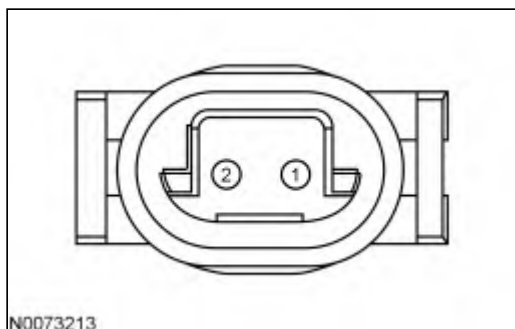
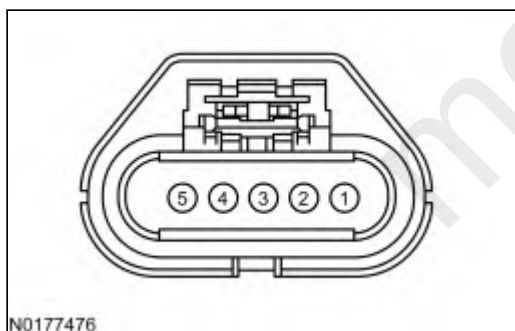
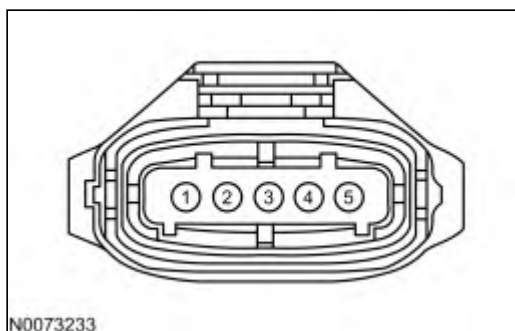


AK: Turbocharger Actuator

Note: Regeneration may occur during normal operation. During regeneration, diagnostic procedures may display biased values. If a regeneration occurs during diagnostic procedures, allow the process to complete before continuing diagnostics.

This pinpoint test is intended to diagnose the following:

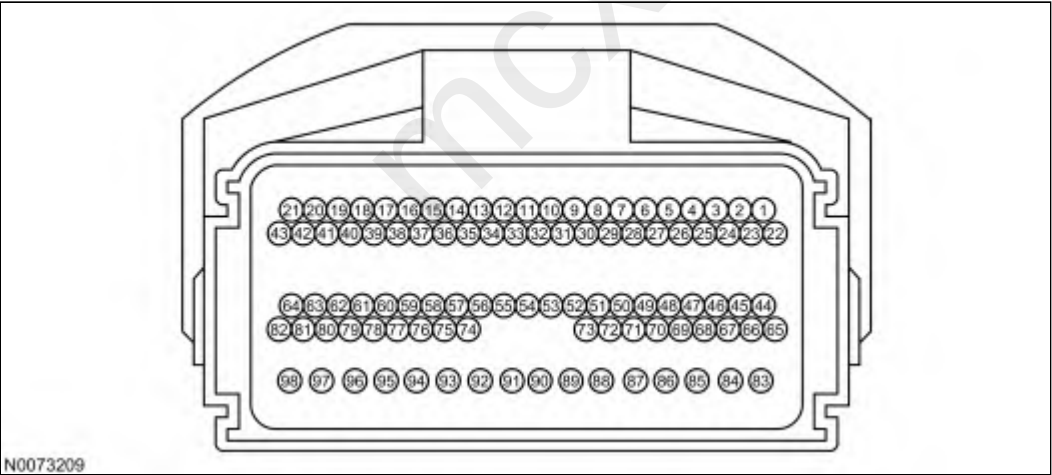
- harness circuits: VPWR and VGTC
- turbocharger actuator (9J559)
- PCM (12A650)

Turbocharger Actuator Connector**A****B****C**

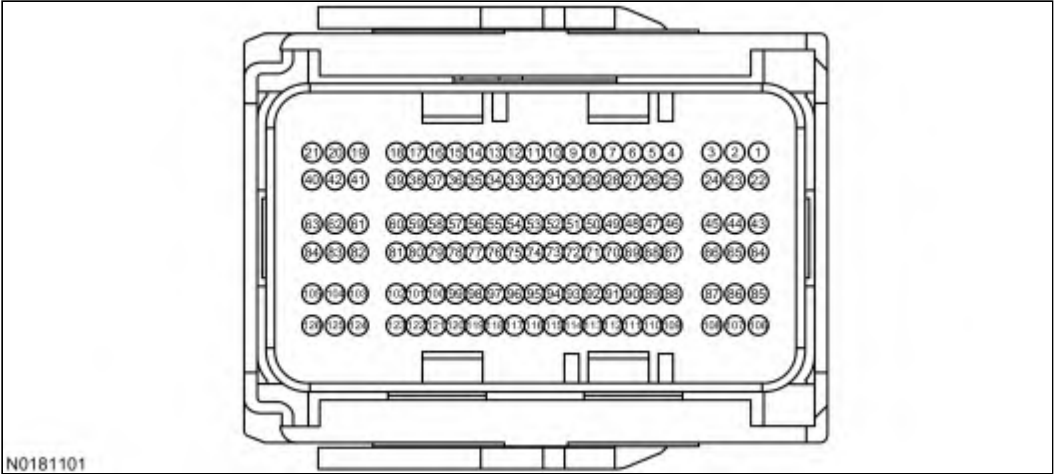
Vehicle	Connector	Pin	Circuit
F-650 / F-750	A	1	VGTC
		2	VPWR
F-Series Super Duty	B	1	VGTVCL
		2	VGTVCH
		3	VGTP
		4	SIGRTN
		5	VREF
Transit Connect	B	2	VGTVCL
		1	VGTVCH
		4	VGTP
		5	SIGRTN
		3	VREF
All other vehicles	C	2	VGTVCL
		1	VGTVCH
		4	VGTP
		3	SIGRTN
		5	VREF

Powertrain Control Module-E (PCM-E) Connector

A

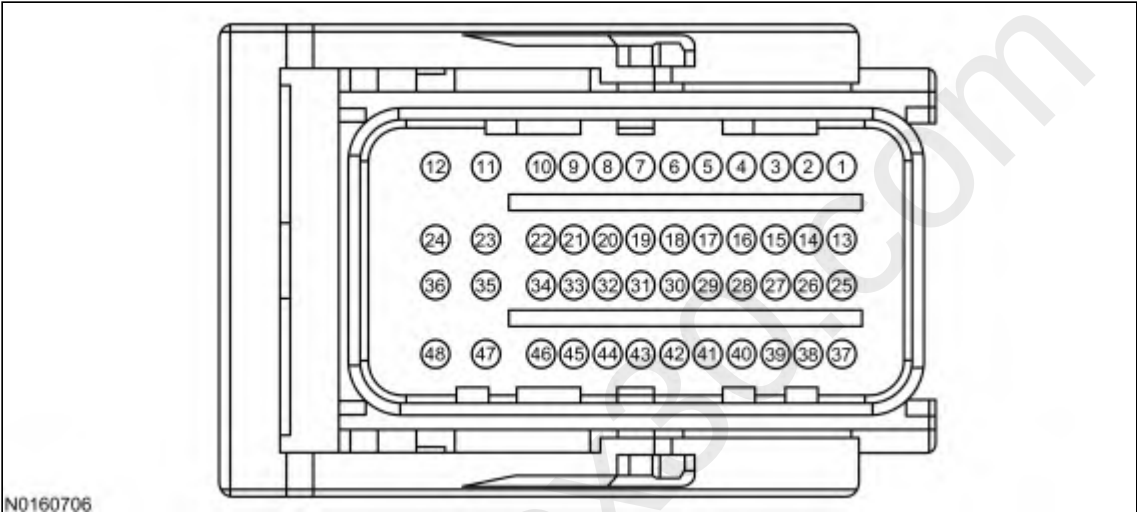


B



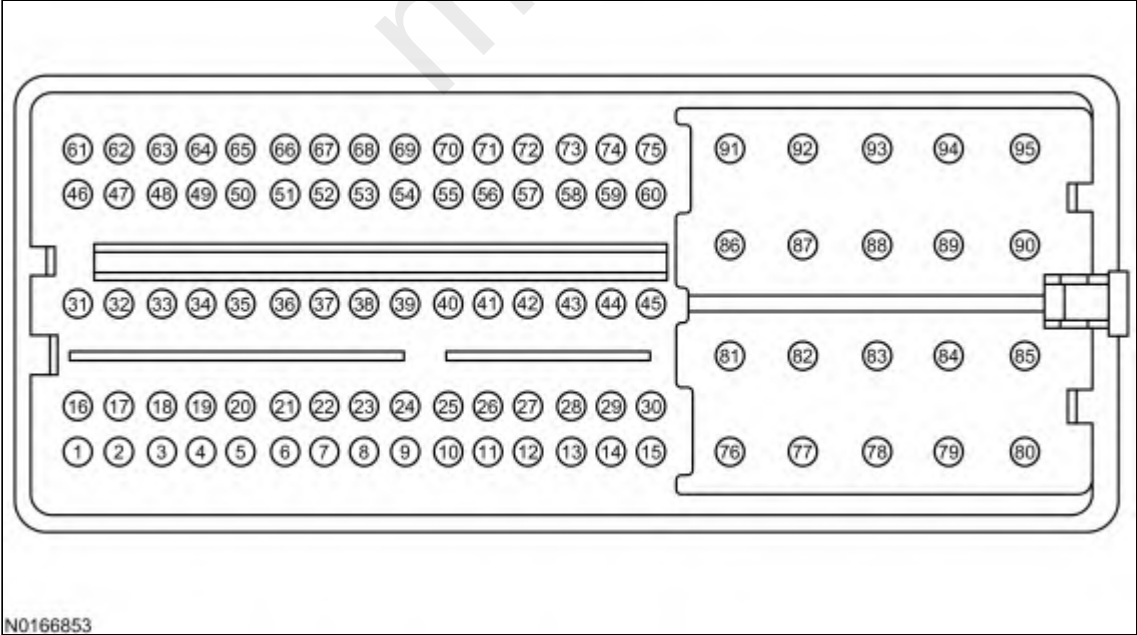
N0181101

C



N0160706

D



N0166853

Vehicle	Connector	Pin	Circuit
F-650 / F-750	A	24	VGTC
F-Series Super Duty	B	108	VGTVCL
		54	VGTVCH
		55	VGTP
Transit	C	42	VGTVCL
		41	VGTVCH
		17	VGTP
Transit Connect	D	92	VGTVCL
		87	VGTVCH
		73	VGTP
All other vehicles	A	67	VGTVCL
		46	VGTVCH
		79	VGTP

AK1 PRELIMINARY DIAGNOSIS

Note: The presence of DTC P132A may indicate that the vehicle is operating in derate mode and may experience a loss of power.

Are DTCs P003A, P0045, P0046, P0047, P0048, P0237, P0238, P0474, P132A, P2564, P2565, P2598, P259E or P259F present?

Yes	GO to AK2 .
No	For symptoms without DTCs, GO to AK2 . For all others, RETURN to Section 3, Symptom Charts for further direction.

AK2 CHECK THE VOLTAGE TO THE COMPONENT

- Ignition OFF.
- Turbocharger Actuator connector disconnected.
- Ignition ON, engine OFF.
- For F-150, F-Series Super Duty, Transit and Transit Connect,
- Measure the voltage between:

(+) Turbocharger Actuator Connector, Harness Side	(-) Turbocharger Actuator Connector, Harness Side
VREF	SIGRTN

- For all others,
- Measure the voltage between:

(+) Turbocharger Actuator Connector, Harness Side	(-)
VPWR	Ground

Is the voltage between 4.5V - 5.5V (F-150, F-Series Super Duty, Transit and Transit Connect) or greater than 10.5V

(all others)?

Yes	GO to AK3 .
No	For F-150, F-Series Super Duty, Transit and Transit Connect, GO to Pinpoint Test B . For all others, REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

AK3 CHECK FOR AN OPEN

- Ignition OFF.
- PCM-E connector disconnected.
- For F-150, F-Series Super Duty, Transit and Transit Connect,
- Measure the resistance between:

(+) Turbocharger Actuator Connector, Harness Side	(-) PCM-E Connector, Harness Side
VGTP	VGTP
VGTVCH	VGTVCH
VGTVCL	VGTVCL

- For all others,
- Measure the resistance between:

(+) Turbocharger Actuator Connector, Harness Side	(-) PCM-E Connector, Harness Side
VGTC	VGTC

Are the resistances less than 5 ohms?

Yes	GO to AK4 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

AK4 CHECK FOR A SHORT TO GROUND

- For F-150, F-Series Super Duty, Transit and Transit Connect,
- Measure the resistance between:

(+) Turbocharger Actuator Connector, Harness Side	(-)
VGTP	Ground
VGTVCH	Ground
VGTVCL	Ground

- For all others,
- Measure the resistance between:

(+) Turbocharger Actuator Connector, Harness Side	(-)
VGTC	Ground

Are the resistances greater than 10K ohms?

Yes	GO to AK5 .
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

AK5 CHECK FOR A SHORT TO VOLTAGE

- Ignition ON, engine OFF.
- For F-150, F-Series Super Duty, Transit and Transit Connect,
- Measure the voltage between:

(+) Turbocharger Actuator Connector, Harness Side	(-)
VGTP	Ground
VGTVCH	Ground
VGTVCL	Ground

- For all others,
- Measure the voltage between:

(+) Turbocharger Actuator Connector, Harness Side	(-)
VGTC	Ground

Is any voltage present?

Yes	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.
No	For F-150, F-series Super Duty, Transit and Transit Connect, GO to AK6 . For all others, GO to AK8 .

AK6 CHECK FOR CONTROL CIRCUITS SHORTED TOGETHER

- Measure the resistance between:

(+) Turbocharger Actuator Connector, Harness Side	(-) Turbocharger Actuator Connector, Harness Side
VGTVCH	VGTVCL

Is the resistance greater than 10K ohms?

Yes	GO to AK7 .
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

AK7 CHECK THE INTERNAL RESISTANCE OF THE TURBOCHARGER ACTUATOR

- Measure the resistance between:

(+) Turbocharger Actuator Connector, Component Side	(-) Turbocharger Actuator Connector, Component Side
VGTVCH	VGTVCL

Is the resistance between 1-900 ohms (F-150, Transit and Transit Connect) or 1-1000 ohms (F-Series Super Duty).

Yes	GO to AK8 .
No	INSTALL a new Turbocharger Actuator. REFER to the Workshop Manual Section 303-04, Fuel Charging and Controls. CARRY OUT the Reset And Clear The Specified Function MAF Sensor and perform a Turbocharger variable vane actuator offset learn on the scan tool. REFER to Section 2, Clear The Continuous Diagnostic Trouble Codes (DTCs) And Reset The Emission Monitors Information in The Powertrain Control Module (PCM). Clear the PCM DTCs. REPEAT the self-test.

AK8 INTERMITTENT CHECK

- PCM-E connector connected.
- Turbocharger Actuator connector connected.
- Ignition ON, engine OFF.
- Access the PCM and monitor the VGT_POS_V (VOLT) PID.
- While observing the PID for voltage spikes, wiggle, shake, and bend small sections of the wiring harness while working from the turbocharger actuator to the PCM.

Is a concern present?

Yes	REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.
No	For Transit Connect, GO to AK10. For all others, GO to AK9.

AK9 CHECK THE TURBOCHARGER ACTUATOR OPERATION WITH THE ENGINE OFF

- Ignition ON, engine OFF.
- Access the PCM and monitor the VGT_POS_V (VOLT) PID.
- Access the PCM and control the VGTDC (PER) PID.
- For F-Series Super Duty.
- Monitor the VGT_POS_V PID and compare the values to the turbocharger actuator position sensor table.
- If voltages are not within specified range, carry out a Turbocharger variable vane actuator offset learn on the scan tool.

Turbocharger Actuator Position Sensor (F-Series Super Duty) (Approximate)

VGTDc PID	VGT_POS_V PID minimum	VGT_POS_V PID maximum
0%	1.1 (F-Series Super Duty)	1.3 (F-Series Super Duty)
100%	3.4 (F-Series Super Duty)	4.5 (F-Series Super Duty)

- For all others.
- Monitor the VGT_POS_V PID and compare the values to the turbocharger actuator position sensor table.

Turbocharger Actuator Position Sensor (Approximate)

VGTDc PID	VGT_POS_V PID minimum	VGT_POS_V PID maximum
0%	0.65 (F-150) 0.96 (all others)	0.85 (F-150) 1.04 (all others)
100%	4.15 (F-150) 3.92 (all others)	4.35 (F-150) 4.08 (all others)

Does the VGT_POS_V PID value approximately match the values in the turbocharger actuator position sensor table?

Yes	GO to AK10 .
No	INSTALL a new Turbocharger Actuator. REFER to the Workshop Manual Section 303-04, Fuel Charging and Controls. CARRY OUT the Reset And Clear The Specified Function MAF Sensor and perform a Turbocharger variable vane actuator offset learn on the scan tool. REFER to Section 2, Clear The Continuous Diagnostic Trouble Codes (DTCs) And Reset The Emission Monitors Information in The Powertrain Control Module (PCM). Clear the PCM DTCs. REPEAT the self-test.

AK10 CHECK THE OPERATION OF THE TURBOCHARGER ACTUATOR

- Ignition ON, engine OFF.
- Access the PCM and control the VGTDc (PER) PID.
- Command the VGTDc PID duty cycle to 0%.
- Record the turbocharger actuator arm position.
- Command the VGTDc PID duty cycle to 100%.
- Record the turbocharger actuator arm position.

Does the turbocharger actuator arm change position when commanded?

Yes	The system is operating correctly at this time. RETURN to Section 3, Symptom Charts for further direction.
No	INSTALL a new Turbocharger Actuator. REFER to the Workshop Manual Section 303-04, Fuel Charging and Controls. CARRY OUT the Reset And Clear The Specified Function MAF Sensor and perform a Turbocharger variable vane actuator offset learn on the scan tool. REFER to Section 2, Clear The Continuous Diagnostic Trouble Codes (DTCs) And Reset The Emission Monitors Information in The Powertrain Control Module (PCM). Clear the PCM DTCs. REPEAT the self-test.

AK11 CHECK FOR CORRECT TURBOCHARGER ACTUATOR OPERATION

- Visually inspect for:
 - pushed out pins
 - corrosion
- Connect the turbocharger actuator connector and make sure it seats correctly.
- Carry out the PCM self-test and verify the concern is still present.

Is the concern still present?

Yes	INSTALL a new Turbocharger Actuator. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. CARRY OUT the Reset And Clear The Specified Function Turbo System on the scan tool. REFER to Section 2, Clear The Continuous Diagnostic Trouble Codes (DTCs) And Reset The Emission Monitors Information in The Powertrain Control Module (PCM). Clear the PCM DTCs. REPEAT the self-test.
No	The system is operating correctly at this time. The concern may have been caused by a loose or

corroded connector.

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