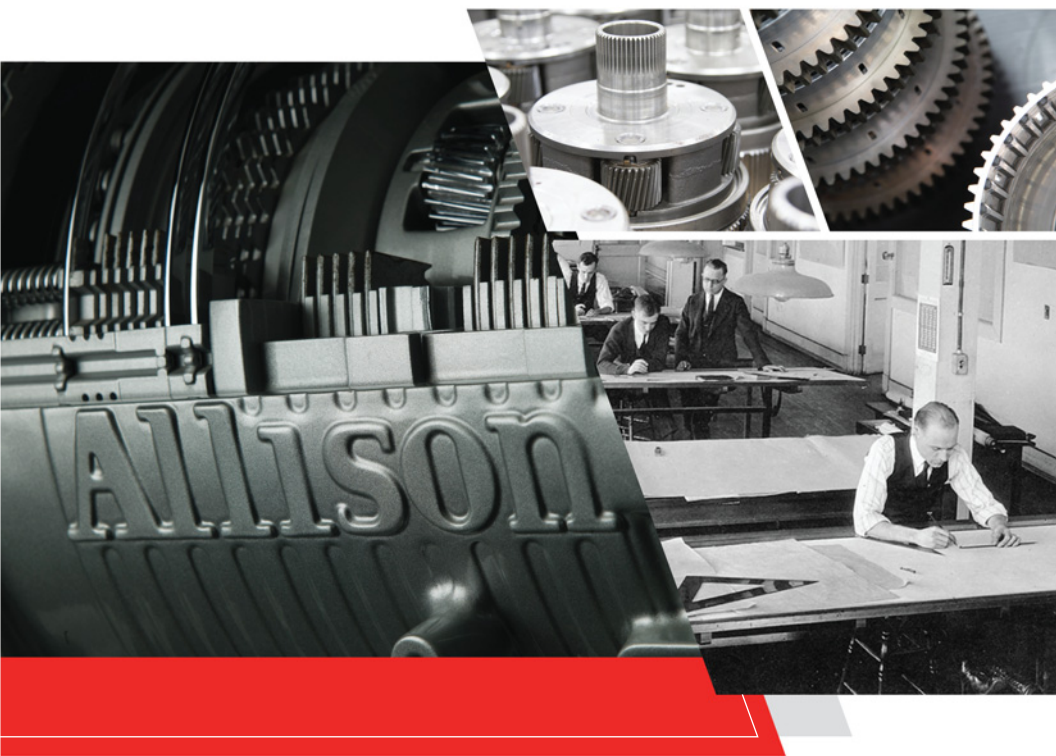


Allison Hybrid

H 40/50 EP™



OPERATOR'S MANUAL

OM3491EN



Operator's Manual

2019 JUNE

OM3491EN

Allison Transmission

Allison Hybrid

H 40/50 EP™



Allison
Transmission.

Allison Transmission, Inc.
P.O. Box 894 Indianapolis, Indiana 46206-0894
www.allisontransmission.com

IMPORTANT SAFETY INFORMATION

IT IS YOUR RESPONSIBILITY to be completely familiar with the warnings and cautions in this manual. These warnings and cautions advise of specific methods or actions that can result in personal injury, equipment damage, or cause the equipment to become unsafe. These warnings and cautions are not exhaustive. Allison Transmission could not possibly know, evaluate, or advise the service trade of all conceivable procedures by which service might be performed or of the possible hazardous consequences of each procedure. Accordingly, ANYONE WHO USES A SERVICE PROCEDURE OR TOOL WHICH IS NOT RECOMMENDED BY ALLISON TRANSMISSION MUST first be thoroughly satisfied that neither personal safety nor equipment safety will be jeopardized by the service methods used.

Vehicle or equipment manufacturers (collectively hereinafter "manufacturer(s)") integrate Allison transmissions into vehicles or equipment used for a variety of vocations and services. The manufacturer is responsible for identifying the specific operating conditions to which the vehicle or equipment will be subjected and to communicate the appropriate means for preventing unintended vehicle or equipment movement within those conditions, in order to ensure vehicle or equipment safety and operator safety. The vehicle or equipment owner and operator should be aware of and follow the manufacturer's operating instructions and warnings related to parking and preventing unintended vehicle or equipment movement.

Proper service and repair is important to the safe and reliable operation of the equipment. The service procedures recommended by Allison Transmission (or the manufacturer) and described in this manual are effective methods for performing service and diagnostic operations. Some procedures require using specially designed tools. Use special tools when and in the manner recommended.

The WARNINGS, CAUTIONS, and NOTES in this manual apply only to the Allison transmission and not to other vehicle or equipment systems which may interact with the transmission. Be sure to review and observe any vehicle or equipment system information provided by the manufacturer and/or body builder at all times the Allison transmission is being serviced.

WARNINGS, CAUTIONS, NOTES

Three types of headings are used in this manual to attract your attention:



WARNING: A warning is used when an operating procedure, practice, etc., which, if not correctly followed, could result in personal injury or loss of life.



CAUTION: A caution is used when an operating procedure, practice, etc., which, if not strictly observed, could result in damage to or destruction of equipment.



NOTE: A note is used when an operating procedure, practice, etc., is essential to highlight.

ABBREVIATIONS AND ACRONYMS

• ABS	Anti-lock Brake System
• AC	Alternating Current
• ATC	Automatic Traction Control
• DC	Direct Current
• DPIM	Dual Power Inverter Module
• DTC	Diagnostic Trouble Code
• DTCs	Diagnostic Trouble Codes
• ES-S	Engine Stop-Start
• ESS	Energy Storage System
• HCM	Hybrid Control Module
• HGM	Hybrid Gateway Module
• HV	High Voltage
• HVAC	Heating, Ventilation and Air Conditioning
• HVIL	High Voltage Interlock Loop
• IDI	Inverter Disable at Idle
• ISP	Input Shaft Protection
• LED	Light Emitting Diode
• OEM	Original Equipment Manufacturer
• OLS	Oil Level Sensor
• PBSS	Pushbutton Shift Selector
• SOC	State of Charge
• TAC	Technical Assistance Center
• TCM	Transmission Control Module
• VCM	Vehicle Control Module

TRADEMARK USAGE

The following trademarks are the property of the companies indicated:

- Allison DOC[®] is a registered trademark of Allison Transmission, Inc.
- H 40/50 EP[™] is a trademark of Allison Transmission, Inc.
- HUSH[™] is a trademark of Allison Transmission, Inc.
- TES 468[™] is a trademark of Allison Transmission, Inc.

ISO 14000

As a responsible corporate citizen, Allison Transmission, Inc. is dedicated to protecting human health, natural resources and the global environment. End-users and service personnel are responsible for understanding and complying with all applicable environmental laws, safety regulations, and Allison Transmission's policies and standards. The following recommendations concern the treatment and disposal of hazardous materials resulting from servicing an Allison Transmission product.

1. All lubricants/fluids used in the operation or storage of a transmission are to be treated as hazardous waste. These fluids are to be separated and discarded per current local statutes/regulations for the purpose of recycling, treatment, storage, and/or disposal.
2. Oil soaked components (e.g., filters, seals, clutch packs, etc.) are to be treated as hazardous waste and are to be handled and discarded per current local statutes/regulations.
3. Exhausted electronic components (e.g., transmission control modules (TCM), pressure switches, speed sensors, etc.) are to be treated as electronic waste and are to be handled and discarded per current local statutes/regulations.

LIST OF WARNINGS

This manual contains the following warnings—

IT IS YOUR RESPONSIBILITY TO BE FAMILIAR WITH ALL OF THEM.



WARNING: This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm.

For more information go to www.p65Warnings.ca.gov/product.

- The H 40/50 EP System uses potentially hazardous electrical energy. All H 40/50 EP System components are identified with warning labels or symbols (see Figure 2–1, Figure 2–2, and Figure 2–3). **DO NOT** attempt to service components containing potentially hazardous electrical energy if you are not trained to do so.

In the event of an accident, please refer to OEM documentation for first responder emergency personnel procedures to safely shut down vehicle systems.

All persons working with potentially hazardous electric energy should familiarize themselves with safe electrical work practices. Refer to publicly available documentation that can assist a technician in developing the safe electrical work practices required to service the H 40/50 EP System electrical system. Do not attempt to service the H 40/50 EP System if not trained to do so. Contact your nearest H 40/50 EP System service center. To find your nearest H 40/50 EP System service center, visit www.allisontransmission.com or call 1-800-252-5283.

H 40/50 EP System Normal Operating Conditions:

ESS Voltage Range: 432–780 VDC

DPIM Current Range: –350 to +350 A

LIST OF WARNINGS (cont'd)

This manual contains the following warnings—

IT IS YOUR RESPONSIBILITY TO BE FAMILIAR WITH ALL OF THEM.

- **DO NOT** rely on the High Voltage Interlock Loop (HVIL) or control systems to de-energize the system. Always perform the Electrical Disconnect Verification Procedure to be sure the system is discharged before servicing components.

DO NOT attempt to bypass any High Voltage Interlock for any reason. Tampering with the HVIL may result in injury. Failure to follow proper safety procedures may result in serious personal injury or death.

- Each time you park the vehicle or leave the operator's station with the engine running, do the following:
 - Bring the vehicle to a complete stop using the service brake.
 - Put the Drive Unit in N (Neutral).
 - Apply the parking brake, and make sure it is properly engaged.
 - If the operator's station will be unoccupied with the engine running, chock the wheels and take any other steps necessary to keep the vehicle from moving.

If this procedure is not followed, the vehicle can move suddenly and you or others could be injured.

LIST OF WARNINGS (cont'd)

This manual contains the following warnings—
IT IS YOUR RESPONSIBILITY TO BE FAMILIAR WITH ALL OF THEM.

- **When welding on the vehicle:**
 - **DO NOT WELD** on the vehicle without completely disconnecting all low voltage wiring harnesses from the HCMs.
 - **DO NOT WELD** on the vehicle without completely disconnecting the high voltage AC cables from the DPIM and the high voltage DC cables from the ESS.
 - **DO NOT WELD** on the vehicle without completely disconnecting any OEM grounding strap for the DPIM or ESS.
 - **DO NOT WELD** on any H 40/50 EP System components including any HCM, DPIM, ESS, or Drive Unit.
 - **DO NOT CONNECT** welding cables to any H 40/50 EP System component.

NOTES

TABLE OF CONTENTS

IMPORTANT SAFETY INFORMATION	3
ABBREVIATIONS AND ACRONYMS	4
TRADEMARK USAGE	5
ISO 14000	6
LIST OF WARNINGS	7

1.0 INTRODUCTION

1.1 KEEPING THAT ALLISON ADVANTAGE	14
1.2 THE ALLISON H 40/50 EP SYSTEM	15
1.3 DRIVE UNIT	16
1.4 DUAL POWER INVERTER MODULE (DPIM)	17
1.5 ENERGY STORAGE SYSTEM (ESS)	18
1.6 HYBRID CONTROL MODULES	19
1.7 PUSHBUTTON SHIFT SELECTOR (PBSS)	20

2.0 ELECTRICAL SAFETY

2.1 ELECTRICAL SYSTEMS	21
2.1.1 High Voltage Interlock Loop	23
2.1.2 General Electrical Safety Precautions	24
2.1.3 Electrical Safe Work Practices	24

3.0 ELECTRONIC CONTROLS

3.1 PUSHBUTTON SHIFT SELECTOR (PBSS)	25
3.2 UP AND DOWN ARROW BUTTONS	27
3.3 DIAGNOSIS	27
3.4 PRE 4TH GENERATION DIAGNOSTIC TROUBLE CODES	27
3.4.1 Diagnostic Code Display Procedures	28
3.4.2 To Display Stored Codes	28
3.4.3 To Clear Active Indicators and Resume Vehicle Operation	29
3.5 4TH GENERATION AND 5TH GENERATION DIAGNOSTIC TROUBLE CODES	29
3.5.1 Diagnostic Code Display Procedures	30
3.5.2 To Display Stored Codes	30
3.5.3 To Clear Active Indicators and Resume Vehicle Operation	31

4.0 OPERATING FEATURES

4.1 TURNING THE VEHICLE ON/OFF	32
4.2 COLD ENGINE START-UP	32
4.3 COLD ENGINE IDLE SPEED	32
4.4 FAST ENGINE SHUTDOWN	32
4.5 INPUT SHAFT PROTECTION (ISP)	32
4.6 SYSTEM OVERRIDE	33
4.7 ENGINE HIGH-IDLE	33

- 4.8 INVERTER DISABLE AT IDLE (IDI) 33
- 4.9 ENGINE CRANK INHIBIT, ESS UNDER VOLTAGE CRANK PROTECT 33
- 4.10 CREEP TORQUE 34
- 4.11 DIRECTION CHANGES 34
- 4.12 ACCELERATOR CONTROL 34
- 4.13 SLOWING AND STOPPING YOUR VEHICLE 34
- 4.14 ENGINE STOP-START (ES-S) 34
- 4.15 HUSH™ MODE 35
- 4.16 REGENERATIVE BRAKING 35
- 4.17 DRIVING ON SNOW OR ICE 36
- 4.18 PARKING BRAKE 36
- 4.19 AUXILIARY BRAKE ENABLE 36
- 4.20 HIGH WATER 37
- 4.21 DASH INDICATOR LIGHTS 37
 - 4.21.1 WAIT TO START 37
 - 4.21.2 HYBRID INITIALIZATION 37
 - 4.21.3 SYSTEM OVERTEMP 37
 - 4.21.4 CHECK SYSTEM 38
 - 4.21.5 STOP SYSTEM 38
- 4.22 ACCIDENT OR OTHER EMERGENCY 38
- 4.23 TOWING OR PUSHING 38

5.0 CARE AND MAINTENANCE

- 5.1 PERIODIC INSPECTION AND CARE 39
- 5.2 DRIVE UNIT 39
- 5.3 PROPER FLUID LEVEL 39
- 5.4 FLUID CHECK 39
- 5.5 FLUID LEVEL DISPLAY CRITERIA 40
- 5.6 INVALID FOR DISPLAY CODES 40
- 5.7 FLUID LEVEL SHIFT SELECTOR DISPLAY 41
- 5.8 EXITING THE FLUID LEVEL MODE 41
- 5.9 FLUID RECOMMENDATIONS 41
- 5.10 FLUID AND FILTER CHANGE INTERVALS 42
 - 5.10.1 Fluid and Filter Change Intervals 42
 - 5.10.2 Abnormal Conditions 42
 - 5.10.3 Fluid Analysis 43
- 5.11 DPIM INSPECTION 43
- 5.12 ESS INSPECTION 44
- 5.13 ESS AIR INLET FILTER 44
- 5.14 WASHING THE VEHICLE 44
- 5.15 WELDING 45

6.0 CUSTOMER SERVICE

- 6.1 OWNER ASSISTANCE 46

6.2	SERVICE LITERATURE	47
6.3	ALLISON TRANSMISSION DISTRIBUTORS	48
	REVISION HISTORY	49

1.0 INTRODUCTION

1.1 KEEPING THAT ALLISON ADVANTAGE



84019

Congratulations! Your vehicle is equipped with the advanced Allison H 40/50 EP System. Two H 40/50 EP System models are available: the H 40 EP System and the H 50 EP System. The CertPlus version of these models use CertPlus components for vehicles operating in ARB adopting states. For more information about the CertPlus H 40/50 EP System, contact your nearest Allison Hybrid H 40/50 EP System service center. The input and output ratings for the models are:

	H 40 EP & H 40 EP CertPlus	H 50 EP & H 50 EP CertPlus
Input continuous:	209 kW (280 hp)	246 kW (330 hp)
Rated input torque:	1235 N•m (910 lb ft)	1420 N•m (1050 lb ft)
Rated input speed:	2300 rpm	2300 rpm
Acceleration power:	261 kW (350 hp)	298 kW (400 hp)

This handbook will help you gain maximum benefit from your Allison H 40/50 EP System equipped vehicle.

1.2 THE ALLISON H 40/50 EP SYSTEM

Operation of the H 40/50 EP System is similar to a conventional engine-transmission package and is largely transparent to the driver.

The Allison H 40/50 EP System consists of:

- Drive Unit
- Dual Power Inverter Module (DPIM)
- Energy Storage System (ESS)
- Three Hybrid Control Modules (TCM/VCM/HGM)
- Pushbutton Shift Selector (PBSS)

The Drive Unit is mounted to the vehicle engine and coupled to the driveline in the same manner as a transmission. The Drive Unit assembly contains two electric motors that, in combination with planetary gearing and rotating and stationary clutches, provide rotational power to the Drive Unit output.

1.3 DRIVE UNIT

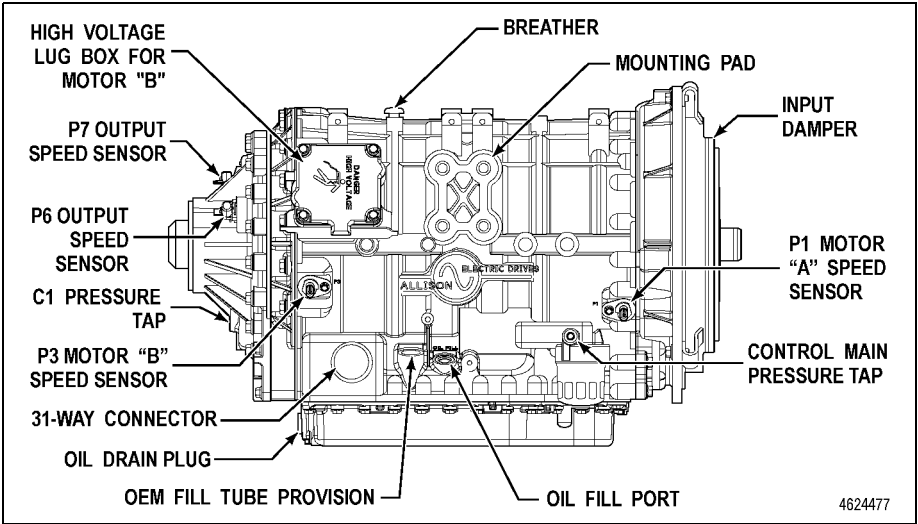


Figure 1-1. Drive Unit — Right Side

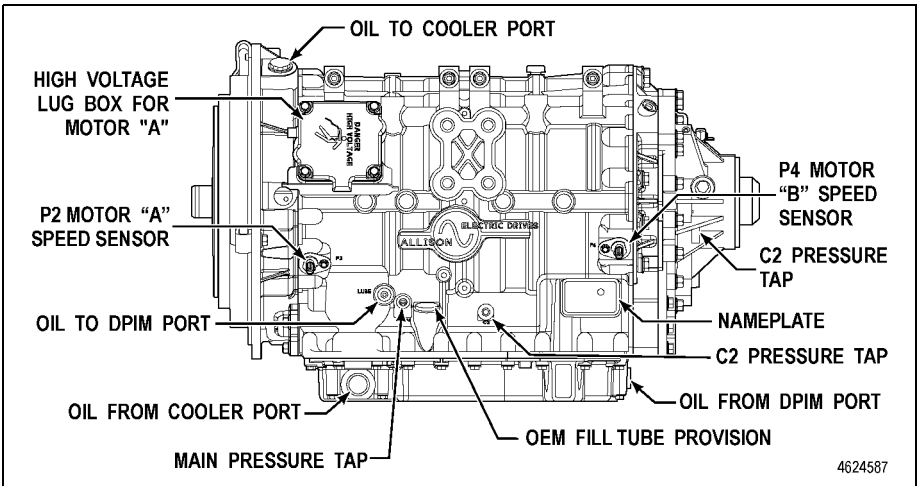


Figure 1-2. Drive Unit — Left Side

1.4 DUAL POWER INVERTER MODULE (DPIM)

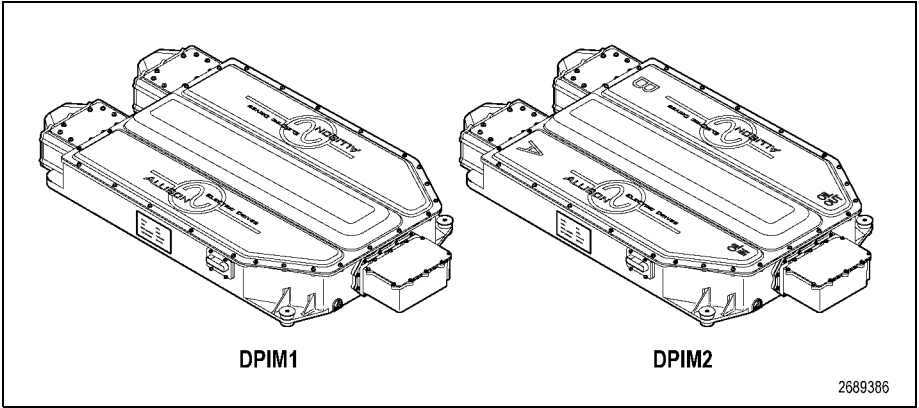
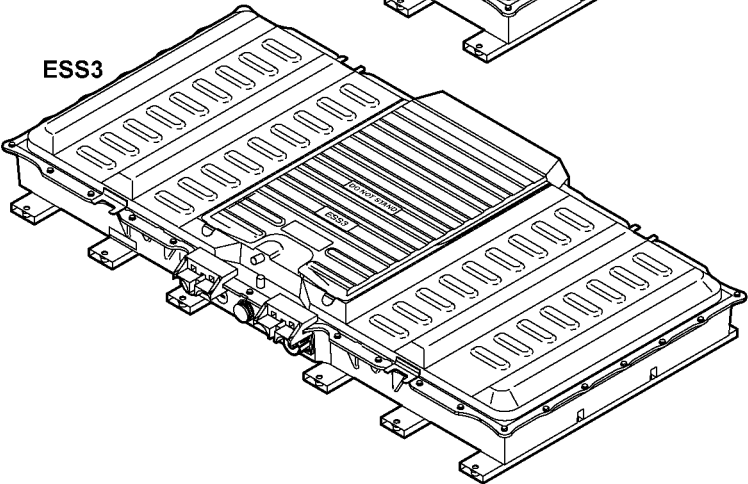
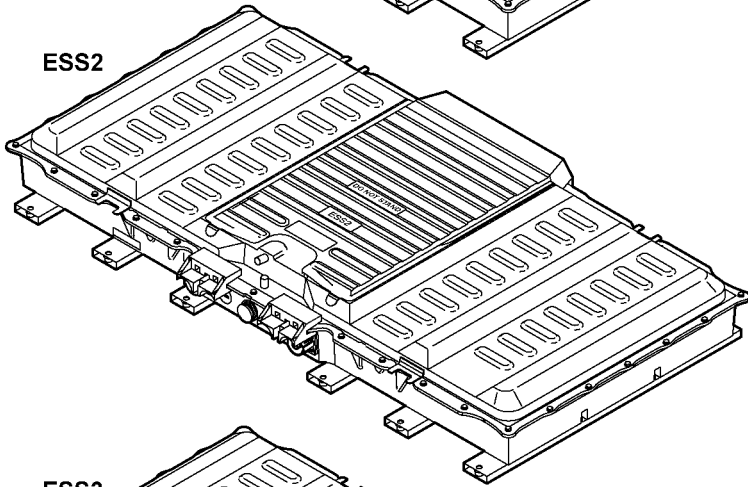
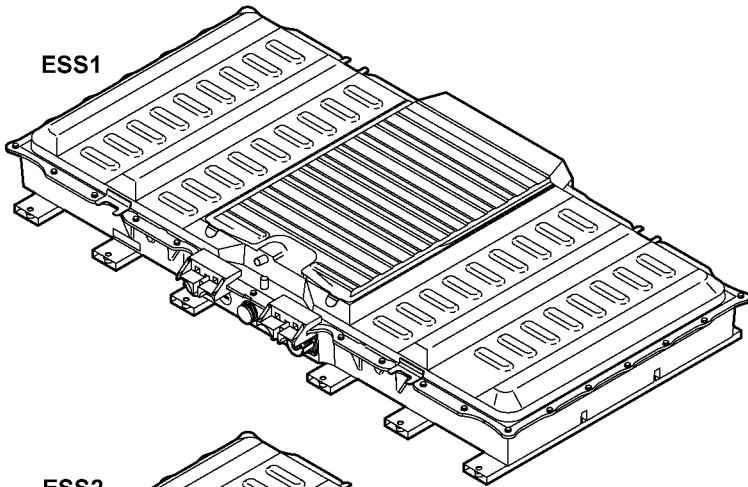


Figure 1–3. Dual Power Inverter Module

The Dual Power Inverter Module (DPIM) converts AC electricity to DC electricity and vice-versa. During regenerative braking, AC electricity generated by the electric motors in the Drive Unit is converted to DC electricity and stored in the Energy Storage System (ESS). Power from the ESS is combined with engine power within the Drive Unit, a process called torque blending, to accelerate the vehicle.

1.5 ENERGY STORAGE SYSTEM (ESS)



2689653

The Energy Storage System (ESS) stores and releases DC electrical energy for use in the DPIM and optional high voltage (HV) accessories. The ESS contains control systems that monitor and control state of charge, temperature, and power throughput.

1.6 HYBRID CONTROL MODULES

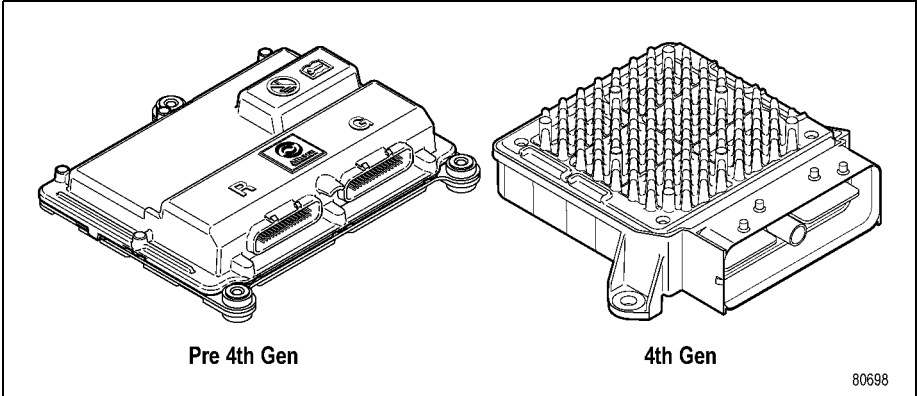


Figure 1–4. Pre 4th Generation and 4th Generation TCM/VCM

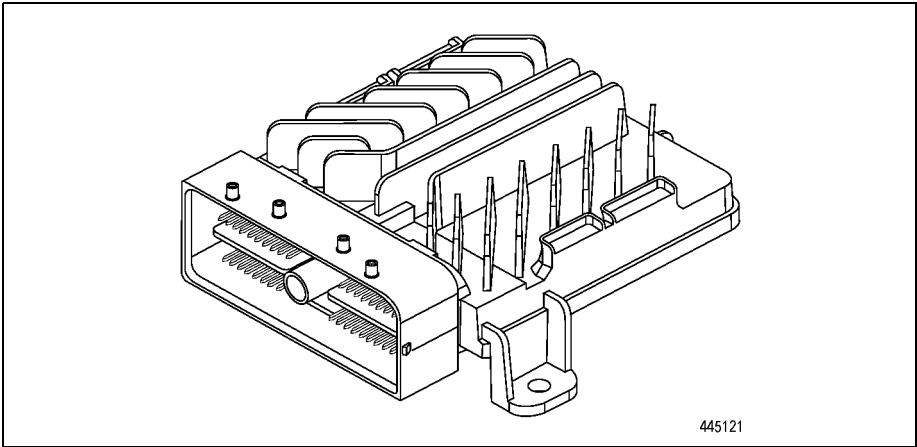


Figure 1–5. 5th Generation TCM/VCM/HGM

The H 40/50 EP System uses two or three external control modules depending on the model year. The Transmission Control Module (TCM), Vehicle Control Module (VCM), and on newer models the Hybrid Gateway Module (HGM), contain system software and calibration data and perform diagnostic data management.

1.7 PUSHBUTTON SHIFT SELECTOR (PBSS)

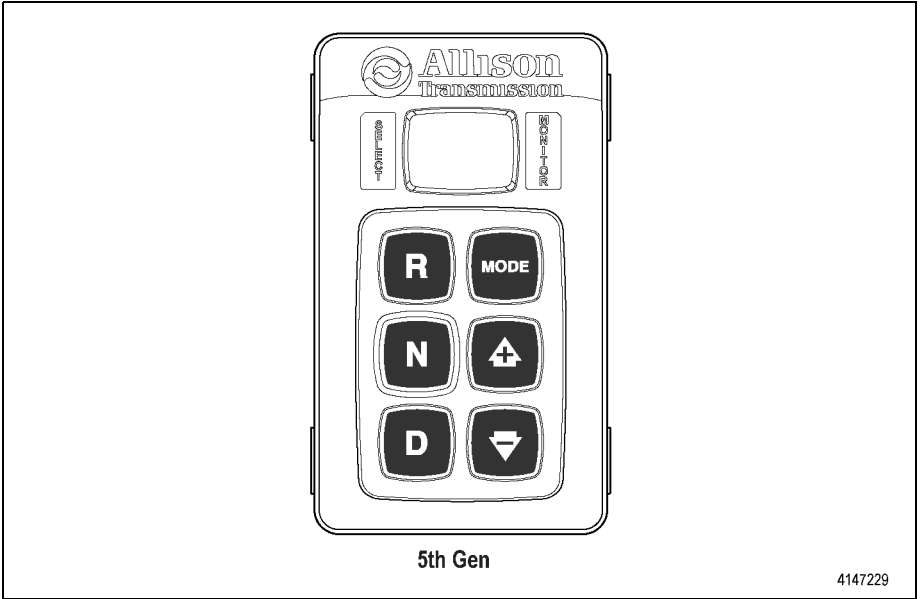


Figure 1–6. 5th Generation Pushbutton Shift Selector (PBSS)

The Pushbutton Shift Selector (PBSS) is the vehicle operator's interface with the H 40/50 EP System. It is used to command vehicle direction of operation, check oil level, display some diagnostic trouble codes (DTCs), and also interact with other optional vehicle features. The PBSS features three (3) directional buttons, up and down arrow buttons, a mode button, and a display screen. Details on button usage and displays can be found in Sections [3.0 ELECTRONIC CONTROLS](#) and [4.0 OPERATING FEATURES](#).

2.0 ELECTRICAL SAFETY

2.1 ELECTRICAL SYSTEMS



WARNING: The H 40/50 EP System uses potentially hazardous electrical energy. All H 40/50 EP System components are identified with warning labels or symbols (see Figure 2–1, Figure 2–2, and Figure 2–3). DO NOT attempt to service components containing potentially hazardous electrical energy if you are not trained to do so.

In the event of an accident, please refer to OEM documentation for first responder emergency personnel procedures to safely shut down vehicle systems.

All persons working with potentially hazardous electric energy should familiarize themselves with safe electrical work practices. Refer to publicly available documentation that can assist a technician in developing the safe electrical work practices required to service the H 40/50 EP System electrical system. Do not attempt to service the H 40/50 EP System if not trained to do so. Contact your nearest H 40/50 EP System service center. To find your nearest H 40/50 EP System service center, visit www.allisontransmission.com or call 1-800-252-5283.

H 40/50 EP System Normal Operating Conditions:

ESS Voltage Range: 432–780 VDC

DPIM Current Range: –350 to +350 A



V10323.00.00

Figure 2-1. DPIM Warning Label



V10322.00.00

Figure 2-2. ESS Warning Label

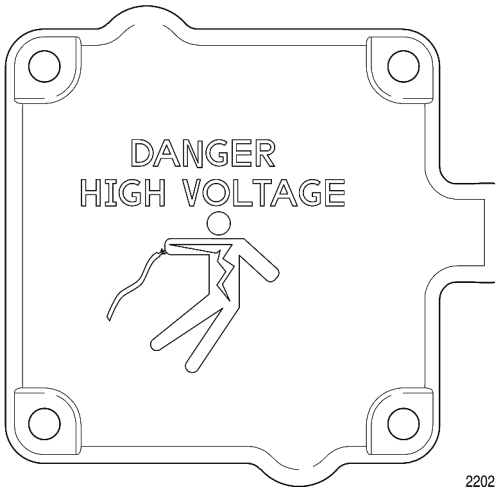


Figure 2-3. Drive Unit Warning (Lug Box)

2.1.1 High Voltage Interlock Loop.

The H 40/50 EP System uses a High Voltage Interlock Loop (HVIL) to attempt to prevent access to potentially hazardous electrical circuits. The HVIL consists of a control circuit routed to switches under the cover plates located on all hybrid components where potentially hazardous electrical energy may exist (refer to Figure 2-4). When a switch is open, the HVIL circuit is open and is described as Invalid.

An open HVIL circuit detected during ignition key-on prohibits the pre-charge sequence from occurring (ESS Main and Pre-Charge Relays remain open). Diagnostic Trouble Code (DTC) 80-22, HVIL Invalid–Shutdown, is logged and the **STOP SYSTEM** lamp illuminates. Engine cranking will not occur.

An open HVIL circuit detected during forward or reverse operation logs DTC 80-21, HVIL Invalid. DTC 80-21 is not displayed on the PBSS and does not result in an active system shutdown. If DTC 80-21 remains active when **N** (Neutral) is selected and output speed is zero, DTC 80-22 is logged. With DTC 80-22 active, the **STOP SYSTEM** lamp illuminates and an active system shutdown occurs.

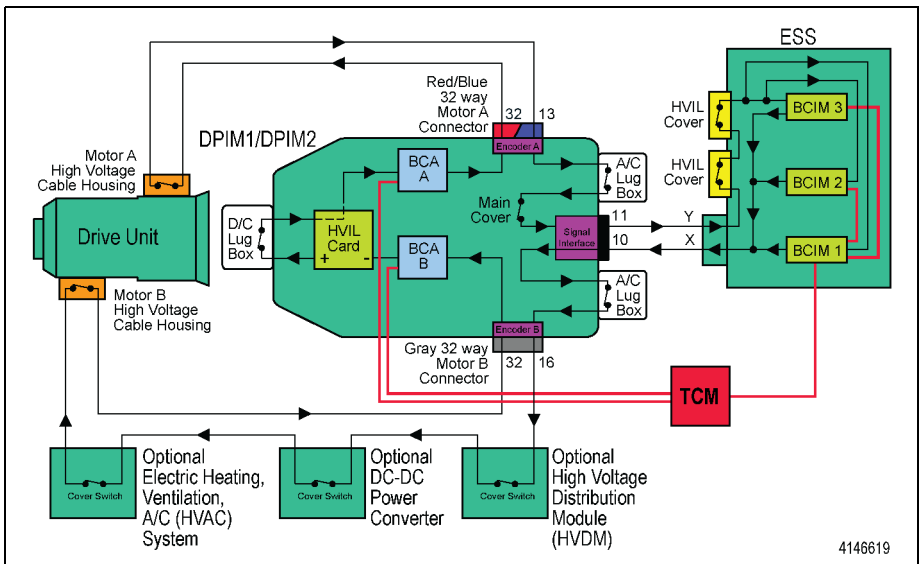


Figure 2-4. High Voltage Interlock Loop (HVIL) Circuit



WARNING: DO NOT rely on the High Voltage Interlock Loop (HVIL) or control systems to de-energize the system. Always perform the Electrical Disconnect Verification Procedure to be sure the system is discharged before servicing components.

DO NOT attempt to bypass any High Voltage Interlock for any reason. Tampering with the HVIL may result in injury. Failure to follow proper safety procedures may result in serious personal injury or death.



NOTE: Refer to the proper H 40/50 EP System Troubleshooting Manual (TS3715/TS5812) for troubleshooting procedures.

2.1.2 General Electrical Safety Precautions.

- Always treat electrical systems as if they are powered **ON**.
- Make sure vehicle ignition is **OFF**.
- Make sure the vehicle knife switch is **OFF**.
- Always follow the **Electrical Disconnect Verification Procedure** before servicing the Drive Unit, DPIM, or ESS where potentially hazardous voltages may exist.

2.1.3 Electrical Safe Work Practices.

More information for establishing safe electrical work practices can be found at the following sources:

- www.OSHA.gov, 29CFR 1910 Subpart S
- www.NFPA.org, NFPA 70E-2004

3.0 ELECTRONIC CONTROLS

3.1 PUSHBUTTON SHIFT SELECTOR (PBSS)

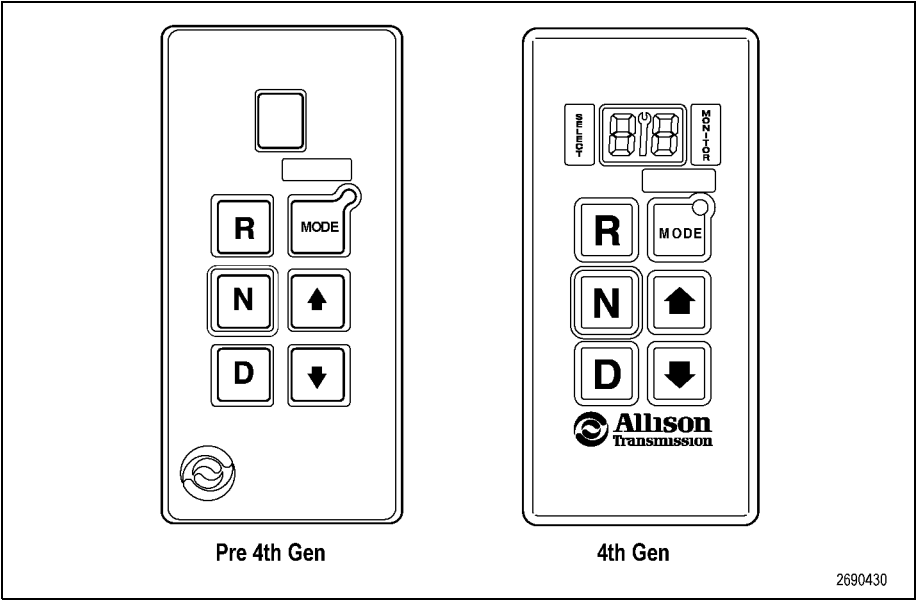


Figure 3–1. Pushbutton Shift Selectors



Figure 3–2. Pushbutton Shift Selectors

The Pushbutton Shift Selector (PBSS) commands direction of operation rather than selecting an operating range. The direction of operation displays on the shift selector. The PBSS also operates the electronic Oil Level Sensor (OLS), displays Diagnostic Trouble Codes (DTCs), and controls the level of regenerative braking.

Shift selector directional buttons are:

D (Drive)—Forward, commands forward vehicle movement, **F** displays

N (Neutral)—Neutral, commands neutral, **N** displays, no vehicle movement

R (Reverse)—Reverse, commands rearward vehicle movement, **R** displays

The PBSS display and buttons may provide additional information and functionality if optional operating features are incorporated into the control system. Refer to section [4.0 OPERATING FEATURES](#) for additional information.

MY13 and later H 40/50 EP Systems with 4th Generation controls incorporate a 5th Generation PBSS that was backwards compatible with the 4th Generation control system. MY10 through MY12 H 40/50 EP Systems with 4th Generation controls incorporated a 4th Generation PBSS unless serviced with a 5th Generation PBSS.

3.2 UP AND DOWN ARROW BUTTONS

Pressing the ↓ (Down) arrow while in forward operation commands the H 40/50 EP System to increase the regenerative braking effect. Regenerative braking provides the same braking function as a hydraulic retarder in a conventional transmission. The Pushbutton Shift Selector (PBSS) displays **F** or **L** to identify the level of regenerative braking in use. Increasing regenerative braking does not limit forward speed to a particular range. The H 40/50 EP System remains in the selected regenerative braking mode until the vehicle ignition is turned off, the ↑ (Up) or ↓ (Down) arrows are used, or **N** (Neutral) is selected. When ignition is turned on or **N** (Neutral) is selected, the system returns to the default regenerative braking level.

Simultaneously pressing and holding the ↑ (Up) and ↓ (Down) arrows for five seconds while in **N** (Neutral) starts the Oil Level Sensor (OLS) mode. Simultaneously pressing the ↑ (Up) and ↓ (Down) arrows again, while in OLS mode, starts the diagnostic mode in which Diagnostic Trouble Codes (DTCs) can be retrieved.

3.3 DIAGNOSIS

Continued illumination of the **CHECK SYSTEM** light during vehicle operation (not start-up) indicates the Transmission Control Module (TCM) has signaled a Diagnostic Trouble Code (DTC). Various conditions may activate a DTC without illuminating the **CHECK SYSTEM** light. Up to nine DTCs can be recorded in the PBSS. DTCs can be read and cleared by using either the shift selector or the Allison DOC® Premium (H 40/50 EP™) diagnostic tool. Basic information on reading, clearing and troubleshooting DTCs is covered in sections [3.4 PRE 4TH GENERATION DIAGNOSTIC TROUBLE CODES](#) and [3.5 4TH GENERATION AND 5TH GENERATION DIAGNOSTIC TROUBLE CODES](#) sections. More detailed information is available in the Troubleshooting Manual (TS3715EN/TS5812EN).

3.4 PRE 4TH GENERATION DIAGNOSTIC TROUBLE CODES

Diagnostic Trouble Codes (DTCs) are numerical indications relating to a malfunction in system operation. Each code consists of a two-digit main code and a two-digit subcode.

These codes are logged in the Transmission Control Module (TCM) memory with the most recent code listed first. A maximum of nine codes (numbered d1–d9) may be listed in PBSS memory at one time. As codes are added, the oldest non-active, or historic, code is dropped from the list. If all codes are active, the code with the lowest priority that is not included on the severity list

is dropped from the list. Access to the diagnostic codes and code information is through the Pushbutton Shift Selector (PBSS) or the diagnostic tool.

The TCM stores the active and historic (non-active) codes separately. An active code is any code that is current in the TCM decision-making process. Historic codes are codes that are retained in the TCM's memory and will not necessarily affect the TCM decision-making process. Historic codes are useful in determining if a problem is isolated, intermittent, or results from a previous malfunction.

3.4.1 Diagnostic Code Display Procedures.

Diagnostic codes can be read and cleared by two methods:

- With the PBSS
- With Allison DOC[®] Premium (H 40/50 EP[™]). The use of the diagnostic tool is described in the User's Guide (GN7589EN) available in the "help" section of the software.

3.4.2 To Display Stored Codes.

- Bring the vehicle to a stop at a safe location.
- Apply the parking brake.
- Vehicle ignition in **ON** position, **N** (Neutral) selected
- Simultaneously press and hold the ↑ (Up) and ↓ (Down) arrows for five seconds to access the Oil Level Sensor (OLS) mode—press the buttons again to enter Diagnostic Mode.
- Observe the digital display for codes (codes appear one digit at a time).
- Press the **MODE** button to see the next code—repeat for subsequent codes.



NOTE: Be sure to record all codes displayed before they are cleared. This is essential for troubleshooting.

Diagnostic codes are displayed on the PBSS as follows:

1. Code list position
2. Main code
3. Subcode

Each item is displayed for one second. The display cycles continuously until the next code list position is accessed by pressing the **MODE** button. The following list represents the display cycle using code 25 11, as an example.

- Code list position—d,1

- Main code—2,5
- Subcode—1,1
- Cycle repeats—d,1, etc.

To view the next diagnostic code (d,2, d,3, d,4, etc.), momentarily press the **MODE** button. Momentarily pressing the **MODE** button after the ninth code is displayed will restart the list of codes.

If a listed code is active, the LED indicator next to the **MODE** button is illuminated. Any code position which does not have a diagnostic code logged displays “—”.

3.4.3 To Clear Active Indicators and Resume Vehicle Operation.

Press and hold the **MODE** button for approximately ten seconds until the display shows a “*”. Release the **MODE** button and active indicators such as the **CHECK SYSTEM** light will not be illuminated. Some codes are self-clearing and others require ignition cycles to clear.



NOTE: If the condition that caused the code is still present, the code becomes active again.

3.5 4TH GENERATION AND 5TH GENERATION DIAGNOSTIC TROUBLE CODES

Diagnostic Trouble Codes (DTCs) are numerical indications relating to a malfunction in system operation. Each code consists of a two-digit main code and a two-digit subcode.

These codes are logged in the Transmission Control Module (TCM) memory with the most recent code listed first. A maximum of nine codes (numbered d1–d9) may be listed in PBSS memory at one time. As codes are added, the oldest non-active, or historic, code is dropped from the list. If all codes are active, the code with the lowest priority that is not included on the severity list is dropped from the list. Access to the diagnostic codes and code information is through the Pushbutton Shift Selector (PBSS) or the diagnostic tool.

The TCM stores the active and historic (non-active) codes separately. An active code is any code that is current in the TCM decision-making process. Historic codes are codes that are retained in the TCM's memory and will not necessarily affect the TCM decision-making process. Historic codes are useful in determining if a problem is isolated, intermittent, or results from a previous malfunction.

3.5.1 Diagnostic Code Display Procedures.

Diagnostic codes can be read and cleared by two methods:

- With the PBSS
- With Allison DOC[®] Premium (H 40/50 EP[™]). The use of the diagnostic tool is described in the User's Guide (GN7589EN) available in the "help" section of the software.

3.5.2 To Display Stored Codes.

- Bring the vehicle to a stop at a safe location.
- Apply the parking brake.
- Vehicle ignition in **ON** position, **N** (Neutral) selected
- Simultaneously press and hold the ↑ (Up) and ↓ (Down) arrows for five seconds to access the Oil Level Sensor (OLS) mode—press the buttons again to enter Diagnostic Mode.
- Observe the digital display for codes (codes appear two digits at a time).
- Press the **MODE** button to see the next code—repeat for subsequent codes.



NOTE: Be sure to record all codes displayed before they are cleared. This is essential for troubleshooting.

Diagnostic codes are displayed on the PBSS as follows:

1. Code list position
2. Main code
3. Subcode

Each item is displayed for one second. The display cycles continuously until the next code list position is accessed by pressing the **MODE** button. The following list represents the display cycle using code 25 11, as an example.

- Code list position—d1
- Main code—25
- Subcode—11
- Cycle repeats—d1, etc.

To view the next diagnostic code (d2, d3, d4, etc.), momentarily press the **MODE** button. Momentarily pressing the **MODE** button after the ninth code is displayed will restart the list of codes.

If a listed code is active, the LED indicator next to the **MODE** button is illuminated. Any code position which does not have a diagnostic code logged displays “ – –”.

3.5.3 To Clear Active Indicators and Resume Vehicle Operation.

Press and hold the **MODE** button for approximately ten seconds until the displays shows a “* *”. Release the **MODE** button and active indicators such as the **CHECK SYSTEM** light will not be illuminated. Some codes are self-clearing and others require ignition cycles to clear.



NOTE: If the condition that caused the code is still present, the code becomes active again.

4.0 OPERATING FEATURES

4.1 TURNING THE VEHICLE ON/OFF

Vehicle on/off procedures are the same as with a conventional transmission equipped vehicle. Select **N** (Neutral) and apply the parking brake before turning the vehicle off.

4.2 COLD ENGINE START-UP

When transmission sump temperature is below 0°C (32°F), the system automatically uses a cold engine start sequence. In Cold Engine Start-up, the engine cranks for an extended time (4 seconds) at a low speed to facilitate diesel fuel ignition before being brought to a high idle speed.

If the engine start is unsuccessful, the engine crank is aborted and the operator is required to retry engine start-up after the **WAIT TO START** and **HYBRID INITIALIZATION** lights are no longer illuminated.

4.3 COLD ENGINE IDLE SPEED

At sump temperature below 0°C (32°F), the system automatically commands the engine speed to a high idle condition to increase fluid temperature.

4.4 FAST ENGINE SHUTDOWN

At ignition key off, the Drive Unit actively stops the engine, resulting in a controlled, fast, engine shutdown.

4.5 INPUT SHAFT PROTECTION (ISP)

Input Shaft Protection (ISP) software is a feature designed to reduce time the Drive Unit is exposed to excessive engine-induced reversing torque. When a start attempt is made, the H 40/50 EP System will first rotate the engine at a low speed while monitoring the torque required to spin the engine. If the required torque is low, the H 40/50 EP System will increase the engine speed and the engine will be started. If the required torque to spin the engine

during startup is excessive, the H 40/50 EP System will abort engine cranking and set a DTC.

4.6 SYSTEM OVERRIDE

A flashing **STOP SYSTEM** dash indicator lamp signals the driver to a forthcoming shutdown. The shutdown time can be extended by thirty seconds by actuating the vehicle's system override switch.

4.7 ENGINE HIGH-IDLE

Neutral-to-Range (Forward or Reverse) operation can be made with engine in high idle state.

4.8 INVERTER DISABLE AT IDLE (IDI)

Inverter Disable at Idle (IDI) allows the engine to idle at a lower speed under certain vehicle conditions. At idle and in neutral, inverters A and B are both disabled and the engine idle speed decreased when the following conditions are present:

- Energy Storage System (ESS) State of Charge (SOC) is greater than fifty percent
- Neutral range is obtained
- Zero output speed
- Service brake pedal apply at zero percent

In forward range, only inverter A is disabled and the engine idle speed decreased when the following conditions are met:

- ESS SOC is greater than fifty percent
- Zero output speed
- Service brake pedal apply greater than fifteen percent

4.9 ENGINE CRANK INHIBIT, ESS UNDER VOLTAGE CRANK PROTECT

If, after multiple failed engine start attempts, the ESS reaches a lower than desired voltage level, engine cranking will be inhibited and Diagnostic Trouble Code (DTC) 80-44 is logged. The DTC must be cleared before engine start is permitted. If after the fourth attempt to crank is aborted due to DTC 80-44, High Voltage Under Voltage Crank Protect, DTC 80-45, High Voltage Under Voltage Crank Inhibit, fault is logged. This DTC can only be cleared with Allison DOC[®] Premium (H 40/50 EP).

4.10 CREEP TORQUE

To simulate the feel of a conventional automatic transmission with a torque converter, creep torque from the Drive Unit is applied at closed throttle and the service brake unapplied. This creep torque is limited to 8 km/h (5 mph).

4.11 DIRECTION CHANGES

Make all direction changes with the service brake applied and zero road speed. Range changes can be made **D** (Drive) to **R** (Reverse) without first selecting **N** (Neutral). Requiring range changes through **N** (Neutral) can be changed in the calibration. This feature can only be modified with the Allison DOC® Premium (H 40/50 EP™) diagnostic tool.

4.12 ACCELERATOR CONTROL

As you increase throttle application, you will experience a smooth, steady increase in road speed without discernible changes in gear ratios. Engine speed is not directly proportional to vehicle speed or driver-requested acceleration.

4.13 SLOWING AND STOPPING YOUR VEHICLE

Slow and stop your vehicle as you would if you were driving with an automatic transmission. All Drive Unit functions, such as regenerative braking, occur automatically and are transparent to the driver.

4.14 ENGINE STOP-START (ES-S)

Engine stop-start is a feature developed to conserve fuel consumption at idle and reduce pollution of H 40/50 EP Systems. Generally, the H 40/50 EP System will temporarily eliminate engine operation at complete stops. While the engine is shut off, the H 40/50 EP System supplies power from the ESS to all of the vehicle electrical accessories including the electric HVAC system and the vehicle brake interlock system is engaged to hold the vehicle stationary. The vehicle brake interlock will remain active until range is re-attained. When the service brake is released or the accelerator is pressed, the engine will automatically restart and forward range will be automatically selected. The vehicle OEM may modify the restart sequence based on various system parameters. Refer to OEM provided documentation for details regarding integration of the ES-S feature with the body and brake control systems.

The ES-S feature introduces additional information and functionality to the PBSS. When the ES-S feature is enabled and in **D** (Drive) range, the PBSS will display an "s" and the MODE indicator on the right side of the display

while the customary "F" is displayed on the left side. When ES-S mode is active (engine stopped), the "s" will flash indicating that the engine is off and will restart automatically. If the "F" begins flashing while the engine is off and the "s" is flashing, a condition has occurred preventing the automatic restart of the engine. The operator must select **N** (Neutral) on the PBSS and manually restart the engine. If the "s" displayed on the PBSS disappears during normal operation, the H 40/50 EP System has returned to a normal operating mode with ES-S disabled. This may be a result of a H 40/50 EP System fault or a change in the requested mode from the body control system or an operator.

The ES-S feature can be toggled on and off by the vehicle operator by pressing the MODE button on the PBSS if enabled in the software by using Allison DOC® Premium (H 40/50 EP™). If temporarily disabled, the ES-S feature will become enabled after the vehicle ignition is cycled.

4.15 HUSH™ MODE

HUSH™ mode was an optional feature designed to allow the H 40/50 EP System to operate with reduced exhaust emissions and noise levels. This feature was available in specific markets for applications where reduced emissions or noise may be required such as in long tunnels. The feature offering was discontinued in 2007. In general, the H 40/50 EP System will operate the engine at reduced power and vehicle propulsion is provided mainly from the ESS and Drive Unit motors in HUSH™ mode.

The HUSH™ mode feature introduces additional information and functionality to the PBSS. Pressing the MODE button on the PBSS will start ESS pre-charging. The MODE light will flash while the ESS SOC increases and when fully charged, stops flashing and remains lit. Pressing the MODE button on the PBSS will enter HUSH™ mode. The "F" displayed on the PBSS will change to an "H". When HUSH™ mode is exited, the displayed "H" will return to an "F" and the MODE indicator will turn off on the PBSS. If the Station Mode request is active, the "H" displayed on the PBSS will begin flashing, the Drive Unit will automatically shift to **N** (Neutral), and the engine will stop. When the Station Mode Request input circuit is opened and becomes inactive, the engine will restart automatically. If the service brakes are applied, the "H" displayed on the PBSS will stop flashing and forward range will automatically be selected. If the service brakes are not applied, the "H" will continue to flash and the operator must apply the service brakes and select **D** (Drive) on the PBSS.

4.16 REGENERATIVE BRAKING

The H 40/50 EP System expends energy to propel the vehicle and recovers a major portion of that expended energy with regenerative braking. During

regenerative braking the electric motors in the Drive Unit are electrically switched from motor operation to generator operation. With the motors now generators, mechanical energy is routed from the vehicle driveline into the Drive Unit's generators, converted to electrical energy, routed through the DPIM and recharges the ESS. Regenerative braking occurs whenever the throttle is not pressed and increases with application of the service brakes.

Regenerative braking performs the same function as an automatically applied hydraulic retarder on a conventional Allison automatic transmission by slowing the vehicle driveline and reducing the need of the driver to use the service brakes.

4.17 DRIVING ON SNOW OR ICE

Regenerative braking is automatically disabled when the Anti-lock Brake System (ABS) signals wheel slip or lock up conditions. This allows the driver to use the service brakes to control the vehicle in a slide condition. If the vehicle is equipped with Automatic Traction Control (ATC), output torque is automatically reduced when the ATC signals wheel slip conditions, allowing the vehicle to regain traction.

4.18 PARKING BRAKE



WARNING: Each time you park the vehicle or leave the operator's station with the engine running, do the following:

- Bring the vehicle to a complete stop using the service brake.
- Put the Drive Unit in **N** (Neutral).
- Apply the parking brake, and make sure it is properly engaged.
- If the operator's station will be unoccupied with the engine running, chock the wheels and take any other steps necessary to keep the vehicle from moving.

If this procedure is not followed, the vehicle can move suddenly and you or others could be injured.

The parking brake is intended to secure an unattended vehicle with the engine ignition off. Always maintain the vehicle parking brake system according to the manufacturer's specifications.

4.19 AUXILIARY BRAKE ENABLE

Auxiliary braking capability (which includes regenerative braking and the engine exhaust brake) will be disabled when the vehicle auxiliary brake

switch is off. When auxiliary braking is disabled, all vehicle braking must be performed with the service brakes.

4.20 HIGH WATER

Follow the high-water precautions specified by the Original Equipment Manufacturer (OEM).

4.21 DASH INDICATOR LIGHTS

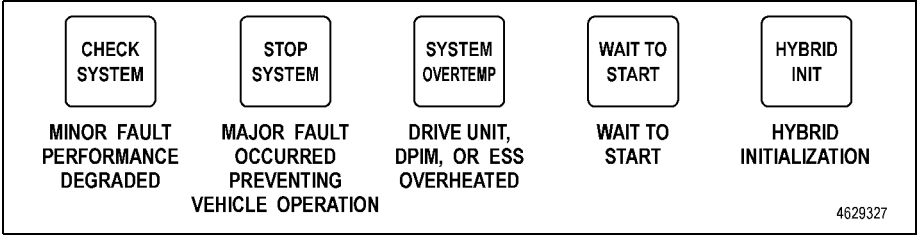


Figure 4–1. Warning Lights

4.21.1 WAIT TO START.

The **WAIT TO START** light is located on the dash panel. This indicator notifies the operator that the vehicle system is not ready to start. The light is extinguished when the vehicle systems are ready for start-up. If the indicator remains illuminated, check the Pushbutton Shift Selector (PBSS) for Diagnostic Trouble Codes (DTCs) related to the H 40/50 EP System. Continued illumination of this indicator can also indicate vehicle system inhibits. In model year 2013 and later, the **WAIT TO START** light will be controlled separately by the engine ECM and the **HYBRID INITIALIZATION** light will be added.

4.21.2 HYBRID INITIALIZATION.

The **HYBRID INITIALIZATION** light is located on the dash panel. This indicator notifies the operator that the vehicle H 40/50 EP System is not ready to start. The light is extinguished when the vehicle H 40/50 EP System is ready for start-up. If the indicator remains illuminated, check the Pushbutton Shift Selector (PBSS) for Diagnostic Trouble Codes (DTCs) related to the H 40/50 EP System. Continued illumination of this indicator can also indicate vehicle system inhibits.

4.21.3 SYSTEM OVERTEMP.

The **SYSTEM OVERTEMP** warning light is located on the dash panel and alerts the operator when any of the H 40/50 EP System components have

reached a thermal limit. Overtemp faults result in reduced performance or a disabled propulsion system condition. Check the PBSS for specific DTCs.

4.21.4 CHECK SYSTEM.

The **CHECK SYSTEM** warning light is located on the dash panel and alerts the operator that an H 40/50 EP System fault has occurred. Vehicle propulsion will not be disabled when **CHECK SYSTEM** is illuminated. Immediately return the vehicle for service. If a fault occurs, a DTC for that fault is logged in TCM memory. Check the PBSS for specific DTCs.

4.21.5 STOP SYSTEM.

The **STOP SYSTEM** warning light is located on the dash panel and alerts the operator that a severe H 40/50 EP System fault has occurred. Faults of this nature may disable the propulsion system. The driver may have approximately 30 seconds to move the vehicle to a safe location before the H 40/50 EP System is disabled. During this time, the **STOP SYSTEM** light flashes. Stop the vehicle immediately and remove it from service. If a fault occurs, a DTC for that fault is logged in TCM memory. Check the PBSS for specific DTCs.

4.22 ACCIDENT OR OTHER EMERGENCY

In case of vehicle accident or any other kind of emergency involving the vehicle, inform emergency personnel of the onboard components containing potentially hazardous electrical energy. Refer to OEM provided documentation for first responder information.

4.23 TOWING OR PUSHING



CAUTION: When towing or pushing the vehicle, the driveshaft or axle shafts **MUST** be removed or internal Drive Unit components can be damaged.

5.0 CARE AND MAINTENANCE

5.1 PERIODIC INSPECTION AND CARE

Basic maintenance inspections help prolong the trouble-free operation of the vehicle. Periodically perform a visual inspection of the components.

5.2 DRIVE UNIT

Clean and inspect the exterior of the Drive Unit at regular intervals. Severity of service and operating conditions determine the frequency of inspections. Inspect the Drive Unit for:

- Loose bolts—Drive Unit and mounting components
- Loose, worn, frayed electrical connections
- Improperly routed vehicle electrical harness
- Damaged or loose hoses
- Fluid leaks—repair immediately
- Clogged or dirty breather

5.3 PROPER FLUID LEVEL

Proper transmission fluid level is important to the performance, reliability, and durability of the Drive Unit. The Drive Unit uses transmission fluid to cool, lubricate, and transmit hydraulic power. Low fluid level can result in inadequate cooling, poor clutch apply, and overheating. High fluid level can cause fluid aeration due to churning and the formation of air bubbles in the fluid. Aeration increases fluid oxidation rates and reduces fluid life. Aeration can also cause overheating due to increased friction. Fluid may be expelled through the breather or dipstick tube when the fluid level is too high.

5.4 FLUID CHECK

The Drive Unit is equipped with an electronic Oil Level Sensor (OLS). The OLS provides the means to check the Drive Unit fluid level. To display fluid

level, press and hold the pushbutton shift selector ↑ (Up) and ↓ (Down) arrow keys simultaneously for five seconds.

5.5 FLUID LEVEL DISPLAY CRITERIA

As soon as fluid level information is requested, the TCM checks to see if conditions are right to allow a fluid level check. Certain operating conditions must be met for a period of two minutes before fluid level can be checked. These operating conditions are:

- Engine at idle (625–850 rpm)
- Sump fluid at operating temperature of 20–80°C (68–176°F)
- Drive Unit output shaft stopped
- Drive Unit in **N** (Neutral)
- OLS functioning properly



NOTE: The vehicle should be parked on level ground prior to starting any oil level check.

Information is displayed immediately if the two-minute period has elapsed before the fluid level check was requested. However, if the two-minute period has not elapsed, a countdown displays before fluid level information displays. The countdown display flashes constantly. The countdown starts at 8 and decreases sequentially to 1 during the two-minute period.

When a fluid level check is requested, and the two-minute countdown is in process, the flashing display shows the number corresponding to the countdown progress. For example, if the fluid level check was requested in the middle of the two-minute countdown period, the display would flash a 5 or a 4 and decrease sequentially to 1 during the remainder of the two-minute period.

5.6 INVALID FOR DISPLAY CODES

An Invalid for Display code is returned when a fluid level check is requested, but an operational condition has not been met. The shift selector displays Invalid for Display codes one character at a time. The Invalid for Display condition interrupts the two-minute countdown (momentary increase in engine speed does not affect the countdown).

Invalid for Display codes and their meaning are:

Table 5–1. Invalid for Display Codes

4th/5th Generation Display Sequence*	Pre 4th Generation Display Sequence**	Interpretation of Display
oL,- -,50	o,L,- -,5,0	Engine rpm too low, below 625 rpm
oL,- -,59	o,L,- -,5,9	Engine rpm too high, above 850 rpm
oL,- -,65	o,L,- -,6,5	Neutral—not selected
oL,- -,70	o,L,- -,7,0	Sump fluid temperature too low
oL,- -,79	o,L,- -,7,9	Sump fluid temperature too high
oL,- -,89	o,L,- -,8,9	Output shaft rotation
oL,- -,95	o,L,- -,9,5	Sensor failure

*The 4th/5th Generation PBSS displays two digits at a time.

**The Pre 4th Generation PBSS displays one digit at a time.

The countdown is restarted when the condition causing the Invalid for Display code is corrected. The countdown is not restarted if there is a momentary increase in engine rpm that may generate an Invalid for Display code.

5.7 FLUID LEVEL SHIFT SELECTOR DISPLAY

Fluid level information is displayed one or two characters at a time as follows:

4th/5th Generation Display Sequence	Pre 4th Generation Display Sequence	Display Meaning
oL,oK	o,L,o,K	Fluid level is correct
oL,Lo,01	o,L,L,o,0,1	Fluid level is 1 quart low
oL,HI,01	o,L,H,I,0,1	Fluid level is 1 quart high

5.8 EXITING THE FLUID LEVEL MODE

To exit Fluid Level mode, press the **N** (Neutral) button once.

5.9 FLUID RECOMMENDATIONS

The fluid used in the Drive Unit it has an important influence on performance, reliability, and durability. Use **ONLY TES 468™** approved transmission fluid for the H 40/50 EP System. Disregarding this recommendation can result in reduced Drive Unit life.

5.10 FLUID AND FILTER CHANGE INTERVALS



CAUTION: Transmission fluid and filter change frequency is determined by the severity of transmission service. More frequent changes may be necessary than recommended in the general guidelines when operating conditions create high levels of contamination or overheating.

5.10.1 Fluid and Filter Change Intervals.

The Drive Unit Fluid and Filter Change Intervals table is given only as a general guide for fluid and filter change intervals. Refer to the latest version of Service Tip #1099 (available online at www.allisontransmission.com) for additional information on fluid and filter change intervals.

Table 5–2. Drive Unit Fluid and Filter Change Intervals

	Control Main Filter	Suction Filter	Replace Fluid	Lube Filter
Initial Change	8,000 km (5,000 miles)	Overhaul	160,000 km (100,000 miles)	160,000 km (100,000 miles)
Change Interval	80,000 km (50,000 miles)	Overhaul	160,000 km (100,000 miles)	160,000 km (100,000 miles)

For best fluid performance, determine change intervals by severity of service. More frequent fluid and filter changes may be necessary if operating conditions create high levels of contamination or overheating. If there is any question as to the severity of your duty cycle, perform an oil analysis to determine proper change interval.

5.10.2 Abnormal Conditions.

Use fluid analysis to be certain that a proper fluid change interval is established for the Drive Unit in high cycle rate applications. Change the transmission fluid whenever there is evidence of dirt or a high temperature condition. A high temperature condition is indicated by the transmission fluid being discolored or having a strong odor, or by fluid analysis. Local conditions, severity of operation, or duty cycle may require more or less frequent fluid or filter change intervals.

The following table lists the minimum fluid temperatures at which the transmission may be safely operated without preheating the fluid. Preheat with auxiliary heating equipment or by running the equipment or vehicle with the transmission in **N** (Neutral) for a minimum of 20 minutes before attempting range operation.

	Ambient Temperature Below Which Preheat is Required*	
Viscosity Grade	Celsius	Fahrenheit
Use ONLY TES 468 approved fluids	-30	-22
*Refer to the latest version of Service Tip #1099 available online at www.allisontransmission.com .		

5.10.3 Fluid Analysis.

Optimize transmission protection and fluid change intervals by monitoring fluid oxidation according to the tests and limits shown in the following table. Monitor fluid oxidation through a fluid analysis firm or by using an oil analysis kit.

- Fluid analysis firm—Consult your local telephone directory for fluid analysis firms. For consistent and accurate fluid analysis, use only one fluid analysis firm. Refer to the Technician’s Guide for Automatic Transmission Fluid (GN2055EN) for additional information.
- Oil analysis kits (P/N 29537805) are available through your normal Allison Transmission parts source.

Refer to the Technician’s Guide for Automatic Transmission Fluid (GN2055EN) for additional information.

Table 5–3. Fluid Oxidation Measurement Limits

Test	Limit
Viscosity	25% change from new fluid
Total Acid Number	+3.0* change from new fluid
Water	0.2% by volume maximum
*mg of KOH required to neutralize a gram of fluid.	

5.11 DPIM INSPECTION

Clean and inspect the exterior of the DPIM at regular intervals. Location of the DPIM and vehicle operating conditions determine the frequency of inspections. An internal cooling circuit removes heat from the DPIM. COOLER IN and COOLER OUT ports are on the front of the DPIM. Transmission fluid regulated inside the Drive Unit is used to remove heat from the DPIM.

Inspect the DPIM for:

- Loose bolts—mounting components and grounding straps
- Loose, worn, frayed electrical connections

- Improperly routed vehicle electrical harness
- Damaged or loose hoses
- Coolant leaks

5.12 ESS INSPECTION

Clean and inspect the exterior of the ESS at regular intervals. Location of the ESS and vehicle operating conditions determine the frequency of inspections. Inspect the ESS for:

- Loose bolts—mounting components and grounding straps
- Loose, worn, frayed electrical connections
- Improperly routed vehicle electrical harness

5.13 ESS AIR INLET FILTER

Check the ESS air inlet filter element for dirt and debris collection or clogging. If dirt or debris collection or clogging is observed, clean the inlet filter with a vacuum cleaner or an appropriately-sized nylon-bristle brush tip.

The maintenance interval of the ESS is based on location, local climate conditions and OEM adaption hardware.

In some applications, the original ESS air inlet filter element may be replaced by an inlet air filter for an HVAC system providing cool air to the ESS. Refer to the vehicle OEM or HVAC manufacturer's documentation for HVAC filter cleaning and replacement.

5.14 WASHING THE VEHICLE



CAUTION: When cleaning the Drive Unit do not spray steam, water, or cleaning solution directly at the breather (air vent). Spraying steam, water, or cleaning solution at the breather can force the water or cleaning solution into the Drive Unit and contaminate the transmission fluid.

- DO NOT spray water or cleaning solution directly at system control components, harnesses or connectors.
- DO NOT spray water or cleaning solution directly at the TCM/VCM/HGM.
- DO NOT spray water or cleaning solution directly at the Allison H 40/50 EP System control components, DPIM or ESS.

5.15 WELDING



WARNING: When welding on the vehicle:

- DO NOT WELD on the vehicle without completely disconnecting all low voltage wiring harnesses from the HCMs.
- DO NOT WELD on the vehicle without completely disconnecting the high voltage AC cables from the DPIM and the high voltage DC cables from the ESS.
- DO NOT WELD on the vehicle without completely disconnecting any OEM grounding strap for the DPIM or ESS.
- DO NOT WELD on any H 40/50 EP System components including any HCM, DPIM, ESS, or Drive Unit.
- DO NOT CONNECT welding cables to any H 40/50 EP System component.

6.0 CUSTOMER SERVICE

6.1 OWNER ASSISTANCE

The satisfaction and goodwill of the owners of Allison products are of primary concern to Allison Transmission, its distributors, and their dealers.

There are Allison Transmission service locations throughout the world that are eager to meet your parts and service needs with:

- Expert service by trained personnel
- Emergency service 24 hours a day in many areas
- Complete parts support
- Sales teams to help determine your transmission requirements
- Product information and literature

Normally, any situation that arises in connection with the sale, operation, or service of your transmission will be handled by the distributor or dealer in your area. Consult the telephone directory for the Allison Transmission service outlet nearest you or utilize Allison Transmission's Sales and Service Locator tool on the Allison Transmission web site at www.allisontransmission.com.

We recognize, however, that despite the best intentions of everyone concerned, misunderstandings may occur. To further assure your complete satisfaction, we have developed the following three-step procedure to be followed in the event a problem has not been handled satisfactorily.

Step One—Discuss your problem with a member of management from the distributorship or dealership. Frequently, complaints are the result of a breakdown in communication and can quickly be resolved by a member of management. If you have already discussed the problem with the Sales or Service Manager, contact the General Manager. All Allison Transmission dealers are associated with an Allison Transmission distributor. If the problem originates with a dealer, explain the matter to a management member of the distributorship with whom the dealer has his service agreement. The dealer will provide his Allison Transmission distributor's name, address, and telephone number on request.

Step Two—When it appears the problem cannot be readily resolved at the distributor level without additional assistance, **contact the Allison Technical Assistance Center (TAC) at 800-252-5283**. They will place you in contact with the Regional Customer Support Manager for your area.

For prompt assistance, please have the following information available.

- Name and location of authorized distributor or dealer
- Vehicle year, make, and model
- Drive Unit, DPIM, and ESS serial numbers. This data is available on the nameplate of each component. Also provide the H 40/50 EP System system identification number (SID)
- H 40/50 EP System delivery date and accumulated miles and/or hours of operation
- Nature of problem
- Chronological summary of unit's history

Step Three—If you are still not satisfied after contacting the Regional Customer Support Manager, **present the entire matter to the Home Office by writing to the following address:**

Allison Transmission
Attn: Manager, Warranty Administration
PO Box 894, Mail Code PF9
Indianapolis, IN 46206-0894

The inclusion of all pertinent information will assist the Home Office in expediting the matter.

When contacting the Home Office, please keep in mind that ultimately the problem will likely be resolved at the distributorship or dealership using their facilities, equipment, and personnel. Therefore, it is suggested that Step One be followed when experiencing a problem.

Your purchase of an Allison Transmission product is greatly appreciated, and it is our sincere desire to be sure of your complete satisfaction.

6.2 SERVICE LITERATURE

Allison Transmission, Inc. service literature provides fully illustrated instructions for operation, maintenance, troubleshooting, service, overhaul, and parts support for your transmission. For maximum performance and service life from your unit, you may order additional publications via phone, email or web.

TOLL FREE: 844-829-3595
INTERNATIONAL: 613-271-3842
allisontransmission@gilmore.ca
www.allisontransmissionpublications.com

For more information about Allison products please visit
www.allisontransmission.com.

6.3 ALLISON TRANSMISSION DISTRIBUTORS

See the Allison Transmission, Inc. Sales and Service Locator
<http://www.allisontransmission.com/sales-service-locator>

REVISION HISTORY

This revision history includes a summary of changes made to the following topics between 2019/04 and 2019/06.

1-1. KEEPING THAT ALLISON ADVANTAGE

2019/04 Updated introduction paragraph

1-2. THE ALLISON H 40/50 EP SYSTEM

2019/05 Update Naming and minor changes to content

1-3. DRIVE UNIT

2019/05 Updated Side Views Updated Naming

1-6. HYBRID CONTROL MODULES

2019/05 Title changes and minor content changes

1-7. PUSHBUTTON SHIFT SELECTOR (PBSS)

2019/05 New

2-1. ELECTRICAL SYSTEMS

2019/05 Hybrid naming changes, removal of references in HVIL paragraph.

3-2. UP AND DOWN ARROW BUTTONS

2019/05 Punctuation correction

3-3. DIAGNOSIS

2019/05 Small wording change in paragraph

3-4. PRE 4TH GENERATION DIAGNOSTIC TROUBLE CODES

2019/05 Minor content changes

4-1. TURNING THE VEHICLE ON/OFF

2019/05 Minor content change

4-4. FAST ENGINE SHUTDOWN

2019/05 Name change

4-7. ENGINE HIGH-IDLE

2019/05 Update paragraph

4-10. CREEP TORQUE

2019/05 Paragraph changes

4-11. DIRECTION CHANGES

2019/05 Paragraph changes

4-14. ENGINE STOP-START (ES-S)

2019/05 Complete re-write of this section

4-15. HUSH™ MODE

2019/05 New section

4-16. REGENERATIVE BRAKING

2019/05 Updated first paragraph

4-18. PARKING BRAKE

2019/05 Name changes

4-19. AUXILIARY BRAKE ENABLE

2019/05 Paragraph change

4-21. DASH INDICATOR LIGHTS

2019/05 Update image
Changes in all paragraphs

4-22. ACCIDENT OR OTHER EMERGENCY

2019/05 Changed paragraph

4-23. TOWING OR PUSHING

2019/05 Change name

5-2. DRIVE UNIT

2019/05 Name change

5-3. PROPER FLUID LEVEL

2019/05 Name change and paragraph updates

5-4. FLUID CHECK

2019/05 Name change

5-5. FLUID LEVEL DISPLAY CRITERIA

2019/05 Name change and paragraph updates

5-9. FLUID RECOMMENDATIONS

2019/05 Name changes

5-10. FLUID AND FILTER CHANGE INTERVALS

2019/05 Name change

5-11. DPIM INSPECTION

2019/05 Name change

5-13. ESS AIR INLET FILTER

2019/05 New note

5-14. WASHING THE VEHICLE

2019/05 Name change

5-15. WELDING

2019/05 Name change

6-1. OWNER ASSISTANCE

2019/05 Removed outdated information

NOTES

NOTES

NOTES



A World Of Support

From our headquarters in Indianapolis, Indiana to our manufacturing plants in Hungary and India, to approximately 1,400 Allison Authorized Distributors and Dealers around the globe, you are never far from the products, training, service and support you demand.

Our support starts from the moment an Allison transmission is specified. We work with you to ensure that the model and ratings fit your engine to create a tailored package of powerful performance and reliable efficiency. And when you need parts or service, you can count on global access to factory-trained specialists and genuine Allison replacement parts.

allisontransmission.com

*One Allison Way
Indianapolis, Indiana USA 46222-3271*

OM3491EN (201906)

*Information or specifications subject to
change without notice or obligation.*

© 2019 Allison Transmission Inc.
All Rights Reserved.

allisontransmission.com

