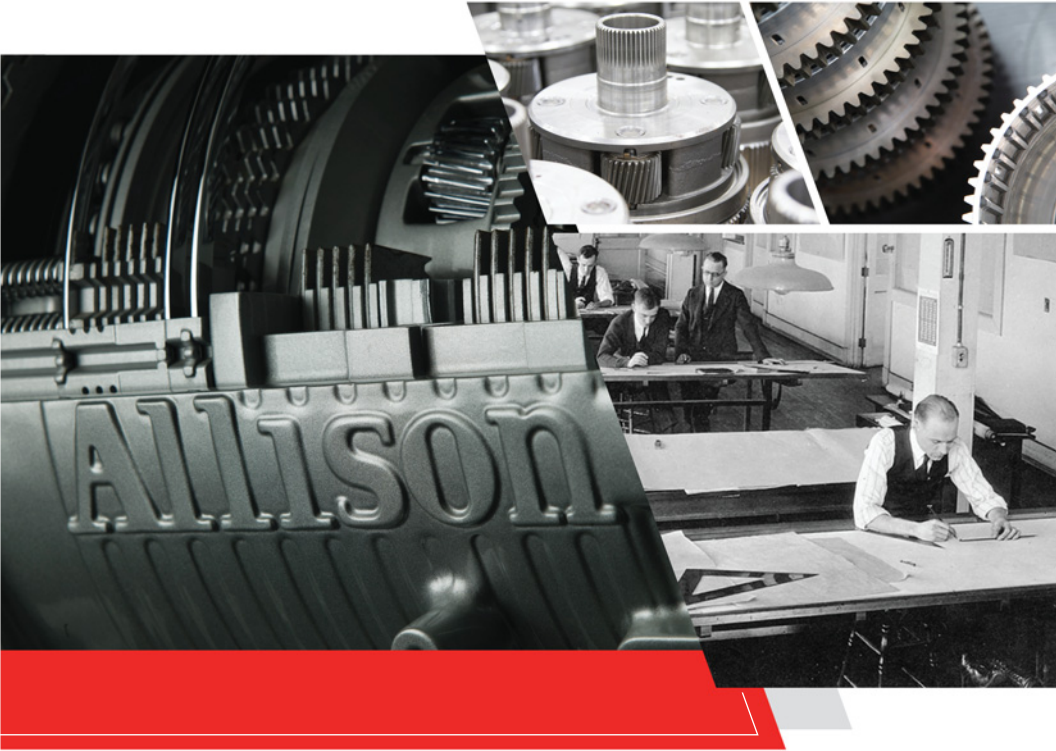


# Allison eGen Flex™



## OPERATOR'S MANUAL

OM8688EN



# Operator's Manual

2022 MAY

OM8688EN

# Allison Transmission

eGen Flex™



**Allison**  
Transmission.

Allison Transmission, Inc.  
P.O. Box 894 Indianapolis, Indiana 46206-0894  
[allisontransmission.com](http://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
• DTC	Diagnostic Trouble Code
• DTCs	Diagnostic Trouble Codes
• DTI	Dual Traction Inverter
• ECM	Engine Control Module
• ES-S	Engine Stop-Start
• EV	Electric Vehicle
• HGM	Hybrid Gateway Module
• HVAC	Heating, Ventilation and Air Conditioning
• IAP2	Increased Accessory Power 2
• IDI	Inverter Disable at Idle
• OEM	Original Equipment Manufacturer
• OLS	Oil Level Sensor
• PBSS	Push Button Shift Selector
• RESS	Rechargeable Energy Storage System
• SOC	State of Charge
• TAC	Technical Assistance Center
• TCM	Transmission Control Module
• VCM	Vehicle Control Module
• VEPI	Vanner Exportable Power Inverter
• WEG	Water Ethylene Glycol

## **TRADEMARK USAGE**

The following trademarks are the property of the companies indicated:

- Allison DOC<sup>®</sup> is a registered trademark of Allison Transmission, Inc.
- eGen Flex<sup>™</sup> is a trademark of Allison Transmission, Inc.
- TES 668<sup>®</sup> 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](http://www.p65Warnings.ca.gov/product).

- **The eGen Flex uses potentially hazardous electrical energy. All eGen Flex 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 eGen Flex. Do not attempt to service the eGen Flex if not trained to do so. Contact your nearest eGen Flex service center. To find your nearest eGen Flex service center, visit [allisontransmission.com](http://allisontransmission.com) or call 1-800-252-5283.**

**eGen Flex Normal Operating Conditions:**

- **RESS Voltage Range: 450–756 VDC**
- **DTI Current Range: -475 to +475 A**



## **LIST OF WARNINGS (cont'd)**

**This manual contains the following warnings—**

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

- **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.**

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# 1.0 INTRODUCTION

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## 1.1 KEEPING THAT ALLISON ADVANTAGE



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Congratulations! Your vehicle is equipped with an advanced Allison eGen Flex or eGen Flex Max. Four models are available: the eGen Flex 40, eGen Flex 50, eGen Flex 40 Max and the eGen Flex 50 Max. The input and output ratings for the models are:

eGen Flex 40 eGen Flex 40 Max	eGen Flex 50 eGen Flex 50 Max
Input continuous	
209 kW (280 hp)	246 kW (330 hp)
Rated input torque	
1235 N•m (911 lb ft)	1420 N•m (1047 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 eGen Flex equipped vehicle.

## 1.2 THE ALLISON eGEN FLEX

Operation of the eGen Flex is similar to a conventional engine-transmission package and is largely transparent to the driver.

The Allison eGen Flex consists of:

- Drive Unit
- Dual Traction Inverter (DTI)
- Rechargeable Energy Storage System (RESS)
- Increased Accessory Power 2 (IAP2)
- Three Hybrid Control Modules (TCM/VCM/HGM)
- Push Button Shift Selector (PBSS)

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

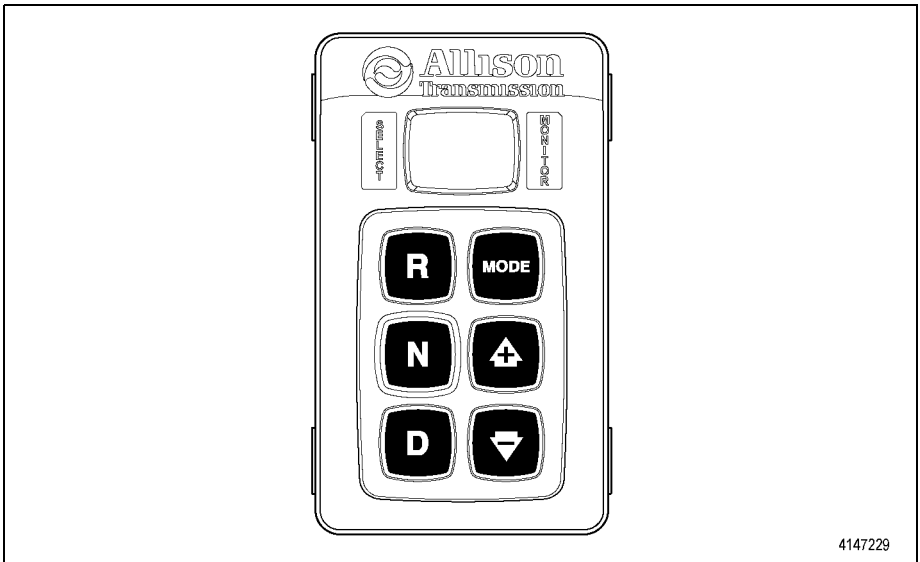
The Dual Traction Inverter (DTI) converts AC electricity to DC electricity and vice-versa. When the vehicle is slowing down with regenerative braking, AC electricity generated by the electric motors in the Drive Unit is converted to DC electricity and stored in the Rechargeable Energy Storage System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

The Rechargeable Energy Storage System (RESS) stores and releases DC electrical energy for use in the eGen Flex. The RESS provides DC electrical

energy to the DTI to be converted into AC electrical energy for the Drive Unit electric motors. The RESS is recharged during regenerative braking. The RESS also provides DC electrical energy to the high voltage IAP2 accessories. The RESS contains control systems that monitor and control state of charge, temperature, and power throughput.

The eGen Flex uses three external control modules. The Transmission Control Module (TCM), Vehicle Control Module (VCM), and Hybrid Gateway Module (HGM) contain system software and calibration data, and perform diagnostic data management.

### 1.3 PUSH BUTTON SHIFT SELECTOR (PBSS)



**Figure 1–1. 5th Generation Push Button Shift Selector (PBSS)**

The Push Button Shift Selector (PBSS) is the vehicle operator's interface with the eGen Flex. It is used to command vehicle direction of operation, check oil level, display diagnostic trouble codes (DTCs), and also interact with other optional vehicle features. The PBSS features three (3) directional range 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](#).

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## 2.0 ELECTRICAL SAFETY

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### 2.1 ELECTRICAL SYSTEMS



**WARNING:** The eGen Flex uses potentially hazardous electrical energy. All eGen Flex 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 eGen Flex. Do not attempt to service the eGen Flex if not trained to do so. Contact your nearest eGen Flex service center. To find your nearest eGen Flex service center, visit [allisontransmission.com](http://allisontransmission.com) or call 1-800-252-5283.

eGen Flex Normal Operating Conditions:

- RESS Voltage Range: **450–756** VDC
- DTI Current Range: **-475 to +475** A



Figure 2-1. DTI Warning Labels

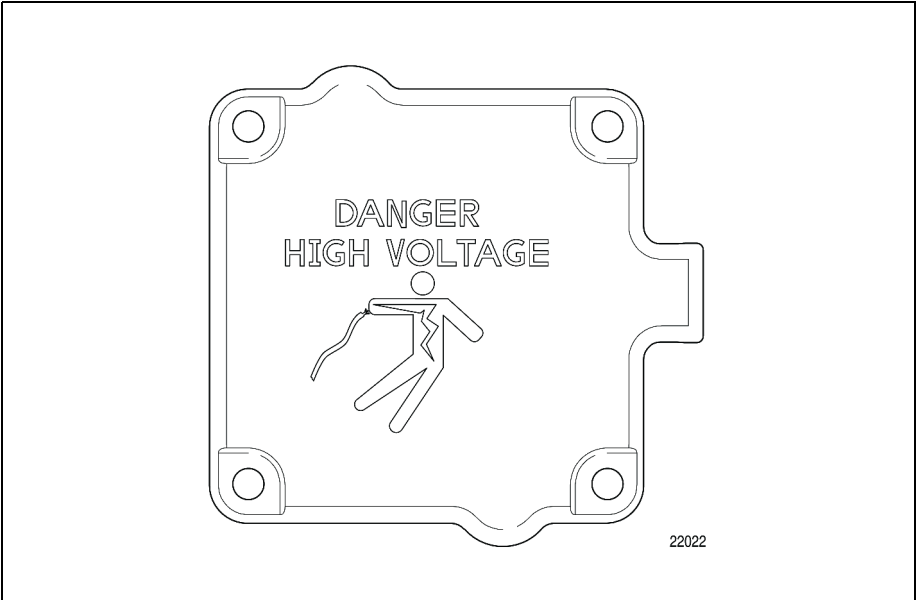
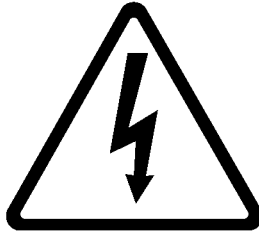


Figure 2-2. Drive Unit Warning (Lug Box)





⚠ INFORMATION					
	NOTE OPERATING INSTRUCTIONS		SHIELD EYES		NO SMOKING, NO NAKED FLAME, NO SPARKS
⚠ CAUTION					
	DO NOT STEP OR STAND ON THIS SURFACE		ATTENTION! DANGER		LITHIUM BATTERY
⚠ WARNING					
	<b>FLAMMABLE CHEMICALS</b> Exposure may result in severe injury Refer to maintenance manual before servicing		<b>CORROSIVE</b> Exposure may result in severe injury Refer to maintenance manual before servicing		Exposure may result in severe injury Wear appropriate PPE
⚠ DANGER					
	<b>HIGH VOLTAGE</b> Exposure may result in severe injury or death Turn off and lock-out system power before servicing		<b>EXPLOSIVE</b> Serious injury or death will occur Keep away from heat & flame Authorized Personnel only		<b>BATTERY DANGER</b> Risk of battery fire or explosion Don't touch battery without HV protection

### WARNING

- If cells are defective - corrosive gas or liquid could be around the battery pack (see Material Safety Data sheet for more details)!
- Electrolyte could harm your eyes - Please wear protection glasses!
- Please keep the battery pack away from direct temperatures of more than 90°C [194°F]!
- Please store the battery pack at a dry place with temperatures between 10°C [50°F] and 30°C [86°F]!
- Read safety and handling instruction carefully before operating!
- Installation, handling and integration only through qualified electrical experts!
- Use suitable high voltage clothing and tools at any time!
- Do not open pack or lift by any connectors.
- Service by certified trained technicians.
- Disconnect all connections prior to installation and/or removal.
- Battery is intended for ATI product and should not be used in any other application.



Li-ion



5503644

Figure 2-3. RESS Warning Labels

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## 3.0 ELECTRONIC CONTROLS

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### 3.1 PUSH BUTTON SHIFT SELECTOR (PBSS)



**Figure 3–1. Push Button Shift Selectors**

The Push Button Shift Selector (PBSS) commands direction of vehicle operation rather than selecting an operating range. The direction of vehicle 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.

## 3.2 UP AND DOWN ARROW BUTTONS

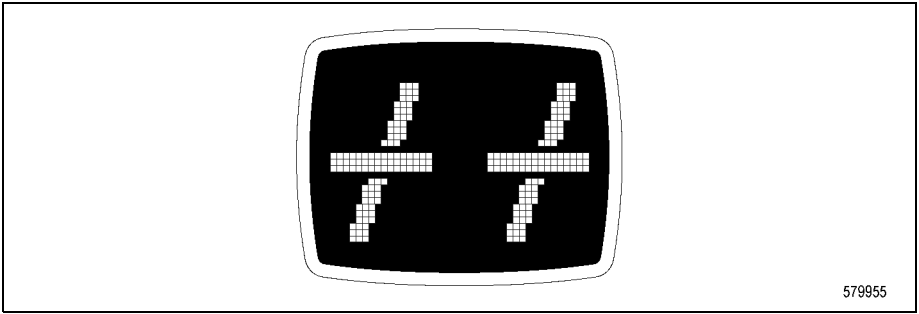
Pressing the ↓ (Down) arrow while in forward operation commands the eGen Flex to increase the regenerative braking effect and changes the left character on the Push Button Shift Selector (PBSS) from **F** (Forward) to **L** (Low). Regenerative braking provides the same braking function as a hydraulic retarder in a conventional transmission. Increasing regenerative braking does not limit forward speed to a particular range. The eGen Flex 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 displayed in the PBSS. DTCs can be read by using either the shift selector or the Allison DOC Premium (H 40/50 EP and eGen Flex) diagnostic tool. Basic information on reading and troubleshooting DTCs is covered in sections [3.4 5TH GENERATION DIAGNOSTIC TROUBLE CODES](#). More detailed information is available in the eGen Flex Troubleshooting Manual (TS8686EN).

When the PBSS loses all communications with the TCM (both CAN and wired), the PBSS will display a system initialization error (refer to [Figure 3–2](#)). Refer to the eGen Flex Troubleshooting Manual (TS8686EN) for detailed information.



**Figure 3–2. PBSS Initialization Error**

### **3.4 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 Push Button 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 displayed with the PBSS.

#### **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 two digits at a time).

- Press the **MODE** button to see the next code—repeat for subsequent codes.

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, PBSS display will also include “MODE”. Any code position which does not have a diagnostic code logged displays “—”.

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## 4.0 OPERATING FEATURES

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### 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 eGen Flex 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, 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 eGen Flex 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 SYSTEM OVERRIDE

If a fault occurs in the eGen Flex that enables the **STOP SYSTEM** dash lamp, indicating to the driver a forthcoming shutdown, the time until shutdown can be extended thirty (30) seconds by activating the vehicle's system override switch. The system override switch should be used to move the vehicle to a safe location prior to selecting **N** (Neutral) or turning the vehicle ignition off. Faults that set a **STOP SYSTEM** and remain active after turning the vehicle

ignition off and back on will prevent the eGen Flex from starting the engine to prevent damage.

## **4.6 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:

- RESS SOC is above the relevant threshold
- Neutral range is obtained
- Zero output speed
- Service brake pedal apply at zero percent
- EV & EV Charge Mode active
- ES-S active
- Elevated electric accessory loads

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

- RESS SOC is above the relevant threshold
- Zero output speed
- Service brake pedal apply greater than fifteen percent
- EV & EV Charge Mode active
- ES-S active
- Elevated electric accessory loads

## **4.7 ENGINE CRANK INHIBIT, RESS UNDER VOLTAGE CRANK PROTECT**

If, after multiple failed engine start attempts, the RESS 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 diagnostic tool Allison DOC Premium (H 40/50 EP and eGen Flex).

## **4.8 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).

## **4.9 DIRECTION CHANGES**

Make all direction changes with the service brake applied and zero road speed. Depending on the eGen Flex software configuration, the operator may be able to change from **D** (Drive) to **R** (Reverse) or **R** (Reverse) to **D** (Drive) without first selecting **N** (Neutral).

## **4.10 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.

## **4.11 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.

## **4.12 ENGINE STOP-START (ES-S)**

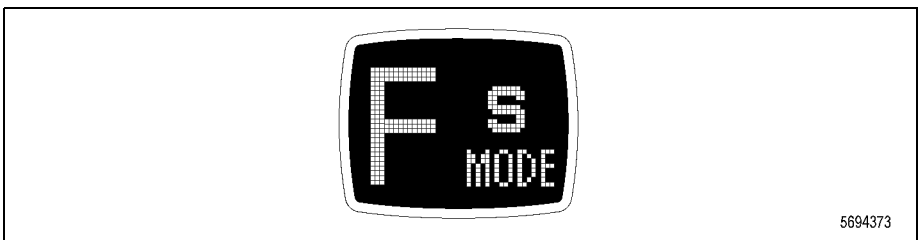
Engine stop-start is a feature developed to conserve fuel consumption at idle and reduce pollution of the eGen Flex. Generally, the eGen Flex will temporarily eliminate engine operation at complete stops. While the engine is shut off, the eGen Flex supplies power from the RESS to all of the vehicle electrical 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 forward 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" in 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 eGen Flex has returned to hybrid operating mode with ES-S disabled. This may be a result of an eGen Flex fault or a change in the requested mode from the body control system or by the operator.

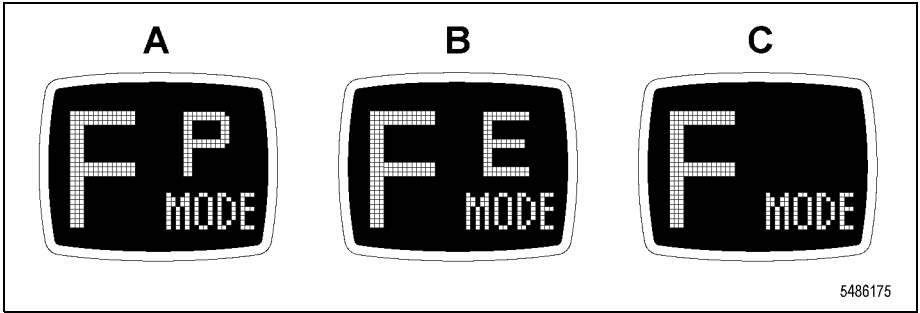
The ES-S feature can be toggled on and off by the vehicle operator by pressing the MODE button on the PBSS if enabled in the software. If temporarily disabled, the ES-S feature will become enabled after the vehicle ignition is cycled.



**Figure 4–1. PBSS Display for ES-S**

### **4.13 EV OPERATION MODE**

The eGen Flex allows the capability to support stationary operation and moving the vehicle while the engine is off and with electrical accessories still operating. To accomplish this, the eGen Flex may first receive a signal to activate the EV Charge Mode to pre-charge the RESS up to a higher State of Charge (SOC) (elevated engine speed) in order to maximize the upcoming EV Mode event. Upon receiving the EV Mode signal, the eGen Flex will then automatically shut the engine off. The vehicle will continue to operate under electric propulsion with power provided by the drive unit electric motors. This reduces both exhaust and noise emission while operating in an “EV Zone” such as near schools, hospitals, or parks. EV Mode will be disabled either when the signal to exit EV Mode is received, the RESS SOC has reached the low threshold, or a fault occurs that causes the system to force an exit. Typically, the signal for EV Charge and EV Mode are automatically triggered by integration with an onboard GPS or telematics system.



(A) – EV Charge Mode Active  
 (B) – EV Mode Active

(C) – EV Mode Exited, Still being requested by GPS\*

**Figure 4–2. PBSS Displays for EV Mode**

\* When the vehicle is in a Zero-Emission-Zone and operating in EV Mode, the eGen Flex may exit to Hybrid Mode even though the vehicle has not exited the Zero-Emission-Zone. This typically occurs in heavy traffic when and the RESS SOC becomes too low to support EV Operation.

#### **4.14 REGENERATIVE BRAKING**

The eGen Flex 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 DTI and recharges the RESS. Regenerative braking occurs whenever the throttle is not pressed.

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.

#### **4.15 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.

## 4.16 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 off. Always maintain the vehicle parking brake system according to the manufacturer's specifications.

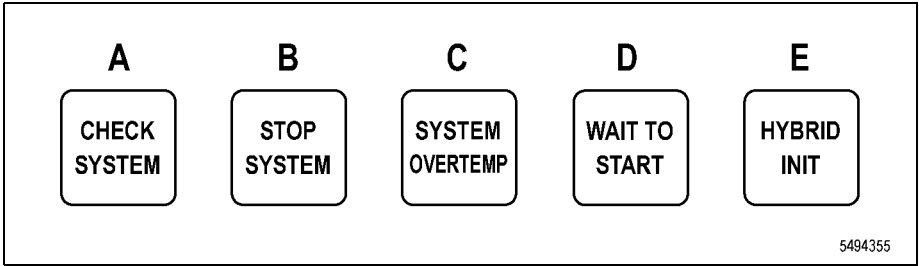
## 4.17 AUXILIARY BRAKE ENABLE

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.

## 4.18 HIGH WATER

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

## 4.19 DASH INDICATOR LIGHTS



- (A) – Minor Fault Performance Degraded  
(B) – Major Fault Occurred Preventing Vehicle Operation  
(C) – Drive Unit, DTI, or RESS Overheated  
(D) – Wait to Start  
(E) – Hybrid Initialization

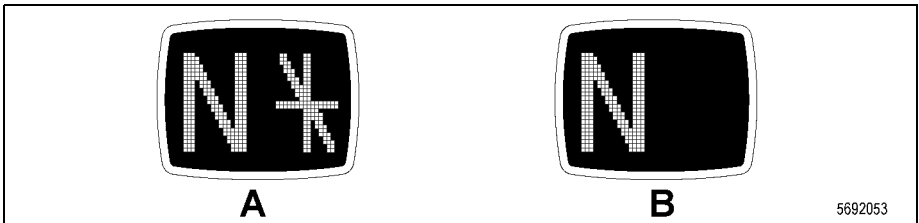
**Figure 4–3. Warning Lights**

### 4.19.1 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 various vehicle systems are ready for start-up. If the indicator remains illuminated, check the Push Button Shift Selector (PBSS) for Diagnostic Trouble Codes (DTCs) related to the eGen Flex. The **WAIT TO START** light may be controlled by the engine ECM. Refer to vehicle OEM documentation for additional information.

### 4.19.2 HYBRID INITIALIZATION.

The **HYBRID INITIALIZATION** light is located on the dash panel and on the PBSS. This indicator notifies the operator that the eGen Flex is not ready to start. The light is extinguished and the asterisk on the PBSS turns off when the eGen Flex is ready for start-up. If the indicator remains illuminated, check the Push Button Shift Selector (PBSS) for Diagnostic Trouble Codes (DTCs) related to the eGen Flex. Continued illumination of this indicator can also indicate vehicle system inhibits.



- (A) – Initializing  
(B) – Ready

**Figure 4–4. PBSS Display for Hybrid Initialization**

### 4.19.3 SYSTEM OVERTEMP.

The **SYSTEM OVERTEMP** warning light is located on the dash panel and alerts the operator when any of the eGen Flex components have reached a thermal limit. Overtemp faults result in reduced performance or a disabled propulsion system condition. Check the PBSS for specific DTCs.

### 4.19.4 CHECK SYSTEM.

The **CHECK SYSTEM** warning light is located on the dash panel and alerts the operator that an eGen Flex fault has occurred. Vehicle propulsion will not be disabled when **CHECK SYSTEM** is illuminated. Return the vehicle for service at the next available opportunity. If a fault occurs, a DTC for that fault is logged in the TCM. Check the PBSS for specific DTCs.

### 4.19.5 STOP SYSTEM.

The **STOP SYSTEM** warning light is located on the dash panel and alerts the operator that a severe eGen Flex 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 eGen Flex 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 the TCM. Check the PBSS for specific DTCs.

## 4.20 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.

## 4.21 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.

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## 5.0 CARE AND MAINTENANCE

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### 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 DRIVE UNIT 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 DRIVE UNIT 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 Push Button Shift Selector ↑ (Up) and ↓ (Down) arrow keys simultaneously for five seconds.

## 5.5 DRIVE UNIT 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)
- Vehicle on level ground
- OLS functioning properly



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

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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.

### 5.5.1 Drive Unit Conditions Invalid for Fluid Level 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**

<b>5th Generation Display Sequence*</b>	<b>Interpretation of Display</b>
oL,- -,50	Engine rpm too low, below 625 rpm
oL,- -,59	Engine rpm too high, above 850 rpm
oL,- -,65	Neutral—not selected
oL,- -,69	Level ground
oL,- -,70	Sump fluid temperature too low
oL,- -,79	Sump fluid temperature too high
oL,- -,89	Output shaft rotation
oL,- -,95	Sensor failure
*The 5th Generation PBSS displays two digits 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.

### **5.5.2 Drive Unit Fluid Level Shift Selector Display.**

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

<b>5th Generation Display Sequence</b>	<b>Display Meaning</b>
oL,oK	Fluid level is correct
oL,Lo,01	Fluid level is 1 quart low
oL,HI,01	Fluid level is 1 quart high

### **5.5.3 Exiting the Fluid Level Mode.**

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

## **5.6 DRIVE UNIT FLUID RECOMMENDATIONS**

The fluid used in the Drive Unit it has an important influence on performance, reliability, and durability. Use **ONLY TES 668** approved transmission fluid in the Drive Unit. Disregarding this recommendation can result in reduced Drive Unit life.



## 5.7 DRIVE UNIT FLUID AND FILTER CHANGE INTERVALS

### 5.7.1 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 [allisontransmission.com](http://allisontransmission.com)) for additional information on fluid and filter change intervals.

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

	<b>Control Main Filter</b>	<b>Suction Filter</b>	<b>Replace Fluid</b>	<b>Lube Filter</b>
<b>Initial Change</b>	8,000 km (5,000 miles)	Overhaul	160,000 km (100,000 miles)	160,000 km (100,000 miles)
<b>Change Interval</b>	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.

### 5.7.2 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.

## 5.8 RESS MAINTENANCE

### 5.8.1 RESS Inspection.

Clean and inspect the exterior of the RESS at regular intervals. The location of the component and operating conditions determine the frequency of inspections. Inspect the RESS for:

- Loose screws on mounting components and enclosure lid
- Loose, worn or frayed electrical components
- Improperly routed vehicle electrical harness
- Damage to the housing

- Leaking around coolant connections
- Damage to electrical connectors

### **5.8.2 RESS Coolant.**

The RESS is heated and cooled via a dedicated OEM-equipped battery Thermal Management System (BTMS). The coolant used in this system is a solution of deionized water and Valvoline EV Heat Transfer Fluid (HTF) Low Solids (LS) mixed to 50% concentration. The WEG coolant and RESS should be:

- Inspected for proper fill level and freeze point (-40°C or less) annually
- Flushed with deionized water every 5 years

Valvoline EV HTF LS coolant or deionized water may be added to correct the freeze point.

## **5.9 DTI MAINTENANCE**

### **5.9.1 DTI Inspection.**

Clean and inspect the exterior of the DTI at regular intervals. Location of the DTI and vehicle operating conditions determine the frequency of inspections.

Inspect the DTI for:

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

### **5.9.2 DTI Coolant.**

The DTI is cooled via a water and ethylene glycol (WEG) solution of deionized water and Valvoline EV Heat Transfer Fluid (HTF) Low Solids (LS) mixed to 50% concentration. The coolant circuit is shared with the high voltage electric accessory inverter (VEPI). The WEG coolant and DTI should be:

- Inspected for proper fill level and freeze point (-40°C or less) annually
- Flushed with deionized water every 5 years

Valvoline EV HTF LS coolant or deionized water may be added to correct the freeze point.

## 5.10 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 eGen Flex control components, DTI or RESS.

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## 6.0 CUSTOMER SERVICE

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### 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 [allisontransmission.com](http://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, DTI and RESS serial numbers. This data is available on the nameplate of each component. Also provide the eGen Flex system identification number (SID)
- eGen Flex 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](http://www.allisontransmissionpublications.com)

For more information about Allison products please visit  
[allisontransmission.com](http://allisontransmission.com).

### **6.3 ALLISON TRANSMISSION DISTRIBUTORS**

See the Allison Transmission, Inc. Sales and Service Locator  
[www.allisontransmission.com/sales-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 2022/01 and 2022/04.

### **5-8. RESS MAINTENANCE**

2022/04 Added RESS Inspection and RESS Coolant information.

### **5-9. DTI MAINTENANCE**

2022/04 Added DTI Inspection and DTI Coolant information.

## NOTES



## NOTES

## NOTES



## A World Of Support

From our headquarters in Indianapolis, Indiana, USA, to our plants in Hungary and India, to more than 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 Allison Genuine Parts™.

**[allisontransmission.com](http://allisontransmission.com)**

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