

2019 ATMC Conference

Writing Effective Test Questions

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Agenda

- I. Desired Results**
- II. Cognitive Skill Levels**
- III. Anatomy**
- IV. Question Styles**
- V. Statistics**
- VI. Development**

Desired Results

- **Assess candidate's:**
 - Knowledge
 - Understanding
 - Competence
- **Differentiate/Discriminate**
 - Knowledgeable
 - Less than Knowledgeable

Cognitive Skill Level

1. Knowledge

2. Comprehension

3. Application

4. Analysis

5. Synthesis

6. Evaluation

Simple memory

Understanding & Problem Solving

Cognitive Skill Level

LTFT stands for:

- (A) Low Tire Fault Tolerant.
- (B) Long Term Fuel Trim.
- (C) Left Turn Full Throttle.
- (D) Lock To Full Turn.

Cognitive Skill Levels

LTFT	+30%
STFT	- 3%

While test driving the vehicle at steady cruise speed with the feedback system in closed loop, the technician observes the fuel trim readings shown. Which of these could be the cause?

- (A) An intake vacuum leak
- (B) High fuel pressure
- (C) A contaminated MAF
- (D) A leaking fuel injector

Anatomy

- Stem
- Key
- Distractors

Stem

A compression test shows one cylinder is too low. A leakage test on that cylinder shows there is too much leakage. During the leakage test, air could be heard coming out of the tail pipe. Which of these could be the cause?

- (A) Broken piston rings
- (B) A leaking head gasket
- (C) A leaking exhaust gasket
- (D) An exhaust valve not seating

Stem

- Defines situation
- Gives all information needed
- Concise
- Asks just one question

Distractors

A compression test shows one cylinder is too low. A leakage test on that cylinder shows there is too much leakage. During the leakage test, air could be heard coming out of the tail pipe. Which of these could be the cause?

- (A) Broken piston rings**
- (B) A leaking head gasket**
- (C) A leaking exhaust gasket**
- (D) An exhaust valve not seating**

Distractors

- Absolutely incorrect
- Plausible
- Related in topic
- Similar in length

Key

A compression test shows that one cylinder is too low. A leakage test on that cylinder shows that there is too much leakage. During the leakage test, air could be heard coming out of the tail pipe. Which of these could be the cause?

- (A) Broken piston rings
- (B) A bad head gasket
- (C) A leaking exhaust gasket
- (D) An exhaust valve not seating**

Key

- Absolutely correct
- Only answer that is correct
- Similar in length

Question Styles

- Direct
- Completion
- Contrasting View
- Except

Direct

A vehicle bottoms out when driven over bumps.
Which of these could be the cause?

- (A) Weak springs
- (B) A loose lower ball joint
- (C) Weak shocks
- (D) A worn upper strut mount

Completion

One taillight bulb is dim and all of the other exterior lights operate correctly. The voltage drop across the dim taillight bulb's socket is 4.0 volts. Which of these could be the cause?

- (A) An open ground circuit for the dim taillight
- (B) An 8.0-volt drop on the ground circuit
- (C) An undercharging generator (alternator)
- (D) A 0.8-volt drop on the ground circuit

A/B

Technician A says an ohmmeter can be used to measure resistance in a relay coil when the relay is ON.

Technician B says proper polarity must be considered when connecting an ohmmeter across a solenoid coil.

Who is right?

- A) A only
- B) B only
- C) Both A and B
- D) Neither A nor B

A/B with Stem

A vehicle has repeated powertrain control module (PCM) failures.

Technician A says an open EVAP vent control solenoid winding could be the cause.

Technician B says a shorted EGR control solenoid winding could be the cause.

Who is right?

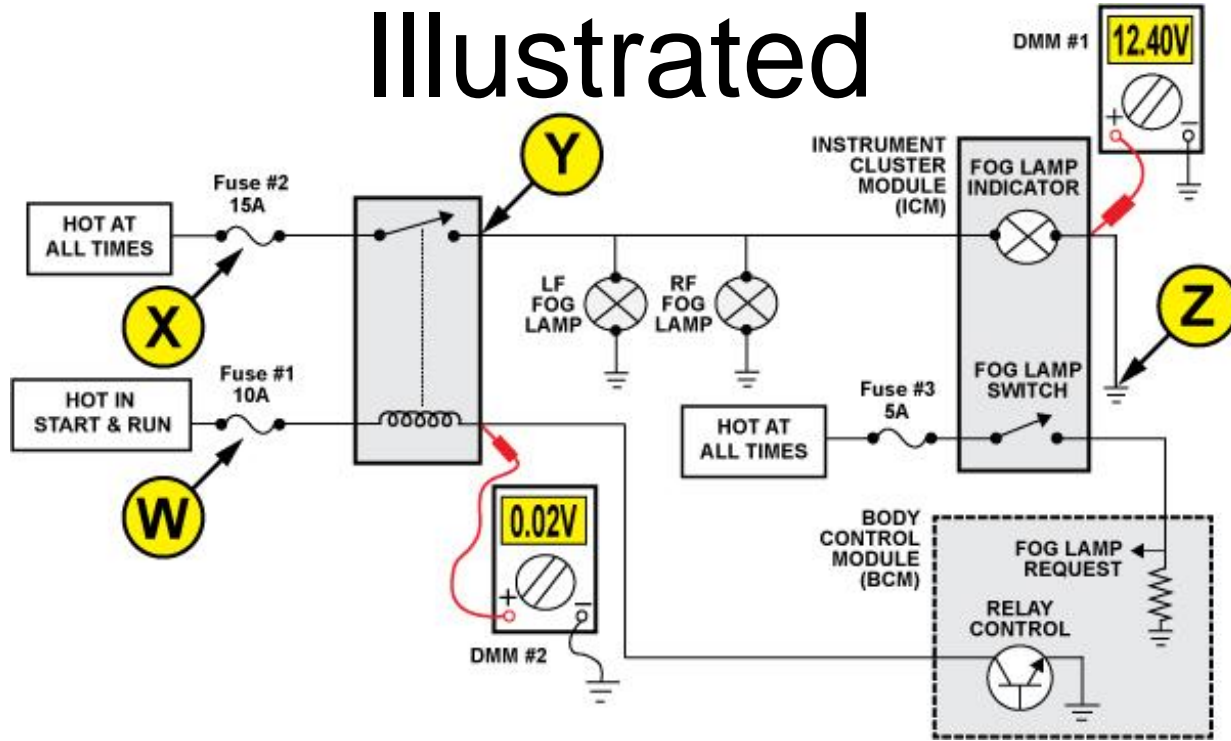
- (A) A only
- (B) B only
- (C) Both A and B
- (D) Neither A nor B

Except

During a power balance test, no change in rpm is observed when the technician turns off the #4 fuel injector. Any of these could be the cause EXCEPT:

- (A) an open injector coil.
- (B) a fouled spark plug.
- (C) low cylinder compression.
- (D) a worn rod bearing.

Illustrated



The fog lamps work normally, but the fog lamp indicator light does not illuminate when the fog lamp switch is closed on the system in the illustration shown. During diagnosis, the technician observes the DMM readings shown. Which of these could be the cause?

- A. A blown fuse at W
- B. A blown fuse at X
- C. High resistance at Y
- D. High resistance at Z

Statistics

- Psychometric data
- Four choices
 - A, B, C, & D
- Accurate analysis
 - Differentiation factor
 - Difficulty
- Consistent form difficulty

Development

1. Select the procedure, activity, or topic.
2. Select a related real-world problem.
 - Troubleshooting failure analysis charts
 - TSBs
 - Service information
 - Training/equipment manuals
 - Textbooks
 - **EXPERIENCE**

Development

3. Set the scene.
4. Provide the answer.
5. Develop plausible distractors.

• **Narrow it down**

- Address significant (nontrivial) knowledge
- Address higher-order thinking where possible (application, analysis)
- Choose topic from test specifications
- Use task list if available



- **Choose an item type**

- Multiple choice
- Fill in the blank
- Matching
- Essay
- Advanced formats

• **Focus the stem**

- Provide all information needed to answer.
- Avoid unnecessary information in stem.
- Be written concisely.
- Ask just one question.
- Clear, simple language.

• **Develop plausible distractors**

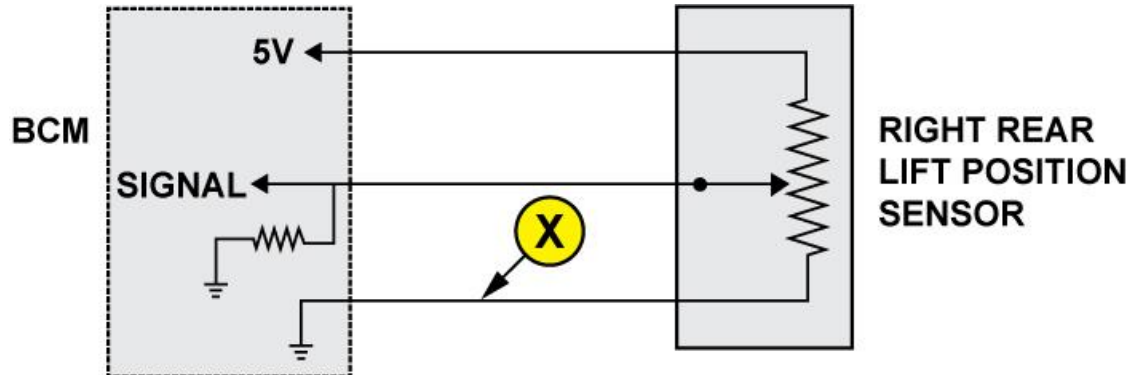
- Balanced in length/nature
- Do not overlap (ranges)
- Not use “all/none of the above”
- Avoid humorous, odd, bogus or silly options

Group Exercises

Examples of questions written in ASE workshops will demonstrate some common problems. Seminar participants will be shown the example and then offered “fixed” versions for consideration.

After a problem question, another with the same problem will be offered so participants may attempt their own fix.

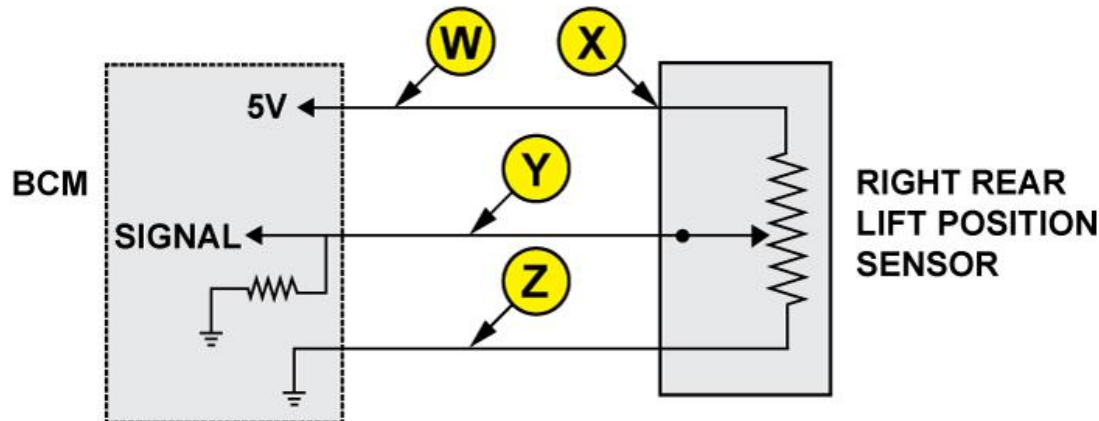
Inverted



The electronic suspension control system sensor shown uses a 5 volt reference. What sensor value will display if there is an open at X?

- A) 0 volts
- B) 2.5 volts
- C) 5 volts
- D) 12 volts

Inverted (Fixed)



During analysis of a “Right Rear Lift Position Sensor Circuit” DTC, the technician observes a sensor voltage reading of 5 volts on the scan tool. Which of these could be the cause?

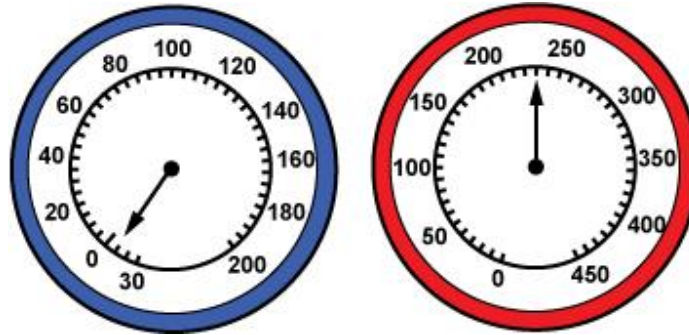
- A) A short-to-ground at W
- B) An open circuit at X
- C) A short-to-ground at Y
- D) An open circuit at Z

Inverted

With an A/C system in operation, which of the following gauge readings indicate the expansion valve is stuck completely closed?

- A) Low side gauge low / high side gauge high
- B) Low side gauge high / high side gauge low
- C) Low side gauge in a vacuum / high side gauge normal to high
- D) Low side and high side gauges both read approximately the same

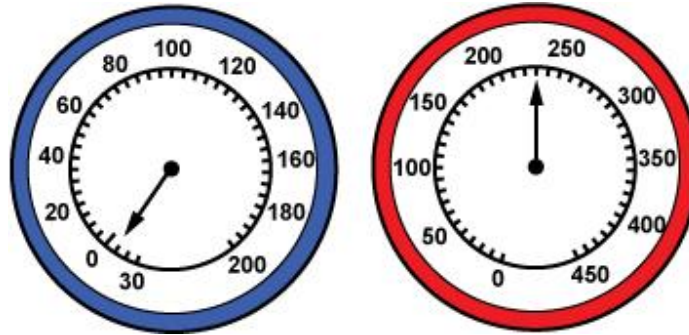
Inverted Repair Exercise



Which of these could be the cause?

- A)
- B)
- C)
- D) A stuck-closed expansion valve

Inverted Repair Exercise



During an A/C performance test with the engine at idle and the A/C system set to MAX COOL, the technician observes the A/C manifold gauge readings shown. Which of these could be the cause?

- A) A low refrigerant charge
- B) A restriction in the high side line
- C) Restricted air flow across the condenser
- D) A stuck-closed expansion valve

A/B Argument

The shop foreman says when performing a wheel alignment, the toe should be set last.

Technician A says the shop foreman is incorrect because there is no set order for adjusting alignment angles.

Technician B says the shop foreman is correct because toe is affected by caster and camber, so it should be set last.

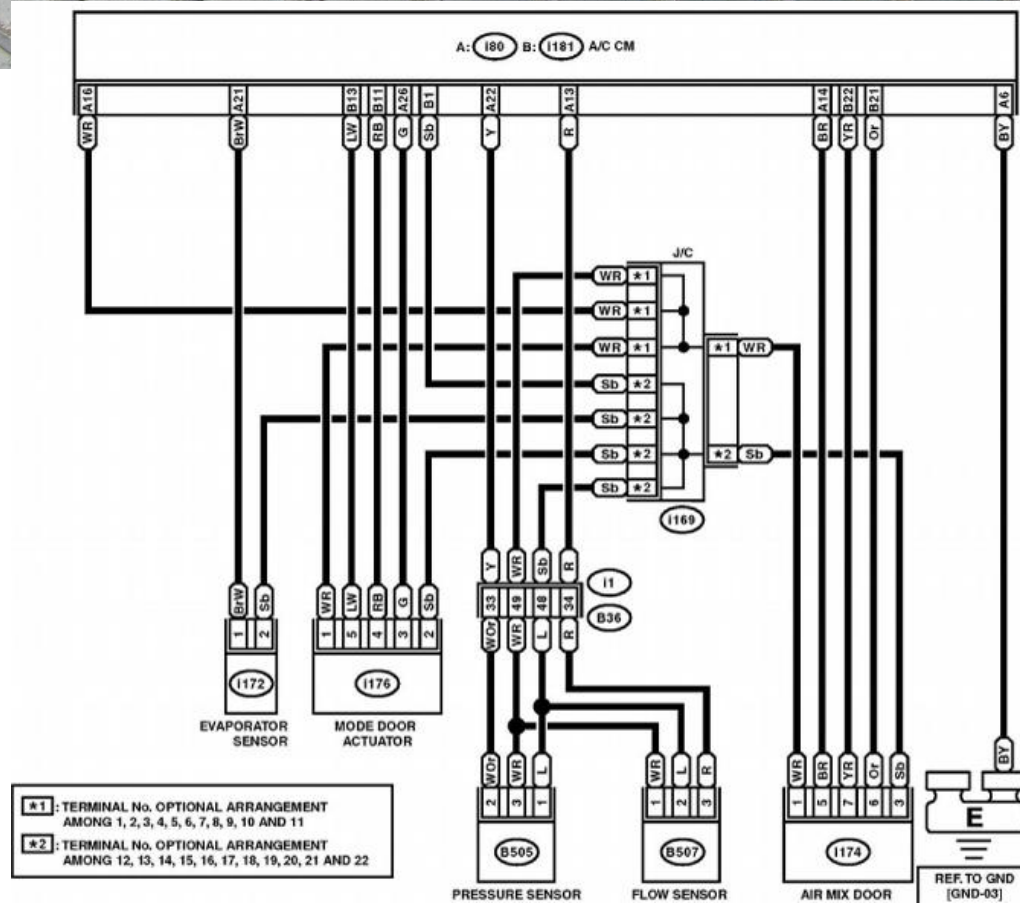
Who is right?

- (A) A only
- (B) B only
- (C) Both A and B
- (D) Neither A nor B

A/B Argument (Fixed)

A four wheel alignment is being performed. Which of these alignment angles should be set last?

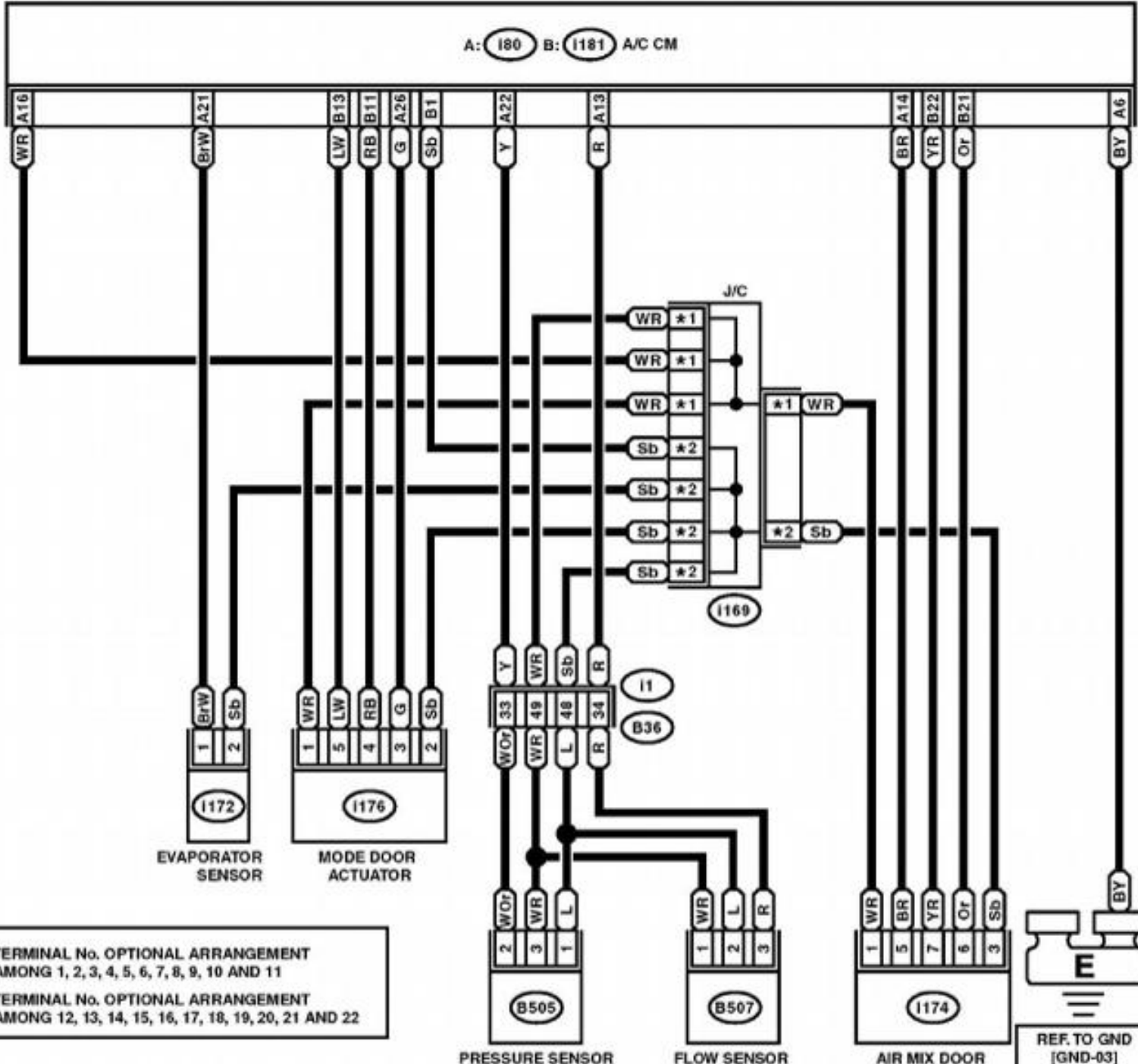
- (A) Front caster
- (B) Front camber
- (C) Front toe
- (D) Rear toe



Based on the wiring diagram provided.

Technician A says the mode door actuator and the flow sensor share common circuits.

Technician B says the evaporator sensor and the mix door actuator do not share common circuits.



A: (180) B: (1181) A/C CM

EVAPORATOR SENSOR

MODE DOOR ACTUATOR

PRESSURE SENSOR

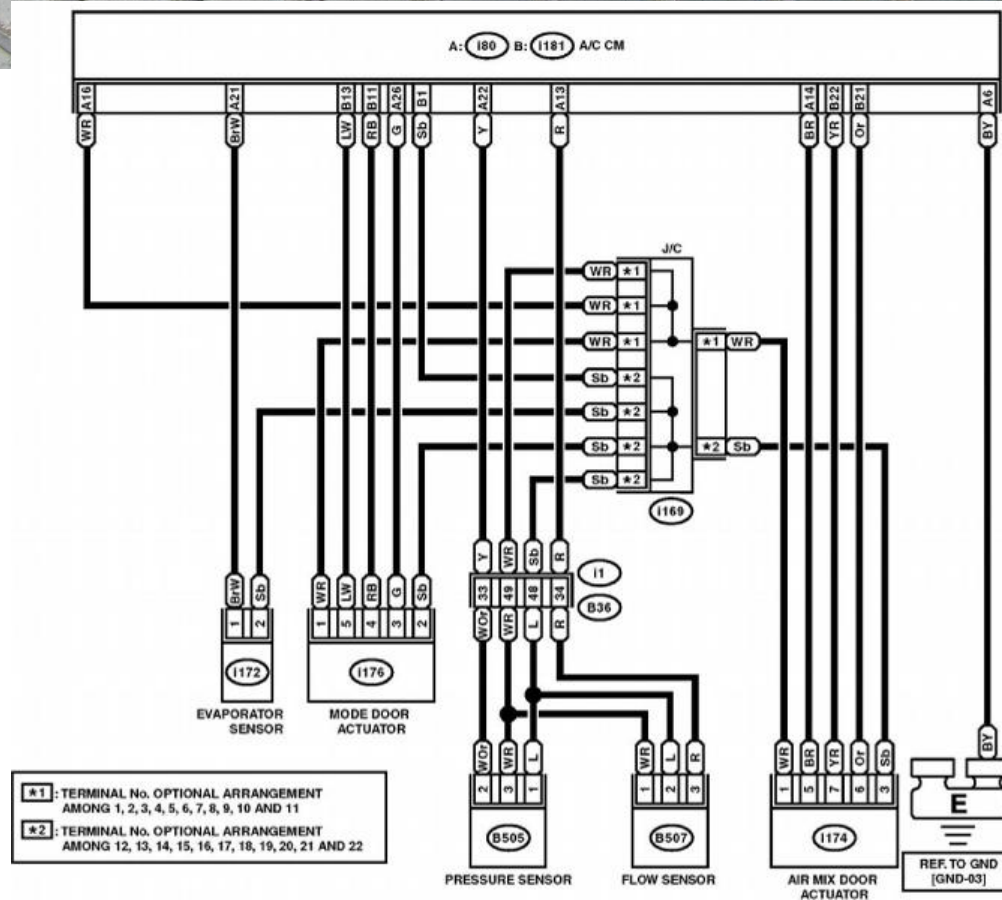
FLOW SENSOR

AIR MIX DOOR

REF. TO GND [GND-03]

- *1** : TERMINAL No. OPTIONAL ARRANGEMENT AMONG 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 AND 11
- *2** : TERMINAL No. OPTIONAL ARRANGEMENT AMONG 12, 13, 14, 15, 16, 17, 18, 19, 20, 21 AND 22

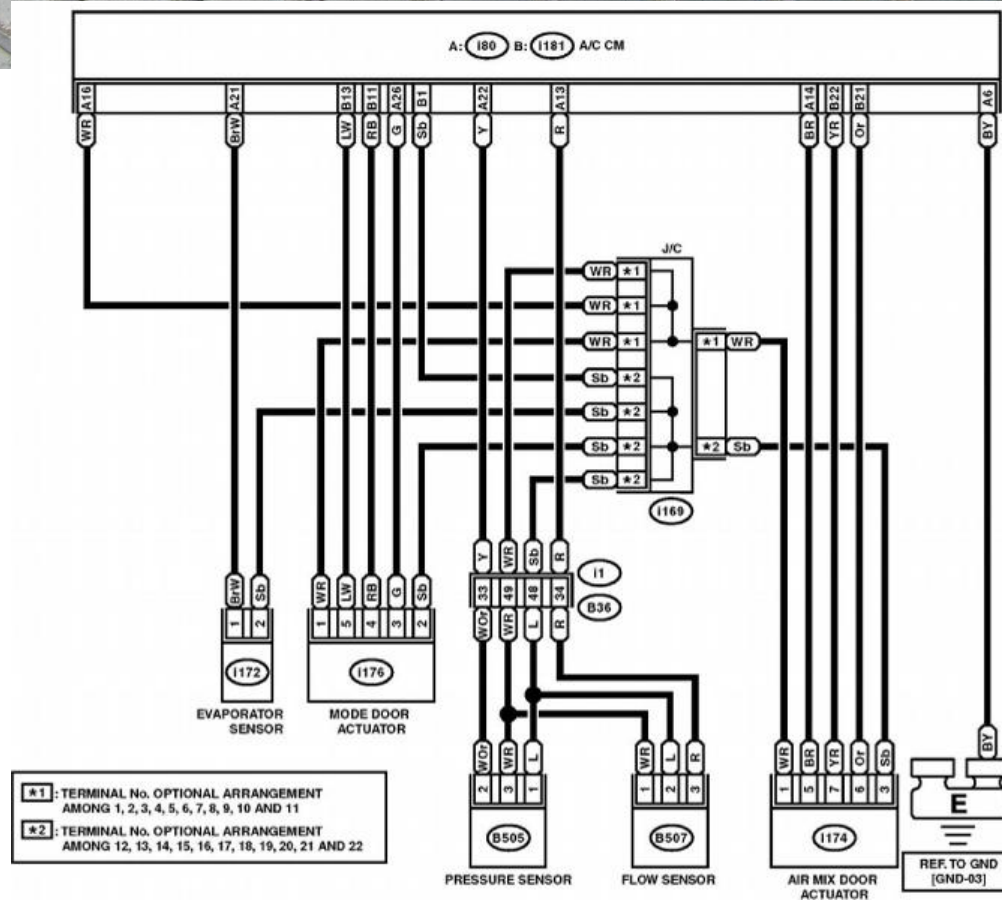
A/B Argument Exercise



A vehicle with the wiring schematic shown is being analyzed.

Technician A says the flow sensor and the mode door actuator both have three wire connectors.

Technician B says the flow sensor and the pressure sensor both have five wire connectors.



In the wiring schematic shown, which of these has a 4-way connection?

- A) The mode door actuator
- B) The flow sensor
- C) The J/C connector
- D) The B36 connector

Too Much Detail

The technician is investigating a complaint of an intermittent clicking noise from the dash of an automatic climate control system. The system uses feedback potentiometers to track position of the air door actuators. He notices he can duplicate the problem when the system is set to 70° F. If the temperature is set to any other position, the clicking goes away. This problem is most likely caused by:

- A) A worn spot in the air mix door potentiometer
- B) A disconnected recirculation door actuator
- C) An open circuit in the air mix door potentiometer signal circuit
- D) A shorted air mix door reference circuit

Too Much Detail (Fixed)

A vehicle with an automatic climate control (ATC) system has an intermittent clicking noise from the dash. The problem can be duplicated when the system is set to 70° F. If the temperature is set to any other position, the clicking goes away. This could be caused by:

- A) a worn spot in the air mix door potentiometer.
- B) a disconnected recirculation door actuator.
- C) an open circuit in the air mix door potentiometer signal circuit.
- D) a shorted air mix door reference circuit.

Too Much Detail

Technician A says if an outside air/recirculation door is stuck in the outside air position, interior fogging is likely to occur.

Technician B says if an outside air/recirculation door is stuck in the recirculation position, interior fogging is likely to occur.

Too Much Detail Exercise

Too Much Detail Exercise

The windows are fogging inside a vehicle.

Technician A says a sticking mode door could be the cause.

Technician B says a sticking recirculation door could be the cause.

Format

A bus is brought to the shop with a complaint of a transmission fluid life indicator on. This indicates:

- A) The transmission fluid level is low.
- B) The transmission fluid burned.
- C) The transmission fluid is due for replacement.
- D) The transmission fluid has been contaminated.

Format (Fixed)

A bus is brought to the shop with a complaint of a transmission fluid life indicator on. This indicates the transmission fluid:

- A) level is low.
- B) is burned.
- C) is due for replacement.
- D) has been contaminated.

Format Exercise - Direct Question

Format Exercise - Direct Question

The transmission fluid life indicator is illuminated on a school bus. Which of these could be the cause?

- A) A low fluid level
- B) Burned fluid
- C) Time for fluid replacement
- D) Contaminated fluid

All of the above - Not Key

After the front wheel bearings on a truck have been inspected or replaced, and the specification is 0.001" and 0.005", what other tooling is needed to achieve this setting?

- A) Torque wrench
- B) Shims
- C) Dial indicator
- D) All of the above

All of the above - Not Key

After the front wheel bearings on a truck have been replaced, which of these tools is needed to achieve the correct endplay specification of 0.001” to 0.005”?

- A) A torque wrench
- B) Shims
- C) A dial indicator
- D) A feeler gauge

Note: Example is still not finished. A torque wrench may be a correct answer and a shim is not a tool.

All of the above - Key

Before replacing the brake pads on a vehicle with an electronic parking brake, what service may need to be performed?

- A) Install a battery booster pack on the battery.
- B) Use a scanner or similar tool to retract the electric motor.
- C) Push the pistons back into the caliper.
- D) All of the above

All of the above converts to Except

Before replacing the brake pads on a vehicle with an electronic parking brake, any of these may need to be performed EXCEPT:

- A) installing a battery booster pack on the battery.
- B) using a scan tool to retract the electric motor.
- C) pushing the pistons back into the caliper.
- D) setting the parking brake to the ON position.

Note: Example replaced “all of the above” with an answer option which cannot cause the problem described in the stem.

All of the above - Key

A red brake warning light is illuminated. This could be caused by:

- A) Low fluid level in the master cylinder.
- B) A leak in a brake line.
- C) A grounded differential pressure switch.
- D) All of the above.

All of the above converts to Except

The red brake warning light is illuminated on the instrument cluster. This could be caused by any of these EXCEPT:

- A) Low fluid level in the master cylinder.
- B) A leak in a brake line.
- C) A grounded differential pressure switch.
- D)

All of the above converts to Except

The red brake warning light is illuminated on the instrument cluster. This could be caused by any of these EXCEPT:

- A) low fluid level in the master cylinder.
- B) a leak in a brake line.
- C) a grounded differential pressure switch.
- D) an overfilled master cylinder fluid level.

Note: Example replaced “all of the above” with an answer option which cannot cause the problem described in the stem.

It's in the details...

A customer complains of slow warm up and insufficient heat in cool weather. A likely cause would be:

- A) A stuck open thermostat.
- B) A low engine coolant level.
- C) A failed engine coolant temperature switch.
- D) A blocked heater hose.

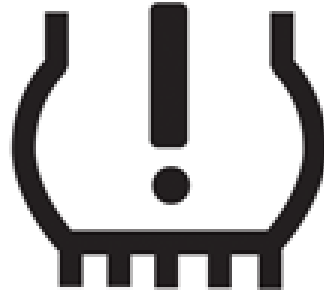
Note: Use of “likely,” “most likely,” and “least likely” imply more than one correct answer is listed. If true, question is unfair.

It's in the details... (Focused)

A customer states the passenger compartment is slow to warm up and there is a lack of warm air from the dash vents in cool weather. Which of these could be the cause?

- A) A stuck-open thermostat
- B) A low engine coolant level
- C) A failed engine coolant temperature switch
- D) A blocked heater hose

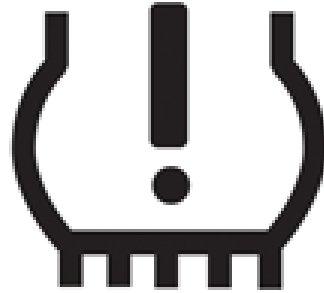
Gender Neutral



A customer states the lamp shown in the illustration is illuminated on his dash. The technician should first:

- A) Connect a scan tool to the DLC
- B) Rotate the tires
- C) Check the tire pressures
- D) Check for a blown fuse

Gender Neutral



The indicator lamp shown in the illustration is illuminated on the dash. The technician should first:

- A) Connect a scan tool to the DLC
- B) Rotate the tires
- C) Check the tire pressures
- D) Check for a blown fuse

4 Choice version of A/B?

A four-wheel drive truck with a lift kit and oversized tires comes in to the shop for an alignment.

- A) Mechanic A says, “Do a four wheel alignment.”
- B) Mechanic B says, “Set it to factory specs.”
- C) Mechanic C says, “Set the toe and go.”
- D) The shop owner says, “Get that thing out of my shop!”

Note: Example is humorous take on ASE question styles as presented by ASE workshop participant.

Review

- **All test questions should:**
 - Avoid using all encompassing words such as “always” or “never”.
 - Use gender-neutral language and avoid race/gender bias or offensiveness.
 - Avoid negatively worded questions when possible. Especially true in CV questions.
 - Avoid double negatives in stem & options.

Review

- **All test questions should:**
 - When appropriate, address a problem or procedure, not just theory.
 - Avoid addressing more than a single topic in the same question (apples and oranges).
 - Use standard abbreviations, no jargon or slang.

Review

- **All test questions should:**
 - Be applicable to most technicians & cars.
 - Address common diagnosis & repair experiences.
 - Relate to “need-to-know” knowledge or skill, vs. “nice-to-know.”

Thank you!

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FIVE STEPS TO DEVELOPING ANY TEST QUESTION

Step 1 - Select the diagnostic procedure or activity to be addressed in the question.

Step 2 - Identify the related task.

Step 3 - Provide details of the diagnostic procedure or activity (e.g. A technician is checking...or... A rattling sound is heard...).

Step 4 - Provide the answer.

Step 5 - Develop plausible distractors.*

* **Note:** The quality of the distractors has been called the most critical factor in a good test question. A good way to create them is to *think of typical or easily-made errors of technicians.*

DEVELOPING A DIAGNOSTIC QUESTION

Sentence #1 – State a problem with the vehicle.

Sentences # 2, 3, etc – Provide test results for the diagnostic routine.

Last Sentence – "Which of these could be the cause?" (WOTCBTC)

Finally – Provide the key and plausible distractors, and remember to identify the related task from the task list.

RESOURCES FOR DEVELOPING QUESTIONS

1. Job experiences
2. Troubleshooting and failure analysis charts
3. Technical bulletins
4. Training manuals, service manuals, and textbooks
5. Diagnostic equipment manuals
6. Provided Test Task List

FINAL CHECKLIST

Questions should:

- be related to a specific task on the task list.
- address a problem or procedure, not theory.
- be applicable to most technicians and cars.
- address common diagnosis and repair experiences.
- relate to need-to-know knowledge or skill, vs. nice-to-know.
- have only one right answer.
- have options that are similar in length and parallel in wording.
- have plausible distractors.
- be written concisely. Minimize the amount of reading.
- use simple, easily-understood words ("words" not "vocabulary").
- include the central idea in the stem, not in the options.

Pitfalls to avoid:

- Technician A contradicts Technician B
- Two technicians are discussing...
- Technician B builds on Technician A's statement
- Apples and Oranges (two different topics in the same question)
- Use of negatives such as "not" in the stem or the options
- Overlap in meaning of the options
- Overlap in numerical values of the options ("0 to 10" and "under 100")
- Long complex sentences and big words
- Internal clues to the right answer, such as:
 - pairs or triplets of options
 - absurd or ridiculous options
 - one answer longer than the others
 - the use of absolutes like "completely"
 - one option having better grammatical "flow" with the stem
- "Double-barreled" options (two elements or concepts in the same option, such as "leads to overheating and carbon build-up")
- Too many EXCEPT questions
- Too many questions with the key located at B or C. Try to write questions with the keys equally in all 4 positions
- Inverted questions: "An engine has a burned valve. What engine performance concern would this cause?"
- None of the above as an answer
- All of the above as an answer
- Bias or offensiveness by age, gender, nationality, or ethnicity