness
- J-50165 DPIM2 Adapter Harness
- J-46708 Multimeter
- J-39197 Jumper Wire Kit

DTC 73–37 Inverter A Loss of Both Encoder Signals (cont'd)

NOTE: DPIM2 has a blue Motor A Terminal Protection Assurance (TPA) key and J-46711, TCM/VCM/DPIM Breakout Harness, has a red Motor A TPA key. When servicing a DPIM2, use J-50165, Adapter Harness, with J-46711, TCM/VCM/DPIM Breakout Harness. This will convert the J-46711's red connector TPA key to a blue connector TPA key and allow it to connect to a DPIM2.

Step	Action	Value(s)	Yes	No
1	Are any 13-XX series DTCs set along with this code?		<i>Troubleshoot these codes first.</i>	<i>Go to Step 2</i>
2	1. Install Universal Allison DOC®. 2. Start the engine. 3. Record the DTC snapshot. 4. Monitor TCM ignition voltage. Is the voltage within the specified values?	9–18V	<i>Go to Step 3</i>	<i>Resolve voltage problem. Go to Step 20</i>
3	Is DTC 73-37 active?		<i>Go to Step 5</i>	<i>Go to Step 4</i>
4	1. Clear the DTC. 2. Attempt to duplicate the conditions in the failure record (mode, temperature, etc.). Does DTC 73-37 return?		<i>Go to Step 5</i>	<i>System OK</i>
5	Perform a visual inspection of the red/blue 32-way connector at the Dual Power Inverter Module (DPIM), the P1 speed sensor, and the P2 speed sensor. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is there any water intrusion, damaged wiring, etc. that may cause a loss and/or corruption of signal?		<i>Make repairs as necessary and go to Step 20</i>	<i>Go to Step 6</i>
6	1. Turn OFF the ignition. 2. Install J-39700, Universal Breakout Box, to the DPIM 24-way and the OEM 24-way connectors using J-46711, TCM/VCM/DPIM Breakout Harness. 3. Turn ON the ignition. Is the harness connected and the ignition turned back ON ?		<i>Go to Step 7</i>	
7	At J-46711-1, DPIM Overlay, measure battery supply voltage on pins 1, 2, 5, and 6 of the DPIM 24-way connector. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is the voltage within the specified range?	10.5–16V	<i>Go to Step 8</i>	<i>Open or short in vehicle harness. Repair as necessary and go to Step 20</i>

Section 5—DIAGNOSTIC CODES

DTC 73–37 Inverter A Loss of Both Encoder Signals *(cont'd)*

Step	Action	Value(s)	Yes	No
8	<p>At J-46711-1, DPIM Overlay, measure wakeup signal voltage on pins 3 and 4 of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9–16V	Go to Step 9	Open or short in vehicle harness. Repair as necessary and go to Step 20
9	<p>At J-46711-1, DPIM Overlay, measure torque enable voltage on pins 16 (Inverter B Torque Enable) and 17 (Inverter A Torque Enable) of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9–16V	Go to Step 10	Open or short in vehicle harness. Repair as necessary and go to Step 20
10	<ol style="list-style-type: none"> Turn OFF the ignition. Disconnect the J-46711, TCM/VCM/DPIM Breakout Harness, from the DPIM 24-way connector. Leave the OEM 24-way connector mated to the J-46711. At J-46711-1, DPIM Overlay, measure resistance to ground on 12V battery return pins 18, 19, 20, and 21 of the DPIM 24-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 11	Open or short in vehicle harness. Repair as necessary and go to Step 20

DTC 73–37 Inverter A Loss of Both Encoder Signals (cont'd)

Step	Action	Value(s)	Yes	No
11	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Disconnect the DPIM 24-way and OEM 24-way connectors from the J-46711, TCM/VCM/DPIM Breakout Harness. 3. Connect the OEM 24-way connector to the DPIM 24-way connector. 4. Disconnect the red/blue OEM 32-way connector from the DPIM. 5. Connect the red/blue DPIM 32-way connector of the J-46711, TCM/VCM/DPIM Breakout Harness, using J-50165, DPIM2 Adapter Harness, to the DPIM connector ONLY. Leave the J-46711 disconnected from the red/blue OEM 32-way connector. 6. Turn ON the ignition. 7. At J-50165-3, DPIM2 Overlay, measure the speed sensor supply Open Circuit Voltage (OCV) at the red/blue 32-way connector by measuring the voltage between pin 6 and pin 22 of the red/blue 32-way DPIM connector. 8. At J-50165-3, DPIM2 Overlay, measure the speed sensor supply Open Circuit Voltage (OCV) at the red/blue 32-way connector by measuring the voltage between pin 9 and pin 25 of the red/blue 32-way DPIM connector. <p>Were both voltages within the specified range?</p>	DPIM1 10-13V DPIM2 7.5-18V (nominal ~12V)	Go to Step 12	Go to Step 19
12	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the J-50165, DPIM2 Adapter Harness, from the red/blue DPIM 32-way connector. 3. Connect the J-50165, DPIM2 Adapter Harness, to the red/blue OEM 32-way connector ONLY. 4. Turn ON the ignition. 5. At J-50165-3, DPIM2 Overlay, measure for voltage on pins 6, 7, 8, 9, 10, 22, 24, and 25. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was voltage measured on any of the pins?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 13

Section 5—DIAGNOSTIC CODES

DTC 73–37 Inverter A Loss of Both Encoder Signals *(cont'd)*

Step	Action	Value(s)	Yes	No
13	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the P1 and P2 encoder connectors. 3. At J-50165-3, DPIM2 Overlay, measure for shorts-to-ground on pins 6, 7, 9, 10, 22, and 25. 4. At J-50165-3, DPIM2 Overlay, measure for shorts to other wires on pins 6, 7, 8, 9, 10, 22, 24, and 25. <p>NOTE: There will be continuity between pins 8 and 24 of the red/blue 32-way connector because all motor speed sensor shield wires are spliced together.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were any shorts-to-ground or shorts to any other wires found?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 14
14	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Connect the J-50165, DPIM2 Adapter Harness, to the red/blue DPIM 32-way connector. Leave it connected to the red/blue OEM 32-way connector and leave the P1 and P2 encoder connectors disconnected. 3. Turn ON the ignition. 4. Measure sensor supply voltage at the P1 encoder connector on pin C. 5. Measure sensor supply voltage at the P2 encoder connector on pin C. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were both voltages within the specified range?</p>	DPIM1 10-13V DPIM2 7.5-18V (nominal ~12V)	Go to Step 15	Open or short in vehicle harness. Repair as necessary and go to Step 20
15	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Leave the P1 and P2 encoder connectors disconnected. 3. Use J-39197, Jumper Wire Kit, to measure resistance to ground on pin B of the P1 encoder connector. 4. Use J-39197, Jumper Wire Kit, to measure resistance to ground on pin B of the P2 encoder connector. <p>Were the measured resistance values within specification?</p>	Less than 4 Ohms	Go to Step 16	Open or short in vehicle harness. Repair as necessary and go to Step 20

DTC 73–37 Inverter A Loss of Both Encoder Signals (cont'd)

Step	Action	Value(s)	Yes	No
16	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P1 and P2 encoder connectors disconnected. 3. Use J-39197, Jumper Wire Kit, to jumper pins A and C on the P1 encoder connector. 4. Use J-39197, Jumper Wire Kit, to jumper pins A and C on the P2 encoder connector. 5. Disconnect the red/blue DPIM 32-way connector from J-50165, DPIM2 Adapter Harness, leaving J-50165 mated to the red/blue OEM 32-way connector. 6. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 6 and 10 of the red/blue OEM 32-way connector. 7. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 7 and 9 of the red/blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were the measured resistance values within specification?</p>	Less than 4 Ohms	Go to Step 17	Open or short in vehicle harness. Repair as necessary and go to Step 20
17	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P1 and P2 encoder connectors disconnected. 3. Remove the jumper wire from the P1 and P2 encoder connectors. 4. Use J-39197, Jumper Wire Kit, to jumper pins A and B on the P1 encoder connector. 5. Use J-39197, Jumper Wire Kit, to jumper pins A and B on the P2 encoder connector. 6. Leave the J-50165, DPIM2 Adapter Harness, mated to the red/blue OEM 32-way connector ONLY. 7. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 10 and 22 of the red/blue OEM 32-way connector. 8. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 7 and 25 of the red/blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were the measured resistance values within specification?</p>	Less than 4 Ohms	Go to Step 18	Open or short in vehicle harness. Repair as necessary and go to Step 20
18	<p>Replace the P1 and P2 speed sensors.</p> <p>Have the speed sensors been replaced?</p>		Go to Step 20	Replace the speed sensor. Go to Step 20

Section 5—DIAGNOSTIC CODES

DTC 73–37 Inverter A Loss of Both Encoder Signals *(cont'd)*

Step	Action	Value(s)	Yes	No
19	<p>NOTE: In most cases, the Dual Power Inverter Module (DPIM) is not at fault. Investigate thoroughly before replacing the DPIM.</p> <p>Replace DPIM. Contact Technical Assistance Center (TAC) at 1-800-252-5283 for DPIM replacement authorization. TAC will require a snapshot.</p> <p>Is the replacement of the DPIM complete?</p>		Go to Step 20	Replace DPIM. Go to Step 20
20	<p>To verify the repair:</p> <ol style="list-style-type: none"> 1. Clear the DTC. 2. Operate the vehicle under normal driving conditions. <p>Did the DTC return?</p>		Begin the diagnosis again. Go to Step 1	System OK

DTC 73–38 Inverter A Secondary Encoder Signal Lost

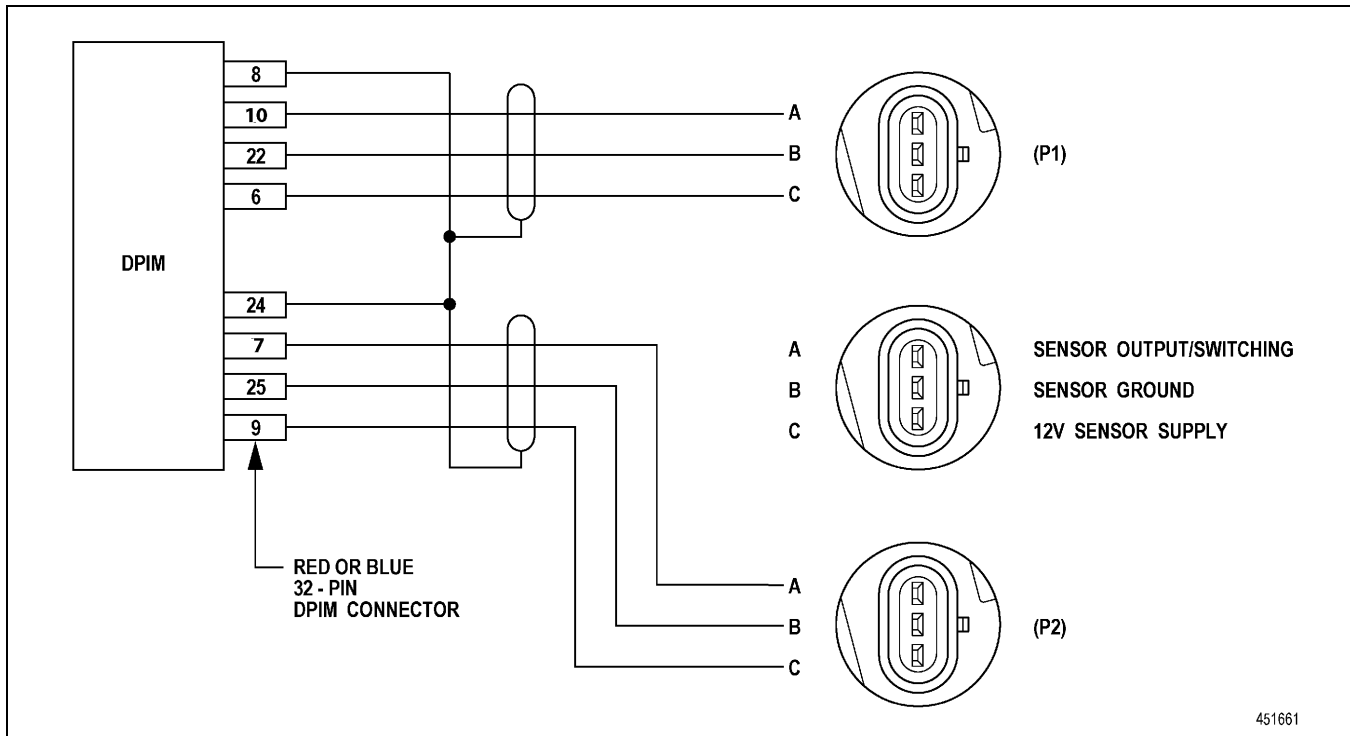


Figure 5–46.

Overview:

This DTC is logged when the speed signal is lost or intermittent from the P1 motor speed sensor.

Action Taken When DTC Sets:

When DTC 73-38 is active, the following conditions will occur:

- **MIL** light illuminates
- **Check System** light illuminates
- Disable Inverter A
 - Inverter A CAN enable will be removed. Vehicle can limp home on one motor only.
- Disable special mode
 - HUSH™ mode will be disabled

Possible Causes:

- Open/break in 12V supply or signal harness
- Loss of sensor ground
- Bad sensor
- Internal DPIM fault

Tool Requirements:

- Universal Allison DOC®
- J-39700 Universal Breakout Box

Section 5—DIAGNOSTIC CODES

DTC 73–38 Inverter A Secondary Encoder Signal Lost *(cont'd)*

- J-46711 TCM/VCM/DPIM Breakout Harness
- J-50165 DPIM2 Adapter Harness
- J-46708 Multimeter
- J-39197 Jumper Wire Kit



NOTE: DPIM2 has a blue Motor A Terminal Protection Assurance (TPA) key and J-46711, TCM/VCM/DPIM Breakout Harness, has a red Motor A TPA key. When servicing a DPIM2, use J-50165, Adapter Harness, with J-46711, TCM/VCM/DPIM Breakout Harness. This will convert the J-46711's red connector TPA key to a blue connector TPA key and allow it to connect to a DPIM2.

Step	Action	Value(s)	Yes	No
1	Are any 13-XX series DTCs set along with this code?		<i>Troubleshoot these codes first.</i>	<i>Go to Step 2</i>
2	1. Install Universal Allison DOC®. 2. Start the engine. 3. Record the DTC snapshot. 4. Monitor TCM ignition voltage. Is the voltage within the specified values?	9–18V	<i>Go to Step 3</i>	<i>Resolve voltage problem. Go to Step 20</i>
3	Is DTC 73-38 active?		<i>Go to Step 5</i>	<i>Go to Step 4</i>
4	1. Clear the DTC. 2. Attempt to duplicate the conditions in the failure record (mode, temperature, etc.). Does DTC 73-38 return?		<i>Go to Step 5</i>	<i>System OK</i>
5	Perform a visual inspection of P1 sensor OR both P1 and P2. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is there any water intrusion, damaged wiring, etc. that may cause a loss and/or corruption of signal?		<i>Make repairs as necessary and go to Step 20</i>	<i>Go to Step 6</i>
6	1. Turn OFF the ignition. 2. Install J-39700, Universal Breakout Box, to the DPIM 24-way and the OEM 24-way connectors using J-46711, TCM/VCM/DPIM Breakout Harness. 3. Turn ON the ignition. Is the harness connected and the ignition turned back ON ?		<i>Go to Step 7</i>	

DTC 73–38 Inverter A Secondary Encoder Signal Lost (cont'd)

Step	Action	Value(s)	Yes	No
7	<p>At J-46711-1, DPIM Overlay, measure battery supply voltage on pins 1, 2, 5, and 6 of the DPIM 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	10.5–16V	Go to Step 8	Open or short in vehicle harness. Repair as necessary and go to Step 20
8	<p>At J-46711-1, DPIM Overlay, measure wakeup signal voltage on pins 3 and 4 of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9–16V	Go to Step 9	Open or short in vehicle harness. Repair as necessary and go to Step 20
9	<p>At J-46711-1, DPIM Overlay, measure torque enable voltage on pins 16 (Inverter B Torque Enable) and 17 (Inverter A Torque Enable) of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9–16V	Go to Step 10	Open or short in vehicle harness. Repair as necessary and go to Step 20
10	<ol style="list-style-type: none"> Turn OFF the ignition. Disconnect the J-46711, TCM/VCM/ DPIM Breakout Harness, from the DPIM 24-way connector. Leave the OEM 24-way connector mated to the J-46711. At J-46711-1, DPIM Overlay, measure resistance to ground on 12V battery return pins 18, 19, 20, and 21 of the DPIM 24-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 11	Open or short in vehicle harness. Repair as necessary and go to Step 20

Section 5—DIAGNOSTIC CODES

DTC 73–38 Inverter A Secondary Encoder Signal Lost *(cont'd)*

Step	Action	Value(s)	Yes	No
11	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Disconnect the DPIM 24-way and OEM 24-way connectors from the J-46711, TCM/VCM/DPIM Breakout Harness. 3. Connect the OEM 24-way connector to the DPIM 24-way connector. 4. Disconnect the red/blue OEM 32-way connector from the DPIM. 5. Connect the red/blue DPIM 32-way connector of the J-46711, TCM/VCM/DPIM Breakout Harness, using J-50165, DPIM2 Adapter Harness, to the DPIM connector ONLY. Leave the J-46711 disconnected from the red/blue OEM 32-way connector. 6. Turn ON the ignition. 7. At J-50165-3, DPIM2 Overlay, measure the speed sensor supply Open Circuit Voltage (OCV) at the red/blue 32-way connector by measuring the voltage between pin 6 and pin 22 of the red/blue 32-way DPIM connector. <p>Is the voltage within the specified range?</p>	<p>DPIM1 10-13V</p> <p>DPIM2 7.5-18V (nominal ~12V)</p>	Go to Step 12	Go to Step 19
12	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the J-50165, DPIM2 Adapter Harness, from the red/blue DPIM 32-way connector. 3. Connect the J-50165, DPIM2 Adapter Harness, to the red/blue OEM 32-way connector ONLY. 4. Turn ON the ignition. 5. At J-50165-3, DPIM2 Overlay, measure for voltage on pins 6, 10, 8, and 22. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was voltage measured on any of the pins?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 13

DTC 73–38 Inverter A Secondary Encoder Signal Lost (cont'd)

Step	Action	Value(s)	Yes	No
13	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the P1 encoder connector. 3. At J-50165-3, DPIM2 Overlay, measure for shorts-to-ground on pins 6, 10, 8, and 22. 4. At J-50165-3, DPIM2 Overlay, measure for shorts to other wires on pins 6, 10, 8, and 22. <p>NOTE: There will be continuity between pins 8 and 24 of the red/blue 32-way connector because all motor speed sensor shield wires are spliced together.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were any shorts-to-ground or shorts to any other wires found?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 14
14	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Connect the J-50165, DPIM2 Adapter Harness, to the red/blue DPIM 32-way connector. Leave it connected to the red/blue OEM 32-way connector and leave the P1 encoder connector disconnected. 3. Turn ON the ignition. 4. Measure sensor supply voltage at the P1 encoder connector on pin C. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	DPIM1 10-13V DPIM2 7.5-18V (nominal ~12V)	Go to Step 15	Open or short in vehicle harness. Repair as necessary and go to Step 20
15	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Leave the P1 encoder connector disconnected. 3. Use J-39197, Jumper Wire Kit, to measure resistance to ground on pin B of the P1 encoder connector. <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 16	Open or short in vehicle harness. Repair as necessary and go to Step 20

Section 5—DIAGNOSTIC CODES

DTC 73–38 Inverter A Secondary Encoder Signal Lost *(cont'd)*

Step	Action	Value(s)	Yes	No
16	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P1 encoder connector disconnected. 3. Use J-39197, Jumper Wire Kit, to jumper pins A and C on the P1 encoder connector. 4. Disconnect the red/blue DPIM 32-way connector from J-50165, DPIM2 Adapter Harness, leaving J-50165 mated to the red/blue OEM 32-way connector. 5. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 10 and 6 of the red/blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 17	Open or short in vehicle harness. Repair as necessary and go to Step 20
17	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P2 encoder connector disconnected. 3. Remove the jumper wire from the P2 encoder connector. 4. Use J-39197, Jumper Wire Kit, to jumper pins A and B on the P2 encoder connector. 5. Leave the J-50165, DPIM2 Adapter Harness, mated to the red/blue OEM 32-way connector ONLY. 6. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 10 and 22 of the red/blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 18	Open or short in vehicle harness. Repair as necessary and go to Step 20
18	<p>Replace the P1 speed sensor.</p> <p>Has the speed sensor been replaced?</p>		Go to Step 20	Replace the speed sensor. Go to Step 20
19	<p>NOTE: In most cases, the Dual Power Inverter Module (DPIM) is not at fault. Investigate thoroughly before replacing the DPIM.</p> <p>Replace DPIM. Contact Technical Assistance Center (TAC) at 1-800-252-5283 for DPIM replacement authorization. TAC will require a snapshot.</p> <p>Is the replacement of the DPIM complete?</p>		Go to Step 20	Replace DPIM. Go to Step 20

DTC 73–38 Inverter A Secondary Encoder Signal Lost (cont'd)

Step	Action	Value(s)	Yes	No
20	To verify the repair: 1. Clear the DTC. 2. Operate the vehicle under normal driving conditions. Did the DTC return?		<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

DTC 73-39 (DPIM1) Inverter A Encoder Power Supply Out-of-Range High

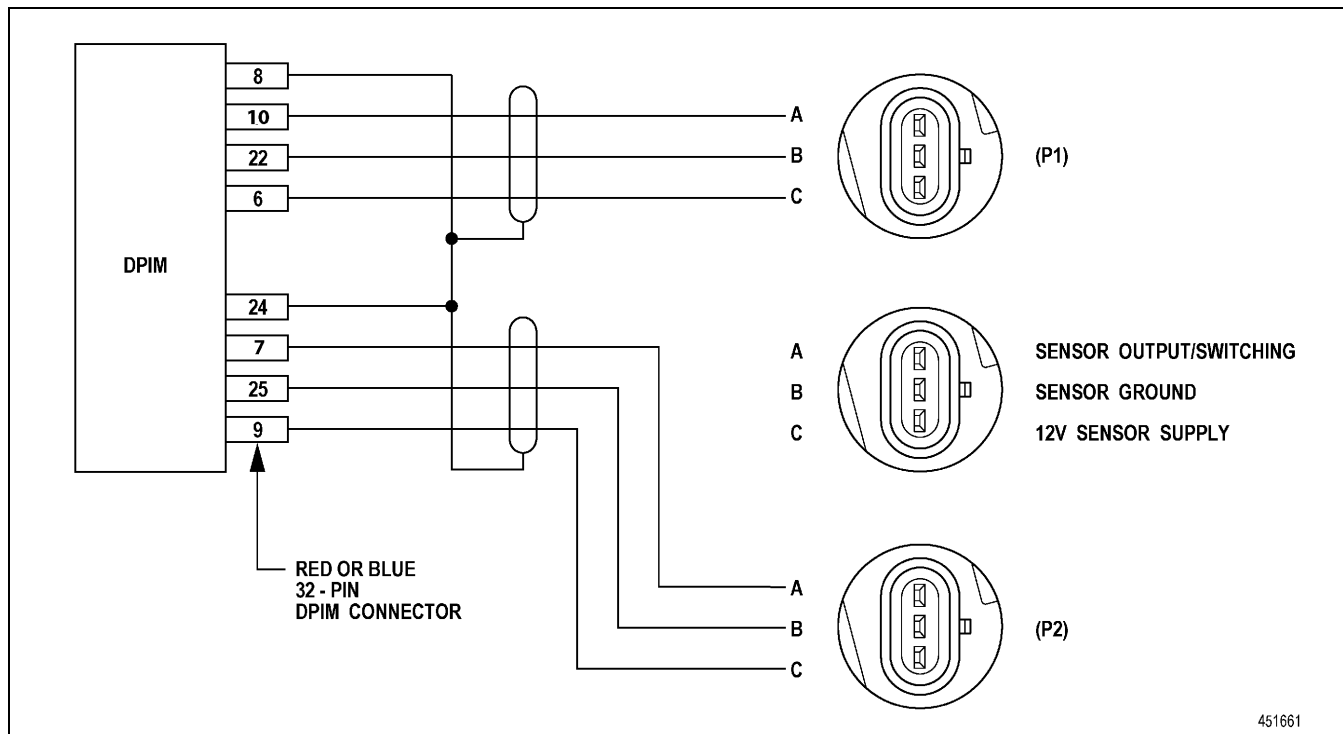


Figure 5-47.

Action Taken When DTC Sets:

- None

Possible Causes:

- Short to 12V or 24V power

Tool Requirements:

- Universal Allison DOC®
- J-39700 Universal Breakout Box
- J-46711 TCM/VCM/DPIM Breakout Harness
- J-46708 Multimeter
- J-39197 Jumper Wire Kit

Step	Action	Value(s)	Yes	No
1	Are any 13-XX series DTCs set along with this code?		<i>Troubleshoot these codes first.</i>	<i>Go to Step 2</i>
2	1. Install Universal Allison DOC®. 2. Start the engine. 3. Record the DTC snapshot. 4. Monitor TCM ignition voltage. Is the voltage within the specified values?	9–18V	<i>Go to Step 3</i>	<i>Resolve voltage problem. Go to Step 20</i>
3	Is DTC 73-39 active?		<i>Go to Step 5</i>	<i>Go to Step 4</i>

DTC 73-39 (DPIM1) Inverter A Encoder Power Supply Out-of-Range High (cont'd)

Step	Action	Value(s)	Yes	No
4	1. Clear the DTC. 2. Attempt to duplicate the conditions in the failure record (mode, temperature, etc.). Does DTC 73-39 return?		Go to Step 5	System OK
5	Perform a visual inspection of the red 32-way connector at the Dual Power Inverter Module (DPIM), the P1 speed sensor, and the P2 speed sensor. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is there any water intrusion, damaged wiring, etc. that may cause a loss and/or corruption of signal?		Make repairs as necessary and go to Step 20	Go to Step 6
6	1. Turn OFF the ignition. 2. Install J-39700, Universal Breakout Box, to the DPIM 24-way and the OEM 24-way connectors using J-46711, TCM/VCM/DPIM Breakout Harness. 3. Turn ON the ignition. Is the harness connected and the ignition turned back ON ?		Go to Step 7	
7	At J-46711-1, DPIM Overlay, measure battery supply voltage on pins 1, 2, 5, and 6 of the DPIM 24-way connector. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is the voltage within the specified range?	10.5–16V	Go to Step 8	Open or short in vehicle harness. Repair as necessary and go to Step 20
8	At J-46711-1, DPIM Overlay, measure wakeup signal voltage on pins 3 and 4 of the 24-way connector. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is the voltage within the specified range?	9–16V	Go to Step 9	Open or short in vehicle harness. Repair as necessary and go to Step 20

Section 5—DIAGNOSTIC CODES

DTC 73-39 (DPIM1) Inverter A Encoder Power Supply Out-of-Range High *(cont'd)*

Step	Action	Value(s)	Yes	No
9	<p>At J-46711-1, DPIM Overlay, measure torque enable voltage on pins 16 (Inverter B Torque Enable) and 17 (Inverter A Torque Enable) of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9–16V	Go to Step 10	<p>Open or short in vehicle harness. Repair as necessary and go to Step 20</p>
10	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the J-46711, TCM/VCM/DPIM Breakout Harness, from the DPIM 24-way connector. Leave the OEM 24-way connector mated to the J-46711. 3. At J-46711-1, DPIM Overlay, measure resistance to ground on 12V battery return pins 18, 19, 20, and 21 of the DPIM 24-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 11	<p>Open or short in vehicle harness. Repair as necessary and go to Step 20</p>

DTC 73-39 (DPIM1) Inverter A Encoder Power Supply Out-of-Range High *(cont'd)*

Step	Action	Value(s)	Yes	No
11	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Disconnect the DPIM 24-way and OEM 24-way connectors from the J-46711, TCM/VCM/DPIM Breakout Harness. 3. Connect the OEM 24-way connector to the DPIM 24-way connector. 4. Disconnect the red OEM 32-way connector from the DPIM. 5. Connect the red DPIM 32-way connector of the J-46711, TCM/VCM/DPIM Breakout Harness, to the DPIM connector ONLY. Leave the J-46711 disconnected from the red OEM 32-way connector. 6. Turn ON the ignition. 7. At J-46711-1, DPIM Overlay, measure the speed sensor supply Open Circuit Voltage (OCV) at the red 32-way connector by measuring the voltage between pin 6 and pin 22 of the red 32-way DPIM connector. 8. At J-46711-1, DPIM Overlay, measure the speed sensor supply Open Circuit Voltage (OCV) at the red 32-way connector by measuring the voltage between pin 9 and pin 25 of the red 32-way DPIM connector. <p>Were both voltages within the specified range?</p>	10–13V	Go to Step 12	Go to Step 19
12	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the J-46711, TCM/VCM/DPIM Breakout Harness, from the red DPIM 32-way connector. 3. Connect the J-46711, TCM/VCM/DPIM Breakout Harness, to the red OEM 32-way connector ONLY. 4. Turn ON the ignition. 5. At J-46711-1, DPIM Overlay, measure for voltage on pins 6, 7, 8, 9, 10, 22, 24, and 25. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was voltage measured on any of the pins?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 13

Section 5—DIAGNOSTIC CODES

DTC 73-39 (DPIM1) Inverter A Encoder Power Supply Out-of-Range High *(cont'd)*

Step	Action	Value(s)	Yes	No
13	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the P1 and P2 encoder connectors. 3. At J-46711-1, DPIM Overlay, measure for shorts-to-ground on pins 6, 7, 9, 10, 22, and 25. 4. At J-46711-1, DPIM Overlay, measure for shorts to other wires on pins 6, 7, 8, 9, 10, 22, 24, and 25. <p>NOTE: There will be continuity between pins 8 and 24 of the red 32-way connector because all motor speed sensor shield wires are spliced together.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were any shorts-to-ground or shorts to any other wires found?</p>		<i>Short in vehicle harness. Repair as necessary and go to Step 20</i>	<i>Go to Step 14</i>
14	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Connect the J-46711, TCM/VCM/DPIM Breakout Harness, to the red DPIM 32-way connector. Leave it connected to the red OEM 32-way connector and leave the P1 and P2 encoder connectors disconnected. 3. Turn ON the ignition. 4. Measure sensor supply voltage at the P1 encoder connector on pin C. 5. Measure sensor supply voltage at the P2 encoder connector on pin C. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were both voltages within the specified range?</p>	10–13V	<i>Go to Step 15</i>	<i>Open or short in vehicle harness. Repair as necessary and go to Step 20</i>
15	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Leave the P1 and P2 encoder connectors disconnected. 3. Use J-39197, Jumper Wire Kit, to measure resistance to ground on pin B of the P1 encoder connector. 4. Use J-39197, Jumper Wire Kit, to measure resistance to ground on pin B of the P2 encoder connector. <p>Were the measured resistance values within specification?</p>	Less than 4 Ohms	<i>Go to Step 16</i>	<i>Open or short in vehicle harness. Repair as necessary and go to Step 20</i>

DTC 73-39 (DPIM1) Inverter A Encoder Power Supply Out-of-Range High *(cont'd)*

Step	Action	Value(s)	Yes	No
16	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P1 and P2 encoder connectors disconnected. 3. Use J-39197, Jumper Wire Kit, to jumper pins A and C on the P1 encoder connector. 4. Use J-39197, Jumper Wire Kit, to jumper pins A and C on the P2 encoder connector. 5. Disconnect the red DPIM 32-way connector from J-46711, TCM/VCM/DPIM Breakout Harness, leaving J-46711 mated to the red OEM 32-way connector. 6. At J-46711-1, DPIM Overlay, measure the resistance between pins 6 and 10 of the red OEM 32-way connector. 7. At J-46711-1, DPIM Overlay, measure the resistance between pins 7 and 9 of the red OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were the measure resistance values within specification?</p>	Less than 4 Ohms	Go to Step 17	Open or short in vehicle harness. Repair as necessary and go to Step 20
17	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P1 and P2 encoder connectors disconnected. 3. Remove the jumper wire from the P1 and P2 encoder connectors. 4. Use J-39197, Jumper Wire Kit, to jumper pins A and B on the P1 encoder connector. 5. Use J-39197, Jumper Wire Kit, to jumper pins A and B on the P2 encoder connector. 6. Leave the J-46711, TCM/VCM/DPIM Breakout Harness, mated to the red OEM 32-way connector ONLY. 7. At J-46711-1, DPIM Overlay, measure the resistance between pins 10 and 22 of the red OEM 32-way connector. 8. At J-46711-1, DPIM Overlay, measure the resistance between pins 7 and 25 of the red OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were the measure resistance values within specification?</p>	Less than 4 Ohms	Go to Step 18	Open or short in vehicle harness. Repair as necessary and go to Step 20

Section 5—DIAGNOSTIC CODES

DTC 73-39 (DPIM1) Inverter A Encoder Power Supply Out-of-Range High *(cont'd)*

Step	Action	Value(s)	Yes	No
18	Replace the both P1 and P2 speed sensors. Have the speed sensor been replaced?		Go to Step 20	Replace the speed sensor. Go to Step 20
19	<p>NOTE: In most cases, the Dual Power Inverter Module (DPIM) is not at fault. Investigate thoroughly before replacing the DPIM.</p> <p>Replace DPIM. Contact Technical Assistance Center (TAC) at 1-800-252-5283 for DPIM replacement authorization. TAC will require a snapshot.</p> <p>Is the replacement of the DPIM complete?</p>		Go to Step 20	Replace DPIM. Go to Step 20
20	<p>To verify the repair:</p> <ol style="list-style-type: none"> 1. Clear the DTC. 2. Operate the vehicle under normal driving conditions. <p>Did the DTC return?</p>		<p>Begin the diagnosis again.</p> <p>Go to Step 1</p>	System OK

DTC 73-39 (DPIM2) Inverter A Encoder Power Supply Out-of-Range High

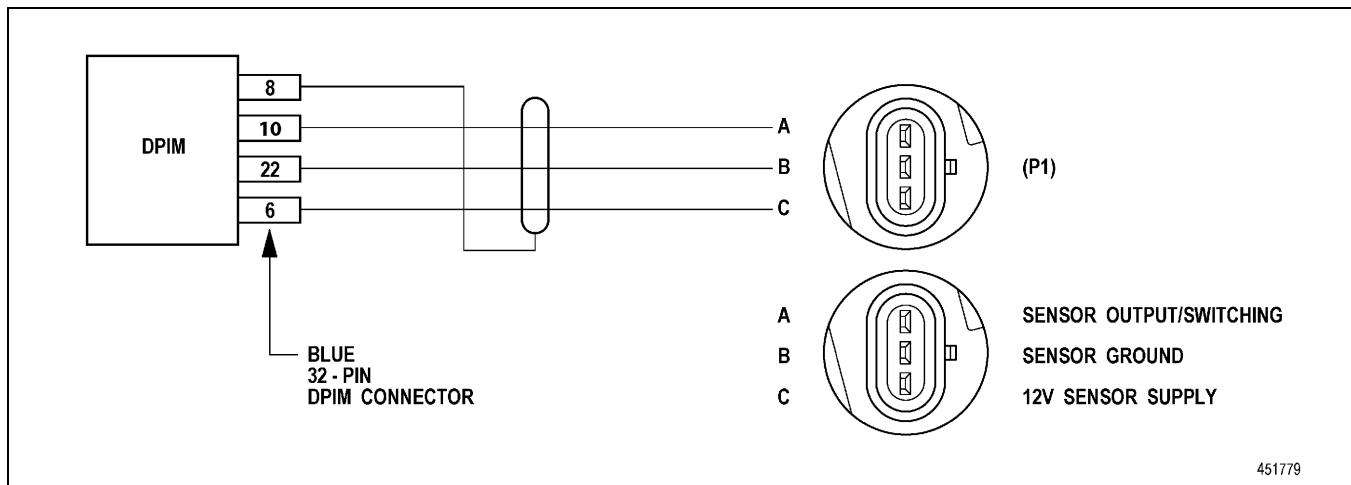


Figure 5-48.

Overview:

The DPIM encoders are used to measure motor speed/direction and are required for motor operation. DPIM2 uses separate power supplies for each of the encoders. This code is specific to the P1 sensor power supply. The power supplied to this sensor is monitored to detect sensor/harness issues.

Action Taken When DTC Sets:

- None

Possible Causes:

- Short to 12V or 24V power
- Internal DPIM short

Tool Requirements:

- J-39700 Universal Breakout Box
- J-46711 TCM/VCM/DPIM Breakout Harness
- J-50165 DPIM2 Adapter Harness
- J-46708 Multimeter
- J-39197 Jumper Wire Kit
- Universal Allison DOC®



NOTE: DPIM2 has a blue Motor A Terminal Protection Assurance (TPA) key and J-46711, TCM/VCM/DPIM Breakout Harness, has a red Motor A TPA key. When servicing a DPIM2, use J-50165, DPIM2 Adapter Harness, with J-46711, TCM/VCM/DPIM Breakout Harness. This will convert the J-46711's red connector TPA key to a blue connector TPA key and allow it to connect to a DPIM2.

Section 5—DIAGNOSTIC CODES

DTC 73-39 (DPIM2) Inverter A Encoder Power Supply Out-of-Range High *(cont'd)*

Step	Action	Value(s)	Yes	No
1	Are DTCs 13-23 and/or 13-24 set along with this code?		<i>Troubleshoot these codes first.</i>	<i>Go to Step 2</i>
2	1. Install Universal Allison DOC®. 2. Start the engine. 3. Record the DTC snapshot. 4. Monitor TCM ignition voltage. Is the voltage within the specified values?	9–18V	<i>Go to Step 3</i>	<i>Resolve voltage problem. Go to Step 20</i>
3	Is DTC 73-39 active?		<i>Go to Step 5</i>	<i>Go to Step 4</i>
4	1. Clear the DTC. 2. Attempt to duplicate the conditions in the failure record (mode, temperature, etc.). Does DTC 73-39 return?		<i>Go to Step 5</i>	<i>System OK</i>
5	Perform a visual inspection of the blue 32-way connector at the Dual Power Inverter Module (DPIM) and at the P1 speed sensor. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is there any water intrusion, damaged wiring, etc. that may cause a loss and/or corruption of signal?		<i>Make repairs as necessary and go to Step 20</i>	<i>Go to Step 6</i>
6	1. Turn OFF the ignition. 2. Install J-39700, Universal Breakout Box, to the DPIM 24-way and OEM 24-way connectors using J-46711, TCM/VCM/DPIM Breakout Harness. 3. Turn ON the ignition. Is the harness connected and the ignition turned back ON ?		<i>Go to Step 7</i>	
7	At J-46711-1, DPIM Overlay, measure battery supply voltage on pins 1, 2, 5, and 6 of the DPIM 24-way connector. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is the voltage within the specified range?	10.5–16V	<i>Go to Step 8</i>	<i>Open or short in vehicle harness. Repair as necessary and go to Step 20</i>

DTC 73-39 (DPIM2) Inverter A Encoder Power Supply Out-of-Range High (cont'd)

Step	Action	Value(s)	Yes	No
8	<p>At J-46711-1, DPIM Overlay, measure wakeup signal voltage on pins 3 and 4 of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9–16V	Go to Step 9	<p>Open or short in vehicle harness. Repair as necessary and go to Step 20</p>
9	<p>At J-46711-1, DPIM Overlay, measure torque enable voltage on pins 16 (Inverter B Torque Enable) and 17 (Inverter A Torque Enable) of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9–16V	Go to Step 10	<p>Open or short in vehicle harness. Repair as necessary and go to Step 20</p>
10	<ol style="list-style-type: none"> Turn OFF the ignition. Disconnect the J-46711, TCM/VCM/DPIM Breakout Harness, from the DPIM 24-way connector. Leave the OEM 24-way connector mated to the J-46711. At J-46711-1, DPIM Overlay, measure resistance to ground on 12V battery return pins 18, 19, 20, and 21 of the DPIM 24-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 11	<p>Open or short in vehicle harness. Repair as necessary and go to Step 20</p>

Section 5—DIAGNOSTIC CODES

DTC 73-39 (DPIM2) Inverter A Encoder Power Supply Out-of-Range High *(cont'd)*

Step	Action	Value(s)	Yes	No
11	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Disconnect the DPIM 24-way and OEM 24-way connectors from the J-46711, TCM/VCM/DPIM Breakout Harness. 3. Connect the OEM 24-way connector to the DPIM 24-way connector. 4. Disconnect the blue OEM 32-way connector from the DPIM. 5. Connect the blue DPIM 32-way connector of the J-46711, TCM/VCM/DPIM Breakout Harness, to the DPIM connector ONLY using J-50165, DPIM2 Adapter Harness. Leave the J-46711 disconnected from the blue OEM 32-way connector. 6. Turn ON the ignition. 7. At J-50165-3, DPIM2 Overlay, measure the speed sensor supply Open Circuit Voltage (OCV) at the blue 32-way connector by measuring the voltage between pin 6 and pin 22 of the blue 32-way DPIM connector. <p>Is the voltage within the specified range?</p>	7.5–18V (nominal ~12V)	Go to Step 12	Go to Step 19
12	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the J-50165, DPIM2 Adapter Harness, from the blue DPIM 32-way connector. 3. Connect the J-50165, DPIM2 Adapter Harness, to the blue OEM 32-way connector ONLY. 4. Turn ON the ignition. 5. At J-50165-3, DPIM2 Overlay, measure for voltage on pins 6, 10, 8, and 22. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was voltage measured on any of the pins?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 13

DTC 73-39 (DPIM2) Inverter A Encoder Power Supply Out-of-Range High (cont'd)

Step	Action	Value(s)	Yes	No
13	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the P1 encoder connector. 3. At J-50165-3, DPIM2 Overlay, measure for shorts-to-ground on pins 6, 10, and 22. 4. At J-50165-3, DPIM2 Overlay, measure for shorts to other wires on pins 6, 10, 8 and 22. <p>NOTE: There will be continuity between pins 8 and 24 of the gray 32-way connector because all motor speed sensor shield wires are spliced together.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were any shorts-to-ground or shorts to any other wires found?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 14
14	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Connect the J-46711, TCM/VCM/DPIM Breakout Harness, to the blue DPIM 32-way connector using J-50165, DPIM2 Adapter Harness. Leave it connected to the blue OEM 32-way connector and leave the P1 encoder connector disconnected. 3. Turn ON the ignition. 4. Check sensor supply voltage at the P1 encoder connector on pin C. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	7.5–18V (nominal ~12V)	Go to Step 15	Open or short in vehicle harness. Repair as necessary and go to Step 20
15	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Leave the P1 encoder connector disconnected. 3. Use J-39197, Jumper Wire Kit, to measure resistance to ground on pin B of the encoder connector. <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 16	Open or short in vehicle harness. Repair as necessary and go to Step 20

Section 5—DIAGNOSTIC CODES

DTC 73-39 (DPIM2) Inverter A Encoder Power Supply Out-of-Range High *(cont'd)*

Step	Action	Value(s)	Yes	No
16	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P1 encoder connector disconnected. 3. Use J-39197, Jumper Wire Kit, to jumper pins A and C on the P1 encoder connector. 4. Disconnect the blue DPIM 32-way connector from J-50165, DPIM2 Adapter Harness, leaving it mated to the blue OEM 32-way connector. 5. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 6 and 10 of the blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 17	Open or short in vehicle harness. Repair as necessary and go to Step 20
17	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P1 encoder connector disconnected. 3. Remove the jumper wire from the P1 encoder connector. 4. Use J-39197, Jumper Wire Kit, to jumper pins A and B on the P1 encoder connector. 5. Leave the J-46711 TCM mated to the blue OEM 32-way connector ONLY. 6. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 10 and 22 of the blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 18	Open or short in vehicle harness. Repair as necessary and go to Step 20
18	<p>Replace the P1 speed sensor.</p> <p>Has the speed sensor been replaced?</p>		Go to Step 20	Replace the speed sensor. Go to Step 20
19	<p>NOTE: In most cases, the Dual Power Inverter Module (DPIM) is not at fault. Investigate thoroughly before replacing the DPIM.</p> <p>Replace DPIM. Contact Technical Assistance Center (TAC) at 1-800-252-5283 for DPIM replacement authorization. TAC will require a snapshot.</p> <p>Is the replacement of the DPIM complete?</p>		Go to Step 20	Replace DPIM. Go to Step 20

**DTC 73-39 (DPIM2) Inverter A Encoder Power Supply
Out-of-Range High (cont'd)**

Step	Action	Value(s)	Yes	No
20	To verify the repair: 1. Clear the DTC. 2. Operate the vehicle under normal driving conditions. Did the DTC return?		<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

DTC 73-41 (DPIM1) Inverter A Encoder Power Supply Out-of-Range Low

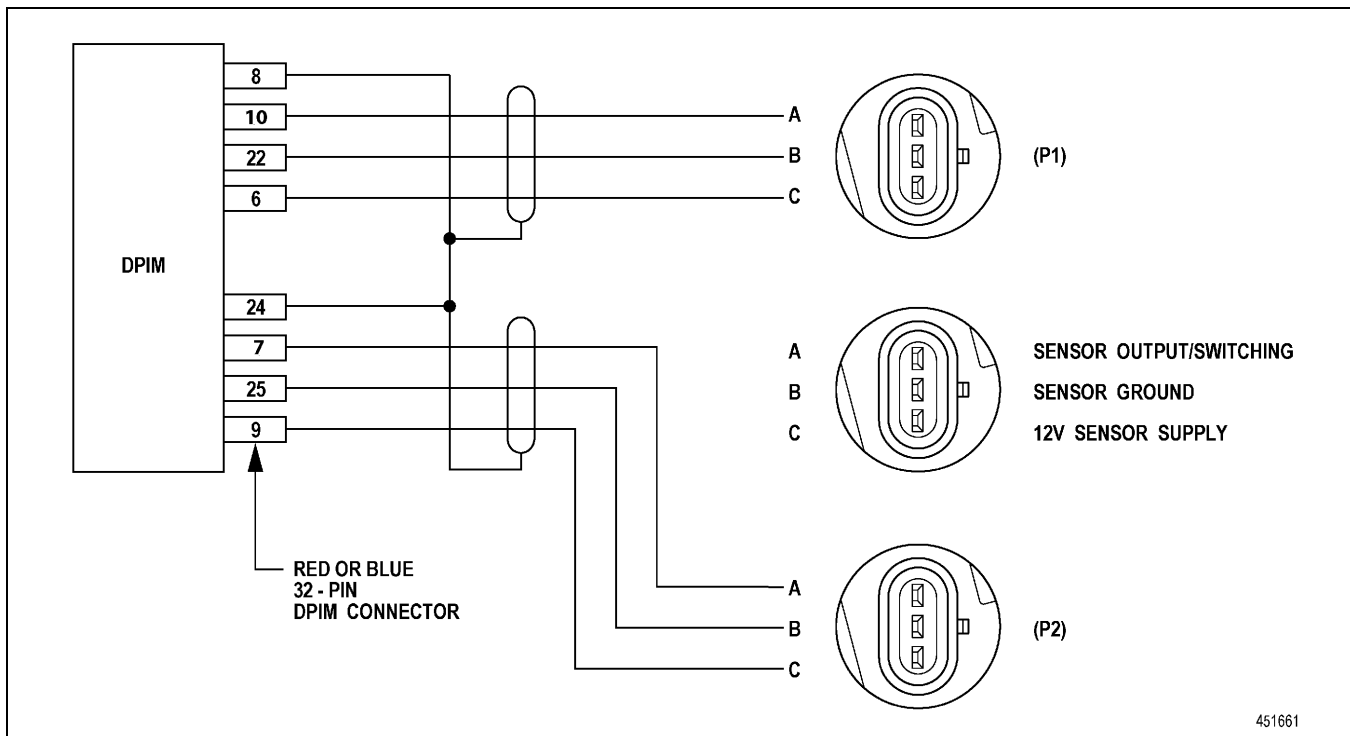


Figure 5-51.

Action Taken When DTC Sets:

When DTC 73-41 is active, the following conditions will occur:

- **MIL** light illuminates
- **Check System** light illuminates
- Disable Inverter A
 - Inverter A CAN enable will be removed. Vehicle can limp home on one motor only.
- Disable special mode
 - HUSH™ mode will be disabled

Possible Causes:

- Low 12V supply power
- 12V supply/harness to speed sensor signal is damaged
- Bad sensor
- Internal DPIM fault

Tool Requirements:

- Universal Allison DOC®
- J-39700 Universal Breakout Box
- J-46711 TCM/VCM/DPIM Breakout Harness

Section 5—DIAGNOSTIC CODES

DTC 73-41 (DPIM1) Inverter A Encoder Power Supply Out-of-Range Low *(cont'd)*

- J-46708 Multimeter
- J-39197 Jumper Wire Kit

Step	Action	Value(s)	Yes	No
1	Are any 13-XX series codes set along with this code?		<i>Troubleshoot these codes first.</i>	<i>Go to Step 2</i>
2	1. Install Universal Allison DOC®. 2. Start the engine. 3. Record the DTC snapshot. 4. Monitor TCM ignition voltage. Is the voltage within the specified values?	9-18V	<i>Go to Step 3</i>	<i>Resolve voltage problem. Go to Step 20</i>
3	Is code 73-41 active?		<i>Go to Step 5</i>	<i>Go to Step 4</i>
4	1. Clear the DTC. 2. Attempt to duplicate the conditions in the failure record (mode, temperature, etc.). Does code 73-41 return?		<i>Go to Step 5</i>	<i>System OK</i>
5	Perform a visual inspection of the red 32-way connector at the Dual Power Inverter Module (DPIM), the P1 speed sensor, and the P2 speed sensor. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is there any water intrusion, damaged wiring, etc. that may cause a loss and/or corruption of signal?		<i>Make repairs as necessary and go to Step 20</i>	<i>Go to Step 6</i>
6	1. Turn OFF the ignition. 2. Install J-39700, Universal Breakout Box, to the DPIM 24-way and the OEM 24-way connectors using J-46711, TCM/VCM/DPIM Breakout Harness. 3. Turn ON the ignition. Is the harness connected and the ignition turned back ON ?		<i>Go to Step 7</i>	
7	At J-46711-1, DPIM Overlay, measure battery supply voltage on pins 1, 2, 5, and 6 of the DPIM 24-way connector. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is the voltage within the specified range?	10.5-16V	<i>Go to Step 8</i>	<i>Open or short in vehicle harness. Repair as necessary and go to Step 20</i>

DTC 73-41 (DPIM1) Inverter A Encoder Power Supply Out-of-Range Low (cont'd)

Step	Action	Value(s)	Yes	No
8	<p>At J-46711-1, DPIM Overlay, measure wakeup signal voltage on pins 3 and 4 of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9-16V	Go to Step 9	Open or short in vehicle harness. Repair as necessary and go to Step 20
9	<p>At J-46711-1, DPIM Overlay, measure torque enable voltage on pins 16 (Inverter B Torque Enable) and 17 (Inverter A Torque Enable) of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9-16V	Go to Step 10	Open or short in vehicle harness. Repair as necessary and go to Step 20
10	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the J-46711, TCM/VCM/DPIM Breakout Harness, from the DPIM 24-way connector. Leave the OEM 24-way connector mated to the J-46711. 3. At J-46711-1, DPIM Overlay, measure resistance to ground on 12V battery return pins 18, 19, 20, and 21 of the DPIM 24-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 11	Open or short in vehicle harness. Repair as necessary and go to Step 20

Section 5—DIAGNOSTIC CODES

DTC 73-41 (DPIM1) Inverter A Encoder Power Supply Out-of-Range Low *(cont'd)*

Step	Action	Value(s)	Yes	No
11	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Disconnect the DPIM 24-way and OEM 24-way connectors from the J-46711, TCM/VCM/DPIM Breakout Harness. 3. Connect the OEM 24-way connector to the DPIM 24-way connector. 4. Disconnect the red OEM 32-way connector from the DPIM. 5. Connect the red DPIM 32-way connector of the J-46711, TCM/VCM/DPIM Breakout Harness, to the DPIM connector ONLY. Leave the J-46711 disconnected from the red OEM 32-way connector. 6. Turn ON the ignition. 7. At J-46711-1, DPIM Overlay, measure the speed sensor supply Open Circuit Voltage (OCV) at the red 32-way connector by measuring the voltage between pin 6 and pin 22 of the red 32-way DPIM connector. 8. At J-46711-1, DPIM Overlay, measure the speed sensor supply Open Circuit Voltage (OCV) at the red 32-way connector by measuring the voltage between pin 9 and pin 25 of the red 32-way DPIM connector. <p>Were both voltages within the specified range?</p>	10-13V	Go to Step 12	Go to Step 19
12	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the J-46711, TCM/VCM/DPIM Breakout Harness, from the red DPIM 32-way connector. 3. Connect the J-46711, TCM/VCM/DPIM Breakout Harness, to the red OEM 32-way connector ONLY. 4. Turn ON the ignition. 5. At J-46711-1, DPIM Overlay, measure for voltage on pins 6, 7, 8, 9, 10, 22, 24, and 25. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was voltage measured on any of the pins?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 13

DTC 73-41 (DPIM1) Inverter A Encoder Power Supply Out-of-Range Low (cont'd)

Step	Action	Value(s)	Yes	No
13	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the P1 and P2 encoder connectors. 3. At J-46711-1, DPIM Overlay, measure for shorts-to-ground on pins 6, 7, 9, 10, 22, and 25. 4. At J-46711-1, DPIM Overlay, measure for shorts to other wires on pins 6, 7, 8, 9, 10, 22, 24, and 25. <p>NOTE: There will be continuity between pins 8 and 24 of the red 32-way connector because all motor speed sensor shield wires are spliced together.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were any shorts-to-ground or shorts to any other wires found?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 14
14	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Connect the J-46711, TCM/VCM/DPIM Breakout Harness, to the red DPIM 32-way connector. Leave it connected to the red OEM 32-way connector and leave the P1 and P2 encoder connectors disconnected. 3. Turn ON the ignition. 4. Measure sensor supply voltage at the P1 encoder connector on pin C. 5. Measure sensor supply voltage at the P2 encoder connector on pin C. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were both voltages within the specified range?</p>	10-13V	Go to Step 15	Open or short in vehicle harness. Repair as necessary and go to Step 20
15	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Leave the P1 and P2 encoder connectors disconnected. 3. Use J-39197, Jumper Wire Kit, to measure resistance to ground on pin B of the P1 encoder connector. 4. Use J-39197, Jumper Wire Kit, to measure resistance to ground on pin B of the P2 encoder connector. <p>Were the measured resistance values within specification?</p>	Less than 4 Ohms	Go to Step 16	Open or short in vehicle harness. Repair as necessary and go to Step 20

Section 5—DIAGNOSTIC CODES

DTC 73-41 (DPIM1) Inverter A Encoder Power Supply Out-of-Range Low *(cont'd)*

Step	Action	Value(s)	Yes	No
16	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P1 and P2 encoder connectors disconnected. 3. Use J-39197, Jumper Wire Kit, to jumper pins A and C on the P1 encoder connector. 4. Use J-39197, Jumper Wire Kit, to jumper pins A and C on the P2 encoder connector. 5. Disconnect the red DPIM 32-way connector from J-46711, TCM/VCM/DPIM Breakout Harness, leaving J-46711 mated to the red OEM 32-way connector. 6. At J-46711-1, DPIM Overlay, measure the resistance between pins 6 and 10 of the red OEM 32-way connector. 7. At J-46711-1, DPIM Overlay, measure the resistance between pins 7 and 9 of the red OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were the measured resistance values within specification?</p>	Less than 4 Ohms	Go to Step 17	Open or short in vehicle harness. Repair as necessary and go to Step 20
17	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P1 and P2 encoder connectors disconnected. 3. Remove the jumper wire from the P1 and P2 encoder connectors. 4. Use J-39197, Jumper Wire Kit, to jumper pins A and B on the P1 encoder connector. 5. Use J-39197, Jumper Wire Kit, to jumper pins A and B on the P2 encoder connector. 6. Leave the J-46711, TCM/VCM/DPIM Breakout Harness, mated to the red OEM 32-way connector ONLY. 7. At J-46711-1, DPIM Overlay, measure the resistance between pins 10 and 22 of the red OEM 32-way connector. 8. At J-46711-1, DPIM Overlay, measure the resistance between pins 7 and 25 of the red OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were the measured resistance values within specification?</p>	Less than 4 Ohms	Go to Step 18	Open or short in vehicle harness. Repair as necessary and go to Step 20
18	Replace both the P1 and P2 speed sensors. Have the speed sensors been replaced?		Go to Step 20	

DTC 73-41 (DPIM1) Inverter A Encoder Power Supply Out-of-Range Low (*cont'd*)

Step	Action	Value(s)	Yes	No
19	<p>NOTE: In most cases, the Dual Power Inverter Module (DPIM) is not at fault. Investigate thoroughly before replacing the DPIM.</p> <p>Replace DPIM. Contact Technical Assistance Center (TAC) at 1-800-252-5283 for DPIM replacement authorization. TAC will require a snapshot.</p> <p>Is the replacement of the DPIM complete?</p>		Go to Step 20	
20	<p>In order to verify your repair:</p> <ol style="list-style-type: none"> 1. Clear the DTC. 2. Operate the vehicle under normal driving conditions. <p>Did the DTC return?</p>		<p>Begin the diagnosis again.</p> <p>Go to Step 1</p>	System OK

DTC 73-41 (DPIM2) Inverter A Encoder Power Supply Out-of-Range Low

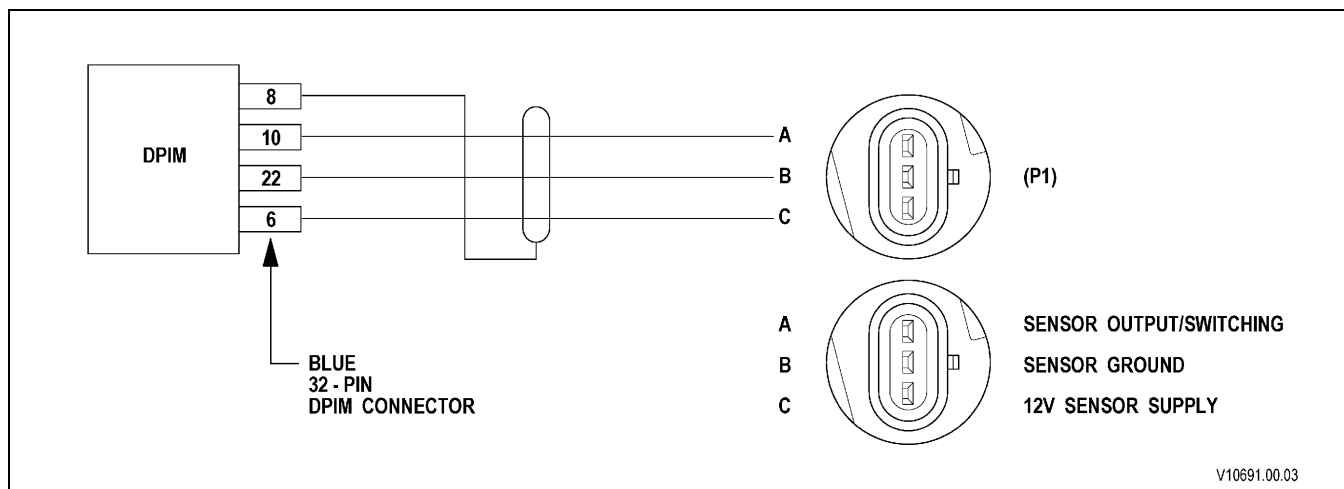


Figure 5-52.

Overview:

The DPIM encoders are used to measure motor speed/direction and are required for motor operation. DPIM2 uses separate power supplies for each of the encoders. This code is specific to the P1 sensor power supply. The power supplied to this sensor is monitored to detect sensor/harness issues.

Action Taken When DTC Sets:

- **MIL** light illuminates
- **Check System** light illuminates

Possible Causes:

- 12V power supply issues (battery/charging)
- Short or open in 12V power supply wiring
- Internal DPIM fault

Tool Requirements:

- J-39700 Universal Breakout Box
- J-46711 TCM/VCM/DPIM Breakout Harness
- J-50165 DPIM2 Adapter Harness
- J-46708 Multimeter
- J-39197 Jumper Wire Kit
- Universal Allison DOC®



NOTE: DPIM2 has a blue Motor A Terminal Protection Assurance (TPA) key and breakout harness J-46711 has a red Motor A TPA key. When servicing a DPIM2, use adapter harness J-50165 with breakout box harness J-46711. This will convert the J-46711's red connector TPA key to a blue connector TPA key and allow it to connect to a DPIM2.

DTC 73-41 (DPIM2) Inverter A Encoder Power Supply Out-of-Range Low (cont'd)

Step	Action	Value(s)	Yes	No
1	Are codes 13-12, 13-13 and/or 13-15 set along with this code?		<i>Troubleshoot these codes first.</i>	<i>Go to Step 2</i>
2	1. Install Universal Allison DOC®. 2. Start the engine. 3. Record the DTC snapshot. 4. Monitor TCM ignition voltage. Is the voltage within the specified values?	9-18V	<i>Go to Step 3</i>	<i>Resolve voltage problem. Go to Step 20</i>
3	Is code 73-41 active?		<i>Go to Step 5</i>	<i>Go to Step 4</i>
4	1. Clear the DTC. 2. Attempt to duplicate the conditions in the failure record (mode, temperature, etc.). Does code 73-41 return?		<i>Go to Step 5</i>	<i>System OK</i>
5	Perform a visual inspection of the blue 32-way connector at the Dual Power Inverter Module (DPIM) and at the P1 speed sensor. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is there any water intrusion, damaged wiring, etc. that may cause a loss and/or corruption of signal?		<i>Make repairs as necessary and go to Step 20</i>	<i>Go to Step 6</i>
6	1. Turn OFF the ignition. 2. Install J-39700, Universal Breakout Box, to the DPIM 24-way and OEM 24-way connectors using J-46711, TCM/VCM/DPIM Breakout Harness. 3. Turn ON the ignition. Is the harness connected and the ignition turned back ON ?		<i>Go to Step 7</i>	
7	At J-46711-1, DPIM Overlay, measure battery supply voltage on pins 1, 2, 5, and 6 of the DPIM 24-way connector. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is the voltage within the specified range?	10.5-16V	<i>Go to Step 8</i>	<i>Open or short in vehicle harness. Repair as necessary and go to Step 20</i>

Section 5—DIAGNOSTIC CODES

DTC 73-41 (DPIM2) Inverter A Encoder Power Supply Out-of-Range Low *(cont'd)*

Step	Action	Value(s)	Yes	No
8	<p>At J-46711-1, DPIM Overlay, measure wakeup signal voltage on pins 3 and 4 of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9-16V	Go to Step 9	Open or short in vehicle harness. Repair as necessary and go to Step 20
9	<p>At J-46711-1, DPIM Overlay, measure torque enable voltage on pins 16 (Inverter B Torque Enable) and 17 (Inverter A Torque Enable) of the 24-way connector.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	9-16V	Go to Step 10	Open or short in vehicle harness. Repair as necessary and go to Step 20
10	<ol style="list-style-type: none"> Turn OFF the ignition. Disconnect the J-46711, TCM/VCM/DPIM Breakout Harness, from the DPIM 24-way connector. Leave the OEM 24-way connector mated to the J-46711. At J-46711-1, DPIM Overlay, measure resistance to ground on 12V battery return pins 18, 19, 20, and 21 of the DPIM 24-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 11	Open or short in vehicle harness. Repair as necessary and go to Step 20

DTC 73-41 (DPIM2) Inverter A Encoder Power Supply Out-of-Range Low (cont'd)

Step	Action	Value(s)	Yes	No
11	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Disconnect the DPIM 24-way and OEM 24-way connectors from the J-46711, TCM/VCM/DPIM Breakout Harness. 3. Connect the OEM 24-way connector to the DPIM 24-way connector. 4. Disconnect the blue OEM 32-way connector from the DPIM. 5. Connect the blue DPIM 32-way connector of the J-46711, TCM/VCM/DPIM Breakout Harness, to the DPIM connector ONLY using J-50165, DPIM2 Adapter Harness. Leave the J-46711 disconnected from the blue OEM 32-way connector. 6. Turn ON the ignition. 7. At J-50165-3, DPIM2 Overlay, measure the speed sensor supply Open Circuit Voltage (OCV) at the blue 32-way connector by measuring the voltage between pin 6 and pin 22 of the blue 32-way DPIM connector. <p>Is the voltage within the specified range?</p>	7.5-18V (nominal ~12V)	Go to Step 12	Go to Step 19
12	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the J-50165, DPIM2 Adapter Harness, from the blue DPIM 32-way connector. 3. Connect the J-50165, DPIM2 Adapter Harness, to the blue OEM 32-way connector ONLY. 4. Turn ON the ignition. 5. At J-50165-3, DPIM2 Overlay, measure for voltage on pins 6, 8, 10, and 22. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was voltage measured on any of the pins?</p>		Short in vehicle harness. Repair as necessary and go to Step 20 .	Go to Step 13

Section 5—DIAGNOSTIC CODES

DTC 73-41 (DPIM2) Inverter A Encoder Power Supply Out-of-Range Low *(cont'd)*

Step	Action	Value(s)	Yes	No
13	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the P1 encoder connector. 3. At J-50165-3, DPIM2 Overlay, measure for shorts-to-ground on pins 6, 10, and 22. 4. At J-50165-3, DPIM2 Overlay, measure for shorts to other wires on pins 6, 8, 10, and 22. <p>NOTE: There will be continuity between pins 8 and 24 of the gray 32-way connector because all motor speed sensor shield wires are spliced together.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were any shorts-to-ground or shorts to any other wires found?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 14
14	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Connect the J-50165, DPIM2 Adapter Harness, to the blue DPIM 32-way connector. Leave it connected to the blue OEM 32-way connector and leave the P1 encoder connector disconnected. 3. Turn ON the ignition. 4. Check sensor supply voltage at the P1 encoder connector on pin C. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Is the voltage within the specified range?</p>	7.5-18V (nominal ~12V)	Go to Step 15	Open or short in vehicle harness. Repair as necessary and go to Step 20
15	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Leave the P1 encoder connector disconnected. 3. Use J-39197, Jumper Wire Kit, to measure resistance to ground on pin B of the encoder connector. <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 16	Open or short in vehicle harness. Repair as necessary and go to Step 20

DTC 73-41 (DPIM2) Inverter A Encoder Power Supply Out-of-Range Low (cont'd)

Step	Action	Value(s)	Yes	No
16	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P1 encoder connector disconnected. 3. Use J-39197, Jumper Wire Kit, to jumper pins A and C on the P1 encoder connector. 4. Disconnect the blue DPIM 32-way connector from J-50165, DPIM2 Adapter Harness, leaving it mated to the blue OEM 32-way connector. 5. Measure the resistance between pins 6 and 10 of the blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 17	Open or short in vehicle harness. Repair as necessary and go to Step 20
17	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P1 encoder connector disconnected. 3. Remove the jumper wire from the P1 encoder connector. 4. Use J-39197, Jumper Wire Kit, to jumper pins A and B on the P1 encoder connector. 5. Leave the J-50165 DPIM2 Adapter Harness, mated to the blue OEM 32-way connector ONLY. 6. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 10 and 22 of the blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 18	Open or short in vehicle harness. Repair as necessary and go to Step 20
18	<p>Replace the P1 speed sensor.</p> <p>Has the speed sensor been replaced?</p>		Go to Step 20	
19	<p>NOTE: In most cases, the Dual Power Inverter Module (DPIM) is not at fault. Investigate thoroughly before replacing the DPIM.</p> <p>Replace DPIM. Contact Technical Assistance Center (TAC) at 1-800-252-5283 for DPIM replacement authorization. TAC will require a snapshot.</p> <p>Is the replacement of the DPIM complete?</p>		Go to Step 20	

Section 5—DIAGNOSTIC CODES

DTC 73-41 (DPIM2) Inverter A Encoder Power Supply Out-of-Range Low *(cont'd)*

Step	Action	Value(s)	Yes	No
20	In order to verify your repair: 1. Clear the DTC. 2. Operate the vehicle under normal driving conditions. Did the DTC return?		<i>Begin the diagnosis again.</i> <i>Go to Step 1</i>	<i>System OK</i>

DTC 73-73 Inverter A Encoder Duty Cycle Out-of-Range

Overview:

DTC 73-73 is logged when the DPIM CAN message indicates that motor sensor A duty cycle is outside calibrated parameters. This code was designed to detect faults in motor A sensors P1 and P2.

Actions Taken When DTC Sets:

- None

Possible Causes:

- P1 and P2 motor speed sensors

Tool Requirements:

- Universal Allison DOC®
- J-39700 Universal Breakout Box
- J-46711 TCM/VCM/DPIM Breakout Harness
- J-46708 Multimeter
- AMB-45 Amprobe Device "Megger"

Diagnostic Aids :

- This DTC tracks the duty cycle parameters from the DPIM's EPCU2 CAN message and sets when they are outside the calibration limits.
- The purpose of these DTC is to detect errors in the motor speed sensors operation for drive unit motor A.
- This code doesn't light a lamp and has no restrictive mode; it will only show as historical when the Universal Allison DOC® service tool is connected.
- Ideally this will allow the speed sensors to be replaced before more restrictive codes could affect vehicle operation.
- DTCs 67-12 and 73-52 may be set with this DTC.

Step	Action	Value(s)	Yes	No
1	1. Install Universal Allison DOC®. 2. Start the engine. 3. Record the DTC snapshot. Has the DTC been successfully recorded?		Go to Step 2	
2	Is code 73-73 shown in Universal Allison DOC® history?		Go to Step 3	
3	1. Replace the P1 and P2 motor speed sensors. NOTE: Always replace P1 and P2 sensors as pairs. Is code 73-73 active?		Go to Step 4	
4	In order to verify your repair: 1. Clear the DTC. 2. Operate the vehicle under normal driving conditions. Did the DTC return?		Begin the diagnosis again. Go to Step 1	System OK

DTC 73–95 Motor A Torque Integrity

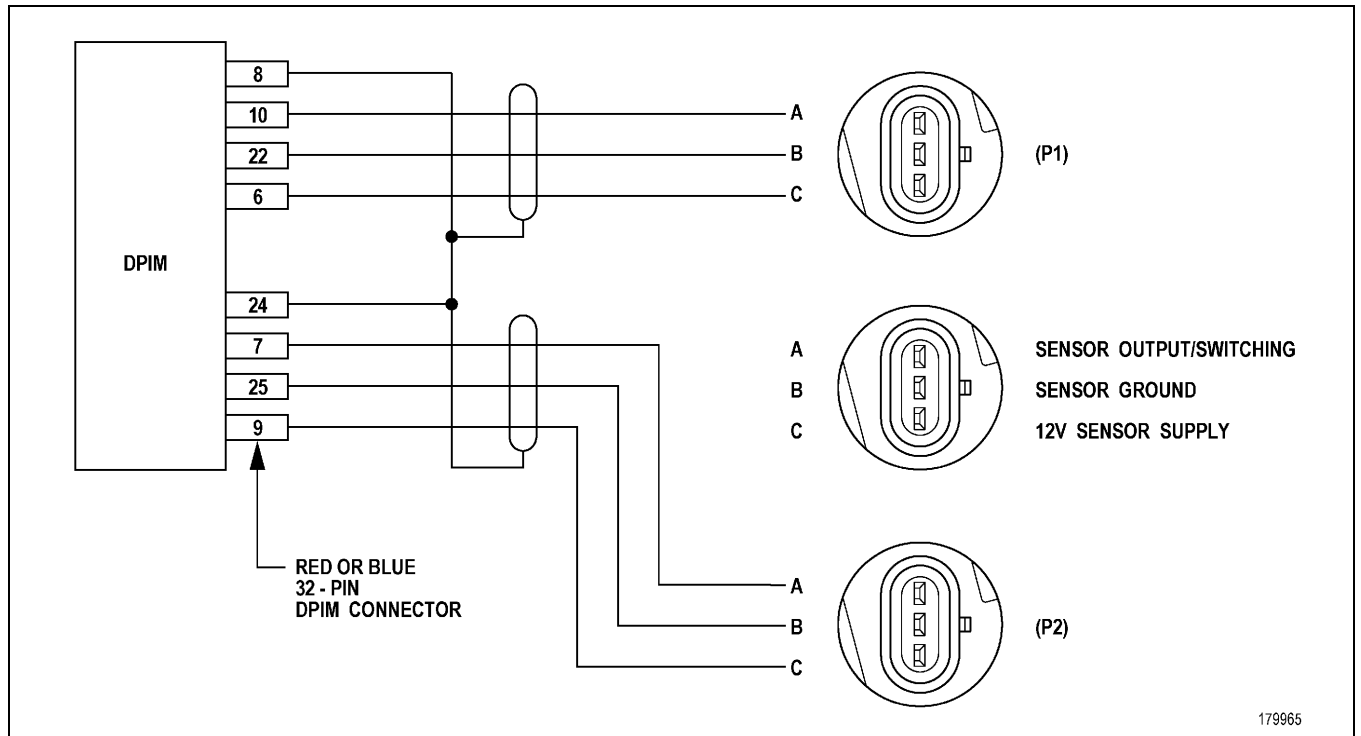


Figure 5–69.

Overview:

When the engine start button is pressed, the motor torque integrity test is run before allowing the engine to crank. This code is logged if the motor did not rotate, did not rotate fast enough, or rotated in the wrong direction, given a defined input.

Actions Taken When DTC Sets:

When DTC 73-95 is active, the following conditions will occur:

- **Check System** light illuminates
- Disable Inverter A
 - Inverter A CAN enable will be removed. Vehicle can limp home on one motor only.
- Disable special mode
 - HUSH™ mode will be disabled

Possible Causes:

- Motor speed sensor harnesses installed improperly
- Short-to-ground or opens on motor speed sensor wiring
- Faulty motor speed sensor

Tool Requirements:

- Universal Allison DOC®
- J-39700 Universal Breakout Box

DTC 73–95 Motor A Torque Integrity (cont'd)

- J-46711 TCM/VCM/DPIM Breakout Harness
- J-50165 DPIM2 Adapter Harness
- J-46708 Multimeter
- J-39197 Jumper Wire Kit



NOTE: DPIM2 has a blue Motor A Terminal Protection Assurance (TPA) key and J-46711, TCM/VCM/DPIM Breakout Harness, has a red Motor A TPA key. When servicing a DPIM2, use J-50165, Adapter Harness, with J-46711, TCM/VCM/DPIM Breakout Harness. This will convert the J-46711's red connector TPA key to a blue connector TPA key and allow it to connect to a DPIM2.

Step	Action	Value(s)	Yes	No
1	Are any 13-XX series codes set along with this code?		<i>Troubleshoot these codes first.</i>	<i>Go to Step 2</i>
2	1. Install Universal Allison DOC®. 2. Start the engine. 3. Record the DTC snapshot. 4. Monitor TCM ignition voltage. Is the voltage within the specified values?	9-18V	<i>Go to Step 3</i>	<i>Resolve voltage problem. Go to Step 20</i>
3	Is code 73-95 active?		<i>Go to Step 5</i>	<i>Go to Step 4</i>
4	1. Clear the DTC. 2. Attempt to duplicate the conditions in the failure record (mode, temperature, etc.). Does code 73-95 return?		<i>Go to Step 5</i>	<i>System OK</i>
5	Remove the oil pan. Is there excessive metal debris in the pan indicating a mechanical failure?		<i>Remove the Drive Unit and repair as necessary. Go to Step 20.</i>	<i>Go to Step 6</i>
6	Perform a visual inspection of the red/blue 32-way connector at the Dual Power Inverter Module (DPIM), the P1 speed sensor, and the P2 speed sensor. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is there any water intrusion, damaged wiring, etc. that may cause a loss and/or corruption of signal?		<i>Make repairs as necessary and go to Step 20</i>	<i>Go to Step 7</i>

Section 5—DIAGNOSTIC CODES

DTC 73–95 Motor A Torque Integrity (cont'd)

Step	Action	Value(s)	Yes	No
7	1. Turn OFF the ignition. 2. Install J-39700, Universal Breakout Box, to the DPIM 24-way and the OEM 24-way connectors using J-46711, TCM/VCM/DPIM Breakout Harness. 3. Turn ON the ignition. Is the harness connected and the ignition turned back ON ?		Go to Step 8	
8	At J-46711-1, DPIM Overlay, measure battery supply voltage on pins 1, 2, 5, and 6 of the DPIM 24-way connector. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is the voltage within the specified range?	10.5-16V	Go to Step 9	Open or short in vehicle harness. Repair as necessary and go to Step 20
9	At J-46711-1, DPIM Overlay, measure wakeup signal voltage on pins 3 and 4 of the 24-way connector. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is the voltage within the specified range?	9-16V	Go to Step 10	Open or short in vehicle harness. Repair as necessary and go to Step 20
10	At J-46711-1, DPIM Overlay, measure torque enable voltage on pins 16 (Inverter B Torque Enable) and 17 (Inverter A Torque Enable) of the 24-way connector. NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is the voltage within the specified range?	9-16V	Go to Step 11	Open or short in vehicle harness. Repair as necessary and go to Step 20

DTC 73–95 Motor A Torque Integrity (cont'd)

Step	Action	Value(s)	Yes	No
11	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the J-46711, TCM/VCM/DPIM Breakout Harness, from the DPIM 24-way connector. Leave the OEM 24-way connector mated to the J-46711. 3. At J-46711-1, DPIM Overlay, measure resistance to ground on 12V battery return pins 18, 19, 20, and 21 of the DPIM 24-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was the resistance within specification?</p>	Less than 4 Ohms	Go to Step 12	Open or short in vehicle harness. Repair as necessary and go to Step 20
12	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Disconnect the DPIM 24-way and OEM 24-way connectors from the J-46711, TCM/VCM/DPIM Breakout Harness. 3. Connect the OEM 24-way connector to the DPIM 24-way connector. 4. Disconnect the red/blue OEM 32-way connector from the DPIM. 5. Connect the red/blue DPIM 32-way connector of the J-46711, TCM/VCM/DPIM Breakout Harness, using J-50165 , DPIM2 Adapter Harness, to the DPIM connector ONLY. Leave the J-46711 disconnected from the red/blue OEM 32-way connector. 6. Turn ON the ignition. 7. At J-50165-3, DPIM2 Overlay, measure the speed sensor supply Open Circuit Voltage (OCV) at the red/blue 32-way connector by measuring the voltage between pin 6 and pin 22 of the red/blue 32-way DPIM connector. 8. At J-50165-3, DPIM2 Overlay, measure the speed sensor supply Open Circuit Voltage (OCV) at the red/blue 32-way connector by measuring the voltage between pin 9 and pin 25 of the red/blue 32-way DPIM connector. <p>Were both voltages within the specified range?</p>	DPIM1 10-13V DPIM2 7.5-18V (nominal ~12V)	Go to Step 13	Go to Step 19

Section 5—DIAGNOSTIC CODES

DTC 73–95 Motor A Torque Integrity (cont'd)

Step	Action	Value(s)	Yes	No
13	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the J-50165, DPIM2 Adapter Harness, from the red/blue DPIM 32-way connector. 3. Connect the J-50165, DPIM2 Adapter Harness, to the red/blue OEM 32-way connector ONLY. 4. Turn ON the ignition. 5. At J-50165-3, DPIM2 Overlay, measure for voltage on pins 6, 7, 8, 9, 10, 22, 24, and 25. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Was voltage measured on any of the pins?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 14
14	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the P1 and P2 encoder connectors. 3. At J-50165-3, DPIM2 Overlay, measure for shorts-to-ground on pins 6, 7, 9, 10, 22, and 25. 4. At J-50165-3, DPIM2 Overlay, measure for shorts to other wires on pins 6, 7, 8, 9, 10, 22, 24, and 25. <p>NOTE: There will be continuity between pins 8 and 24 of the red/blue 32-way connector because all motor speed sensor shield wires are spliced together.</p> <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were any shorts-to-ground or shorts to any other wires found?</p>		Short in vehicle harness. Repair as necessary and go to Step 20	Go to Step 15

DTC 73–95 Motor A Torque Integrity (cont'd)

Step	Action	Value(s)	Yes	No
15	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Connect the J-50165, DPIM2 Adapter Harness, to the red/blue DPIM 32-way connector. Leave it connected to the red/blue OEM 32-way connector and leave the P1 and P2 encoder connectors disconnected. 3. Turn ON the ignition. 4. Measure sensor supply voltage at the P1 encoder connector on pin C. 5. Measure sensor supply voltage at the P2 encoder connector on pin C. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were both voltages within the specified range?</p>	DPIM1 10-13V DPIM2 7.5-18V (nominal ~12V)	Go to Step 16	Open or short in vehicle harness. Repair as necessary and go to Step 20
16	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Leave the P1 and P2 encoder connectors disconnected. 3. Use J-39197, Jumper Wire Kit, to measure resistance to ground on pin B of the P1 encoder connector. 4. Use J-39197, Jumper Wire Kit, to measure resistance to ground on pin B of the P2 encoder connector. <p>Were the measured resistance values within specification?</p>	Less than 4 Ohms	Go to Step 17	Open or short in vehicle harness. Repair as necessary and go to Step 20

Section 5—DIAGNOSTIC CODES

DTC 73–95 Motor A Torque Integrity *(cont'd)*

Step	Action	Value(s)	Yes	No
17	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P1 and P2 encoder connectors disconnected. 3. Use J-39197, Jumper Wire Kit, to jumper pins A and C on the P1 encoder connector. 4. Use J-39197, Jumper Wire Kit, to jumper pins A and C on the P2 encoder connector. 5. Disconnect the red/blue DPIM 32-way connector from J-50165, DPIM2 Adapter Harness, leaving J-50165 mated to the red/blue OEM 32-way connector. 6. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 6 and 10 of the red/blue OEM 32-way connector. 7. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 7 and 9 of the red/blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were the measured resistance values within specification?</p>	Less than 4 Ohms	Go to Step 18	Open or short in vehicle harness. Repair as necessary and go to Step 20
18	<ol style="list-style-type: none"> 1. Leave the ignition OFF. 2. Leave the P1 and P2 encoder connectors disconnected. 3. Remove the jumper wire from the P1 and P2 encoder connectors. 4. Use J-39197, Jumper Wire Kit, to jumper pins A and B on the P1 encoder connector. 5. Use J-39197, Jumper Wire Kit, to jumper pins A and B on the P2 encoder connector. 6. Leave the J-50165, DPIM2 Adapter Harness, mated to the red/blue OEM 32-way connector ONLY. 7. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 10 and 22 of the red/blue OEM 32-way connector. 8. At J-50165-3, DPIM2 Overlay, measure the resistance between pins 7 and 25 of the red/blue OEM 32-way connector. <p>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</p> <p>Were the measured resistance values within specification?</p>	Less than 4 Ohms	Contact Technical Assistance Center (TAC) at 1-800-252-5283	Open or short in vehicle harness. Repair as necessary and go to Step 20

DTC 73–95 Motor A Torque Integrity (cont'd)

Step	Action	Value(s)	Yes	No
19	Replace the P1 and/or P2 speed sensor. Has the speed sensor been replaced?		Go to Step 20	
20	<p>NOTE: In most cases, the Dual Power Inverter Module (DPIM) is not at fault. Investigate thoroughly before replacing the DPIM.</p> <p>Replace DPIM. Contact Technical Assistance Center (TAC) at 1-800-252-5283 for DPIM replacement authorization. TAC will require a snapshot.</p> <p>Is the replacement of the DPIM complete?</p>		Go to Step 21	
21	<p>In order to verify your repair:</p> <ol style="list-style-type: none"> 1. Clear the DTC. 2. Operate the vehicle under normal driving conditions. <p>Did the DTC return?</p>		<p>Begin the diagnosis again.</p> <p>Go to Step 1</p>	System OK