ROUSH CLEANTECH

2016

Ford E-Series and F-Series Products

Liquid Propane Autogas Fuel System (4th Generation)

Includes:

E-450 Custom Body

F-59

Revision History		
-BA	Initial Release	5/2015

DIAGNOSTIC MANUAL

P-01B101-BA

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INTRODUCTION

SAFETY INFORMATION

The National Fire Protection Association (NFPA) publishes a code book of rules that apply to the storage, handling, transportation and use of liquefied petroleum gas (LP-Gas or LPG). The book is known as NFPA 58. It is revised as necessary and published every other year. This code is adopted as law in virtually every political subdivision in the United States. Check with your local authorities for regulations applicable to liquid propane.

Alert Messages

The following alert messages may appear from time to time in appropriate places in this manual. Ensure that all personnel read and adhere to these alert messages.

⚠ DANGER

Although propane is nontoxic, nonpoisonous, has the lowest flammability range of any alternative fuel and dissipates quickly when released into the atmosphere, propane vapor is heavier than air and seeks the lowest point. When the ratio of propane to air is between 2.2% and 9.6%, propane will burn in the presence of an ignition source at 940°F (504°C) or hotter. Keep away from heat, sparks, flames, static electricity or other sources of ignition. Failure to heed this danger may result in severe personal injury or death.

⚠ DANGER

The fuel supply lines remain pressurized after engine shutdown. Keep away from heat, sparks, flames, static electricity or other sources of ignition. Do NOT enter storage areas or confined space unless they are adequately ventilated. Failure to heed this danger may result in severe personal injury or death.

⚠ DANGER

Do NOT carry lighted smoking materials or smoke while working on fuel system components. Failure to heed this danger could result in severe personal injury or death.

⚠ DANGER

Disconnect the battery ground at the battery to ensure that the vehicle electrical system has no current. Failure to heed this danger could result in severe personal injury or death.

⚠ DANGER

Propane is heavier than air and seeks the lowest available level when released to the atmosphere. Keep heat, sparks, flames, static electricity or other sources of ignition out of the area when venting or purging the fuel lines or tank. Failure to heed this danger can result in severe personal injury or property damage.

⚠ DANGER

Technicians working with, or around, fuel systems should be properly trained to utilize extreme care and caution at all times. Failure to exercise extreme caution and care may lead to serious accidents which can result in property damage, personal injury and/or death.

⚠ WARNING

Liquid propane is cold. The temperature of propane in its liquid state at atmospheric pressure is –44°F (–42°C). Wear eye and ear protection during venting and repair operations. Keep moisture away from the valves. Failure to heed this warning can result in personal injury.

Installation, Garaging and Training

Chapter 11 of NFPA 58 applies to engine fuel systems using LP-Gas in internal combustion engines, including containers, container appurtenances, carburetion equipment, piping, hose and fittings and their installation. Additionally, this chapter applies to garaging of vehicles and to the training of personnel.

Paragraph 11.2 specifies that each person engaged in installing, repairing, filling or otherwise servicing an LP-Gas engine fuel system shall be trained. Contact the Propane Education and Research Council to learn more about their CETP E-Learning computer-based training program: courtney.gendron@propanecouncil.org, or vincent.sibilia@propanecouncil.org.

Purging and Venting (Tanks and Lines)

Venting of LP-Gas to the atmosphere is covered by paragraphs 7.3.1, General, and 7.3.2, Purging of NFPA 58, 2008 edition. Refer to NFPA 58, Local Codes and Proper Training for specific information relating to safe venting of LPG.

TROUBLESHOOTING

DIAGNOSTIC TROUBLE CODES

About Diagnostic Trouble Codes

All diagnostic trouble codes (DTCs) known to be affected by the liquid propane autogas (LPA) system are covered in this manual. For all other DTCs, refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* at www.motorcraft.com.

System and Diagnostic Terminology

Acronym or Abbreviation	Description
BS	Bleed Solenoid
CAN	Controller Area Network
DTC	Diagnostic Trouble Code
EFPR	Electronic Fuel Pump Relay
ERFS	Electronic Returnless Fuel System
EVAP	Evaporative
FCS	Flow Control Solenoid
FLIM	Fuel Level Interface Module
FLS	Fuel Level Sender
FP	Fuel Pump
FPCM	Fuel Pump Control Module
FRP	Fuel Rail Pressure
FRPCM	Fuel Rail Pressure Control Module
FTS	Fuel Temperature Sensor
GRD	Ground
HEGO	Heated Exhaust Gas Oxygen
IC	Instrument Cluster
IPTS	Injection Pressure Temperature Sensor
KOEO	Key On Engine Off
KOER	Key On Engine Running
LPA	Liquid Propane Autogas
MAF	Mass Air Flow
OEM	Original Equipment Manufacturer
OPD	Overfill Protection Device
PCM	Powertrain Control Module
PID	Parameter Identification
PWR GND	Power Ground
SIG RTN	Signal Return
SRM	Smart Relay Module
SS	Supply Solenoid
TPTS	Tank Pressure Temperature Sensor
TS	Tank Solenoid
VMV	Vapor Management Valve
VPWR	Voltage Power
VREF	Voltage Reference
WOT	Wide Open Throttle

Diagnostic Trouble Code List

Code	Description
P0005	Fuel Shutoff Valve “A” Control Circuit/Open
P0090	Fuel Pressure Regulator Circuit/Open
P009B	Fuel Pressure Relief Control Circuit/Open
P009E	Fuel Pressure Relief Control Performance/Stuck Off
P0148	Fuel Delivery Error
P0171	System Too Lean (Bank 1)
P0172	System Too Rich (Bank 1)
P0174	System Too Lean (Bank 2)
P0175	System Too Rich (Bank 2)
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance
P0182	Fuel Temperature Sensor “A” Circuit Low
P0183	Fuel Temperature Sensor “A” Circuit High
P0190	Fuel Rail Pressure Sensor Circuit (Bank 1)
P0192	Fuel Rail Pressure Sensor Circuit Low (Bank 1)
P0193	Fuel Rail Pressure Sensor Circuit High (Bank 1)
P01A0	Alternate Fuel Tank “A” Pressure Sensor Circuit Low
P01A1	Alternate Fuel Tank “A” Pressure Sensor Circuit High
P01A2	Alternative Fuel Tank "A" Pressure Sensor Circuit Intermittent/Erratic
P01AC	Alternate Fuel Tank Temperature Sensor Circuit Low
P01AD	Alternate Fuel Tank Temperature Sensor High
P01AE	Alternate Fuel Tank Temperature Sensor Circuit Intermittent/Erratic
P025A	Fuel Pump Module “A” Control Circuit/Open
P025B	Fuel Pump Module “A” Control Circuit Range/Performance
P027B	Fuel Pump Module “B” Control Circuit Range/Performance
P03xx	Misfire
P0461	Fuel Level Sender “A” Circuit Range/Performance
P0462	Fuel Level Sender “A” Circuit Low
P0463	Fuel Level Sender “A” Circuit High
P0627	Fuel Pump “A” Control Circuit Open
P064A	Fuel Pump Control Module “A”
P116E	Fuel Pressure Relief Valve Actuated
P1453	Fuel Tank Pressure Relief Valve Malfunction
P2195	Heated Exhaust Gas Oxygen Sensor Stuck
P2197	Heated Exhaust Gas Oxygen Sensor Stuck
P25B0	Fuel Level Sensor “A” Stuck
P2632	Fuel Pump “B” Control Circuit/Open
P2665	Fuel Shutoff Valve “B” Control Circuit/Open
P26B3	Fuel Shutoff Valve “A” Control Circuit Performance/Stuck Off
P26B5	Fuel Shutoff Valve “B” Control Circuit Performance/Stuck Off
P26EA	Fuel Pump Control Module “B”
U0108	Lost Communication with Alternative Fuel Control Module

Code	Description
U0109	Lost Communication with Fuel Pump Control Module “A”
U016C	Lost Communication with Fuel Pump Control Module “B”
U210B	Lost Communication Between Fuel Pump Control Module “A” and Restraint Control Module
U210C	Lost Communication Between Fuel Pump Control Module “B” and Restraint Control Module

Calibration Release OBD Summary Chart

	Cert	Calibration	OBD Class	Detail Chart	Comments
Vehicle		**(03P150)**			
E-450	50S	PGJC-Ax, Bx, Cx, Dx	EMD+	E-Series 6.8L HDE	EMD+
F-59 (Step Van)	50S	PFMB-Ax	EMD+	F-Series 6.8L HDE	EMD+

Calibration Release OBD Summary Chart

		E-Series 6.8L HDE Group E-450	**F-Series 6.8L HDE Group** F-59
Code	**Description**	**2016**	**2015**
P0005	Fuel Shutoff Valve "A" Control Circuit/Open	1	1
P0090	Fuel Pressure Regulator Control Circuit/Open	1	1
P009B	Fuel Pressure Relief Control Circuit/Open	2	2
P009E	Fuel Pressure Relief Control Performance/Stuck Off	2	2
P0148	Fuel Delivery Error	1	1
P0171	System Too Lean (Bank 1)	2	2
P0172	System Too Rich (Bank 1)	2	2
P0174	System Too Lean (Bank 2)	2	2
P0175	System Too Rich (Bank 2)	2	2
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	1	1
P0182	Fuel Temperature Sensor “A” Circuit Low	2	2
P0183	Fuel Temperature Sensor “A” Circuit High	2	2
P0190	Fuel Rail Pressure Sensor Circuit (Bank 1)	2	2
P0192	Fuel Rail Pressure Sensor Circuit Low (Bank 1)	2	2
P0193	Fuel Rail Pressure Sensor Circuit High (Bank 1)	2	2
P01A0	Alternate Fuel Tank “A” Pressure Sensor Circuit Low	1	1
P01A1	Alternate Fuel Tank “A” Pressure Sensor Circuit High	1	1
P01A2	Alternative Fuel Tank "A" Pressure Sensor Circuit Intermittent/Erratic	1	1
P01AC	Alternate Fuel Tank Temperature Sensor Circuit Low	1	1
P01AD	Alternate Fuel Tank Temperature Sensor High	1	1
P01AE	Alternate Fuel Tank Temperature Sensor Circuit Intermittent/Erratic	1	1
P025A	Fuel Pump Module “A” Control Circuit/Open	1	1

		E-Series 6.8L HDE Group E-450	F-Series 6.8L HDE Group F-59
Code	**Description**	**2016**	**2015**
P025B	Fuel Pump Module “A” Control Circuit Range/Performance	1	1
P027B	Fuel Pump Module “B” Control Circuit Range/Performance	1	1
P03xx	Misfire	1	1
P0461	Fuel Level Sensor “A” Circuit Range/Performance	1	1
P0462	Fuel Level Sensor “A” Circuit Low	1	1
P0463	Fuel Level Sensor “A” Circuit High	1	1
P0627	Fuel Pump “A" Control Circuit Open	1	1
P064A	Fuel Pump Control Module “A”	1	0
P116E	Fuel Pressure Relief Valve Actuated	1	1
P1453	Fuel Tank Pressure Relief Valve Malfunction	1	1
P2195	Heated Exhaust Gas Oxygen Sensor Stuck	2	2
P2197	Heated Exhaust Gas Oxygen Sensor Stuck	2	2
P25B0	Fuel Level Sensor “A” Stuck	1	1
P2632	Fuel Pump “B” Control Circuit/Open	1	1
P2665	Fuel Shutoff Valve "B" Control Circuit/Open	1	1
P26B3	Fuel Shutoff Valve “A” Control Circuit Performance/Stuck Off	1	1
P26B5	Fuel Shutoff Valve "B" Control Circuit Performance/Stuck Off	1	1
P26EA	Fuel Pump Control Module “B”	1	0
U0108	Lost Communication with Alternative Fuel Control Module	2	2
U0109	Loss of Communication on Fuel Pump Control Module “A”	1	1
U016C	Loss of Communication on Fuel Pump Control Module “B”	1	1
U201B	Lost Communication Between Fuel Pump Control Module “A” and Restraint Control Module	0	1
U210C	Lost Communication Between Fuel Pump Control Module “B” and Restraint Control Module	0	1

0	Code not present
1	DTC – non MIL
2	DTC – MIL (two trips)

Flow Control Solenoid

P0090 — Fuel Pressure Regulator Circuit Open

Description	FCS circuit fault. SRM monitors FCS circuit for open and short circuit faults.
Possible Causes	• Short to voltage • Water in the harness connector • Open power circuit • GND circuit • Low battery voltage • Corrosion • Incorrect connections • Damaged FCS coil • Blown fuse
Symptom	Fuel pressure in the rail does not change when commanded. Extended fuel rail flush time.
Diagnostic Aid	Check the FRPCM and SRM electrical connector for damage, corrosion and water intrusion.
Action	Refer to the *Fuel Rail Pressure Control Module Electrical Check* procedure in *Diagnostic Tests and Procedures*.

Bleed Solenoid

P009E/P26B3 — Fuel Pressure Relief Control Performance Stuck Off/Fuel Shutoff Valve "A" Control Circuit Performance Stuck Off

Description	Fuel rail failed to bleed. The PCM measures fuel rail pressure on key-up to determine if fuel rail has been properly bled.
Possible Causes	• BS did not open • FRPCM check valve leaked (P26B3) • FRPCM supply solenoid leaked (P26B3) • Bleed port (bleed rate restrictor in outlet to VMV) clogged • EVAP line kinked • Blown fuse
Symptom	Fuel pressure present in the fuel rail after bleed event should have occurred; this may result in hard starts.
Diagnostic Aid	Check that FRPCM bleeds fuel from rail. Leaks to FRPCM can also trigger a fault.
Action	Refer to the *Fuel System Fails to Bleed* procedure in *Diagnostic Tests and Procedures*.

P009B — Fuel Pressure Relief Control Circuit Open

Description	Bleed solenoid circuit fault. The SRM monitors bleed solenoid circuit for open and short circuit faults.
Possible Causes	• Short to voltage • Water in the harness connector • Open power circuit • Open GND circuit • Low battery voltage • Corrosion • Incorrect connections • Damaged BS coil
Symptom	Fuel rail bleed system does not operate correctly. There is a potential for fuel odor or hard start.
Diagnostic Aid	Check the FRPCM and SRM electrical for damage, corrosion and water intrusion.
Action	Refer to the *Fuel Rail Pressure Control Module Electrical Check* procedure in *Diagnostic Tests and Procedures*.

Tank Solenoid

P0005 — Fuel Shutoff Valve “A” Control Circuit Open

Description	TS circuit fault. The SRM monitors tank solenoid circuit for open and short circuit faults.
Possible Causes	• Short to voltage • Water in the harness connector • Open power circuit • Open GND circuit • Low battery voltage • Corrosion • Incorrect connections • Damaged TS coil • Blown fuse
Symptom	Vehicle does not start. The pumps run but no pressure builds in the fuel rail.
Diagnostic Aid	Check the FRPCM and SRM electrical connectors for damage, corrosion and water intrusion.
Action	Refer to the *Tank Solenoid Electrical Check* procedure in *Diagnostic Tests and Procedures*.

Fuel Rail Pressure Control Module Supply Solenoid and Wiring

P26B5 — Fuel Shutoff Valve "B" Control Circuit Performance/Stuck Off

Description	Fuel supply solenoid stuck. The SRM monitors fuel rail pressure before and after the solenoid was commanded open. If the pressure rise is below a threshold, the fault is set.
Possible Causes	• Electrical fault • Damaged SS coil • Damaged SS armature • Excess flow valve tripped • Tank solenoid stuck closed • Tank manual valve closed • Fuel pumps not powering on • Blown fuse
Symptom	Vehicle does not start. The pumps run (or may not) but no pressure builds in the fuel rail.
Diagnostic Aid	Check the FRPCM and SRM electrical connectors for damage, corrosion and water intrusion.
Action	Refer to the *Engine Cranks, No Start* procedure in *Diagnostic Tests and Procedures*.

P2665 — Fuel Shutoff Valve "B" Control Circuit/Open

Description	FRPCM supply solenoid circuit fault. SRM monitors supply solenoid circuit for open and short circuit faults.
Possible Causes	• Short to voltage • Water in the harness connector • Open power circuit • Open GND circuit • Low battery voltage • Corrosion • Incorrect connections • Damaged SS coil • Blown fuse
Symptom	Vehicle does not start. The pumps run but no pressure builds in the fuel rail.
Diagnostic Aid	Check the FRPCM and SRM electrical connectors for damage, corrosion and water intrusion.
Action	Refer to the *Fuel Rail Pressure Control Module Electrical Check* procedure in *Diagnostic Tests and Procedures.*

SRM, CAN Bus Circuit Wiring

U0108 — Lost Communication with Alternative Fuel Control Module

Description	Lost communication with SRM. The PCM monitors CAN bus communication for missing messages from the SRM. If the messages are continuously missing, a fault is set.
Possible Causes	• Wiring between the SRM and PCM • SRM lacks power • Blown fuse
Symptom	Rough idle.
Diagnostic Aid	Check the FRPCM and SRM electrical connectors for damage, corrosion and water intrusion. Check for power at the SRM.
Action	Refer to the *Smart Relay Module Electrical Check* procedure in *Diagnostic Tests and Procedures*.

Fuel System

P0148 — Fuel Delivery Error

Description	LPA system is operating in vapor space. At least one bank is lean at WOT.
Possible Causes	• Severely restricted fuel filter • Severely restricted fuel supply line • Damaged or worn fuel pump • Damaged or contaminated MAF sensor • Excess flow valve tripped • TS or SS closed • Tank manual shutoff valve not completely open
Symptom	Vehicle hesitation or stall condition.
Diagnostic Aid	—
Action	Refer to the *Engine Cranks, No Start* procedure in *Diagnostic Tests and Procedures*.

P116E — Fuel Pressure Relief Valve Actuated

Description	Maximum injection pressure reached. The PCM monitors fuel rail pressure and battery voltage. Based on these measurements, the PCM adjusts fuel pump speed to stay below the maximum operating pressure of the injectors.
Possible Causes	• Operating the vehicle in high ambient conditions • Vehicle operated in a low voltage condition
Symptom	Vehicle hesitation, stall, rough idle, misfire or no start.
Diagnostic Aid	The P116E code is meant as an indication that the fuel system was operated at the limits of the system. The customer may have experienced drive issues although the system is performing as expected.
Action	Refer to the *Maximum Pressure Check* procedure in *Diagnostic Tests and Procedures*.

P0171, P0174 — System Too Lean (Bank 1 and Bank 2 respectively)

Description	Refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* for more descriptive information.
Possible Causes	• The LPA system was operated in the vapor region • Refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* for a list of other causes.
Symptom	—
Diagnostic Aid	Verify that no LPA system faults are present and then follow the Ford service manual procedure.
Action	Refer to the *Fuel Pressure Drop Check* procedure in *Diagnostic Tests and Procedures*.

P0172, P0175 — System Too Rich (Bank 1 and Bank 2 respectively)

Description	Refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* for more descriptive information.
Possible Causes	• The LPA system was operated in the vapor region • Refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* for a list of other causes.
Symptom	—
Diagnostic Aid	Verify that no LPA system faults are present and then follow the Ford service manual procedure.
Action	Refer to the *Fuel Pressure Drop Check* procedure in *Diagnostic Tests and Procedures*.

P1453 — Fuel Tank Pressure Relief Valve Malfunction

Description	The SRM reads the FPTS and passes the voltage reading over the CAN bus to the PCM. If the pressure value of the propane fuel tank approaches the Pressure Relief Valve “pop-off” pressure, a fault is set.
Possible Causes	• High ambient temperature operation • Propane tank fill is contaminated with nitrogen or other constituents • Vehicle is parked over heat source
Symptom	The driver is alerted with a coolant gauge High setting until the fault condition clears.
Diagnostic Aid	
Action	Refer to TBD

P03xx — Misfire

Description	Refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* for more descriptive information.
Possible Causes	• The LPA system was operated in the vapor region • Refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* for a list of other causes.
Symptom	—
Diagnostic Aid	Verify that no LPA system faults are present and then follow the Ford service manual procedure.
Action	Refer to the *Fuel Pressure Drop Check* procedure in *Diagnostic Tests and Procedures*.

Heated Exhaust Gas Oxygen Sensor

P2195, P2197 — Heated Exhaust Gas Oxygen Sensor Stuck

Description	Refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* for more descriptive information.
Possible Causes	• The LPA system was operated in the vapor region • Refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* for a list of other causes.
Symptom	—
Diagnostic Aid	Verify that no LPA system faults are present and then follow the Ford service manual procedure.
Action	Refer to the *Fuel Pressure Drop Check* procedure in *Diagnostic Tests and Procedures.*

Electronic Fuel Pump Relay (A/B)

U0109, U016C — Lost Communication with Fuel Pump Control Module A/B

Description	The SRM repeats the signal from the second EFPR to the PCM over the CAN bus. The PCM monitors this communication. If there is a lack of communication for a long enough period of time, a fault is set.
Possible Causes	• Wire fault between the EFPR and SRM • Wire fault between SRM and PCM • No power to the EFPR • SRM fault • CAN bus fault • Blown fuse • Refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* for a list of other causes.
Symptom	—
Diagnostic Aid	—
Action	Refer to the *Fuel Pump Control Module Electrical Continuity Test* procedure and also the *Smart Relay Module Electrical Test* procedure in *Diagnostic Tests and Procedures*.

P025A — Fuel Pump Module "A" Control Circuit/Open

Description	The SRM receives the output of the second fuel pump monitor line and repeats the output over the CAN bus to the PCM. The PCM monitors the commanded output versus the monitor's feedback. If the monitor is out-of-range, a fault is set.
Possible Causes	Refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* for a list of other causes.
Symptom	Poor starts, rough idle, hesitation/surge.
Diagnostic Aid	—
Action	Refer to the *Fuel Pump Control Module Electrical Continuity Test* procedure in *Diagnostic Tests and Procedures*.

P025B — Fuel Pump Module "A" Control Circuit Range/Performance

Description	The Fuel Pump Control Module (FPCM) A receives control commands from the PCM on a Fuel Pump Command (FPC) pin. The FPCM A passes diagnostic information on the CAN bus to the PCM. If the FPCM A receives an invalid control command from the PCM on the FPC, it sends a corresponding signal to the PCM on the CAN bus and the fault is set.
Possible Causes	Refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* for a list of other causes.
Symptom	—
Diagnostic Aid	
Action	Refer to the *Fuel Pump Control Module Electrical Continuity Test* procedure in *Diagnostic Tests and Procedures*.

P027B — Fuel Pump Module "B" Control Circuit Range/Performance

Description	The Fuel Pump Control Module (FPCM) B receives control commands from the PCM on a Fuel Pump Command (FPC) pin. The FPCM B passes diagnostic information on the CAN bus to the PCM. If the FPCM B receives an invalid control command from the PCM on the FPC, it sends a corresponding signal to the PCM on the CAN bus and the fault is set.
Possible Causes	Refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* for a list of other causes.
Symptom	—
Diagnostic Aid	
Action	Refer to the *Fuel Pump Control Module Electrical Continuity Test* procedure in *Diagnostic Tests and Procedures*.

U210B — Lost Communication Between Fuel Pump Control Module "A" and Restraint Control Module

Description	The FPCM A constantly receives either an OK signal or a disable signal from the RCM on a dedicated "disable" wire. The FPCM A passes diagnostic information on the CAN bus to the PCM. If the FPCM A fails to receive a signal from the RCM, the FPCM A passes a signal, indicating it lost communication with the RCM, to the PCM and the fault is set.
Possible Causes	• Wire fault between EFPR "A" and RCM • Wire fault between SRM and PCM • No power to the EFPR "A" • SRM fault • CAN fault • Blown fuse • RCM failure • EFPR "A" failure
Symptom	
Diagnostic Aid	
Action	

U210C — Lost Communication Between Fuel Pump Control Module "B" and Restraint Control Module

Description	The FPCM B constantly receives either an OK signal or a disable signal from the RCM on a dedicated "disable" wire. The FPCM B passes diagnostic information on the CAN bus to the SRM. The SRM passes that diagnostic information on the CAN bus to the PCM. If the FPCM B fails to receive a signal from the RCM, the FPCM B passes a signal, indicating it lost communication with the RCM, to the SRM. The SRM passes that signal on the CAN bus to the PCM and the fault is set.
Possible Causes	• Wire fault between EFPR "B" and RCM • Wire fault between SRM and PCM • No power to the EFPR "B" • SRM fault • CAN fault • Blown fuse • RCM failure • EFPR "B" failure
Symptom	
Diagnostic Aid	
Action	

P0627 — Fuel Pump "A" Control Circuit Open

Description	The Fuel Pump Control Module (FPCM) A diagnoses faults of fuel pump A. The FPCM A passes diagnostic information on the CAN bus to the PCM. If the PCM receives a FPCM A signal indicating a fuel pump problem, the fault is set.
Possible Causes	• Wiring fault between FPCM A and fuel pump A • Open circuit • FPCM A fault • CAN fault
Symptom	—
Diagnostic Aid	
Action	Refer to the *Fuel Pump Control Module Electrical Continuity Test* procedure in *Diagnostic Tests and Procedures*.

P064A — Fuel Pump Control Module "A"

Description	The Fuel Pump Control Module (FPCM) A has its own internal diagnostics. The FPCM A passes diagnostic information on the CAN bus to the PCM. If the PCM receives a FPCM A signal indicating an internal problem, the fault is set.
Possible Causes	• FPCM A fault • CAN fault
Symptom	—
Diagnostic Aid	
Action	Refer to the *Fuel Pump Control Module Electrical Continuity Test* procedure in *Diagnostic Tests and Procedures*.

P2632 — Fuel Pump "B" Control Circuit/Open

Description	The Fuel Pump Control Module (FPCM) B diagnoses faults of fuel pump B. The FPCM B passes diagnostic information on the CAN bus to the PCM. If the PCM receives a FPCM B signal indicating a fuel pump problem, the fault is set.
Possible Causes	• Wiring fault between FPCM A and fuel pump A • Open circuit • FPCM A fault • CAN fault
Symptom	—
Diagnostic Aid	
Action	Refer to the *Fuel Pump Control Module Electrical Continuity Test* procedure in *Diagnostic Tests and Procedures*.

P26EA — Fuel Pump Control Module "B"

Description	The Fuel Pump Control Module (FPCM) B has its own internal diagnostics. The FPCM B passes diagnostic information on the CAN bus to the PCM. If the PCM receives a FPCM B signal indicating an internal problem, the fault is set.
Possible Causes	• FPCM B fault • CAN fault
Symptom	—
Diagnostic Aid	
Action	Refer to the *Fuel Pump Control Module Electrical Continuity Test* procedure in *Diagnostic Tests and Procedures*.

Integrated Pressure Temperature Sensor

P0181 — Fuel Temperature Sensor "A" Circuit Range/Performance

Description	The SRM reads the IPTS and passes the voltage reading over the CAN bus to the PCM. The PCM monitors the voltage as if the sensor were plugged into the vehicle.
Possible Causes	• CAN bus fault between the SRM and PCM • Wiring fault between IPTS and SRM • Short in harness • Short in harness • Open circuit • Open or short to voltage in harness • Incorrect harness connection • Damaged IPTS • IPTS failure • SRM failure
Symptom	—
Diagnostic Aid	Verify the fuel rail temperature PID value to determine open or short.
Action	Refer to the *Injection Pressure Temperature Sensor Electrical Check* procedure in *Diagnostic Tests and Procedures*.

P0182 — Fuel Temperature Sensor "A" Circuit Low

Description	The SRM reads the IPTS and passes the voltage reading over the CAN to the PCM monitors the voltage as if the sensor were plugged into the vehicle.
Possible Causes	• CAN bus fault between the SRM and PCM • Wiring fault between IPTS and SRM • Short in harness • VREF open or short • Low ambient temperature operation • Incorrect harness connection • Damaged IPTS (or FTS) • IPTS failure • SRM failure
Symptom	—
Diagnostic Aid	Verify the fuel rail temperature PID value to determine open or short.
Action	Refer to the *Injection Pressure Temperature Sensor Electrical Check* procedure in *Diagnostic Tests and Procedures*.

P0183 — Fuel Temperature Sensor "A" Circuit High

Description	The SRM reads the IPTS and passes the voltage reading over the CAN bus to the PCM. The PCM monitors the voltage as if the sensor were plugged into the vehicle.
Possible Causes	• CAN bus fault between the SRM and PCM • Wiring fault between IPTS and SRM • Open circuit • Open or short to voltage in harness • Incorrect harness connection • Damaged IPTS (FTS) • IPTS failure • SRM failure
Symptom	—
Diagnostic Aid	Verify the fuel rail temperature PID value to determine open or short.
Action	Refer to the *Injection Pressure Temperature Sensor Electrical Check* procedure in *Diagnostic Tests and Procedures*.

P0190 — Fuel Rail Pressure Sensor Circuit

Description	The SRM reads the IPTS and passes the voltage reading over the CAN bus to the PCM. The PCM monitors the voltage as if the sensor were plugged into the vehicle.
Possible Causes	• CAN bus fault between the SRM and PCM • Wiring fault between IPTS and SRM • VREF open in harness • VREF open in sensor • Vacuum leaks • IPTS failure • SRM failure
Symptom	—
Diagnostic Aid	VREF should be between 4–6 volts.
Action	Refer to the *Injection Pressure Temperature Sensor Electrical Check* procedure in *Diagnostic Tests and Procedures*.

P0192 — Fuel Rail Pressure Sensor Circuit Low

Description	The SRM reads the IPTS and passes the voltage reading over the CAN bus to the PCM. The PCM monitors the voltage as if the sensor were plugged into the vehicle.
Possible Causes	• CAN bus fault between the SRM and PCM • Wiring fault between IPTS and SRM • IPTS FRP signal short to SIG RTN or PWR GND • Damaged IPTS (or FRP) • IPTS failure • SRM failure
Symptom	—
Diagnostic Aid	A FRP PID value during ignition ON, engine OFF, or ignition ON, engine running is less than 0.3 volt. This indicates a concern is present.
Action	Refer to the *Injection Pressure Temperature Sensor Electrical Check* procedure in *Diagnostic Tests and Procedures*.

P0193 — Fuel Rail Pressure Sensor Circuit High

Description	The SRM reads the IPTS and passes the voltage reading over the CAN bus to the PCM. The PCM monitors the voltage as if the sensor were plugged into the vehicle.
Possible Causes	• CAN bus fault between the SRM and PCM • Wiring fault between IPTS and SRM • IPTS FRP signal short to VREF or VPWR • IPTS (or FRP) open signal • Damaged IPTS (or FRP) • IPTS failure • SRM failure
Symptom	—
Diagnostic Aid	Verify the FRP PID value to determine open or short.
Action	Refer to the *Injection Pressure Temperature Sensor Electrical Check* procedure in *Diagnostic Tests and Procedures*.

P01A0 — Alternate Fuel Tank “A” Pressure Sensor Circuit Low

Description	The SRM reads the TPTS and passes the voltage reading over the CAN bus to the PCM. The PCM monitors the voltage as if the sensor were plugged into the vehicle.
Possible Causes	• CAN bus fault between the SRM and PCM • Wiring fault between TPTS and SRM • VREF open in harness • VREF open in sensor • Vacuum leaks • TPTS failure • SRM failure
Symptom	—
Diagnostic Aid	VREF should be between 4-6 volts.
Action	Refer to the *Tank Pressure Temperature Sensor Electrical Check* procedure in the *Diagnostic Tests and Procedures*.

P01A1 — Alternate Fuel Tank "A" Pressure Sensor Circuit High

Description	The SRM reads the TPTS and passes the voltage reading over the CAN bus to the PCM. The PCM monitors the voltage as if the sensor were plugged into the vehicle.
Possible Causes	• CAN bus fault between the SRM and PCM • Wiring fault between TPTS and SRM • TPTS Fuel Pressure signal short to SIG RTN or PWR GND • TPTS (or Fuel Pressure) open signal • Damaged TPTS • TPTS failure • SRM failure
Symptom	—
Diagnostic Aid	Verify the Propane Tank Fuel Pressure PID value to determine open or short.
Action	Refer to the *Tank Pressure Temperature Sensor Electrical Check* procedure in the *Diagnostic Tests and Procedures*.

P01A2 — Alternative Fuel Tank "A" Pressure Sensor Circuit Intermittent/Erratic

Description	The SRM reads the TPTS and passes the voltage reading over the CAN bus to the PCM. The PCM monitors the voltage as if the sensor were plugged into the vehicle.
Possible Causes	• CAN bus fault between the SRM and PCM • Intermittent wiring fault between TPTS and SRM • TPTS Fuel Pressure intermittent signal short to SIG RTN or PWR GND • TPTS (or Fuel Pressure) intermittent open signal • VREF intermittent open in harness • VREF intermittent open in sensor • Vacuum leaks • Damaged FPTS • FPTS failure • SRM failure
Symptom	—
Diagnostic Aid	Verify the Propane Tank Fuel Pressure PID value to determine open or short.
Action	Refer to the *Tank Pressure Temperature Sensor Electrical Check* procedure in the *Diagnostic Tests and Procedures*.

P01AC — Alternate Fuel Tank Temperature Sensor Circuit Low

Description	The SRM reads the TPTS and passes the voltage reading over the CAN bus to the PCM. The PCM monitors the voltage as if the sensor were plugged into the vehicle.
Possible Causes	• CAN bus fault between the SRM and PCM • Wiring fault between TPTS and SRM • Short in harness • VREF open or short • Low ambient temperature operation • Incorrect harness connection • Damaged FPTS • FPTS failure • SRM failure
Symptom	—
Diagnostic Aid	Verify the Propane Tank Fuel Pressure PID value to determine open or short.
Action	Refer to the *Tank Pressure Temperature Sensor Electrical Check* procedure in the *Diagnostic Tests and Procedures*.

P01AD — Alternate Fuel Tank Temperature Sensor Circuit High

Description	The SRM reads the TPTS and passes the voltage reading over the CAN bus to the PCM. The PCM monitors the voltage as if the sensor were plugged into the vehicle.
Possible Causes	• CAN bus fault between the SRM and PCM • Wiring fault between TPTS and SRM • Open circuit • Open or short to voltage in harness • Incorrect harness connection • Damaged FPTS • FPTS failure • SRM failure
Symptom	—
Diagnostic Aid	Verify the Fuel Temperature PID value to determine open or short.
Action	Refer to the *Tank Pressure Temperature Sensor Electrical Check* procedure in the *Diagnostic Tests and Procedures*.

P01AE — Alternative Fuel Tank Temperature Sensor Circuit Intermittent/Erratic

Description	The SRM reads the TPTS and passes the voltage reading over the CAN bus to the PCM. The PCM monitors the voltage as if the sensor were plugged into the vehicle.
Possible Causes	• CAN bus fault between the SRM and PCM • Intermittent wiring fault between TPTS and SRM • TPTS Fuel Pressure intermittent signal short to SIG RTN or PWR GND • TPTS (or Fuel Pressure) intermittent open signal • VREF intermittent open in harness • VREF intermittent open in sensor • Vacuum leaks • Damaged FPTS • TPTS failure • SRM failure
Symptom	—
Diagnostic Aid	Verify the Propane Tank Fuel Pressure PID value to determine open or short.
Action	Refer to the *Tank Pressure Temperature Sensor Electrical Check* procedure in the *Diagnostic Tests and Procedures*.

Fuel Level Sender

P0461 — Fuel Level Sender "A" Circuit Range/Performance

Description	Refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* for more descriptive information.
Possible Causes	Refer to the Ford service manual. Causes are the same except that communication is between the sender and the SRM and not the IC.
Symptom	—
Diagnostic Aid	The SRM reads fuel level sender input and broadcasts it to the IC and PCM.
Action	Refer to the *Fuel Level Indication System Check* procedure in *Diagnostic Tests and Procedures*.

P0462 — Fuel Level Sender "A" Circuit Low

Description	This DTC sets when the Fuel Level Gauge signal is electrically less than the minimum allowable sender value.
Possible Causes	• Fuel level sender wiring shorted to ground • Damaged Fuel Level Sender • Smart Relay Module
Symptom	P0462 — Fuel gauge may read empty all the time P2067 — Fuel gauge will only show primary tank
Diagnostic Aid	Smart Relay Module (SRM) reads fuel level sender and broadcasts to the PCM and Instrument Cluster.
Action	Refer to the following tests located later in this manual. • *SRM Electrical Test* • *Fuel Level Sender Test* • *Fuel Level Interface Module*

P0463 — Fuel Level Sender "A" Circuit High

Description	This DTC sets when the Fuel Level Gauge signal is electrically less than the minimum allowable sender value.
Possible Causes	• Fuel level sender wiring is disconnected or shorted to above 5 volts • Damaged Fuel Level Sender • Smart Relay Module
Symptom	P0463 — Fuel gauge may read full all the time P2068 — Fuel gauge will only show primary tank
Diagnostic Aid	Smart Relay Module (SRM) reads fuel level sender and broadcasts to the PCM and Instrument Cluster.
Action	Refer to the following tests located later in this manual. • *SRM Electrical Test* • *Fuel Level Sender Test* • *Fuel Level Interface Module*

P25B0 — Fuel Level Sensor “A” Stuck

Description	The SRM reads Fuel Level Sender (FLS) input and broadcasts it to the IC and PCM. If the vehicle is driven a considerable distance and the FLS value doesn't change, the fault is set.
Possible Causes	• Fuel Level Sender fault • Wire fault between FLS and SRM • SRM fault
Symptom	The driver is unaware of a low fuel condition.
Diagnostic Aid	
Action	Refer to the *Fuel Level Indication System Check* procedure in *Diagnostic Tests and Procedures*.

Secondary Tank – Fuel Will Not Transfer

F-650 vehicles can be equipped with a unique ROUSH CleanTech liquid propane autogas storage system which includes two fuel tanks. The system operates as if it were just one large tank. A few key points about the system:

- The engine is always running from the driver's side tank. All fuel to the engine, and the excess fuel returning to the tank, is only connected to this tank.
- The passenger's side tank is used to store extra fuel only. When the driver's side tank fuel level drops, the system will activate fuel pumps in passenger's side tank to transfer fuel automatically.
- Both tanks are filled at the same time from the single fuel filler located on the driver's side. There is a ball valve on the fill line for the right-hand tank, which is used for periodic inspections only. It should always be open during normal operation in order to use the full system capacity.

The ROUSH CleanTech control system reads the usable fuel level in each tank and adds them together to provide a single reading for the instrument cluster. However, if the system detects a failure in the fuel transfer system which may interfere with the ability to transfer fuel, it will provide a reading based on the driver's side tank only. This ensures that the driver is warned before the vehicle runs out of fuel. If this occurs, the vehicle is fully usable, but should be serviced in order to restore full function and use of the full system fuel capacity.

The fuel transfer line from the passenger's side tank is connected to a dedicated overfill prevention device (OPD) on the driver's side tank. This is a safety device which ensures that even if there is a fault in the control system, it is not possible for the driver's side tank to overfill during transfers.

Fuel Level Indication Check

The ROUSH CleanTech fuel level indication system differs from the gasoline system as the fuel level sender is not wired directly to the instrument cluster. Instead, the fuel level sender is wired to the SRM, which reads the fuel level and transmits the signal to the PCM via the CAN bus, which in turn simulates the resistance the instrument cluster expects to see for a given fuel level.

NOTE

The gauge on the sending unit must not be used for any diagnostics. The gauge is not accurate. Only voltage outputs should be used for diagnostic purposes.

Symptom	Cause/Action to be taken
Fuel gauge does not move on a partial fill	This behavior is not uncommon. The fuel level sender may not move far enough to trigger movement on the gauge if only a small amount of fuel is added to the tank. Once driven, the gauge may move to reflect the fill.
Malfunction Indicator Lamp (MIL)	There is a circuit fault that has been identified by the PCM. If customer fills vehicle with key ON this could cause the gauge not to move. Customer should drive vehicle for some time to allow gauge to move and fill with key OFF in the future. Initially follow the *Ford Powertrain Control/Emissions Diagnosis Service Manual,* whenever a circuit check is called for, refer to the *Fuel Level Interface Module Electrical Test* procedure.
Gauge points below E	This is an indication of an error state. Initially follow the *Ford Powertrain Control/Emissions Diagnosis Service Manual*, whenever a circuit check is recommended, refer to the *Fuel Level Sender Electrical Check* procedure.
Doesn't read full after a fill a. Tank should be filled on a level surface both front-to-back and side-to-side (a level needs to be placed on the vehicle to verify this). b. Tank pressure and sending unit resistance should be recorded prior to the fill and when the fuel station shuts off along with number of gallons filled. c. Differential and bypass pressure settings need to be confirmed on the fuel station and verified by fueling provider (station output pressure must be at least 25 psi greater than the vehicle tank pressure at time of filling. Recommended differential pressure settings are greater than 135 psi). d. HP rating of the pump on the station needs to be verified. (5 hp pump recommended.) **Note:** Fueling provider can fill unit on level ground with a bobtail to eliminate any issues that may be present with the fueling station. e. Fuel level electrical checks and SRM checks can be performed per the diagnostic manual.	This could be the result of either a fuel level sender fault or an OPD valve triggering prematurely. Refer to fill issues and the *Fuel Level Sender Electrical Check* procedure for more information.

The fuel pressure controls are designed to keep the rails at a certain pressure over tank pressure, therefore, it is important to measure tank pressure prior to collecting fuel rail pressure data. For example, if the fuel tank is at 150 psi (1034 kPa) and pressure in the rail is measured at 200 psi (1379 kPa), the rail is running at 50 psi (345 kPa) over tank.

Condition	Pump Speed	Pressure Over Tank
Engine Off	Off	<10
Idle	Low	>30
Part Throttle	Low	<25
Part Throttle	High	>25
WOT	High	>25

NOTE

Under extreme operating conditions, there is a third pump mode. In the event that the fuel system has degraded and the sensor detects vapor, or if the fuel rail pressure is approaching the limit of the fuel system, the pump runs in a variable speed mode, controlling to a target pressure. In this mode there is no predicted rise over tank pressure. The fuel pump will adjust the pressure to maintain a required operating pressure. This condition will likely result in a P116E or P0148 code.

No Fill

Step	Procedure	Action
1	**Inspect vehicle to check for kinked fill lines.** Are fill lines kinked?	**Yes** — Replaced kinked fill lines. **No** — Go to Step 2.
2	**Determine the location of the overflow protection device (OPD).** Is the OPD located in the end cap of the fuel tank?	**Yes** — Go to Step 3. **No** — Go to Step 6.
3	**Check the fuel gauge in the instrument cluster.** Is the gauge indicating less than 1/4 full?	**Yes** — Go to Step 4. **No** — Go to Step 6.
4	**Check to see if the OPD is being activated.** **NOTE** Fuel splashing off the sides of the empty tank could be activating the OPD float and shutting off the fuel fill line. a. Loosen the fuel fill line at the fill valve or at the inlet to the fuel filter to relieve any pressure in the fill line and release the OPD valve. Retighten the fill line. b. Install a fuel fill pressure tester on the fill valve and close the ball valve. c. Connect the fuel dispensing nozzle to the pressure tester and turn on the pump. Slightly open the ball valve to slowly add approximately 10 gal (38 L) of fuel. d. Did the tank fill?	**Yes** — Go to Step 5. **No** — Go to Step 6.
5	**Remove the fuel fill pressure tester and attempt to fill the vehicle fuel tank to full 80% capacity.** Does the vehicle fuel tank fill to capacity?	**Yes** — Diagnostic is complete. **No** — Go to Step 6.
6	**Check the fuel gauge in the instrument cluster.** Is the gauge indicating more than 1/2 full?	**Yes** — Go to Step 7. **No** — Go to Step 11.
7	**Reverse direction of vehicle at the pump and try to fill the vehicle.** Does the vehicle fuel tank fill?	**Yes** — Vehicle not on level ground. Diagnostic is complete. **No** — Drive vehicle until fuel gauge indicates less than 1/2 full and go to Step 8.

Step	Procedure	Action
8	**Attempt to fill the vehicle fuel tank.** Does the fuel tank fill?	**Yes** — Go to Step 9. **No** — Go to Step 11.
9	**Open bleeder valve.** Does liquid fuel vent?	**Yes** — Go to Step 10. **No** — Go to Step 12.
10	**Check fuel gauge.** Does fuel gauge read full?	**Yes** — Diagnostic complete. **No** — Refer to *Fuel Level Indication Check*.
11	**Check for sufficient fill station pressure.** a. Connect pressure gauge service tool to the fuel tank bleeder valve and record pressure. b. Using a fuel fill pressure tester installed on the fill valve, attempt to fill the vehicle. c. With the dispensing pump on and dispensing nozzle open, measure and record fill station pump pressure. d. Is fill station pump pressure at least 20 psi (138 kPa) greater than tank pressure?	**Yes** — Go to Step 12. **No** — Fill station may not be providing enough pressure to fill. Go to Step 19.
12	**Check body side fuel fill valve; it may be stuck closed.** a. Loosen the fuel fill line connection at the fill valve or at the inlet to the fuel filter to relieve any pressure in the fill line. b. Attempt to push open the piston in the fill valve to determine if it is stuck closed. c. Is the fill valve piston stuck closed?	**Yes** — Replace body-side fill valve and go to Step 13. **No** — Replace filter in the fuel fill line and go to Step 15.
13	**Attempt to fill the vehicle fuel tank.** Does the fuel tank fill?	**Yes** — Diagnostic is complete. **No** — Go to Step 14.
14	**Replace the filter in the fuel fill line and then attempt to fill the vehicle fuel tank.** Does the vehicle fuel tank fill?	**Yes** — Diagnostic is complete. **No** — Go to Step 16.
15	**Attempt to fill the vehicle fuel tank.** Does the fuel tank fill?	**Yes** — Diagnostic is complete. **No** — Go to Step 16.
16	**Replace the OPD valve in the vehicle fuel tank.** Is the OPD valve located in the end cap of the fuel tank?	**Yes** — Go to Step 17. **No** — Go to Step 18.
17	**Attempt to fill the vehicle fuel tank as follows:** **NOTE** When filling a new tank that has the OPD valve mounted in the end cap of the fuel tank, fuel splashing off the sides of the empty tank could be activating the OPD float and shutting off the fuel fill line. a. Install a fuel fill pressure tester on the fill valve and close the ball valve. b. Connect the fuel dispensing nozzle to the pressure tester and turn on the pump. Slightly open the ball valve to slowly add approximately 10 gal (38 L) of fuel. c. Remove the fuel fill pressure tester. d. Attempt to fill the remaining tank volume (to 80% full capacity) at full flow from the dispensing nozzle. e. Did the tank fill?	**Yes** — Diagnostic is complete. **No** — Call ROUSH CleanTech Customer Service at 800-597-6874.
18	**Attempt to fill the vehicle fuel tank.** Does the fuel tank fill?	**Yes** — Diagnostic is complete. **No** — Call ROUSH CleanTech Customer Service at 800-597-6874.

Step	Procedure	Action
19	**Fill station is not providing enough pressure to fill.** a. Using the tables provided at the front of this section, determine expected propane tank pressure based on ambient temperature. b. Is the vehicle fuel tank pressure greater than 20 psi (138 kPa) over the nominal expected pressure?	**Yes** — Go to Step 20. **No** — Locate a dispensing facility with pump output capacity in excess of 100 psi (689 kPa) (preferably an Auto Gas-type facility). Then, go to Step 12.
20	**Vehicle fuel tank is at a higher pressure.** a. Higher pressure is likely caused by heavy vehicle usage heating the fuel. b. Allow the vehicle (fuel tank) to cool and then recheck pressure in the fuel tank.	When tank pressure is within 10 psi (69 kPa) of expected tank pressure, go to Step 21.
21	**Measure and compare vehicle fuel tank and fill station pressures.** a. Connect a pressure gauge service tool to the fuel tank bleeder valve and record fuel tank pressure. b. Using a fuel fill pressure tester installed on the fill valve, attempt to fill the vehicle. c. With the dispensing pump on and dispensing nozzle open, measure and record fill station pump pressure. d. Is fill station pump pressure at least 20 psi (138 kPa) greater than fuel tank pressure?	**Yes** — Go to Step 22. **No** — Fill station is not providing enough pressure to fill vehicle tank. Go to Step 22. Locate a dispensing facility with pump output capacity in excess of 100 psi (689 kPa) (preferably an Auto Gas-type facility).
22	**Attempt to fill the vehicle fuel tank.** Does the fuel tank fill?	**Yes** — Diagnostic is complete. **No** — Go to Step 12.

Slow Fill

Step	Procedure	Action
1	**Inspect vehicle to check for kinked fill lines.** Are fill lines kinked?	**Yes** — Replaced kinked fill lines. **No** — Go to Step 2.
2	**Determine flow rate at which the vehicle fuel system fills.** a. Time the fill station pump for 10 seconds and record the number of gallons dispensed. b. Multiply the gallons dispensed by six to determine the flow rate in gallons per minute. c. Is the fill station pump flow rate at least 6 gal (23 L) per minute?	**Yes** — System fill rate is OK; diagnostic is complete. **No** — Fill station is not providing enough pressure to fill vehicle tank. Go to Step 3.
3	**Measure and compare vehicle fuel tank and fill station pressures.** a. Connect a pressure gauge service tool to the fuel tank bleeder valve and record fuel tank pressure. b. Using a fuel fill pressure tester installed on the fill valve, attempt to fill the vehicle. c. With the dispensing pump on and dispensing nozzle open, measure and record fill station pump pressure. d. Is fill station pump pressure at least 50 psi (345 kPa) greater than fuel tank pressure?	**Yes** — Go to Step 4. **No** — Fill station is not providing enough pressure to fill vehicle tank. Go to Step 11.
4	**Check fuel fill valve; it may not be opening completely.** a. Loosen the fuel fill line connection at the fill valve or at the inlet to the fuel filter to relieve any pressure in the fill line. b. Attempt to push open the piston in the fill valve to determine if it is opening completely. Piston should travel 1/4 inch. c. Is the fill valve piston opening completely?	**Yes** — Replace the filter in the fuel fill line and then go to Step 7. **No** — Replace the fuel fill valve and then go to Step 5.
5	**Attempt to fill the vehicle fuel tank.** Does the fuel tank fill at greater than six gal (23 L) per minute?	**Yes** — Diagnostic is complete. **No** — Go to Step 6.

Step	Procedure	Action
6	**Replace the filter in the fuel fill line.** Does the vehicle fuel tank fill at greater than six gal (23 L) per minute?	**Yes** — Diagnostic is complete. **No** — Go to Step 7.
7	**Attempt to fill the vehicle fuel tank.** Does the fuel tank fill at greater than six gal (23 L) per minute?	**Yes** — Diagnostic is complete. **No** — Go to Step 8.
8	**Replace the overfill protection device (OPD) valve in the vehicle fuel tank.** Is the OPD valve located in the end cap of the fuel tank?	**Yes** — Go to Step 9. **No** — Go to Step 10.
9	**Attempt to fill the vehicle fuel tank as follows:** **NOTE** When filling a new tank that has the OPD valve mounted in the end cap, fuel splashing off the sides of the empty tank could be activating the OPD float and shutting off the fuel fill line. a. Install a fuel fill pressure tester on the fill valve and close the ball valve. b. Connect the fuel dispensing nozzle to the pressure tester and turn on the pump. Slightly open the ball valve to slowly add approximately 10 gal (38 L) of fuel. c. Remove the fuel fill pressure tester. d. Attempt to fill the remaining tank volume (to 80% full capacity) at full flow from the dispensing nozzle. a. Did the tank fill?	**Yes** — Diagnostic is complete. **No** — Call ROUSH CleanTech Customer Service at 800-597-6874.
10	**Attempt to fill the vehicle fuel tank.** Does the fuel tank fill at greater than six gal (23 L) per minute?	**Yes** — Diagnostic is complete. **No** — Call ROUSH CleanTech Customer Service at 800-597-6874.
11	**Fill station is not providing enough pressure to fill.** a. Using the tables provided at the front of this section, determine expected propane tank pressure based on ambient temperature. b. Is the vehicle fuel tank pressure greater than 20 psi (38 kPa) over the nominal expected pressure?	**Yes** — Go to Step 12. **No** — Locate a dispensing facility with pump output capacity in excess of 100 psi (689 kPa) (preferably an Auto Gas-type facility). Then, go to Step 2.
12	**Vehicle fuel tank is at a higher pressure.** a. Higher pressure is likely caused by heavy vehicle usage heating the fuel. b. Allow the vehicle (fuel tank) to cool and then recheck pressure in the fuel tank.	When tank pressure is within 10 psi (69 kPa) of expected tank pressure, go to Step 13.
13	**Measure and compare vehicle fuel tank and fill station pressures.** a. Connect a pressure gauge service tool to the fuel tank bleeder valve and record fuel tank pressure. b. Using a fuel fill pressure tester installed on the fuel fill valve, attempt to fill the vehicle. c. With the dispensing pump on and dispensing nozzle open, measure and record fill station pump pressure. d. Is fill station pump pressure at least 50 psi (345 kPa) greater than fuel tank pressure?	**Yes** — Go to Step 14. **No** — Fill station is not providing enough pressure to fill vehicle tank. Go to Step 14. Locate a dispensing facility with pump output capacity in excess of 100 psi (689 kPa) (preferably an Auto Gas-type facility).
14	**Attempt to fill the vehicle fuel tank.** Does the fuel tank fill at greater than six gal (23 L) per minute?	**Yes** — Diagnostic is complete. **No** — Go to Step 4.

Over Fill

Step	Procedure	Action
1	**Suspect overfill because fuel fill volumes achieved during refueling exceed the rated fuel capacity or excessive vehicle range between refueling.** a. Check the fuel gauge. b. Is the gauge reading below 1/2 tank?	**Yes** — Go to Step 2. **No** — Drive vehicle until gauge reads below 1/4 tank.
2	**Open bleeder valve located on the tank or remotely mounted on the vehicle.** a. Listen at valve to verify propane vapor is venting. b. Is propane vapor venting?	**Yes** — Go to Step 3. **No** — Bleeder valve is not functioning properly. Replace the valve.
3	**Park the vehicle at the refueling station.** a. Check to determine if the vehicle is level using the vehicle frame as reference. b. Does the vehicle sit level?	**Yes** — Go to Step 4. **No** — Using a jack, raise the vehicle to obtain a level condition. Then, go to Step 4.
4	**Locate the American Society of Mechanical Engineers (ASME) inspection plate on the fuel tank.** a. Note the tank water capacity listed on the plate. b. Multiply the listed capacity by 0.05 (5%) and record the value.	With the value recorded, go to Step 5.
5	**Refuel the vehicle as follows:** **NOTE** If the key is on during refueling, it will take the fuel level gauge in the instrument cluster longer to register full. a. Verify that the ignition is in the OFF position. b. Install the fuel fill pressure tester on the fill valve and close the ball valve. c. Connect the fuel dispensing nozzle to the pressure tester. Verify that the bleeder valve is open. d. With the bleeder valve open, turn on the pump. Open the ball valve slightly to very slowly refuel the vehicle. e. While refueling, observe the bleeder valve for fuel discharge. f. Stop filling when a solid stream of liquid fuel flows from the bleeder valve or the dispensing pump stops automatically. g. Did a solid stream of liquid flow from the bleeder valve?	**Yes** — Record the volume of fuel dispensed and then go to Step 6. **No** — Go to Step 7.
6	**Resume filling until the dispensing pump stops automatically.** a. Record the total volume of fuel dispensed and subtract the amount from the volume recorded in Step 5. b. Is the additional amount of fuel dispensed less than 5% of the tank water capacity determined in Step 4?	**Yes** — Tank does not overfill. Diagnostic is complete. **No** — Tank is overfilling. Replace the OPD fill valve in the fuel tank; then, go to Step 8.
7	**The dispensing pump stopped automatically and a liquid fuel stream was not observed flowing from bleeder valve.**	Tank does not overfill. Diagnostic is complete.

Step	Procedure	Action
8	**Refuel the vehicle as follows:** **NOTE** If the key is ON during refueling, it will take the fuel level gauge in the instrument cluster longer to register full. a. Verify that the ignition is in the OFF position. b. Install the fuel fill pressure tester on the fill valve and close the ball valve. c. Connect the fuel dispensing nozzle to the pressure tester. Verify that the bleeder valve is OPEN. d. With the bleeder valve open, turn ON the pump. Open the ball valve slightly to very slowly to refuel the vehicle. e. While refueling, observe the bleeder valve for fuel discharge. f. Stop filling when a solid stream of liquid fuel flows from the bleeder valve or the dispensing pump stops automatically. g. Did a solid stream of liquid flow from the bleeder valve?	**Yes** — Record the volume of fuel dispensed and then go to Step 9. **No** — Go to Step 7.
9	**Resume filling until the dispensing pump stops automatically.** a. Record the volume of fuel dispensed and subtract the amount from the volume recorded in Step 8. b. Is the additional amount of fuel dispensed less than 5% of the tank water capacity determined in Step 4?	**Yes** — Tank does not overfill. Diagnostic is complete. **No** — Tank is overfilling. Replace the fuel tank assembly.

Engine Does Not Crank

Step	Procedure	Action
1	**Is battery voltage above 10 volts?**	**Yes** — Go to Step 2. **No** — Determine cause of low battery voltage.
2	**Verify that the smart relay module (SRM) has communication.** Can fuel rail pressure and temperature be read with a scan tool?	**Yes** — Go to Step 3. **No** — Go to the *Smart Relay Module Electrical Test* procedure.
3	**Refer to the *Ford Powertrain Control/Emission Diagnosis Service Manual*.** Is the problem corrected?	**Yes** — Diagnostic is complete. **No** — Call ROUSH CleanTech Customer Service at 800-597-6874.

Engine Cranks, No Start

NOTE

For harness and connector layout diagrams and system electrical schematics, refer to *Wiring Diagrams and Electrical Schematics*.

Step	Procedure	Action
1	**Verify the following:** a. Is there fuel in the tank of at least 1/8 tank or more? (add fuel if necessary). b. Is the tank supply manual shutoff valve fully open? c. Is battery voltage above 10 volts?	**Yes** — Go to Step 2. **No** — Correct fault and retry.
2	**Check for diagnostic trouble codes (DTC).** Are any codes present?	**Yes** — Go to Step 3. **No** — Go to Step 4.
3	**Is the DTC identified on the ROUSH LPA DTC list?**	**Yes**— Refer to *Diagnostic Trouble Code List*. **No** — Refer to Ford service manual DTC chart.
4	**Check fuel pressure.** a. Measure and record fuel rail and fuel tank pressure, Key ON Engine OFF (KOEO). b. While monitoring fuel pressure, attempt to start engine. c. Record the highest pressure observed. d. Does fuel pressure rise 25 psi (172 kPa) before engine crank?	**Yes** — Go to Step 11. **No** — Go to Step 5.
5	**Check fuel pump operation.** a. Using a current clamp, check current draw on both fuel pump power wires at the fuel tank. Refer to *In-Tank Harness* for correct circuits. b. Turn ignition switch to START position and release. Vehicle will start the flush cycle and pumps should be running. Check current draw. A minimum of 2 amps should be recorded on both fuel pump circuits. c. Do fuel pumps draw current?	**Yes** — Go to Step 6. **No** — If both circuits are showing no current, check the OEM fuel pump (FP) fuse. If only one fuel pump circuit shows current, check the ROUSH CleanTech fuel pump fuse. (See ROUSH CleanTech fuse box for location.) If both fuel pump fuses (OEM and ROUSH CleanTech) are good, go to Step 10.
6	**Check excess flow valve (XFV).** a. Turn ignition key to the OFF position. b. Close the manual shutoff valve on tank. c. Wait 1 minute and then slowly open manual shutoff valve. d. Measure and record fuel pressure, using a scan tool, at injection pressure temperature sensor (IPTS). e. Is problem resolved?	**Yes** — Go to Step 11. **No** — Go to Step 7.
7	**Check ROUSH fuel pump (FP) fuse.** Is fuse intact and OK?	**Yes** — Go to Step 8. **No** — Determine the cause of the short and repair; replace the fuse. Diagnostic is complete.
8	**Check the tank solenoid (TS) and supply solenoid (SS) fuses.** a. Locate the TS fuse (E3-E4) and check its condition. b. Locate the SS fuse (F1-F2) and check its condition. c. Are the fuses blown?	**Yes** — Determine the cause of the short and repair; replace the fuse. **No** — Go to Step 9.

Step	Procedure	Action
9	**Verify that there is power and proper grounding at the tank solenoid (TS) and supply solenoid (SS) wiring circuits.** a. Check for +12 volts at the TS and SS connectors. Refer to the *Tank Solenoid Electrical Check* procedure. b. Is +12 volts present at the TS connector? c. Is +12 volts present at the SS connector?	**Yes** — Voltage present at SS, replace FRPCM. Voltage present at TS, replace fuel supply valve assembly. **No** — Check for an open(s) in the wiring circuits and repair. Diagnostic is complete.
10	**Verify that there is power and proper grounding in the wiring circuit to the tank.** a. Check for +12 volts at the fuel pump 1 (FP1) and fuel pump 2 (FP2) connectors. Refer to the *Fuel Pump Electrical Check* procedure. b. Is +12 volts present at the FP1 connector? c. Is +12 volts present at the FP2 connector?	**Yes** — Go to Step 12. **No** — Check for an open(s) in the wiring circuits and repair.
11	**Injection Pressure Temperature Sensor Rationality** Does temperature and pressure make sense to verification procedure?	**Yes** — Refer to the *Integrated Pressure Temperature Sensor Electrical Check*. **No** — Verify that wiring in circuit is OK. Refer to the *Integrated Pressure Temperature Sensor Electrical Check* procedure. If not, repair wiring. If OK, replace sensor.
12	**Check wiring.** a. Drain the propane from the fuel tank. Refer to the *Fuel Tank Draining Procedure* in the appropriate *ROUSH CleanTech Service Manual* for more information. b. Remove tank service cover. c. Check for open or short circuits on tank pass-through harness. d. Is a wiring problem present?	**Yes** — Replace harness. **No** — Go to Step 13.
13	**Check fuel hoses and quick-connect fittings.** • Are in-tank fuel hoses and quick-connect fittings connected and in good condition?	**Yes** — Replace fuel pump assembly. **No** — Replace hose assemblies as needed.

Engine Stumble, Stall, Rough Idle

NOTE

For harness and connector layout diagrams and system electrical schematics, refer to *Wiring Diagrams and Electrical Schematics*.

Step	Procedure	Action
1	**Verify the following:** a. Is there fuel in the tank of at least 1/8 tank or more? (Add fuel if necessary.) b. Is the tank supply manual shutoff valve fully open? c. Is battery voltage above 11 volts with engine running?	**Yes** — Go to Step 2. **No** — Correct the fault and retry.
2	**Check for diagnostic trouble codes (DTCs).** Are any codes present?	**Yes** — Go to Step 3. **No** — Go to Step 4.
3	**Identify the DTC.** a. Is the DTC covered in the ROUSH CleanTech DTC listing for LPA-fueled vehicles? b. Correct all DTCs before continuing.	**Yes** — Refer to ROUSH CleanTech *Diagnostic Trouble Code List*. **No** — Refer to the appropriate *Ford Powertrain Control/Emissions Diagnosis Service Manual* at www.motorcraft.com.
4	**Does the problem occur only after cold start?**	**Yes** — Go to Step 6. **No** — Go to Step 5.
5	**Determine fuel pressure.** a. Measure tank pressure with Key ON Engine OFF (KOEO). b. Measure fuel rail pressure with Key ON Engine Running (KOER). c. Subtract the KOEO pressure from the KOER pressure to obtain the difference. Compare to the chart in *Expected Fuel Rail Pressure*. d. Is the resulting fuel pressure reading within the expected range?	**Yes** — Go to Step 7. **No** — Go to Step 6.
6	**Determine if the excess flow valve (XFV) is tripped.** a. Turn OFF the engine. b. Wait one minute and then restart the engine. c. Is the fault condition resolved?	**Yes** — Refer to the *Excess Flow Valve Check* procedure. **No** — Go to Step 7.
7	**Check fuel pump operation.** a. Using a current clamp, check current draw on both fuel pump power wires at the fuel tank. Refer to *In-Tank Harness* for correct circuits. b. Turn ignition switch to START position and release. Vehicle will start the flush cycle and pumps should be running. Check current draw. A minimum of 2 amps should be recorded on both fuel pump circuits. c. Do fuel pumps draw current?	**Yes** — Go to Step 11. **No** — If both circuits are showing no current, check the OEM fuel pump (FP) fuse. If only one fuel pump circuit shows current, check the ROUSH CleanTech fuel pump fuse. (See ROUSH CleanTech fuse box for location.) If both fuel pump fuses (OEM and ROUSH CleanTech) are good, go to Step 8.
8	**Verify that there is power and proper grounding in the wiring circuit to the tank.** a. Check for +12 volts at the fuel pump 1 (FP1) and fuel pump 2 (FP2) connectors. Refer to the *Fuel Rail Pressure Control Module Electrical Check* procedure. b. Is +12 volts present at the FP1 connector? c. Is +12 volts present at the FP2 connector?	**Yes** — Go to Step 9. **No** — Check for an open/short in the wiring circuit and repair.

Step	Procedure	Action
9	**Check wiring.** a. Drain the propane from the fuel tank. Refer to the *Fuel Tank Draining Procedure* in the appropriate *ROUSH CleanTech Service Manual* for more information. b. Remove tank service cover. c. Check for open or short circuits on tank pass-through harness. d. Is a wiring problem present?	**Yes** — Replace harness. **No** — Go to Step 10.
10	**Check fuel hoses and quick-connect fittings.** • Are in-tank fuel hoses and quick-connect fittings connected and in good condition?	**Yes** — Replace fuel pump assembly. **No** — Replace hose assemblies as needed.
11	**Injection Pressure Temperature Sensor Rationality** Does temperature and pressure make sense to verification? Refer to the *Integrated Pressure Temperature Sensor Electrical Check* procedure.	**Yes** — Go to Step 12. **No** — Verify that wiring in circuit is OK. If not, repair wiring. If OK, replace sensor.
12	Refer to the appropriate *Ford Powertrain Control/Emissions Diagnosis Service Manual* at www.motorcraft.com.	—

Excess Flow Valve Check

The excess flow valve (XFV) is designed to restrict fuel exiting the tank if the pump is energized while the fuel lines are not connected to the fuel tank. Under normal circumstances, the XFV should not trip. The XFV will reset itself after the fuel pumps have been off for about one minute.

It is common to trip the XFV after the fuel lines have been serviced and contain no pressure. If the XFV trips, turn the vehicle off, wait one minute, and restart. This may take more than one attempt.

If the fuel lines have not been serviced recently and the problem persists, there may be a leak in the supply side fuel line. If the problem is only present after the vehicle has been sitting for a length of time, but not present during a short soak, or there is a propane odor when the vehicle is running, refer to the *Fuel Line Leak Detection* procedure.

Step	Procedure	Action
1	**Verify fuel supply line pressure prior to cranking engine.** a. Read fuel rail pressure and tank pressure. b. Energize bleed solenoid until rail pressure is at least 50 psi (345 kPa) below tank pressure. If rail is bled, skip to Step D. c. Let pressure stabilize for 1 minute. d. Open the supply solenoid. e. Read fuel rail pressure and tank pressure. f. Does fuel rail pressure jump to tank pressure?	**Yes** — Check is OK. **No** — Repair the leak in the fuel supply line.

Maximum Pressure Check

The LPA system operates over a wide range of pressures depending on ambient temperature, driving mode, etc. When the vehicle is subjected to a severe drive cycle in high ambient temperatures, the fuel rail pressure can rise to the limit of the injectors capabilities. This limit is a function of injector voltage and fuel rail pressure. The PCM protects for this condition by reducing the fuel pump speed when the condition is sensed, however, there still may be drive concerns. When the PCM starts controlling the fuel pump a P116E code is set. While this condition can occur in a normally functioning vehicle, it can also be exacerbated by several factors. If the fuel tank was not properly bled during the first fill, trapped air in the vapor space can increase tank pressure. In this condition there is often only a faint smell of propane when the bleeder valve is opened. The tank should be vented until there is a strong propane odor coming from the bleeder valve. The tank pressure should be confirmed against the expected pressure.

Allow the fuel tank to cool to ambient temperature before performing the following procedure.

Step	Procedure	Action
1	**Measure tank pressure and tank surface temperature.** Is tank pressure more than 15 psi (103 kPa) over expected tank pressure?	**Yes** — Vent the tank until pressure is within the expected range. **No** — Vehicle is working properly; inform and explain operating characteristics to customer.

Supply Solenoid Check

NOTE

For harness and connector layout diagrams and system electrical schematics, refer to *Wiring Diagrams and Electrical Schematics*.

Step	Procedure	Action
1	**Verify the following:** a. Is there fuel in the tank of at least 1/8 tank or more? (Add fuel if necessary.) b. Is the tank supply manual shutoff valve fully OPEN? c. Is battery voltage above 10 volts?	**Yes** — Go to Step 2. **No** — Correct fault and retry.
2	**Check for diagnostic trouble codes (DTC).** Are any codes present?	**Yes** — Go to Step 3. **No** — Go to Step 4.
3	**Is the DTC identified on the ROUSH liquid propane autogas DTC list?**	**Yes** — Refer to *Diagnostic Trouble Code List*. **No** — Refer to the Ford service manual DTC chart.
4	**Check fuel pressure.** a. Measure and record fuel rail pressure and fuel tank pressure at Key ON Engine OFF (KOEO). b. While monitoring fuel pressure, attempt to start engine. c. Record the highest pressure observed. d. Does fuel pressure rise 20 psi (138 kPa) before engine crank?	**Yes** — Go to Step 11. **No** — Go to Step 5.

Step	Procedure	Action
5	**Check fuel pump operation.** a. Using a current clamp, check current draw on both fuel pump power wires at the fuel tank. Refer to *In-Tank Harness* for correct circuits. b. Turn ignition switch to START position and release. Vehicle will start the flush cycle and pumps should be running. Check current draw. A minimum of 2 amps should be recorded on both fuel pump circuits. a. Do fuel pumps draw current?	**Yes** — Go to Step 6. **No** — If both circuits are showing no current, check the OEM fuel pump (FP) fuse. If only one fuel pump circuit shows current, check the ROUSH CleanTech fuel pump fuse. (See ROUSH CleanTech fuse box for location.) If both fuel pump fuses (OEM and ROUSH CleanTech) are good, go to Step 10.
6	**Check XFV.** a. Turn OFF engine. b. Wait 1 minute and then restart engine. c. Measure and record fuel rail pressure and fuel tank pressure. d. Is problem resolved?	**Yes** — Go to Step 11. **No** — Go to Step 7.
7	**Check ROUSH FP fuse.** Is fuse intact and OK?	**Yes** — Go to Step 8. **No** — Determine the cause of the short and repair; replace the fuse.
8	**Check the TS and SS fuses.** a. Locate the TS fuse (E3-E4) and check its condition. b. Locate the SS fuse (F1-F2) and check its condition. c. Are the fuses blown?	**Yes** — Determine the cause of the short and repair; replace the fuse. **No** — Go to Step 9.
9	**Verify that there is power and grounding in the TS and SS wiring circuits.** a. Check for +12 volts at the TS and SS connectors. Refer to the *Tank Solenoid Electrical Check* procedure. b. Is +12 volts present at the TS connector? c. Is +12 volts present at the SS connector?	**Yes** — Voltage present at SS, replace FRPCM. Voltage present at TS, replace fuel supply valve assembly. **No** — Check for an open/short in the wiring circuit and repair.
10	**Verify that there is power and grounding in the wiring circuit to the tank.** a. Check for +12 volts at the fuel pump 1 (FP1) and fuel pump 2 (FP2) connectors. Refer to the *Fuel Rail Pressure Control Module Electrical Check* procedure. b. Is +12 volts present at the FP1 connector? c. Is +12 volts present at the FP2 connector?	**Yes** — Refer to *Engine Stumble, Stall, Rough Idle* Step 12. **No** — Check for an open/short in the wiring circuit and repair.
11	**Injection Pressure Temperature Sensor Rationality** Does temperature and pressure make sense to verification?	**Yes** — Go to Step 12. **No** — Verify that wiring in circuit is OK. Refer to the *Injection Pressure Temperature Sensor Electrical Check* procedure. If not, repair wiring. If OK, replace sensor.
12	Refer to the appropriate *Ford Powertrain Control/Emissions Diagnosis Service Manual* at www.motorcraft.com.	—

Fuel System Fails to Bleed

Step	Procedure	Action
1	**Check for diagnostic trouble codes (DTC).** a. Are both DTC 26B3 and P009E present?	**Yes** — Go to Step 8. **No** — Go to Step 2.
2	**Check for oil contamination at vapor port/EVAP line.** a. Disconnect EVAP line from vapor port. b. Is oil present in EVAP line or vapor port?	**Yes** — Replace vapor port and perform Step 3. **No** — Go to Step 3.
3	**Determine if fault condition repeats.** a. START the engine and allow it to run for a few minutes. b. Turn OFF the engine and wait one minute. c. Measure and record the fuel rail pressure, fuel rail temperature and fuel tank pressure with the Key ON Engine OFF (KOEO). d. Energize the bleed solenoid. Refer to the *Manual Solenoid Activation Procedure*. Verify wiring integrity and voltage to solenoid. e. With the engine OFF, monitor fuel rail pressure for 15 minutes. f. Does fuel rail pressure drop more than 20 psi (138 kPa)?	**Yes** — Potential intermittent fault. Return vehicle to customer and see if problem persists. **No** — Go to Step 4.
4	**Verify vapor port function.** a. Disconnect the EVAP line from the FRPCM port. b. Energize the bleed solenoid. Refer to the *Manual Solenoid Activation Procedure*. Verify wiring integrity and voltage to solenoid. c. Is there propane flowing from the port?	**Yes** — Go to Step 7. **No** — Go to Step 5.
5	**Verify bleed solenoid function.** a. Disconnect the EVAP line from the FRPCM port. b. Remove the vapor port. c. Energize the bleed solenoid. Refer to the *Manual Solenoid Activation Procedure*. Verify wiring integrity and voltage to solenoid. d. Is there propane flowing from the port?	**Yes** — Replace vapor port and repeat Step 3. **No** — Go to Step 6.
6	**Verify that wiring is in good condition and functioning.** a. Perform wiring checks of the FRPCM harness. b. Is the wiring OK?	**Yes** — Bleed solenoid stuck closed. Replace the FRPCM. **No** — Repair wiring and repeat Step 3.
7	**Check for a kinked EVAP line.** a. Inspect the EVAP line between the FRPCM and EVAP canister. b. Are there kinks in the line?	**Yes** — Replace the kinked EVAP line and then repeat Step 3. **No** — Go to Step 8.
8	**Check for leaks to the FRPCM.** a. START the engine and allow it to run for a few minutes. b. Turn OFF the engine. c. Measure and record fuel rail pressure. d. Activate bleed solenoid to bleed pressure from fuel rail until fuel pressure drops more than 50 psi (345 kPa). Refer to the *Manual Solenoid Activation Procedure*. e. De-energize bleed solenoid. f. Disconnect the FRPCM and wait 120 minutes. g. Measure fuel rail pressure and fuel tank pressure. h. Does fuel rail pressure rise more than 10 psi (69 kPa)?	**Yes** — FRPCM leaks at either supply solenoid or return check valve. Replace FRPCM. **No** — Potential intermittent fault. Return vehicle to customer and see if problem persists.

Fuel Pressure Drop

NOTE

For harness and connector layout diagrams and system electrical schematics, refer to *Wiring Diagrams and Electrical Schematics*.

Step	Procedure	Action
1	**Verify the following:** a. Is there fuel in the tank of at least 1/8 tank? b. Is the tank supply manual shutoff valve fully open? c. Is battery voltage above 10 volts?	**Yes** — Go to Step 2. **No** — Correct the fault condition and retry.
2	**Determine fuel pressure.** a. Measure and record fuel tank pressure. b. Measure and record fuel rail pressure with Key ON Engine Running (KOER). c. Subtract the tank measurement from the KOER measurement. d. Is the resulting fuel pressure in the expected range?	**Yes** — Go to Step 4. **No** — Go to Step 3.
3	**Determine if the excess flow valve is tripped.** a. Turn OFF the engine. b. Wait one minute and then restart the engine. c. Is the problem resolved?	**Yes** — Refer to the *Excess Flow Valve Check* procedure. **No** — Go to Step 4.
4	**Check fuel pump operation.** a. Using a current clamp, check current draw on both fuel pump power wires at the fuel tank. Refer to *In-Tank Harness* for correct circuits. b. Turn ignition switch to START position and release. Vehicle will start the flush cycle and pumps should be running. Check current draw. A minimum of 2 amps should be recorded on both fuel pump circuits. c. Do fuel pumps draw current?	**Yes** — Go to Step 5. **No** — If both circuits are showing no current, check the OEM fuel pump (FP) fuse. If only one fuel pump circuit shows current, check the ROUSH CleanTech fuel pump fuse. (See ROUSH CleanTech fuse box for location.) If both fuel pump fuses (OEM and ROUSH CleanTech) are good, go to Step 6.
5	**Check tank solenoid (TS) and supply solenoid (SS) fuses.** a. Locate the TS (E3-E4) and SS (F1-F2) fuses. b. Are the fuses blown?	**Yes** — Find and repair the short; replace the fuse. **No** — Go to Step 8.
6	**Verify that there is power and ground in the wiring circuit to the tank.** a. Check for +12 volts at the fuel pump 1 (FP1) and fuel pump 2 (FP2) connectors. Refer to the *Fuel Rail Pressure Control Module Electrical Check* procedure. b. Is +12 volts present at the FP1 connector? c. Is +12 volts present at the FP2 connector?	**Yes** — Refer to *Engine Stumble, Stall, Rough Idle* Step 9. **No** — Check for an open/short in the wiring circuit and repair.
7	**Injection Pressure Temperature Sensor Rationality** Does temperature and pressure make sense to verification? See the *Injection Pressure Temperature Sensor Electrical Check* procedure.	**Yes** — Go to Step 8. **No** — Verify that wiring in circuit is OK. If not, repair wiring. If OK, replace sensor.
8	Refer to the appropriate *Ford Powertrain Control/Emissions Diagnosis Service Manual* at www.motorcraft.com.	—

Fuel Level Indication Check

The ROUSH CleanTech fuel level indication system differs from the gasoline system as the fuel level sender is not wired directly to the instrument cluster. Instead, the fuel level sender is wired to the SRM, which reads the fuel level and transmits the signal to the PCM via the CAN bus, which in turn simulates the resistance the instrument cluster expects to see for a given fuel level.

NOTE

The gauge on the sending unit must not be used for any diagnostics. The gauge is not accurate. Only voltage outputs should be used for diagnostic purposes.

Symptom	Cause/Action to be taken
Fuel gauge does not move on a partial fill	This behavior is not uncommon. The fuel level sender may not move far enough to trigger movement on the gauge if only a small amount of fuel is added to the tank. Once driven, the gauge may move to reflect the fill.
Malfunction Indicator Lamp (MIL)	There is a circuit fault that has been identified by the PCM. If customer fills vehicle with key ON this could cause the gauge not to move. Customer should drive vehicle for some time to allow gauge to move and fill with key OFF in the future. Initially follow the *Ford Powertrain Control/Emissions Diagnosis Service Manual,* whenever a circuit check is called for, refer to the *Fuel Level Interface Module Electrical Test* procedure.
Gauge points below E	This is an indication of an error state. Initially follow the *Ford Powertrain Control/Emissions Diagnosis Service Manual*, whenever a circuit check is recommended, refer to the *Fuel Level Sender Electrical Check* procedure.
Doesn't read full after a fill a. Tank should be filled on a level surface both front-to-back and side-to-side (a level needs to be placed on the vehicle to verify this). b. Tank pressure and sending unit resistance should be recorded prior to the fill and when the fuel station shuts off along with number of gallons filled. c. Differential and bypass pressure settings need to be confirmed on the fuel station and verified by fueling provider (station output pressure must be at least 25 psi greater than the vehicle tank pressure at time of filling. Recommended differential pressure settings are greater than 135 psi). d. HP rating of the pump on the station needs to be verified. (5 hp pump recommended.) **Note:** Fueling provider can fill unit on level ground with a bobtail to eliminate any issues that may be present with the fueling station. e. Fuel level electrical checks and SRM checks can be performed per the diagnostic manual.	This could be the result of either a fuel level sender fault or an OPD valve triggering prematurely. Refer to fill issues and the *Fuel Level Sender Electrical Check* procedure for more information.

Tank Solenoid Electrical Check

NOTE

For harness and connector layout diagrams and system electrical schematics, refer to *Wiring Diagrams and Electrical Schematics*.

CONNECTORS

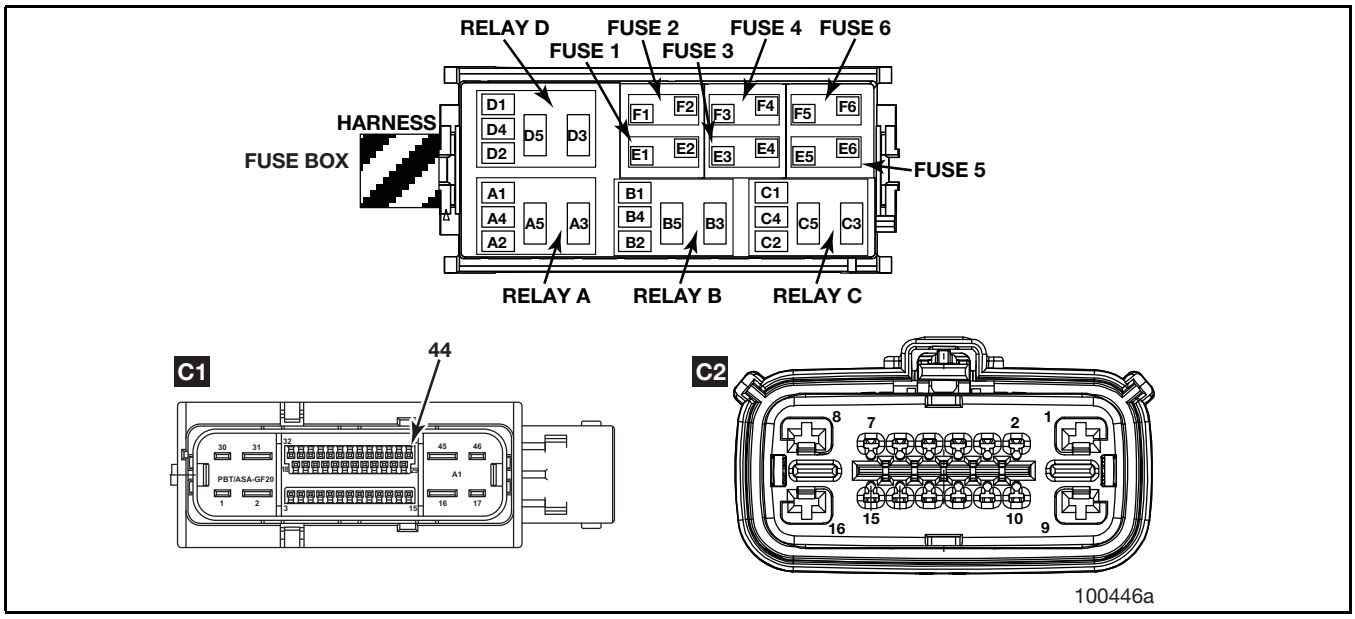


Figure 1 — Underhood Harness Connectors

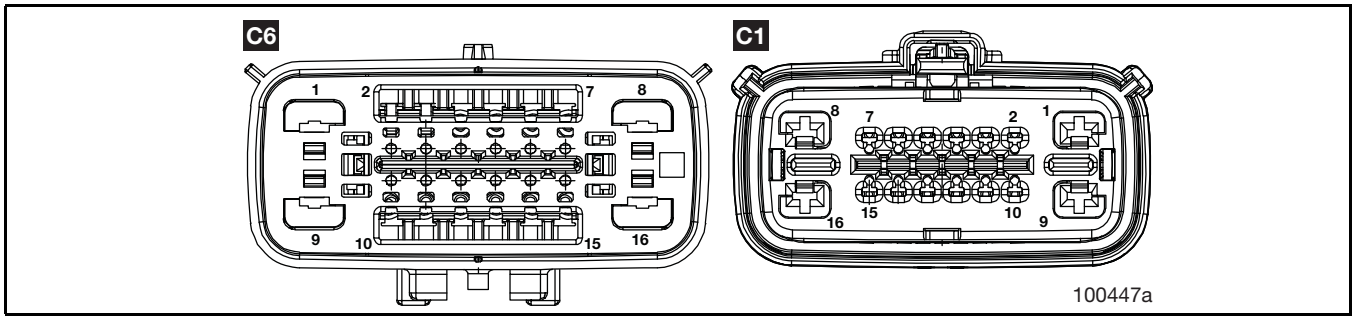


Figure 2 — Rear Frame Harness Connectors

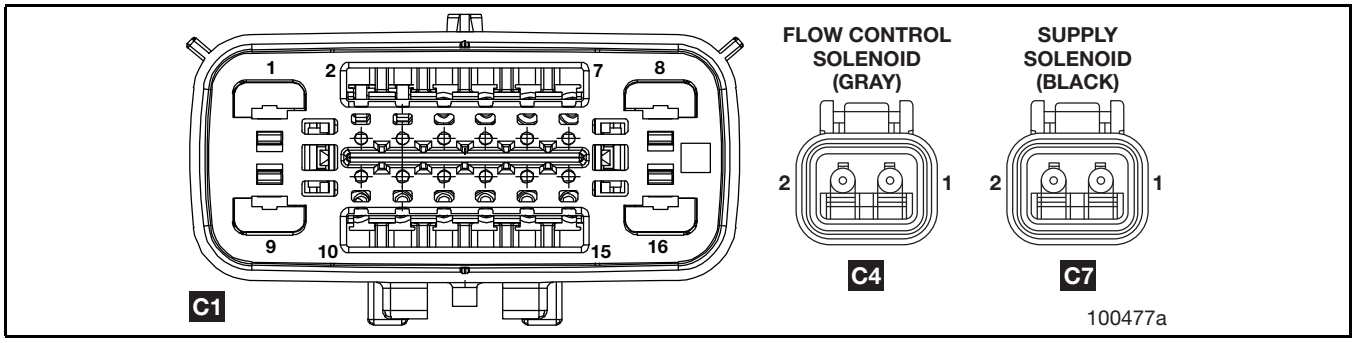


Figure 3 — Tank Harness Connectors

PROCEDURE

Step	Procedure	Action
1	**Unplug the solenoid harness connector C7 from the tank solenoid.**	Go to Step 2.
2	**Using a multimeter, measure resistance of the solenoid.** Is the measured resistance within 6–35 ohms?	**Yes** — Go to Step 3. **No** — Replace the tank solenoid.
3	**Using a multimeter, measure voltage at the tank solenoid as follows:** a. With the ignition key ON, check for voltage present at pin-1, connector C7 (tank harness). Use the body as the reference ground. b. Is battery (B+) voltage present?	**Yes** — Supply circuit OK. **No** — Go to Step 4.
4	**Check fuse (E3-E4, 20A) in auxiliary fuse box.** Is fuse blown?	**Yes** — Replace fuse. **No** — Fuse OK; go to Step 5.
5	**Check relay.** Is relay functioning properly?	**Yes** — Go to Step 6. **No** — Replace relay.
6	**Check supply circuit continuity from solenoid harness to fuse box.** a. Check continuity between: • Pin-1, connector C7 and pin-10, connector C10 (tank harness) • Pin-1, connector C6 and pin-10, connector C1 (rear frame harness) • Pin-1, connector C2 and cavity A5, fuse box (underhood harness) b. Is there good continuity in the circuit?	**Yes** — Go to Step 7. **No** — Repair supply circuit wiring.
7	**Check ground circuit continuity from tank harness to smart relay module (SRM) connector.** a. Check continuity between: • Pin-2, connector C7 and pin-7, connector C10 (tank harness) • Pin-7, connector C6 and pin-7, connector C1 (rear frame harness) • Pin-7, connector C2 and pin-1, connector C1 (underhood harness) b. Is there good continuity in the circuit?	**Yes** — Refer to the *Smart Relay Module Electrical Test* procedure. **No** — Repair ground circuit wiring.

Fuel Rail Pressure Control Module Electrical Check

NOTE

For harness and connector layout diagrams and system electrical schematics, refer to *Wiring Diagrams and Electrical Schematics*.

CONNECTORS

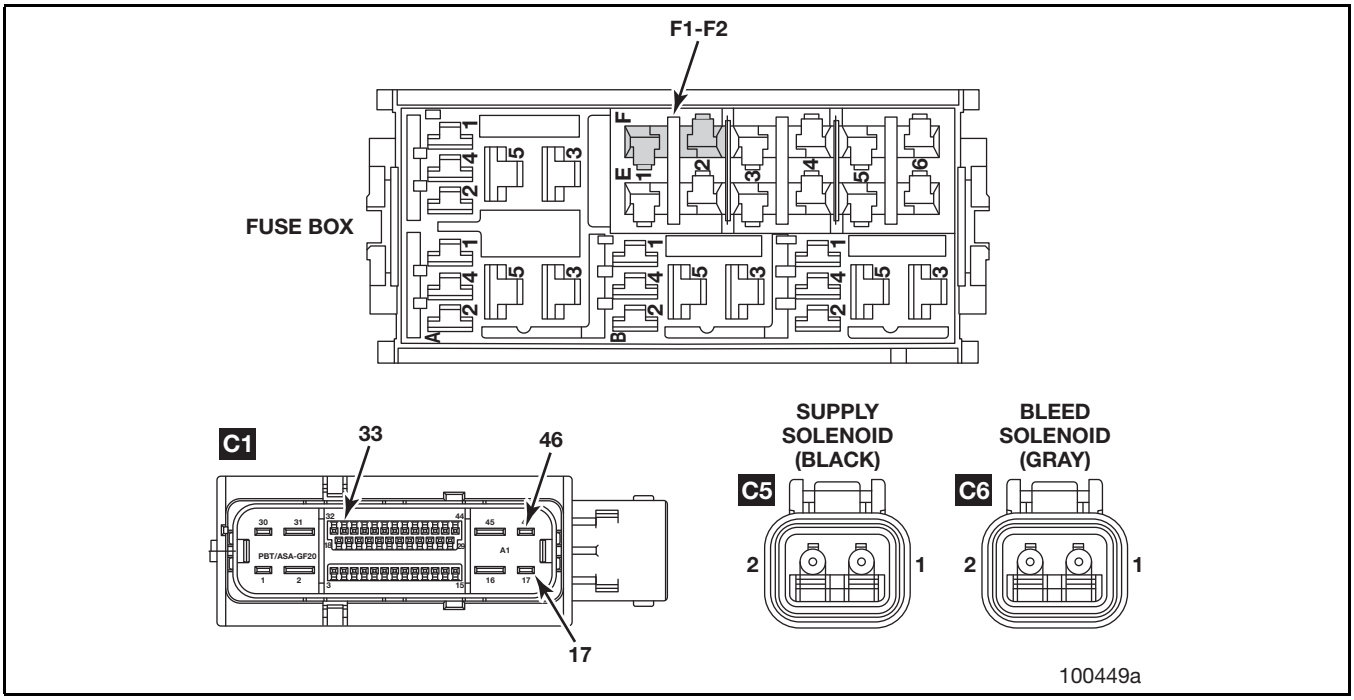


Figure 4 — Underhood Harness Connectors

PROCEDURE

Step	Procedure	Action
1	**Unplug the fuel rail pressure control module (FRPCM) connector from connector 11 of underhood harness.**	Go to Step 2.
2	**Using a multimeter, check the resistance of each solenoid.** a. Check resistance across the terminals of the FRPCM solenoid in sequence as follows: • Supply Solenoid — Pin-1 and pin-2 • Bleed Solenoid — Pin-1 and pin-2 b. Is resistance value the same?	**Yes** — Go to Step 3. **No** — Replace the FRPCM if resistance for any one of the solenoids is not within the specified range.
3	**Check supply voltage to FRPCM solenoids.** Using a multimeter, measure voltage between the terminal for each solenoid at the harness side connectors and ground as follows:	Go to Steps 4–6.

4	**Supply Solenoid** — Pin-1 and body ground	**B+ Voltage** — Go to Step 5. **No Voltage** — Go to Step 5.
5	**Bleed Solenoid** — Pin-1 and body ground	**B+ Voltage** — Continue with Step 8. **No Voltage** — Go to Step 7 if Step 4 has voltage; if Step 4 has no voltage, go to Step 6.
6	**Check fuses (F1-F2, 10A) in auxiliary fuse box.** Is a fuse blown?	**Yes** — Replace fuse. **No** — Go to Step 7.
7	**Check solenoid supply circuit continuity.** a. Check continuity between: • Supply Solenoid — Pin-1, connector C5 (underhood harness) and cavity F2 (auxiliary fuse box) • Bleed Solenoid — Pin-1, connector C6 (underhood harness) and cavity F2 (auxiliary fuse box) b. Is there good continuity in all three circuits?	**Yes** — Go to Step 8. **No** — Repair wiring circuit.
8	**Check solenoid ground circuit continuity.** a. Check continuity in the underhood harness between: • Supply Solenoid — Pin-2, connector C5 and pin-32, connector C1 at SRM • Bleed Solenoid — Pin-2, connector C6 and pin-33, connector C1 at SRM b. Is there good continuity in all three circuits?	**Yes** — Refer to the *Smart Relay Module Electrical Test* procedure. **No** — Repair wiring circuit.

Injection Pressure Temperature Sensor Electrical Check

NOTE

For harness and connector layout diagrams and system electrical schematics, refer to *Wiring Diagrams and Electrical Schematics*.

CONNECTORS

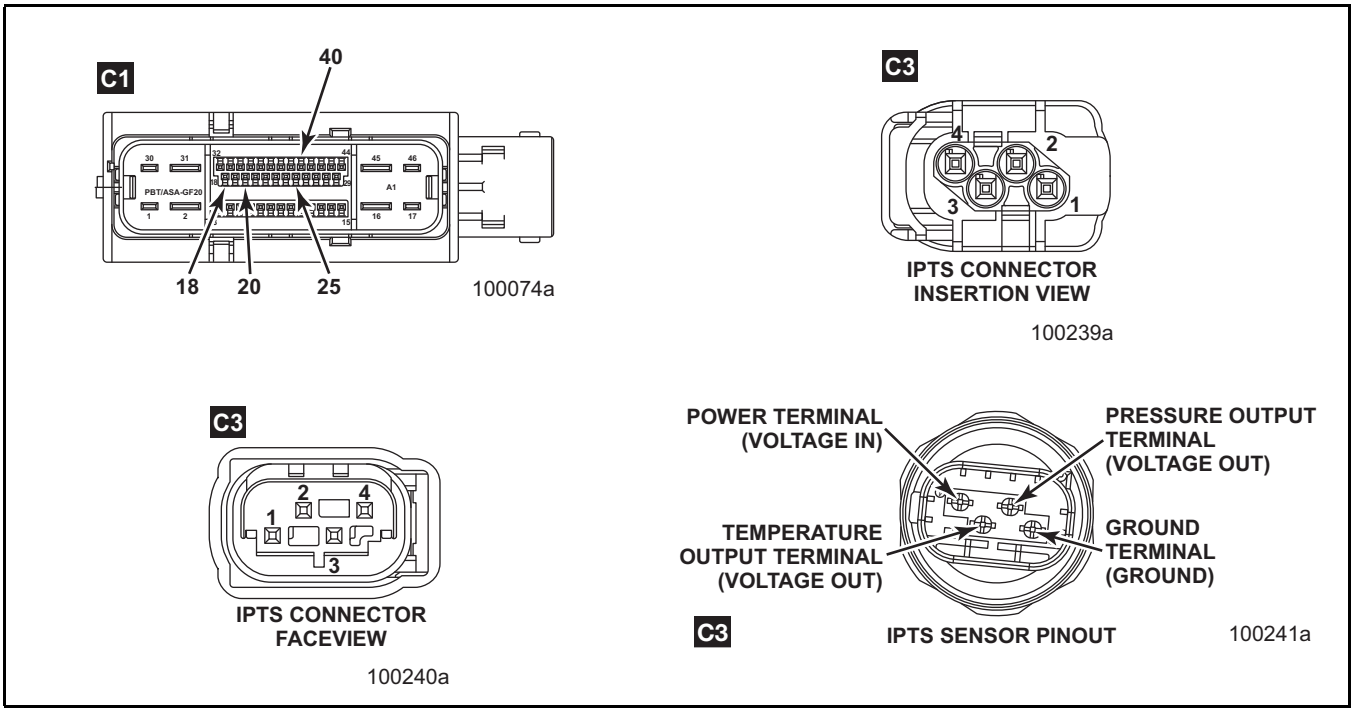


Figure 5 — Underhood Harness Connectors

PROCEDURE

Step	Procedure	Action
1	**Unplug the connector 8 (underhood harness) to the IPTS.**	Go to Step 2.
2	**Check resistance of the injection pressure temperature sensor (IPTS).** a. With vehicle at ambient room temperature (20–30°C, 68–86°F) and using a multimeter, measure resistance across the IPTS terminals (between pin-1 and pin-3). b. Is the resistance value between 8K–12K ohms?	**Yes** — Go to Step 3. **No** — Replace the IPTS.
3	**Check circuit continuity between the IPTS and the smart relay module (SRM).** a. Using a multimeter, check continuity in the underhood harness between: • Pin-1, connector C3 and pin-40, connector C1 • Pin-2, connector C3 and pin-20, connector C1 • Pin-3, connector C3 and pin-18, connector C1 • Pin-4, connector C3 and pin-25, connector C1 b. Is there good continuity in the circuits?	**Yes** — Refer to the *Smart Relay Module Electrical Test* procedure. **No** — Repair circuit wiring.

Tank Pressure Temperature Sensor Electrical Check

NOTE

For harness and connector layout diagrams and system electrical schematics, refer to *Wiring Diagrams and Electrical Schematics*.

CONNECTORS

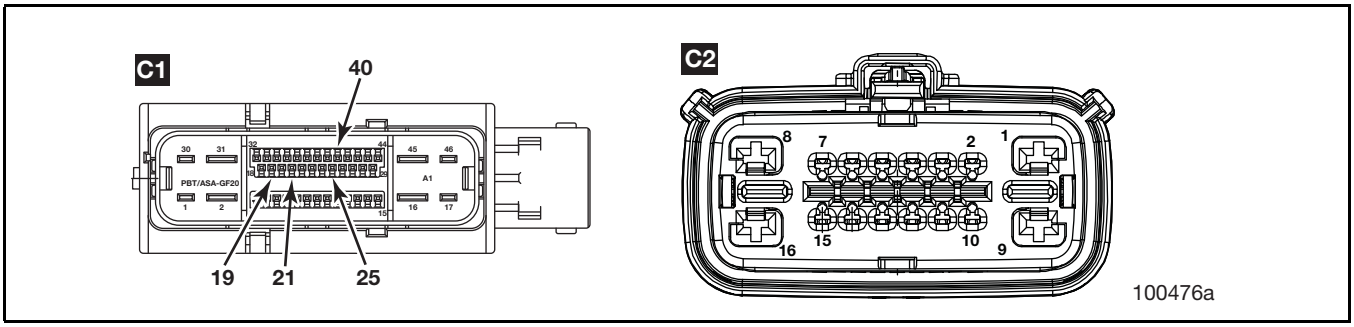


Figure 6 — Underhood Harness Connectors

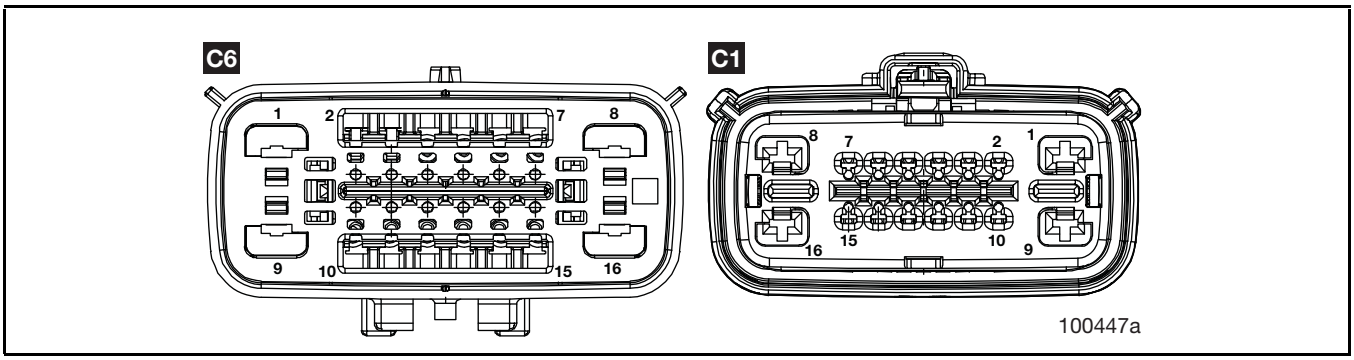


Figure 7 — Rear Frame Harness Connectors

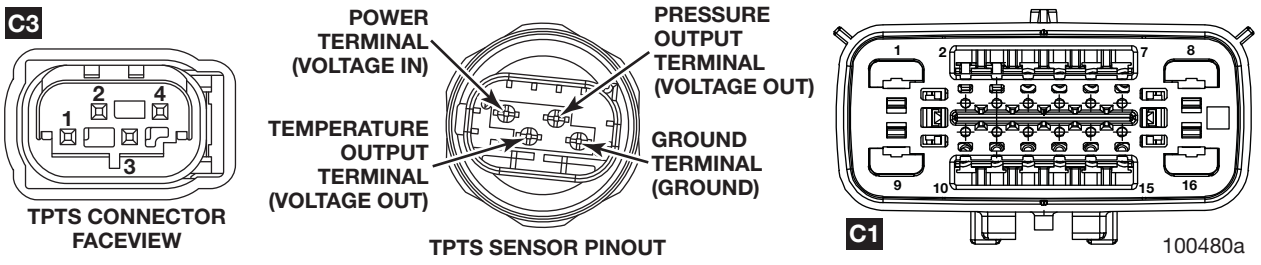


Figure 8 — Fuel Tank Connectors

PROCEDURE

Step	Procedure	Action
1	**Unplug the connector 8 (underhood harness) to the TPTS.**	Go to Step 2.
2	**Check resistance of the fuel pressure temperature sensor (TPTS).** a. With vehicle at ambient room temperature (20–30°C, 68–86°F) and using a multimeter, measure resistance across the FPTS terminals (between pin-1 and pin-3). b. Is the resistance value between 8K–12K ohms?	**Yes** — Go to Step 3. **No** — Replace the TPTS.
3	**Check circuit continuity between the TPTS and the smart relay module (SRM).** a. Using a multimeter, check continuity in the underhood harness between: • Pin-3, connector C2 and pin-40, connector C1 • Pin-6, connector C2 and pin-21, connector C1 • Pin-5, connector C2 and pin-19, connector C1 • Pin-4, connector C2 and pin-25, connector C1 b. Is there good continuity in the circuits?	**Yes** — Refer to the *Smart Relay Module Electrical Test* procedure. **No** — Repair circuit wiring.

Fuel Pump Electrical Test

NOTE

For harness and connector layout diagrams and system electrical schematics, refer to *Wiring Diagrams and Electrical Schematics*.

CONNECTORS

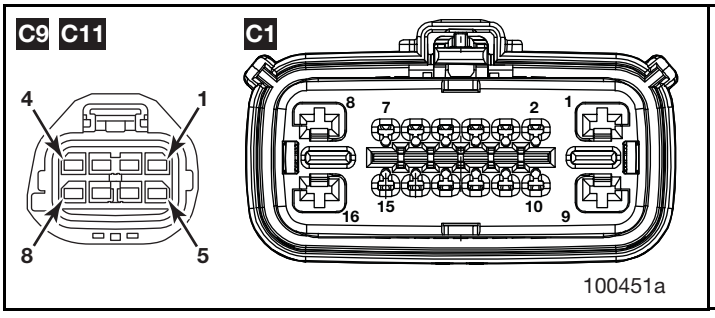


Figure 9 — Rear Frame Harness Connectors

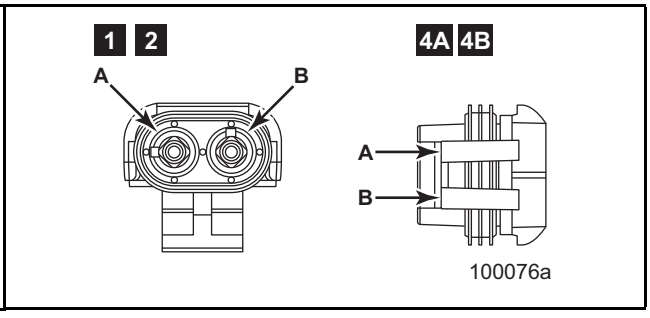


Figure 10 — In-Tank Harness Connectors

PROCEDURE

Step	Procedure	Action
1	**Check fuel pump circuit continuity.** a. Unplug the EFPR connector C11 for fuel pump 1. Check fuel pump circuit continuity. b. Using a multimeter, measure resistance between pin-5 and pin-8. c. Is resistance between 0.4–1.0 ohm?	**Yes** — Go to Step 3. **No** — Go to Step 2.
2	**Check continuity for each fuel pump.** a. Unplug connectors 1 and 4 of in-tank harness. b. Check continuity across connector 1 pins A and B. Is the resistance between 0.4-1.0 Ohms? c. Check continuity across connector 4 pins A and B. Is the resistance between 0.4-1.0 Ohms?	**Yes** — Go to Step 3. **No** — Replace fuel pump assembly.
3	**Check harness circuit continuity from fuel pumps to FPCM.** a. Check continuity for pump 1, wire FPPWR, V+ across: • Pin-A, connector C5 (tank harness) to pin-8, C1 (tank harness) • Pin-8, connector C1 (rear frame harness) and pin-5, connector C9 (rear frame harness) b. Check continuity for pump 1, wire FPRTN, V– across: • Pin-B, connector C5 (tank harness) to pin-16, C1 (tank harness) • Pin-16, connector C1 (rear frame harness) and pin-8, connector C9 (rear frame harness) c. Check continuity for pump 2, wire FPPWR, V+ across: • Pin-A, connector C6 (tank harness) to pin-1, C1 (tank harness) • Pin-1, connector C1 (rear harness) and pin-5, connector C11 (rear harness) d. Check continuity for pump 2, wire FPRTN, V– across: • Pin-B, connector C6 (tank harness) to pin-9, C1 (tank harness) • Pin-9, connector C1 (rear frame harness) and pin-8, connector C11 (rear frame harness) e. Is there good continuity in all circuits?	**Yes** — Refer to the *Fuel Pump Control Module Electrical Continuity Test* procedure. **No** — Repair circuit wiring.

Fuel Pump Control Module Electrical Continuity Test

NOTE

For harness and connector layout diagrams and system electrical schematics, refer to *Wiring Diagrams and Electrical Schematics*.

CONNECTORS

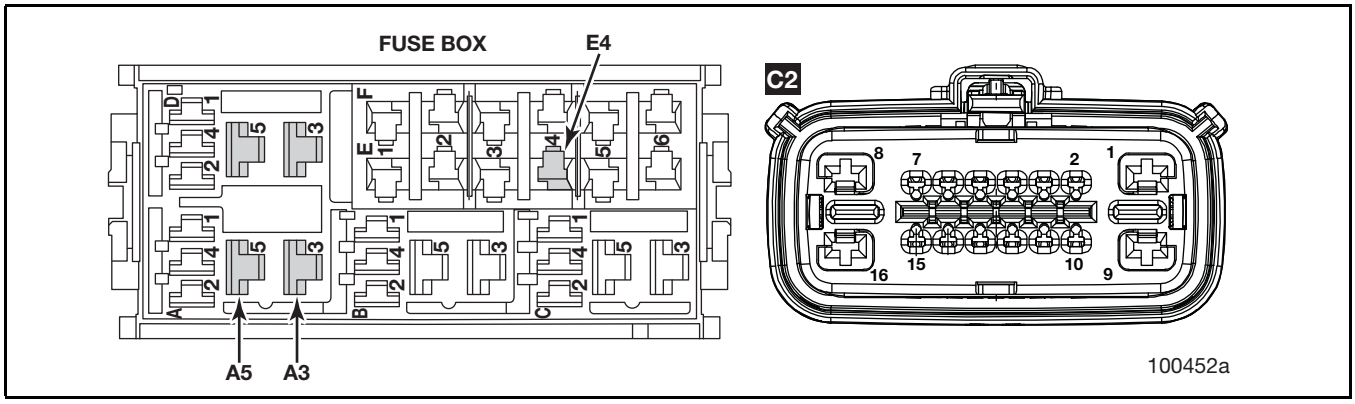


Figure 11 — Underhood Harness Connectors

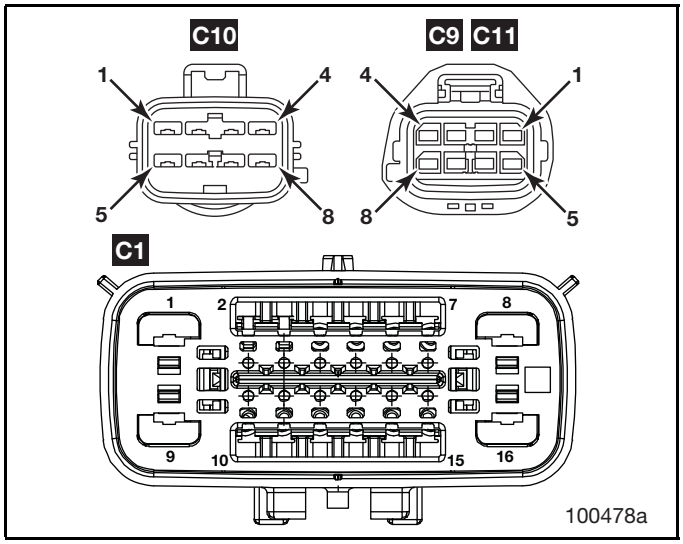


Figure 12 — Rear Frame Harness Connectors

PROCEDURE

Step	Procedure	Action
	For fuel pump control module (FPCM) functional testing and diagnostic trouble codes, refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* at www.motorcraft.com.	
1	**Check Ford FPCM circuit continuity to Ford harness.** a. Disconnect rear frame harness connectors C10 and C11. b. Check for continuity in the rear frame harness across: • Pin-1, connector C10 and pin-1, connector C11 • Pin-3, connector C10 and pin-3, connector C11 • Pin-4, connector C10 and pin-4, connector C11 • Pin-5, connector C10 and pin-5, connector C11 • Pin-6, connector C10 and pin-6, connector C11 • Pin-7, connector C10 and pin-7, connector C11 c. Is there good continuity in each circuit?	**Yes** — Go to Step 2. **No** — Repair circuit wiring.
2	**Check FPCM circuit continuity to Ford harness.** a. Disconnect rear frame harness connector C9. b. Check wire VPWR (V+) for continuity across: • Pin-1, connector C9 (rear frame harness) and pin-1, connector C6 (rear frame harness) • Pin-1, connector C2 (underhood harness) and cavity-A5, fuse box (underhood harness) • Cavity-A3, fuse box (underhood harness) and cavity-E4, fuse box (underhood harness) c. Is there good continuity in each circuit?	**Yes** — Go to Step 3. **No** — Repair circuit wiring.
3	**Check fuse condition (E3-E4).** Is the fuse blown?	**Yes** — Replace the fuse. **No** — Go to Step 4.
4	**Check ROUSH CleanTech FPCM circuit continuity to Ford harness.** a. Check for continuity in the rear frame harness across: • Pin-1, connector C6 and pin-1, connector C9 • Pin-4, connector C10 and pin-4, connector C9 • Pin-1, connector C1 and pin-5, connector C9 • Pin-6, connector C10 and pin-6, connector C9 • Pin-9, connector C1 and pin-8, connector C9 • Pin-15, connector C6 and pin-7, connector C9 b. Is there good continuity in each circuit?	**Yes** — Refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* for functional testing of the FPCM. **No** — Repair circuit wiring.

Smart Relay Module Electrical Test

NOTE

For harness and connector layout diagrams and system electrical schematics, refer to *Wiring Diagrams and Electrical Schematics*.

CONNECTORS

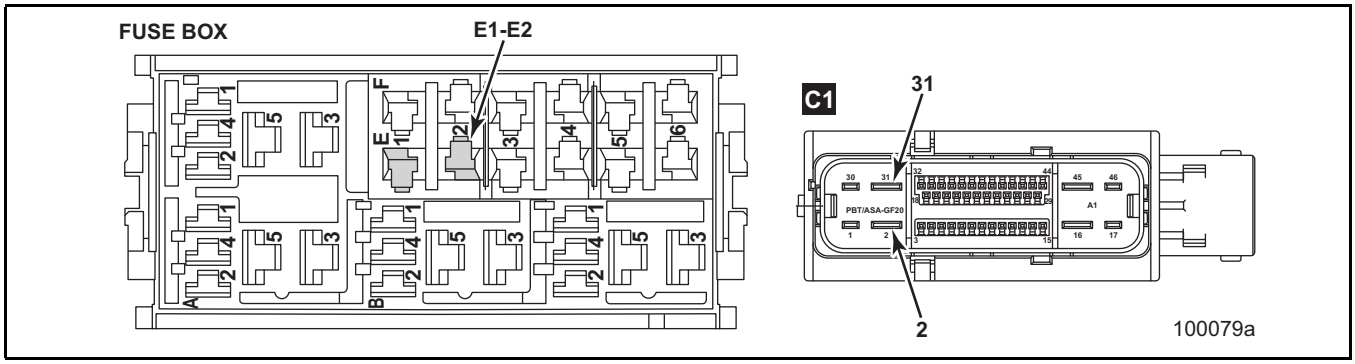


Figure 13 — Underhood Harness Connectors

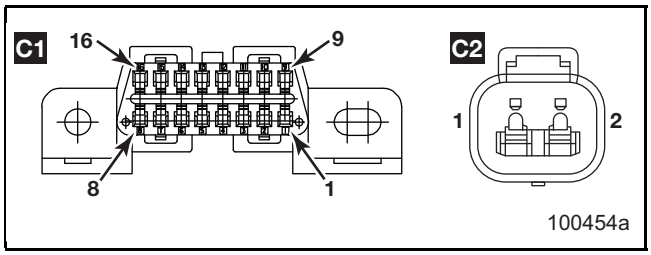


Figure 14 — CAN Harness Connectors

PROCEDURE

Step	Procedure	Action
1	**Disconnect the smart relay module (SRM) connector C1 (underhood harness).**	Go to Step 2.
2	**Check for battery voltage (B+) to the SRM.** a. Using a multimeter, check for B+ voltage at pin-2, connector C1. Use a body ground for reference. b. Is there voltage (B+)?	**Yes** — Go to Step 5. **No** — Go to Step 3.
3	**Check for battery voltage (B+) to the SRM.** a. Check circuit continuity between pin-2, connector C1 and cavity E2, auxiliary fuse box. b. Is there good continuity in the circuit?	**Yes** — Go to Step 4. **No** — Repair circuit wiring.
4	**Check for battery voltage (B+) to the SRM.** a. Check condition of SRM power fuse (E1-E2, 5A) in the auxiliary fuse box. b. Is fuse blown?	**Yes** — Replace fuse. **No** — Go to Step 5.

Step	Procedure	Action
5	**Check the SRM ground circuit for continuity.** a. Using a multimeter, check ground at pin-31, connector C1 (underhood harness). Use a body ground for reference. b. Is there good continuity?	**Yes** — Go to Step 6. **No** — Repair circuit wiring.
6	**Check CAN and underhood harness continuity.** a. Check CAN-H(+) continuity across: • Pin-28, SRM connector C1 (underhood harness) and pin-1, connector 23 (underhood harness) • Pin-1, connector C2 (CAN harness) and pin-6, connector C1 (CAN harness) b. Is there good continuity in the circuits?	**Yes** — Go to Step 7. **No** — Repair circuit wiring.
7	**Check CAN and underhood harness continuity.** a. Check CAN-H(–) continuity across: • Pin-43, SRM connector C1 (underhood harness) and pin-2, connector 23 (underhood harness) • Pin-2, connector C2 (CAN harness) and pin-14, connector C1 (CAN harness) b. Is there good continuity in the circuits?	**Yes** — Refer to the *Ford Powertrain Control/Emissions Diagnosis Service Manual* for functional testing of the CAN bus. **No** — Repair circuit wiring.

Fuel Level Sender Electrical Check

NOTE

For harness and connector layout diagrams and system electrical schematics, refer to *Wiring Diagrams and Electrical Schematics*.

CONNECTORS

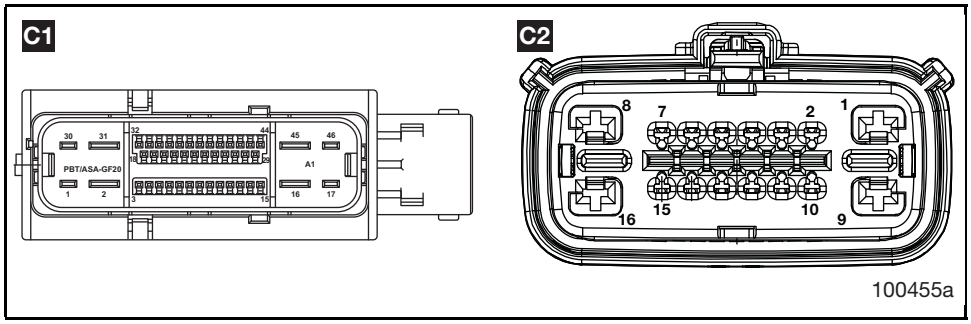


Figure 15 — Underhood Harness Connectors

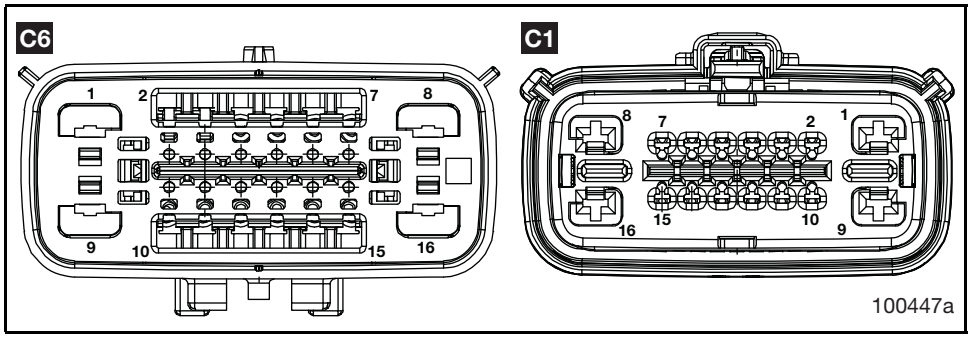


Figure 16 — Rear Frame Harness Connectors

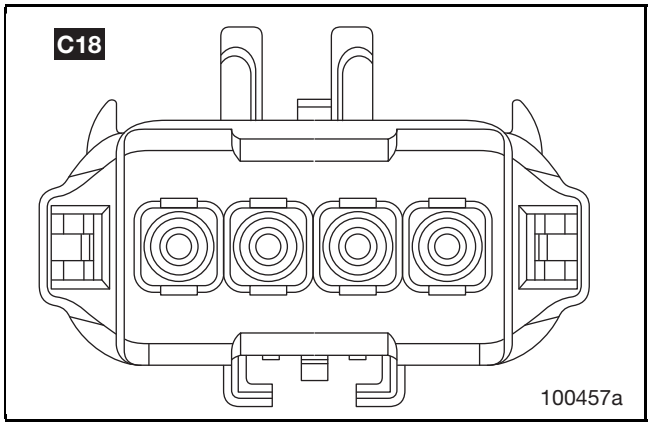


Figure 17 — Rear Frame Harness Connector

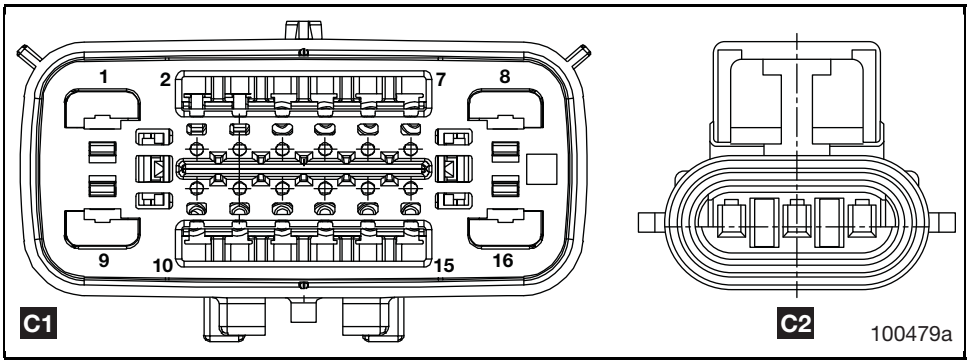


Figure 18 — Tank Harness Connectors

PROCEDURE

Step	Procedure	Action
	Note: When performing the following continuity test make sure to verify off-set of DVOM being used. When you touch the leads together a value will be present this could be 0.1 or greater. Remember to deduct this value from reading for actual resistance value. All continuity (OHMS) readings should be less than 0.5 OHMS	Example – DVOM off-set value is 0.2 ohms, When a circuit reading is taken and the value is 0.6 ohms you would subtract the 0.2 from 0.6 for an actual value of 0.4 ohms.
1	**If any SRM or TPTS DTC's present go to Pin Point test and resolve those faults prior to diagnosing the Fuel Level Sender fault.**	**Yes** — Go to SRM or TPTS PPT. **No** — Go to Step 2.
2	**Check for 5v vref present at pin-A harness side of FLS connector and Pin C.**	**Yes** — Go to Step 5. **No** — Go to Step 3.
3	**Check for continuity of harness for 5v vref circuit and ground circuit of Fuel Level Sender.** a. Check for continuity from FLS pin-A frame side harness to pin-4 of SRM connector: Continuity present - Yes, go to Step 3b. b. Check for continuity from FLS pin-C frame harness at FLS and pin-40 of SRM connector. c. Is there good continuity in each circuit?	**Yes** — Go to Step 4. **No** — Locate and repair open circuit or replace harness.
4	a. Check for continuity from SRM connector C1, pin-3 to connector C2, pin-10 (under-hood harness). Continuity present - Yes, go to Step 4b. b. Check for continuity from connector C6, pin-10 to connector C18, pin-2 (rear frame harness).	**Yes** — Go to Step 5. **No** — Repair circuit issues or replace harness.
5	**Perform output voltage check using a universal probe on Pin B at FLS connector.** a. With harness fully connected place the universal probe into pin-B of sending unit connector and monitor for voltage b. Is voltage present?	**Yes** — Go to Step 6. **No** — Replace electronic portion of sending unit.
6	**Perform sending unit range voltage test.** a. Remove the sending unit electronic portion by removing the 2 phillips screws securing it and use a magnet to move sender from full to empty: Make sure the voltage is within 0-5v. b. Was there any concern with voltage range output test?	**Yes** — Replace electronic portion of sending unit clear faults and test. **No** — Refer to the tank draining and in-tank sending unit replacement procedure to replace the in-tank sending unit.

Manual Solenoid Activation Procedure

NOTE

For harness and connector layout diagrams and system electrical schematics, refer to *Wiring Diagrams and Electrical Schematics*.

CONNECTOR

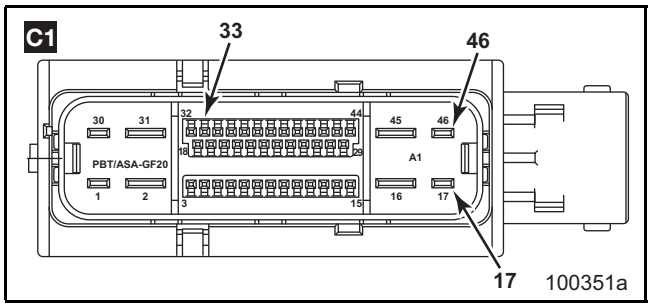


Figure 19 — Connector End View

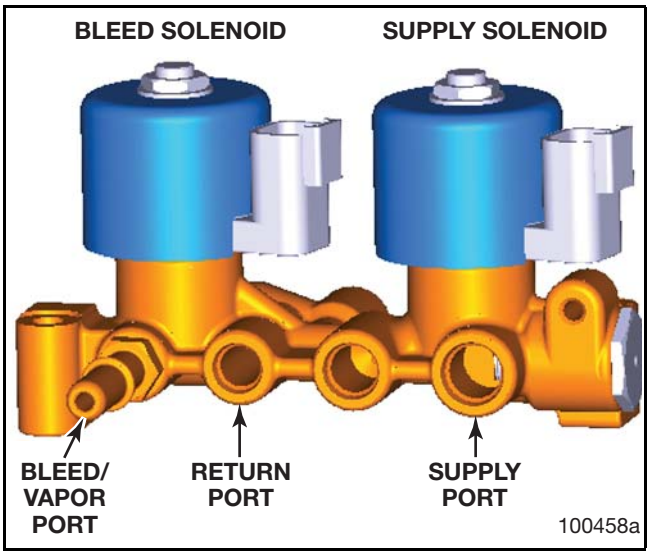


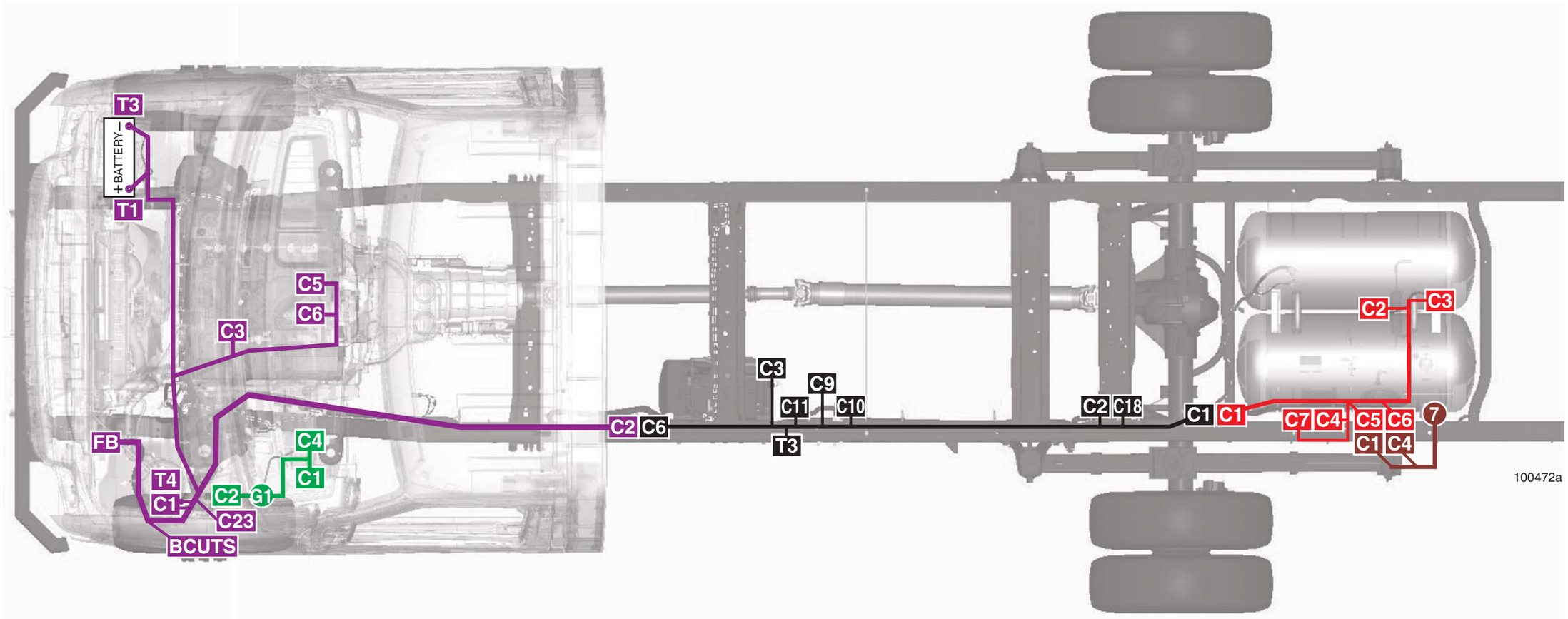
Figure 20 — FRPCM Solenoid Locations

PROCEDURE

Step	Procedure	Action
1	**Disconnect the smart relay module (SRM) wire harness connector at the SRM.**	—
2	**Energize the individual solenoids on the FRPCM by providing a ground to the following pins in the SRM connector:** • Pin 33 – Bleed Solenoid • Pin 32 – Supply Solenoid	—

WIRING DIAGRAMS AND ELECTRICAL SCHEMATICS

E-450 GEN4 Wiring Harnesses and Connector Layout



UNDERHOOD HARNESS
CAN HARNESS
REAR FRAME HARNESS
TANK HARNESS
IN-TANK HARNESS

UNDERHOOD HARNESS

BCUTS – BLUNT CUTS FOR CRANK WARNING, FUEL COOLER, AC2 REQ, AND A/C CLUTCH2

- C1 SRM, 46-PIN
- C2 UNDERHOOD / TANK INLINE, 16-PIN
- C3 IPTS, 4-PIN
- C5 SUPPLY SOLENOID, 2-PIN
- C6 BLEED SOLENOID, 2-PIN
- C23 UNDERHOOD / CAN HARNESS INLINE, 2-PIN
- FB FUSE BOX
- T1 BATTERY PWR, RING TERMINAL
- T3 BATTERY GROUND, RING TERMINAL
- T4 SRM CASE GROUND, RING TERMINAL

CAN HARNESS

- C1 OBD FLANGE MOUNT, 16-PIN
- C2 CAN / UNDERHOOD INLINE, 2-PIN
- C4 OBD INLINE TO FORD HARNESS, 16-PIN
- G1 PASS-THRU GROMMET

REAR FRAME HARNESS

- C1 REAR FRAME / TANK HARNESS INLINE, 16-PIN
- C2 FORD FTPT HARNESS INLINE, 3-PIN
- C3 FORD FTPT SENSOR, 3-PIN
- C6 REAR FRAME / UNDERHOOD INLINE, 16-PIN
- C9 RCT EFPR, 8-PIN
- C10 FORD FPCM HARNESS INLINE, 8-PIN
- C11 FORD EFPR, 8-PIN
- C18 FORD FUEL TANK HARNESS INLINE, 4-PIN
- T3 FRAME GROUND, RING TERMINAL

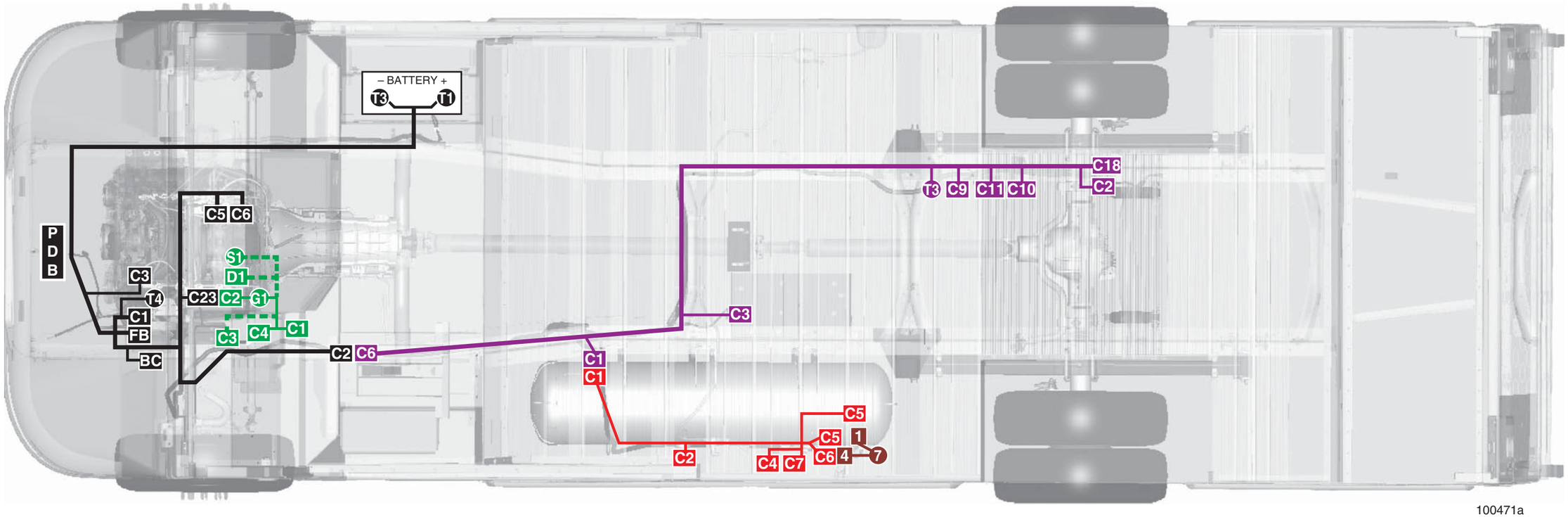
TANK HARNESS

- C1 TANK / REAR FRAME HARNESS INLINE, 16-PIN
- C2 FUEL LEVEL SENDER, 3-PIN
- C3 IPTS #2, 4-PIN
- C4 FLOW CONTROL SOLENOID (GRAY), 2-PIN
- C5 TANK / IN-TANK FP #1 INLINE, 2-PIN
- C6 TANK / IN-TANK FP #2 INLINE, 2-PIN
- C7 SUPPLY SOLENOID (BLACK), 2-PIN

IN-TANK HARNESS

- C1 FUEL PUMP #1 INLINE, 2-PIN
- C4 FUEL PUMP #2 INLINE, 2-PIN
- 7 TANK PASS-THRU GROMMET

2016 F-59 Wiring Harnesses and Connector Layout



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- UNDERHOOD HARNESS
- CAN HARNESS
- REAR FRAME HARNESS
- TANK SOLENOID HARNESS
- IN-TANK HARNESS

UNDERHOOD HARNESS

- C1 SRM, 46-PIN
- C2 UNDERHOOD / REAR FRAME INLINE CONNECTOR, 16-PIN
- C3 IPTS, 4-PIN
- C5 SUPPLY SOLENOID, 2-PIN
- C6 BLEED SOLENOID, 2-PIN
- C23 UNDERHOOD / CAN INLINE CONNECTOR, 4 -PIN
- FB AUX FUSE BOX
- T1 BATT POWER, RING TERMINAL
- T3 BATT GROUND, RING TERMINAL
- T4 SRM CASE GROUND, RING TERMINAL
- BC BLUNT CUTS FOR CK WRNG, FU CLR, A/C CL2, A/C CL3, AC2 REQ, AC3 REQ

CAN HARNESS

- C1 OBD FLANGE MOUNT, 16-PIN
- C2 CAN / UNDERHOOD INLINE, 4-PIN
- C3 CAN / MORGAN INLINE CONNECTOR, 1-PIN (UPS ONLY)
- C4 OBD INLINE CONNECTOR TO FORD HARNESS, 16-PIN
- D1 DIODE (UPS ONLY)
- G1 GROMMET
- S1 SPLICE TO MORGAN OLSON IP HARNESS (UPS ONLY)

REAR FRAME HARNESS

- C1 REAR FRAME / TANK INLINE, 16-PIN
- C2 FTPT FORD HARNESS INLINE, 3-PIN
- C3 FTPT SENSOR, 3-PIN
- C6 REAR FRAME / UNDERHOOD INLINE, 16-PIN
- C9 RCT EFPR, 8-PIN
- C10 FORD FPCM INLINE, 8-PIN
- C11 FORD EFPR, 8-PIN
- C18 FORD FUEL TANK HARNESS INLINE, 4-PIN
- T3 FRAME GROUND (FP SHIELD), RING TERMINAL

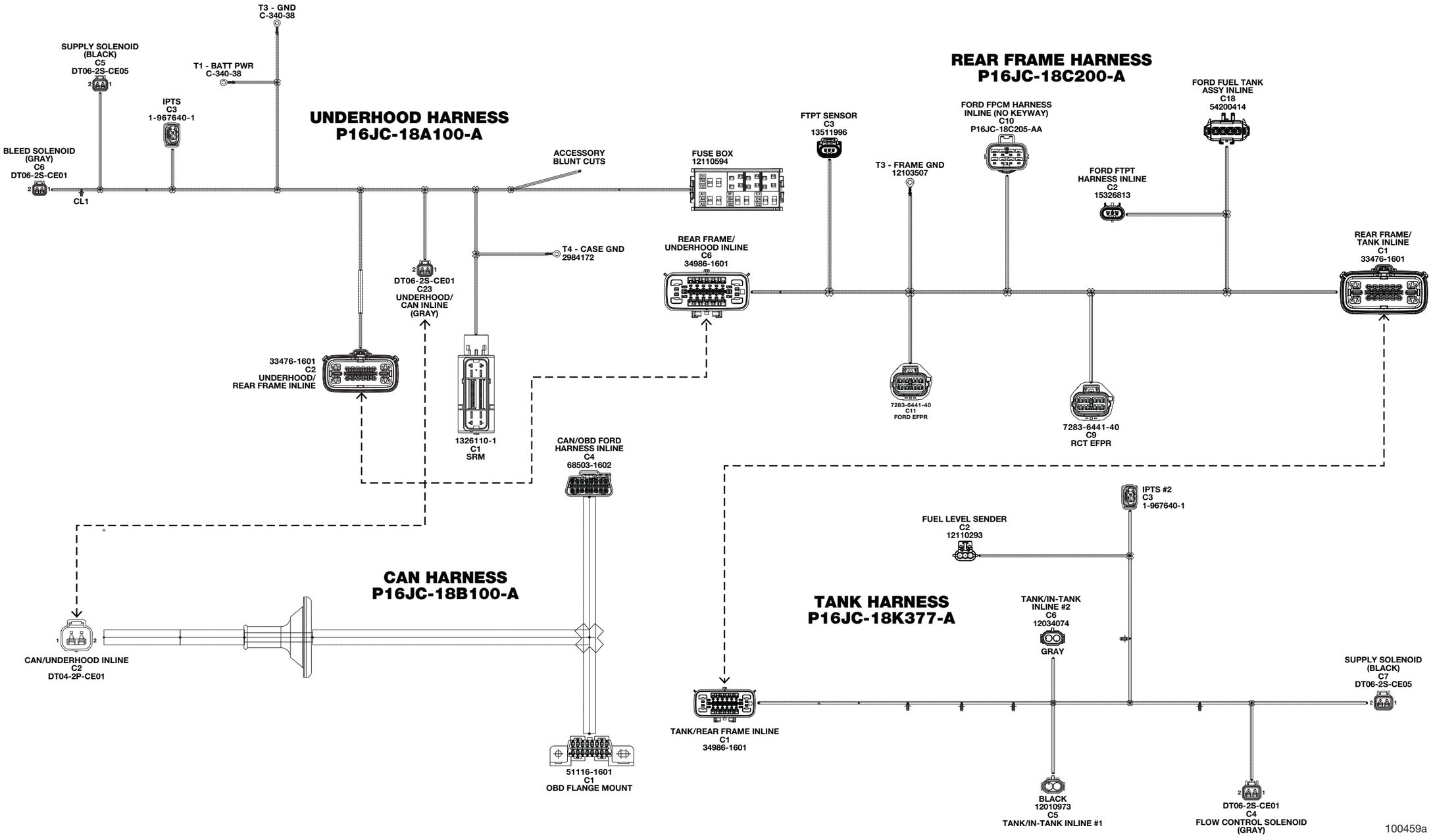
TANK SOLENOID HARNESS

- C1 TANK / REAR FRAME INLINE, 16-PIN
- C2 FUEL LEVEL SENDER, 3-PIN
- C3 IPTS #2, 4-PIN
- C4 FLOW CONTROL SOLENOID VALVE, 2-PIN
- C5 TANK / FUEL PUMP #1 INLINE, 2-PIN (BLK)
- C6 TANK / FUEL PUMP #2 INLINE, 2-PIN (GRAY)
- C7 SUPPLY SOLENOID VALVE, 2-PIN

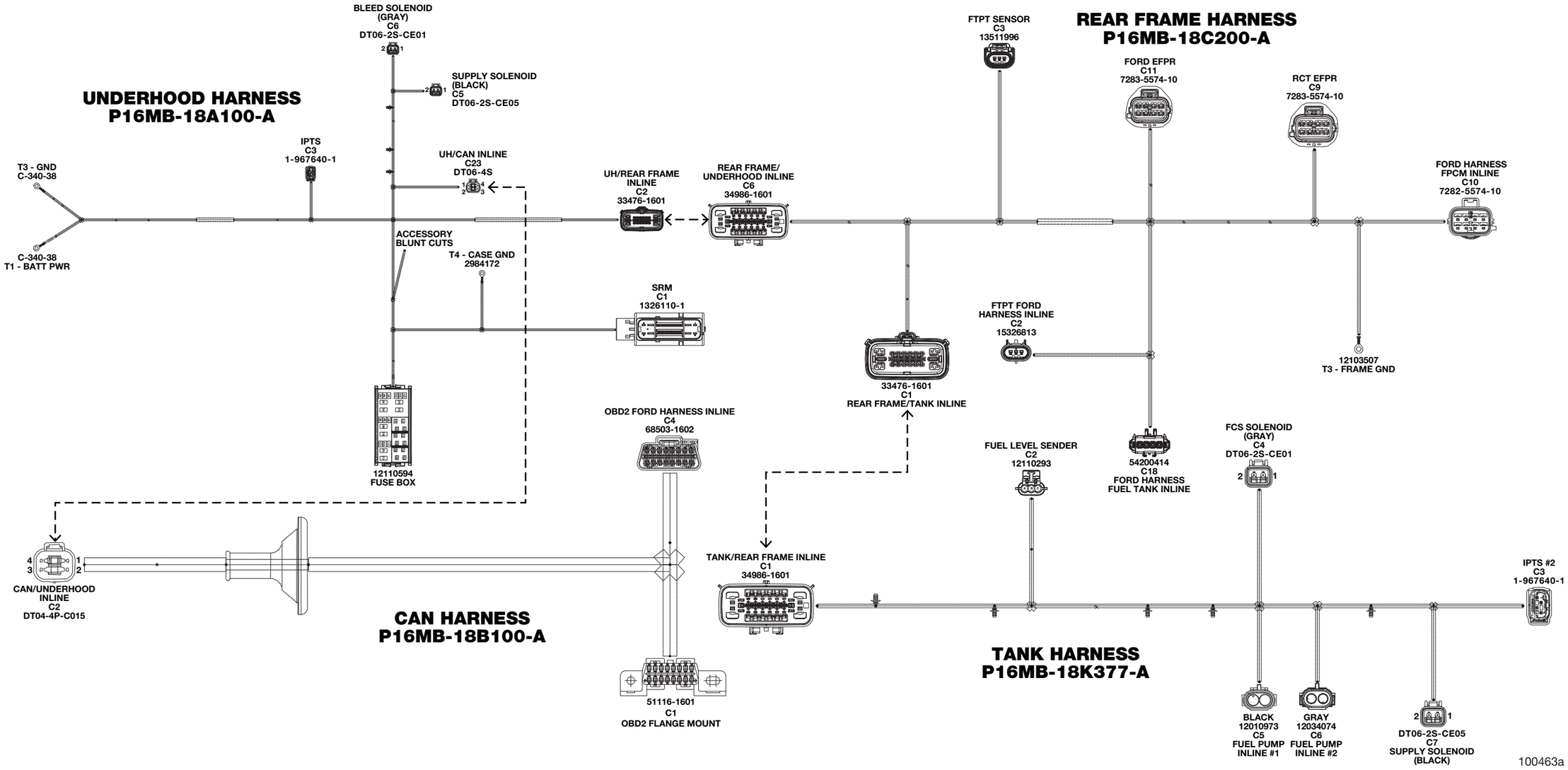
IN-TANK HARNESS

- C1 FUEL PUMP #1 INLINE CONNECTOR
- C4 FUEL PUMP #2 INLINE CONNECTOR
- 7 GROMMET

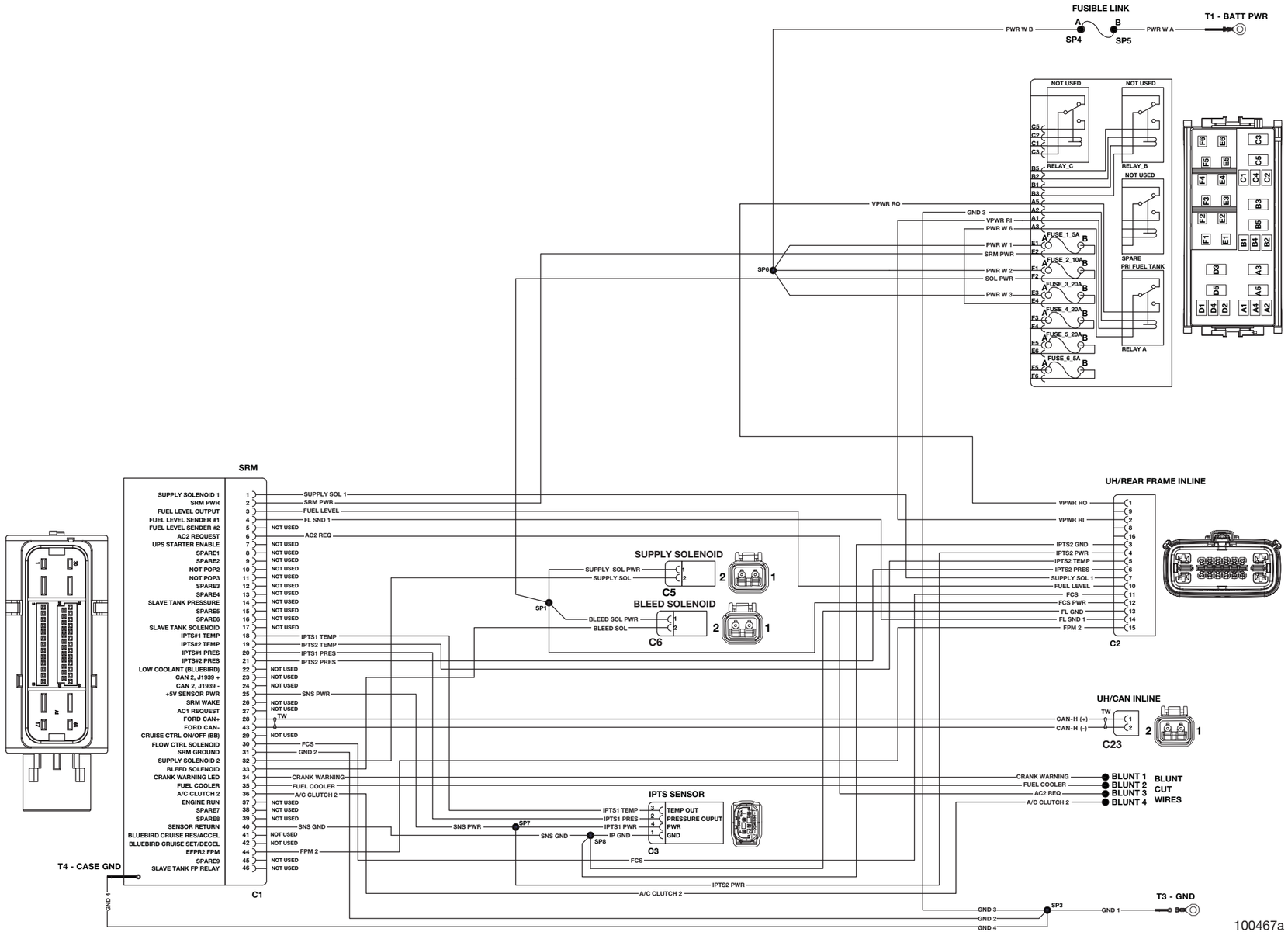
E-450 Roush Wiring Harnesses



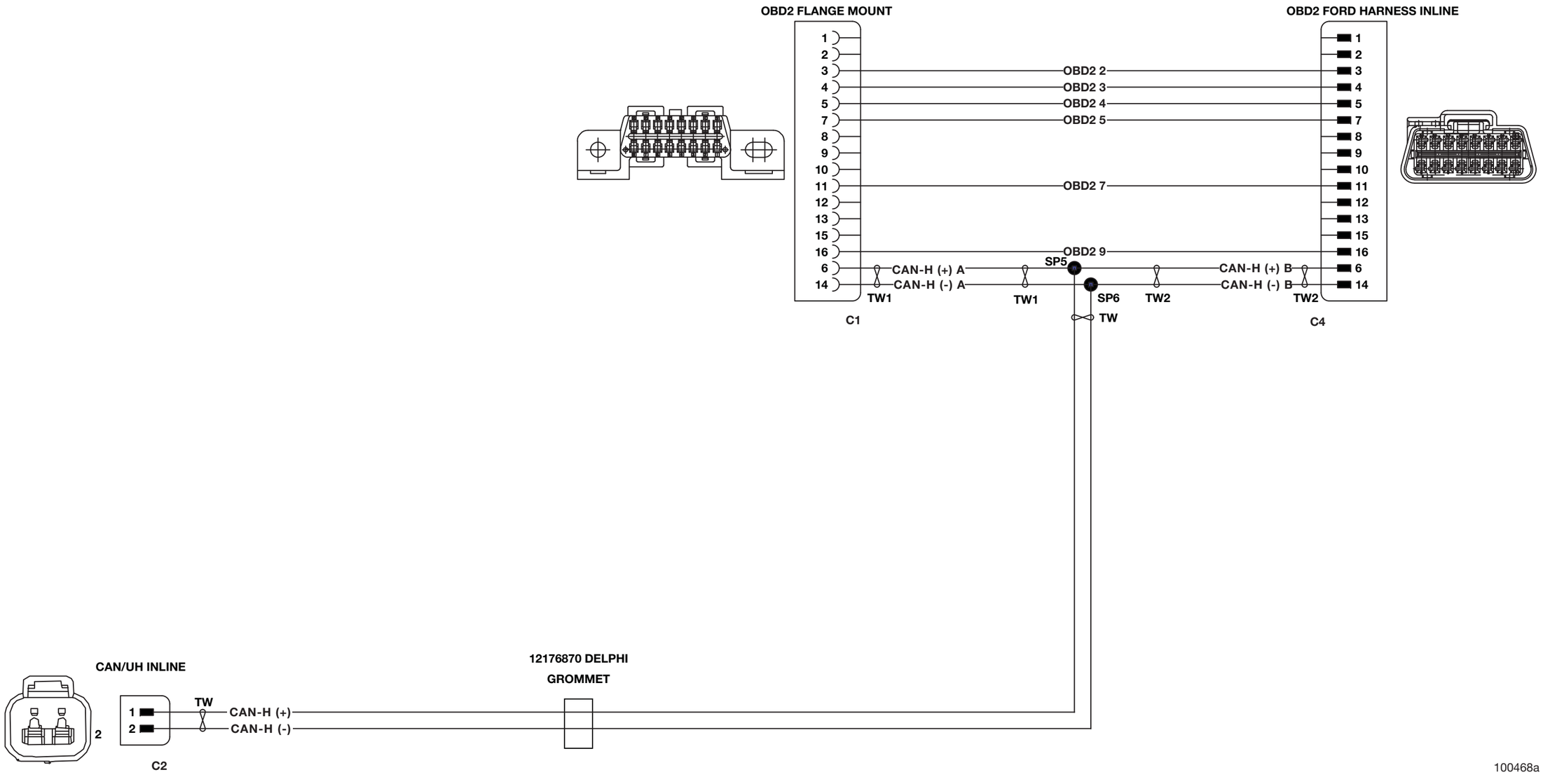
F-59 Roush Wiring Harnesses



E-450 and F-59 Electrical Schematic — Underhood Harness



E-450 Electrical Schematic — CAN Bus Harness



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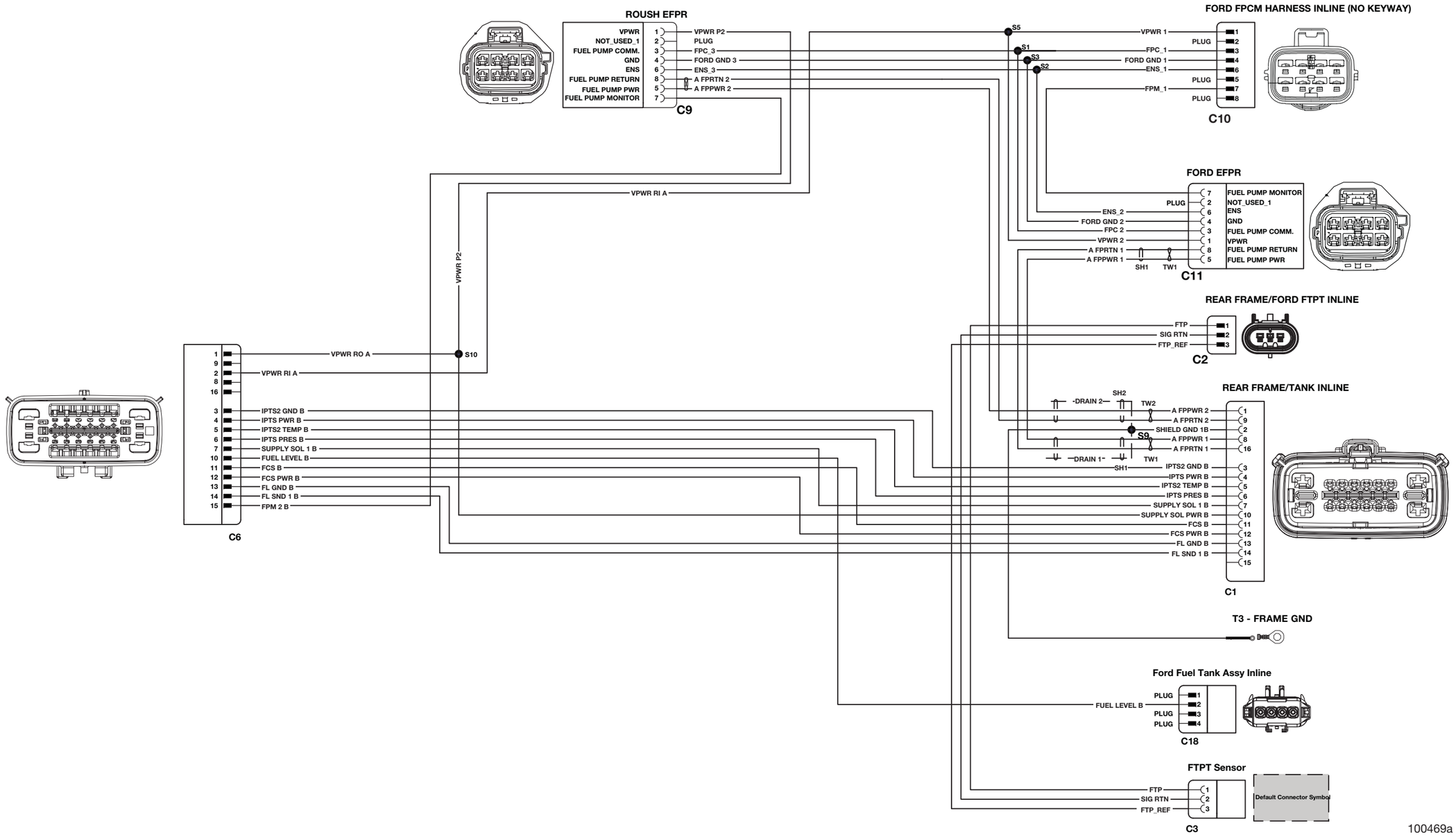
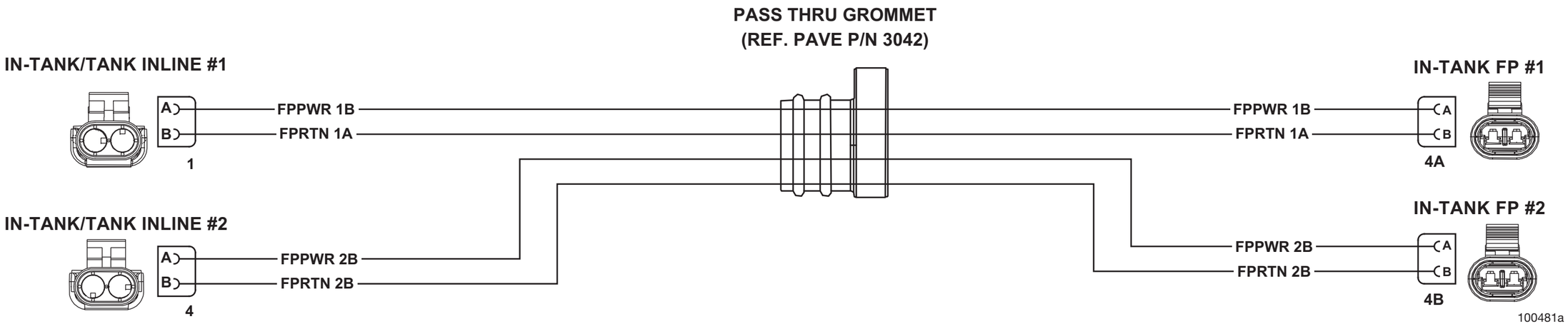
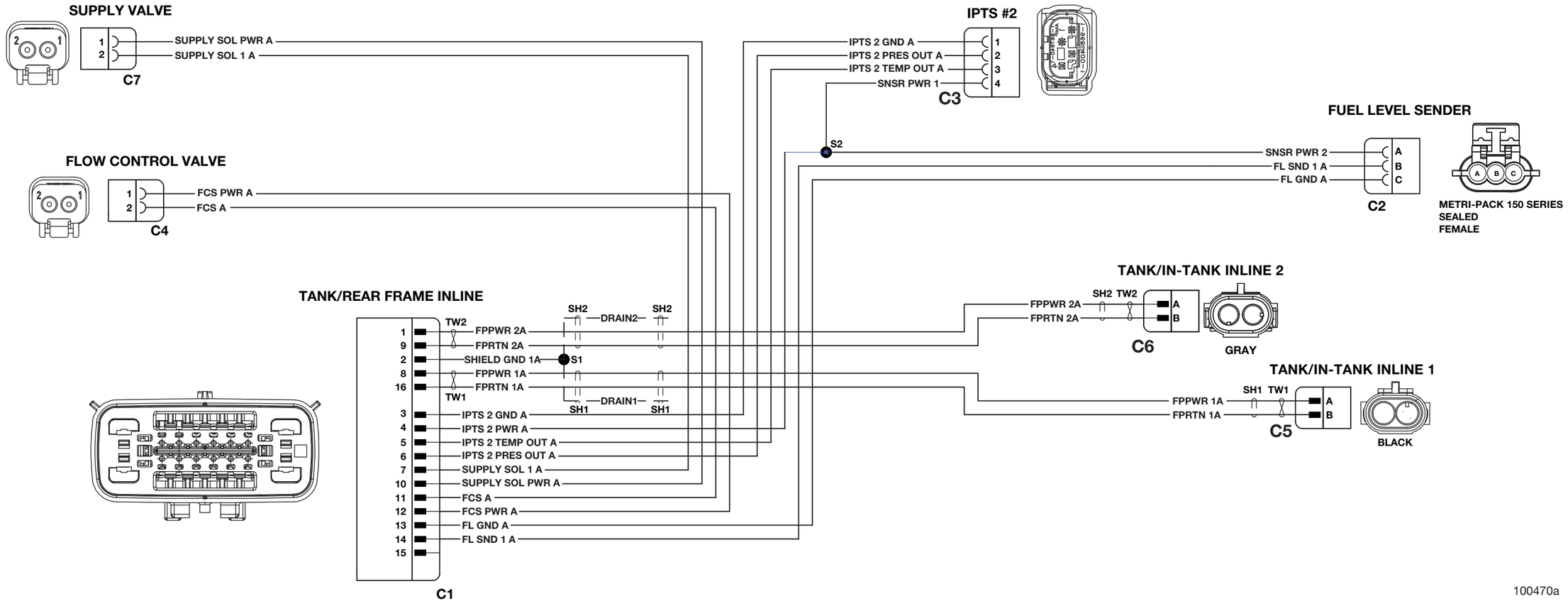
E-450 and F-59 Electrical Schematic — Rear Frame Harness



E-450 and F-59 Electrical Schematic — In-Tank Harness



E-450 and F-59 Electrical Schematic — Tank Harness



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F-59 CAN Schematic