Fuel System Safety – **Storyboard & Specification**

Automotive: Delivery 1
Sim 5: Fuel System Safety
Designer: Elena Tilley
Teleporting?: Yes, but not self-directed
Uberskills / Subskills and Medal Scoring: Link
References:

Fuel Pressure

- https://www.youtube.com/watch?v=qdnCEqMYwes
- https://www.youtube.com/watch?v=9bJ7odJLh-4
- https://www.youtube.com/watch?v=kSBAHD11Qe4
- https://www.youtube.com/watch?v=OLlIMGUGwdI
- https://www.youtube.com/watch?v=MS0fU_OOmVQ

Measure Fuel Volume

- https://www.youtube.com/watch?v=IB5Jg6FzLac

Fuel Filter

- https://www.youtube.com/watch?v=sDtQKNTz0QY
- https://www.youtube.com/watch?v=Gd74-EAiKfo

Tutorial

#1 Intro

[Garage environment][Garage door is open. Trainee is standing outside the car, facing the hood. Hood is closed.]
Welcome to the garage! Today we'll be exploring how to test a vehicle’s fuel system. Testing is done for diagnostic reasons like trouble starting the engine or power issues. We'll cover the three part process of how to: test the fuel pressure, measure the fuel volume, and replace a fuel filter. Let’s get started!

#2 PPE & Emergency Materials

[Trainee is facing the hood. To their left is a rolling cart. The cart is parallel to the vehicle. On top of the workbench is empty. Out of view is a fire extinguisher mounted in one corner, an eye wash station in the opposite corner, and a fire blanket.]

There are several types of PPE needed while working on a vehicle's fuel system.
I’ll give them to you as you need them, on this cart beside you. Let’s start by putting on our PPE.

[safety goggles appear on cart]

oil_2_these_are_your_safety_goggles.wav These are your safety goggles. They protect your eyes from any debris. If you normally wear glasses, you can ask your supervisor about how to get prescription safety goggles.

pedestal_4_use_the_grip.wav Use the grip button on your controller to pick up the safety goggles, then bring them towards your head to put them on.

[trainee grabs goggles]

[if trainee doesn’t grab goggles after 7 seconds] pedestal_4_pick_them_up.wav Use the grip button on your controller to pick them up.

[Trainee puts on goggles][SFX confirmation][haptic feedback]

pedestal_4_there_you_go.wav There you go. Now your eyes are protected.

[If trainee doesn't put on goggles every 7 seconds] pedestal_4_you_have_the.wav You have the goggles. Now all you have to do is bring them towards your headset to put them on.

[chemical gloves appear on cart]
It's a good idea to wear chemical gloves when you're working. These gloves protect your hands from chemicals.
battery_12_use_the_grip.wav Use the grip button your controller to pick up and put on the gloves.

[trainee picks up glove]

hack_53_great_now_put.wav Great! Now put it on your other hand.
[Trainee puts on glove][SFX confirmation]
hack_54_there_you_go.wav There you go. Now do the same for the other hand.
[Trainee puts on glove][SFX confirmation]
hack_55_well_done_now.wav Well done. Now your hands are protected.
[if trainee doesn't pick up or put a glove after 7 seconds]
Battery_12_use_the_grip.wav Use the grip button on your controller to pick up and put on the gloves.

OK! Now that we've got our PPE on, we need to identify the location of some emergency equipment. Gasoline is *extremely* flammable and you need to be ready to act in case of emergency. You must know the location of the fire extinguisher, fire blanket, and eye wash station.

Take a look around the room and identify the fire extinguisher. Use your controller and press the trigger to point to the fire extinguisher.
[ray traces appear from controllers]

[fire extinguisher is in the corner]
[trainee looks around the room and points to the fire extinguisher][sfx confirmation]
[if trainee doesn't look around the room and points to the fire extinguisher after 7 seconds] Take a look around the room and identify the fire extinguisher. Use your controller and press the trigger to point to the fire extinguisher.

Great! The fire blanket is usually kept by the fire extinguisher. Use your controller to point to the fire blanket.

[trainee looks around the room and identifies the fire blanket on a table next to the fire extinguisher][sfx confirmation]
[if trainee doesn't look around the room and identifies the fire blanket after 7 seconds]Take a look around the room and identify the fire blanket.

Let's find the last item!
See if you can spot the eye wash station. Sometimes the eye wash station could include a shower head, but the one you're looking for doesn't. To make it easier to find in the garage, I've highlighted it. Use your controller to point to the eye wash station.

[eye wash station is to in the corner opposite corner of fire extinguisher]
[eye wash station highlights until trainee points at it]
[trainee looks around the room and points to the eye wash station]

[ray trace disappears] [sfx confirmation]
[if trainee doesn't look around the room and points to the eye wash station] See if you can spot the eye wash station. Use the trigger on your controller, to point to the eye wash station.

Nicely done!
We're now ready to complete three tests to assess the fuel system. Let's get started!

#3 Fuel Pump Test -- Part 1: Remove Relay and Fuse

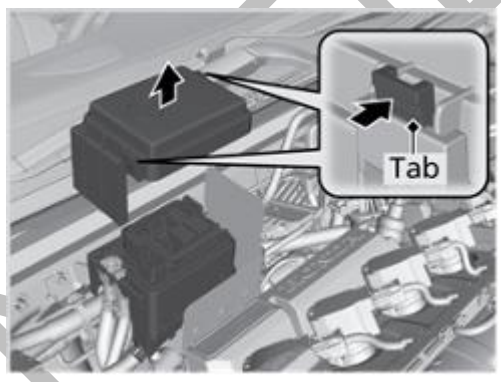
We're going to test the fuel pump. A fuel pump moves gasoline from the vehicle's fuel tank to the engine and maintains pressure in the fuel system.

We need to disable the fuel system by removing power from the fuel pump. I've placed it in park and turned off the engine. Let's take a look under the hood.
[highlight hood]
[trainee touches hood]

airbag_3_use_trigger_open_hood.wav Use the trigger on your controller to open the hood.
[Trainee touches hood][sfx confirmation]
[Hood raises up. Engine, battery, fuse box, etc. are in view]
[if trainee doesn't touch the hood every 7 seconds] Use the trigger button on your controller to open the hood.

The manufacturer's manual indicates the fuse box is here. [highlight fuse box]

We need to take off the fuse box cover to find out where the relay and fuel pressure fuse are located.



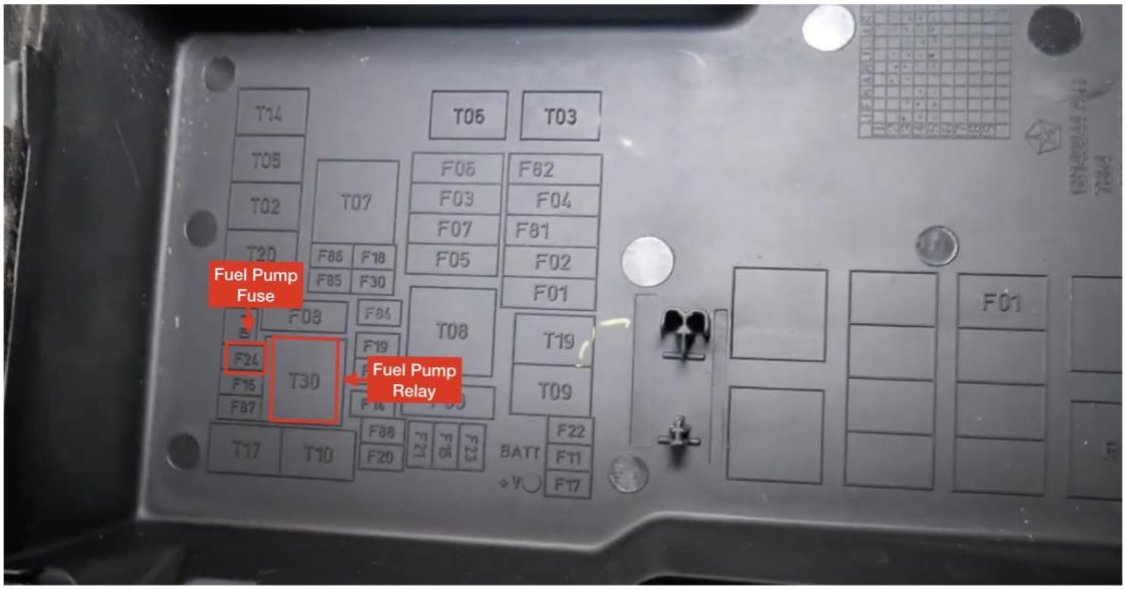
airbag_3_use_your_controller_remove_cover.wav Use your controller to touch the right tab on the fuse box to remove the cover.
[highlight right tab]
[trainee touches right tab on fuse box] [SFX confirmation]
[fuse box cover slides up (similar to a removable lid on a shoebox) and flips over so the inside of the cover is visible]
[if trainee doesn't touch a tab every 7 seconds]
airbag_3_use_your_controller_remove_cover.wav Use your controller to touch the right tab on the fuse box to remove the cover.

airbag_3_underneath_the_fuse_box.wav Underneath the fuse box is a diagram called the fuse chart [highlight the fuse chart]

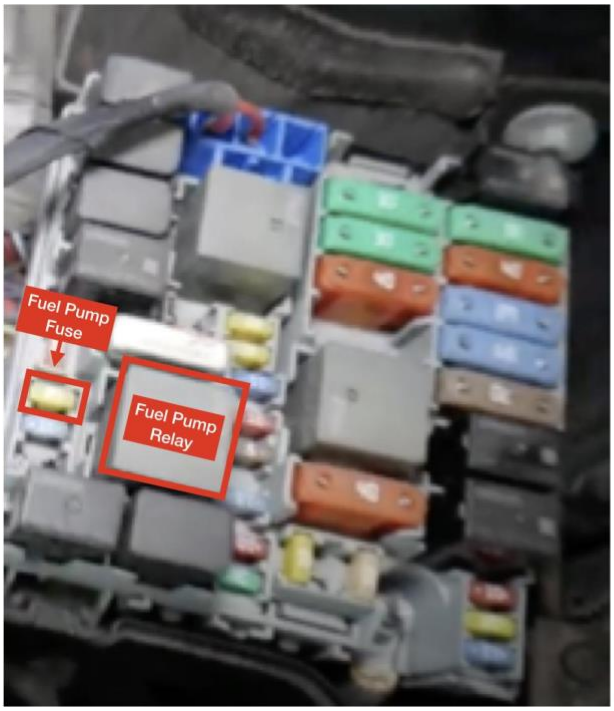
Each fuse and relay has a number that corresponds to its location in the fuse box. Be sure to refer to the manufacturer manual for additional information.
[highlight the fuse number]

You'll need to remove one fuel pressure fuse and one relay.

The fuse that needs to be removed is here. It's labeled F24.
[highlight fuse in fuse diagram].
The relay called T30 is here.
[highlight relay in fuse box]



Let's remove the relay and fuel fuse from the fuse box one at a time. Use the grip button on your controller to remove the relay.



[highlight relay in fuse box]
[trainee removes relay] [sfx confirmation][haptic feedback]
Great! Place the relay on the cart to your left.
[trainee places relay on cart] [sfx confirmation]

I've set a fuse puller on the cart for you to remove the fuse.
[if trainee doesn't remove relay every 7 seconds] Use the grip button on your controller to remove the relay.
[if trainee drops the relay, have the fuse puller reappear on the cart] Looks like you dropped the relay! I've put it back in the cart for you.

airbag_3_use_grip_fuse_puller.wav Use the grip button on your controller to pick up the fuse puller.
[trainee picks up fuse puller]

[if trainee doesn't pick up the fuse puller after 7 seconds] Use the grip button on your controller to pick up the fuse puller.

Use the trigger on your controller to remove the fuel pump fuse and place it on the cart next to you.
[highlight fuel fuse in fuse box]
[trainee removes fuel fuse][sfx confirmation][haptic feedback]
[if trainee doesn't remove fuse every 7 seconds] Use the trigger on your controller to remove the fuel pump fuse and place it on the cart next to you.

airbag_3_that's_it_now.wav That's it! Now, place the fuse on the cart to your left.
[Trainee places fuse on cart] [sfx confirmation]
[if trainee doesn't place fuse on cart every 7 seconds]
airbag_3_place_the_fuse_cart.wav Place the fuse on the cart to your left.
[if trainee drops the fuse puller, have the fuse puller reappear on the cart]
airbag_3_looks_like_dropped_fuse.wav Looks like you dropped the fuse puller! I've put it back on the cart for you.
[if trainee doesnt place fuse on cart] airbag_3_place_the_fuse_trigger.wav Place the fuse on the cart by releasing the trigger on your controller.

Great! Let's move to part two!

#4 Fuel Pump Test -- Part 2: Measure Pressure in Fuel Rail

Nice! Now that the fuse and relay are removed, the power is cut to the fuel pump and no additional pressure can be built in the system. But there is still some remaining pressure. We can remove it by turning on the engine. Remember the engine will not run without the fuel pump maintaining fuel pressure in the fuel system.

When the car is started, the residual pressure will flow through the injectors until the pressure is gone. We can verify there is no more pressure, because the car will start, then die.

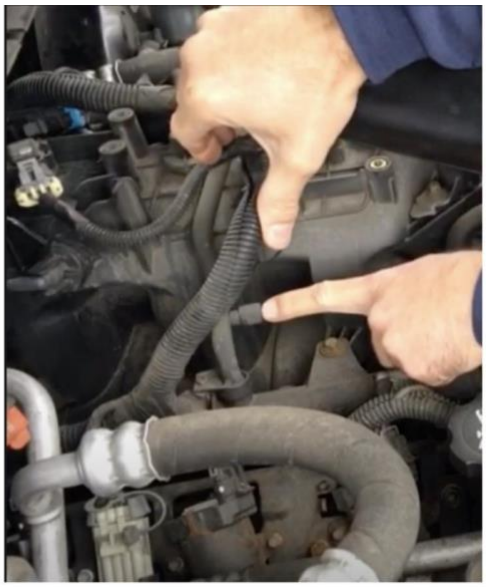
We'll start the engine twice. I will do it for you the first time.

[sfx car starting turning on, then engine turning over for two seconds]
[car dies]

[red button appears on cart]
Now it's your turn. Use your controller to touch the red button in front of you to turn on the car.
[Trainee presses red button on cart][sfx confirmation]
[if trainee doesn't press the red button every 7 seconds] Use your controller to touch the red button in front of you to turn on the car.

[sfx car starting turning on, then engine turning over for two seconds]
[car dies]

Next, we need to access the Schrader valve to install the fuel pressure gauge.
[highlight Schrader valve]
To do this, the cap on the Schrader valve needs to be unscrewed.
[highlight cap on Schrader valve]



Twist once to loosen the cap on the Schrader valve.
[highlight cap on Schrader valve][counterclockwise hint UI appears (this appears as curved arrows)]
[Trainee twists cap] [sfx confirmation][counterclockwise hint UI disappears]

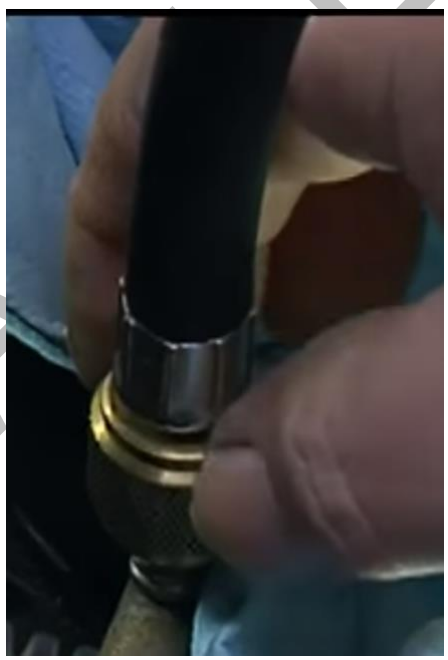
[if trainee doesn't twist cap every 7 seconds] Twist once to loosen the cap.
righty_tighty_lefty_loosey.wav Try the other direction. Remember, righty tighty, lefty loosey.

That's it! Now, use the grip on your controller to place the cap on the cart.
[Trainee places fuse on cart][sfx confirmation]
[if trainee doesn't press place cap on cart every 7 seconds] Use the grip on your controller to place it on the cart to your left.

hack_5_great.wav Great!
On your cart is a tool called a pressure gauge.
[highlight pressure gauge on cart]
We need this to measure the pressure inside of the fuel system.

On the cart, grab the valve at the end of the pressure gauge.
[trainee picks up valve on cart][valve highlights on cart] [sfx confirmation]
[ghost valve above Schrader valve appears]
Place the pressure gauge valve on the Schrader valve.
[trainee aligns pressure gauge valve with ghost valve above Schrader valve] [sfx confirmation]
[if trainee doesn't aligns pressure gauge valve with ghost valve above Schrader valve] Place the pressure gauge valve on the Schrader valve.
[clockwise hint UI appears (this appears as curved arrows) (hint UI remains until trainee compleetes action)]
Twist the valve clockwise to attach it to the Schrader valve.
[trainee twists counterclockwise one time][sfx confirmation]
[if trainee doesn't twists counterclockwise one time] Twist the valve clockwise to attach it to the Schrader valve.

~~Let's attach the gauge by screwing it onto the Schrader valve. Use the grip on your controller to pick up the pressure gauge. Then twist once to attach the gauge to the valve. Make sure to tighten it all the way to prevent any leaks or pressure escaping!~~
~~[clockwise hint UI appears (this appears as curved arrows)]~~
~~[trainee picks up pressure gauge]~~ ~~[sfx confirmation]~~~~[clockwise hint UI disappears]~~
~~[if trainee doesn't pick up pressure gauge every 7 seconds]~~ ~~Use the grip on your controller to pick up the pressure gauge. Then twist clockwise to attach the gauge to the valve.~~
~~[trainee twists clockwise]~~
~~[if trainee doesn't trainee twists counterclockwise three times]~~ ~~Twist clockwise to attach the gauge to the valve.~~
~~[if trainee trainee twists clockwise]~~ ~~Whoops! Turn the other direction!~~ ~~[clockwise hint UI appears (this appears as curved arrows)]~~



Nicely done! We're making great progress! Before we prime the fuel pump, the relay and fuel fuse need to be reinstalled in the fuse box.
[highlight fuse box]

I'll do it for you.
[animate the relay and fuse going back into fuse box]

Now it’s time to prime the fuel pump and verify there are no leaks at the fuel gauge. We can do this by turning the engine on. We need to check that the Schrader valve is not leaking fuel once the vehicle is turned on.

[red button appears on cart]
Use your controller to press the button on your cart to turn on the car.
[trainee presses button to turn on engine]
[if trainee doesn’t button to turn on engine every 7 seconds] Press the button on your car to turn on the car.
[sfx starting engine]
[sfx car idle]

With the engine on, we can see what the pressure gauge reads. Typically, you’ll see a reading from 30-60 psi, or *pounds per square inch*. But refer to the manufacturer’s manual for a vehicle’s normal psi range. We're looking for a reading between 40-50 psi.

[pressure gauge needle rotates to 45 psi]

Looks like the pressure gauge is reading 45 psi and there is no leaking fuel from the Schader valve. Perfect! This indicates the fuel pump is functioning. If the reading doesn't meet specifications the vehicle would require service to diagnose the issue. Great work!

#5 Measure Fuel Volume

We've just walked through how to test if the fuel pump is maintaining enough pressure. We can now move on to measuring the fuel volume. In other words, we'll check the amount of fuel moving through the fuel pump.

You’ll need a measuring tool called a graduated cylinder. I've placed one on your cart.
[graduated cylinder appears on cart]
Grab the graduated cylinder and place it next to the fuel pump.
[trainee grabs graduated cylinder and places it next to the fuel pump][sfx confirmation]
[if trainee doenst grab graduated cylinder and places it next to the fuel pump] Grab the graduated cylinder and place it next to the fuel pump.

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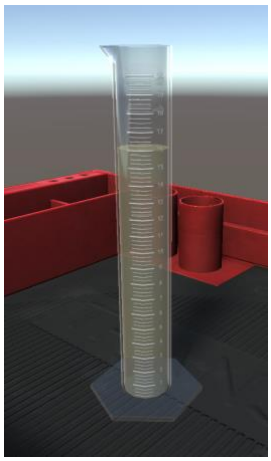

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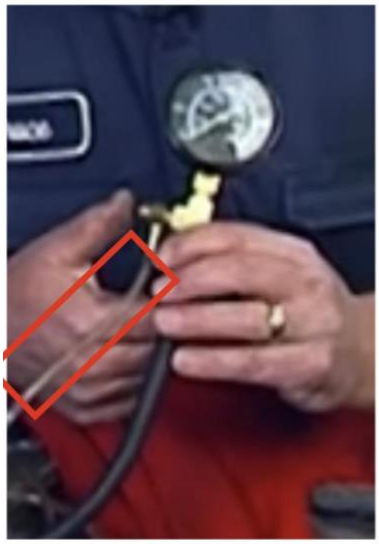
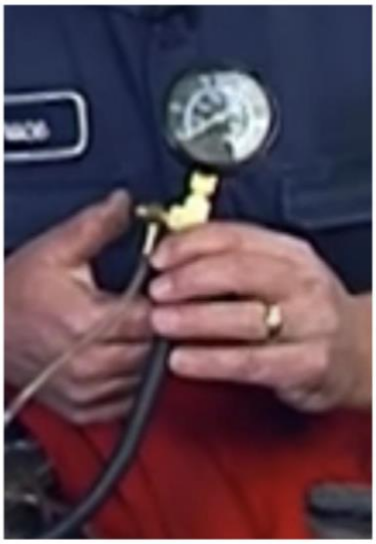
Notice there is a long clear tube attached to the bottom of the pressure gauge.
[highlight clear tube]
To measure the amount of fuel, the tube needs to be inside the graduated cylinder.

Grab the clear tube on the pressure gauge and place it in the graduated cylinder.
[highlight clear tube][ghost gauge tube appears in graduated cylinder]
[trainee grabs clear tube on pressure gauge and puts in graduated cylinder][sfx confirmation]
[if trainee doesn't grabs clear tube on pressure gauge and puts in graduated cylinder every 7 seconds] Grab the clear tube on the pressure gauge and place it in the graduated cylinder.

~~Use your controller to line up the graduated cylinder to the tube. [highlight clear tube]~~
~~[trainee brings aligns graduated cylinder to tube]~~
~~[if trainee doesn't align the graduated cylinder to the tube every 7 seconds]~~ ~~Use your contr/m8 oller to line up the graduated cylinder to the tube.~~





OK, now it's time to fill the graduated cylinder with fuel. This is called bleeding the fuel.

Use your controller to touch the pressure release button [highlight pressure release button] to allow fuel to flow into the graduated cylinder. The cylinder should fill to 16 ounces in 15 seconds.
[Trainee touches pressure release button] [sfx confirmation]

[if trainee doesn't touch the pressure release button every 7 seconds] Use your controller to touch the pressure release button.

Keep your eye on the count down. At the 15 second mark, touch the pressure release button again to shut off the flow of fuel.
[fuel begins to flow when trainee touches pressure release button][countdown from 15 seconds begins via floating numbers in engine]

[Trainee touches pressure release button at 15 second mark] [sfx confirmation]
[graduated cylinder fills to the 16 oz marker]
[if trainee touches the release button before the 15 second mark] Almost! Keep going until it reaches the 16 ounce mark.

[if trainee doesn't touch the pressure release button at 15 second mark]
[fuel overflows from the graduated cylinder]
Looks like you're overflowing! Touch the pressure release button to stop the fuel.
[highlight pressure release button]
[trainee touches pressure release button] [sfx confirmation]
[graduated cylinder adjust to the 16 oz marker]

Looks like the graduated cylinder is filled to the 16 ounce marker--this is what we were looking for. Before we assess the results of this test and the fuel pressure test, let's put everything back together.

As we do this, there might be some residual fuel that leaks. If any fuel leaks a rag can be used to catch any fuel dripping from the fitting connection.

Ok, let's take the fuel gauge off.
[highlight fuel gauge]
Twist to unscrew the gauge and place it on your cart.
[counterclockwise hint UI appears (this appears as curved arrows)]
[Trainee twists fuel gauge] [sfx confirmation] [clockwise hint UI disappears]
[if trainee doesn't twist gauge 7 second mark] Twist to unscrew the gauge and place it on your cart.
[if trainee trainee twists clockwise] Whoops! Turn the other direction! [clockwise hint UI appears (this appears as curved arrows)]

Put the cap back on the Schrader valve. [highlight Schrader valve]
Use the grip on your controller to pick up the cap on your cart and twist clockwise to reattach it to the valve.
[clockwise hint UI appears (this appears as curved arrows)]
[Trainee picks up cap and screws it onto the Schrader valve] [sfx confirmation][clockwise hint UI disappears]
[if trainee doesn't pick up the cap every 7 seconds] Use the grip on your controller to pick up the cap on your cart and twist clockwise to reattach it to the valve.
[if trainee trainee twists counterclockwise] Whoops! Turn the other direction!
[counterclockwise hint UI appears (this appears as curved arrows)]

Great! Let's consider the results of both of these tests. If the fuel pump showed a proper reading during the fuel pump test and the correct amount of fuel flowed during the fuel volume test then the tests were successful! No further action is required.

However, if either the fuel pump test or fuel volume measure test fails, there could be multiple reasons including: restriction in fuel delivery system, low voltage supply to the fuel pump, a failed pump, or the car is out of gas.

Nice work so far! Let's move from working under the hood to under the car to check out how to replace the fuel filter.

[Fade to black]

#6 Replacing Fuel Filter

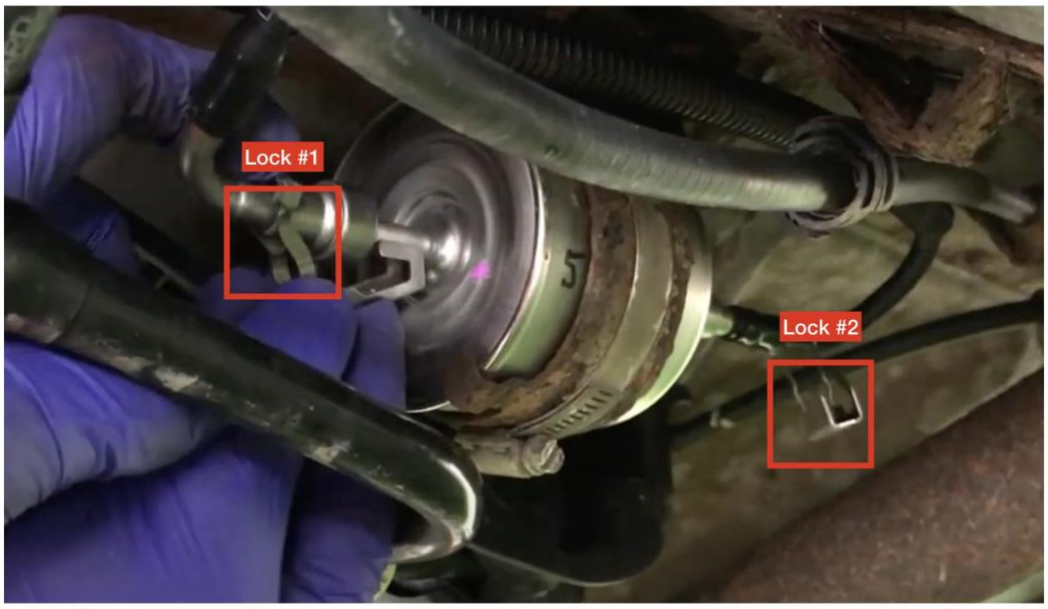
[Fade in]

[Vehicle is elevated on lift. Underbelly of the vehicle is positioned 12 inches above the headset. Trainee is positioned under the fuel filter.]

One part of maintaining the fuel system is replacing the fuel filter. The fuel filter screens dirt and rust particles from the fuel, keeping them from entering the fuel injectors and causing damage. A fuel filter is typically replaced every 30-50,000 miles. This vehicle has a serviceable fuel filter. Let's take a look at it mounted on the frame. To get you started, I've already removed the relay and fuel pump fuse from the fuse box and placed them on your cart.

[relay and fuse are on cart]

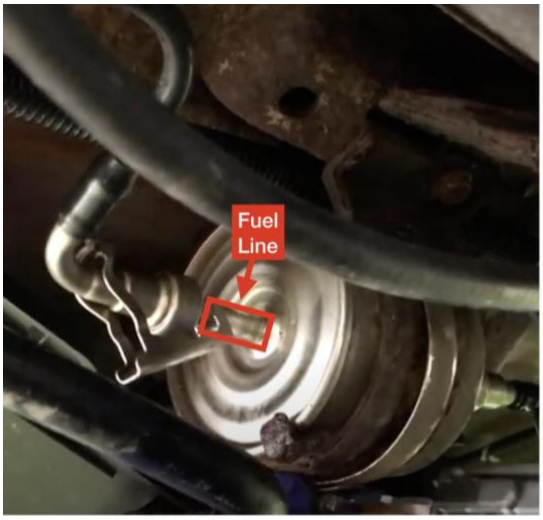
Next the locks around the filter need to be released.
[highlight locks]



Touch the locks to release the filter.
[highlight locks]
[Trainee touches left lock] [sfx confirmation]
[sfx clip release sound]
[Trainee touches right lock] [sfx confirmation]

[sfx clip release sound]
[if trainee doesn't touch a lock every 7 seconds] Touch the locks to release the filter.

Now we need to remove the fuel line connection to the fuel filter.
[highlight fuel line]



To do this we need a unique tool called a "fuel line scissor disconnect". I've gone ahead and placed it on your cart.
[tool appears on cart]

Let's disconnect the fuel line connection. Use the grip on your controller to pick up the fuel line scissor disconnect tool. Make sure to use the 5/16ths side.
[highlight 5/16ths side of tool]
[Trainee picks up tool]
[when picked up the tool will auto orient to the 5/16ths side]
[if trainee doesn't pick up the tool every 7 seconds] Use the grip on your controller to pick up the fuel line scissor disconnect tool.

Use your controller to position the tool around the fuel line on the fuel filter.
[highlight fuel line]

[Trainee lines up tool to ghost fuel line] [sfx confirmation]
[if trainee doesn't lines up tool to ghost fuel line every 7 seconds] Use your controller to position the tool around the fuel line on the fuel filter.


Now the line needs to slide off. There may be some fuel that leaks out. I've put a bucket on your cart and positioned it under the fuel line to catch any residual fuel.
[bucket appears mid air in front of trainee]

Twist the tool until the fuel line slides off free.
~~Move your controller up and down twice to twist the tool until the line slides off free.~~
[trainee twists the tool two times] [sfx confirmation]
[some fuel drips into bucket]
[sfx liquid drips into bucket]
[line comes free]

[if trainee doesn't twist the tool two times every 7 seconds] Twist the tool until the fuel line slides off free.

[trainee drops tool]
[if trainee drops tool] Looks like you dropped the tool! I've put it back on the cart for you.

Normally you would loosen the fuel line connection on the other side, but I'll do it for you.

Our final step is to remove the fuel filter. The filter can be pushed out of the loosened screw clamp. Use your controller to push the filter out.

[trainee pushes filter] [sfx confirmation][haptic feedback]

[fuel filter slides out free]
[fuel drips out of fuel filter into bucket]
[if trainee doesn't push out filter every 7 seconds] Use your controller to push the filter out.

Ok, now place it on the cart.
[trainee places filer on cart] [sfx confirmation]
[if trainee doesn't place filter on cart] Set it on the cart.

Great job on removing the fuel filter!

I'll go ahead and wrap things up here. I'll clean up and put everything back together.

Hands-On Practice

#7 Start over from the beginning

drills_13_lets_start_over_from_the.wav Let's start over from the beginning and try everything again. You'll be scored for this part, and I'll be here if you get stuck, but you'll lose points if I have to help.

#8 PPE

[PPE appears on the cart. CORRECT—Safety glasses and chemical gloves; DISTRACTORS—leather gloves, and hard hat]

[SUBMIT button appears over cart]

On the cart is a variety of PPE. Put on only the PPE you'll need for safely working on the fuel system. When you're done, press the SUBMIT button.

[trainee grabs glasses and gloves]
[trainee puts on glasses and gloves][SFX confirmation]

[trainee presses submit]
[if trainee is idle, repeat every 15 seconds] On the cart is a variety of PPE. Put on only the PPE you'll need for safely working on the fuel system. When you're done, press the SUBMIT button.

[if correct] [SFX confirmation] oil_23_thats_right_the_required_ppe.wav That's right. The required PPE is safety glasses and chemical gloves.

[if incorrect][correct choices left on cart highlight] oil_23_thats_not_quite_right.wav That's not quite right. The required PPE is glasses and gloves.
[gloves appear on trainee's hands, if not already there]
[distractor PPE disappears]

#9 Emergency Equipment

[table appears with emergency materials. CORRECT—fire extinguisher, fire blanket, and eye wash; DISTRACTORS—first aid kit, leather gloves, and steel lock]
[large 2D box floats above the table with question text plus VO:]
On the table are a variety of emergency equipment. Which items are you required to know the location of in case of an emergency? Touch your selections. ~~When you're done, press the SUBMIT button.~~

[trainee selects fire extinguisher][SFX confirmation] airbag_8_that's_right.wav That's right.
[trainee selects fire blanket][SFX confirmation] airbag_8_that's_right.wav That's right.
[trainee selects eye wash station] [SFX confirmation] airbag_8_that's_right.wav That's right.
[trainee selects other item other than fire extinguisher, fire blanket, and eye wash station][sfx incorrect buzzer] airbag_8_that's_not_quite_right.wav That's not quite right.
~~[trainee presses submit]~~

[if trainee is idle, repeat every 15 seconds] ~~On the table are a variety of emergency equipment. What items are you required to know the location in case of emergency? When you're done, press the SUBMIT button.~~
Take a look around the garage and use your controllers to select the items you are required to know the location in case of emergency. When you're done, press the SUBMIT button.

[if correct] [SFX confirmation] That's right. In case of emergency, it's required you know the location of the closest fire extinguisher, fire blanket, and eye wash station while working on the fuel system.
[if incorrect][correct choices left on cart highlight] That's not quite right. In case of emergency, it's required that you know the location of the closest fire extinguisher, fire blanket, and eye wash station while working on the fuel system.

#10 Fuel Pump Test Part 1: Remove Fuse and Relay

[trainee is standing in front of the hood. The hood is closed. Mechanic's cart is to their left with the fuse puller on top and red button. Red button should be on the cart at all times.]
Let's start the first part of testing the fuel pump by removing the relay and fuel pump fuse.
Airbag_12_what_should_we_do.wav What should we do first?

[trainee selects the hood] [SFX confirmation]
[hood of car opens to show the engine, fuse box, and other parts under the hood]
[trainee is idle in opening the hood, repeat every 15 seconds] airbag_12_what_should_we_do.wav
What should we do first?

[if correct] [SFX confirmation] airbag_12_that's_right_the_hood.wav That's right. The hood needs to be opened to access the fuse box.
[if incorrect][hood of car opens to show the engine, fuse box, and other parts under the hood]
airbag_12_that's_not_quite_right_hood.wav That's not quite right. The hood needs to be opened to access the fuse box.

airbag_12_touch_the_fuse_box.wav Touch the fuse box with your controller.
[trainee points to the fuse box] [sfx confirmation]
[trainee is idle in pointing to the fuse box, repeat every 15 seconds]
airbag_12_use_your_controller_touch.wav Use your controller to touch the fuse box.

[if correct] [SFX confirmation] airbag_12_that's_not_quite_right_try.wav That's right. The fuse box is located here.
[if incorrect][correct choice highlights] airbag_12_that's_not_quite_right_fuse.wav That's not quite right. The fuse box is located here.

You need to locate the fuel pressure fuse and relay. What should you do next?
[trainee flips over fuse box cover to see the fuse box diagram]
[fuse box cover flips over to reveal the fuse box diagram]
[trainee is idle in flipping over the fuse box, repeat every 15 seconds] You need to locate the fuel pump fuse and relay. What should you do next?

[if correct] [SFX confirmation] airbag_12_that's_right_fuse_diagram.wav That's right. The fuse box diagram is located here.
[if incorrect][correct choice highlights] airbag_12_that's_not_quite_right_fuse_diagram.wav That's not quite right. The fuse box diagram is located here.

Great! The manufacturer's manual indicates the fuel pump fuse is F24 and the relay is T30. Where are they on the diagram?
[trainee points to F24 and T30 in diagram] [sfx confirmation]
[trainee is idle in pointing to the diagram, repeat every 15 seconds] The manufacturer's manual indicates the fuel pump fuse is F24 and the relay is T30. Where are they on the diagram?
[if trainee points to wrong place on diagram] airbag_12_that's_not_quite_right_try.wav That's not quite right. Try one more time.
[if correct] [SFX confirmation] airbag_8_that's_right.wav That's right.
[if incorrect after a second attempt][correct choices highlights] That's not quite right. The fuse is located here and the relay is here.

Where are the fuse and relay in the fuse box?
[trainee points to F24 and T30 in fuse box] [sfx confirmation]
[trainee is idle in pointing to the F24 fuse and T30 relay in the fuse box, repeat every 15 seconds] Where are the fuse and relay in the fuse box?
[if correct] [SFX confirmation] That's right. The fuse and relay are located there in the fuse box.
[if incorrect][correct choices highlights] That's not quite right. The fuse and relay are located here in the fuse box.

airbag_12_what_should_you_do_next.wav What should you do next?
[trainee picks up fuse puller on cart] [sfx confirmation]
[trainee is idle without picking up fuse puller, repeat every 15 seconds]
[fuse puller highlights]
airbag_12_use_the_grip.wav Use the grip button on your controller to pick up the fuse puller.

[trainee removes fuse][sfx confirmation][haptic feedback]
[Trainee places fuse on cart][sfx confirmation]
[if trainee doesn't place fuse on cart every 15 seconds] airbag_12_place_the_fuse.wav Place the fuse on the cart.
[if trainee pulls the wrong fuse] airbag_8_that's_not_quite_right.wav That's not quite right.

[if trainee drops the fuse puller, have the fuse puller reappear on the cart]
airbag_12_looks_like_you_dropped.wav Looks like you dropped the fuse puller! I've put it back on the cart for you.
[if trainee drops the fuse, have the fuse reappear on the cart]
airbag_12_looks_like_you_dropped.wav Looks like you dropped the fuse! I've put it back on the cart for you.

airbag_12_what_should_you_do_next.wav What should you do next?
[trainee removes relay][sfx confirmation][haptic feedback]
[Trainee places relay on cart][sfx confirmation]
[if trainee doesn't place relay on cart every 15 seconds] Place the relay on the cart.
[if trainee pulls the wrong relay] airbag_8_that's_not_quite_right.wav That's not quite right.

Nicely done!

The electricity is now cut from the fuel pump.

[fade to black]

#11 Fuel Pump Test Part 2: Measure Pressure in Fuel Rail

How do you test that the removing the fuse and relay were removed successfully?

[Trainee presses red button on cart][sfx confirmation]

[sfx car starting turning on, then engine turning over for two seconds]
[car dies]

[if trainee doesn't press the red button every 15 seconds] Use your controller to touch the red button on your cart to turn on the car.
[red button disappears]

Nice! I'll test the engine a second time for you.
[sfx car starting turning on, then engine turning over for two seconds]
[car dies]

Now it's time to measure the pressure in the fuel rail. Where do you start?
[Trainee unscrews Schrader valve cap]
[Trainee places Schrader valve on cart][sfx confirmation]
[if trainee doesn't unscrew Schrader valve cap every 15 seconds] You need to use the grip on your controller to unscrew the cap on the Schrader valve.
[if trainee unscrews Schrader valve cap but doesnt place it on cart every 15 seconds] Place it on the cart.

On your cart are a variety of tools. Which one do you need for measuring pressure?
[Tools appear on the cart. CORRECT—pressure gauge; DISTRACTORS—fuel line scissor disconnect tool and short black hose]
[trainee selects pressure gauge] [sfx confirmation]
[if trainee doesn't select pressure gauge every 15 seconds] Touch the tool you need to measure pressure.
[if trainee incorrectly selects, all incorrect tools disappear]

airbag_12_what_should_you_do_next.wav What should you do next?
[trainee picks up pressure gauge] [sfx confirmation]
[if trainee doesn't pick up the pressure gauge every 15 seconds] Use the grip on your controller to pick up the pressure gauge and screw it on to the Schrader valve.

[clockwise hint UI appears (this appears as curved arrows)]
[trainee picks up pressure gauge] [sfx confirmation][clockwise hint UI disappears]
[if trainee doesn't pick up pressure gauge every 7 seconds] Use the grip on your controller to pick up the pressure gauge. Then twist clockwise to attach the gauge to the valve.

[trainee twists clockwise]
[if trainee doesn't trainee twists counterclockwise three times] Twist clockwise to attach the gauge to the valve.
[if trainee trainee twists clockwise] Whoops! Turn the other direction! [clockwise hint UI appears (this appears as curved arrows)]
Nice! Now it's time to give the fuel pump some power. What do you need to do?

[fuse puller with fuse and relay appears on cart]
[trainee picks up either relay or fuse puller with fuse from cart]
[if trainee doesn't pick up relay or fuse puller with every 15 seconds]
airbag_3_use_grip_fuse_puller.wav Use the grip button on your controller to reinstall the fuse and relay to reinstall it in the fuse box.

[trainee presses red button to turn on engine]
[if trainee doesn't button to turn on the engine every 15 seconds] Press the button on your cart to turn on the car and idle the engine.
[sfx starting engine]
[sfx car idle]

[pressure gauge needle rotates to 45 psi]

Looks like the pressure gauge is reading 45 psi. Nice work!

#12 Measure Fuel Volume

On your cart are some measuring devices. Which one do you need for measuring fuel volume?
[Measuring devices appear on the cart. CORRECT—graduated cylinder; DISTRACTORS—16 oz soda bottle and paper cup]

[trainee selects graduated cylinder] [sfx confirmation] airbag_8_that's_right.wav That's right!
[if trainee doesn't make a selection every 15 seconds] Touch the measuring device you need to measure volume.
[if trainee incorrectly selects, all incorrect items disappear] That's not quite right. The graduated cylinder measures fuel volume.

airbag_12_what_should_you_do_next.wav What should you do next?

[trainee picks up graduated cylinder] [sfx confirmation]
[ghost tube appears around gauge tube]

[if trainee doesn't picks up graduated cylinder every 15 seconds] Use the grip on your controller to pick up the graduated cylinder.

[trainee brings aligns graduated cylinder to tube]
[if trainee doesn't align the graduated cylinder to tube every 15 seconds] Use your controller to line up the graduated cylinder to the tube.

[Trainee touches pressure release button] [sfx confirmation]
[if trainee doesn't touch the pressure release button every 15 seconds] Use your controller to touch the pressure release button.
[fuel begins to flow when trainee touches pressure release button]
[countdown from 15 seconds begins via floating numbers in engine]

Trainee touches pressure release button at 15 second mark] [sfx confirmation]
[graduated cylinder fills to the 16 oz marker]

[if trainee doesn't touch the pressure release button at 15 second mark]
[fuel overflows from the graduated cylinder]
Looks like you're overflowing! Touch the pressure release button to stop the fuel.
[trainee touches pressure release button] [sfx confirmation]
[graduated cylinder adjust to the 16 oz marker]

Ok, let's put everything back to normal.
airbag_12_what_should_you_do_next.wav What should you do next?

[Trainee unscrews fuel gauge] [sfx confirmation]
[if trainee doesn't unscrew fuel gauge at every 15 seconds] Use the grip on your controller to unscrew the gauge and place it on your cart.
[Trainee places fuel gauge on cart] [sfx confirmation]
[if trainee doesn't place the gauge on the cart every 15 seconds] Place it on the cart.

[Trainee picks up Schrader valve cap from cart and screws it onto the Schrader valve]
[sfx confirmation]
[if trainee doesn't pick up the cap every 15 seconds] Use the grip on your controller to pick up the cap on your cart and screw it back on the Schrader valve.

Great! You have tested the fuel pump and measured fuel volume!

[Fade to black]

#13 Replacing Fuel Filter

[Fade in]
[Vehicle is elevated on lift. Underbelly of vehicle is positioned 12 inches above the headset. Trainee is positioned under the fuel filter.]

Your next task is to replace the fuel filter. I've already removed the relay and fuel pump fuse from the fuse box and placed them on your cart.

airbag_12_what_should_you_do_next.wav What should you do next?

[Trainee touches left lock] [sfx confirmation]
[sfx clip release sound]
[Trainee touches right lock] [sfx confirmation]
[sfx clip release sound]
[if trainee doesn't touch a lock every 15 seconds] Use your controller to touch the locks to release the filter.

On your cart are some tools. Grab the tool you need to remove the fuel line connection.
[Measuring devices appear on the cart. CORRECT—fuel line scissor disconnect tool; DISTRACTORS—flat head screwdriver and wrench]
[trainee selects fuel line scissor disconnect tool] [sfx confirmation]
airbag_8_that's_right.wav That's right!
[if trainee doesn't make a selection every 15 seconds] Grab the tool you need to remove the fuel line connection.
[if trainee incorrectly selects, all incorrect items disappear] That's not quite right.
You need the fuel line disconnect tool to remove the fuel line connection.

What's next?
[Trainee lines up tool to fuel line] [sfx confirmation]
[ghost fuel line appears]
[if trainee doesn't lines up tool to ghost fuel line every 15 seconds] Use your controller to position the tool around the fuel line on the fuel filter.
[work cart with bucket appears in front of trainee] I've put a bucket on your cart and positioned it under the fuel line to catch any residual fuel.

airbag_12_what_should_you_do_next.wav What should you do next?

[trainee twists the tool back and forth] [sfx confirmation]
[if trainee doesn't lines up tool to ghost fuel line every 15 seconds] Move your controller up and down to twist the tool until the line slides off free.
[if trainee drops tool] Looks like you dropped the tool! I've put it back on the cart for you.

[trainee pushes out filter] [sfx confirmation]
[fuel filter slides out free]
[fuel drips out of fuel filter into bucket]
[if trainee doesn't line up to the circles to push out the filter every 15 seconds] Use your controller to push the filter out.

[trainee places filer on cart] [sfx confirmation]
[if trainee doesn't place filter on cart] Use the grip on your controller to set the filter on the cart.

You've successfully removed the fuel filter and tested the fuel system!

#14 Wrapping Up

PBSaw_13_Now_Ill_ask.wav Alright! Now I'll ask you some questions on this topic.

[large 2D box question interface floats at trainee eye level, over the cart]

#15 Fuel Pump Function

[Text appears in front of trainee plus VO:
What does the fuel pump not do?
[Choices on buttons:
Moves gasoline from the vehicle's fuel tank to the engine
Maintains pressure in the fuel system
Remove dust and rust from the fuel]

[trainee selects response] [selected response highlights in yellow] [SUBMIT button appears]
[trainee has opportunity to change response] hoists_17_touch_the_submit_button_if.wav
Touch the submit button if that's your response. You can change your answer, if you want.

[trainee is idle for 10 seconds] multiple_touch_the_answer.wav Touch the answer you think

is correct.

[SUBMIT button is touched]

[trainee selects a response, but doesn't touch SUBMIT button within the next 7 seconds] PBSaw_13a_Touch_the_Submit.wav Touch the submit button if that's your response. You can change your answer, if you want.

[if correct] [SFX confirmation] That's right. The fuel pump moves gasoline from the vehicle's fuel tank to the engine and maintains pressure in the fuel system; not dust and rust from fuel.
[if incorrect][correct choices highlights] That's not quite right. The fuel pump moves gasoline from the vehicle's fuel tank to the engine and maintains pressure in the fuel system; not dust and rust from fuel.
[incorrect choices disappears]

#16 PSI Acronym

[Text appears in front of trainee plus VO:
What does PSI stand for?
[Choices on buttons:
Pressure per square inch
Pounds per square inch
Power per square inch]

[trainee selects response] [selected response highlights in yellow] [SUBMIT button appears]
[trainee has opportunity to change response] hoists_17_touch_the_submit_button_if.wav
Touch the submit button if that's your response. You can change your answer, if you want.

[trainee is idle for 10 seconds] multiple_touch_the_answer.wav Touch the answer you think is correct.

[SUBMIT button is touched]

[trainee selects a response, but doesn't touch SUBMIT button within the next 7 seconds]
Touch the submit button if that's your response. You can change your answer, if you want.
[if correct] [SFX confirmation] That's right. PSI stands for pounds per square inch.
[if incorrect][correct choices highlights] That's not quite right. PSI stands for pounds per square inch.

[incorrect choices disappears]

#17 Fuel Volume Ratio

[Text appears in front of trainee plus VO:
When testing fuel volume, what is the ratio of ounces to seconds?
[Choices on buttons:
16 ounces in 15 seconds
15 ounces in 16 seconds
14 ounces in 16 seconds]

[trainee selects response] [selected response highlights in yellow] [SUBMIT button appears]
[trainee has opportunity to change response] hoists_17_touch_the_submit_button_if.wav
Touch the submit button if that's your response. You can change your answer, if you want.

[trainee is idle for 10 seconds] multiple_touch_the_answer.wav Touch the answer you think is correct.

[SUBMIT button is touched]

[trainee selects a response, but doesn't touch SUBMIT button within the next 7 seconds]
Touch the submit button if that's your response. You can change your answer, if you want.

[if correct] [SFX confirmation] That's right! The ratio when testing fuel volume is 16 ounces in 15 seconds.
[if incorrect][correct choices highlights] That's not quite right. The ratio when testing fuel volume is 16 ounces in 15 seconds.
[incorrect choices disappears]

#18 Medal Awarded [or not]

[medal appears, according to scoring logic detailed here]

Congratulations! You just earned a gold/silver/bronze medal! Grab it to unlock it!

[Buttons in menu: MAIN MENU, ANIMATED TUTORIAL, HANDS-ON PRACTICE]

[if not mastered, trainee retakes hands-on practice][pedestal_46_looks_like_you.wav]
Looks like you need more practice on this. You can either retake the animated tutorial, or try the hands-on practice again.