

**X-TYPE**

DATE 08/02

XT303-04

SERVICE**TECHNICAL BULLETIN****Hard Starting/Poor Idle/Restricted
Performance – Engine Management
Diagnosis – Flowcharts**MODEL 2002 MY-ON
X-TYPE

VIN C00001-ON

Issue:

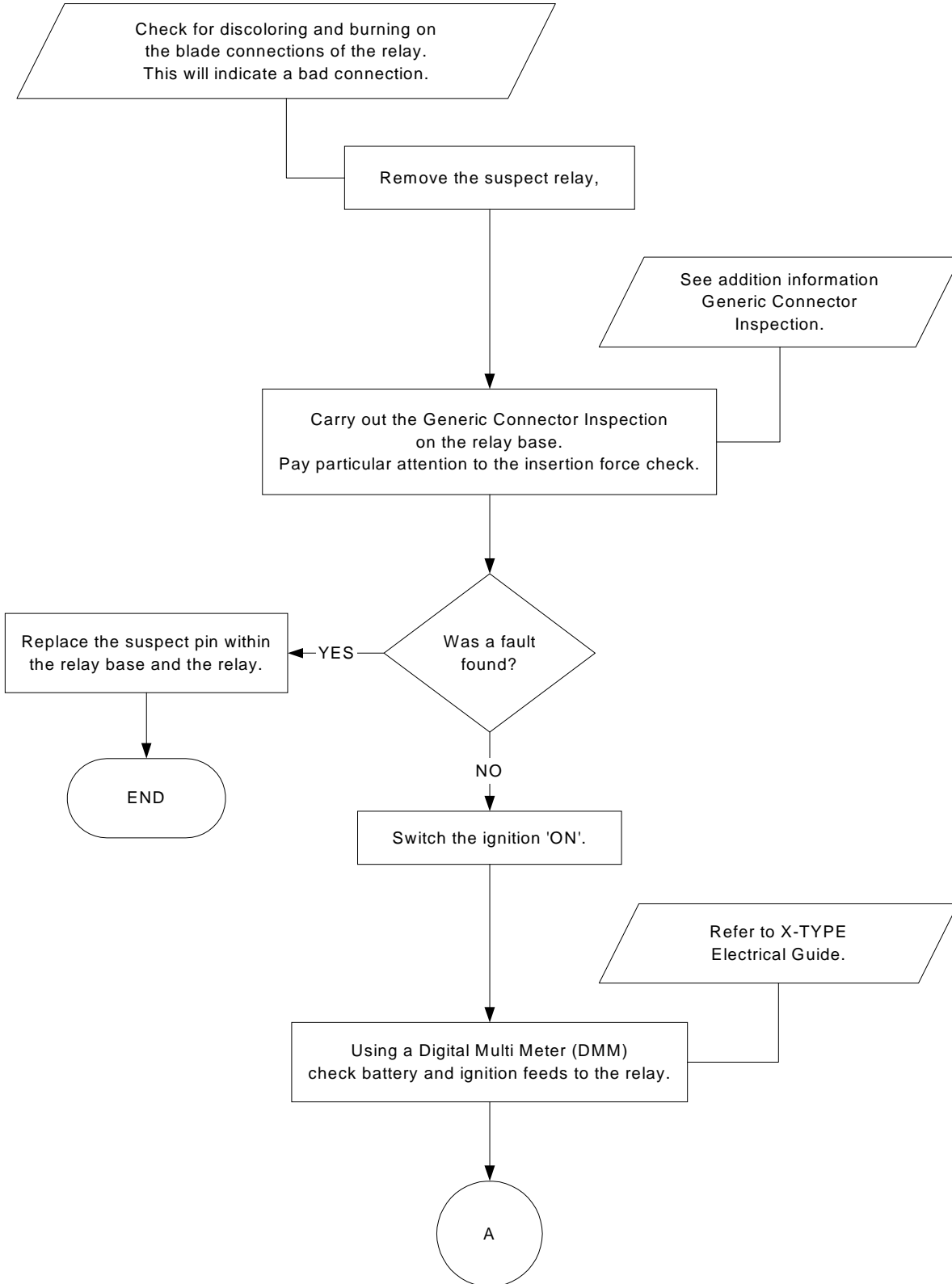
This bulletin provides diagnosis procedures for various components of the engine management system.

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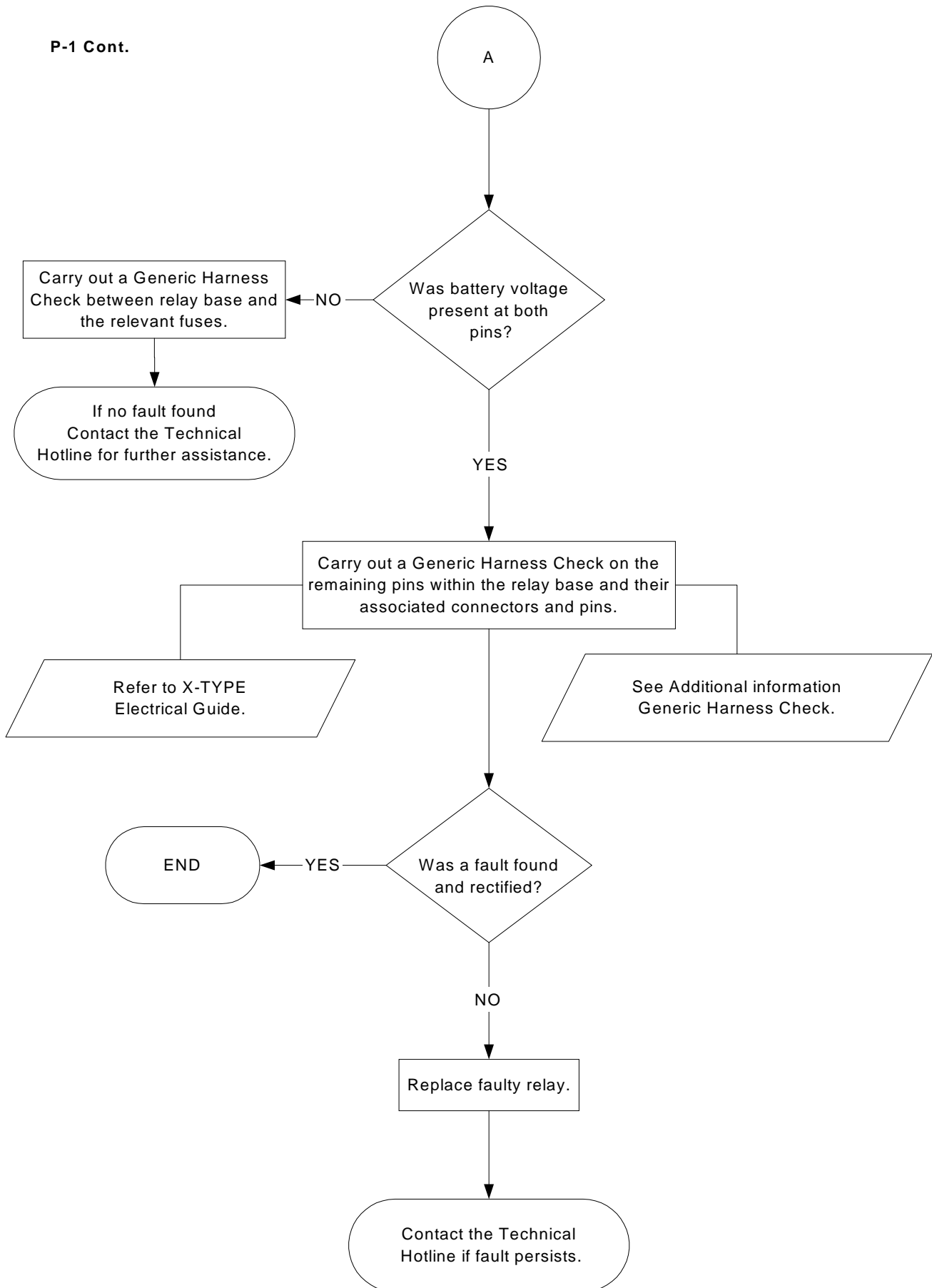
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Engine Management System Flowcharts – Fault Matrix			
Flowchart	Component/area	ECM noticeable default action	Possible symptoms
P-1	Engine Management Relays	None	Non-start. No crank.
P-2	Camshaft Position Sensors	None	Prolonged crank. Stall (A bank fault only). Reduced performance
P-3	Ignition Coils	Restricted performance (max engine speed 3000 rpm). Amber warning lamp illuminated.	Non-start. Poor start. Poor idle. Reduced/restricted performance. Misfire. Stall.
P-4	Upstream and Downstream Oxygen Sensors	Open loop fuel metering upstream oxygen sensors only.	Poor idle. Hesitation. Stall.
P-5	Throttle Position Sensor	Throttle motor and throttle relay disabled. Red warning lamp illuminated. Limp home mode.	Limited throttle response.
P-6	Throttle Motor	Throttle motor and throttle relay disabled. Red warning lamp illuminated. Limp home mode.	Limited throttle response.
P-7	Accelerator Pedal Position Sensor	Red warning lamp illuminated. Limp home mode.	Fixed engine speed (approximately 1200 rpm). No throttle response.
P-8	Variable Valve Timing	None	Prolonged crank. Poor start. Poor idle. Reduced performance. Stall.
P-9	Intake Air Temperature	None	Prolonged detonation.
P-10	Mass Air Flow Meter	Restricted performance (max engine speed 3000 rpm). Amber warning lamp illuminated.	Poor start. Reduced/restricted performance. Start then stall.
P-11	Engine Fuel Temperature Sensor	None	Prolonged crank. Poor start.
P-12	Crankshaft Position Sensor	Restricted performance (max engine speed 3000 rpm). Amber warning lamp illuminated.	Prolonged crank. Poor start. Reduced/restricted performance.
P-13	Air Leakage	Restricted performance (max engine speed 3000 rpm). Amber warning lamp illuminated.	Poor start. Poor idle. Hesitation. Reduced/restricted performance. Start then stall.
P-14	Park Neutral Switch	None	No crank.
P-15	Injection Pressure Sensor	None	Prolonged crank. Poor start. Poor idle. Reduced performance. Hesitation.
P-16	Knock Sensor	Restricted performance (max engine speed 3000 rpm). Amber warning lamp illuminated.	Reduced/restricted performance.
P-17	Clutch Pedal Safety Switch	None	No crank.
P-18	Engine Coolant Temperature Sensor	Restricted performance (max engine speed 3000 rpm). Amber warning lamp illuminated.	Poor start. Poor idle. Hesitation. Reduced/restricted performance. Start then stall.

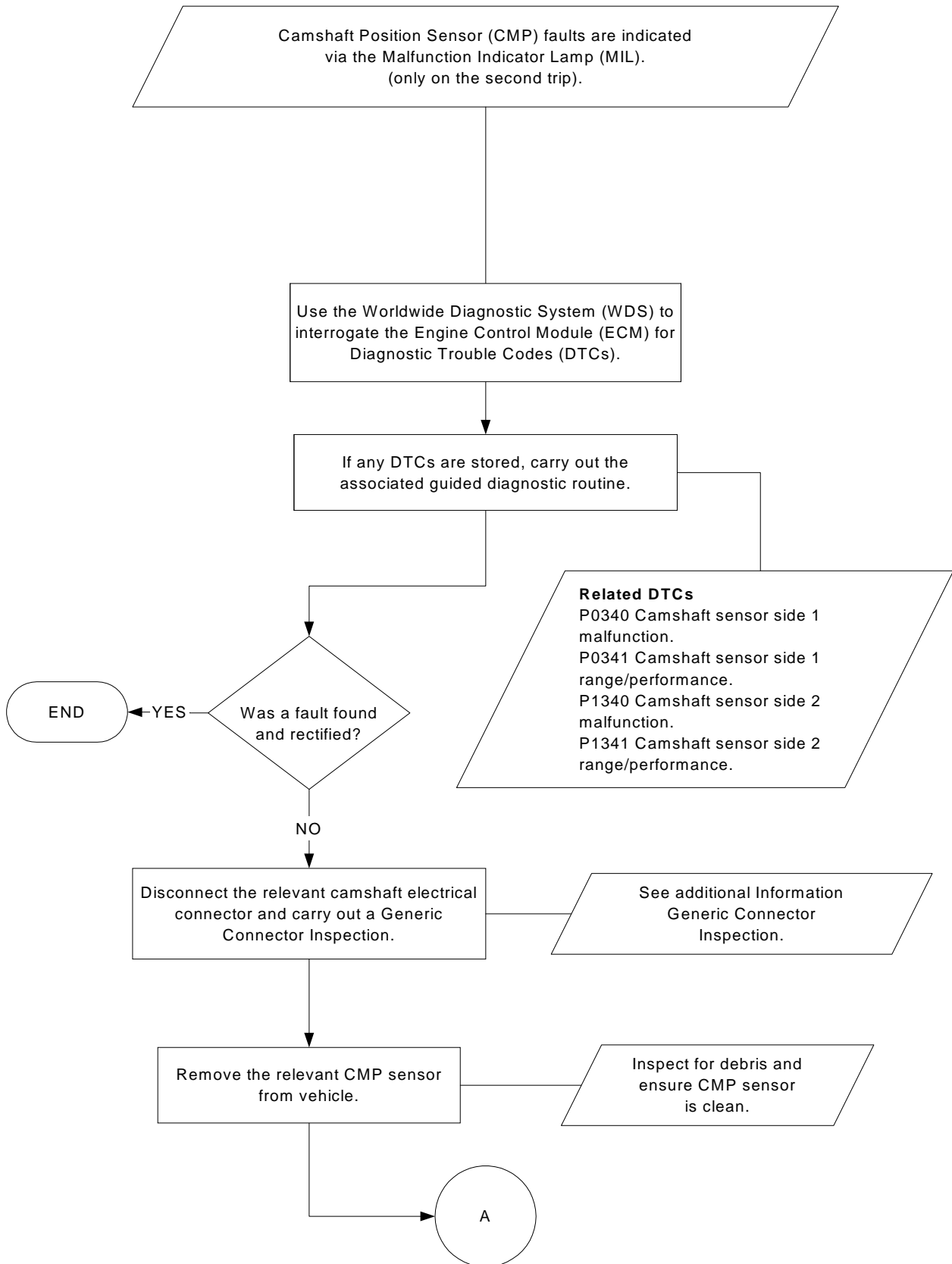
**Engine Management Relays
Flowchart P- 1**



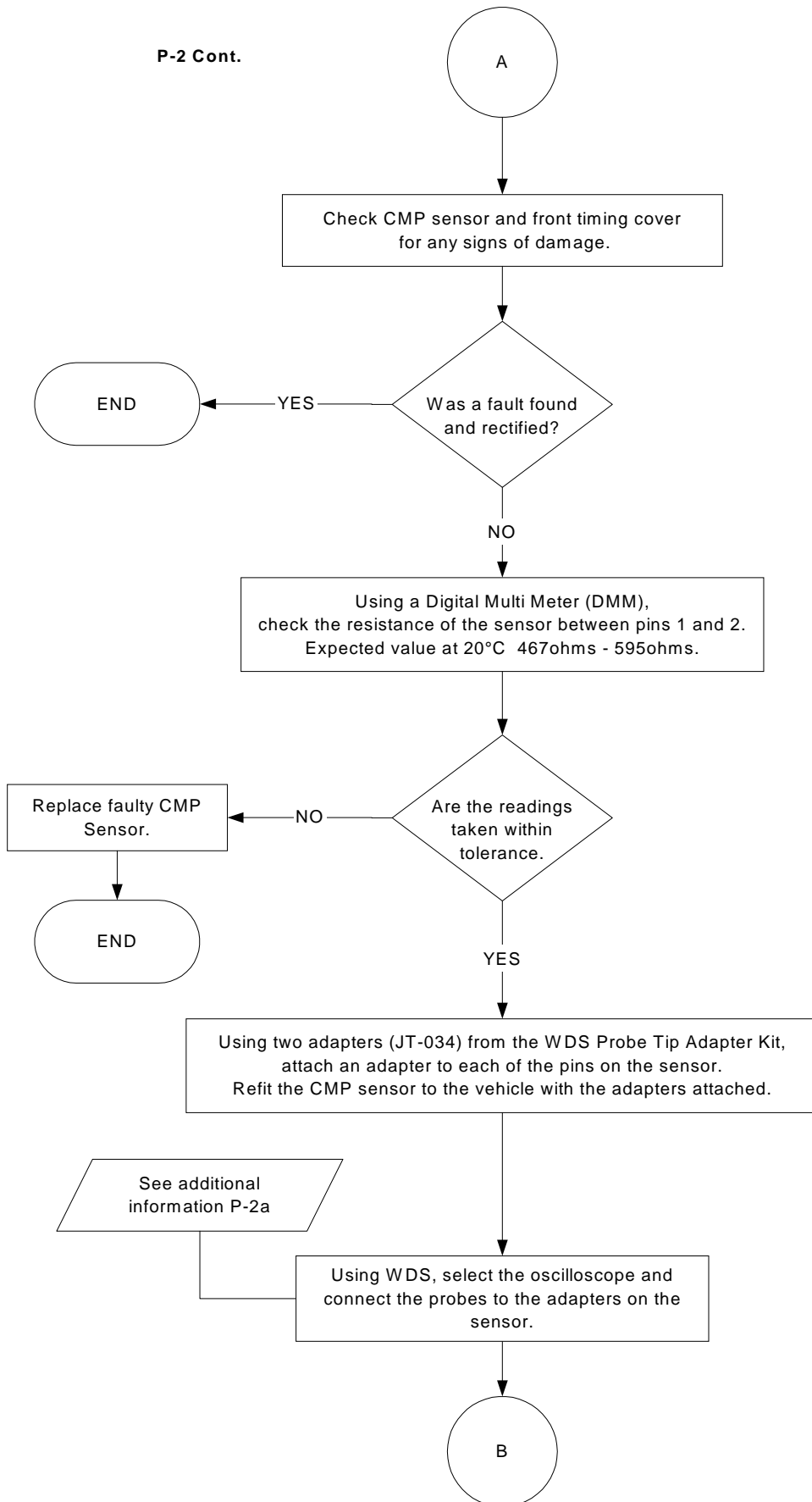
P-1 Cont.



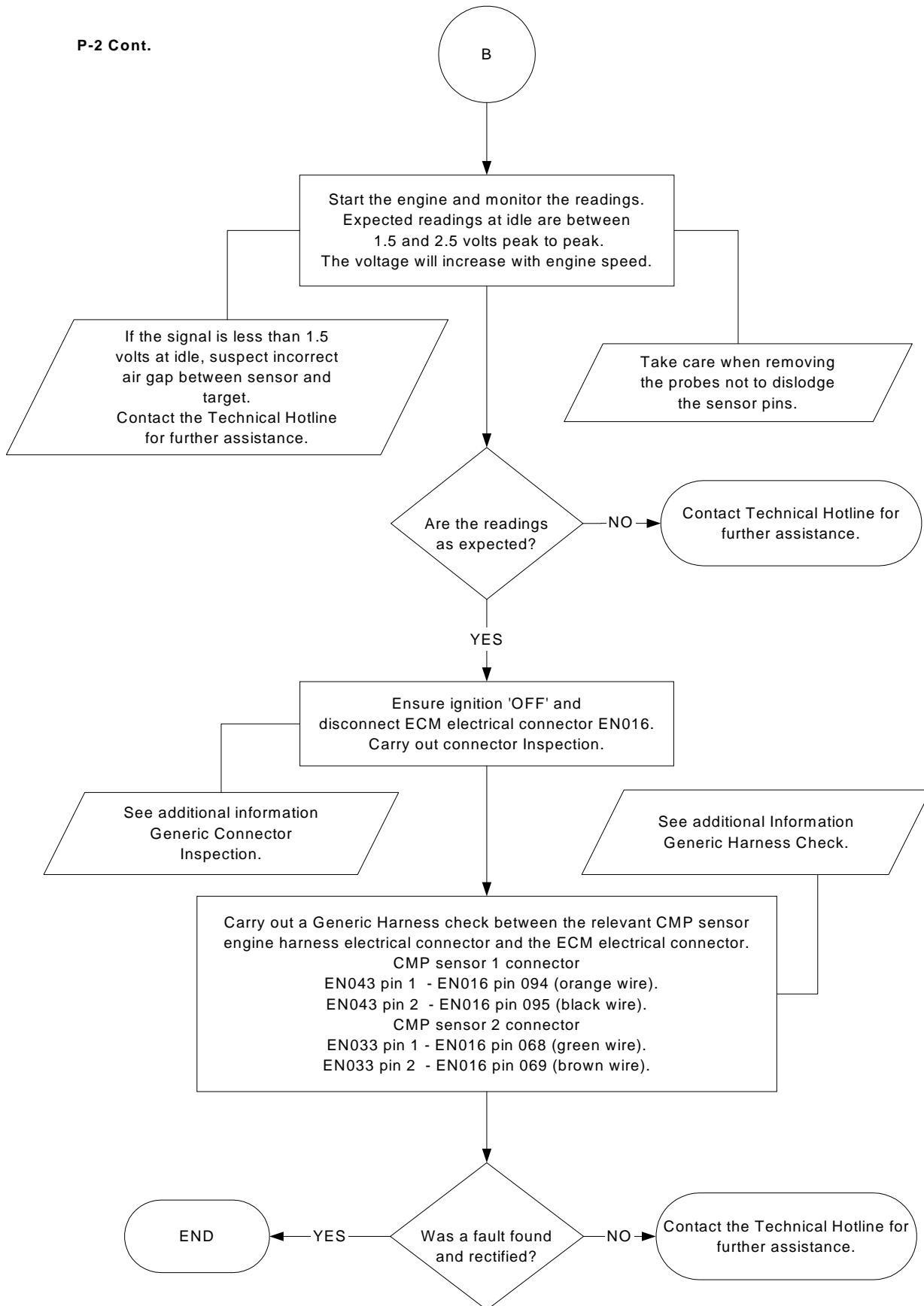
Camshaft Position Sensor Flowchart P- 2



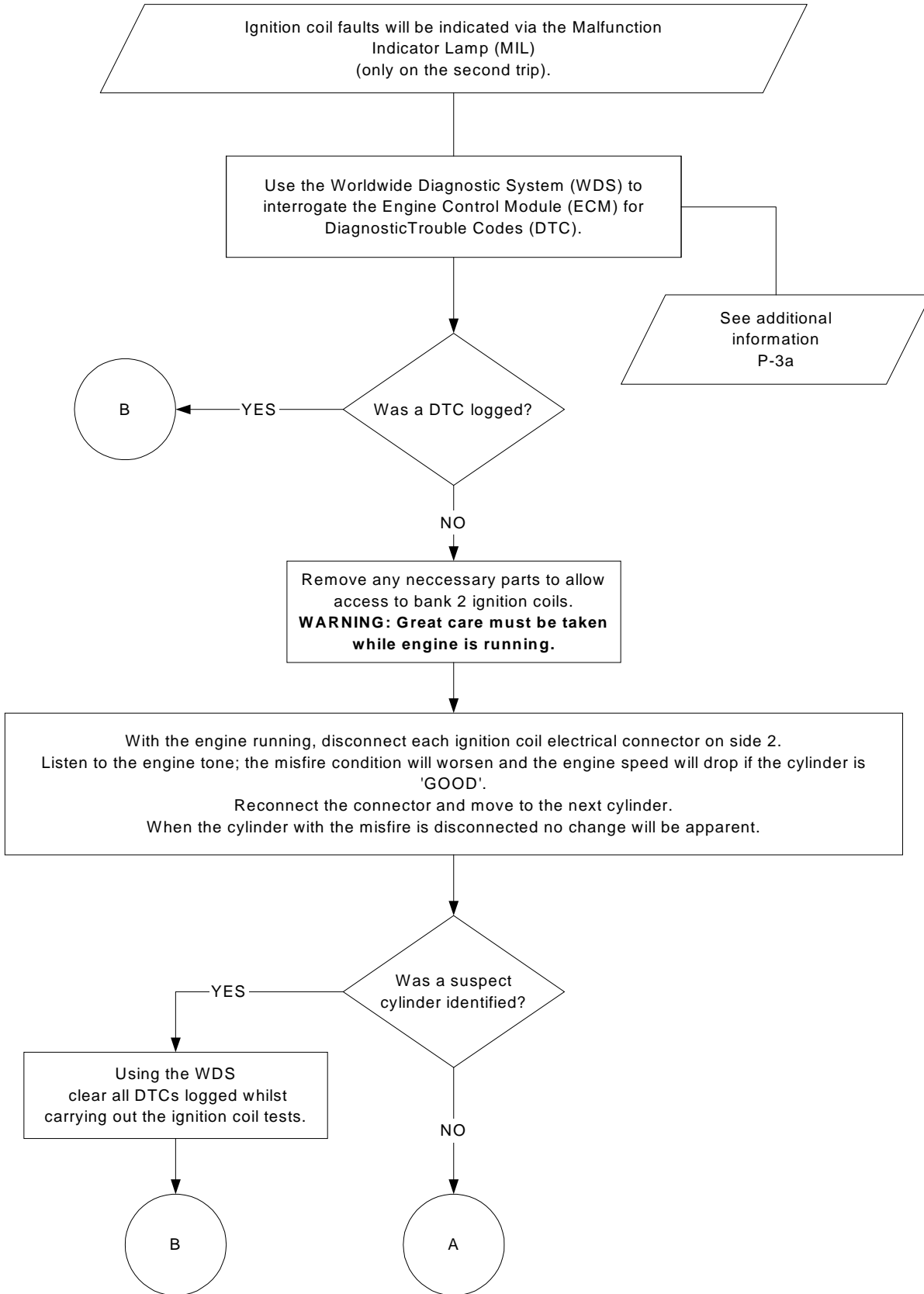
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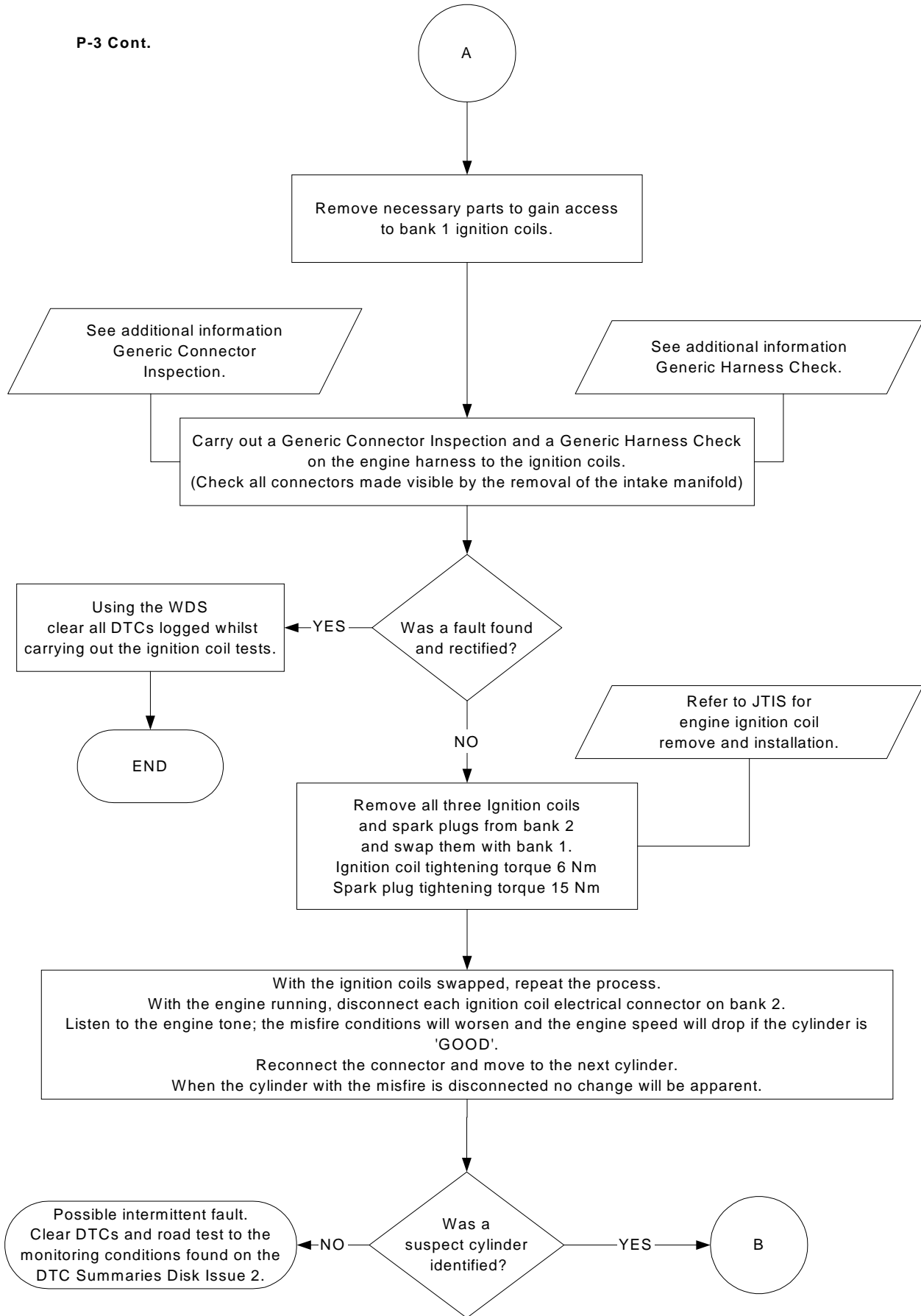
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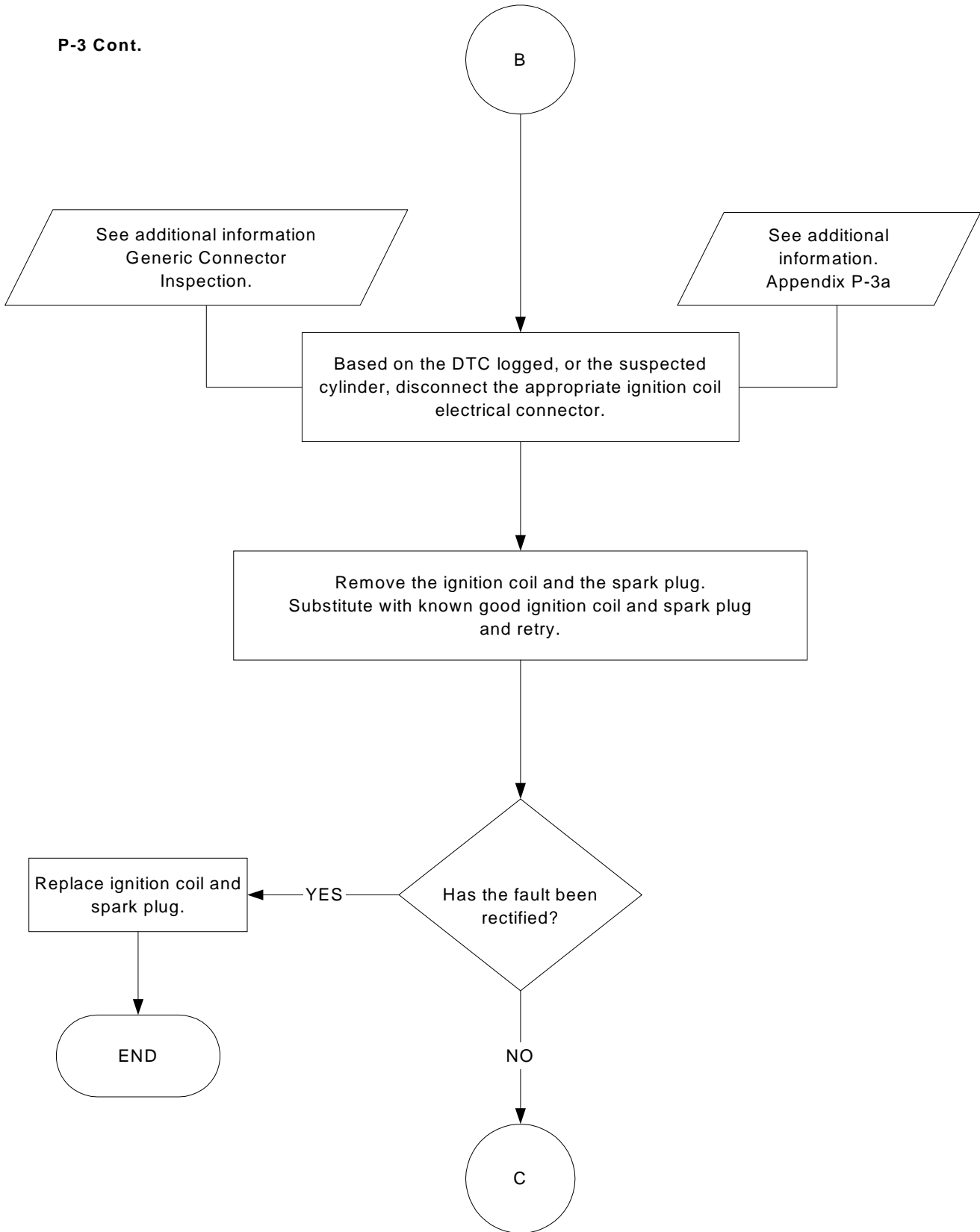
Ignition Coil Flowchart P- 3



P-3 Cont.



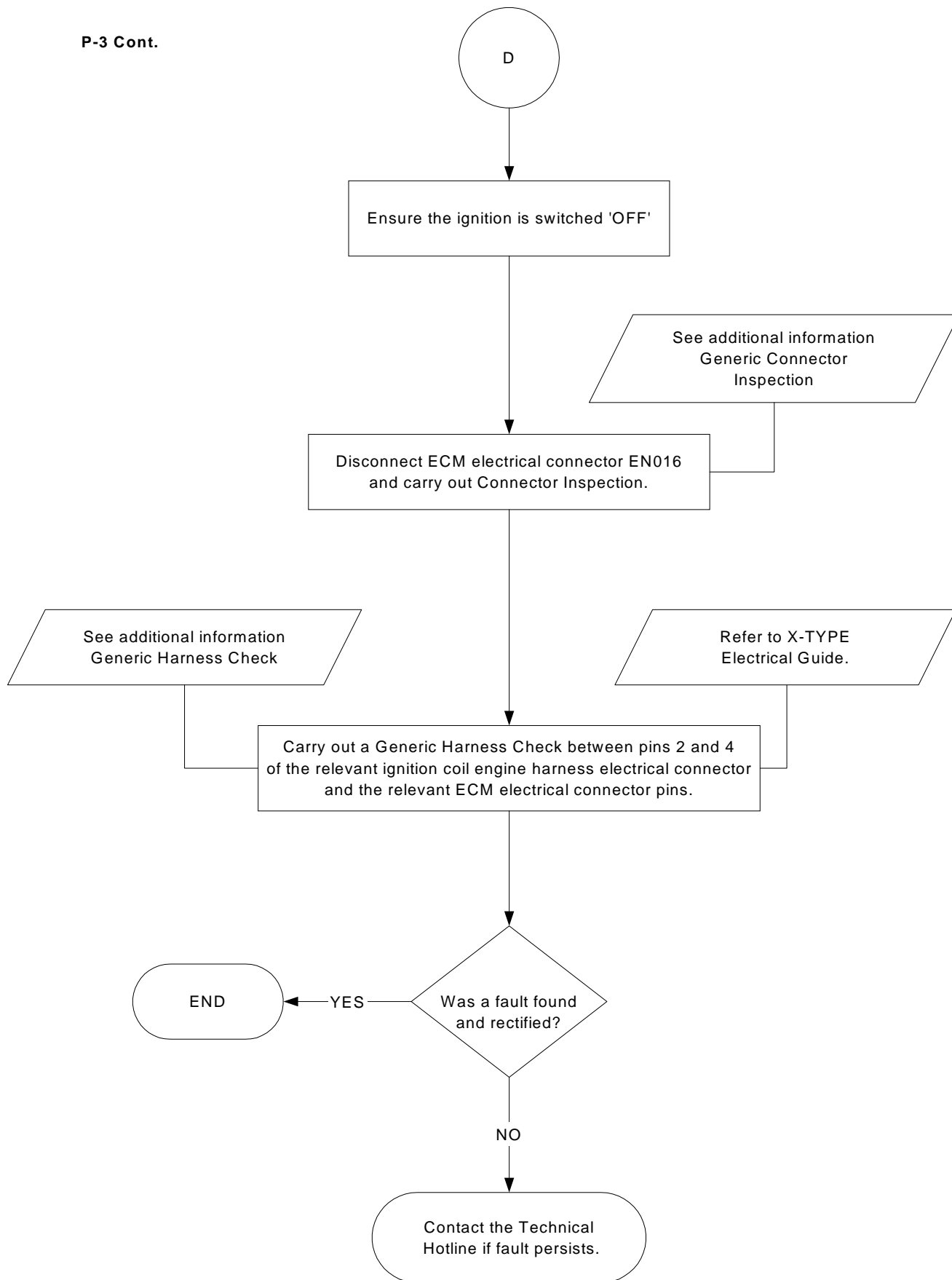
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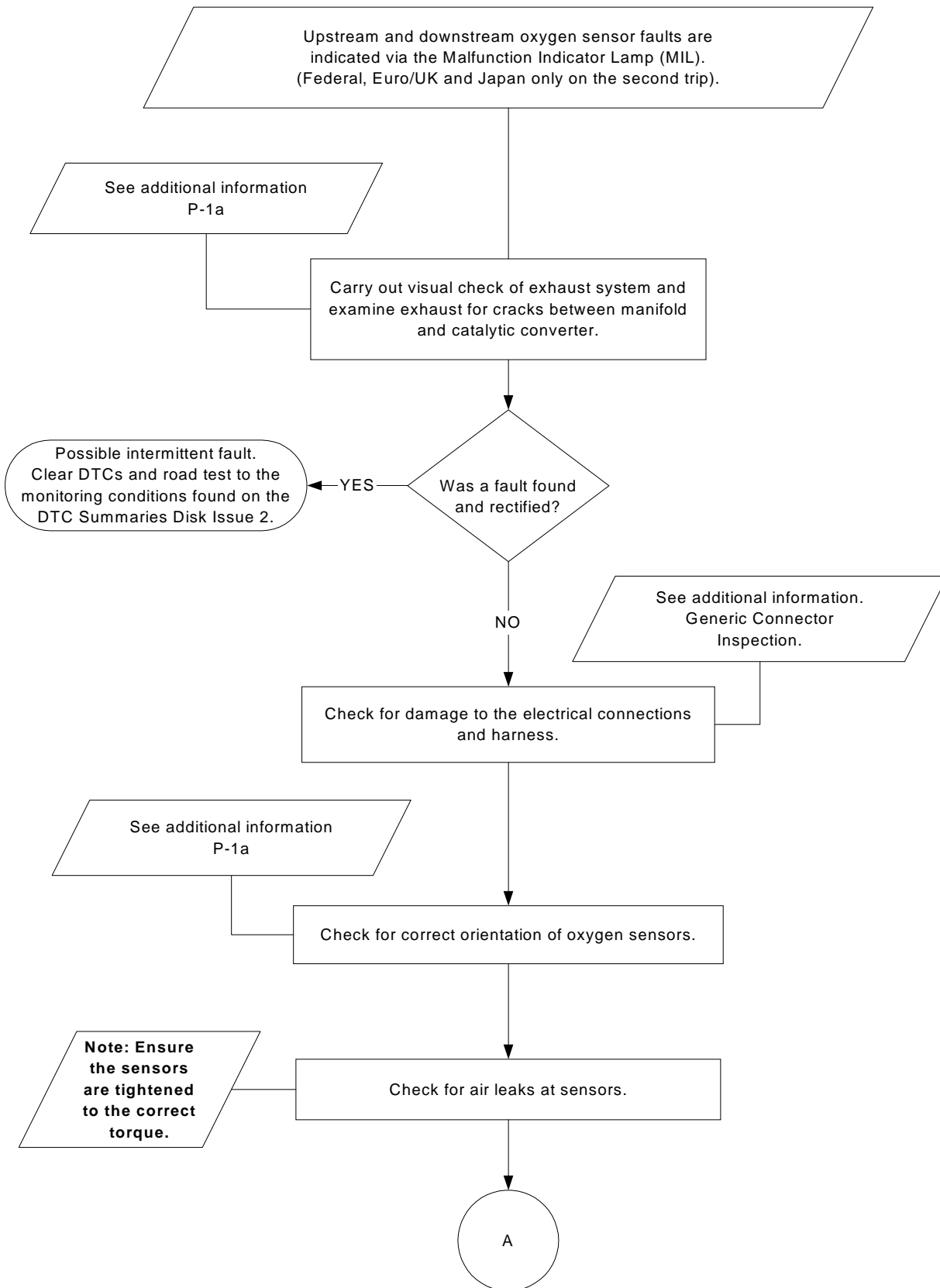
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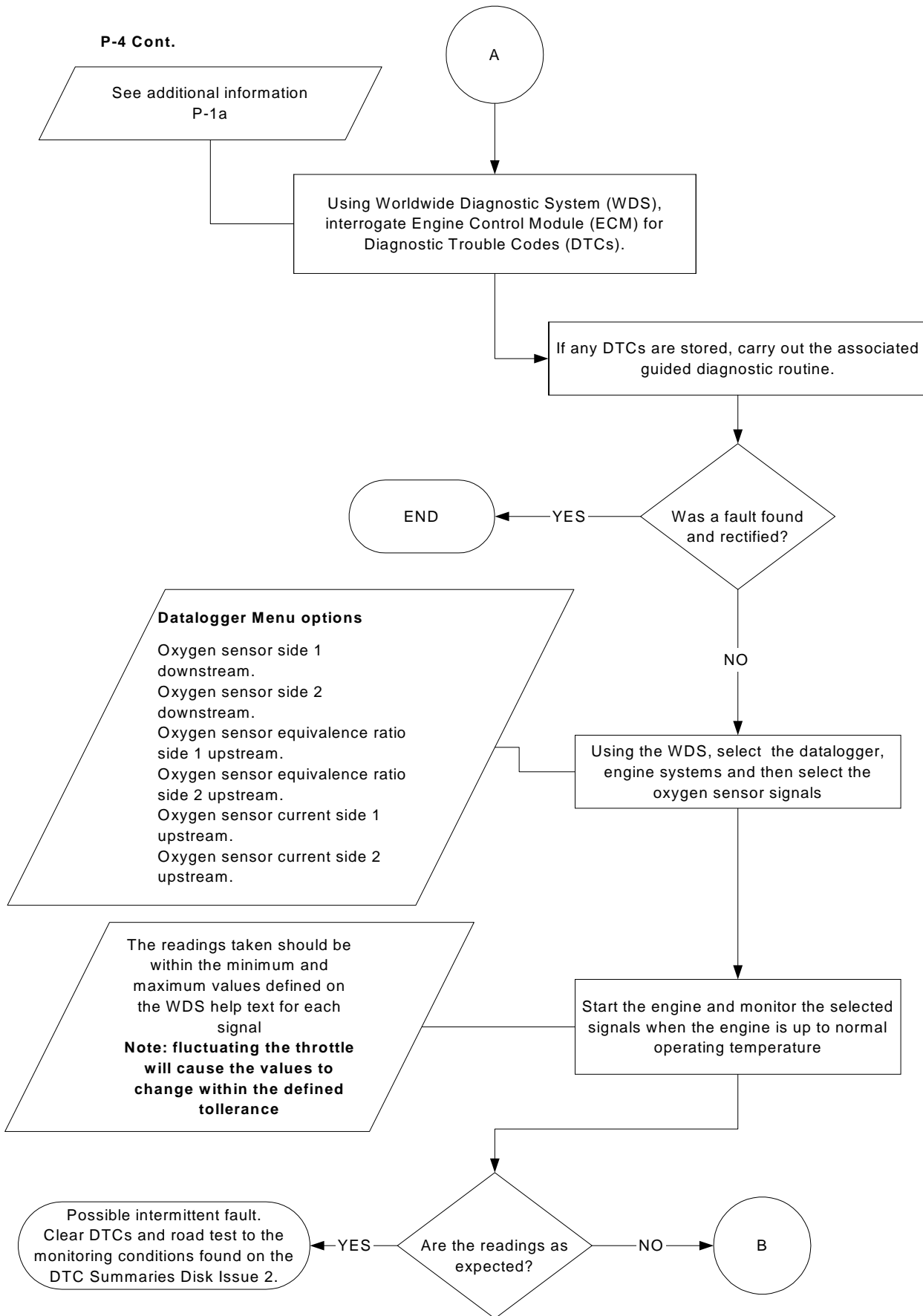


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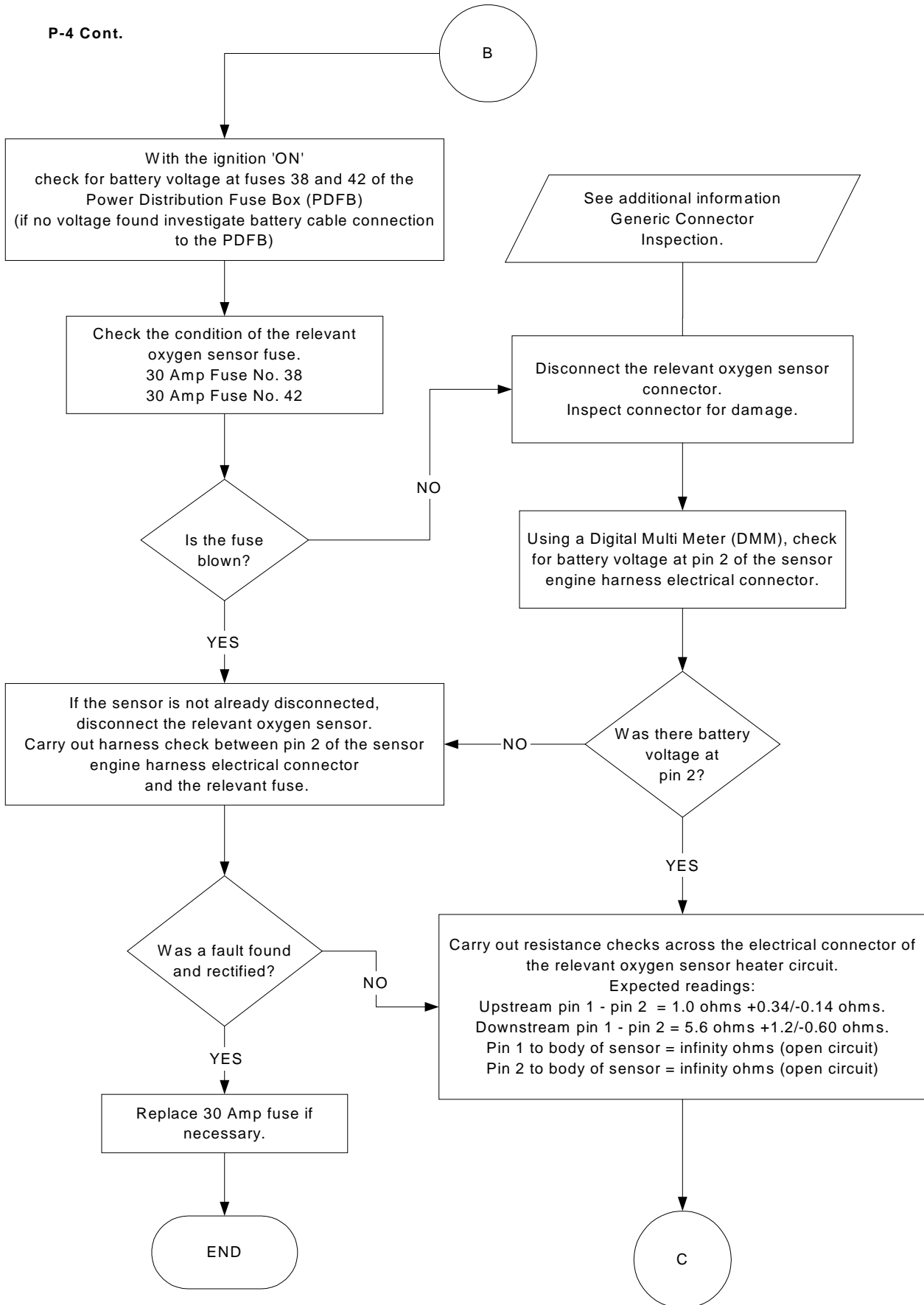


Upstream and Downstream Oxygen Sensors Flowchart P- 4

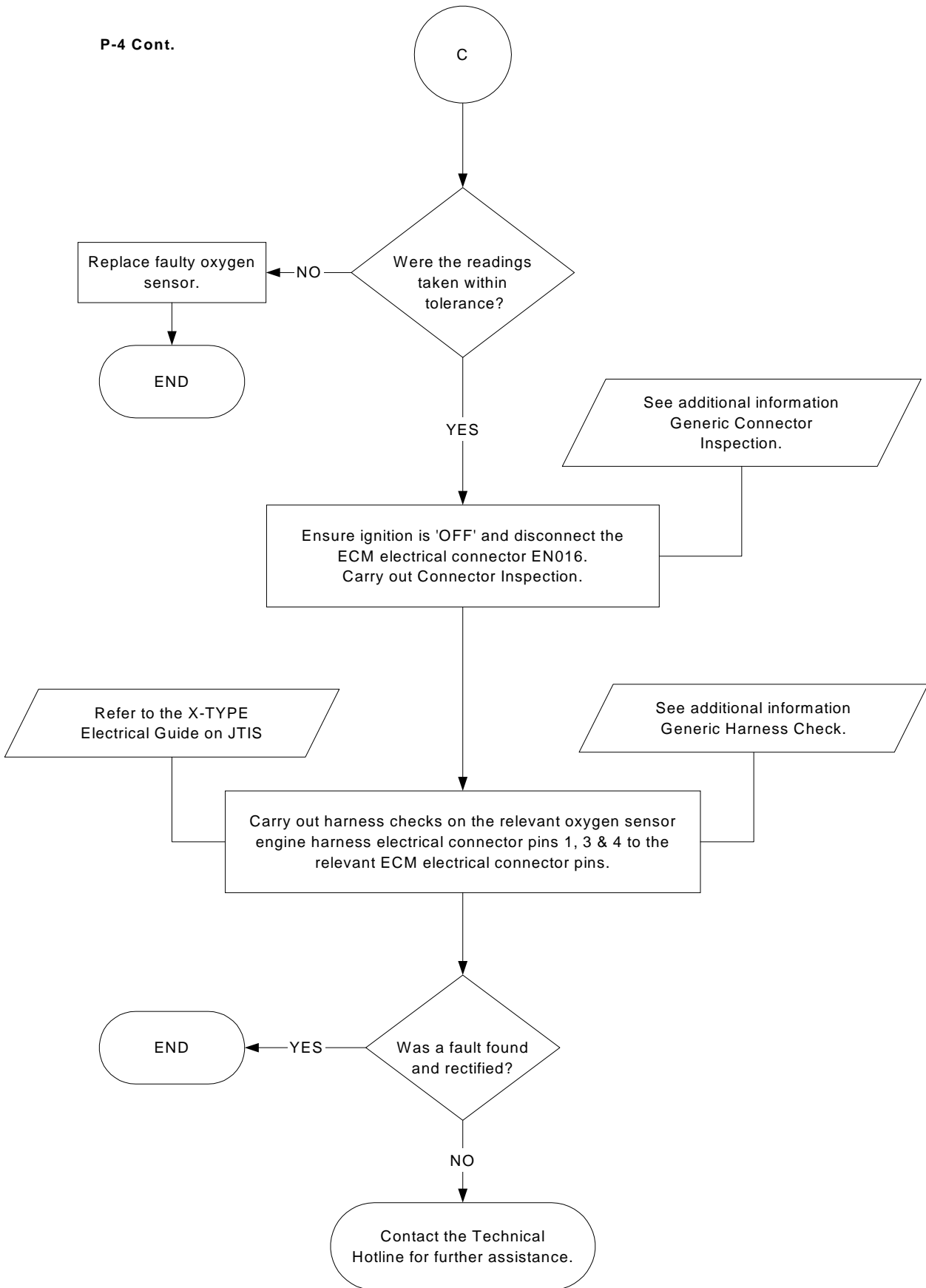




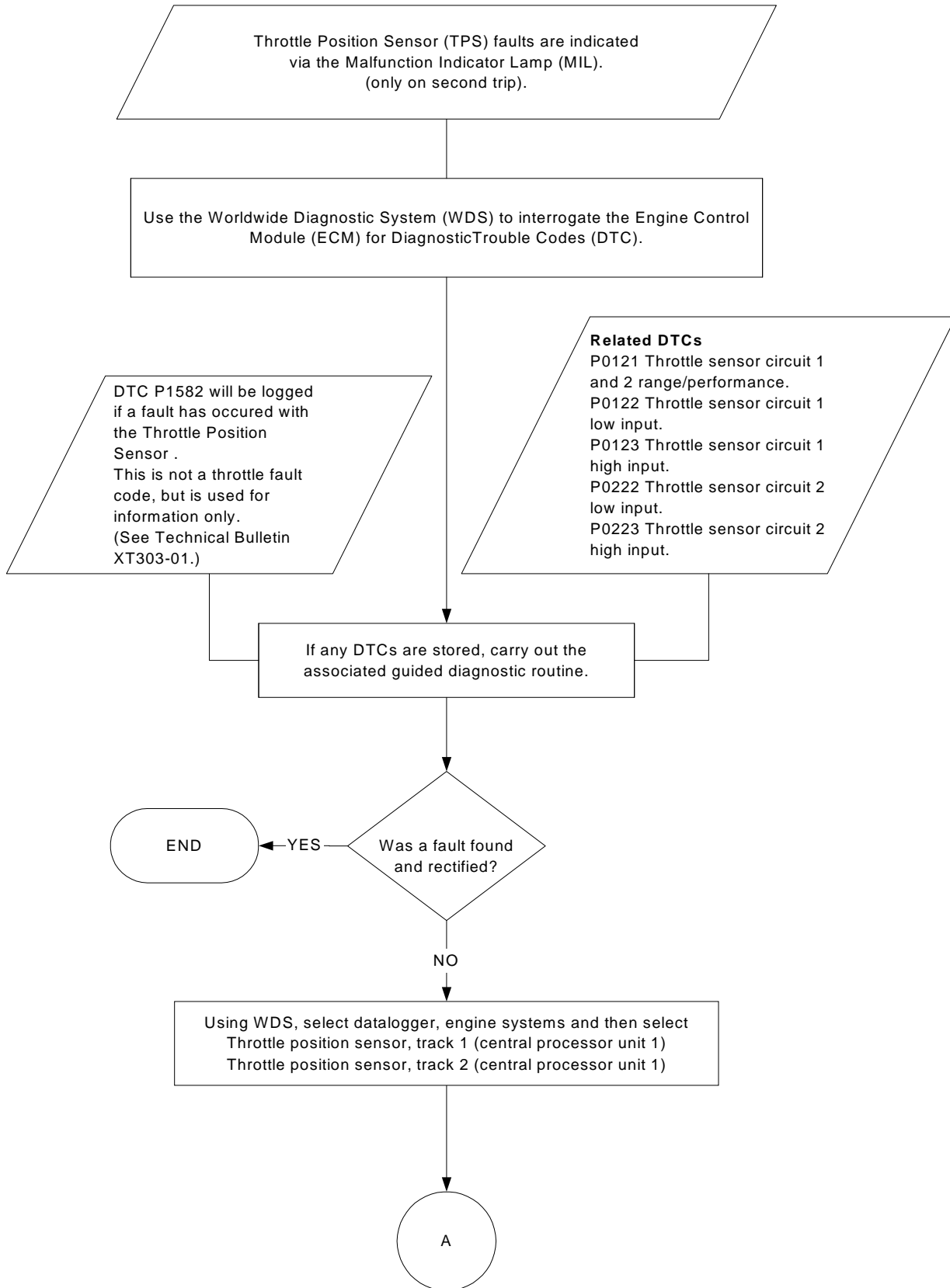
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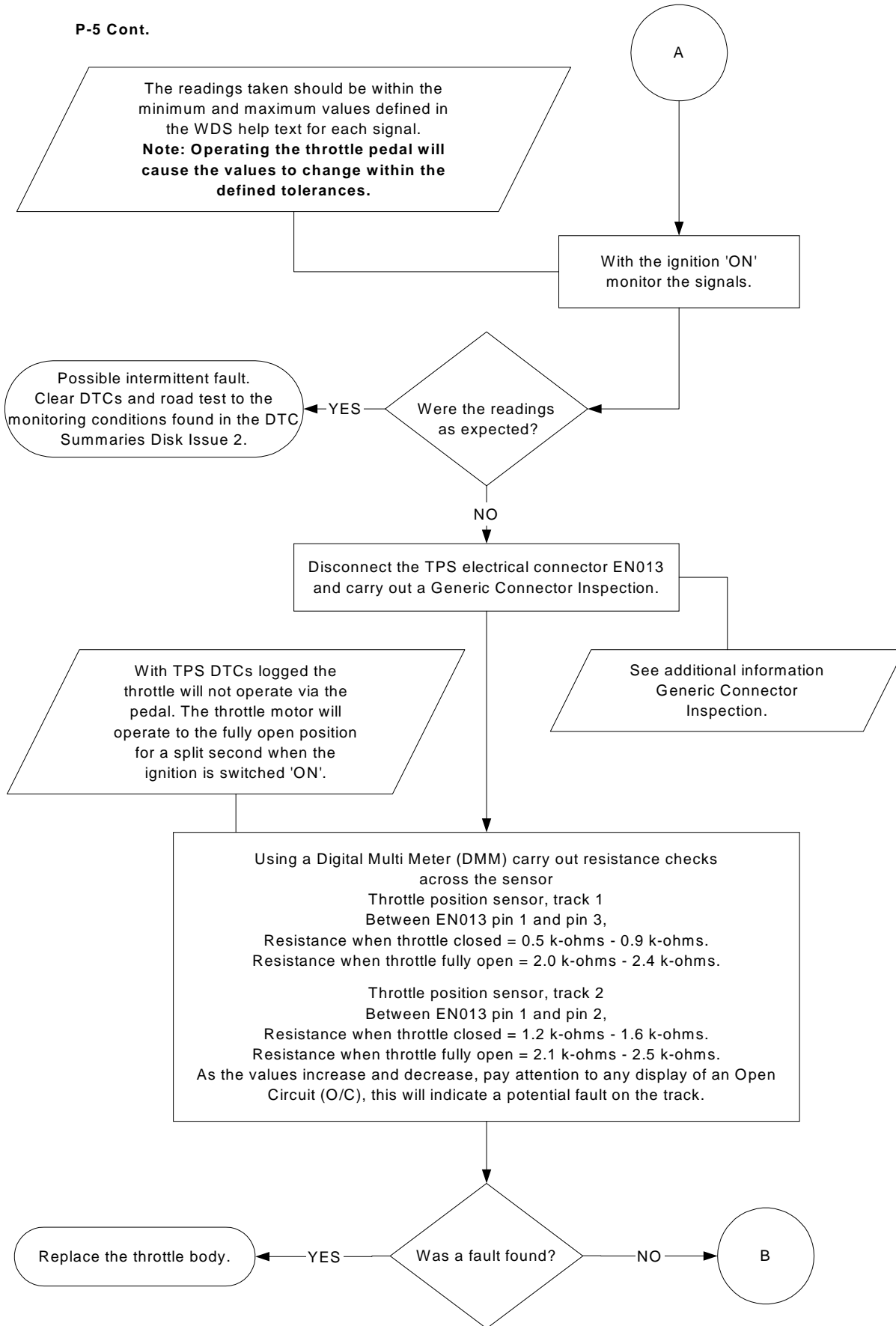
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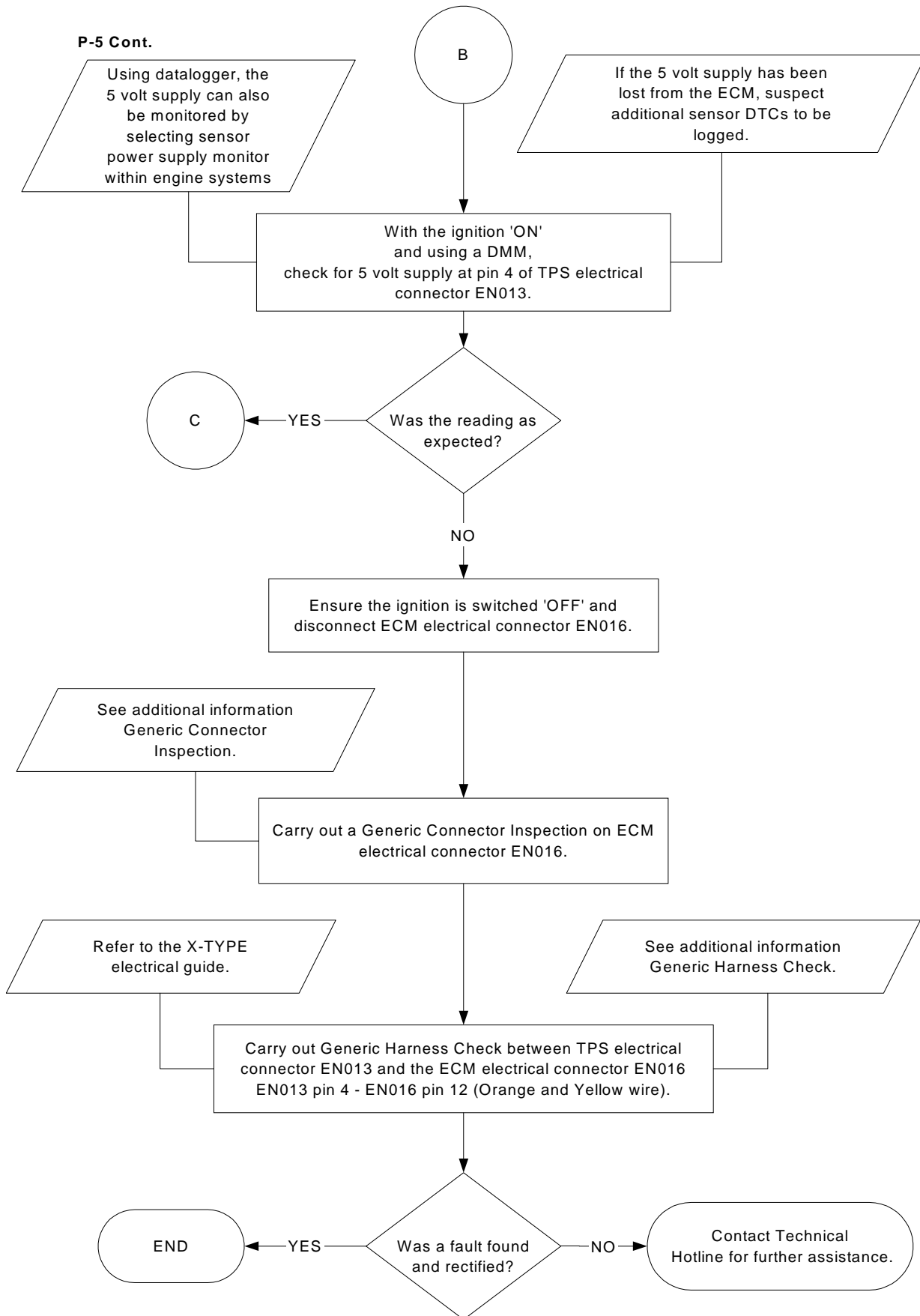


Throttle Position Sensor Flowchart P- 5

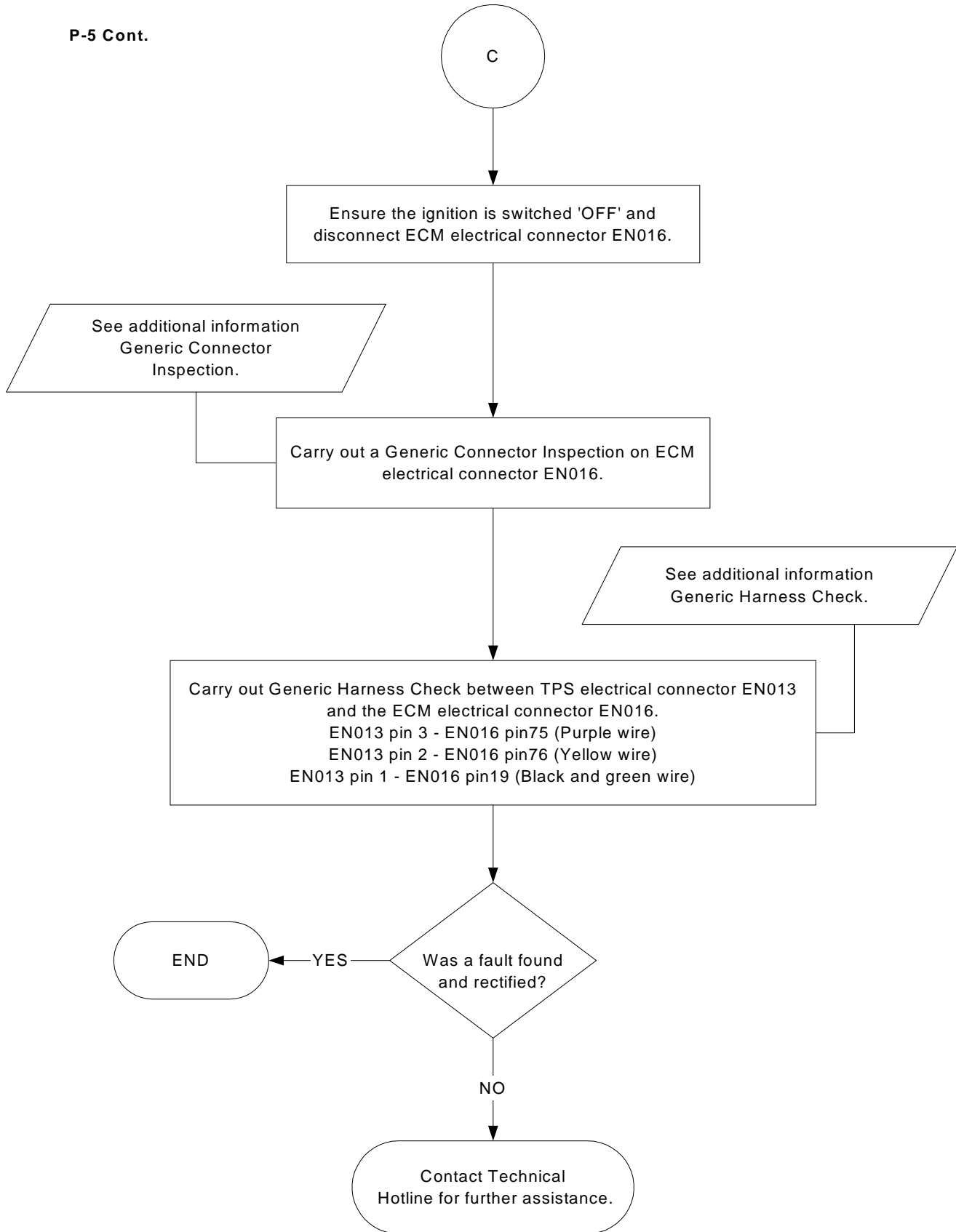


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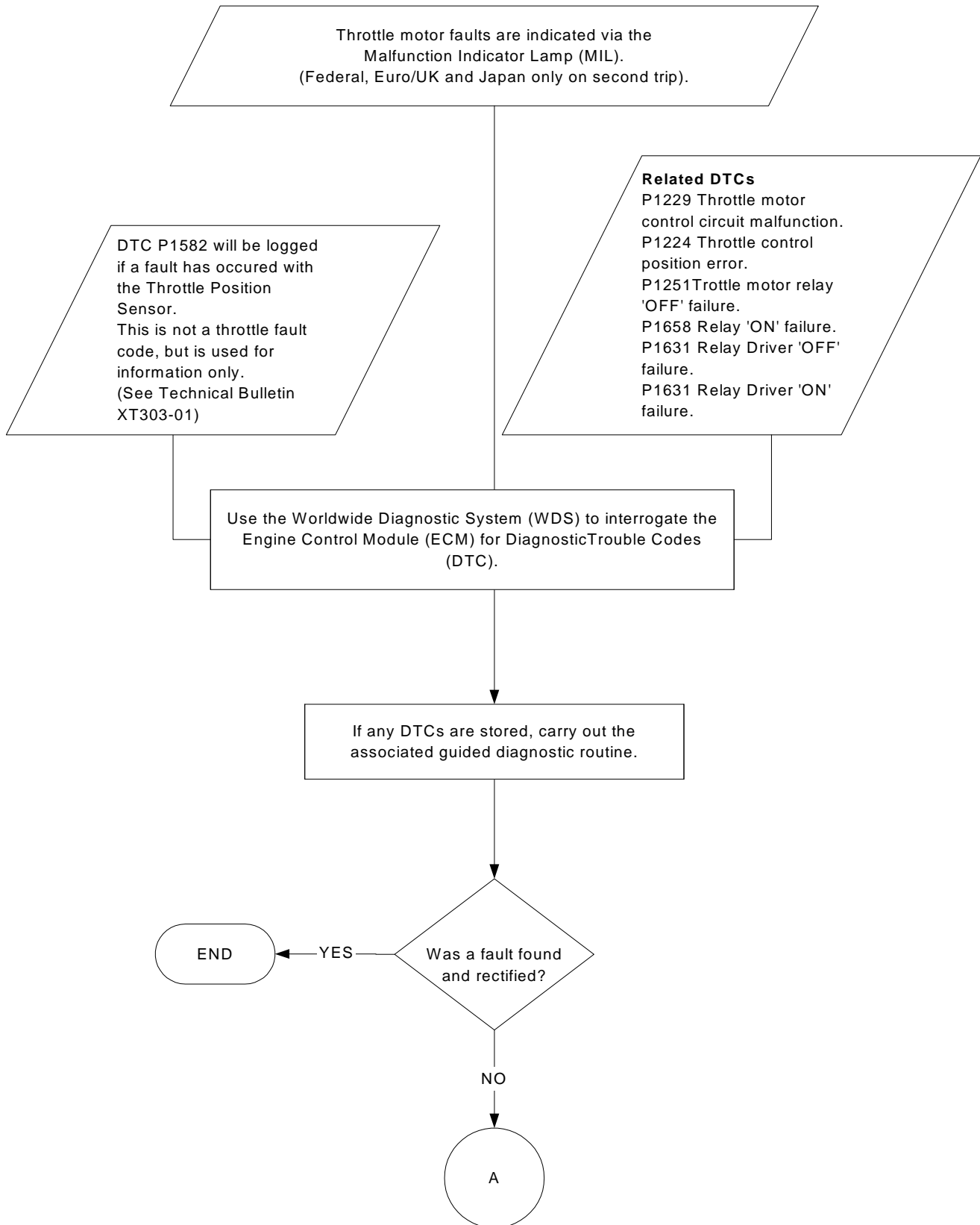




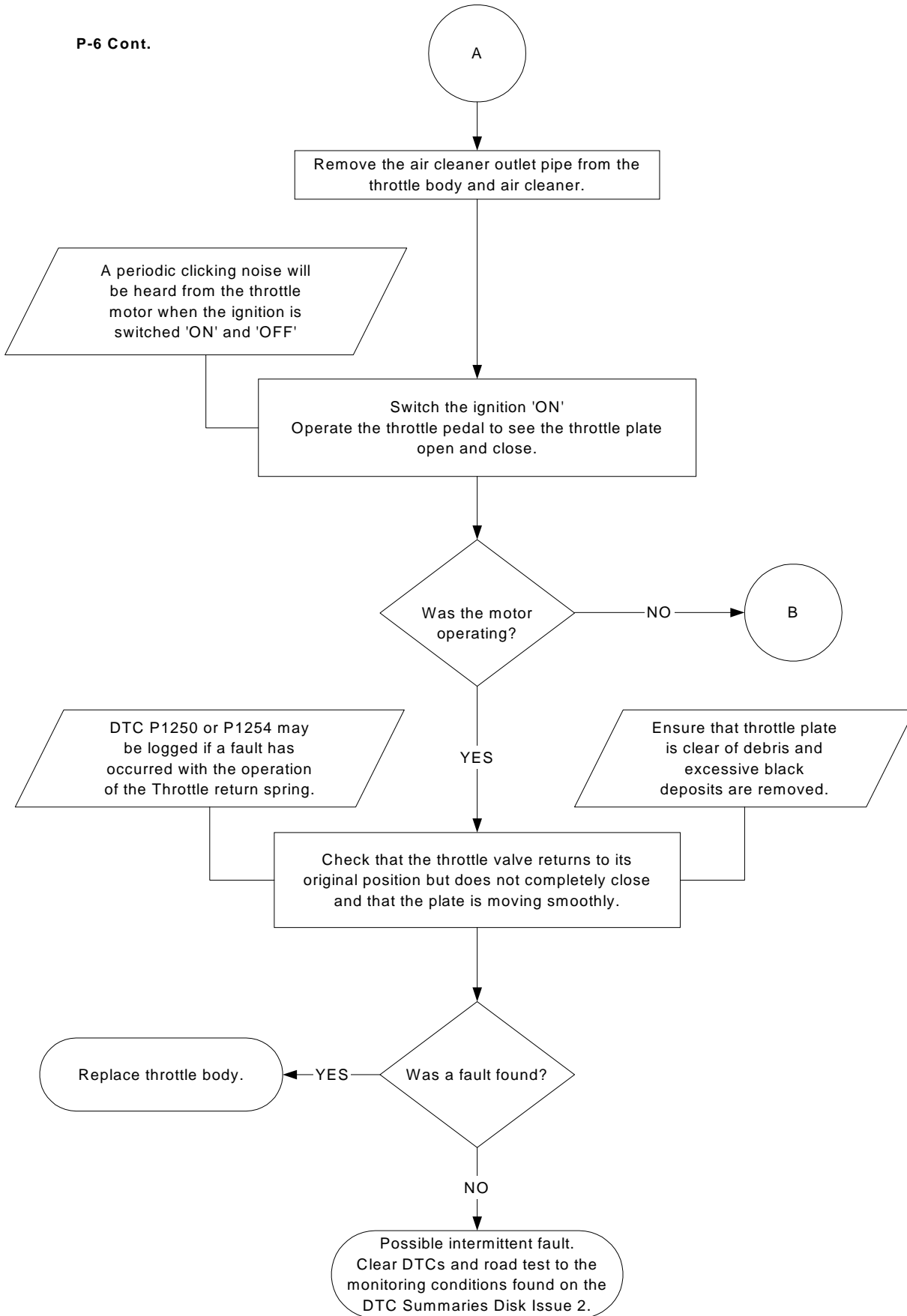
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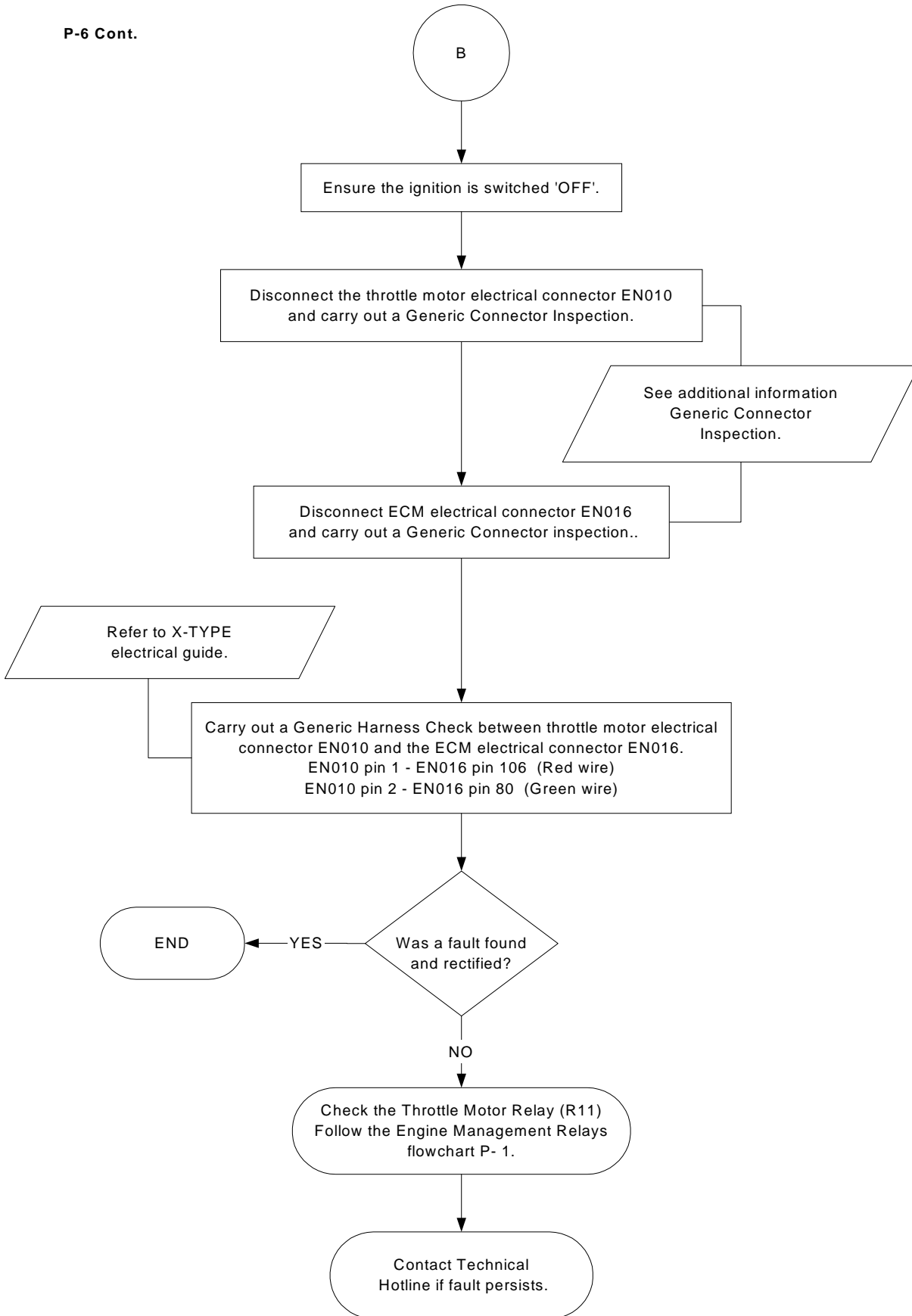
Throttle Motor Flowchart P-6



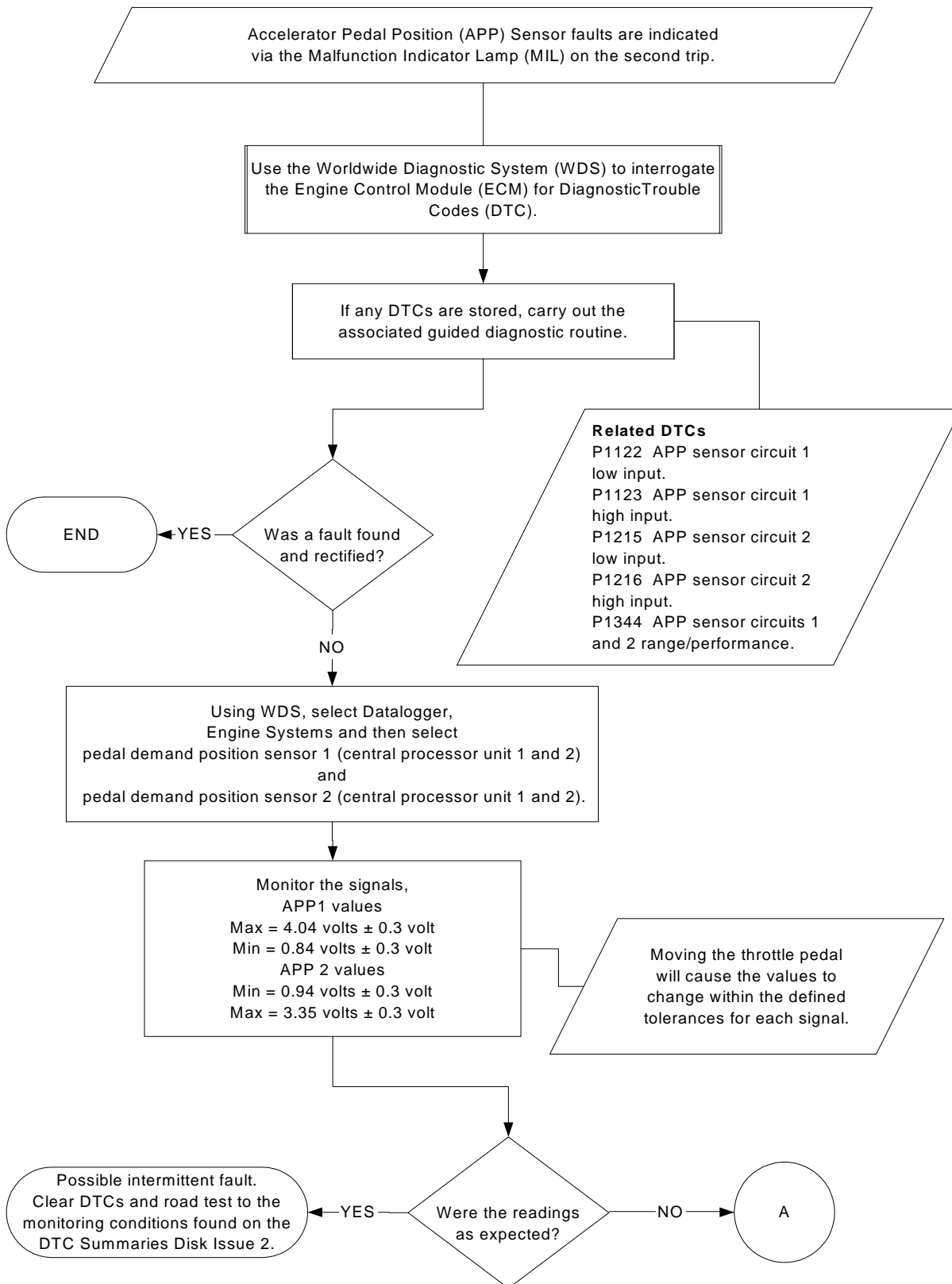
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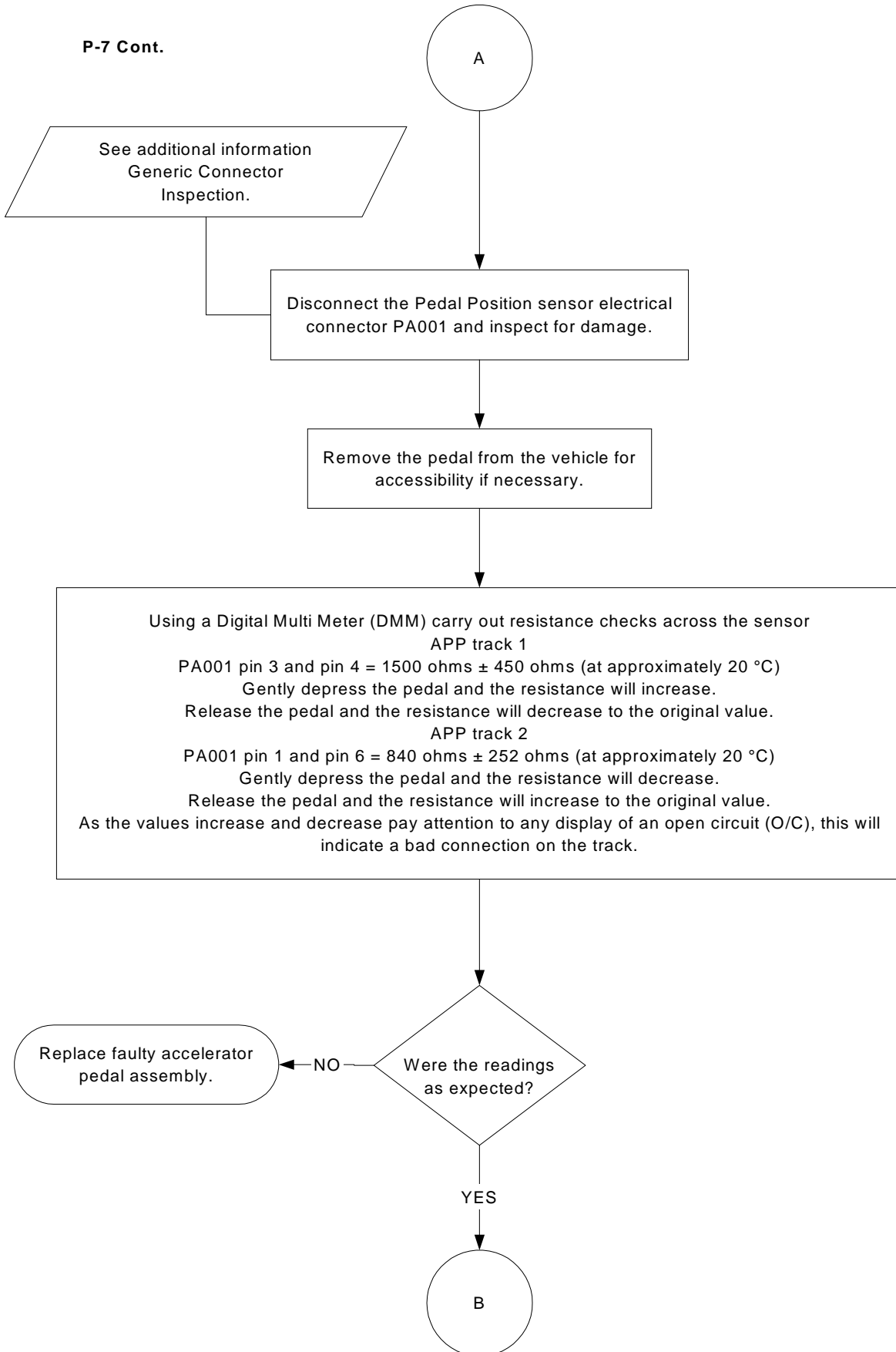
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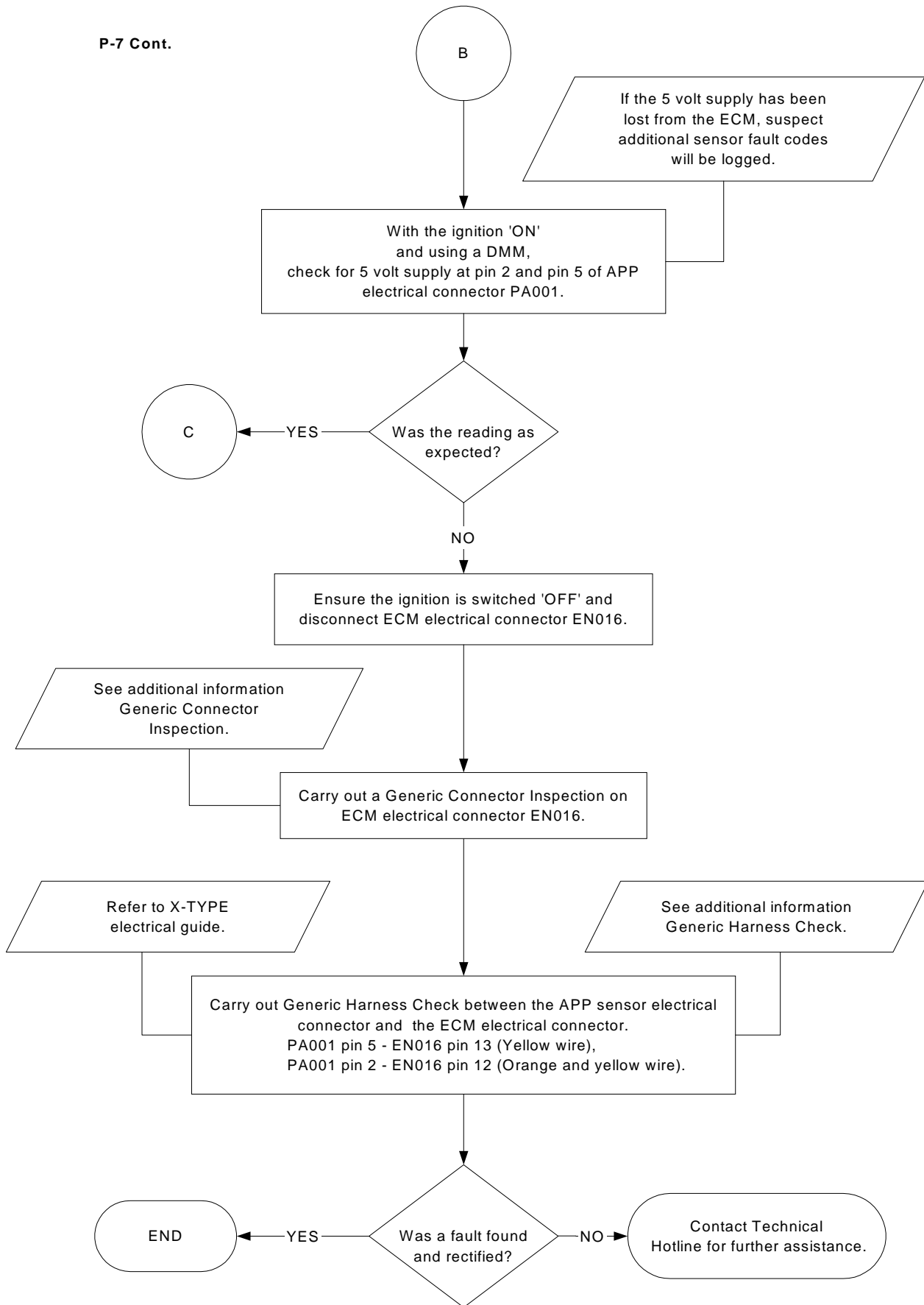
Accelerator Pedal Position Sensor Flowchart P- 7



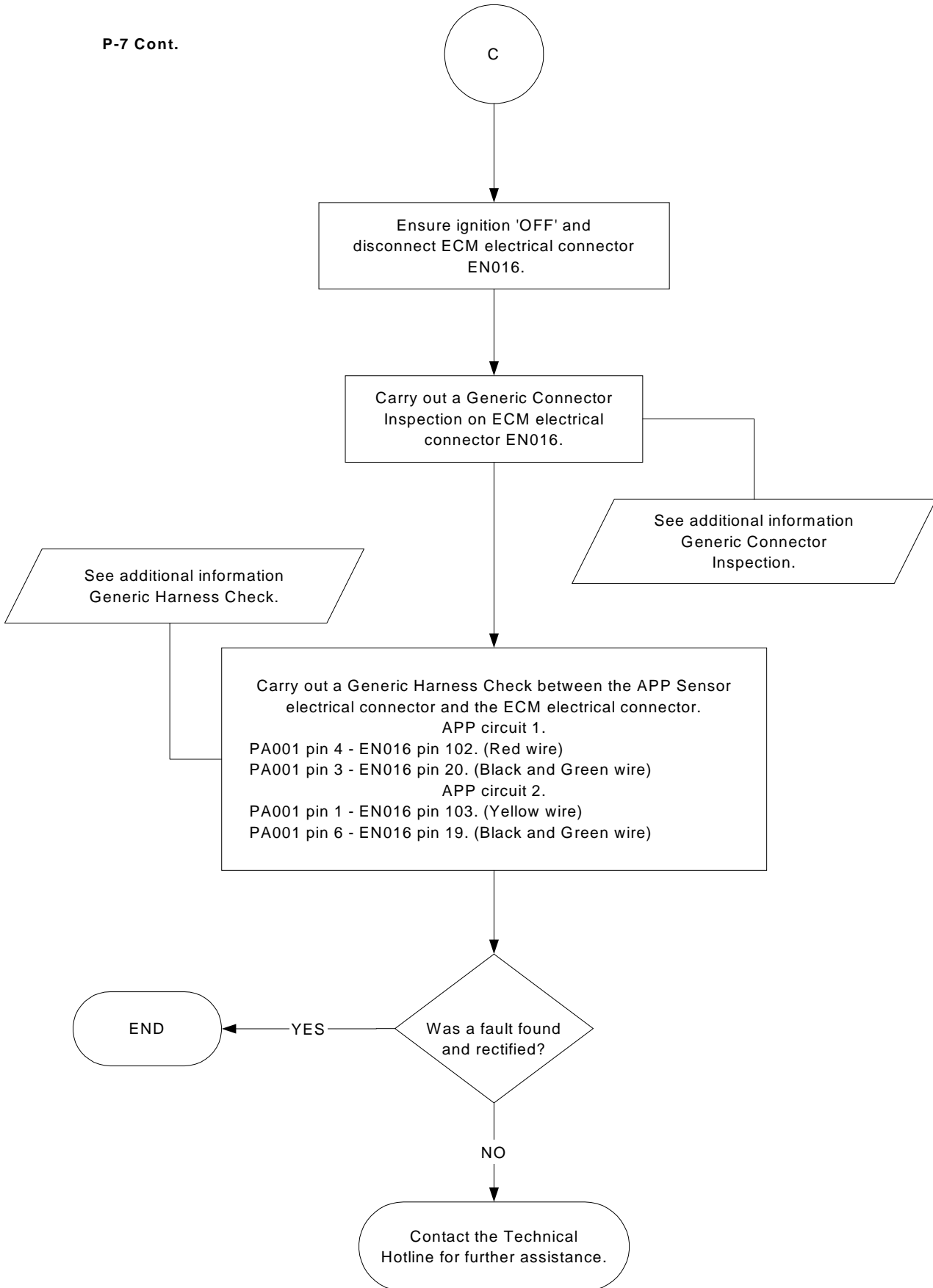
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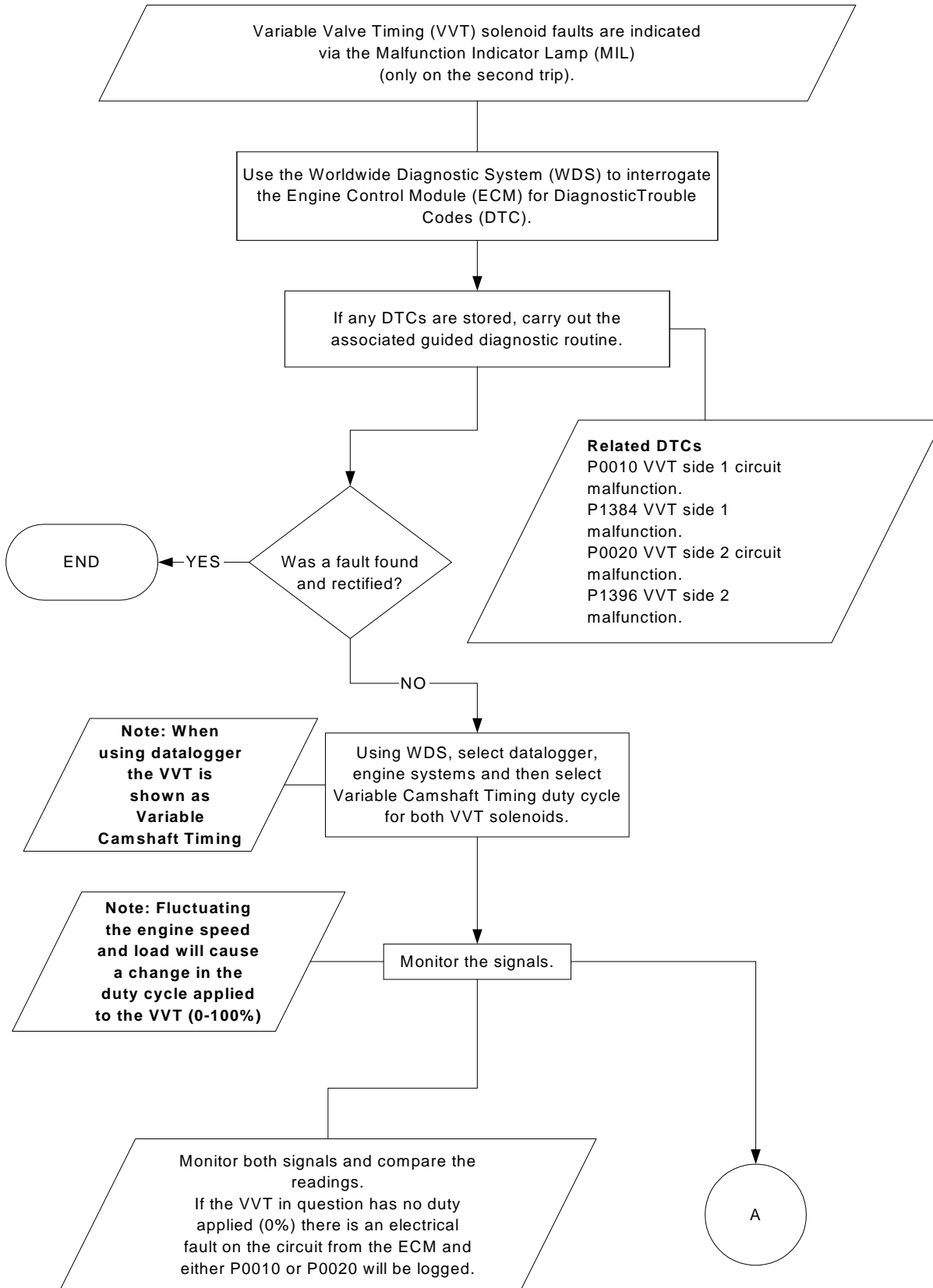
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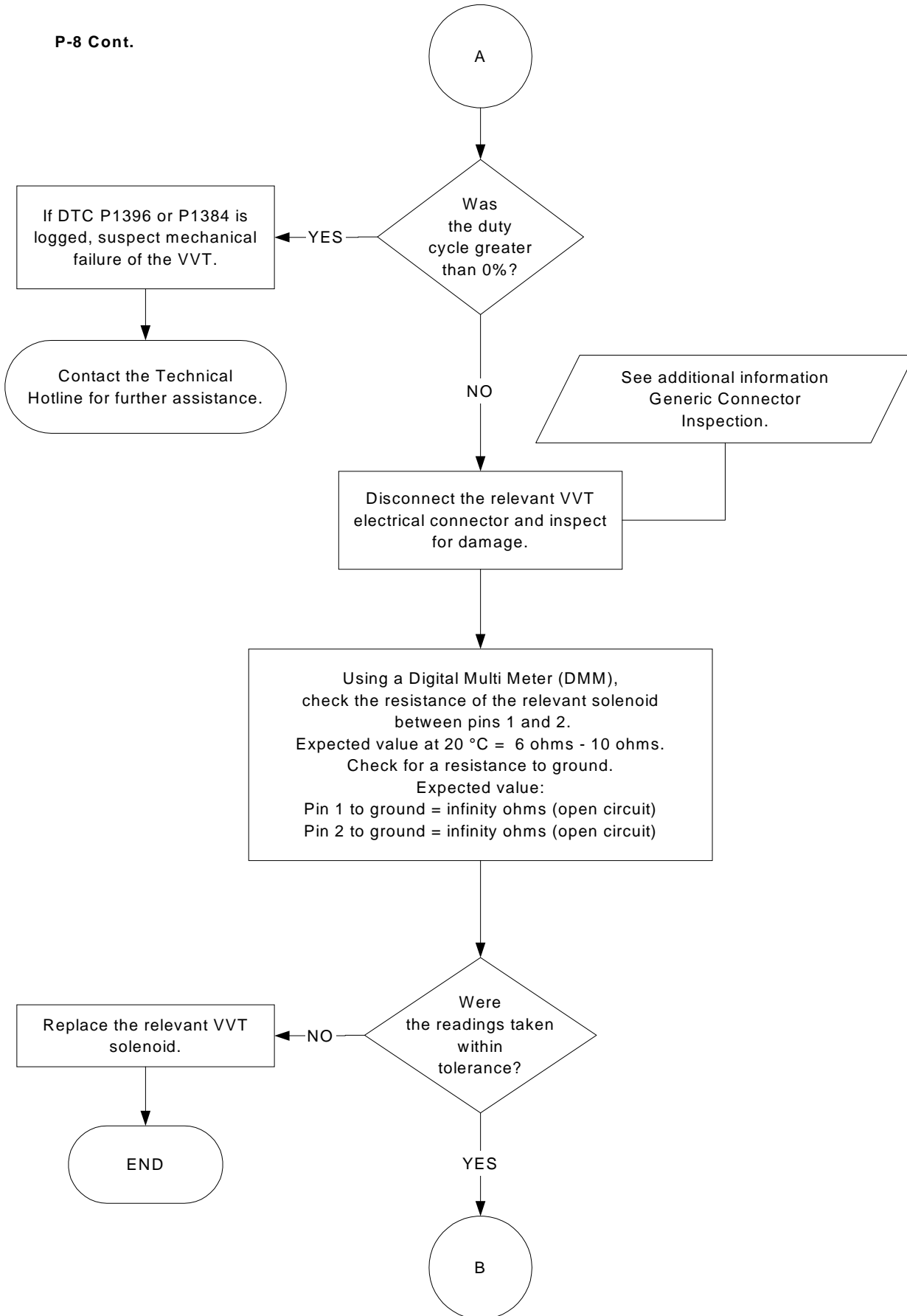
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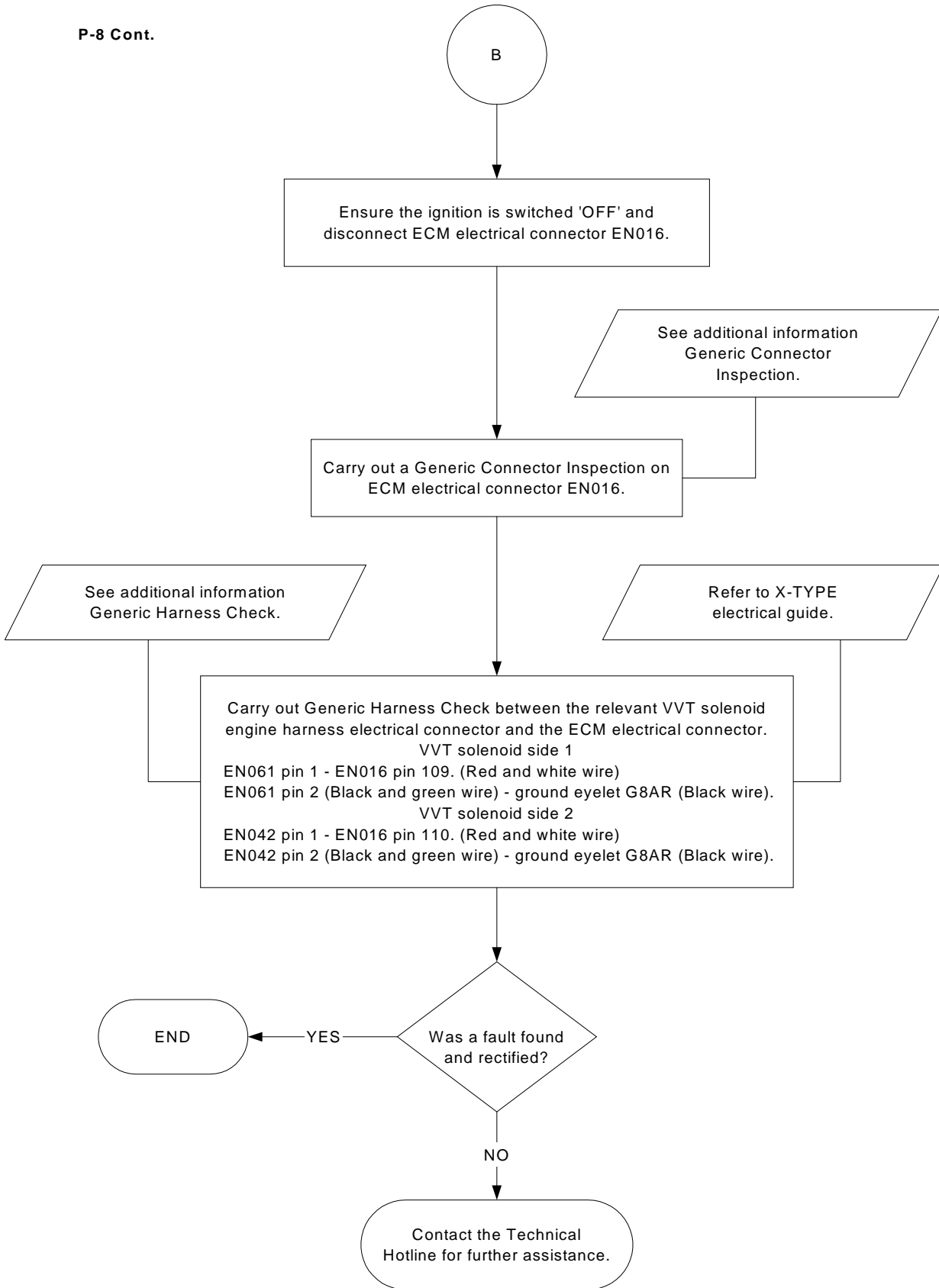
Variable Valve Timing Flowchart P- 8



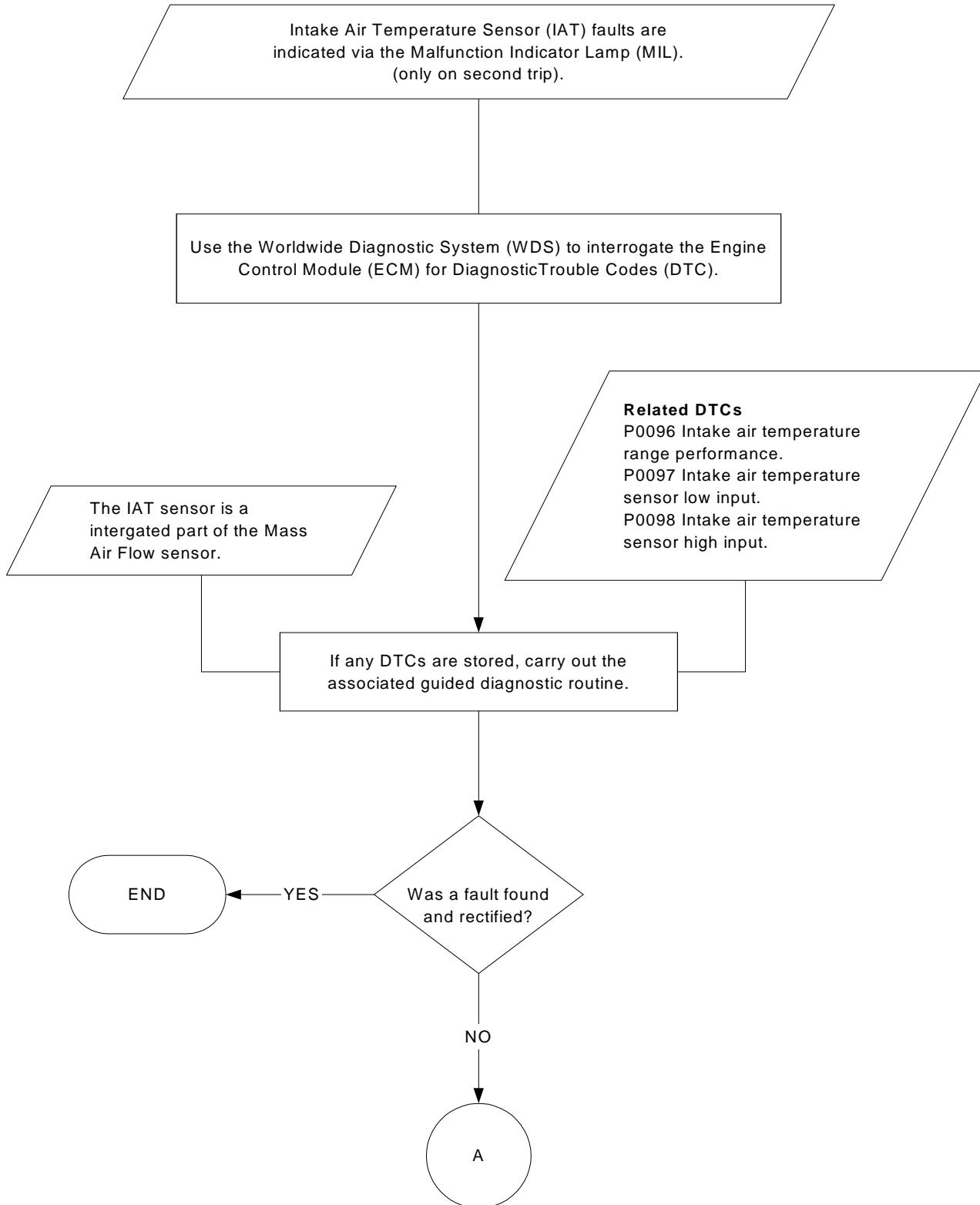
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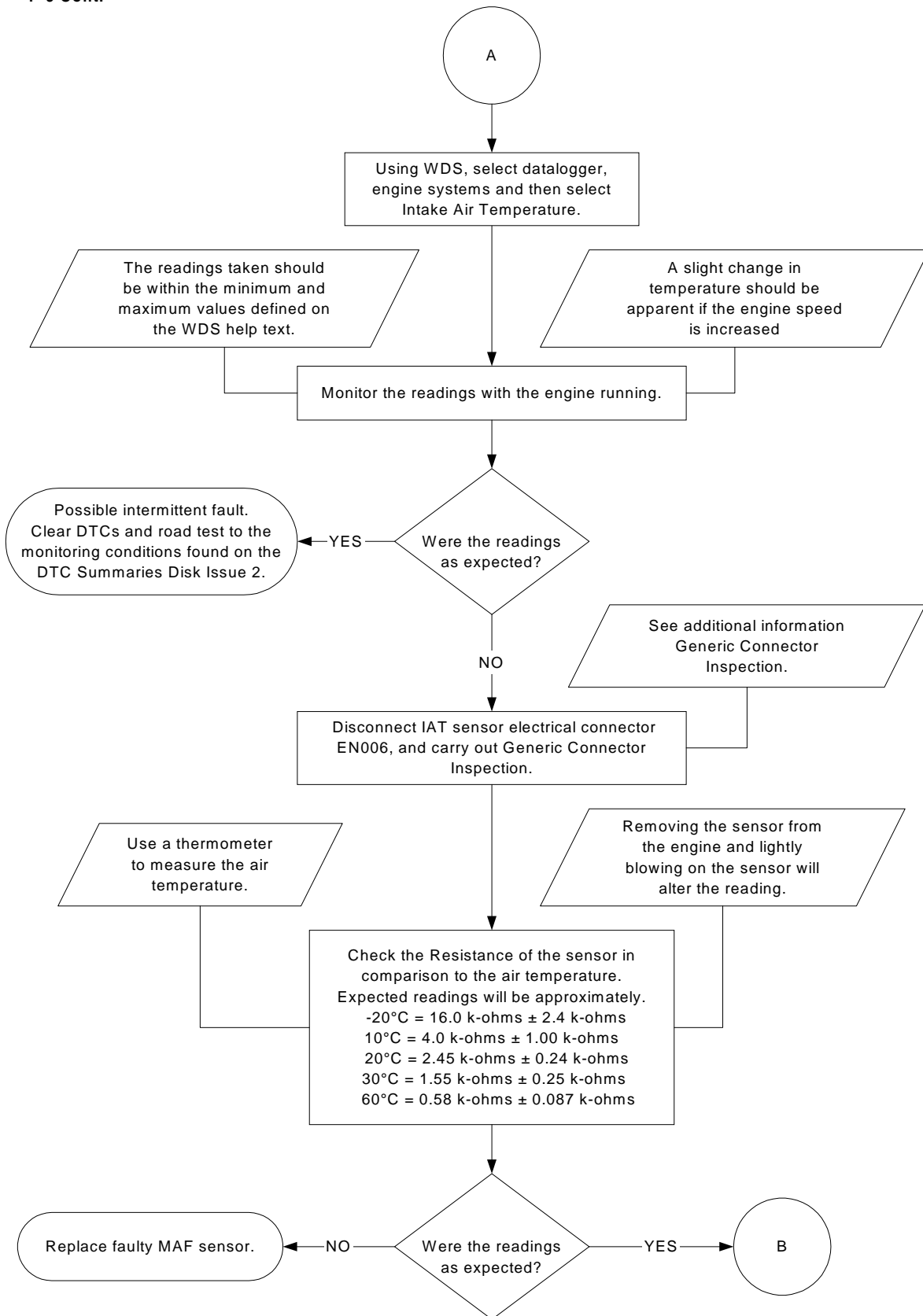
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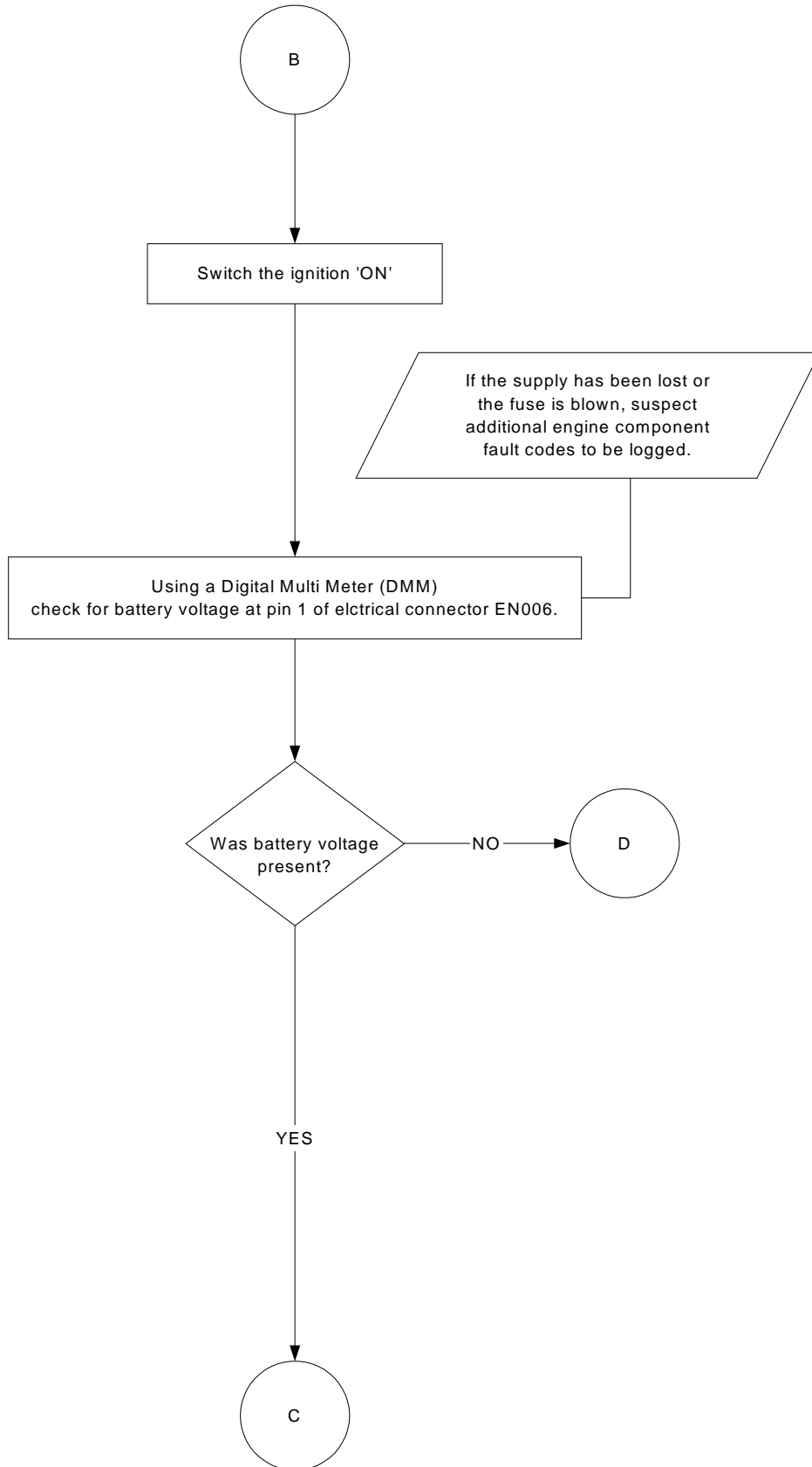
Intake Air Temperature Sensor Flowchart P- 9



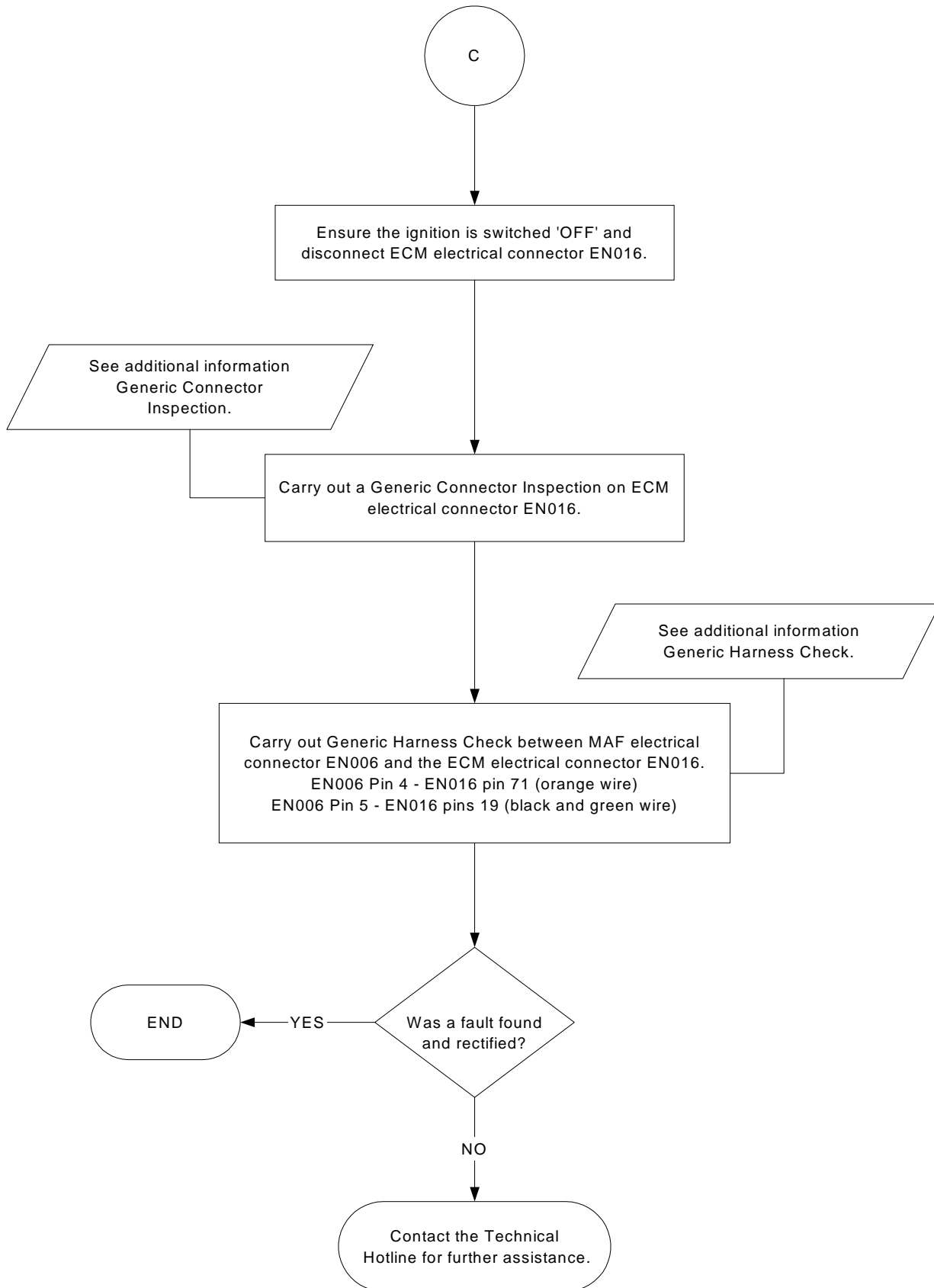
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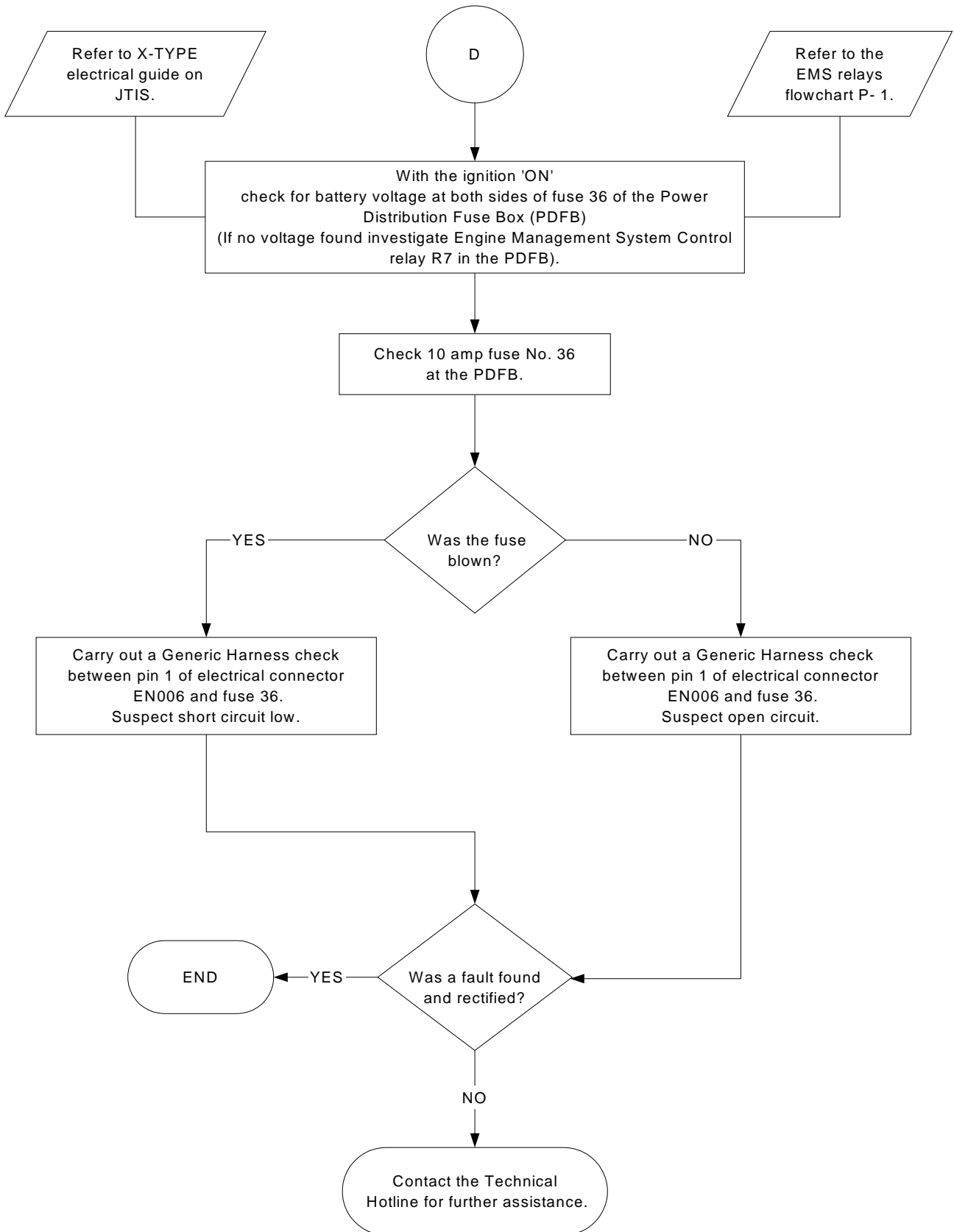
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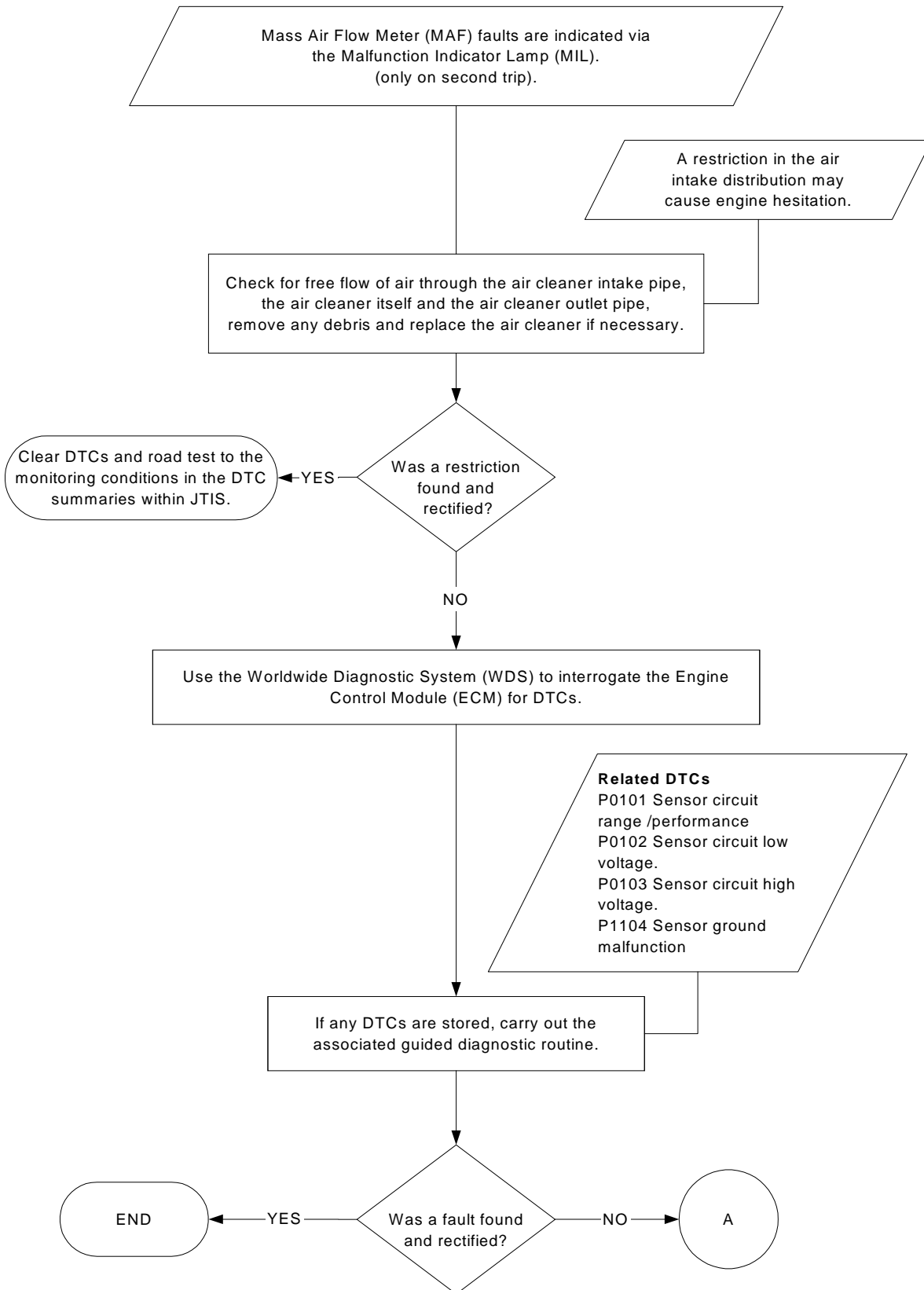
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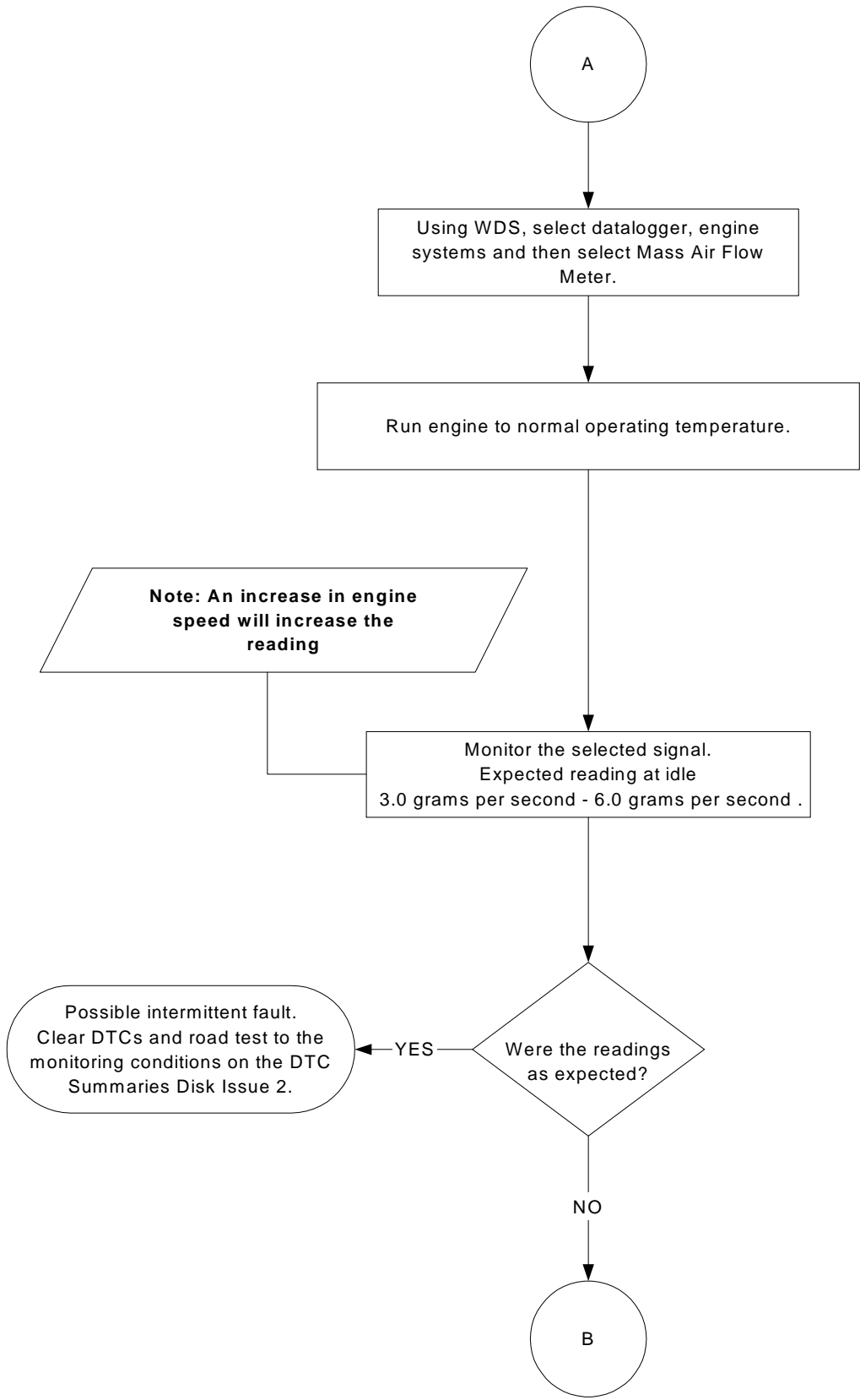
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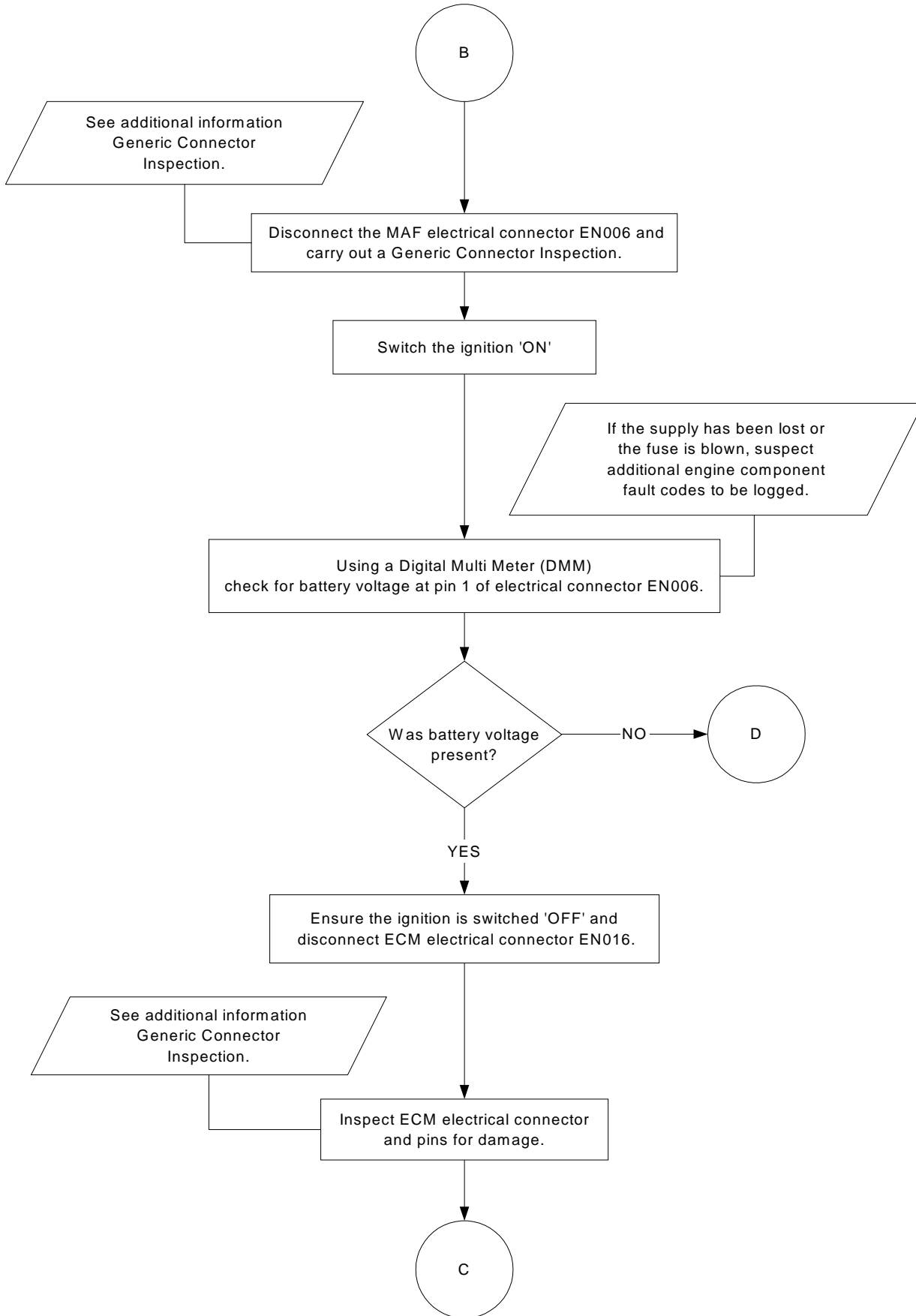
**Mass Air Flow Meter
Flowchart P- 10**



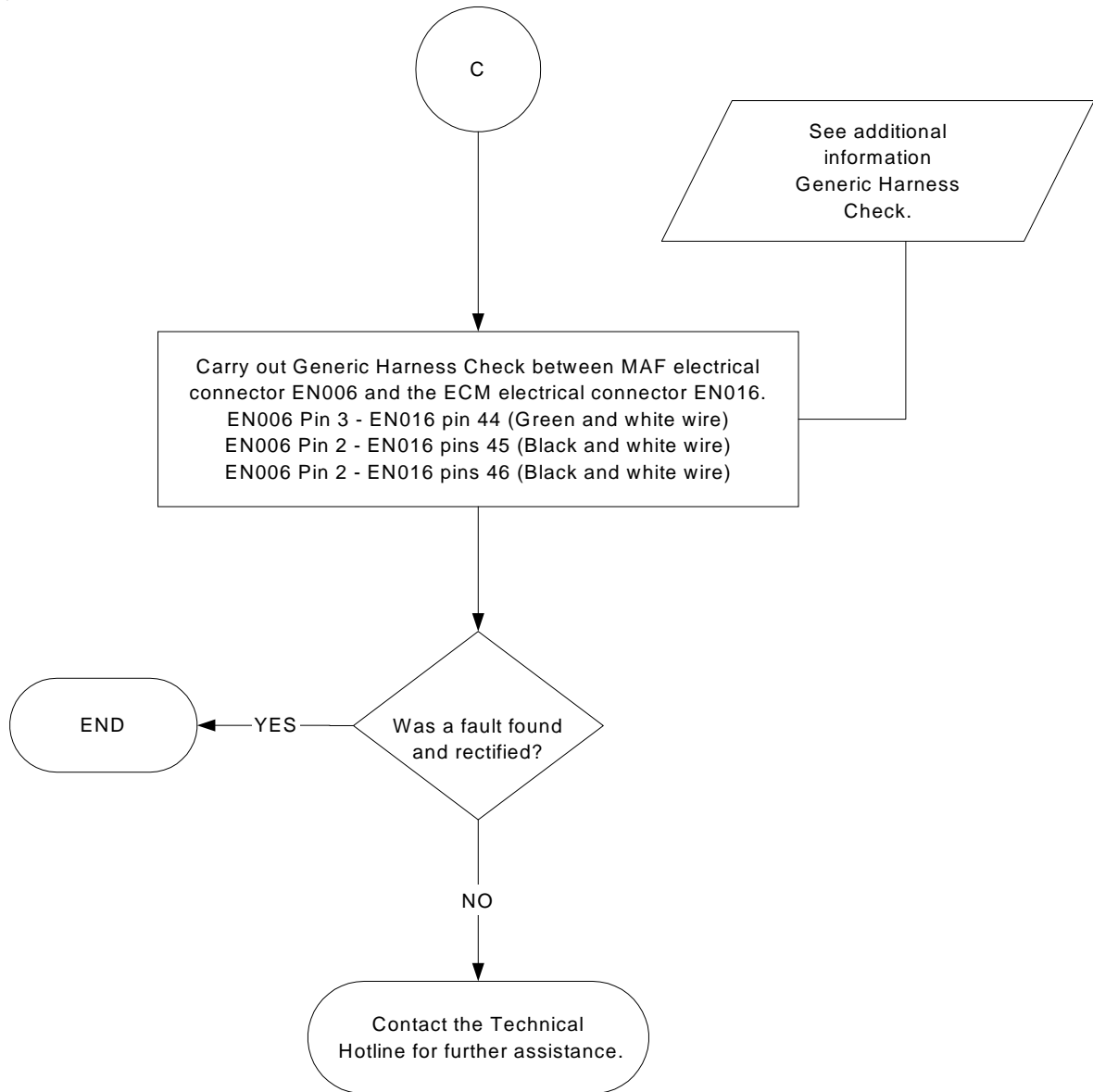
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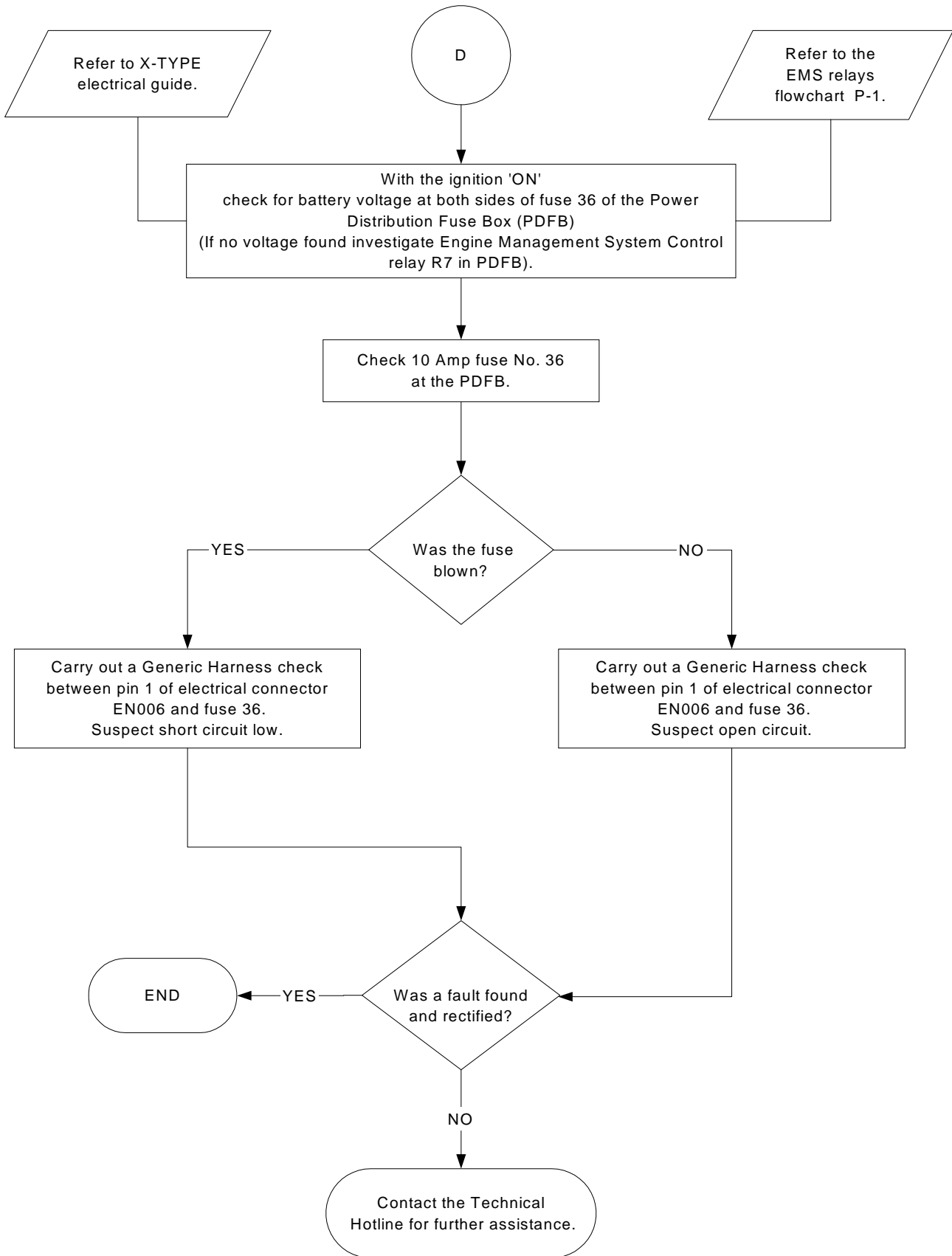
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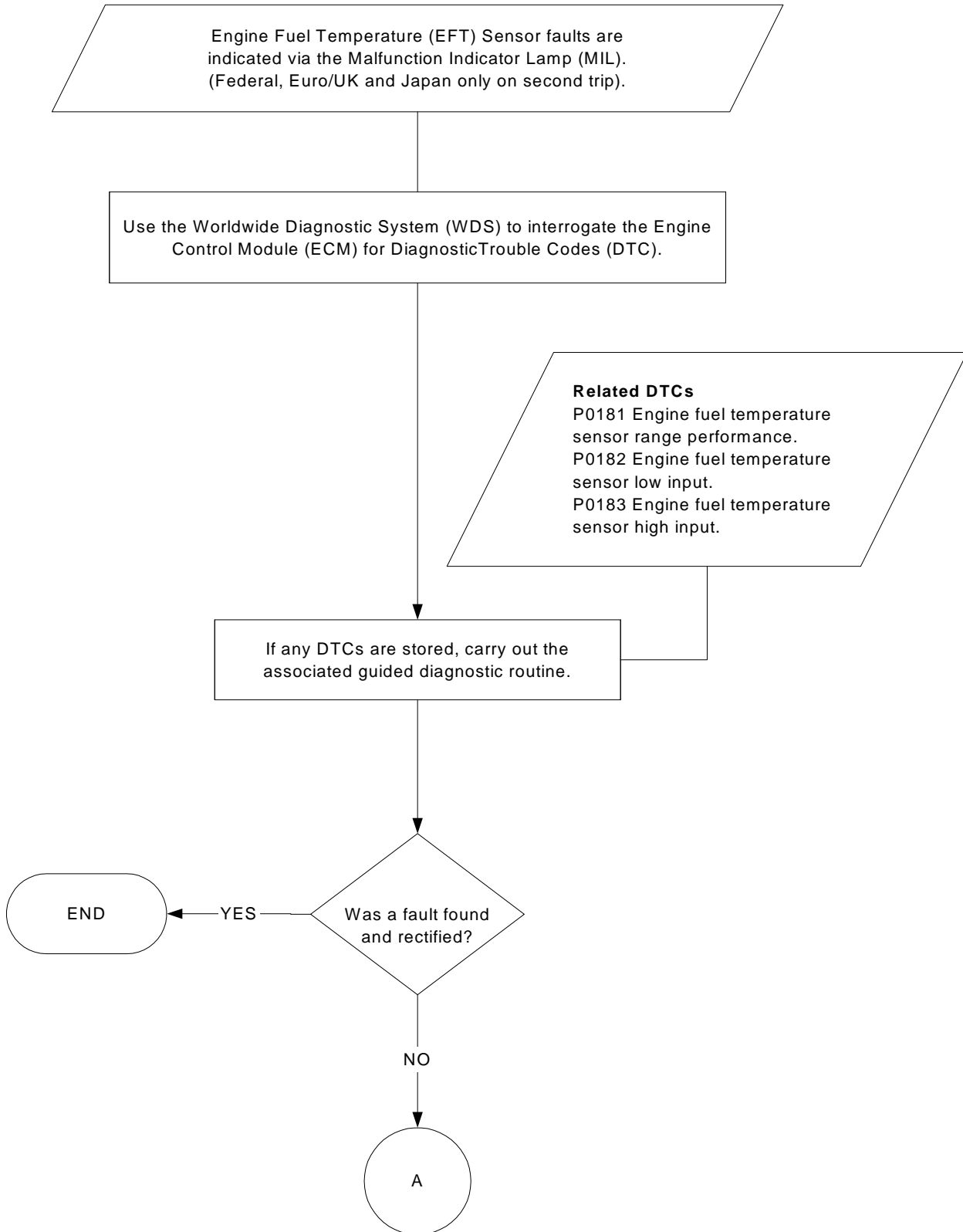
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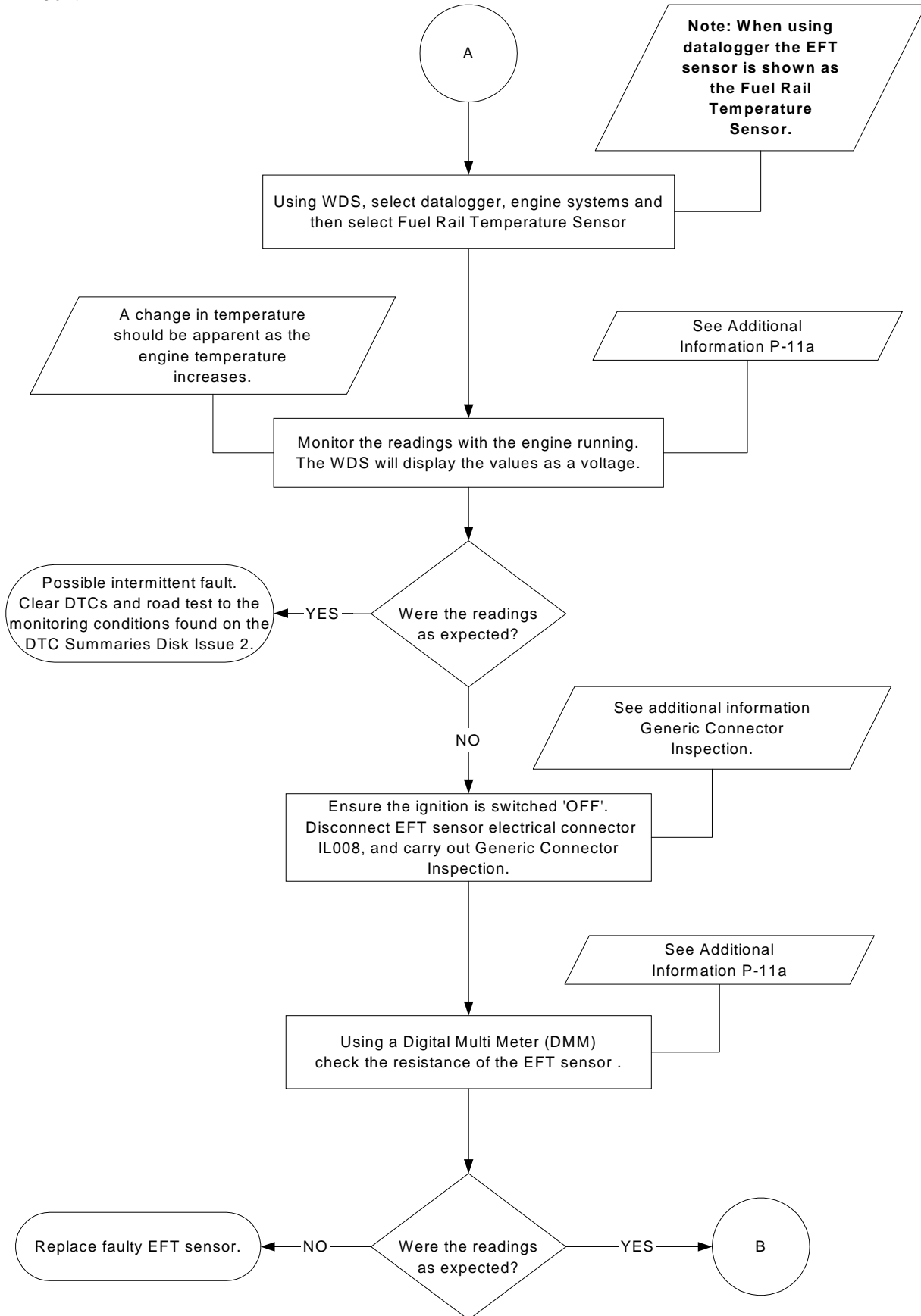
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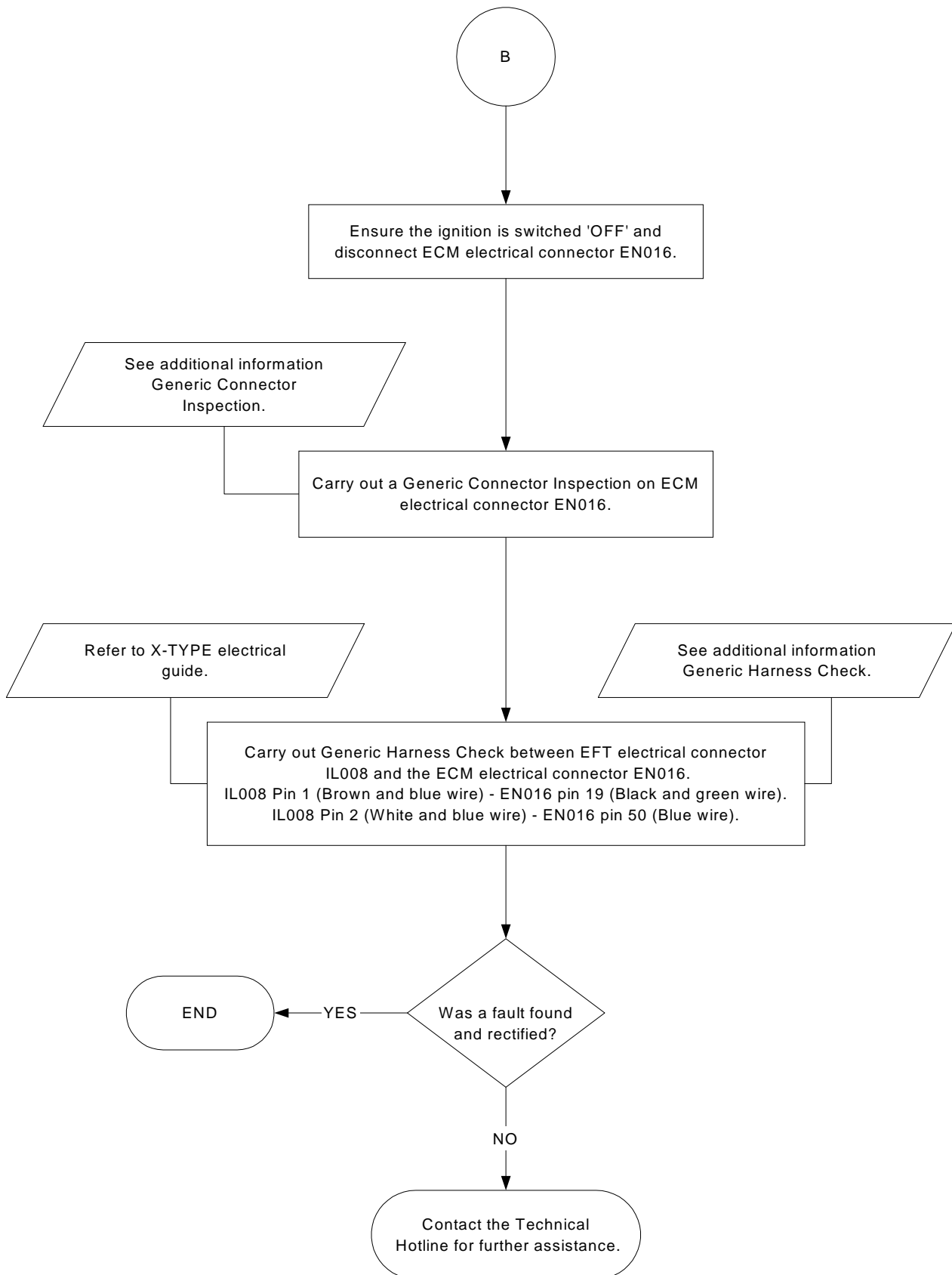
Engine Fuel Temperature Sensor Flowchart P-11



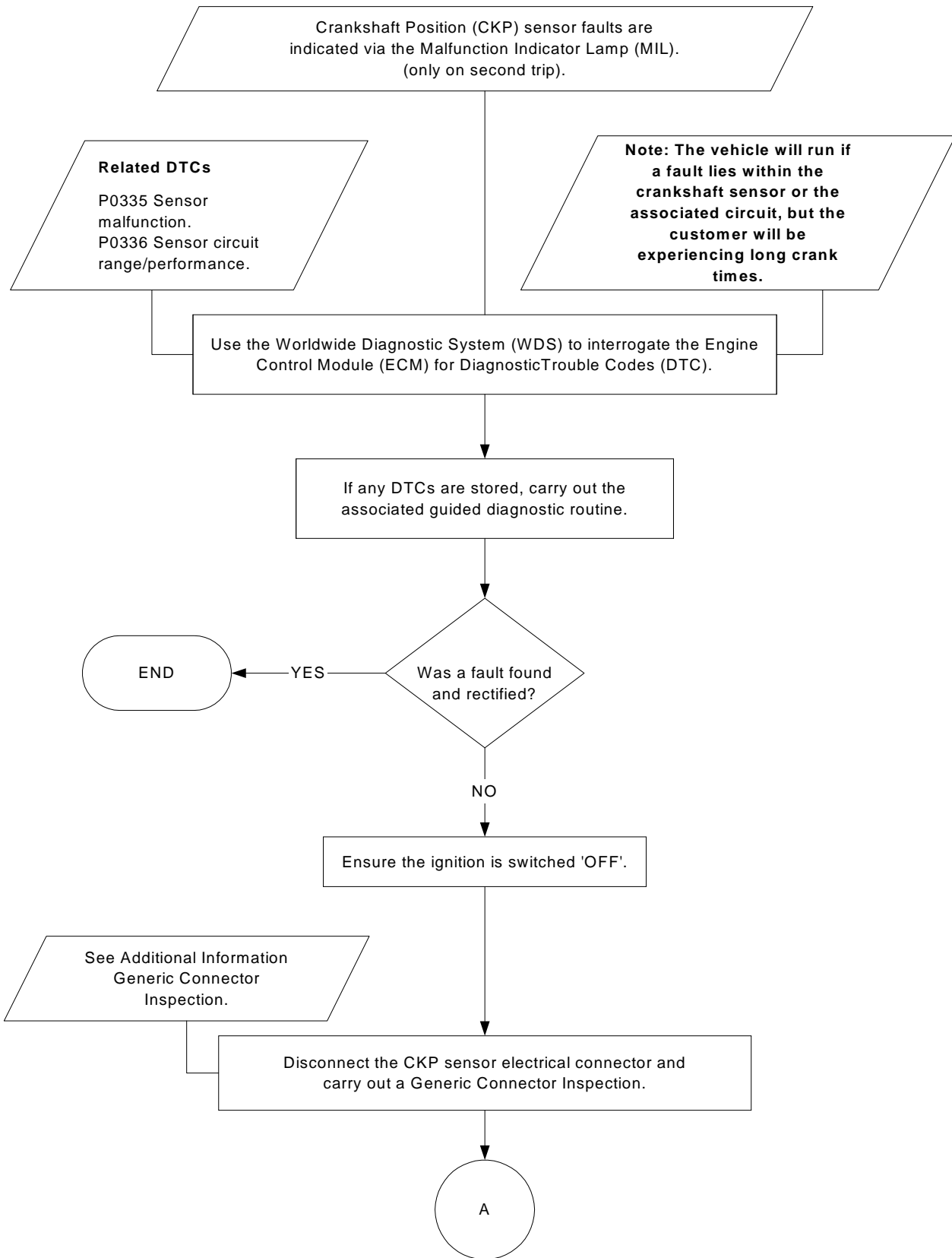
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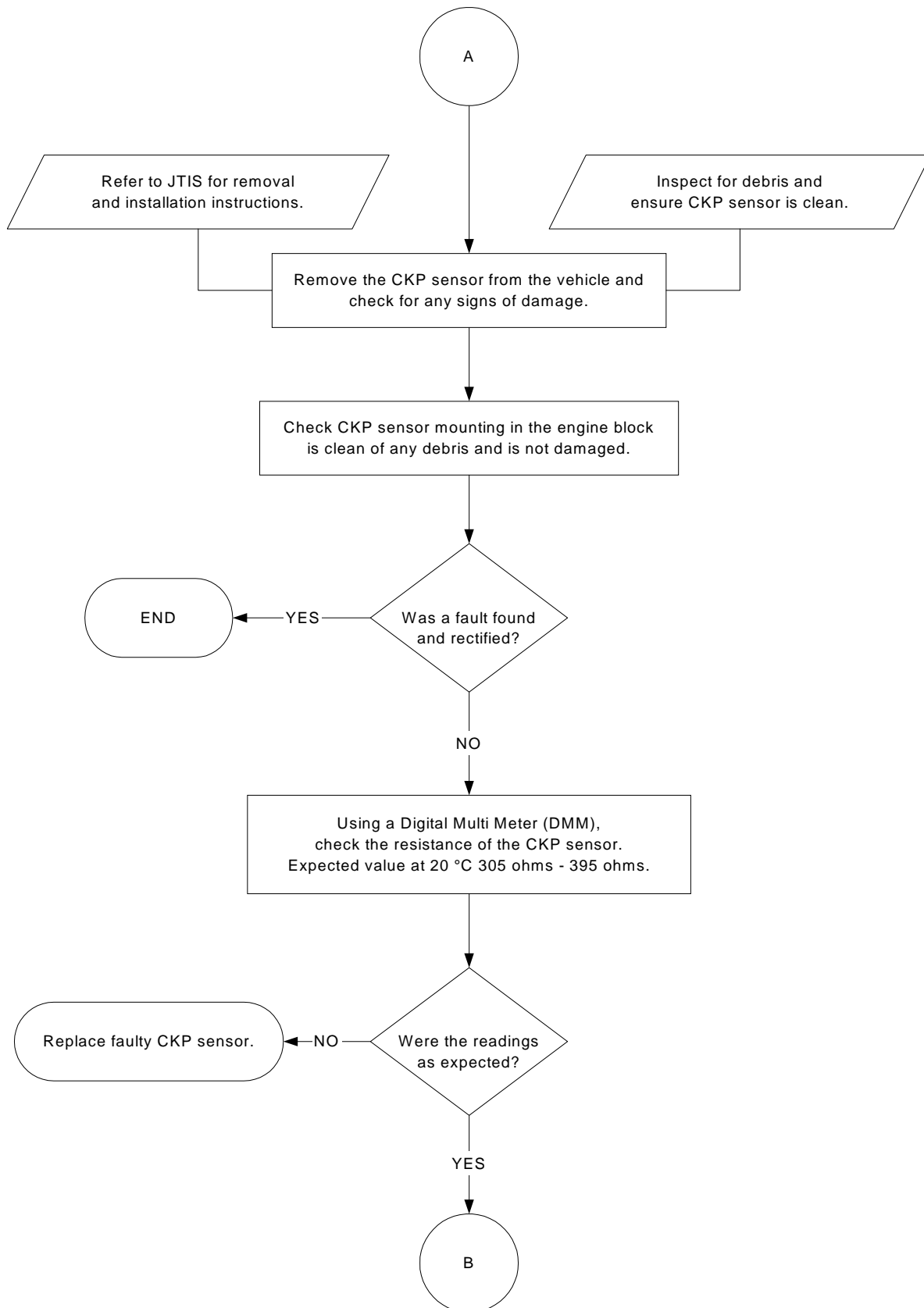
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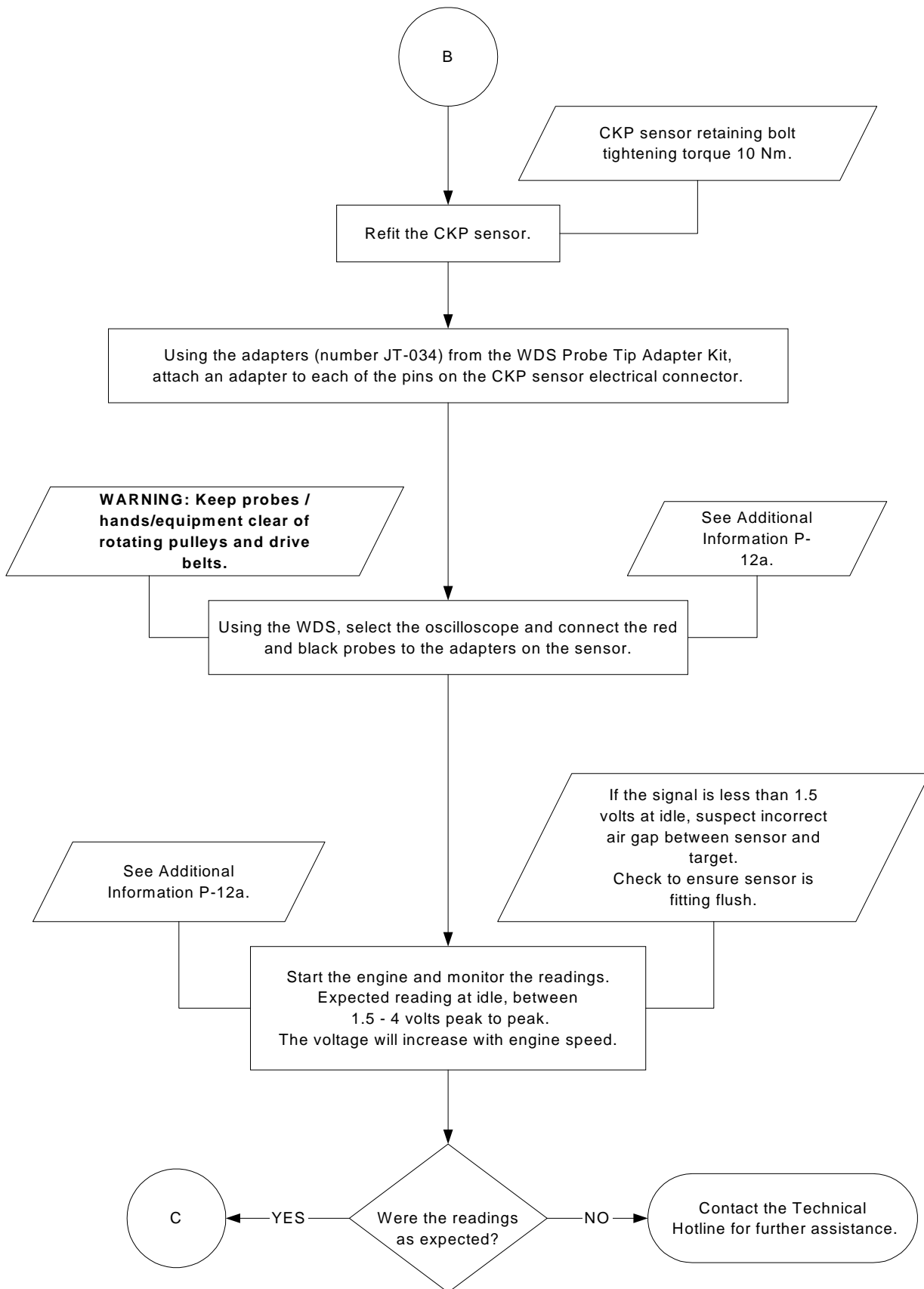
Crankshaft Position Sensor Flowchart P-12



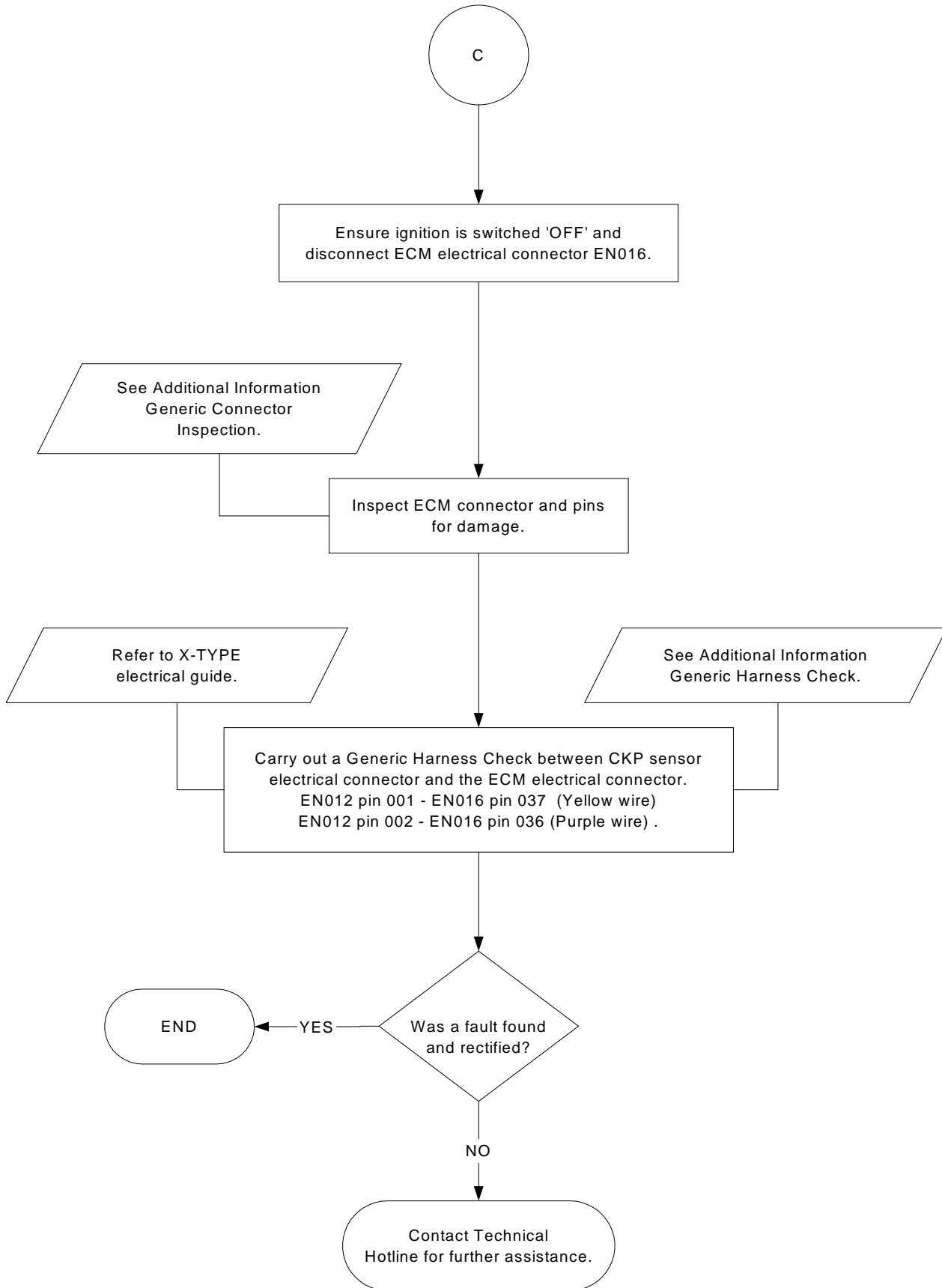
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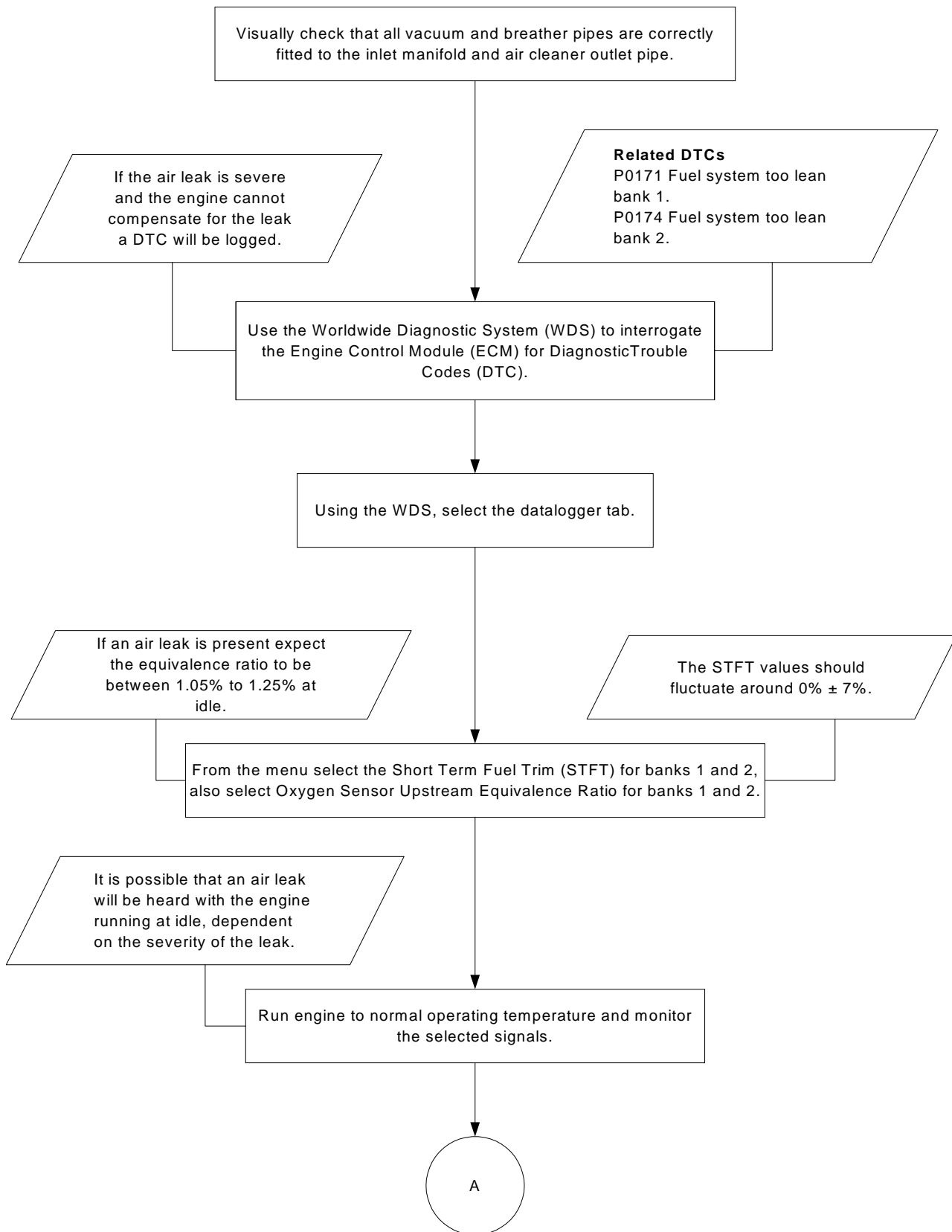
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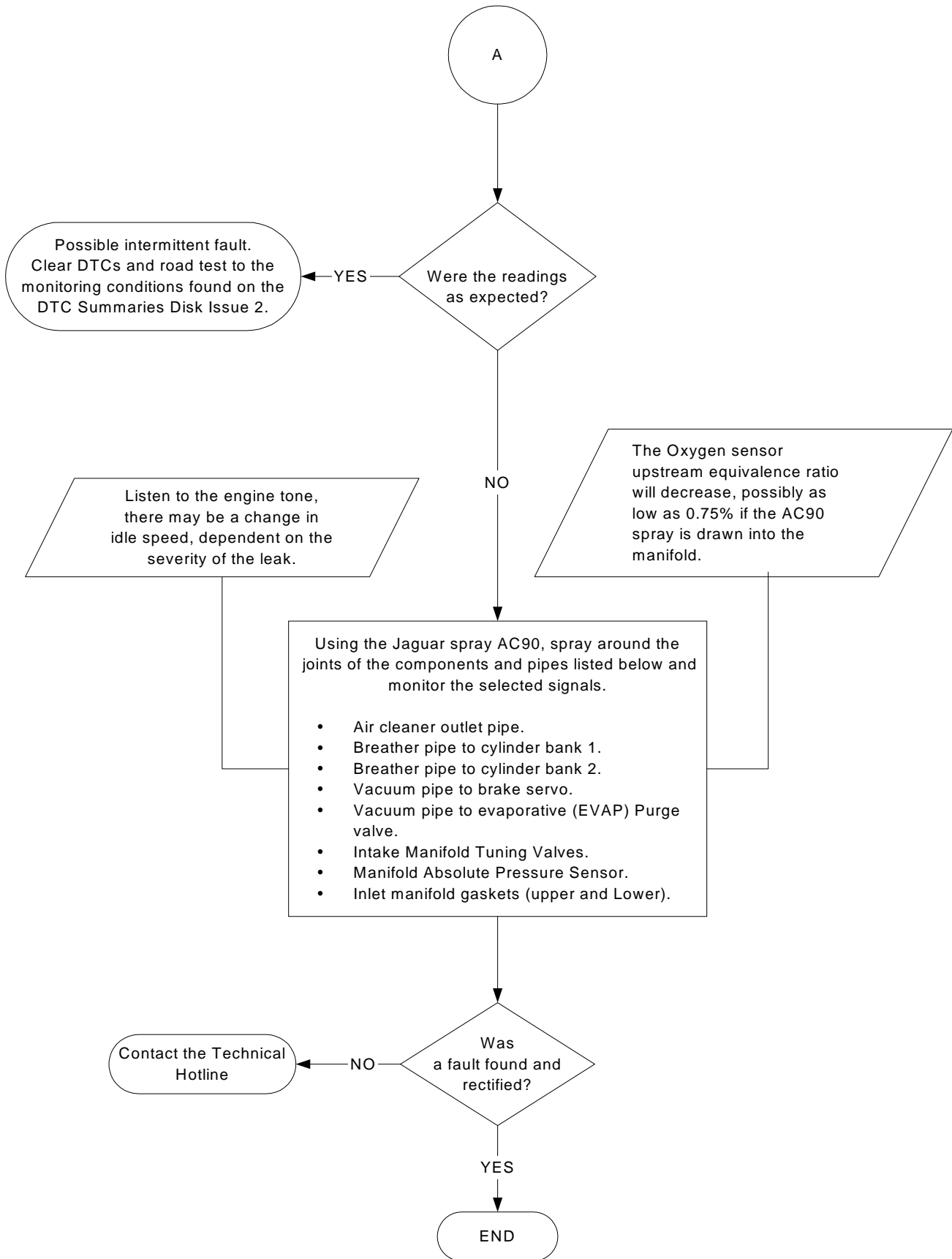
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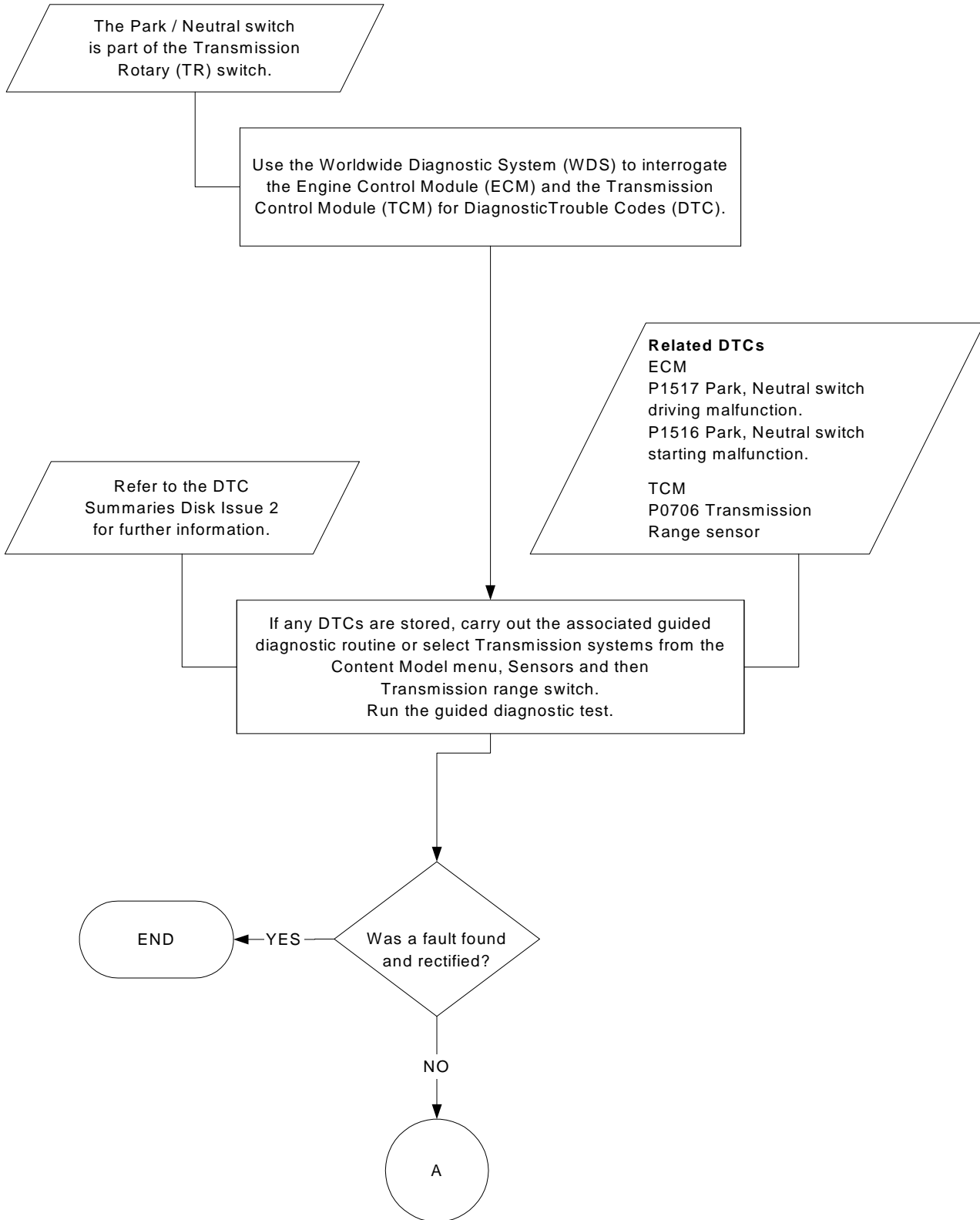
Air Leakage Flowchart P-13



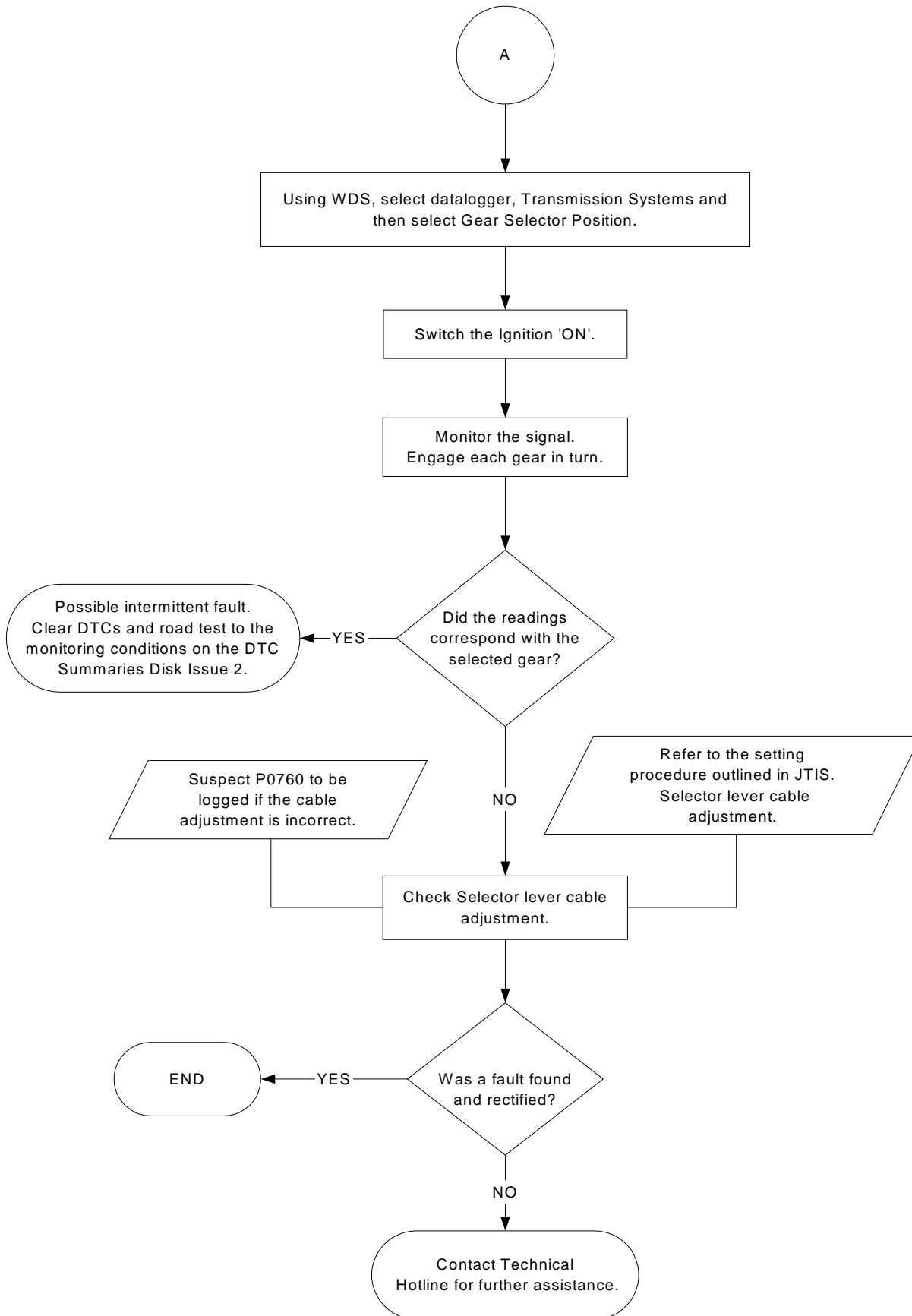
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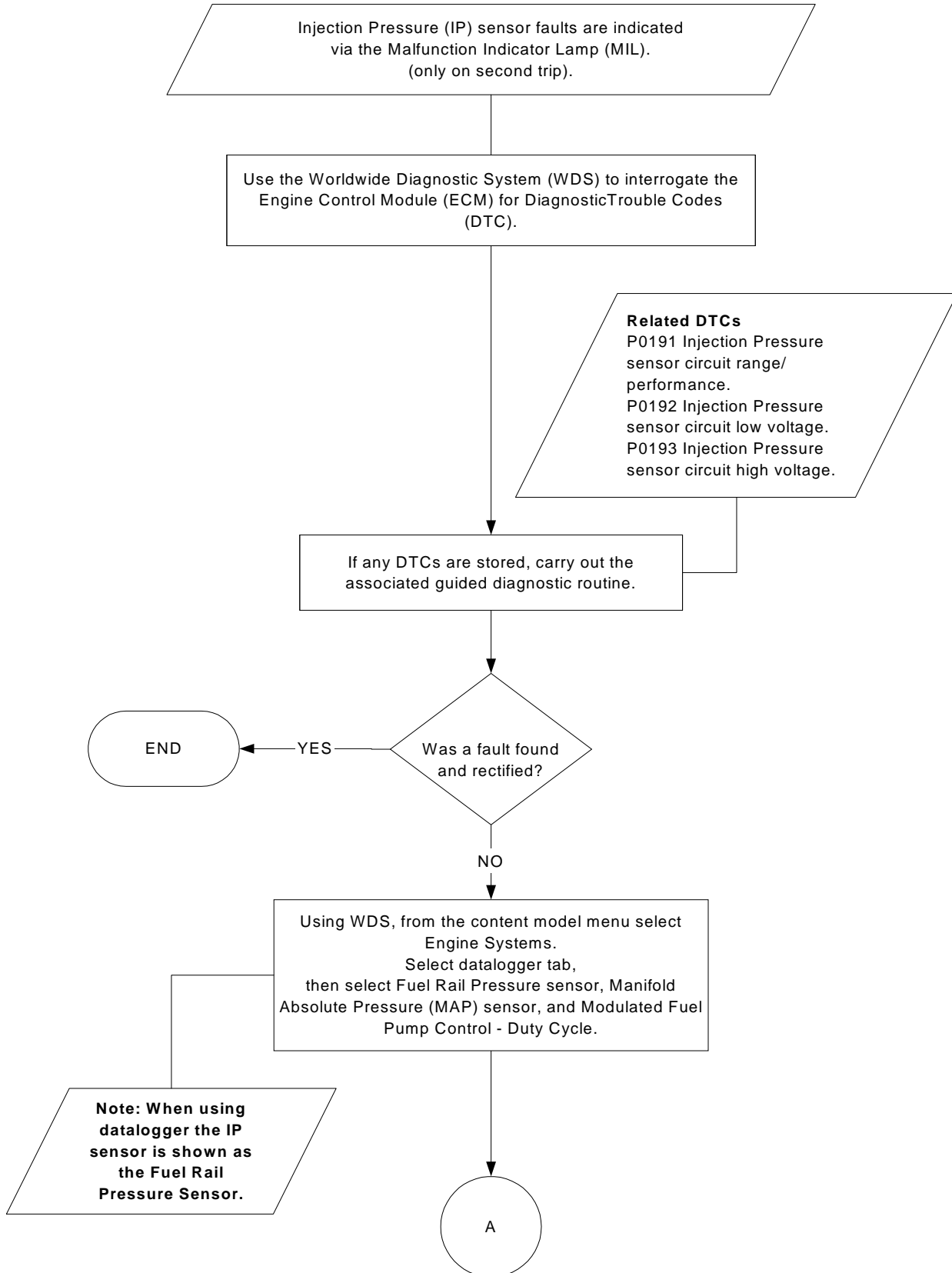
Park Neutral Switch Flowchart P-14



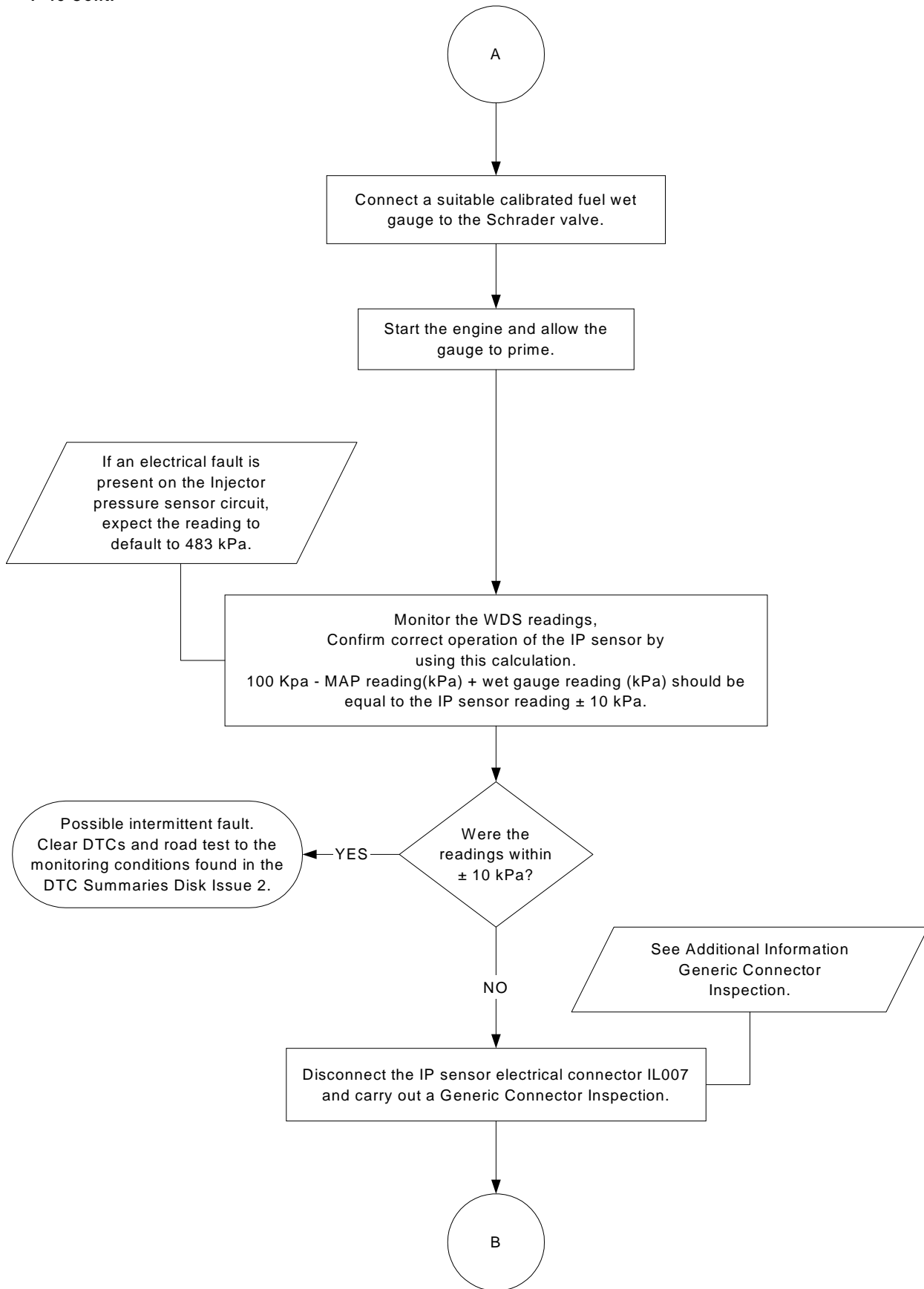
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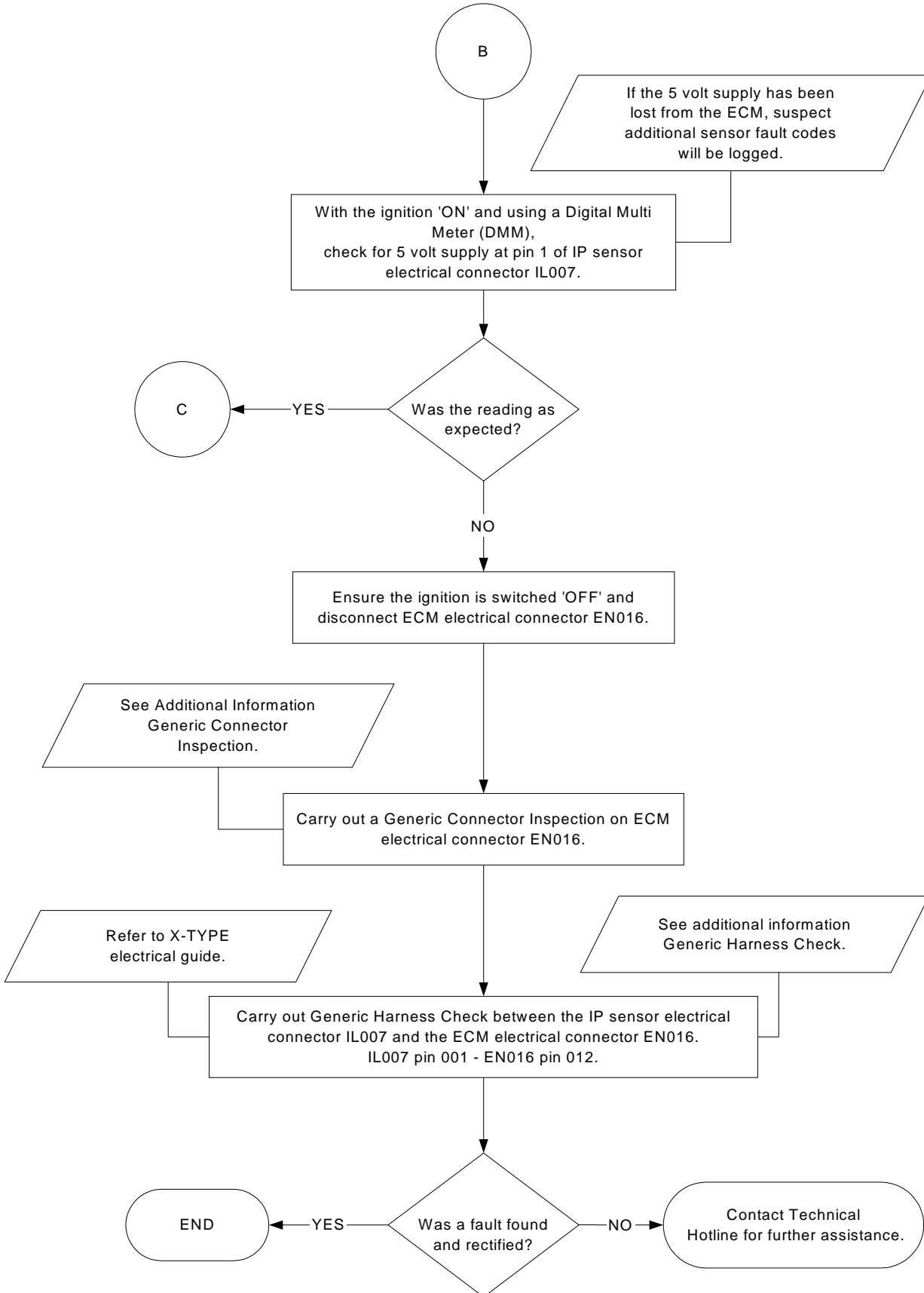
Injection Pressure Sensor Flowchart P-15



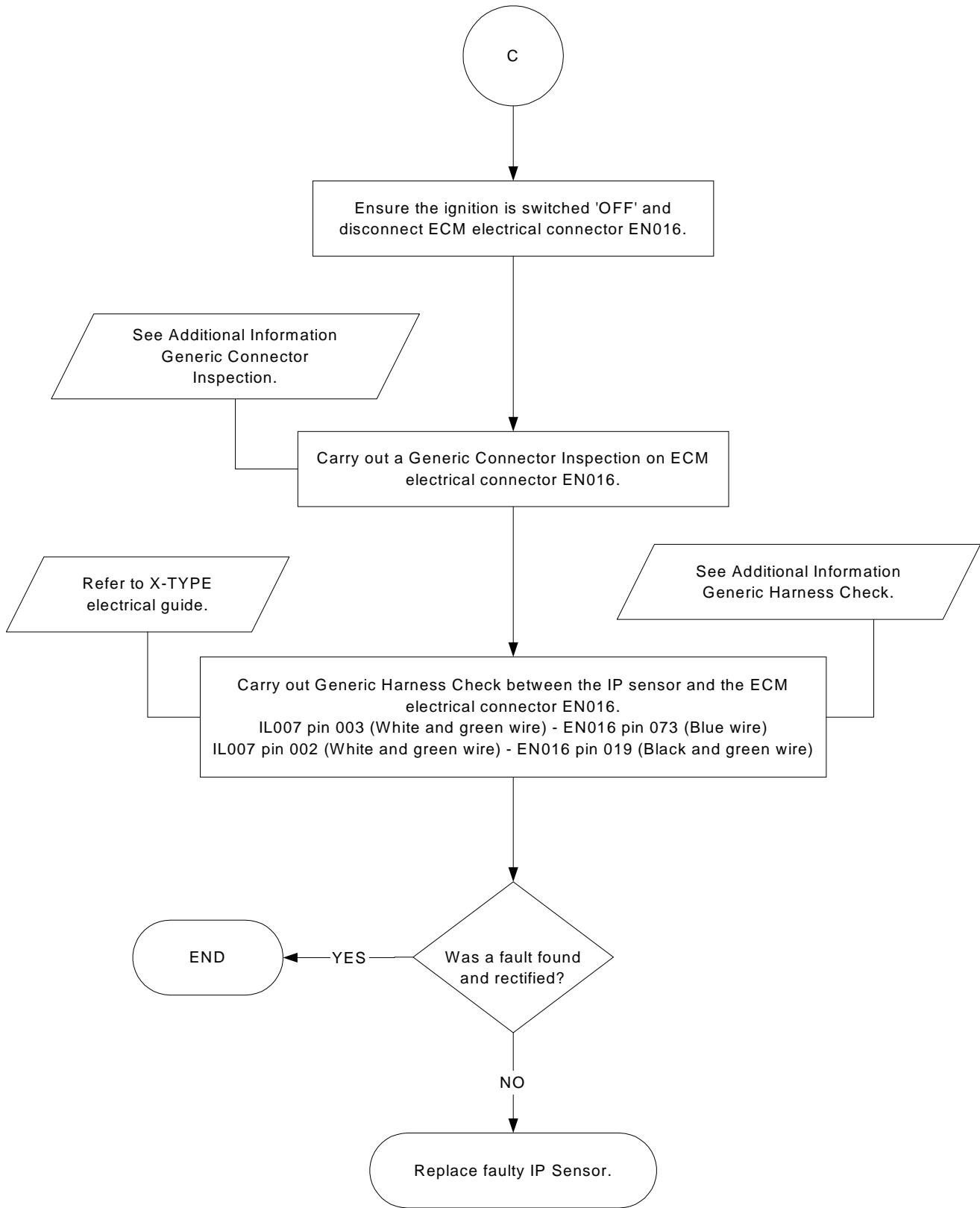
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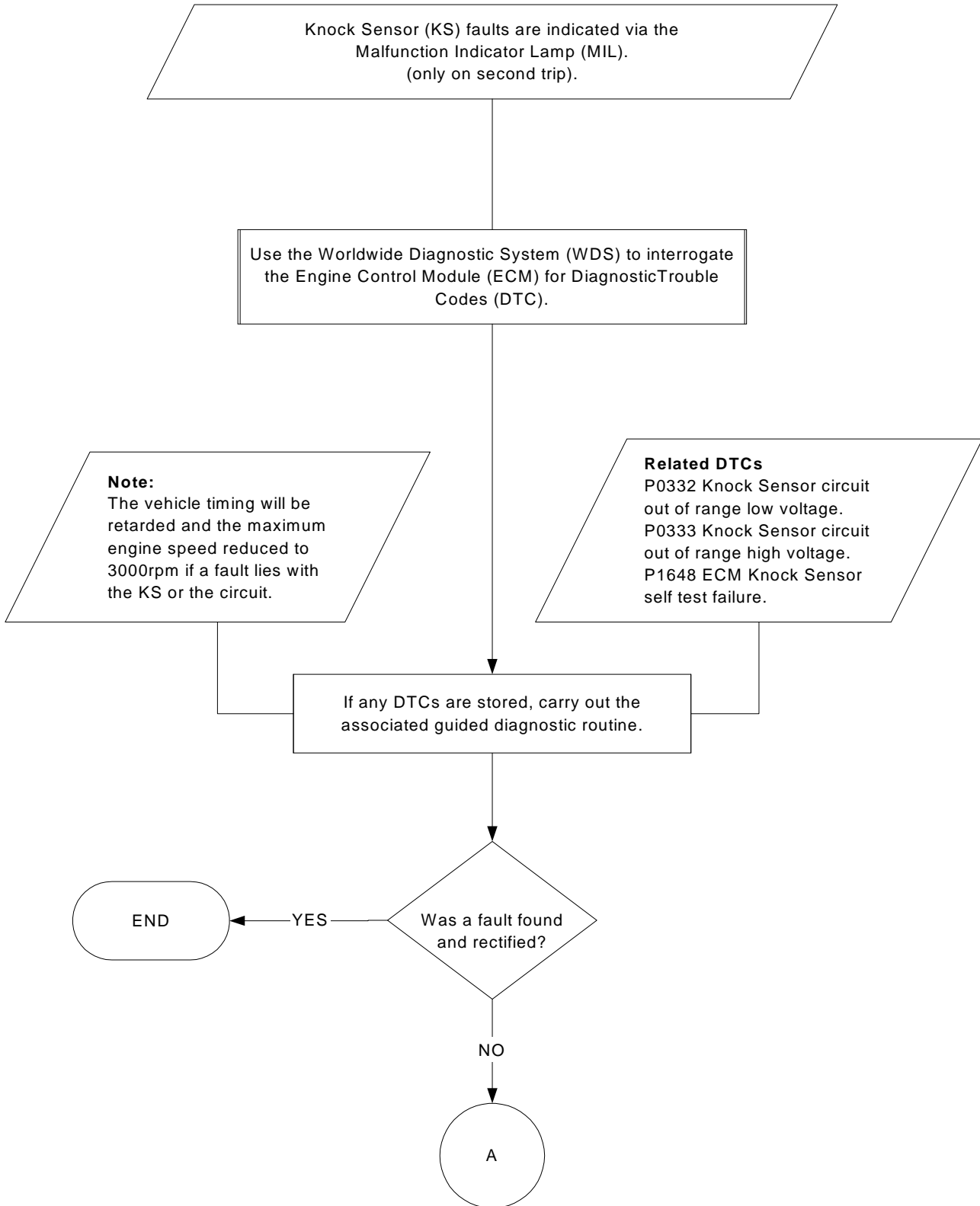
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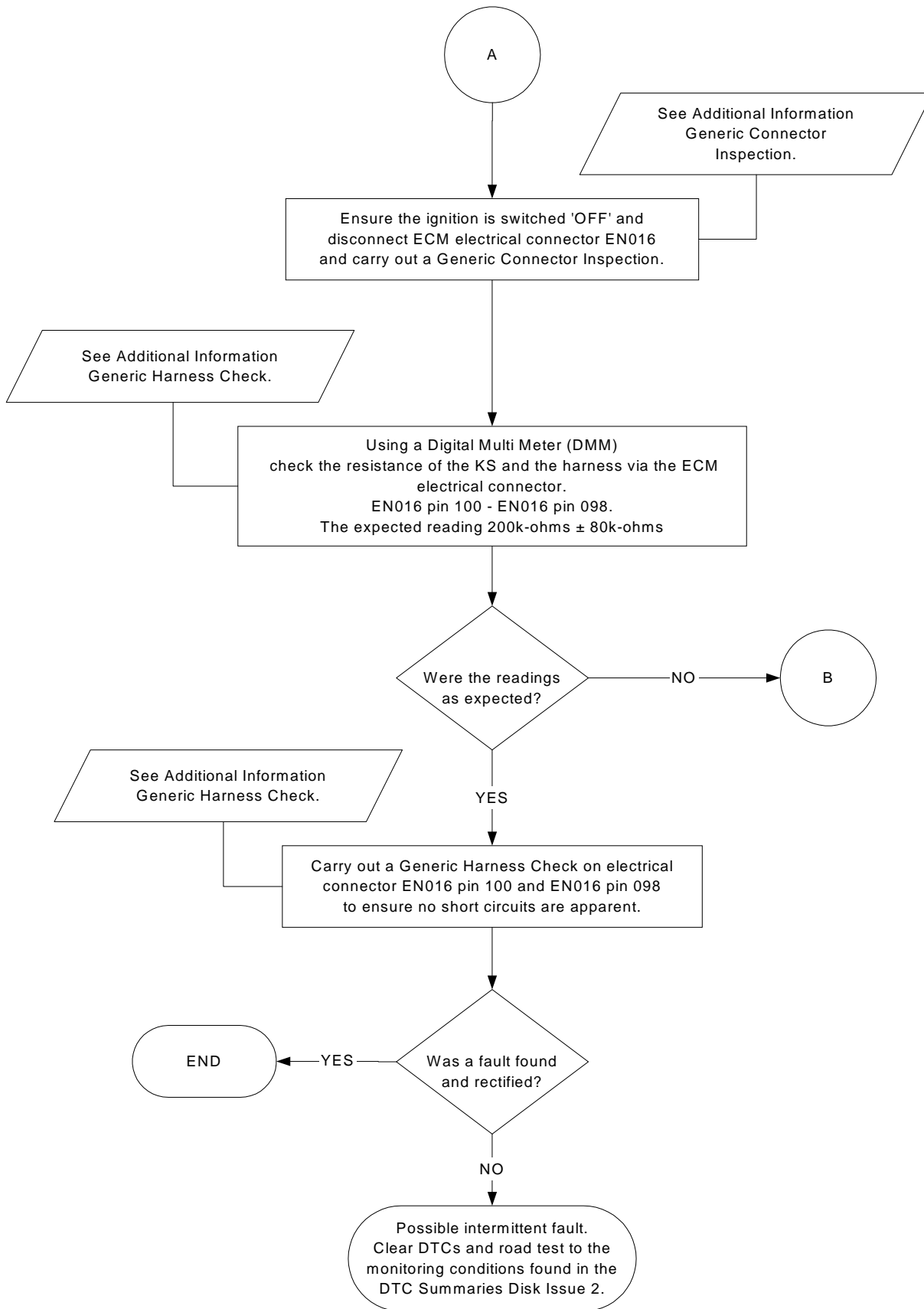
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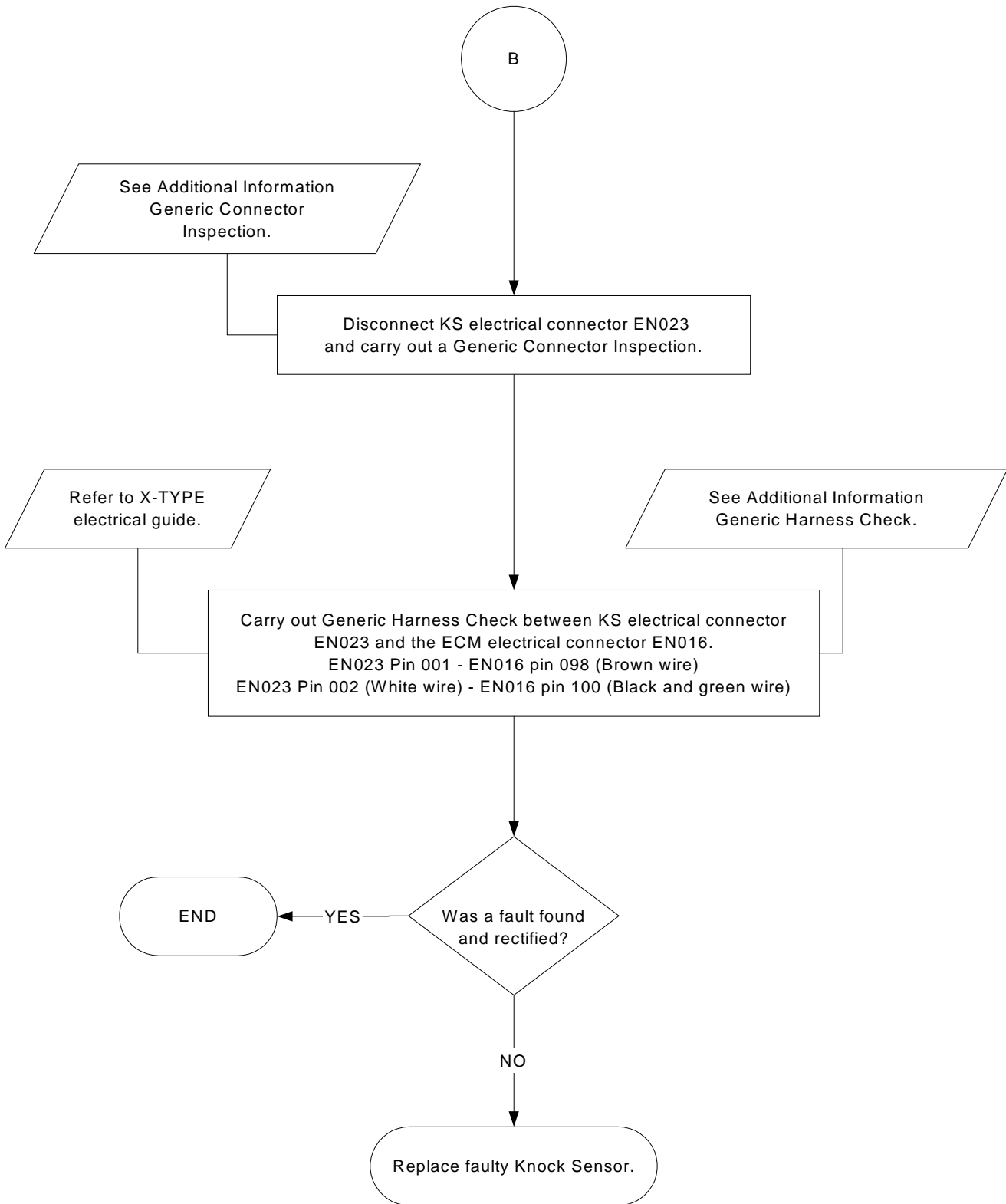
Knock Sensor Flowchart P-16



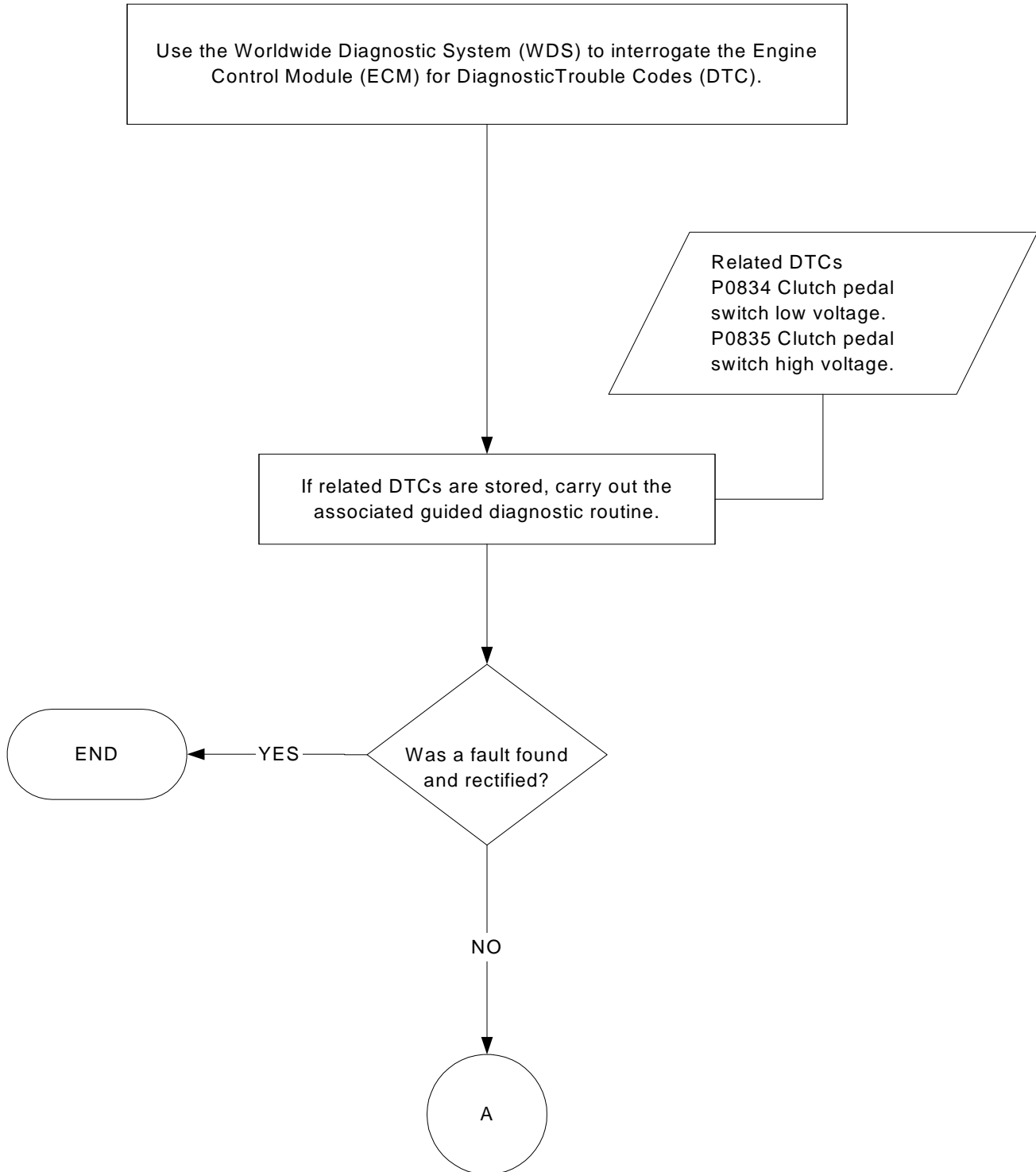
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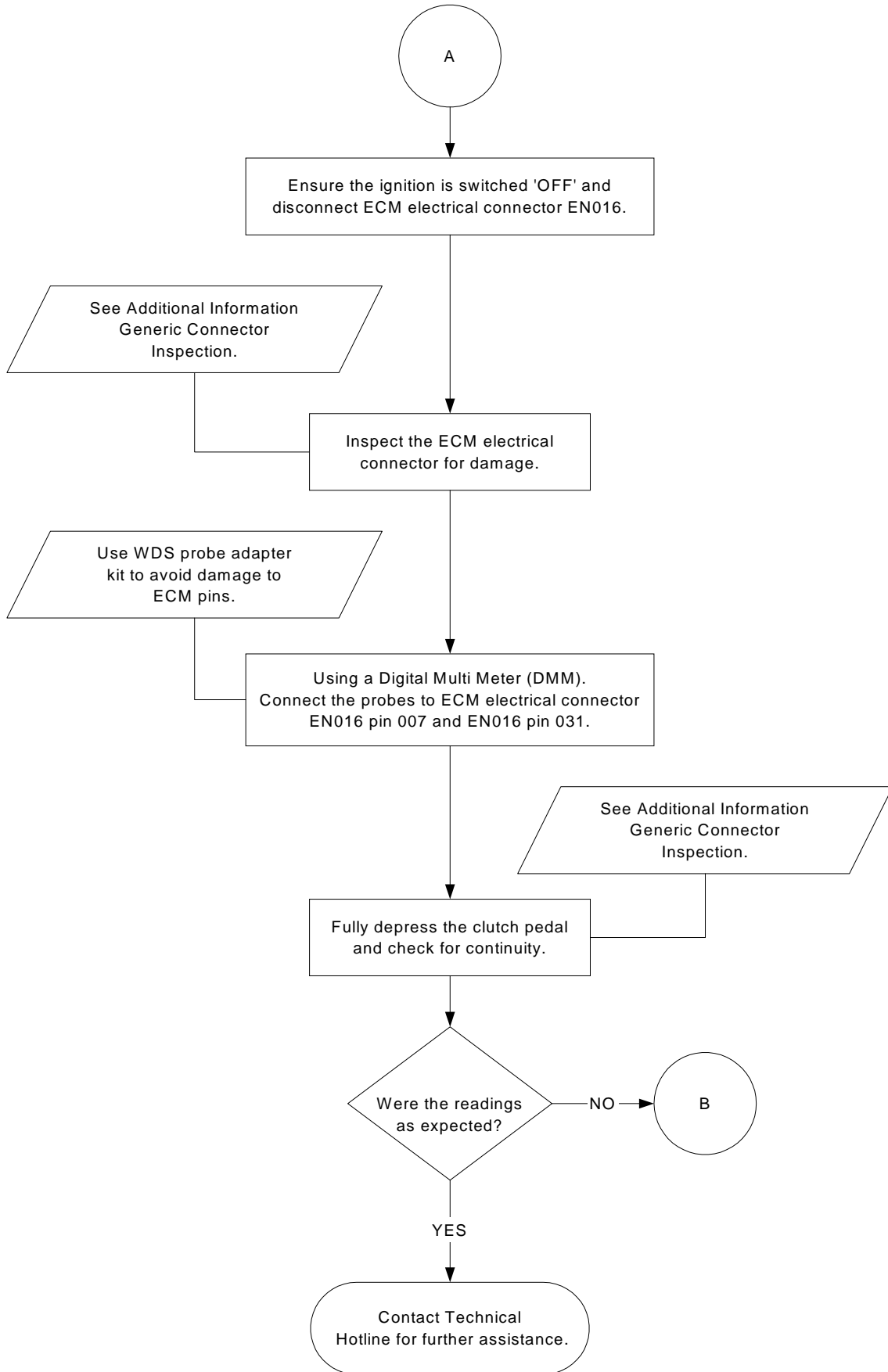
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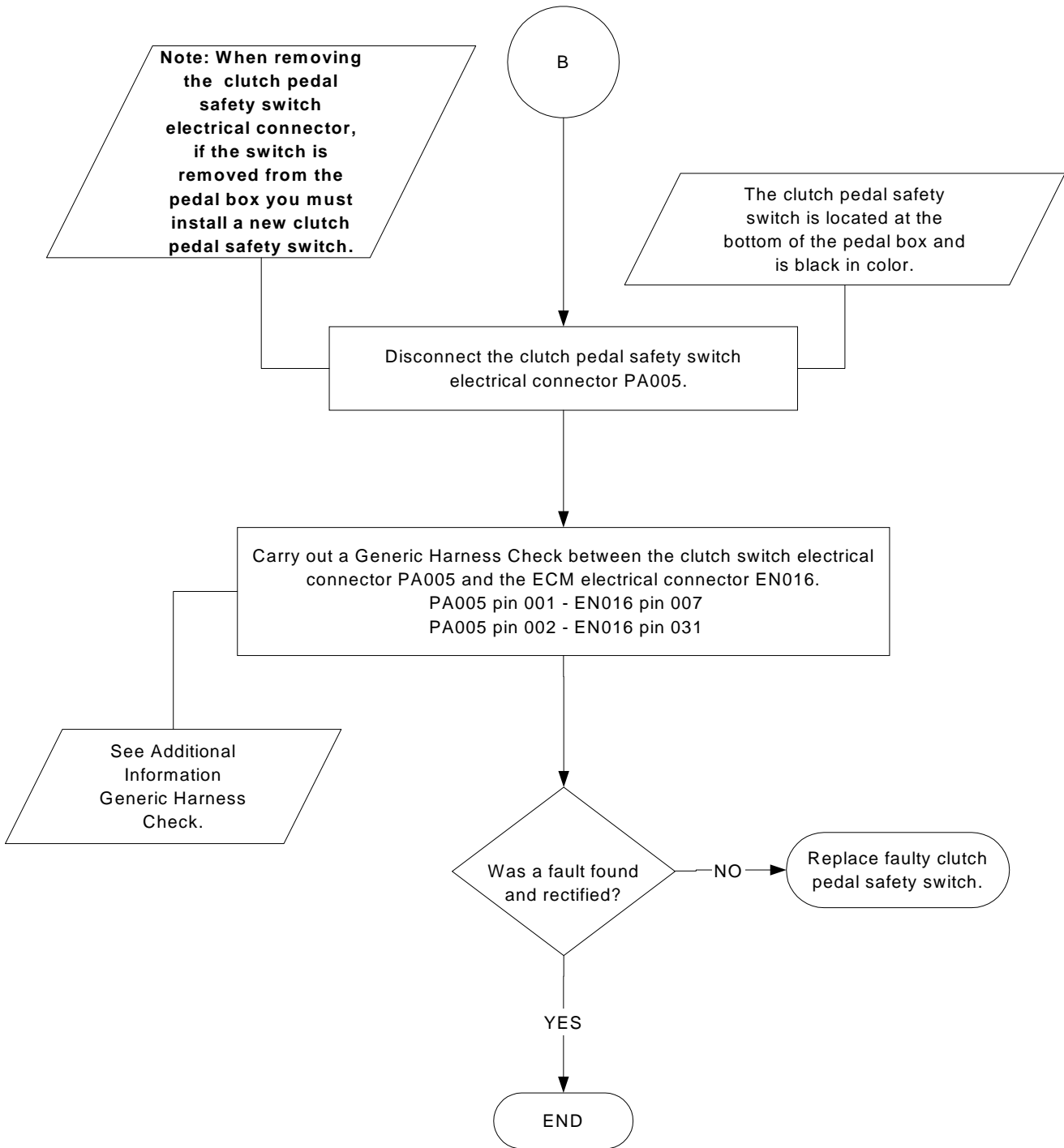
Clutch Pedal Safety Switch Flowchart P-17



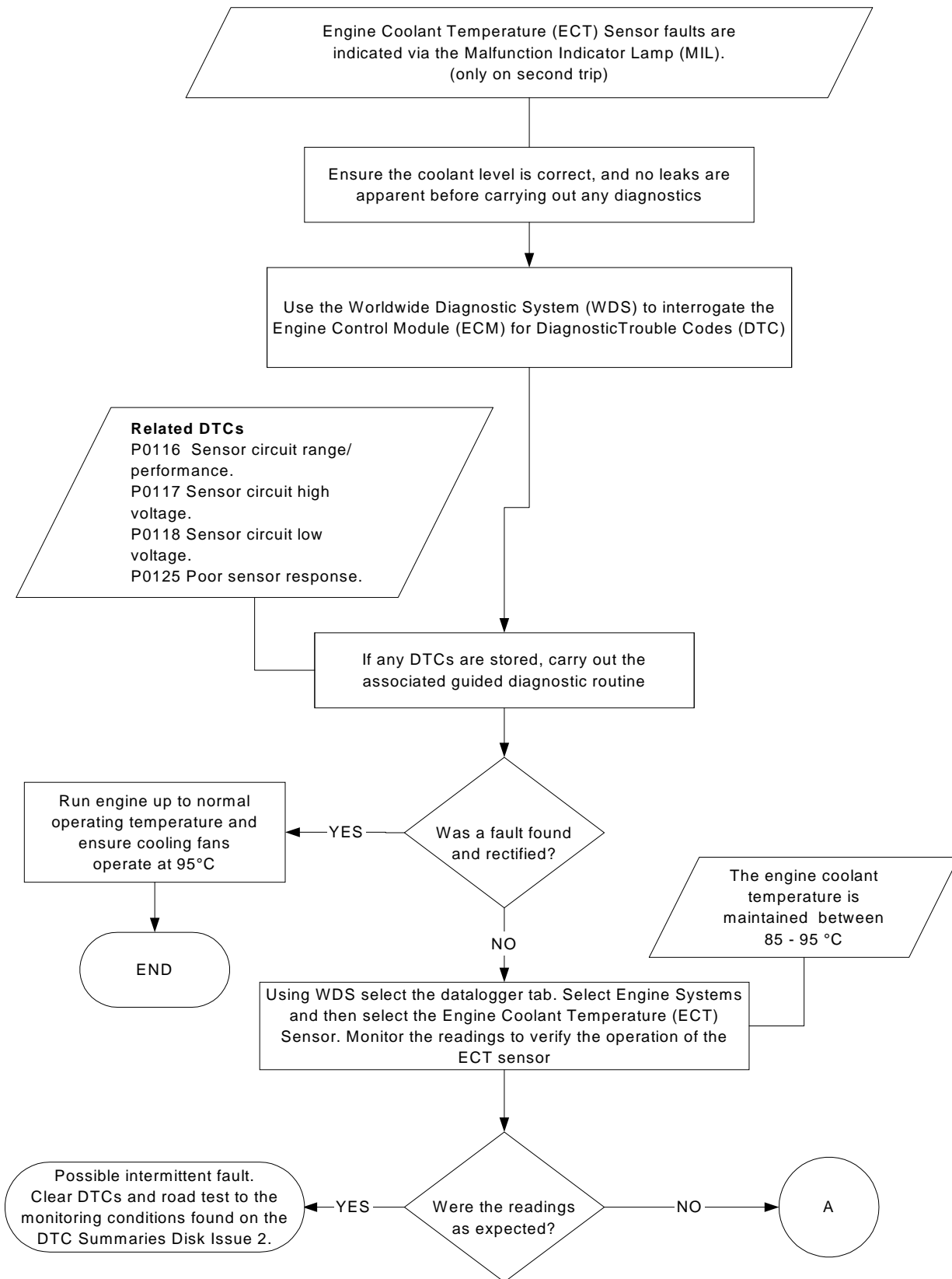
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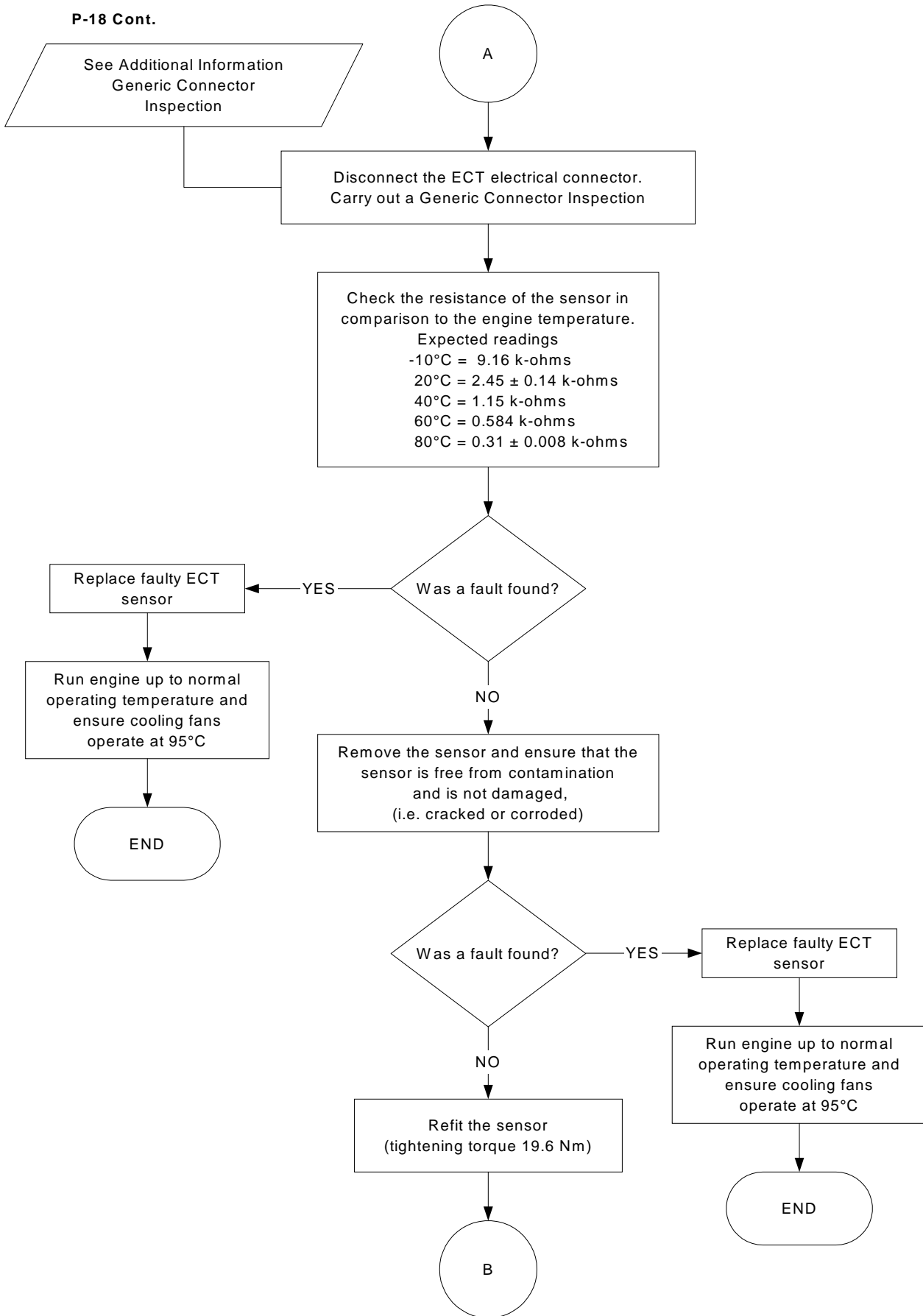
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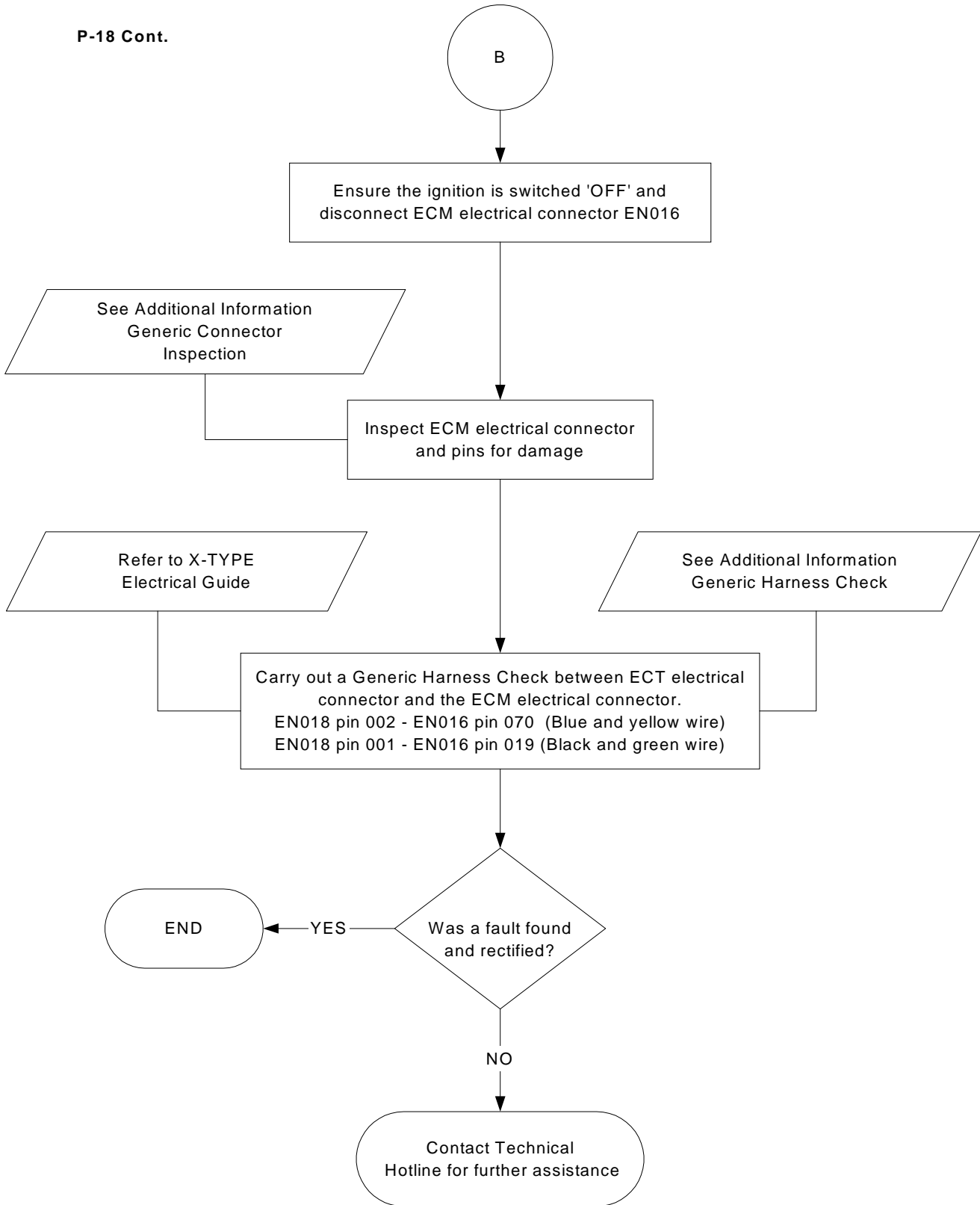
Engine Coolant Temperature Sensor Flowchart P-18



P-18 Cont.



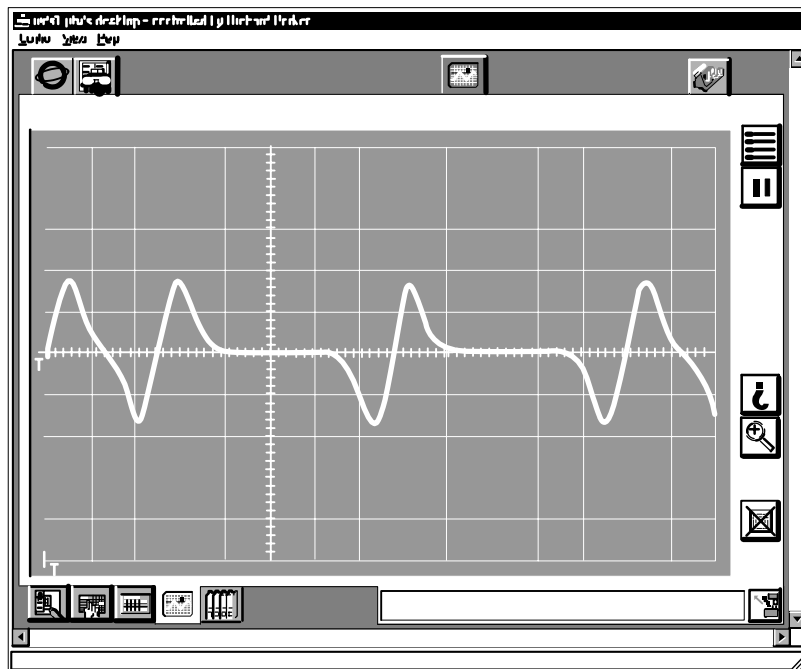
P-18 Cont.



Additional Information P-2a

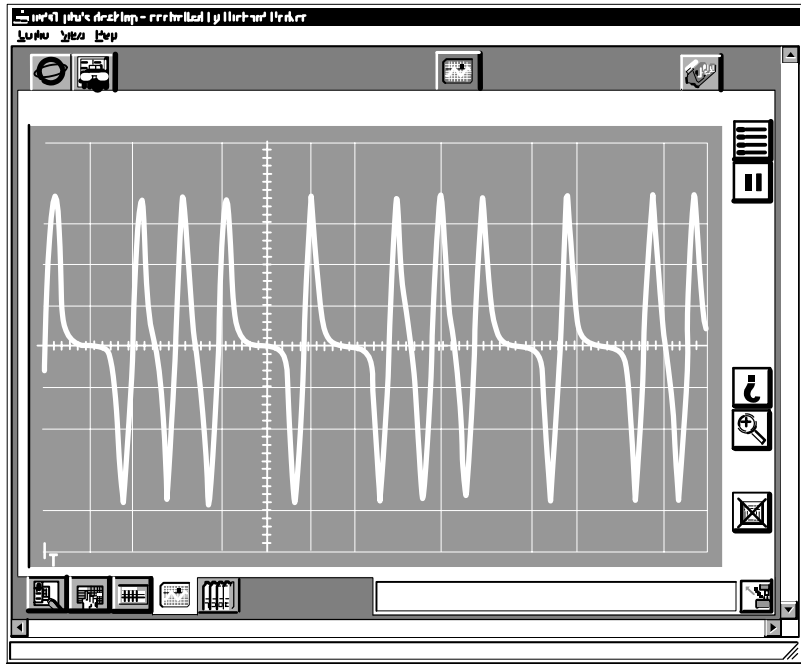
Oscilloscope set up.

1. Configuration sub tab.
Channel 1
Select: Red probe and black probe-Differential.
2. Channel calculation sub tab.
Select: Maximum voltage.
3. Main oscilloscope display sub tab.
Y-axis select: Scale set to 1 volt/div.
X-axis select: Scale set to 10 ms/div.
4. Select: Full screen.



J.100.223

Illustration 1 Trace of the cam sensor at idle



J.100.224

Illustration 2 Trace of cam sensor at 2000 rpm

Additional Information P-3a

Related Diagnostic Trouble Codes.

P1367 Ignition amplifier group 1 malfunction

P1368 Ignition amplifier group 2 malfunction

P0351 to P0356 Ignition amplifier malfunction at the associated cylinder number 1 to 6

P0300 Misfire random/multiple cylinders

P0301 to P0306 Misfire at the associated cylinder number 1 to 6

Criteria.

All side 1 coils malfunction

All side 2 coils malfunction

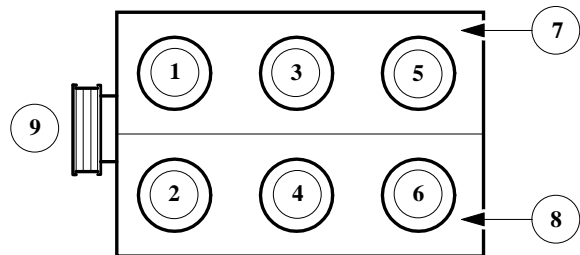
Ignition coil open/short circuit/damaged harness on the associated cylinder

Random misfire detected or misfires on 1 or more cylinders

Misfire detected on the associated cylinder

For further information refer to DTC Summaries Disk Issue 2

Side 1 of engine as indicated at 7, Illustration 3
 Side 2 of engine as indicated at 8, Illustration 3
 Front of engine as indicated at 9, Illustration 3



J.303.1704

Illustration 3

Always refer to the Technical Hotline if problems are encountered.

Additional information P-4a

Subject- Upstream and Downstream Oxygen Sensors.

Checks

- The upstream sensor is also identified as the UHEGO and has a grey connector.
- The downstream sensor is also identified as the HEGO and has a black connector.
- To ensure that the sensors are fitted correctly, the upstream sensor is situated directly above the catalytic converter (Pre-catalytic), and the downstream sensor is at the center of the catalytic converter.
- If the sensor positions are reversed this will cause catalytic converter monitor diagnostic trouble codes P0420 and P0430 to be logged.
- If the catalyst monitor DTCs are logged (P0420/P0430) and the orientation of the sensors is correct then suspect catalytic converter failure. Removing the catalytic converter and visually checking the honeycomb layout can check this.
- Air leaks are possible at the connection of the sensor to the exhaust. Ensure the sensors are tightened to the correct torque.
- Problems may occur due to air leaks within the exhaust system.
- Carry out visual checks for cracks and leaks from the manifold down to the catalytic converter.
- Listen for the exhaust gas escaping when cold, as it may not be noticeable as the exhaust warms and expands.

Cautions

Removal. (Always refer to JTIS)

Ensure the connector on the flylead is disconnected before removal.

Failure to do this may cause the wires to twist and damage or pull out of the sensor.

Installing. (Always refer to JTIS)

Over tightening may cause damage to the element within the sensor.

Ensure the correct tightening torque is used when installing the sensor.

(Torque setting for both sensors 40 Nm +/- 7.2 Nm.)

Ensure the flylead is routed correctly and is not taut, as this may cause damage with engine movement.

Additional information P-4a cont.

Upstream Oxygen Sensor Diagnostic Trouble Codes		Downstream Oxygen Sensor Diagnostic Trouble Codes	
DTC	Description	DTC	Description
P0031	Heater control circuit low A	P0037	Heater control circuit low A
P0032	Heater control circuit high A	P0057	Heater control circuit low B
P0051	Heater control circuit low B	P0038	Heater control circuit high A
P0052	Heater control circuit high B	P0058	Heater control circuit high B
P0131	Circuit low voltage A	P0137	Circuit low voltage A
P0132	Circuit high voltage A	P0157	Circuit low voltage B
P0133	Circuit slow response 1A	P0138	Circuit high voltage A
P0151	Circuit low voltage B	P0158	Circuit high voltage B
P0152	Circuit high voltage B	P0140	Circuit no activity A
P0153	Circuit slow response 1B	P0160	Circuit no activity B
P1646	Control module open/shorted A		
P1647	Control module open/shorted B		

For further information, refer to DTC Summaries Disk Issue 2

Additional Information P-11a

Engine Fuel Temperature Sensor Characteristics.

Temperature.	Nominal resistance Using DMM.	WDS Datalogger voltage display.
-10°C (14°F)	160.3 k-ohms ± 8.3 k-ohms	4.15 volts ± 0.04 v
10°C (50° F)	58.9 k-ohms ± 2.9 k-ohms	3.52 volts ± 0.06 v
20°C (68° F)	37.3 k-ohms ± 2.1 k-ohms	3.09 volts ± 0.07 v
30°C (86° F)	24.2 k-ohms ± 1.4 k-ohms	2.62 volts ± 0.07 v
40°C (104° F)	16.1 k-ohms ± 0.9 k-ohms	2.15 volts ± 0.08 v

Abbreviations:

WDS - Worldwide Diagnostic System.

DMM - Digital Multi Meter.

Note:

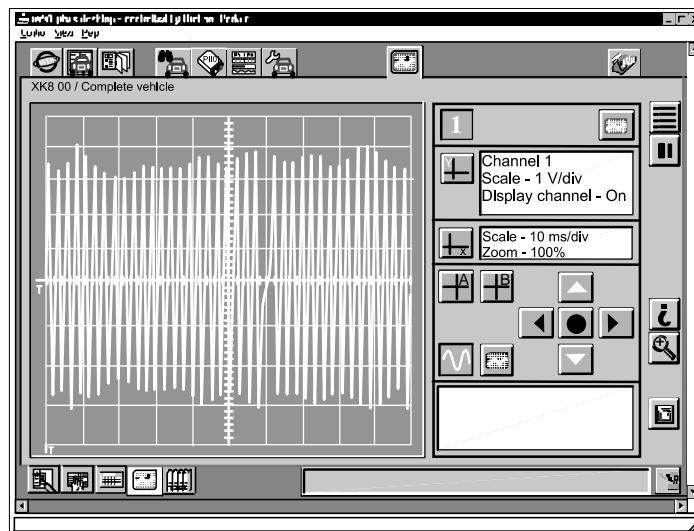
When testing the Engine Fuel Temperature sensor, if the vehicle is cold (approximately workshop temperature 20°C) it is possible to invoke a temperature change by rubbing the rail where the sensor is situated, this will increase the temperature and decrease the resistance.

WARNING: PARTS MAY BE HOT.

Additional Information P-12a

Oscilloscope set up.

- 1 Configuration sub tab.
Channel 1
Select: Red probe and black probe - Differential.
- 2 Channel calculation sub tab.
Select: Maximum voltage.
- 3 Main oscilloscope display sub tab.
Y-axis select: Scale set to 1 V/div.
X-axis select: Scale set to 10 ms/div.
- 4 Select: Full screen.



J.100.225

Fig. 4 Trace of the crankshaft sensor at idle

Generic Connector Inspection

Electrical failures can be caused by problems with the connectors and their pins. Below are a number of points that may aid in investigation.

Backed-out Pins

Inspection of the connector; look for signs that the pin has backed-out. If a seal is fitted to the pin it may be protruding further out the back of the connector. If a pin has backed-out of the cavity in the connector, there is a possibility that it has been forced out when the connector was mated. Make sure that the pins are in line when the two halves of the connector are mated.

Bent Pins

Disconnect the two halves of the connector and visually inspect the pins. If a pin is bent over there is a possibility of a short from pin to pin. Pins can easily be bent over when the connector is mated. Check to ensure the pins within the connector are not knocked out of alignment before the two halves of the connector are mated.

Water ingress/fluid ingress

Disconnect the connector and inspect for signs of water ingress, corrosion may have occurred. If water or any other fluid is visible this may cause a bad connection or even short circuit to the other pins within the connector. Examine the connector seals for any damage and to ensure that the seals are fitted correctly. Ensure that the two halves of the connector latch together securely.

Probing

Ensure when probing a pin that the correct probe is used and excessive force is not used as this may weaken the locating clip and allow the pin to work loose. Care must be taken when probing female pins as the pin can easily be splayed if probed with the incorrect adaptor or the wrong tool. This would then have the potential to cause a bad connection between the two mating halves. Always use the Worldwide Diagnostic System probe kit when probing pins within a connector. (Jaguar probe adaptor kit part number. 3548-1358-00.)

Insertion force

Insertion force is imperative to ensure a good connection is made between the two mating pins. If the female pin is splayed, the connection will be poor. To check the insertion force of the female connector, identify the correct male pin within WDS probe adaptor kit. Gently insert the adaptor into the female pin and then repeat with the other pins within the connector. If the pin in question feels loose in comparison replace both male and female pins.

Chafing

Inspect the harness when in close contact to other objects (i.e. sharp steel brackets). Engine vibration will cause the outer protection to quickly chafe through if the harness is not routed correctly. When performing a repair, ensure that heat resistant tape is used where relevant. Before repairing or replacing any harness, always refer to the electrical wiring harness repair guide, reference publication number JTP 586. When repairing a harness ensure the Jaguar harness repair kit is used. (Part number. 418-S065 and 418-S411.)

Always refer to Technical Hotline if problems are encountered.

Generic Harness Check

- When carrying out any of the tests in the generic harness check, it is imperative that any other sources that share the harness are taken into consideration when a measurement is taken.
- The X-TYPE electrical guide (publication part number – JJM 10 38 20/20) will show all other sources sharing that harness i.e. splices and sensors. This electrical guide is in JTIS.
- Always ensure the digital voltmeter is operating correctly before proceeding.
- Always use the WDS probe kit when probing pins within a connector.

Note: Do not insert the Digital Multi Meter (DMM) leads into the connector pins. (Probe adaptor kit part number: 3548-1358-00.)

Continuity test

Using a DMM, connect the DMM to the pins at both ends of the circuit that you are testing. Ensure you connect to the correct pin when a large number of pins are used in a connector. (Use WDS Probe adapter kit).

Set the DMM to the resistance test or the continuity beeper. The resistance should be between 0 – 10 ohms. If a high resistance or open circuit is found investigate harness for damage.

Short circuit high fault

The DMM can be connected to any ground source on the vehicle, but it is preferable to use the battery negative pole.

Set the DMM to Volts DC; connect the DMM red probe to the suspect pin of the circuit and the DMM black probe to the battery negative pole. No voltage should be seen, if 4 – 13 volts is seen suspect short circuit high and investigate harness for damage.

Always test the circuit with the ignition 'ON' and 'OFF' when trying to identify this fault condition.

Short circuit low fault (to ground)

The DMM can be connected to any ground source on the vehicle, but it is preferable to use the battery negative pole.

Set the DMM to the resistance test; connect the DMM to the suspect pin of the circuit and the battery negative pole, an infinity reading/open circuit (O/C) should be seen.

If a resistance is seen, suspect short circuit low and investigate harness for damage.

Always refer to the Technical Hotline if problems are encountered.