

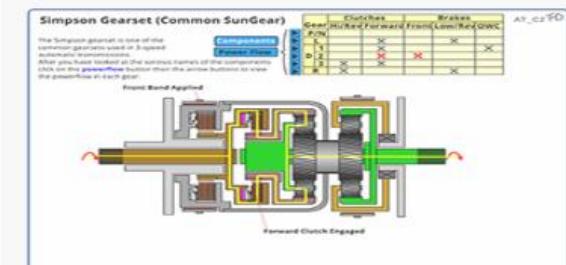
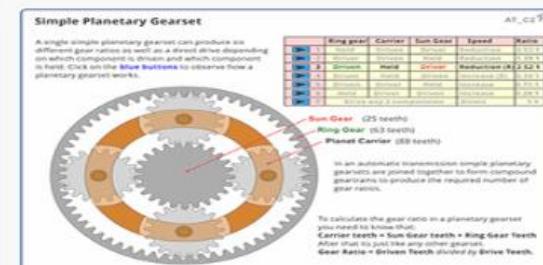
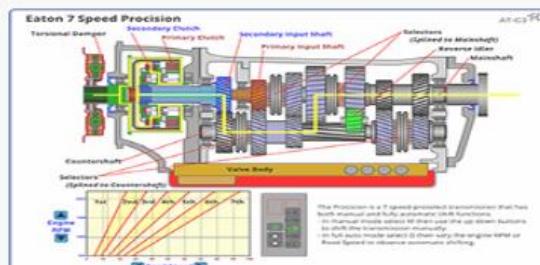
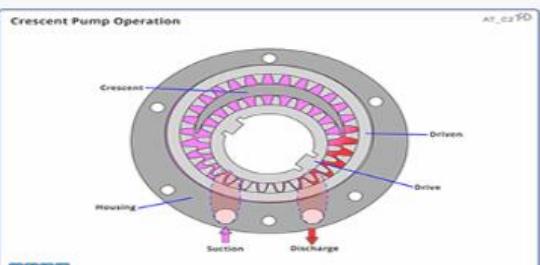
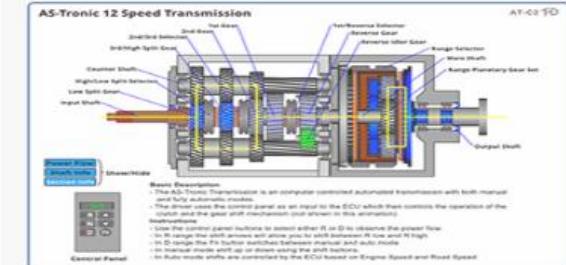
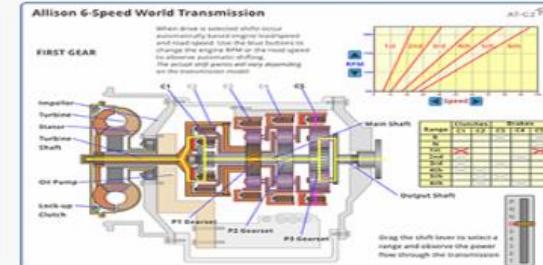
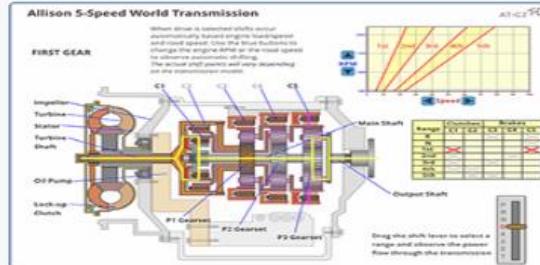
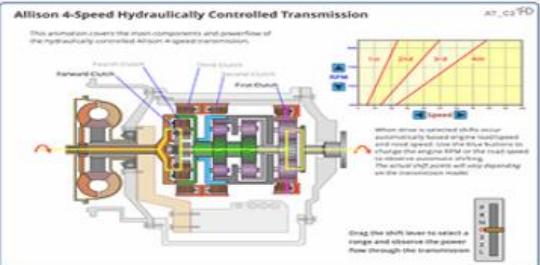
# CDX Animations

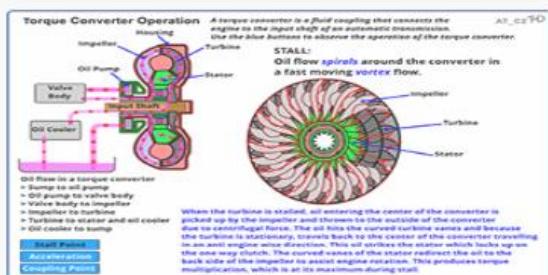
# Pictorial Reference

Animations currently available of as 31/03/2023

# AT Series

# Automatic Transmissions



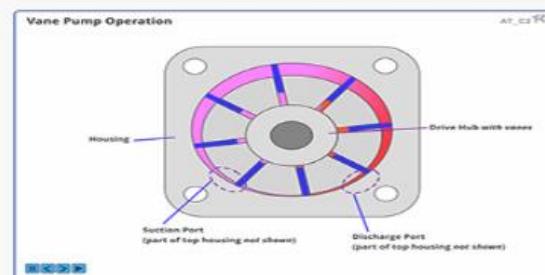


## Torque Converter Operation

AT\_TorqueConverterOperation\_C1

A simple animation that shows the operation of a lockup type torque converter showing the oil flow during stall, acceleration, coupling point and lockup.

Updated September 2022

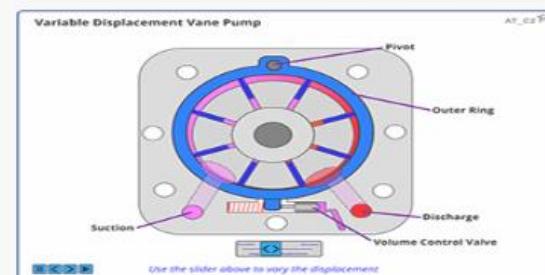


## Vane Pump Operation

AT\_VanePump\_C1

A simple animation that shows the operation of a vane type pump.

Updated September 2022

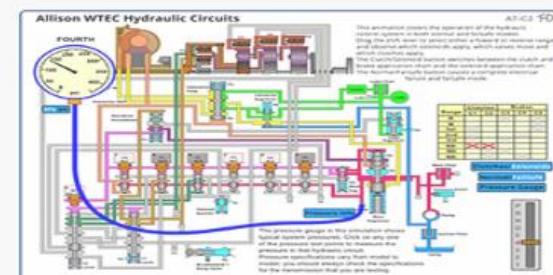


## Variable Displacement Vane Pump

AT\_VarVanePump\_C1

A simple animation that shows the operation of a variable vane type pump.

Updated September 2022

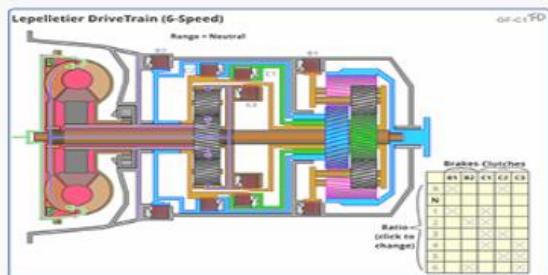


## Allison WTEC Hydraulic Circuits

AT\_WTEChydraulicCircuit\_C1

Description

Updated September 2022

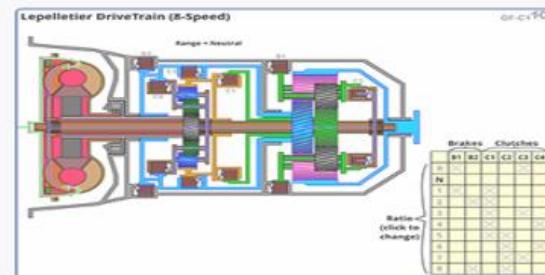


## Lepelletier DriveTrain (6-Speed)

AT\_Lepelletier6\_C1

Description

Updated September 2022

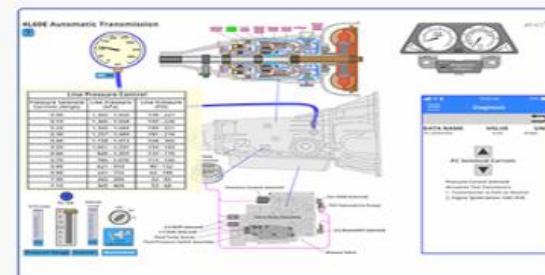


## Lepelletier DriveTrain (8-Speed)

AT\_Lepelletier8\_C1

Description

Updated September 2022

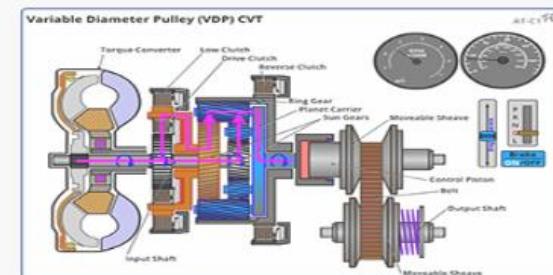


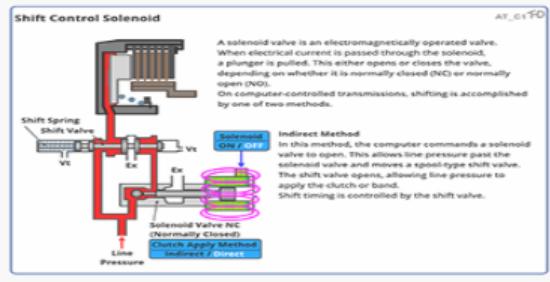
## 4L60E Transmission

AT\_4L60E\_C1

Gives technicians an understanding of transmission operation to aid diagnosis

Updated September 2022



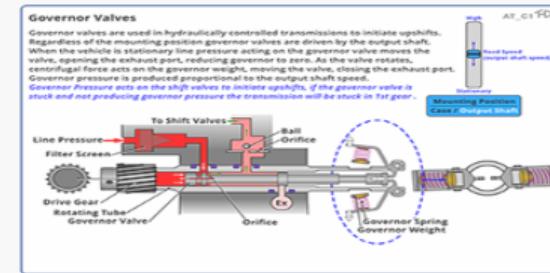


## Transmission Shift Solenoids

AT\_ShtSolSd\_C1

Demonstrates both direct and indirect solenoid control of transmission clutches.

Updated September 2022

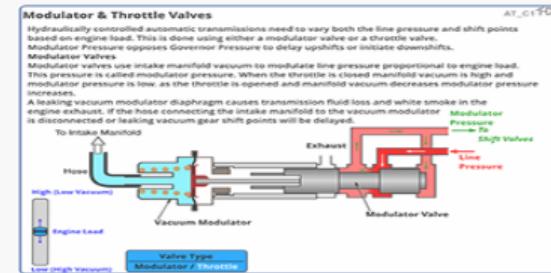


## Governor Valves

AT\_GovVlv\_C1

Demonstrates the operation of the two main types of governor valves used in hydraulically controlled transmissions.

Updated September 2022

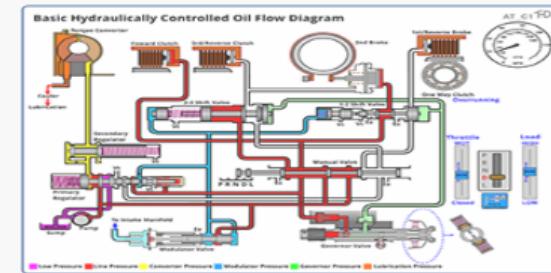


## Modulator & Throttle Valves

AT\_ThrVlv\_C1

Demonstrates both methods of sensing vehicle load in a hydraulically controlled transmission.

Updated September 2022

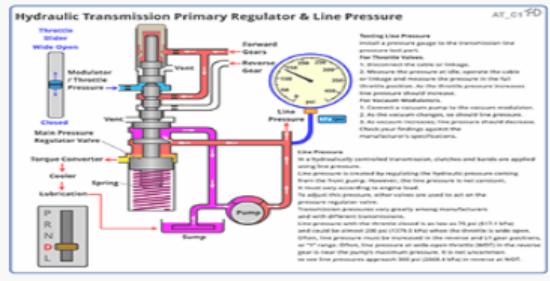


## Basic Hydraulically Controlled Transmission Oil Flow Diagram

AT\_BasHydCir\_C1

Interactive oil flow diagram of a basic 3 speed hydraulically controlled transmission

Updated September 2022

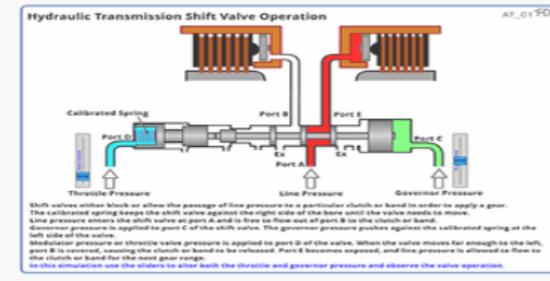


## Hydraulic Transmission: Primary Regulator & Line Pressure

AT\_HydRegLP\_C1

Demonstrates how the primary regulator controls the line pressure inside a hydraulically controlled transmission.

Updated September 2022

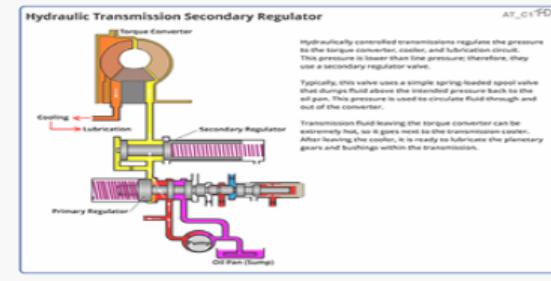


## Hydraulic Transmission: Shift Valve Operation

AT\_HydShftV\_C1

Demonstrates how governor pressure and throttle pressure control the movement of a shift valve in a hydraulically controlled transmission.

Updated September 2022

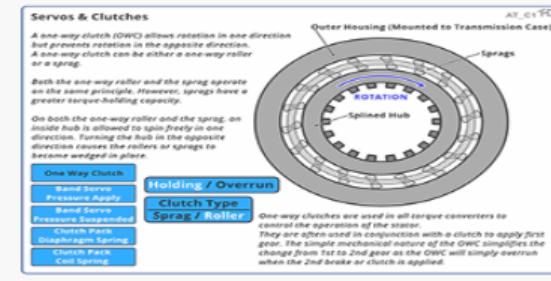


## Hydraulic Transmission: Secondary Regulator & Converter Pressure

AT\_HydTQRV\_C1

Demonstrates how the secondary regulator controls the torque converter pressure.

Updated September 2022

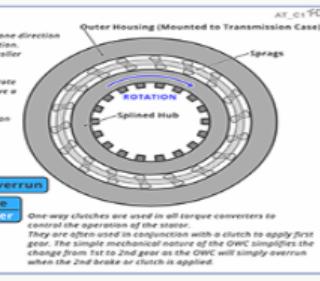


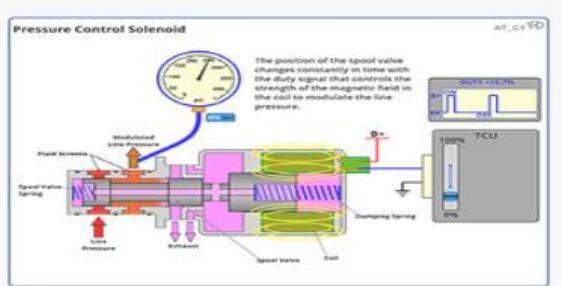
## Servos & Clutches

AT\_CltServo\_C1

Covers the different methods of driving and holding transmission gear train components including the different types of clutches and servos.

Updated September 2022



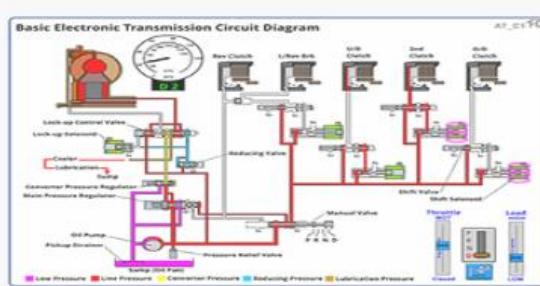


## Pressure Control Solenoid

AT\_DtCycSol\_C1

Demonstrates how the duty cycle control of a solenoid is used to control line pressure in a transmission.

**Updated September 2022**

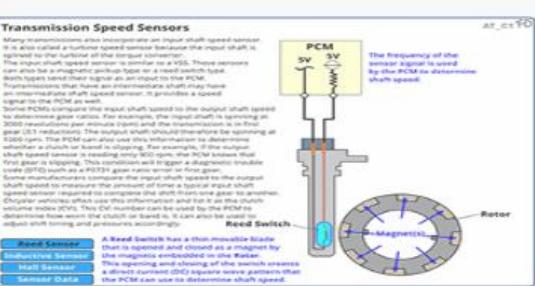


## Basic Electronically Controlled Transmission Oil Flow Diagram

AT\_BasElecCir\_C1

Interactive oil flow diagram of a basic 4 speed electronically controlled transmission covering both normal and failsafe operation

**Updated September 2022**

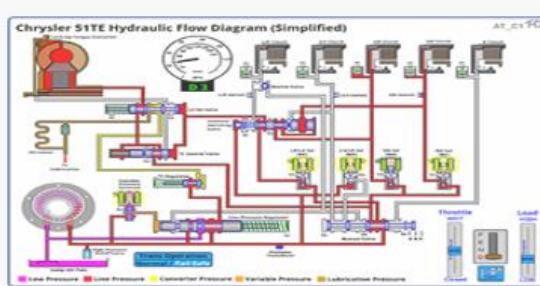


## Transmission Speed Sensors

AT\_RdSpdSen\_C1

Demonstrates the three different types of transmission speed sensors and how the signals are used by the PCM.

**Updated September 2022**

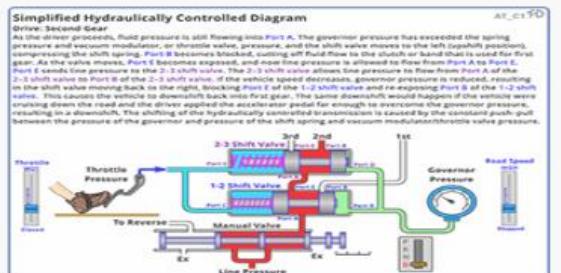


## Chrysler 41TE Hydraulic Flow Diagram (Simplified)

AT\_Cry41TEHyCir\_C1

Interactive oil flow diagram of a simplified Chrysler 41TE 4 speed electronically controlled transmission covering both normal and failsafe operation

**Updated September 2022**

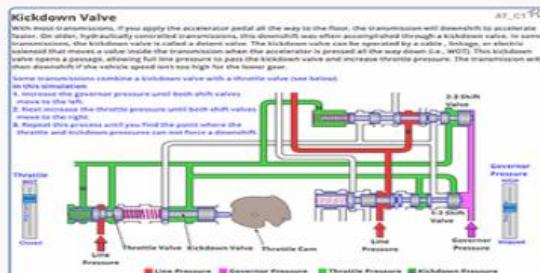


## Simplified Hydraulically Controlled Diagram

AT\_SHCTD\_C1

A simplified interactive diagram of a three speed hydraulically controlled transmission

**Updated September 2022**

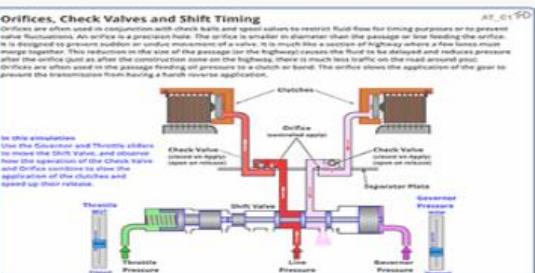


## Kickdown Valve

AT\_KdVlv\_C1

Demonstrates how kickdown pressure combined with throttle pressure can force a downshift in a hydraulically controlled transmission.

**Updated September 2022**

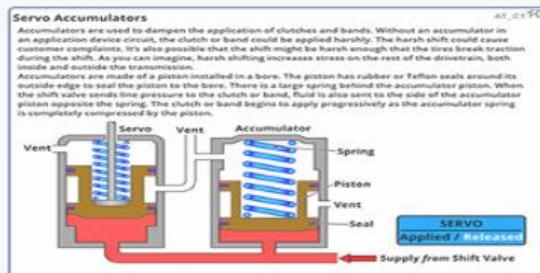


## Orifices, Check Valves and Shift Timing

AT\_OrifOp\_C1

Demonstrates how orifices and check valves combine to control shift timing.

**Updated September 2022**

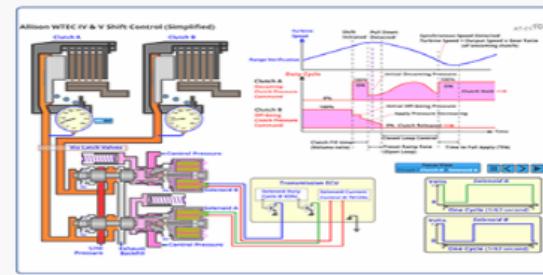
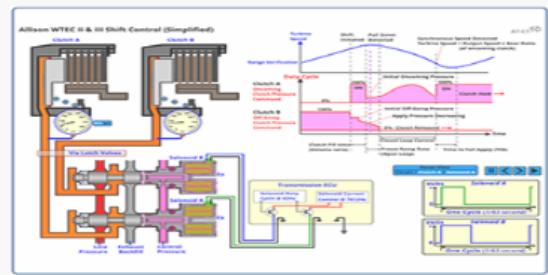
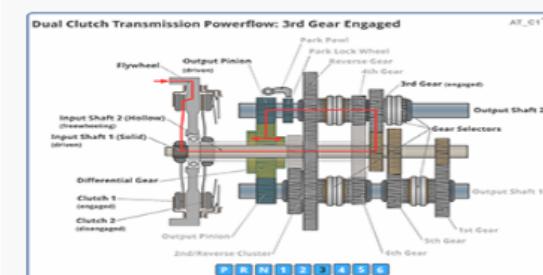
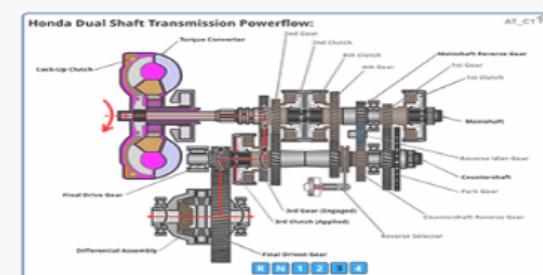
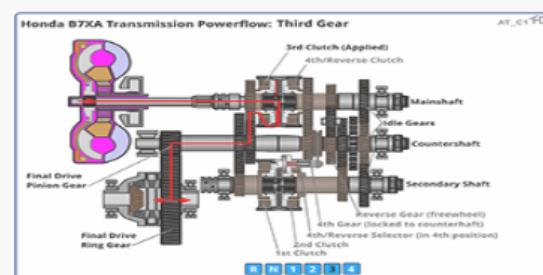
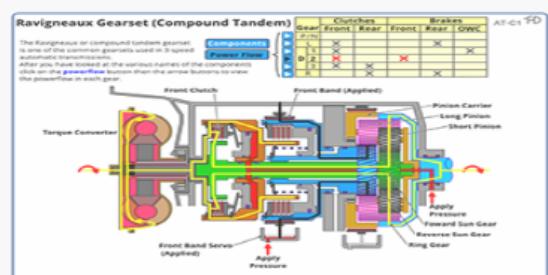


## Servo Accumulators

AT\_ServoApp\_C1

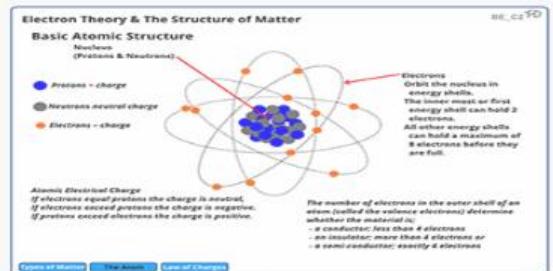
Demonstrates the use of accumulators to control shift timing.

**Updated September 2022**



# BE Series

# Body Electrical

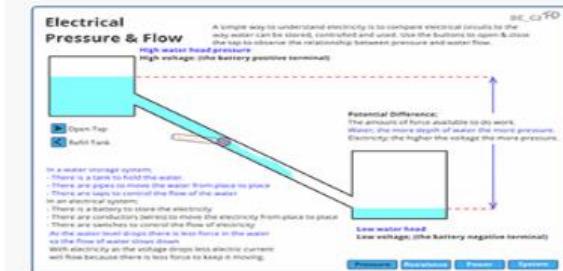


## Electron Theory & The Structure of Matter

BE\_ElectronTheory\_C1

Description

Updated September 2022

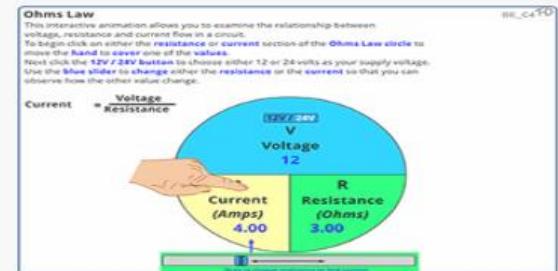


## Electrical Water Analogy

BE\_WaterAnalogy\_C1

Description

Updated September 2022

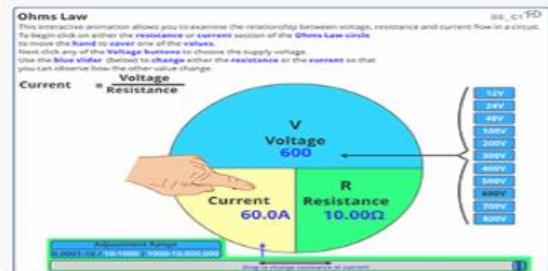


## Ohms Law

BE\_OhmsLaw\_C1

Description

Updated September 2022

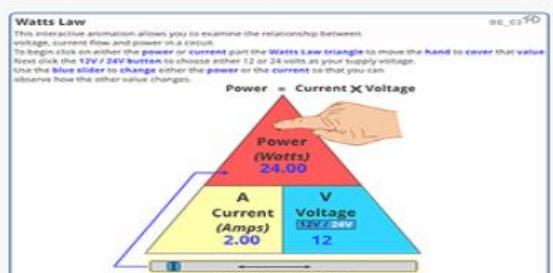


## Ohms Law Version 2

BE\_OhmsLaw\_C1b

Description

Updated September 2022

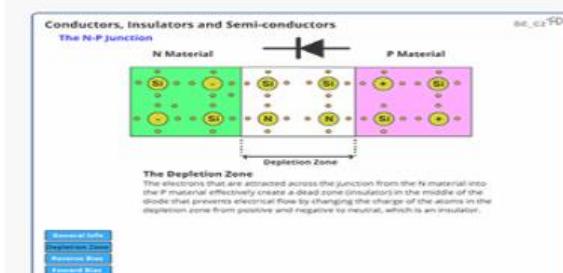


## Watts Law

BE\_WattsLaw\_C1

Description

Updated September 2022

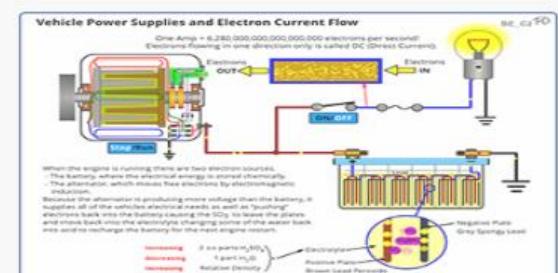


## Semi-Conductors

BE\_SemiConductors\_C1

Description

Updated September 2022

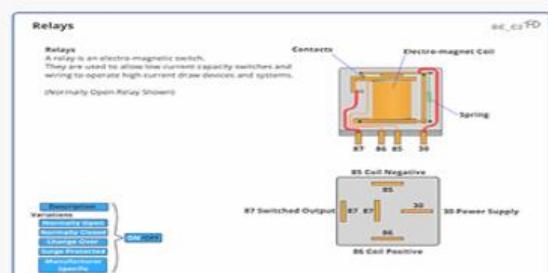


## Vehicle Power Supply

BE\_VehiclePowerSupplyCircuit\_C1

Description

Updated September 2022

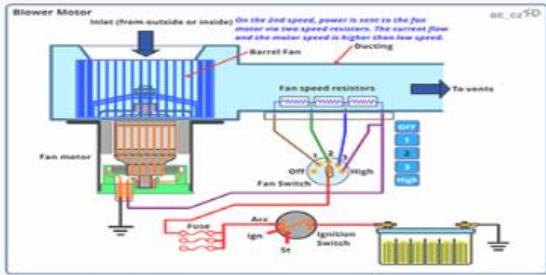


## Relays

BE\_Relyes\_C1

Description

Updated September 2022

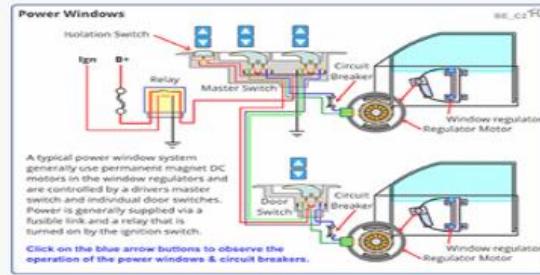


### Blower Motor

BE\_BlowerMotor\_C1

Description

Updated September 2022

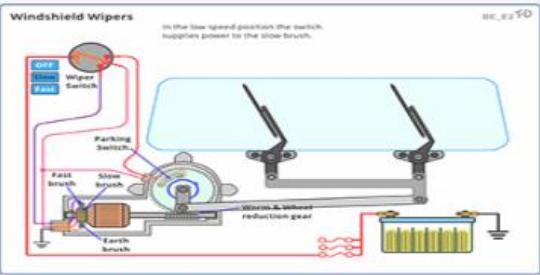


### Power Windows

BE\_PowerWindows\_C1

Description

Updated September 2022

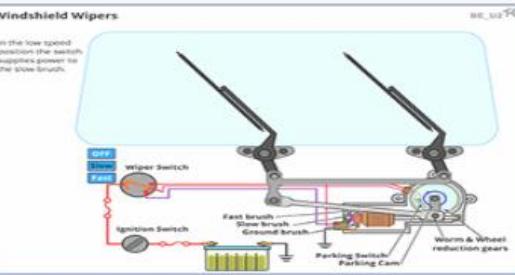


### Windshield Wipers

BE\_WindscreenWipers\_E1

Description

Updated September 2022

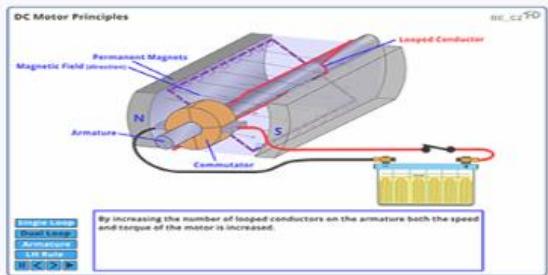


### Windshield Wipers

BE\_WindshieldWipers\_U1

Description

Updated September 2022

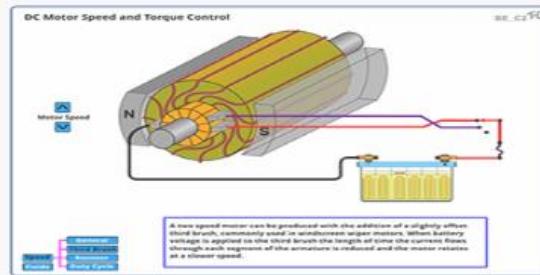


### DC Motor Principles

BE\_DC\_Motor\_Principles\_C1

Description

Updated September 2022

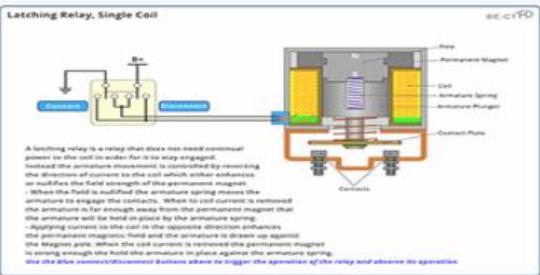


### DC Motor Speed & Torque Control

BE\_DCMotorSpeedTorque\_C1

Description

Updated September 2022

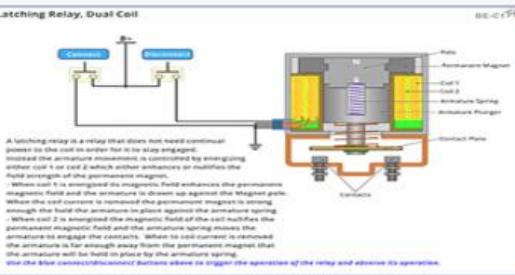


### Latching Relay (Single Coil)

BE\_LatchingRelaySC\_C1

Description

Updated September 2022

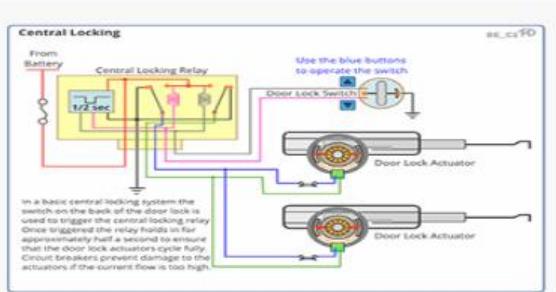


### Latching Relay (Double Coil)

BE\_LatchingRelayDC\_C1

Description

Updated September 2022

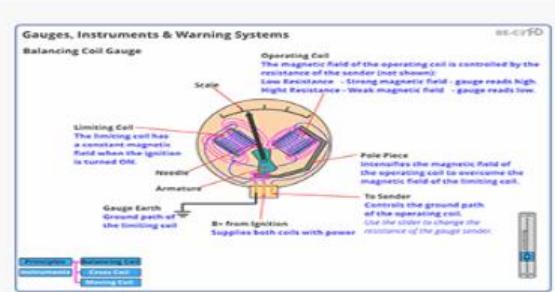


## Central Locking

BE\_CentralLocking\_C1

Description

Updated September 2022

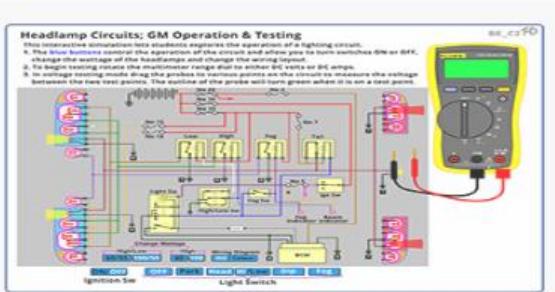


## Gauges Instruments & Warning Systems

BE\_DashGaugesIndicators\_C1

Description

Updated September 2022

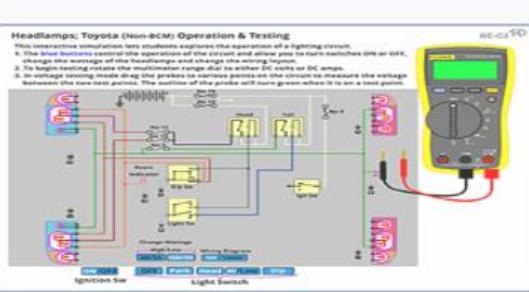


## GM Headlamp Circuit

BE\_GMHeadlamps\_C1

Description

Updated September 2022

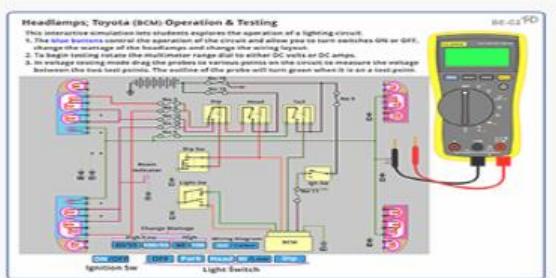


## Toyota BCM Headlamp Circuit

BE\_ToyotaBCMheadlamps\_C1

Description

Updated September 2022

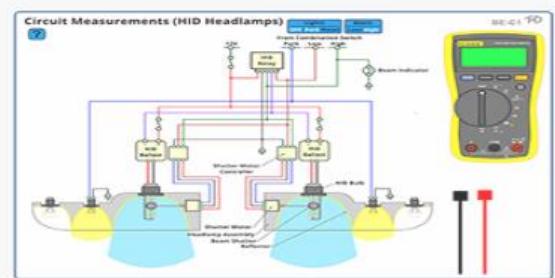


## Toyota Non-BCM Headlamp Circuit

BE\_ToyotaNonBCMheadlamps\_C1

Description

Updated September 2022

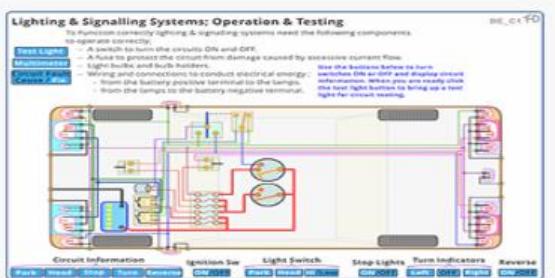


## HID Headlamps Circuit Measurements

BE\_HID\_C1

Description

Updated September 2022

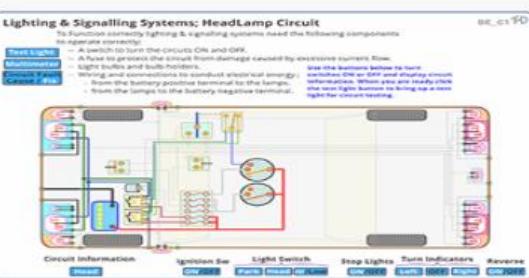


## Lighting & Signalling Master

BE\_LS\_Master\_C1

Replaces: BE\_LightSignal\_Master\_U1

Updated September 2022

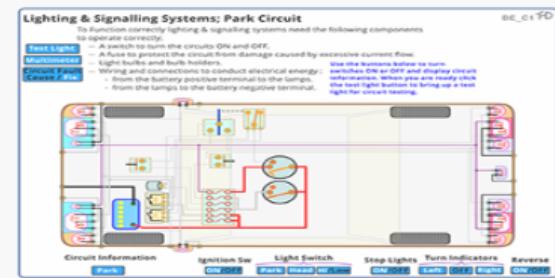


## Lighting & Signalling Headlamp

BE\_LS\_Head\_C1

Replaces: BE\_LightSignal\_Head\_U1

Updated September 2022

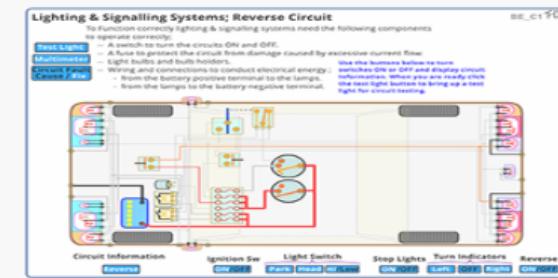


### Lighting & Signalling Park

BE\_LS\_Park\_C1

Replaces: BE\_LightSignal\_Park\_U1

Updated September 2022

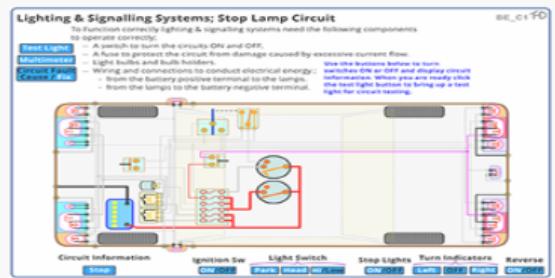


### Lighting & Signalling Reverse

BE\_LS\_Rev\_C1

Replaces: BE\_LightSignal\_Reverse\_U1

Updated September 2022

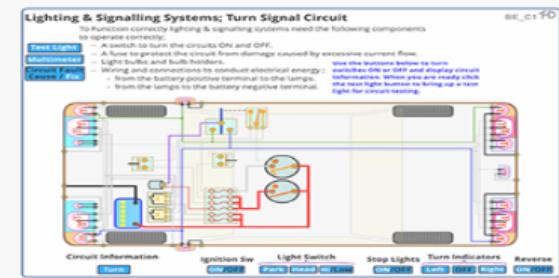


### Lighting & Signalling Stop

BE\_LS\_Stop\_C1

Replaces: BE\_LightSignal\_Stop\_U1

Updated September 2022

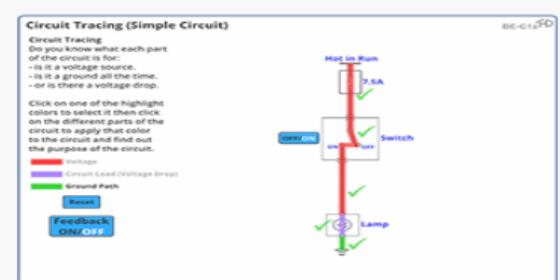


### Lighting & Signalling Turn

BE\_LS\_Turn\_C1

Replaces: BE\_LightSignal\_Turn\_U1

Updated September 2022

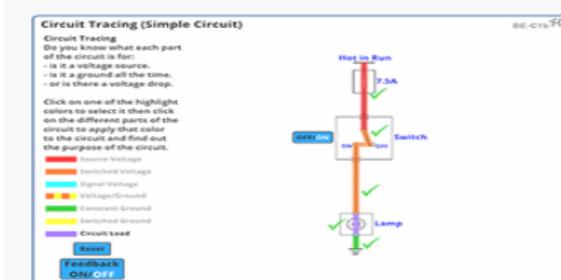


### Circuit Tracing Simple Circuit (3 colour)

BE\_CircuitTrace01\_C1a

Description

Updated September 2022

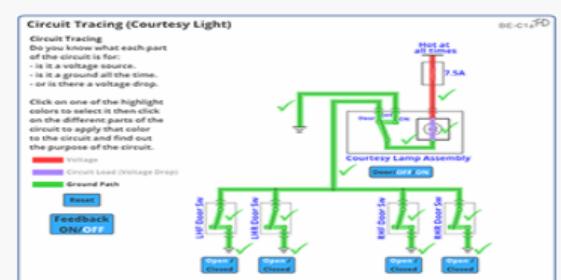


### Circuit Tracing Simple Circuit (7 colour)

BE\_CircuitTrace01\_C1b

Description

Updated September 2022

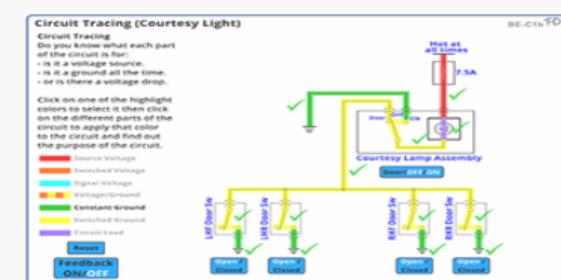


### Circuit Tracing Courtesy Light (3 colour)

BE\_CircuitTrace02\_C1a

Description

Updated September 2022

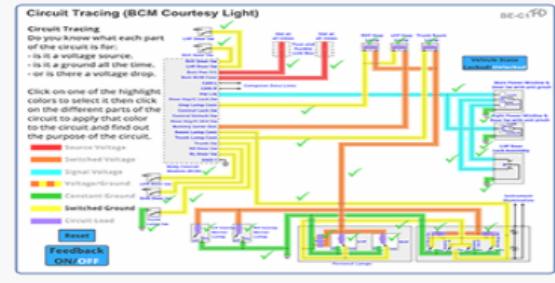
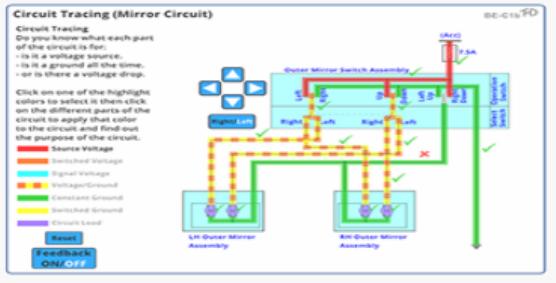
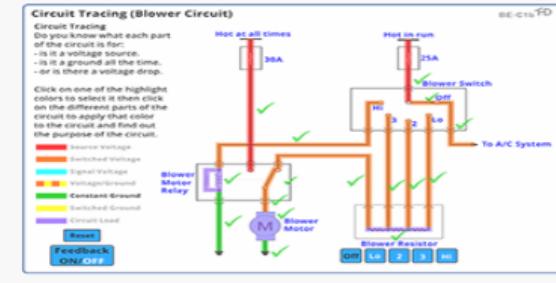
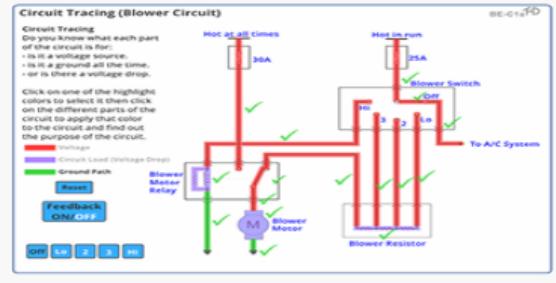
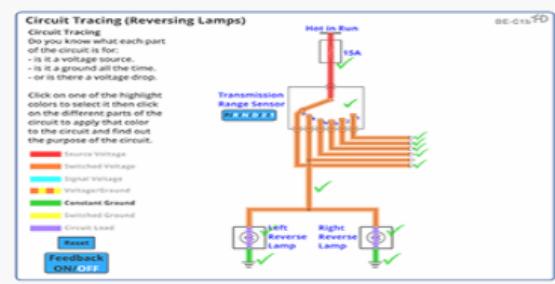
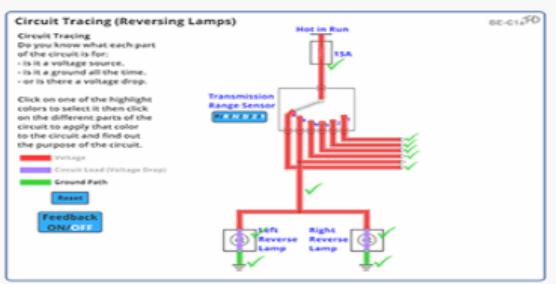
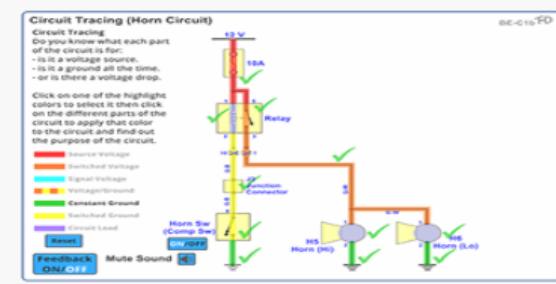
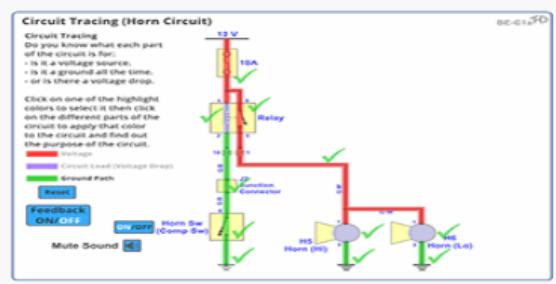


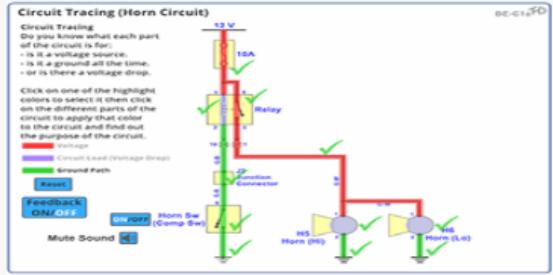
### Circuit Tracing Courtesy Light (7 colour)

BE\_CircuitTrace02\_C1b

Description

Updated September 2022



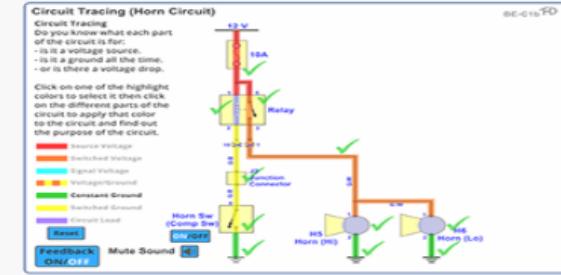


**Circuit Tracing Horn Circuit  
(3 colour)**

**BE\_CircuitTrace01\_C1a**

**Description**

**Updated September 2022**

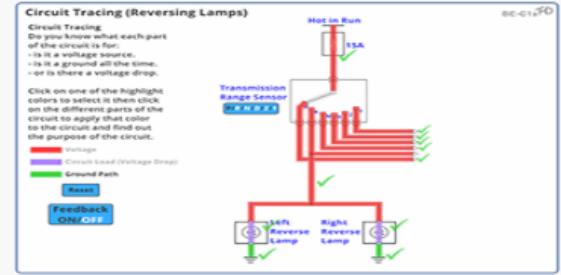


**Circuit Tracing Horn Circuit  
(7 colour)**

**BE\_CircuitTrace01\_C1b**

**Description**

**Updated September 2022**

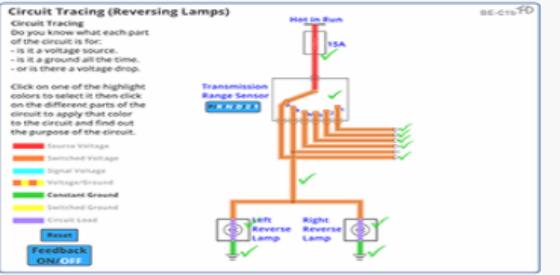


**Circuit Tracing Reversing Lamps  
(3 colour)**

**BE\_CircuitTrace02\_C1a**

**Description**

**Updated September 2022**

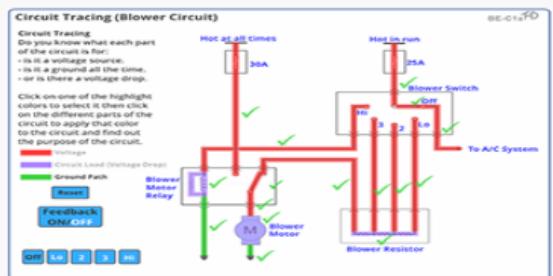


**Circuit Tracing Reversing Lamps  
(7 colour)**

**BE\_CircuitTrace02\_C1b**

**Description**

**Updated September 2022**

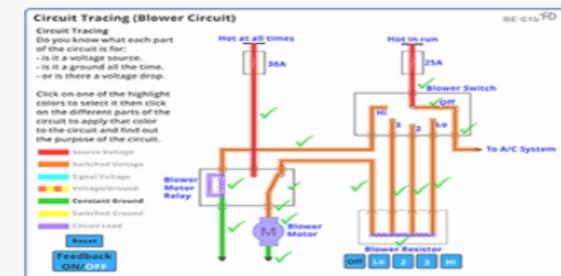


**Circuit Tracing Blower Circuit  
(3 colour)**

**BE\_CircuitTrace05\_C1a**

**Description**

**Updated September 2022**

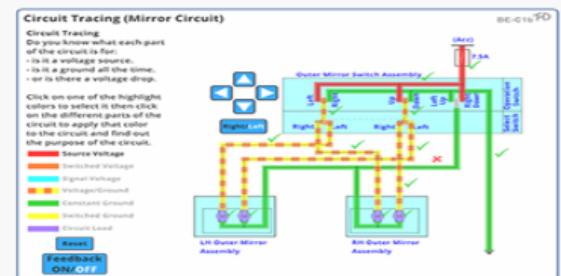


**Circuit Tracing Blower Circuit  
(7 colour)**

**BE\_CircuitTrace05\_C1b**

**Description**

**Updated September 2022**

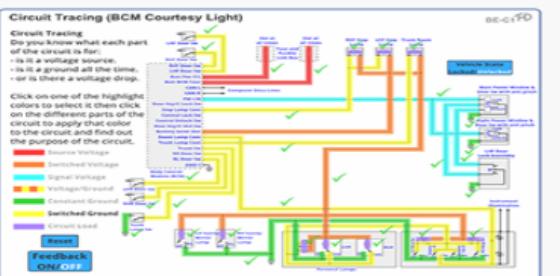


**Circuit Tracing Mirror Circuit  
(7 colour)**

**BE\_CircuitTrace06\_C1a**

**Description**

**Updated September 2022**

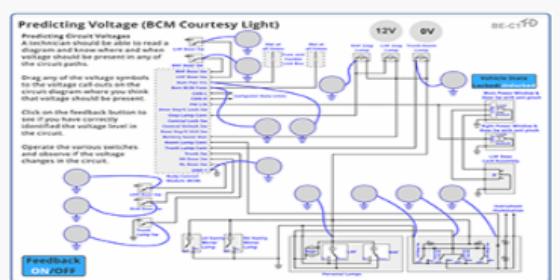


**Circuit Tracing BCM Courtesy Light  
(7 colour)**

**BE\_CircuitTrace07\_C1a**

**Description**

**Updated September 2022**

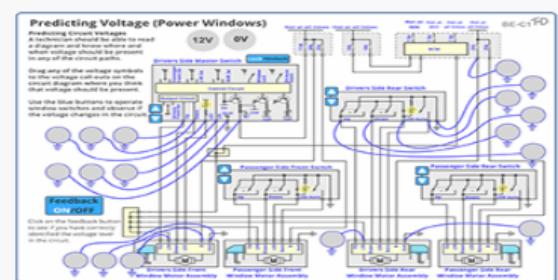


**Prediction Circuit Voltages  
BCM Courtesy Lamps**

BE\_PredictVolts07\_C1

Description

Updated September 2022

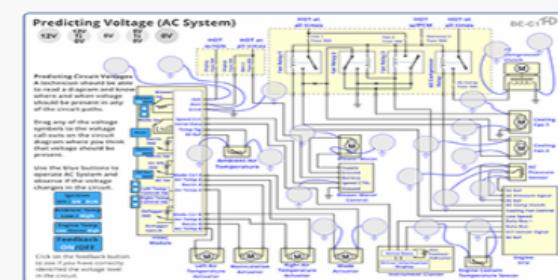


**Prediction Circuit Voltages  
Power Windows**

BE\_PredictVolts08\_C1

Description

Updated September 2022

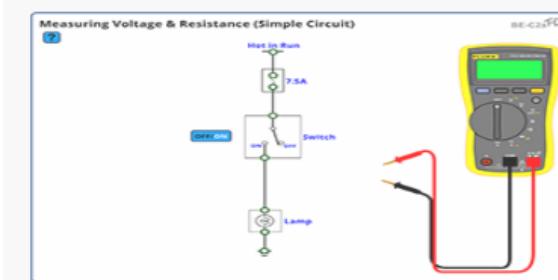


**Prediction Circuit Voltages  
AC Circuit**

BE\_PredictVolts09\_C1

Description

Updated September 2022

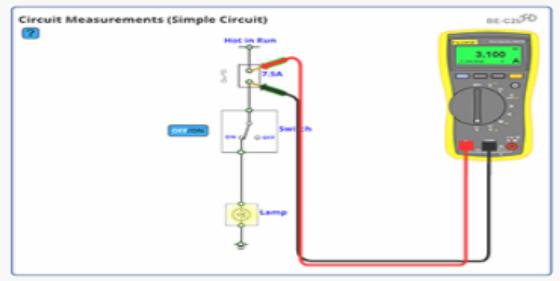


**Measure Voltage & Resistance  
Simple Circuit**

BE\_CircuitMeasure01\_C1a

Description

Updated September 2022

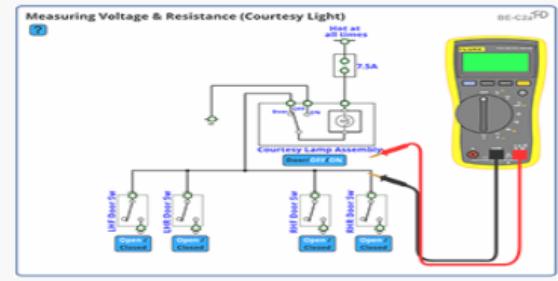


**Circuit Measurement  
Simple Circuit**

BE\_CircuitMeasure01\_C1b

Description

Updated September 2022

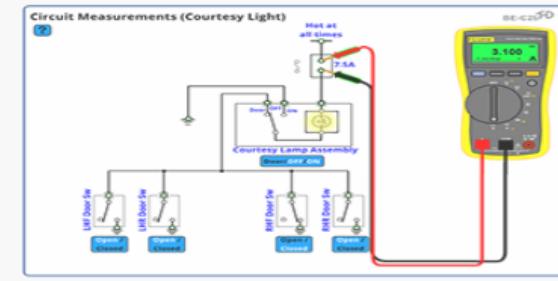


**Measure Voltage & Resistance  
Courtesy Lamp**

BE\_CircuitMeasure01\_C1a

Description

Updated September 2022

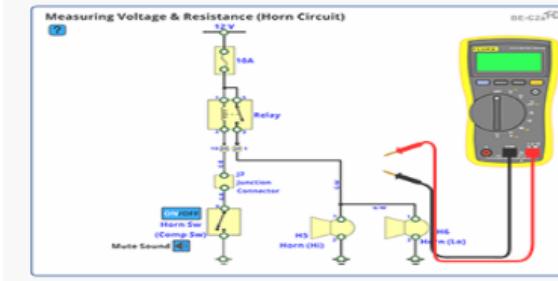


**Circuit Measurement  
Courtesy Lamp**

BE\_CircuitMeasure02\_C1b

Description

Updated September 2022

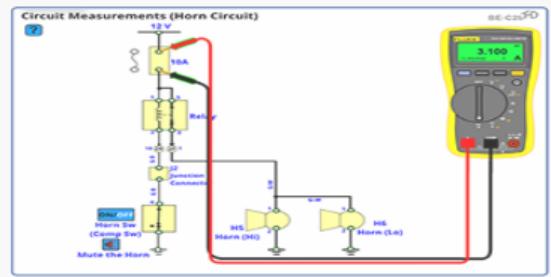


**Measure Voltage & Resistance  
Horn Circuit**

BE\_CircuitMeasure03\_C1a

Description

Updated September 2022

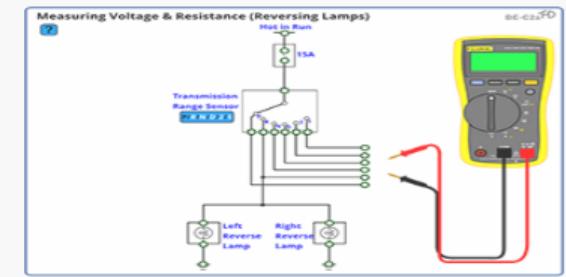


### Circuit Measurement Horn Circuit

BE\_CircuitMeasure03\_C1b

Description

Updated September 2022

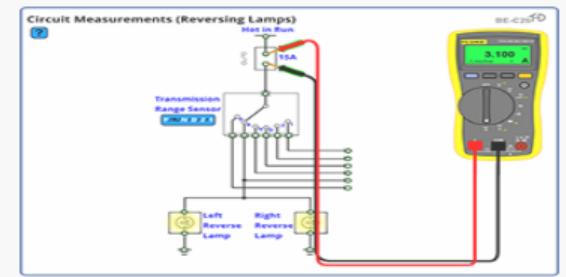


### Measure Voltage & Resistance Reversing Lamps

BE\_CircuitMeasure04\_C1a

Description

Updated September 2022

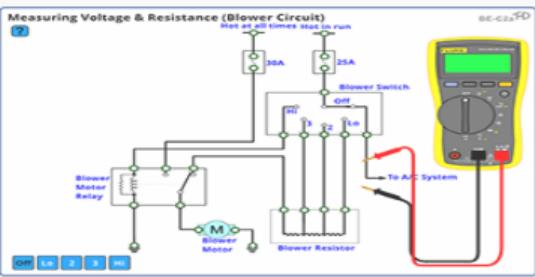


### Circuit Measurement Reversing Lamps

BE\_CircuitMeasure04\_C1b

Description

Updated September 2022

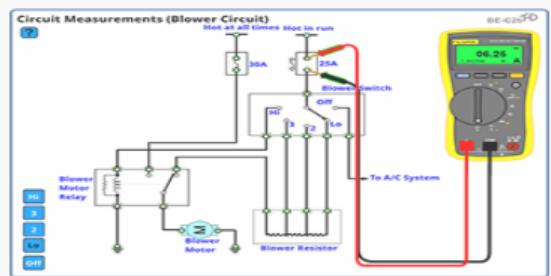


### Measure Voltage & Resistance Blower Circuit

BE\_CircuitMeasure05\_C1a

Description

Updated September 2022

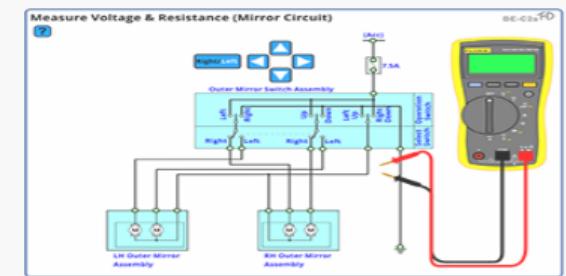


### Circuit Measurement Blower Circuit

BE\_CircuitMeasure05\_C1b

Description

Updated September 2022

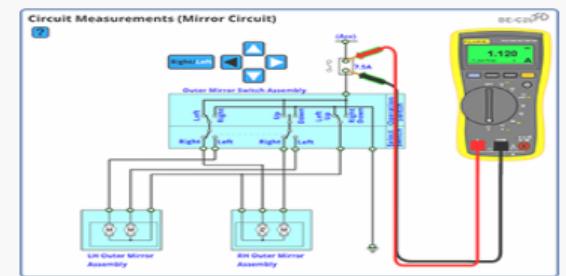


### Measure Voltage & Resistance Mirror Circuit

BE\_CircuitMeasure06\_C1a

Description

Updated September 2022

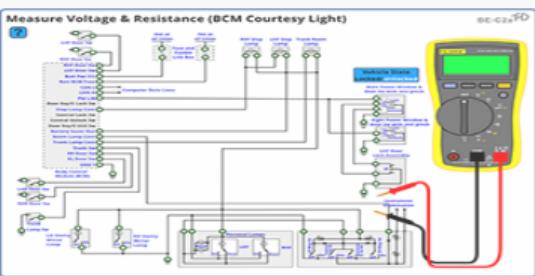


### Circuit Measurement Mirror Circuit

BE\_CircuitMeasure06\_C1b

Description

Updated September 2022

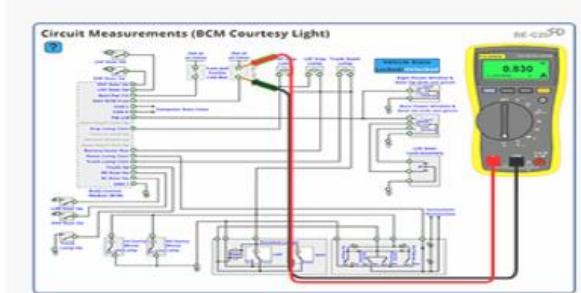


### Measure Voltage & Resistance BCM Courtesy Lamps

BE\_CircuitMeasure07\_C1a

Description

Updated September 2022

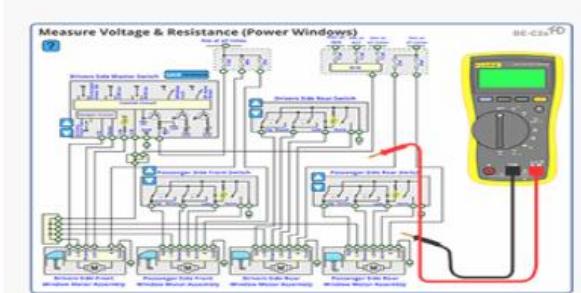


### Circuit Measurement BCM Courtesy Lamps

BE\_CircuitMeasure07\_C1b

Description

Updated September 2022

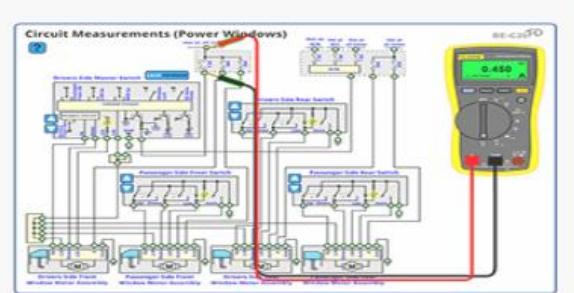


### Measure Voltage & Resistance Power Windows

BE\_CircuitMeasure08\_C1a

Description

Updated September 2022

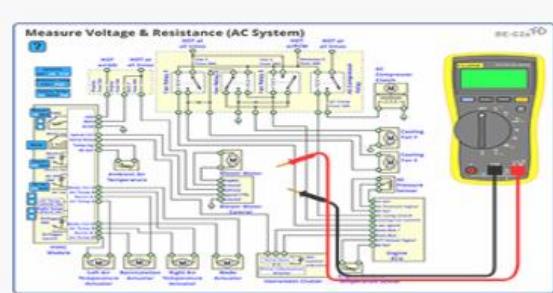


### Circuit Measurement Power Windows

BE\_CircuitMeasure08\_C1b

Description

Updated September 2022

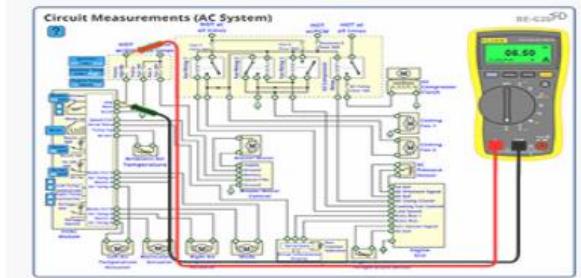


### Measure Voltage & Resistance AC Circuit

BE\_CircuitMeasure09\_C1a

Description

Updated September 2022

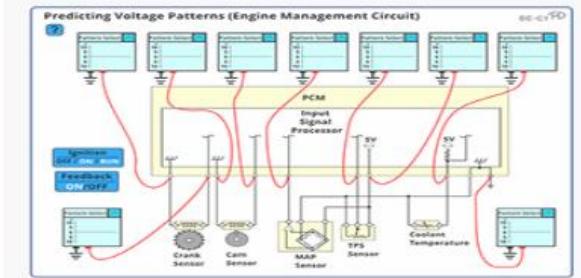


### Circuit Measurement AC Circuit

BE\_CircuitMeasure09\_C1b

Description

Updated September 2022

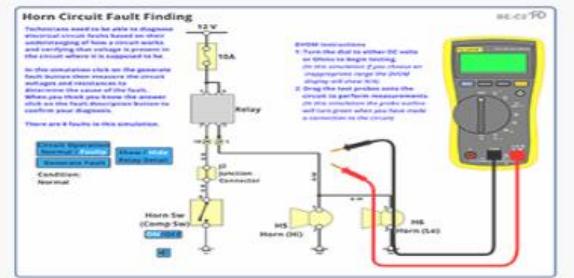


### Prediction Voltage Patterns

BE\_PredictSignal01\_C1

Description

Updated September 2022

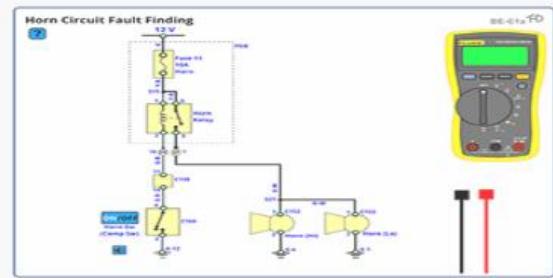


### Horn Circuit Multiple Faults with Feedback

BE\_HornCircuit\_MultipleFaults\_C1

Description

Updated September 2022

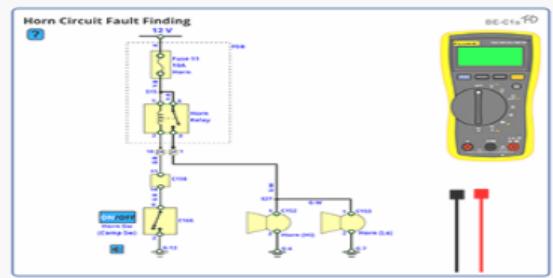


### Horn Circuit Fault No1

BE\_HornFault1\_C1

Blown Fuse

Updated September 2022

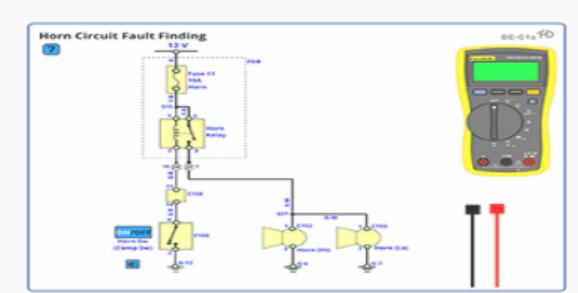


**Horn Circuit Fault No2**

BE\_HornFault2\_C1

Relay Coil Open

**Updated September 2022**

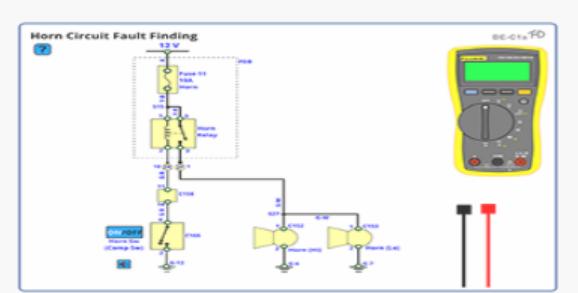


**Horn Circuit Fault No3**

BE\_HornFault3\_C1

Faulty Horn Sw

**Updated September 2022**

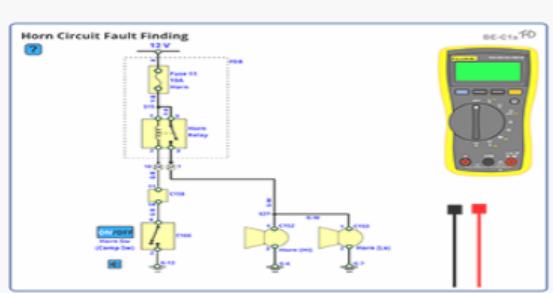


**Horn Circuit Fault No4**

BE\_HornFault4\_C1

Open circuit to Pin 10 of Connector 2K

**Updated September 2022**

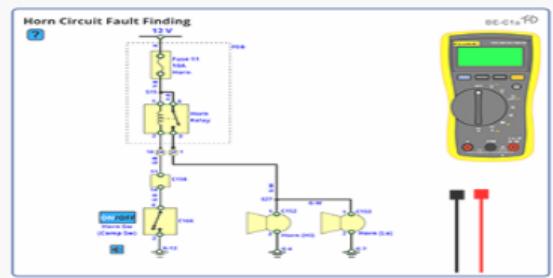


**Horn Circuit Fault No5**

BE\_HornFault5\_C1

Open circuit to Pin 5 of relay

**Updated September 2022**

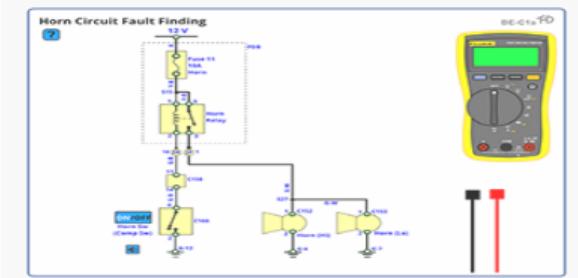


**Horn Circuit Fault No6**

BE\_HornFault6\_C1

Open circuit horn Sw ground wire

**Updated September 2022**

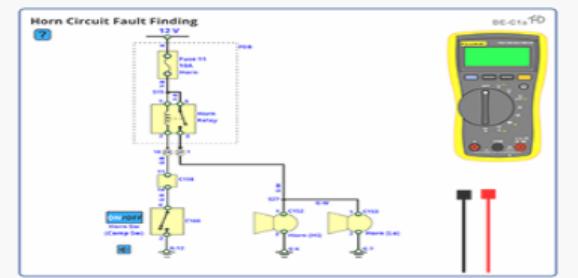


**Horn Circuit Fault No7**

BE\_HornFault7\_C1

Open circuit to Pin 1 of relay

**Updated September 2022**

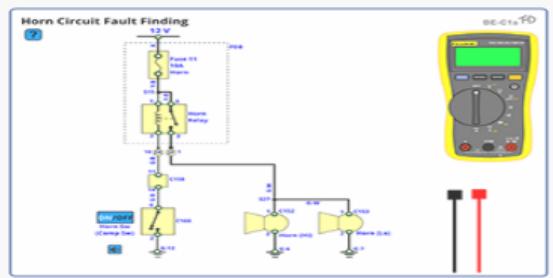


**Horn Circuit Fault No8**

BE\_HornFault7\_C1

Open circuit between relay and horns

**Updated September 2022**

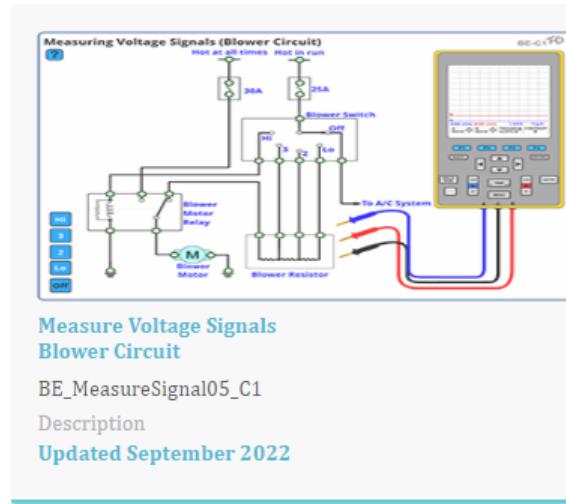
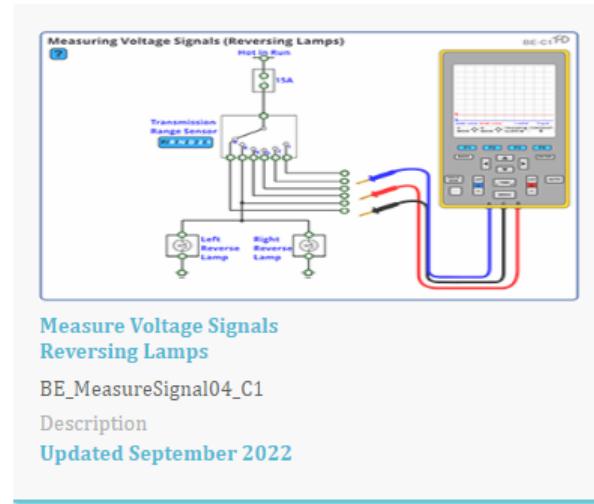
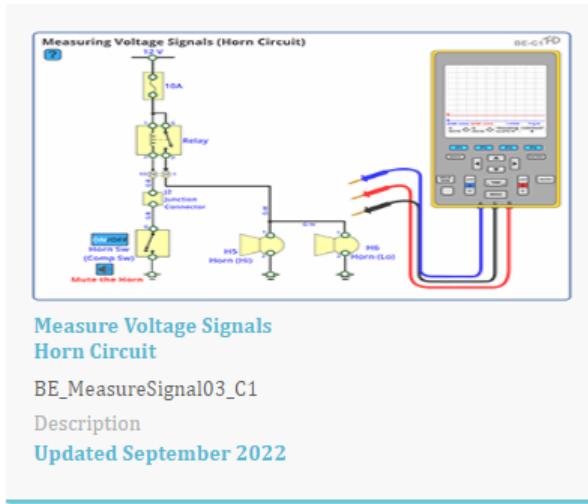
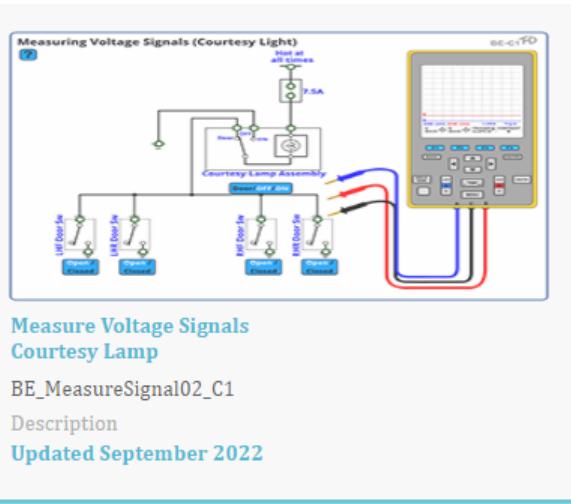
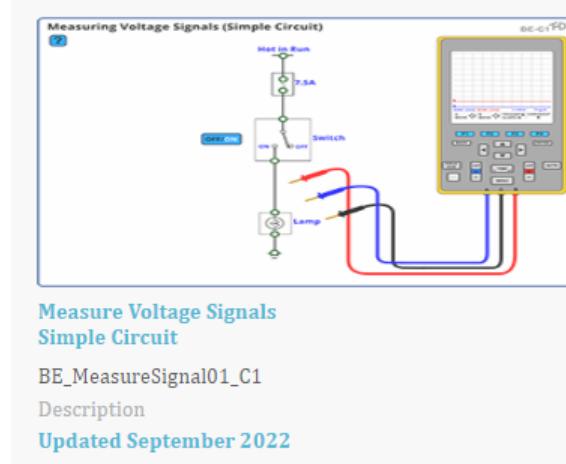
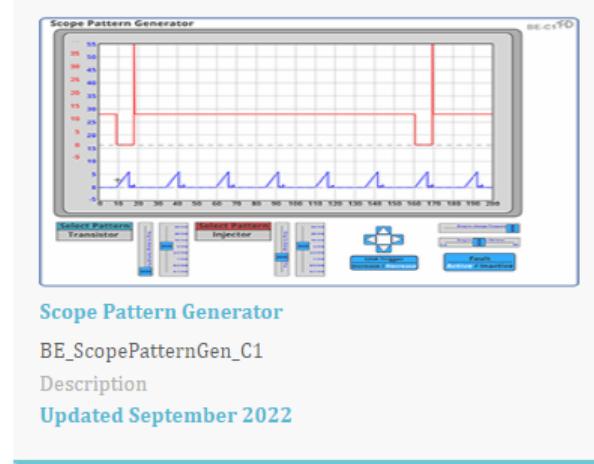
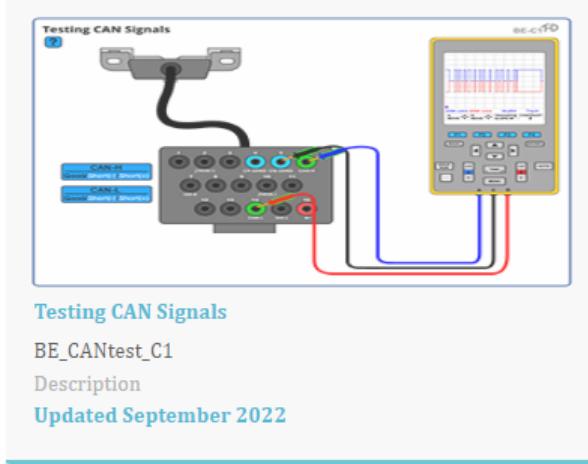
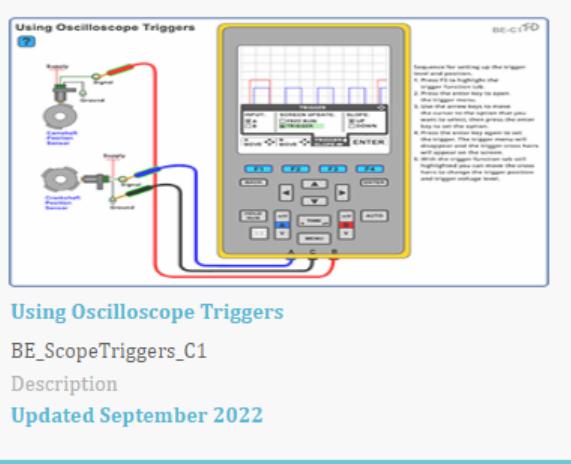


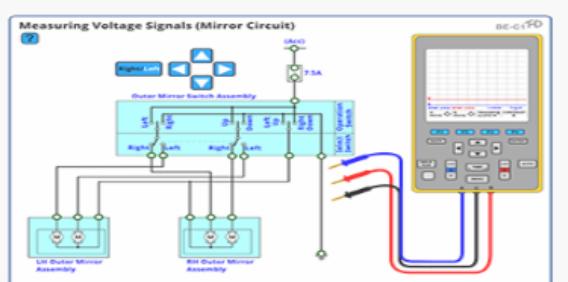
**Horn Circuit Fault No9**

BE\_HornFault9\_C1

Relay contacts faulty

**Updated September 2022**



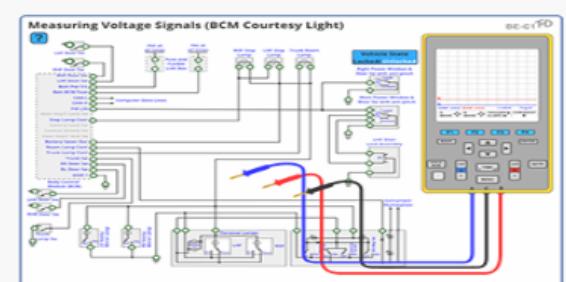


**Measure Voltage Signals  
Mirror Circuit**

BE\_MeasureSignal06\_C1

Description

Updated September 2022

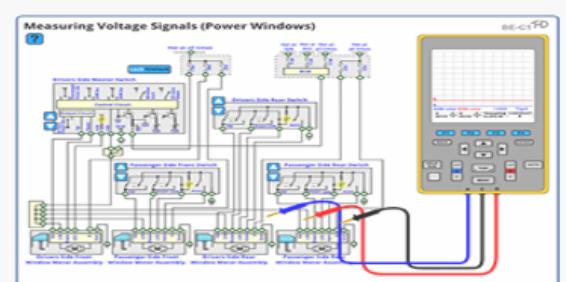


**Measure Voltage Signals  
BCM Courtesy Lamps**

BE\_MeasureSignal07\_C1

Description

Updated September 2022

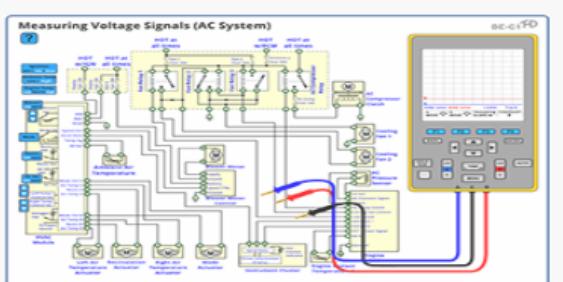


**Measure Voltage Signals  
Power Windows**

BE\_MeasureSignal08\_C1

Description

Updated September 2022

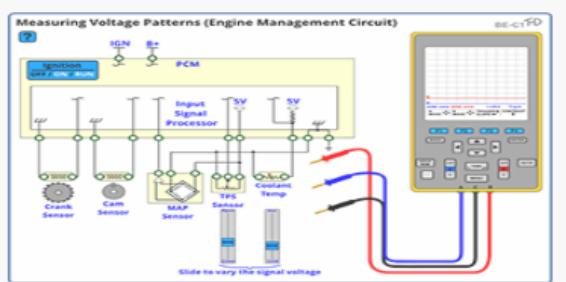


**Measure Voltage Signals  
AC System**

BE\_MeasureSignal09\_C1

Description

Updated September 2022

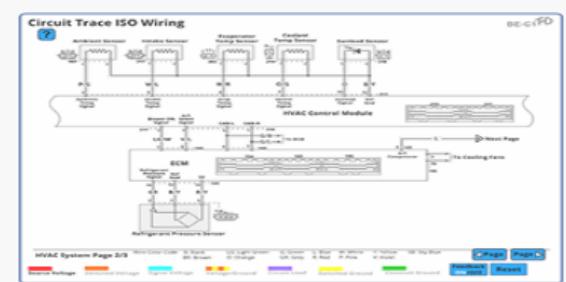


**Measure Voltage Signals  
Engine Management**

BE\_MeasureSignal10\_C1

Description

Updated September 2022

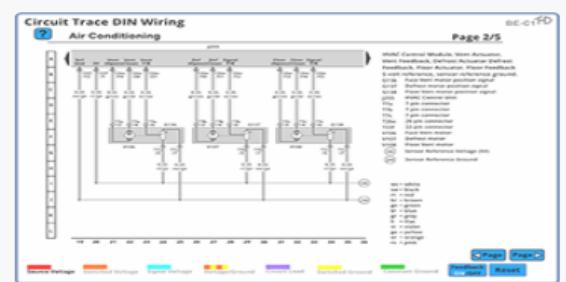


**Circuit Trace  
ISO wiring**

BE\_WireISOtrace\_C1

Description

Updated September 2022

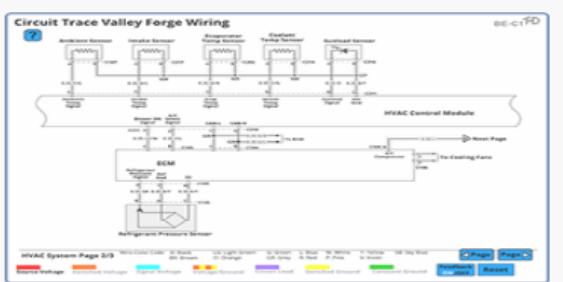


**Circuit Trace  
DIN wiring**

BE\_WireDINtrace\_C1

Description

Updated September 2022

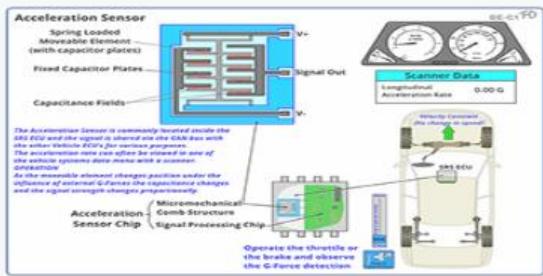


**Circuit Trace  
Valley Forge wiring**

BE\_WireVFtrace\_C1

Description

Updated September 2022

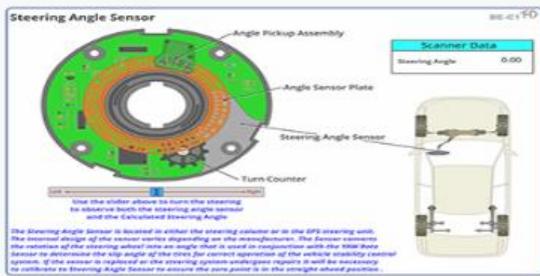


### Accelerometer

BE\_Accelerometer\_C1

Operating Principle of an Accelerometer

Updated September 2022

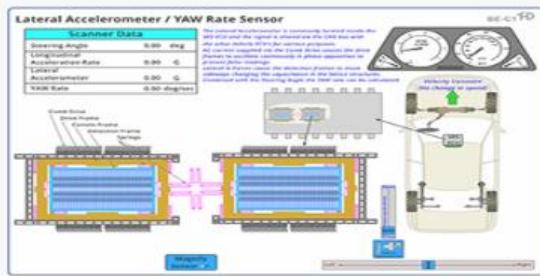


### Steering Angle Sensor

BE\_SteeringAngleSensor\_C1

Operating Principle of a Steering Angle Sensor

Updated September 2022

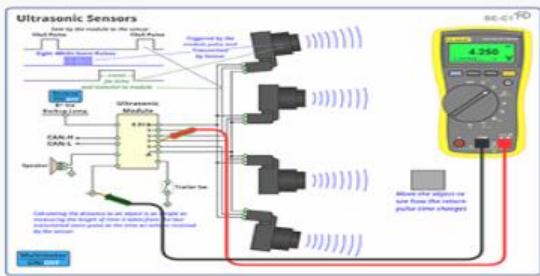


### Lateral Accelerometer/Yaw Rate Sensor

BE\_YAWsensor\_C1

Operating Principle of a Lateral Accelerometer

Updated September 2022

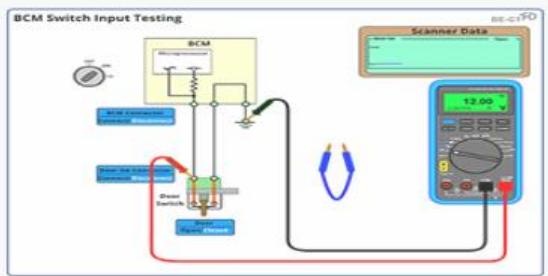


### Unltrasonic Sensors

BE\_ADAS\_02\_C1

Operating Principle & Testing a reverse parking assistant circuit

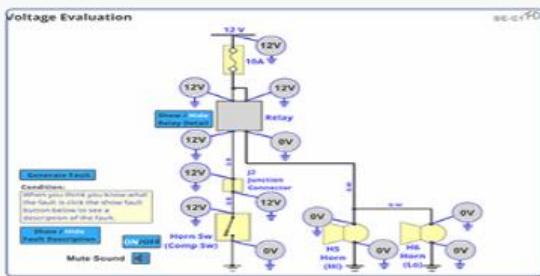
Updated September 2022



BE\_BCMswCircuit\_C1

Testing of a door switch input to a BCM

Updated September 2022

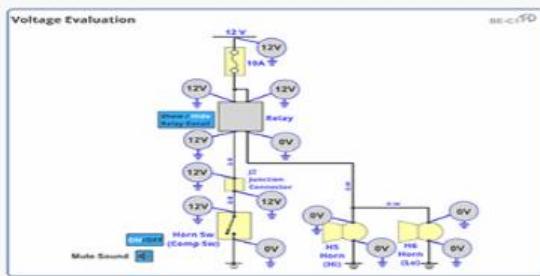


### Voltage Evaluation

BE\_EvalVoltHornAss00\_C1

Teacher Version of assessing Horn Circuit Voltages

Updated September 2022

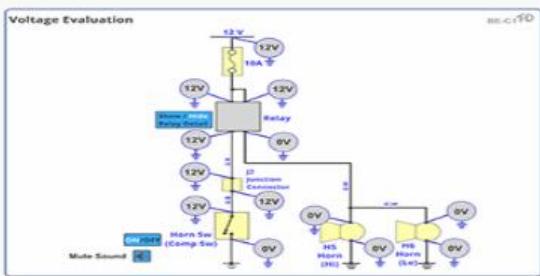


### Voltage Evaluation

BE\_EvalVoltHornAss01\_C1

Accesssion Version: Normal Operation

Updated September 2022

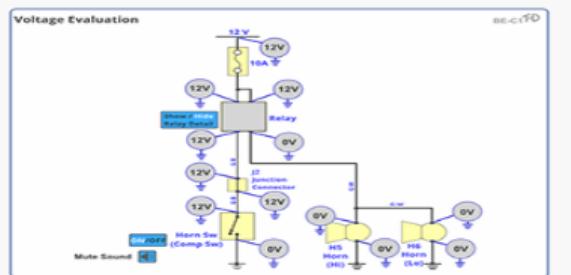


### Voltage Evaluation

BE\_EvalVoltHornAss02\_C1

Accesssion Version: Blown Fuse

Updated September 2022

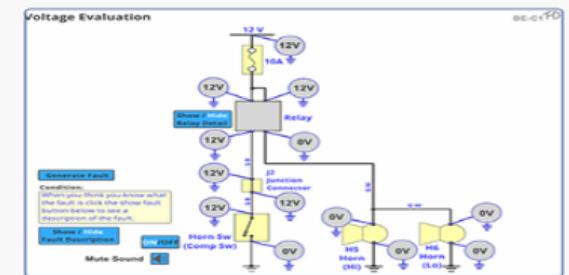


### Voltage Evaluation

BE\_EvalVoltHornAss03\_C1

Accession Version: Relay Coil Open

Updated September 2022

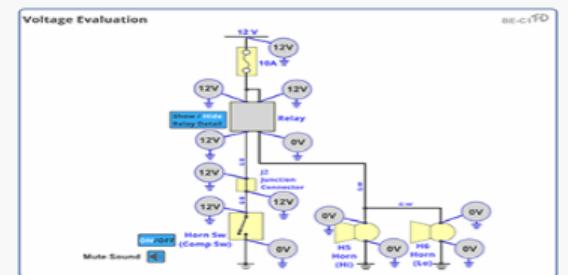


### Voltage Evaluation

BE\_EvalVoltHornAss04\_C1

Accession Version: Faulty Horn Switch

Updated September 2022

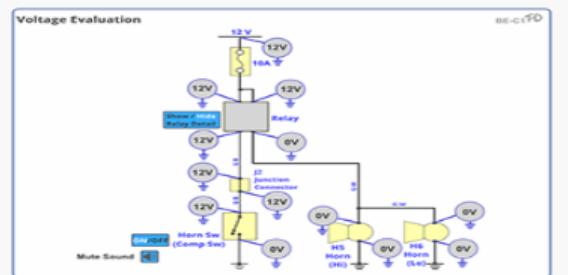


### Voltage Evaluation

BE\_EvalVoltHornAss05\_C1

Accession Version: Open Circuit between relay coil and horn switch

Updated September 2022

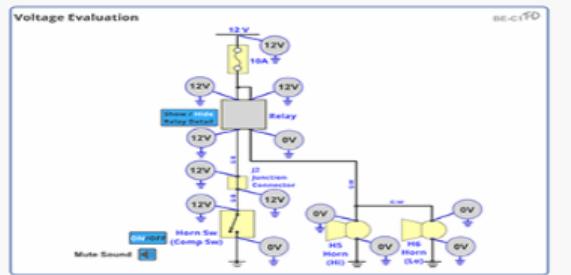


### Voltage Evaluation

BE\_EvalVoltHornAss06\_C1

Accession Version: No power to relay contacts

Updated September 2022

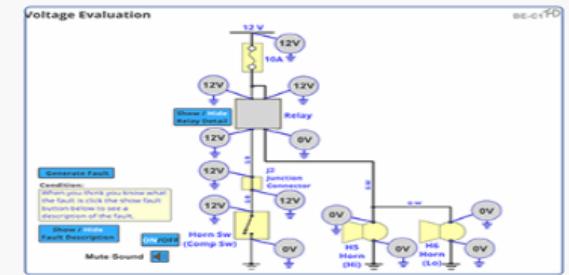


### Voltage Evaluation

BE\_EvalVoltHornAss07\_C1

Accession Version: Open circuit between horn switch and ground

Updated September 2022

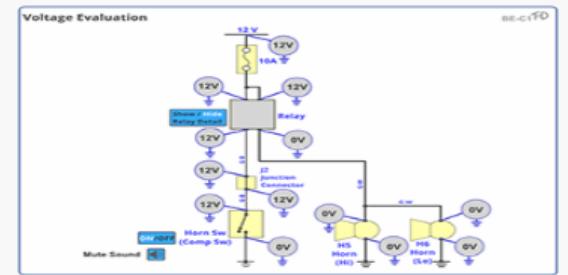


### Voltage Evaluation

BE\_EvalVoltHornAss08\_C1

Accession Version: No power to relay coil

Updated September 2022

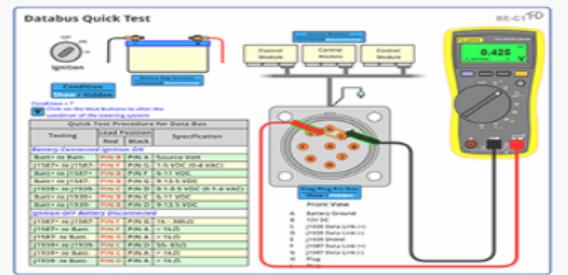


### Voltage Evaluation

BE\_EvalVoltHornAss09\_C1

Accession Version: Open Circuit between relay and both horns

Updated September 2022

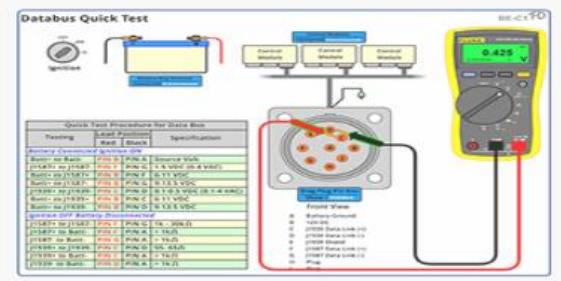
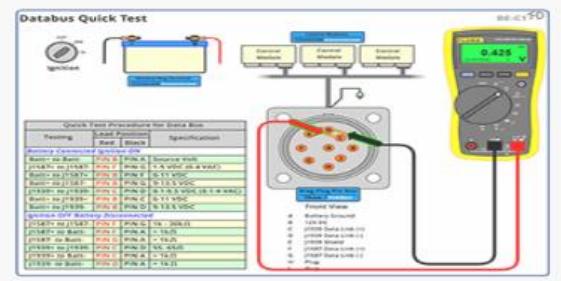
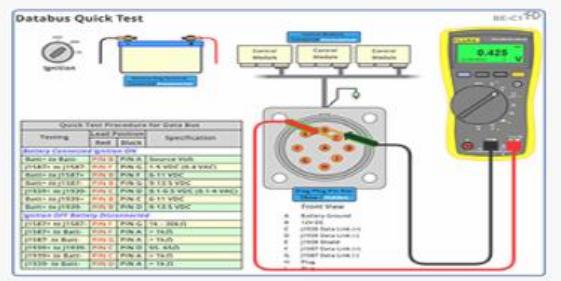
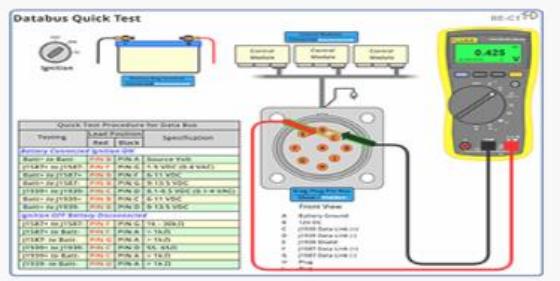
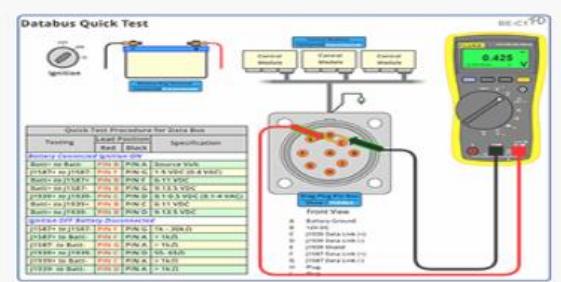
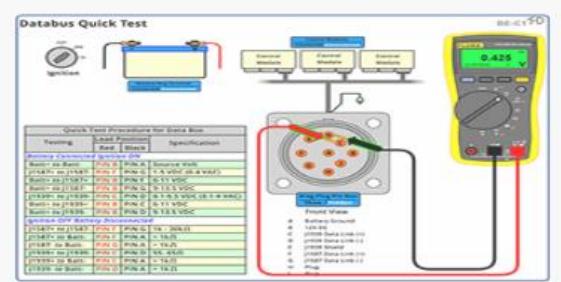
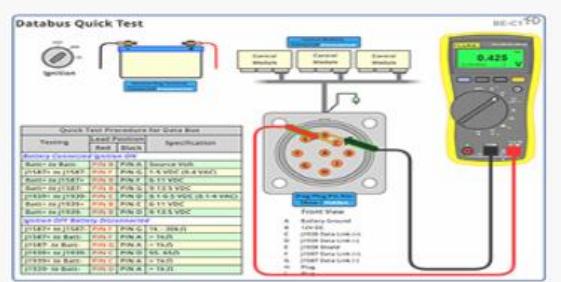
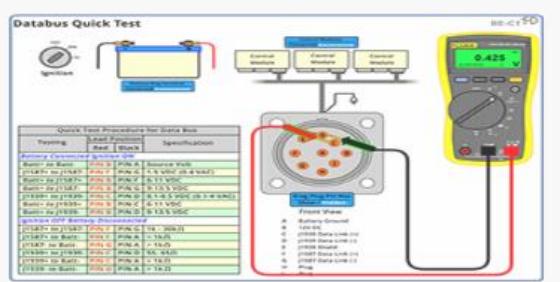


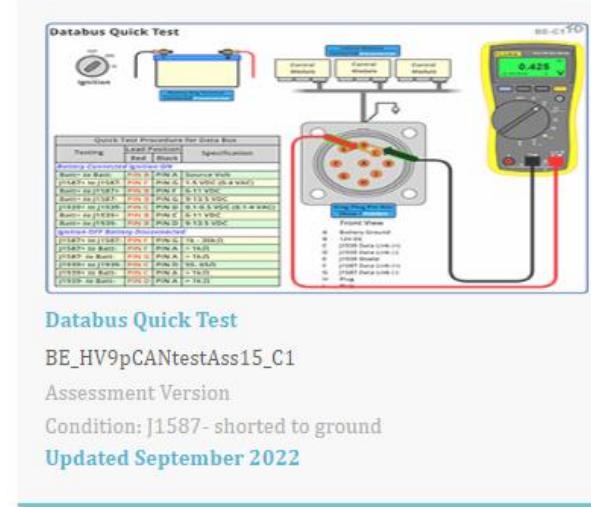
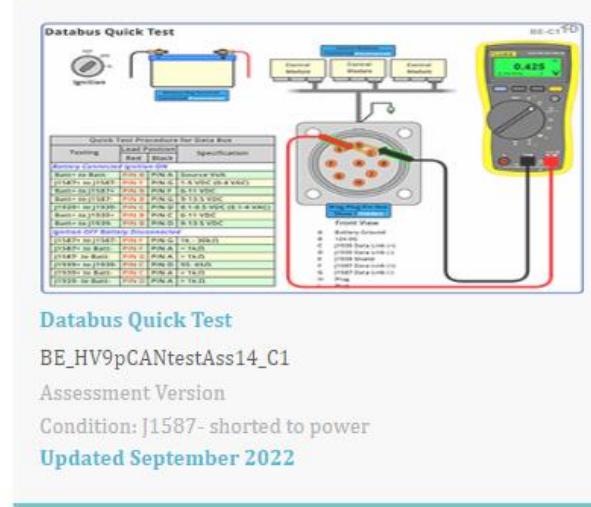
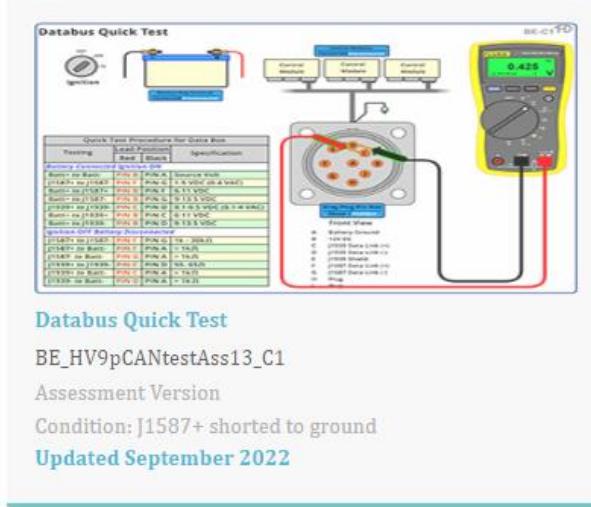
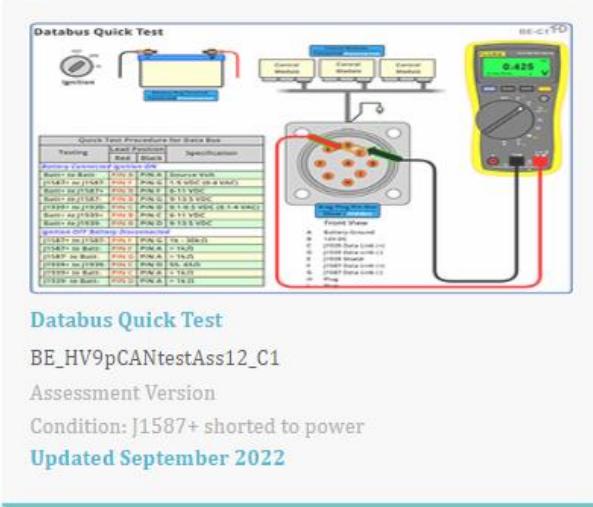
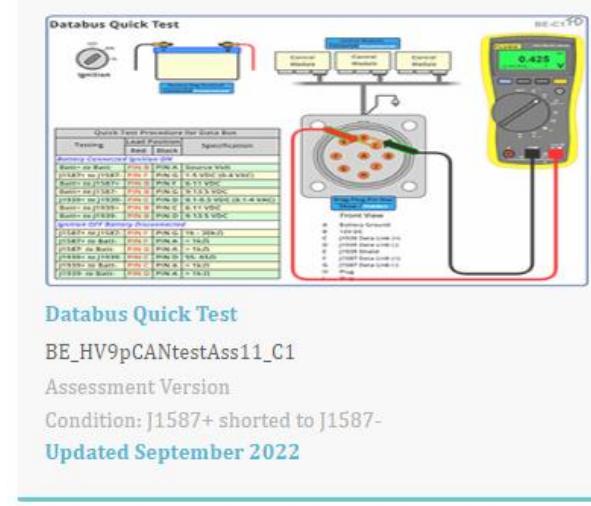
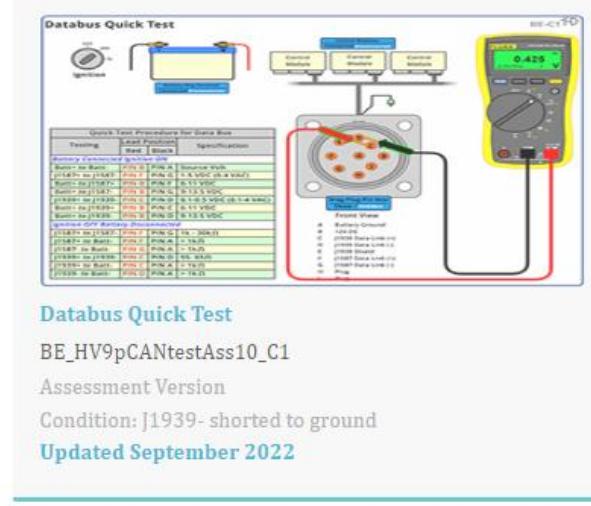
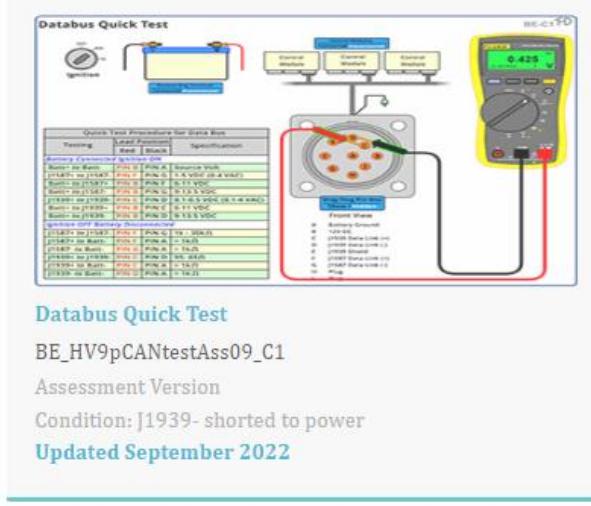
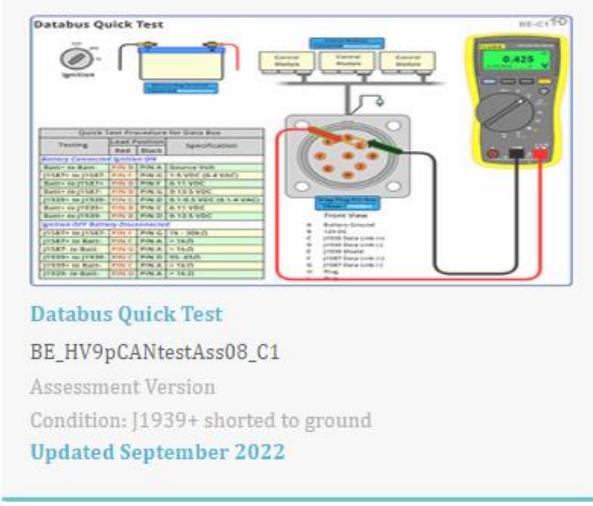
### Databus Quick Test

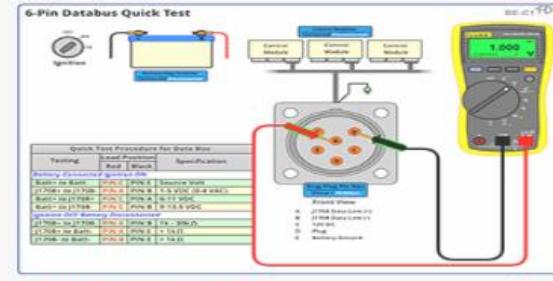
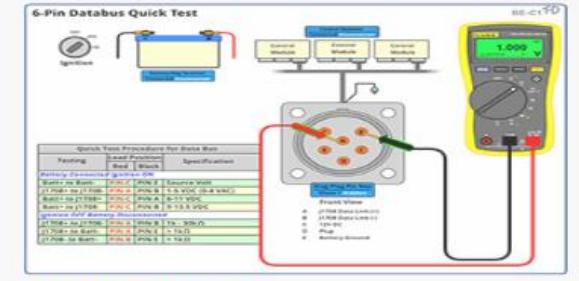
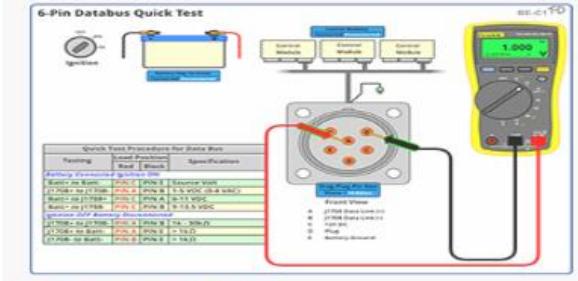
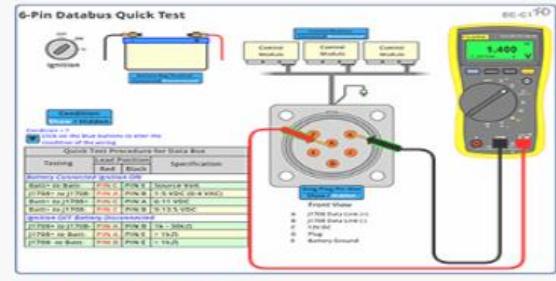
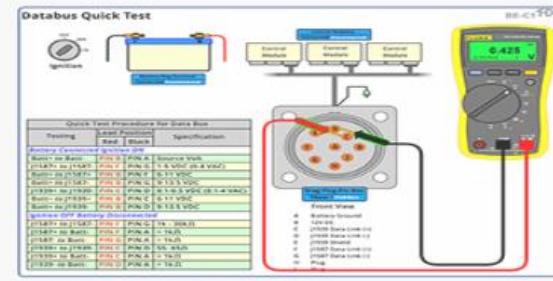
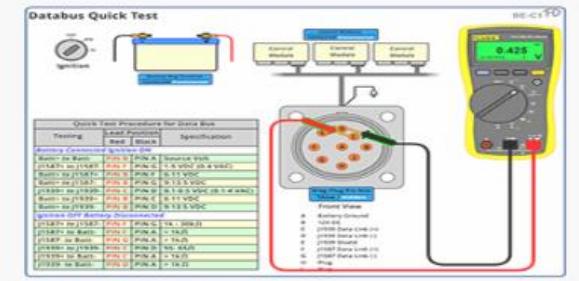
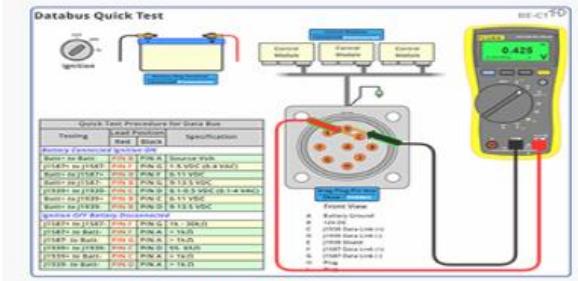
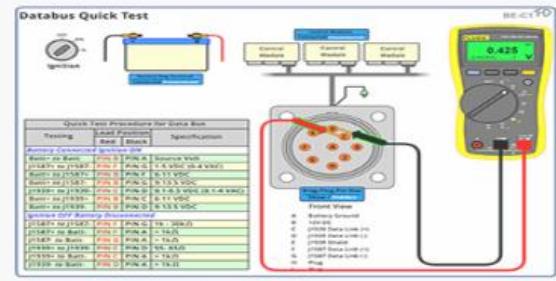
BE\_HV9pCANtestTM\_C1

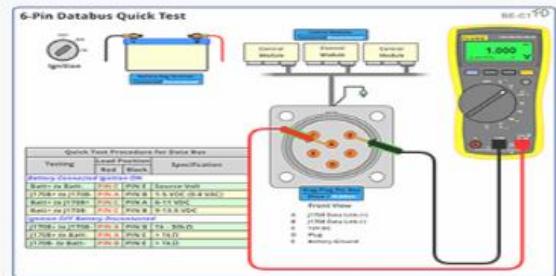
Teaching Version with multiple faults

Updated September 2022









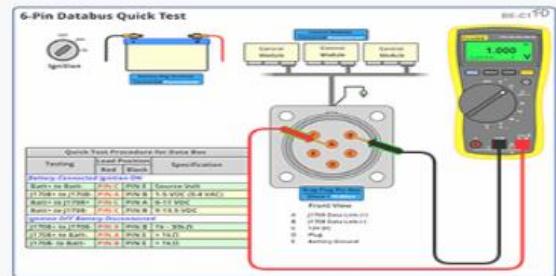
### 6-Pin Databus Quick Test

BE\_HV6pCANtestAss03\_C1

Assessment Version

Condition: J1708+ shorted to J1708-

Updated September 2022



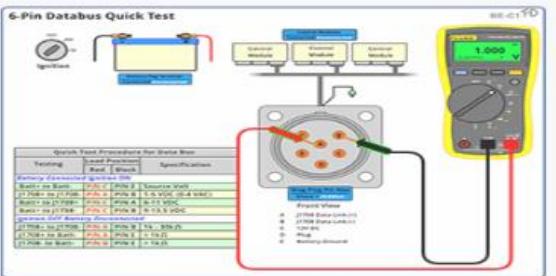
### 6-Pin Databus Quick Test

BE\_HV6pCANtestAss04\_C1

Assessment Version

Condition: J1708+ shorted to power

Updated September 2022



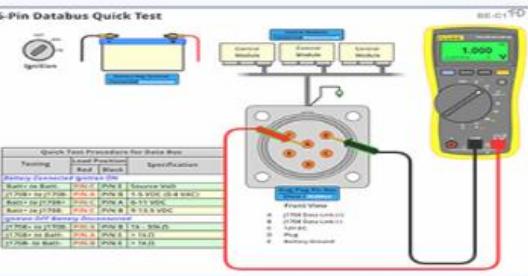
### 6-Pin Databus Quick Test

BE\_HV6pCANtestAss05\_C1

Assessment Version

Condition: J1708+ shorted to ground

Updated September 2022



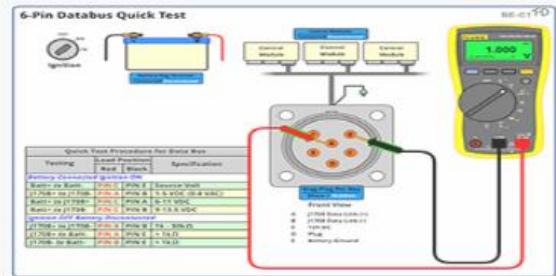
### 6-Pin Databus Quick Test

BE\_HV6pCANtestAss06\_C1

Assessment Version

Condition: J1708- shorted to power

Updated September 2022



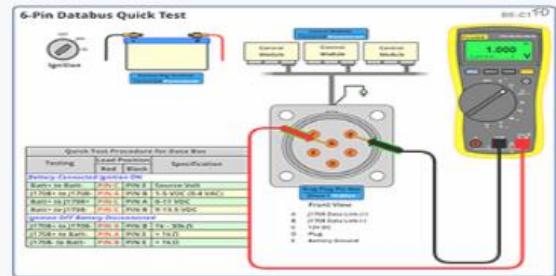
### 6-Pin Databus Quick Test

BE\_HV6pCANtestAss07\_C1

Assessment Version

Condition: J1708- shorted to ground

Updated September 2022



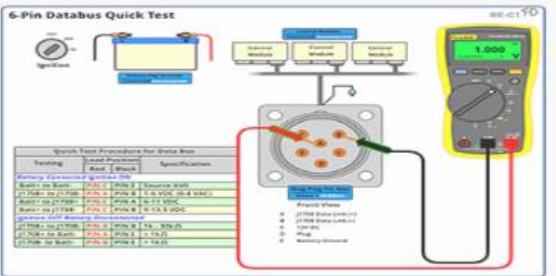
### 6-Pin Databus Quick Test

BE\_HV6pCANtestAss08\_C1

Assessment Version

Condition: Pins C and E swapped

Updated September 2022



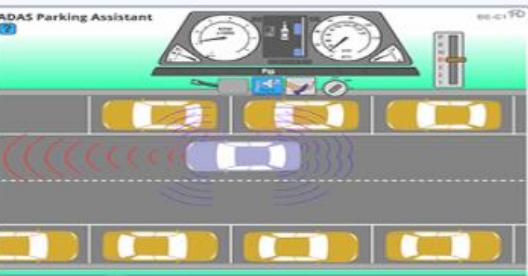
### 6-Pin Databus Quick Test

BE\_HV6pCANtestAss09\_C1

Assessment Version

Condition: Pins A and B swapped

Updated September 2022

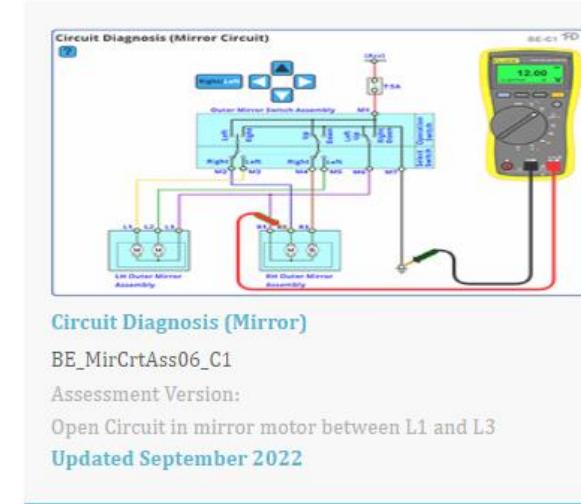
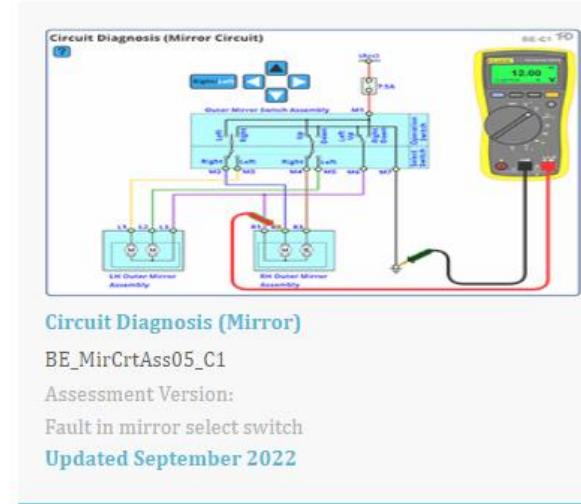
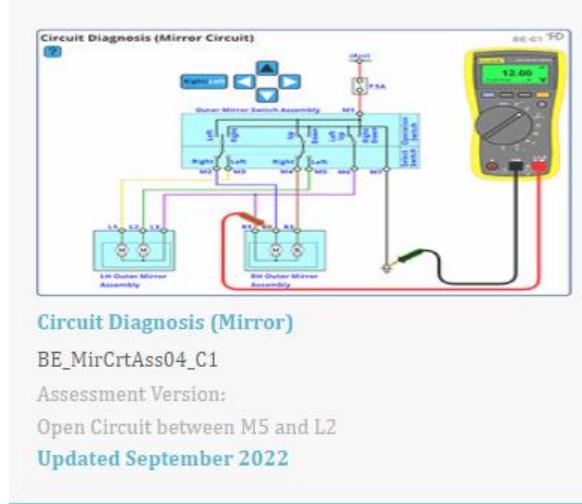
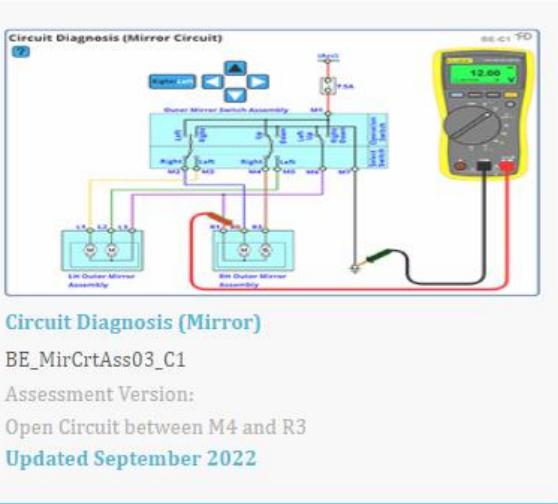
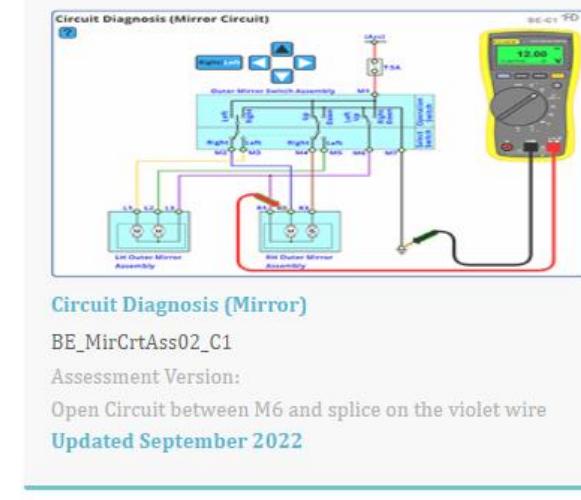
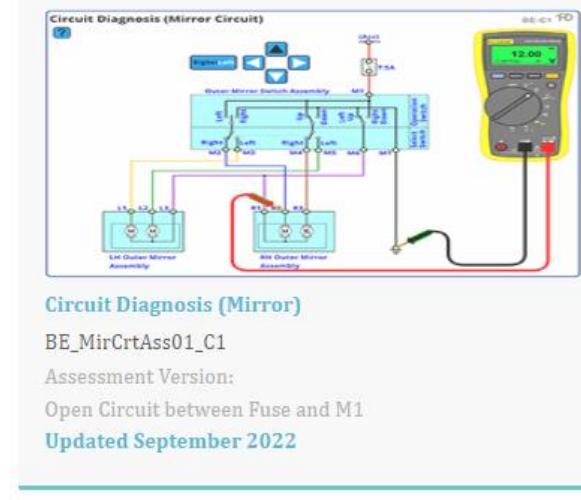
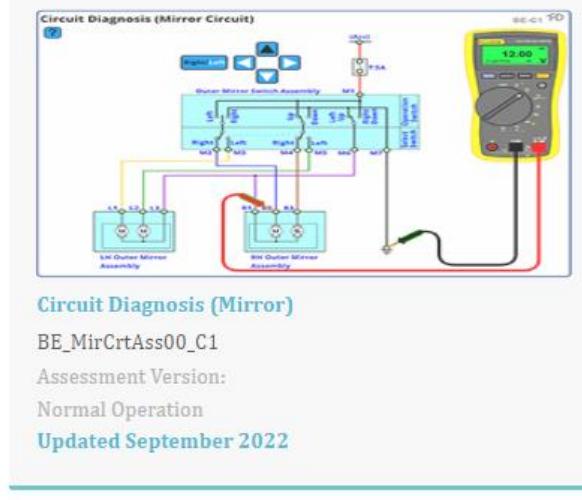
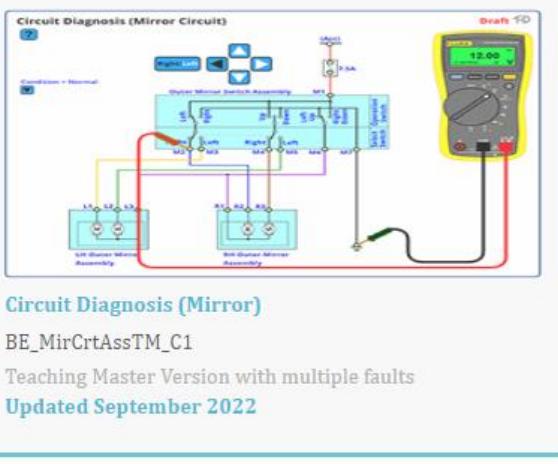


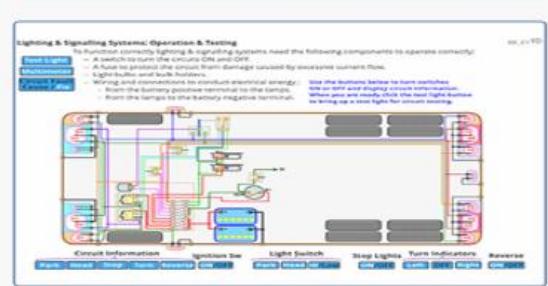
### ADAS Parking Assistant

BE\_ADAS\_01\_C1

Covers the operation of a parking assistance during reverse parking

Updated September 2022





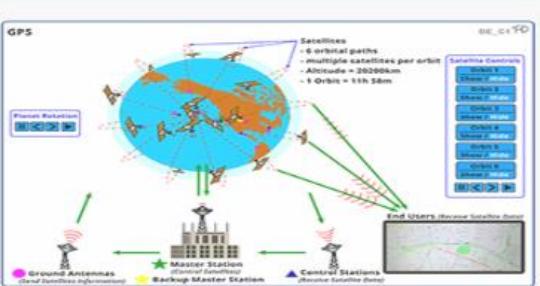
## Lighting & Signalling HV

BE\_LS\_HV\_C1

Description

Updated July 2022

Updated September 2022

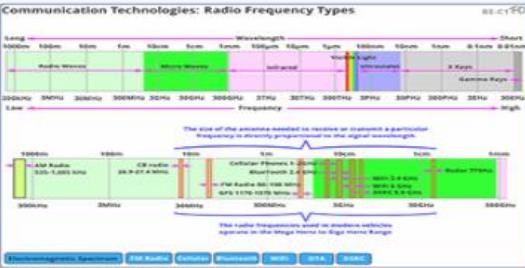


## GPS

BE\_GPS\_C1

Description

Updated September 2022

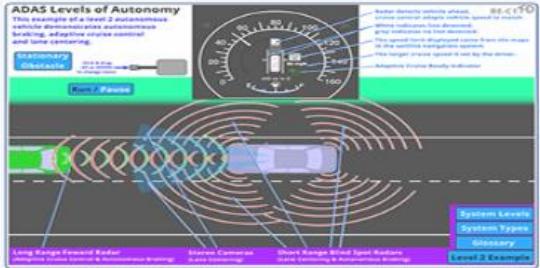


## Vehicle Communication Technologies

BE\_VehComs\_C1

Description

Updated September 2022

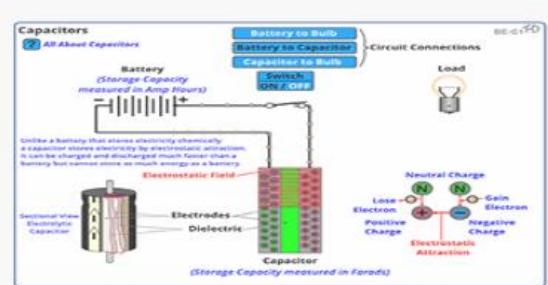


## ADAS Levels of Autonomy

BE\_ADAS\_04\_C1

Description

Updated September 2022

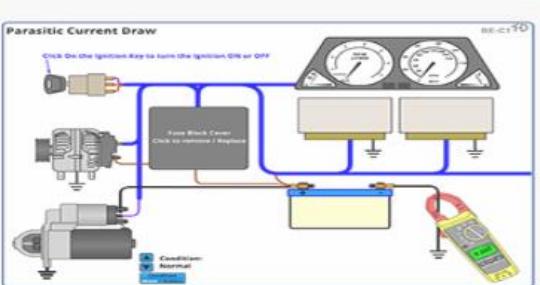


## Capacitors

BE\_Capacitors\_C1

Description

Updated September 2022

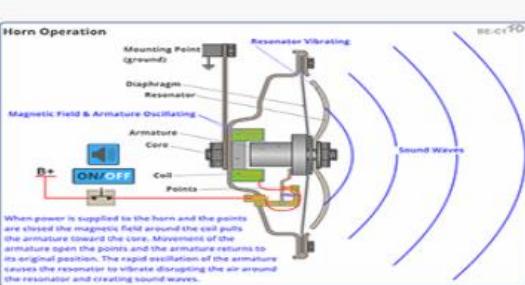


## Parasitic Current Draw

BE\_PSCD\_C1

Description

Updated September 2022

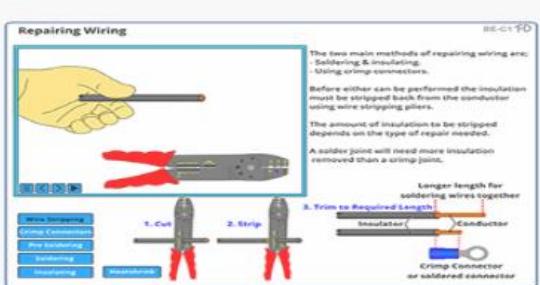


## Horn Operation

BE\_HornOp\_C1

Description

Updated September 2022

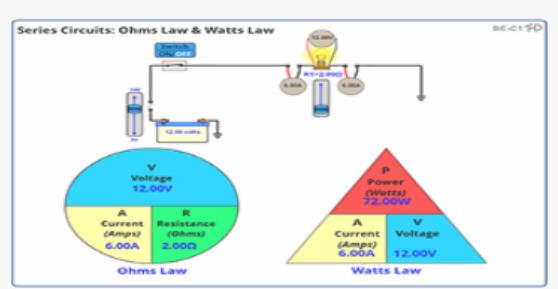


## Wiring Repair

BE\_WireRepair\_C1

Description

Updated September 2022

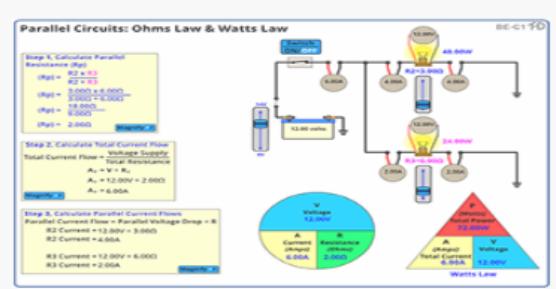


### Series Circuit: Ohms Law & Watts Law

BE\_OLseries\_C1

Description

Updated September 2022

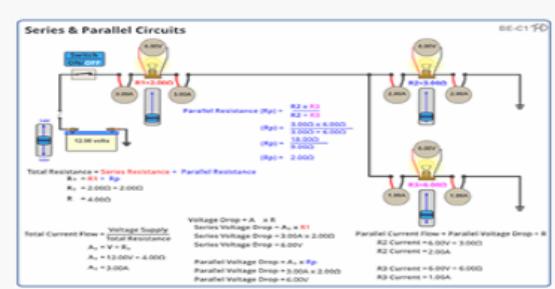


### Parallel Circuit: Ohms Law & Watts Law

BE\_OLparallel\_C1

Description

Updated September 2022

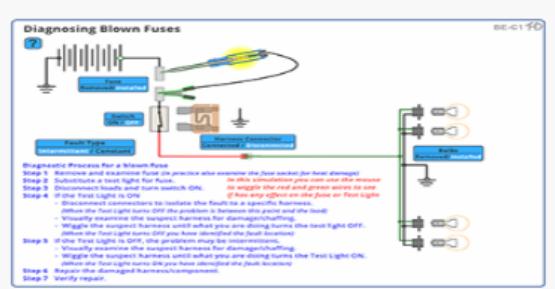


### Series & Parallel Circuits

BE\_SrPaDyn\_C1

Description

Updated September 2022

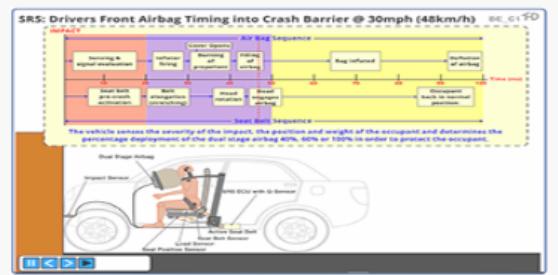


### Diagnosing Blown Fuses

BE\_BlwFuseDiag\_C1

Description

Updated September 2022

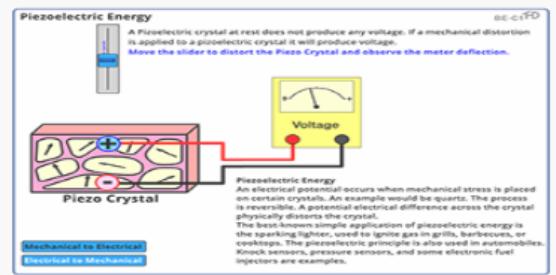


### SRS Crash Timing

BE\_SRSSop\_C1

Description

Updated September 2022

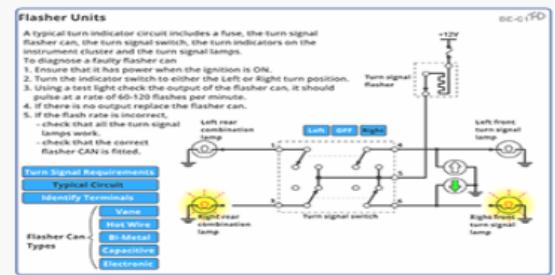


### Piezoelectric Energy

BE\_PizoCry\_C1

Covers how piezo crystals can both produce electricity and be distorted by electricity

Updated September 2022

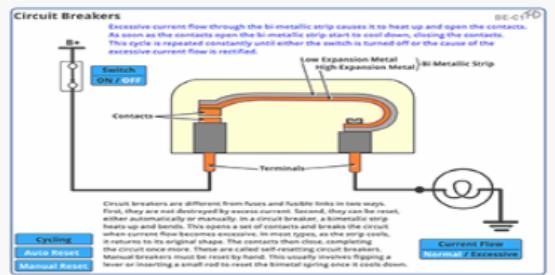


### Flasher Units

BE\_Flashers\_C1

Covers turn indicator circuits and the operation of different types of flasher units.

Updated September 2022



### Circuit Breakers

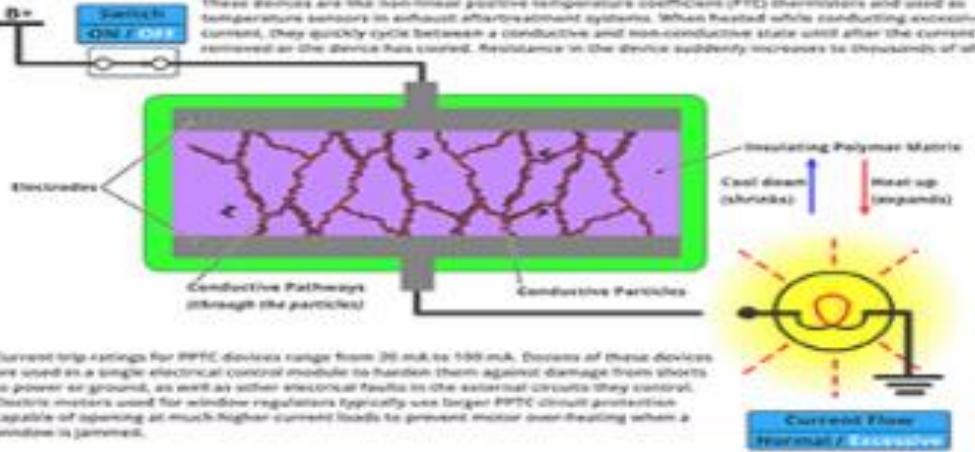
BE\_CircBreaker\_C1

Covers the three main types of circuit breakers.

Updated September 2022

### PTC Fuses

A polymeric positive temperature coefficient (PTC) device, commonly known as a resettable fuse, is a thermistor-like electronic device used to protect against circuit overcurrents. These devices are like non-linear positive temperature coefficient (PTC) thermistors and used as temperature sensors in exhaust after-treatment systems. When heated while conducting excessive current, they quickly cycle between a conductive and non-conductive state until after the current is removed or the device has cooled. Resistance in the device suddenly increases to thousands of ohms.



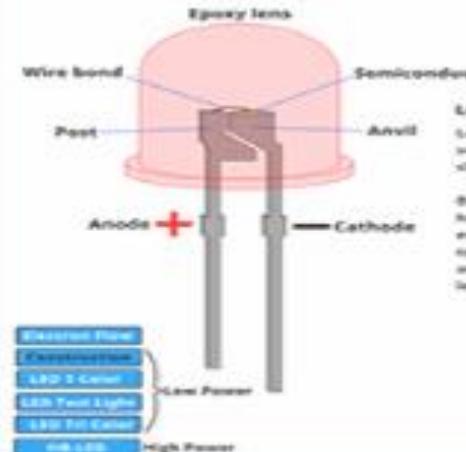
### PTC Fuse

BE\_PTCfuse\_C1

Covers the operation of PTC fuses.

**Updated September 2022**

### LED's



Because an LED operates like a conventional diode, polarity must be observed when connecting an LED. Like other diodes, LEDs generate light when connected correctly in a circuit. Individual LEDs operate at relatively low voltages between one and four volts, and drive currents between 10 and 40 mA. Current above these levels can melt an LED chip.

### Light Emitting Diodes (LED)

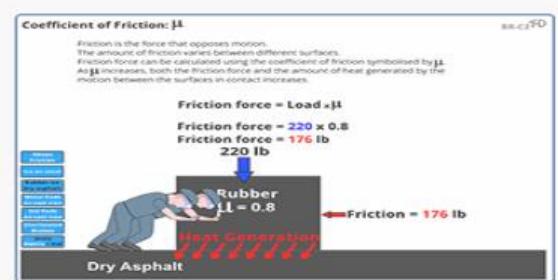
BE\_LEDs\_C1

Covers the construction, Types and operation of LED's.

**Updated September 2022**

# BR Series

# Braking Systems

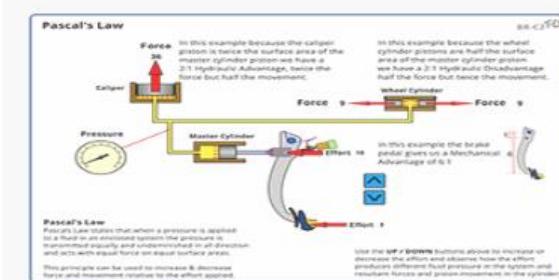


## Coefficient of Friction

BR\_Friction\_C1

Description

Updated September 2022

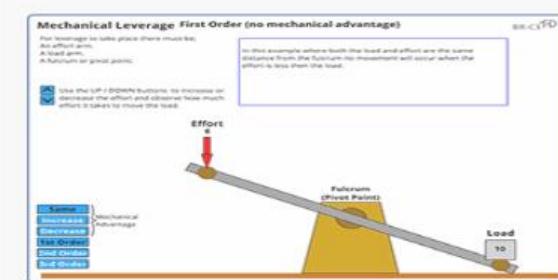


## Pascal's Law

BR\_PascalsLaw\_C1

Description

Updated September 2022

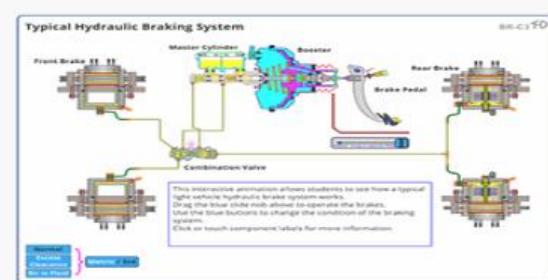


## Mechanical Leverage

BR\_Leverage\_C1

Description

Updated September 2022

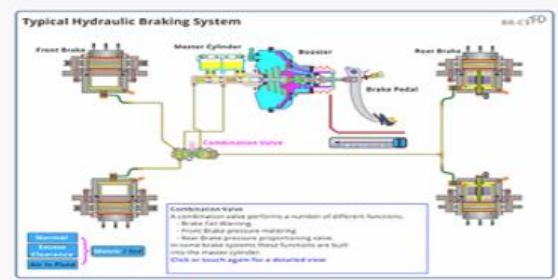


## Typical Hydraulic Brake System

BR\_BasicHydBrakeSys\_C1

Description

Updated September 2022

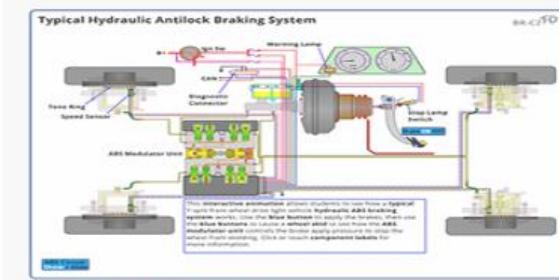


## Typical Hydraulic Brake System

BR\_HydBrakeMaster\_C1

Description

Updated September 2022

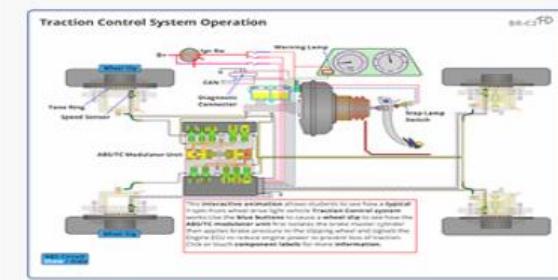


## Typical Hydraulic ABS System

BR\_HydABSSystem\_C1

Description

Updated September 2022

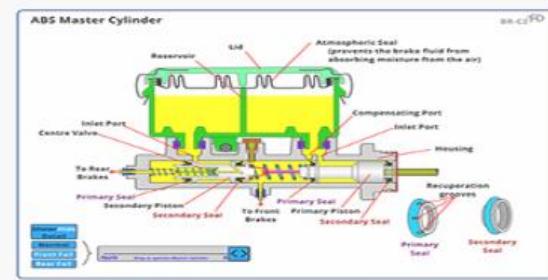


## Traction Control System

BR\_HydTC\_Op\_C1

Description

Updated September 2022

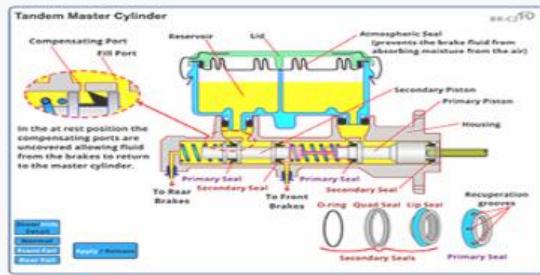


## ABS Master Cylinder

BR\_ABS\_Mc\_C1

Description

Updated September 2022

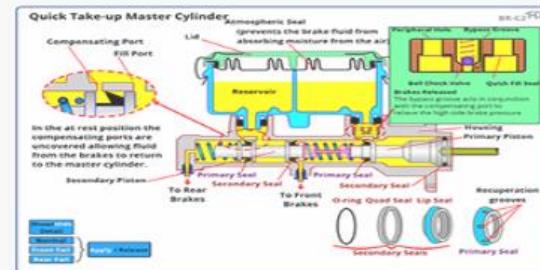


### Tandem Master Cylinder

BR\_TandemMc\_C1

Description

Updated September 2022

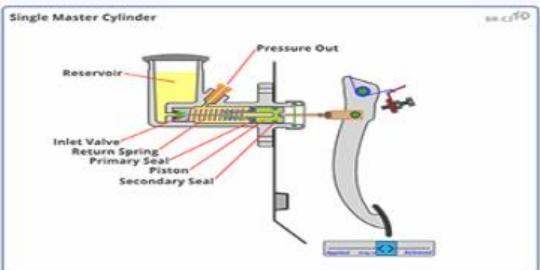


### Quick Take-up Master Cylinder

BR\_QuTakeUpMc\_C1

Description

Updated September 2022

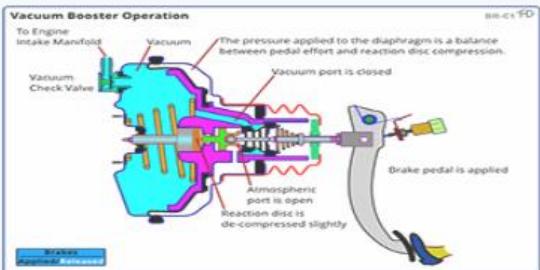


### Single Master Cylinder

BR\_SingleMc\_C1

Description

Updated September 2022

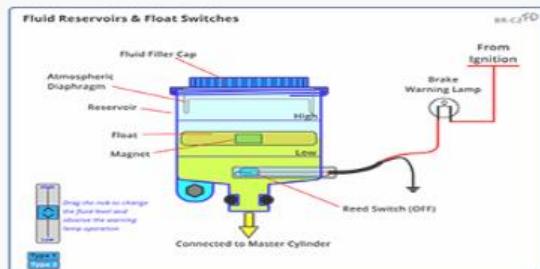


### Vacuum Booster Operation

BR\_VacBoosterOp\_C1

Description

Updated September 2022

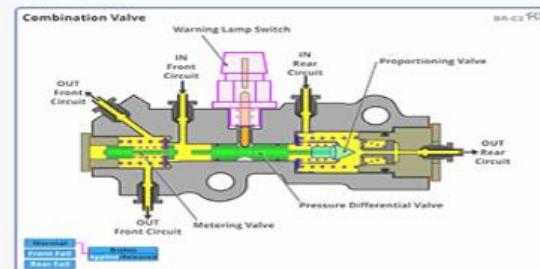


### Fluid Reservoirs and Float Switches

BR\_BrakeReservoirs\_C1

Description

Updated September 2022



### Combination Valve

BR\_CombinationValve\_C2

Description

Updated September 2022

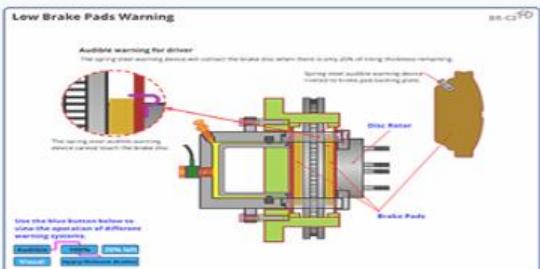


### Disc Brake Types and Inspection

BR\_BrakeDiscInspection\_C1

Description

Updated September 2022

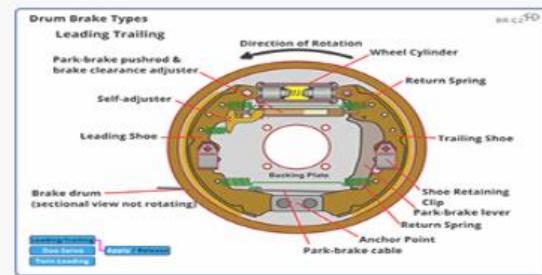
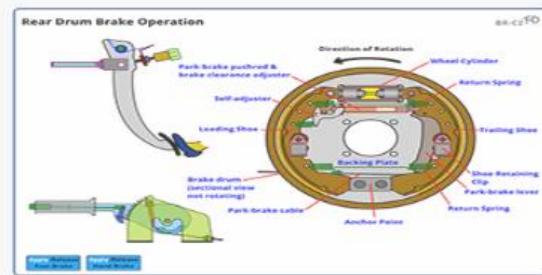
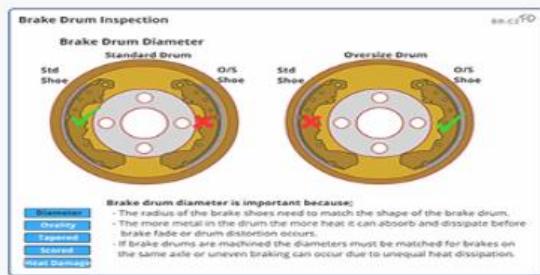
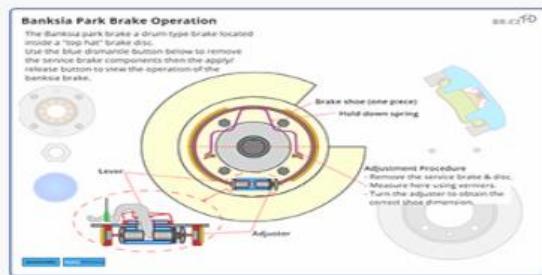
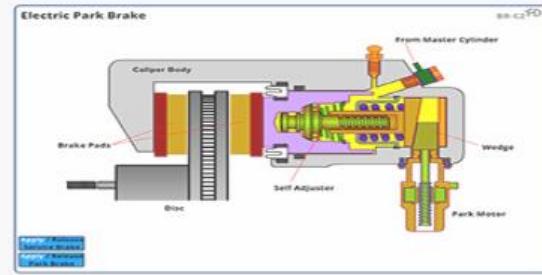
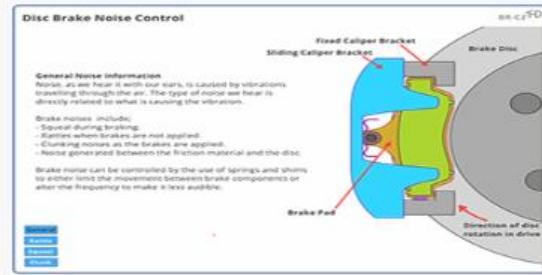
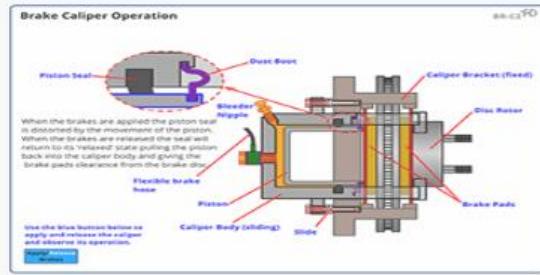
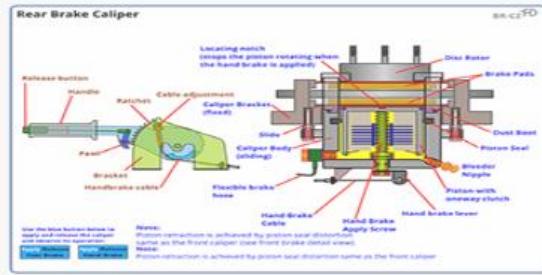


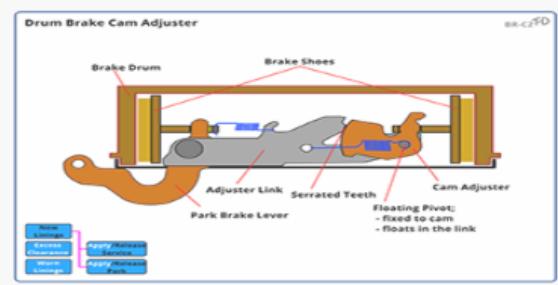
### Low Brake Pad Warning

BR\_LowPadWarning\_C1

Description

Updated September 2022



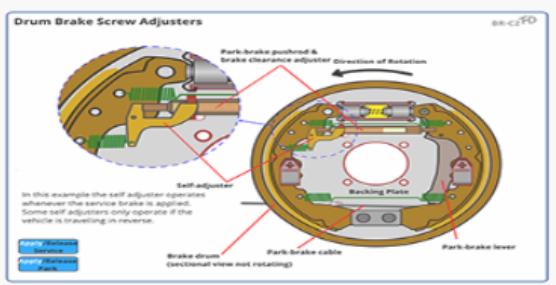


### Drum Brake Cam Adjusters

BR\_DrumCamAdjuster\_C1

Description

Updated September 2022

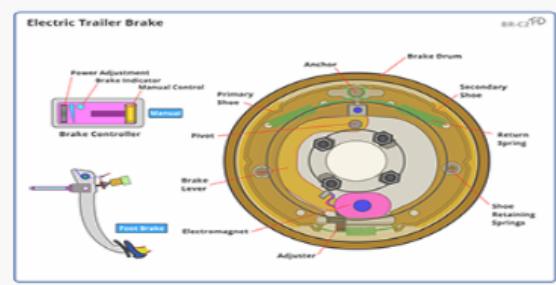


### Drum Brake Screw Adjusters

BR\_DrumScrewAdjuster\_C1

Description

Updated September 2022

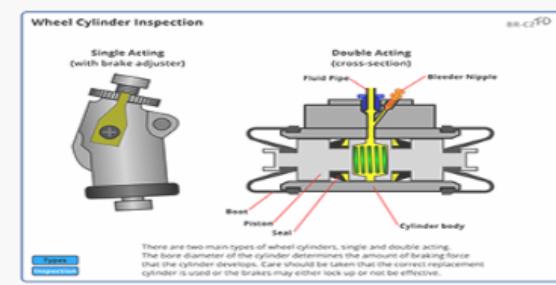


### Electric Trailer Brakes

BR\_ElectricBrake\_C1

Description

Updated September 2022

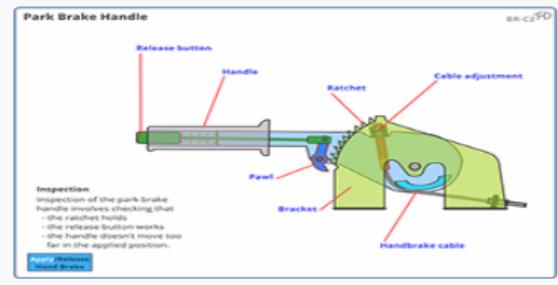


### Wheel Cylinder Inspection

BR\_WheelCylInspect\_C1

Description

Updated September 2022

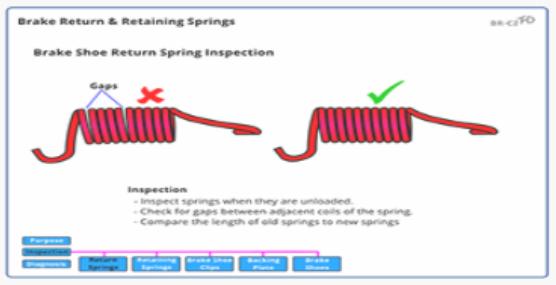


### Park Brake Handle

BR\_ParkHandBrake\_C1

Description

Updated September 2022

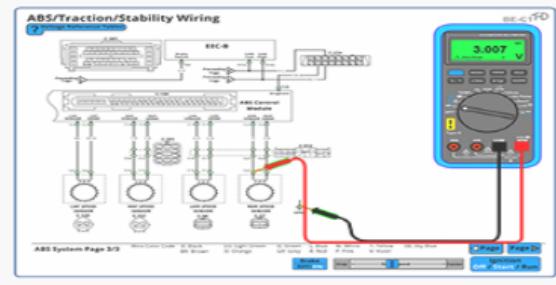


### Brake Component Inspection

BR\_BrakeCompInsp\_C1

Description

Updated September 2022

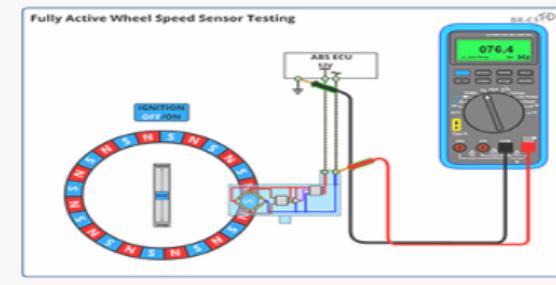


### ABS/Traction/Stability Wiring

BR\_ABSwiringTest\_C1

Description

Updated September 2022

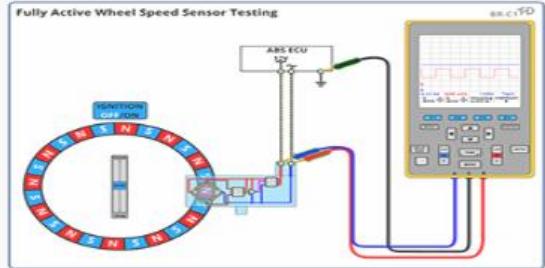


### Fully Active Wheel Speed Sensor Testing

BR\_ABSFactivST\_C1

Description

Updated September 2022

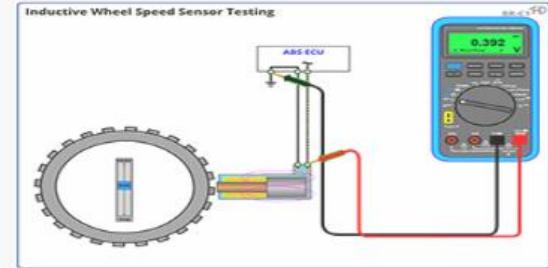


### Fully Active Wheel Speed Sensor Testing

BR\_ABSactivOS\_C1

Description

Updated September 2022

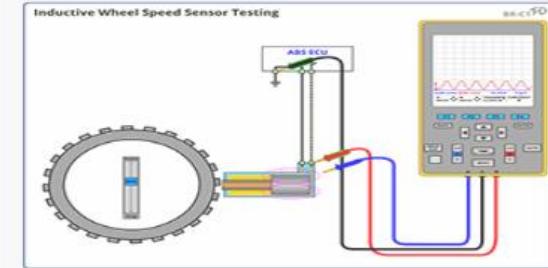


### Inductive Wheel Speed Sensor Testing

BR\_ABSIndST\_C1

Description

Updated September 2022

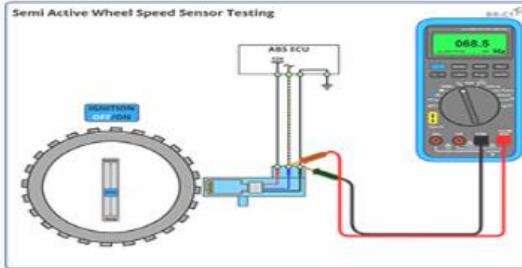


### Inductive Wheel Speed Sensor Testing

BR\_ABSIndOS\_C1

Description

Updated September 2022

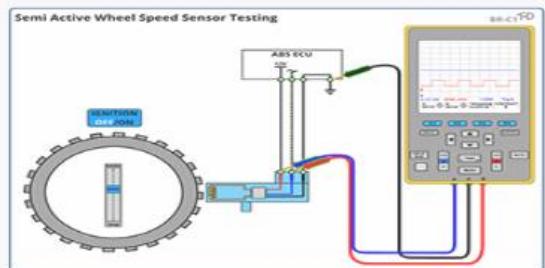


### Semi Active Wheel Speed Sensor Testing

BR\_ABSSactivST\_C1

Description

Updated September 2022

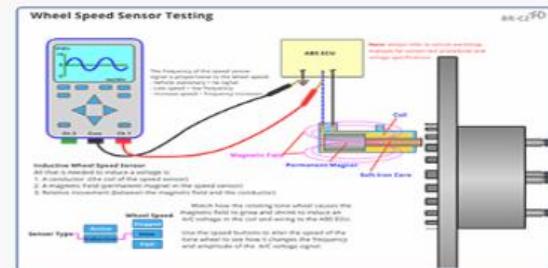


### Semi Active Wheel Speed Sensor Testing

BR\_ABSSactivOC\_C1

Description

Updated September 2022

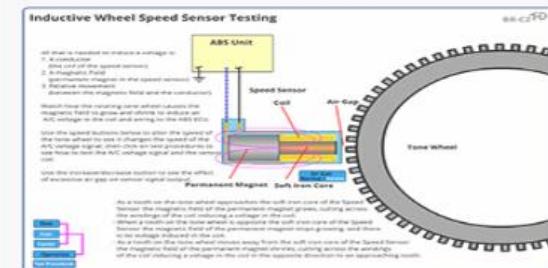


### Wheel Speed Sensor Testing

BR\_HydABSSpeedSensorTesting\_C1

Description

Updated September 2022

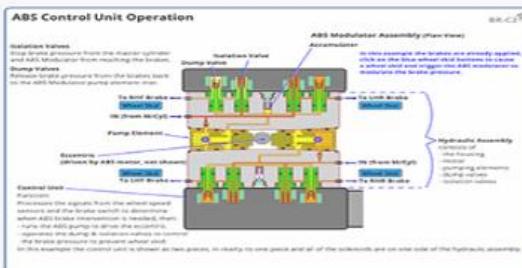


### Inductive Wheel Speed Sensor Testing

BR\_InductiveWheelSpeedSensors\_C1

Description

Updated September 2022

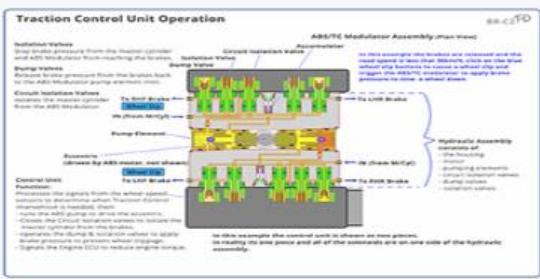


### ABS Control Unit Operation

BR\_HydABS\_ControlUnitOp\_C1

Description

Updated September 2022

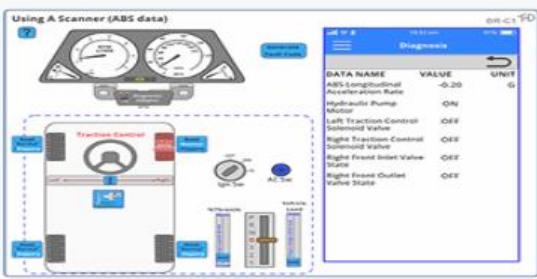


## Traction Control Unit Operation

BR\_HydABS\_TC\_ControlUnitOp\_C1

Description

Updated September 2022



## Using a Scanner ABS Data

BR\_Scanner\_C1

Description

Updated September 2022

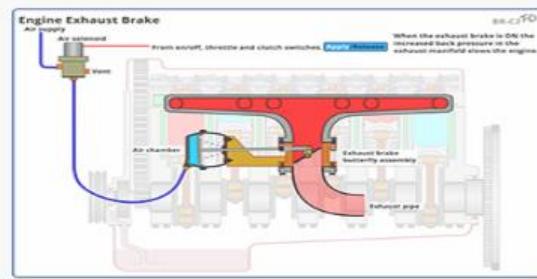


## Using a Scanner ABS Data

BR\_Scanner\_C2

Description

Updated September 2022

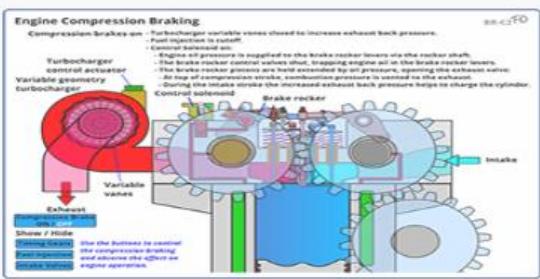


## Engine Exhaust Brake

BR\_EngineExhaustBrake\_C1

Description

Updated September 2022

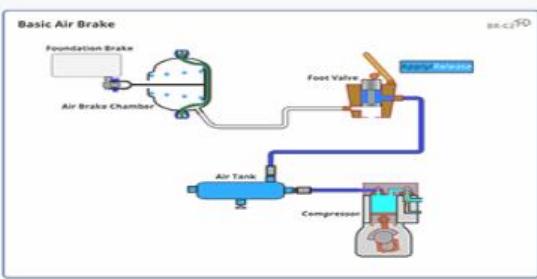


## Engine Compression Braking

BR\_CumminsISxJakeBrake\_C1

Description

Updated September 2022

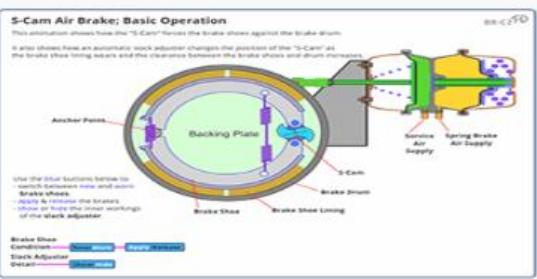


## Basic Air Brake

BR\_AirBrakeSimple\_C1

Description

Updated September 2022

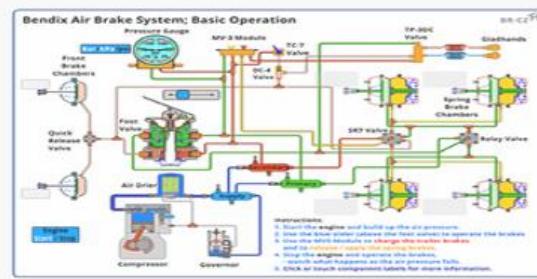


## S-Cam Brake; Basic Operation

BR\_ScamOperation\_C1

Description

Updated September 2022

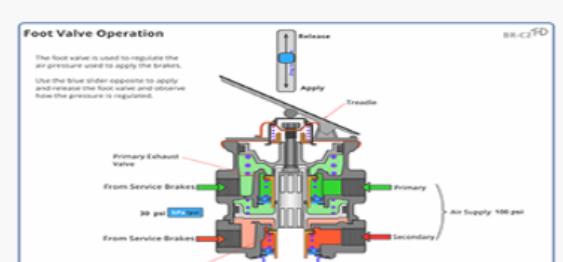
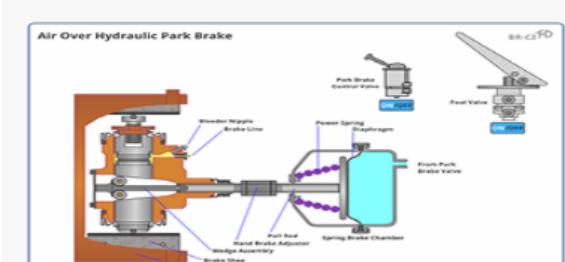
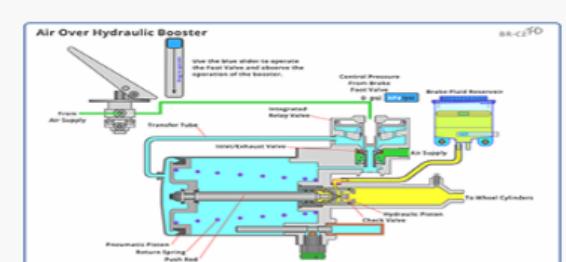
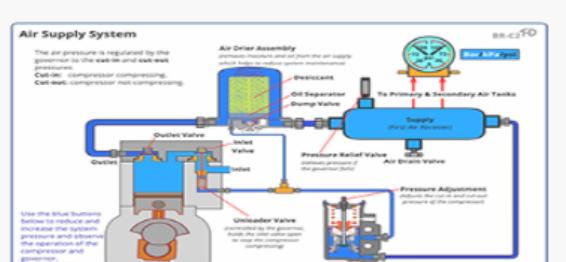
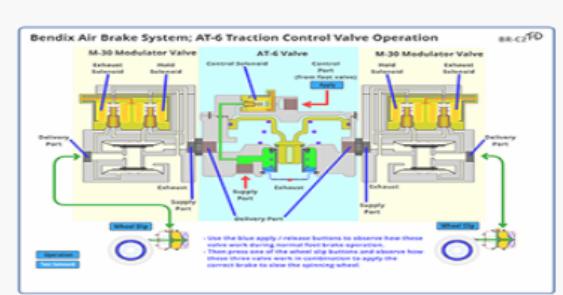
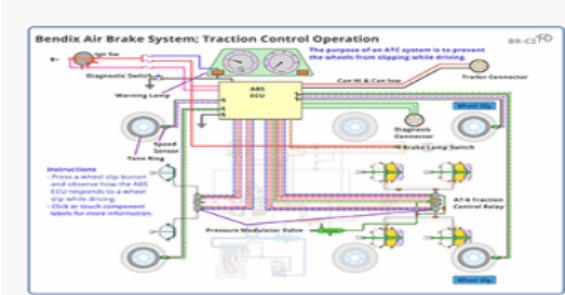
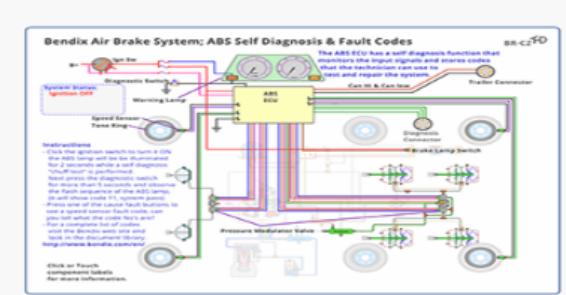
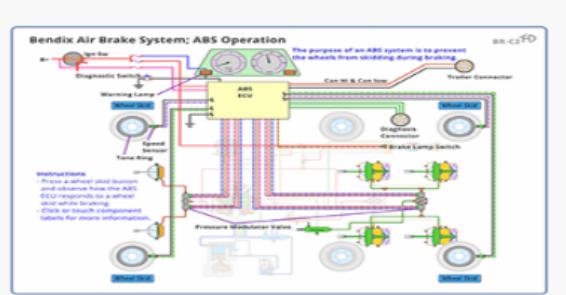


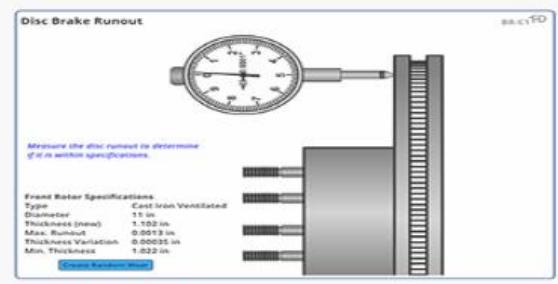
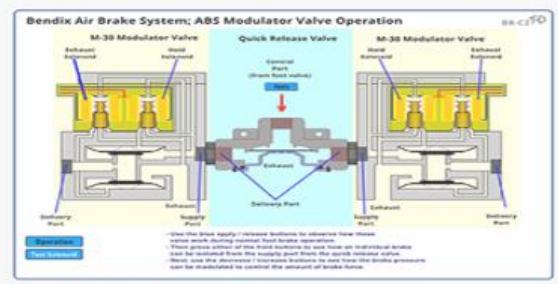
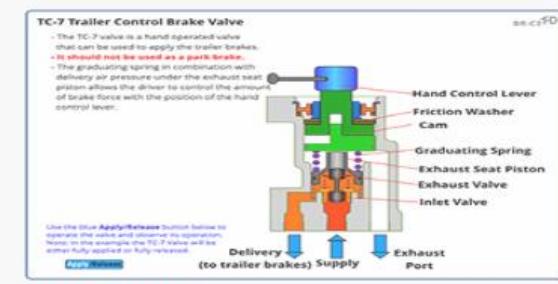
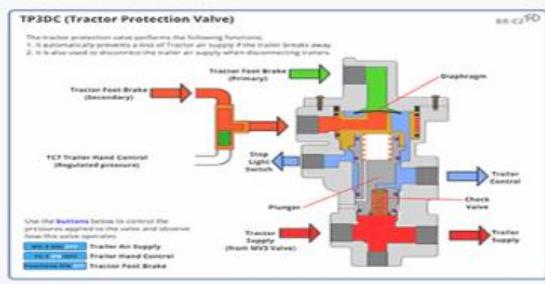
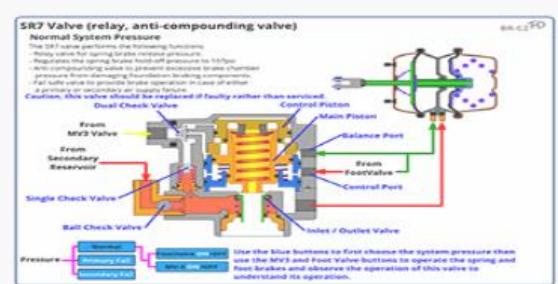
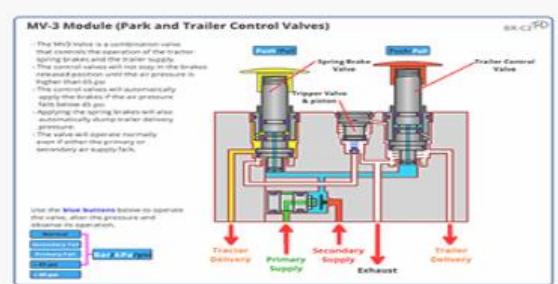
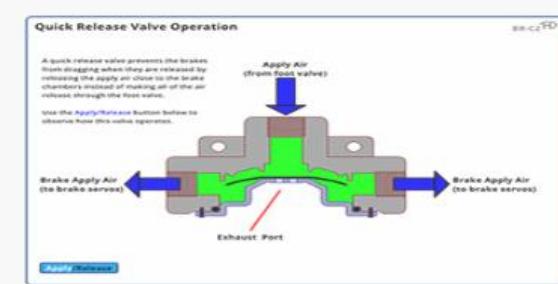
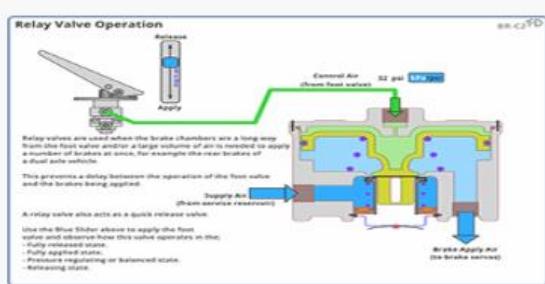
## Bendix Air Brake System; Basic Operation

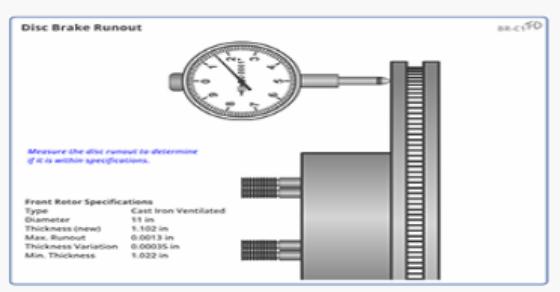
BR\_BendixTractorOperation\_C1

Description

Updated September 2022





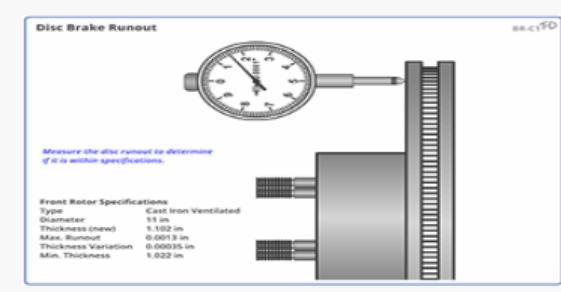


### Brake Disc Runout

BR\_BDrunOTassIn02\_C1

Brake Disc Runout Assessment (0.0004")

Updated September 2022

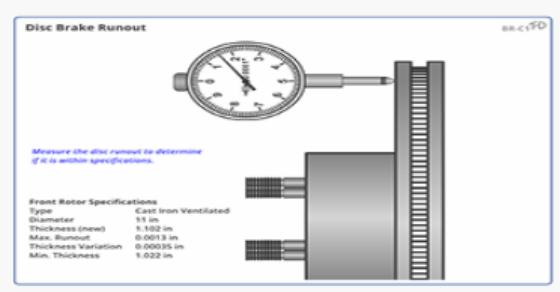


### Brake Disc Runout

BR\_BDrunOTassIn03\_C1

Brake Disc Runout Assessment (0.0009")

Updated September 2022

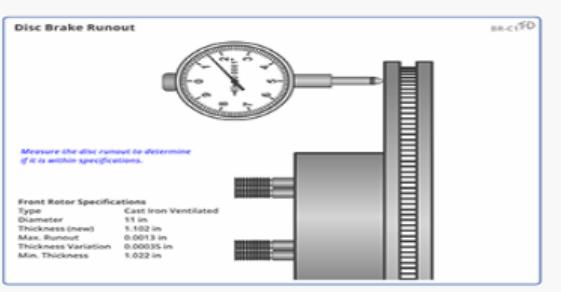


### Brake Disc Runout

BR\_BDrunOTassIn04\_C1

Brake Disc Runout Assessment (0.0012")

Updated September 2022

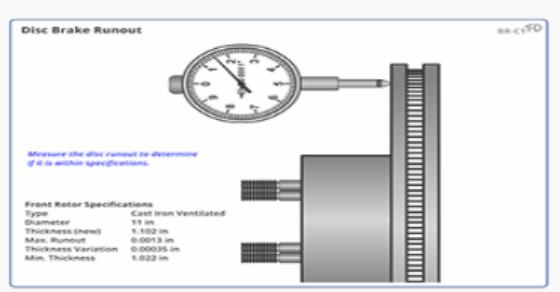


### Brake Disc Runout

BR\_BDrunOTassIn05\_C1

Brake Disc Runout Assessment (0.0013")

Updated September 2022

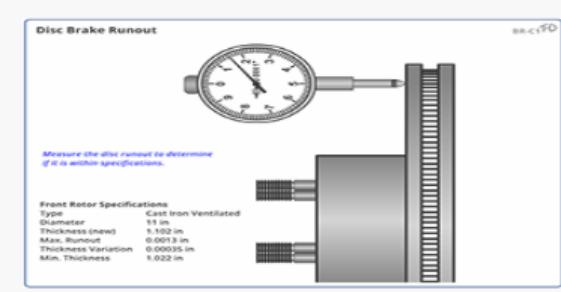


### Brake Disc Runout

BR\_BDrunOTassIn06\_C1

Brake Disc Runout Assessment (0.0014")

Updated September 2022

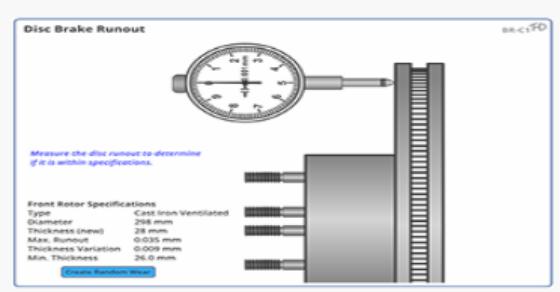


### Brake Disc Runout

BR\_BDrunOTassIn07\_C1

Brake Disc Runout Assessment (0.002")

Updated September 2022

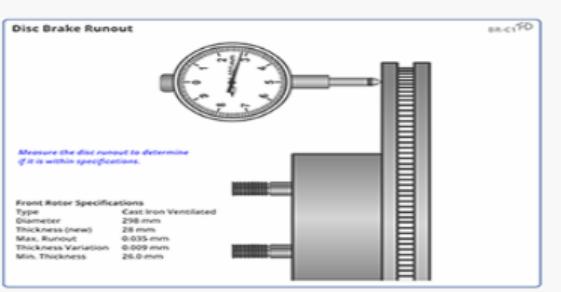


### Brake Disc Runout

BR\_BDrunOTassMm01\_C1

Teacher Resource, Multiple Runout (Metric)

Updated September 2022

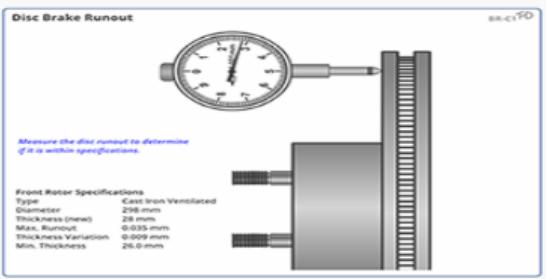


### Brake Disc Runout

BR\_BDrunOTassMm02\_C1

Brake Disc Runout Assessment (0.002mm)

Updated September 2022

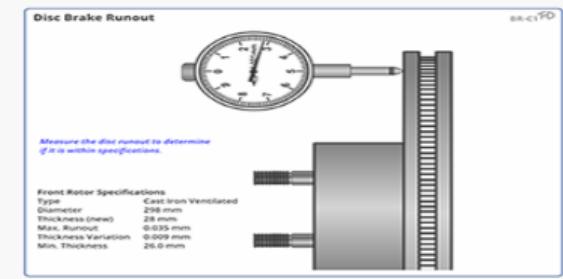


### Brake Disc Runout

BR\_BDrunOTassMm03\_C1

Brake Disc Runout Assessment (0.023mm)

Updated September 2022

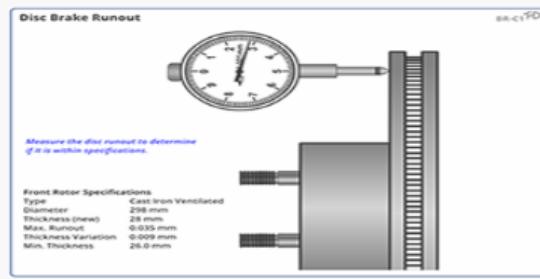


### Brake Disc Runout

BR\_BDrunOTassMm04\_C1

Brake Disc Runout Assessment (0.031mm)

Updated September 2022

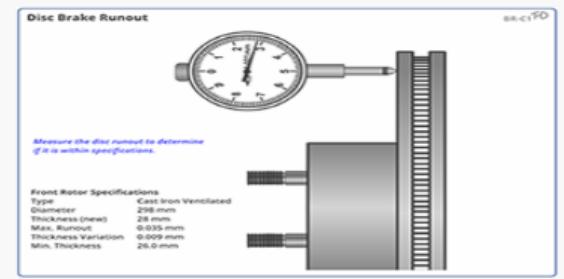


### Brake Disc Runout

BR\_BDrunOTassMm05\_C1

Brake Disc Runout Assessment (0.035mm)

Updated September 2022

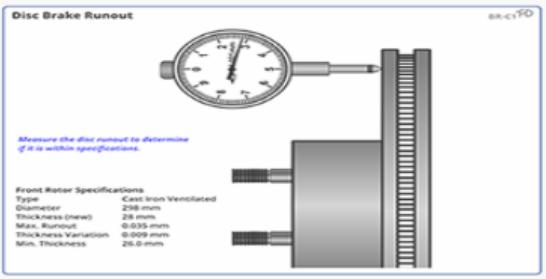


### Brake Disc Runout

BR\_BDrunOTassMm06\_C1

Brake Disc Runout Assessment (0.036mm)

Updated September 2022

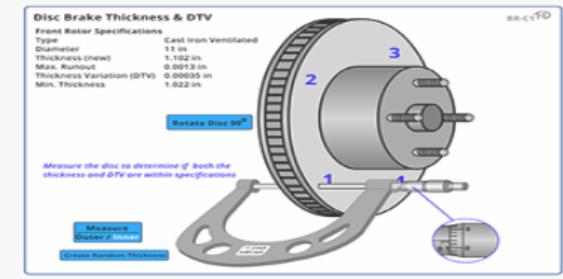


### Brake Disc Runout

BR\_BDrunOTassMm07\_C1

Brake Disc Runout Assessment (0.042mm)

Updated September 2022

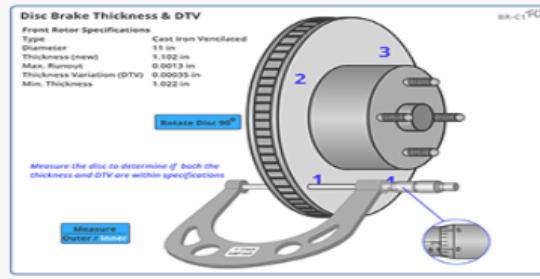


### Brake Disc Thickness & DTV

BR\_BDDTVassIn01\_C1

Teacher Resource, Multiple Runout (Standard)

Updated September 2022

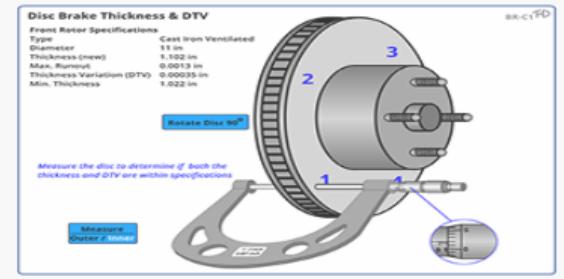


### Brake Disc Thickness & DTV

BR\_BDDTVassIn02\_C1

Brake Disc Thickness & DTV Assessment (1.102")

Updated September 2022

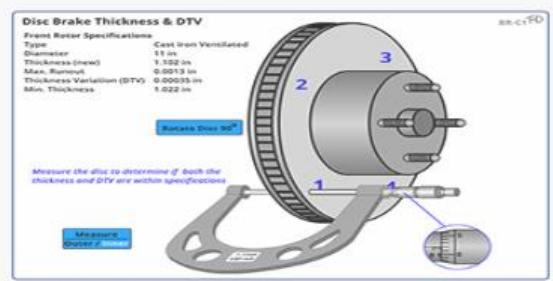


### Brake Disc Thickness & DTV

BR\_BDDTVassIn03\_C1

Brake Disc Thickness & DTV Assessment (1.102 - 1.101")

Updated September 2022



### Brake Disc Thickness & DTV

BR\_BDDTVassIn04\_C1

Brake Disc Thickness & DTV Assessment (1.05 - 1.048")

Updated September 2022

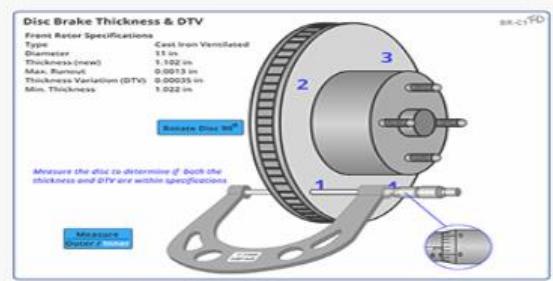


### Brake Disc Thickness & DTV

BR\_BDDTVassIn05\_C1

Brake Disc Thickness & DTV Assessment (1.025")

Updated September 2022

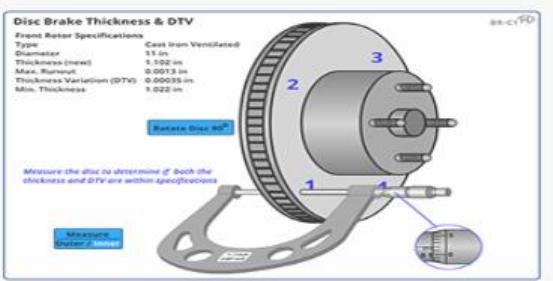


### Brake Disc Thickness & DTV

BR\_BDDTVassIn06\_C1

Brake Disc Thickness & DTV Assessment (1.022 - 1.021")

Updated September 2022

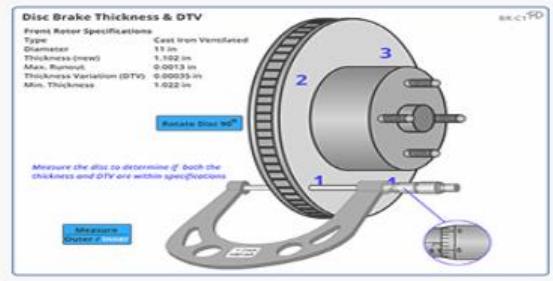


### Brake Disc Thickness & DTV

BR\_BDDTVassIn07\_C1

Brake Disc Thickness & DTV Assessment (1.075 - 1.065")

Updated September 2022

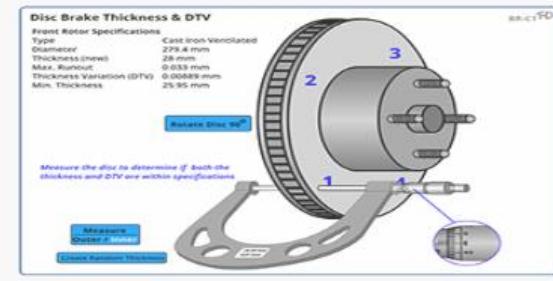


### Brake Disc Thickness & DTV

BR\_BDDTVassIn08\_C1

Brake Disc Thickness & DTV Assessment (1.075 - 1.072")

Updated September 2022

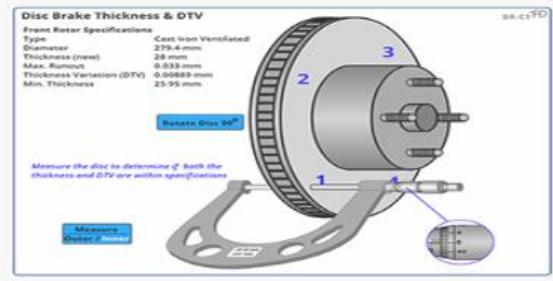


### Brake Disc Thickness & DTV

BR\_BDDTVassMm01\_C1

Teacher Resource, Multiple Runout (Metric)

Updated September 2022

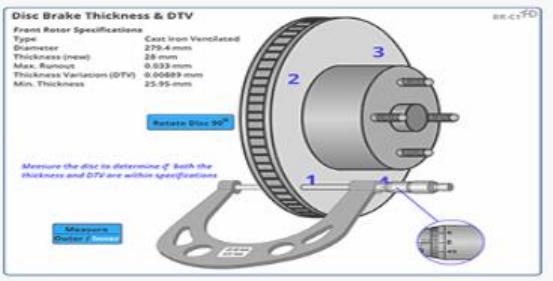


### Brake Disc Thickness & DTV

BR\_BDDTVassMm02\_C1

Brake Disc Thickness & DTV Assessment (28mm)

Updated September 2022

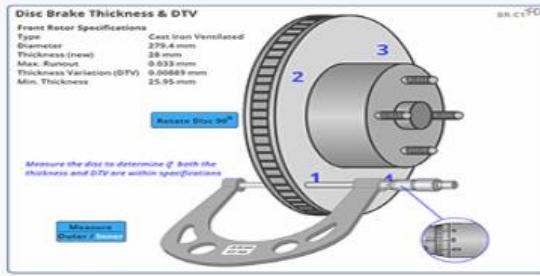


### Brake Disc Thickness & DTV

BR\_BDDTVassMm03\_C1

Brake Disc Thickness & DTV Assessment (28 - 27.97mm)

Updated September 2022



### Brake Disc Thickness & DTV

BR\_BDDTVassMm04\_C1

Brake Disc Thickness & DTV Assessment (26.67 - 26.62mm)

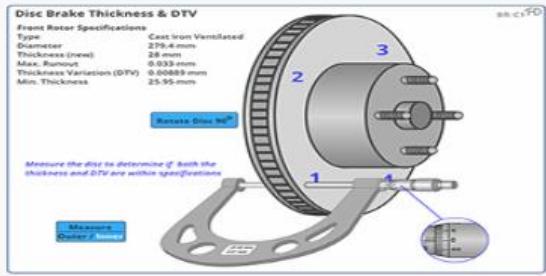
Updated September 2022



### Brake Disc Thickness & DTV

BR\_BDDTVassMm05\_C1

Brake Disc Thickness & DTV Assessment (26.35mm)  
Updated September 2022

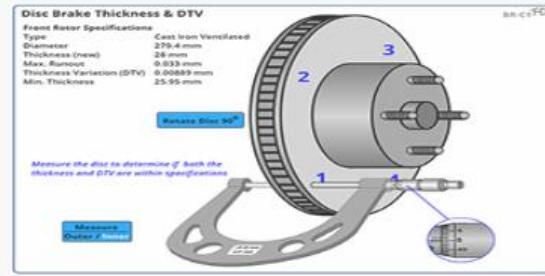


### Brake Disc Thickness & DTV

BR\_BDDTVassMm06\_C1

Brake Disc Thickness & DTV Assessment (26.95 - 26.93mm)

Updated September 2022

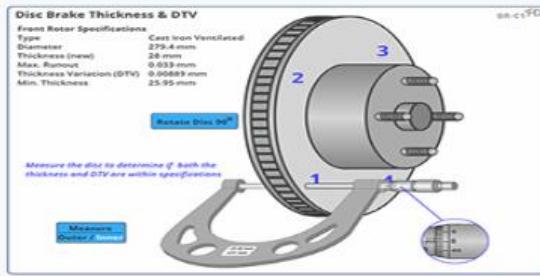


### Brake Disc Thickness & DTV

BR\_BDDTVassMm07\_C1

Brake Disc Thickness & DTV Assessment (27.3 - 27.05mm)

Updated September 2022

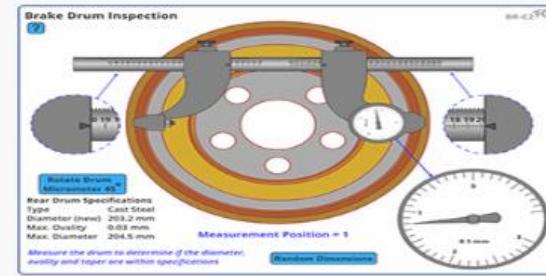


### Brake Disc Thickness & DTV

BR\_BDDTVassMm08\_C1

Brake Disc Thickness & DTV Assessment (27.32 - 27.24mm)

Updated September 2022

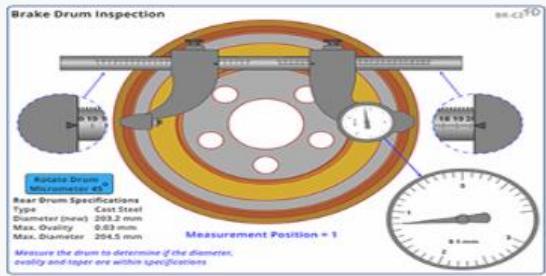


### Brake Drum Measurement

BR\_BDrumAssMm01\_C1

Teacher Resource, Multiple Brake Drum Measurements (Metric)

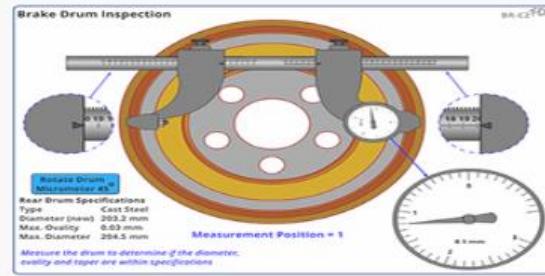
Updated September 2022



### Brake Drum Measurement

BR\_BDrumAssMm02\_C1

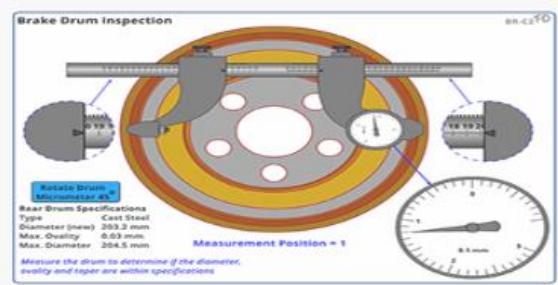
Brake Drum Measurement Assessment (O/S 0.000mm)  
Updated September 2022



### Brake Drum Measurement

BR\_BDrumAssMm03\_C1

Brake Drum Measurement Assessment (O/S 0.100mm)  
Updated September 2022

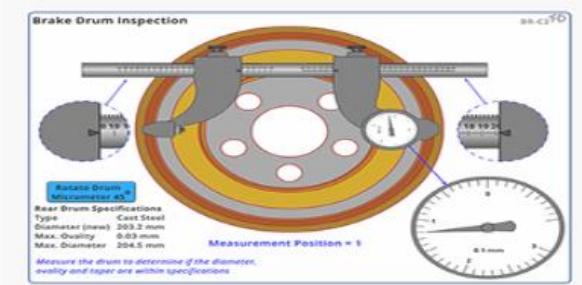


### Brake Drum Measurement

BR\_BDrumAssMm04\_C1

Brake Drum Measurement Assessment (O/S 0.100 - 0.200mm)

Updated September 2022

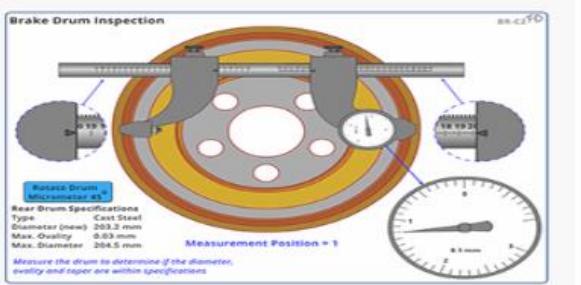


### Brake Drum Measurement

BR\_BDrumAssMm05\_C1

Brake Drum Measurement Assessment (O/S 0.300 - 0.400mm)

Updated September 2022

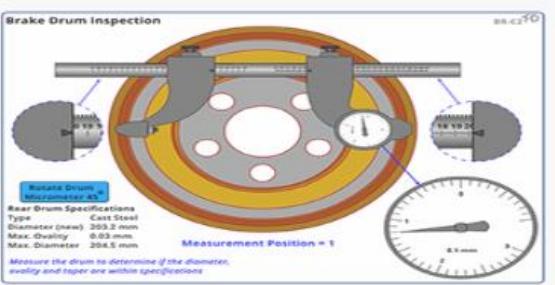


### Brake Drum Measurement

BR\_BDrumAssMm06\_C1

Brake Drum Measurement Assessment (O/S 0.400 - 0.600mm)

Updated September 2022

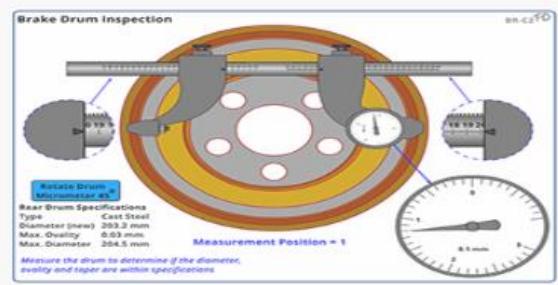


### Brake Drum Measurement

BR\_BDrumAssMm07\_C1

Brake Drum Assessment (O/S 1.300 - 1.500mm)

Updated September 2022

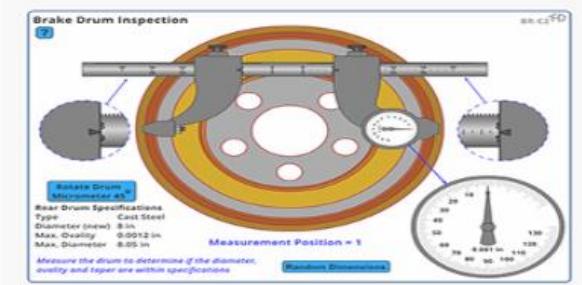


### Brake Drum Measurement

BR\_BDrumAssMm08\_C1

Brake Drum Assessment (O/S 1.600 - 1.700mm)

Updated September 2022

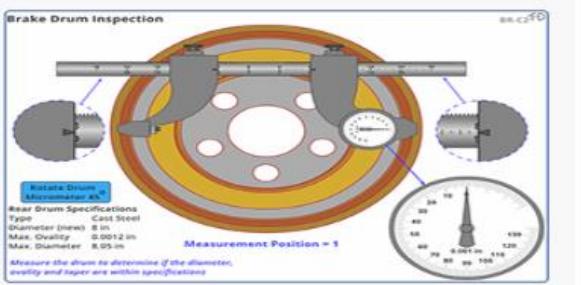


### Brake Drum Measurement

BR\_BDrumAssIn01\_C1

Teacher Resource, Multiple Brake Drum Measurements (Standard)

Updated September 2022

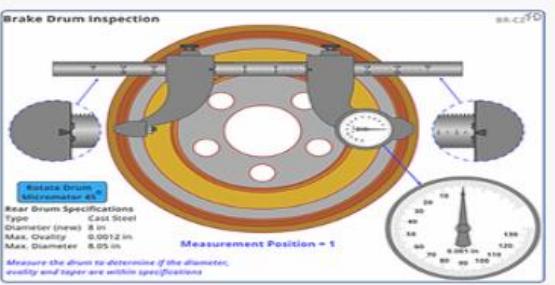


### Brake Drum Measurement

BR\_BDrumAssIn02\_C1

Brake Drum Assessment (O/S 0.000)

Updated September 2022

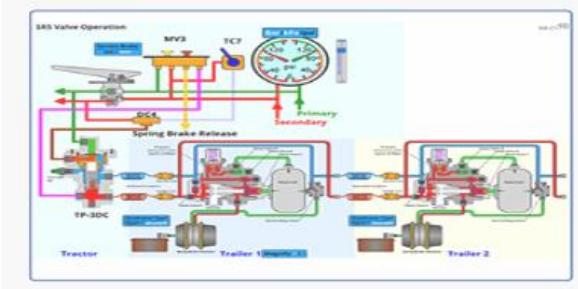
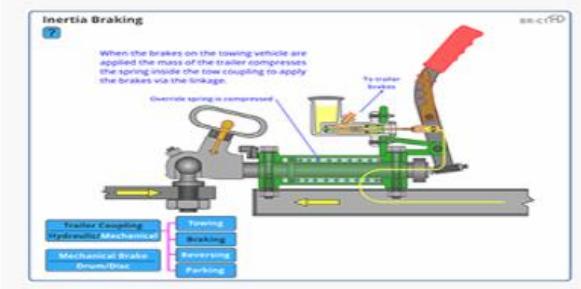
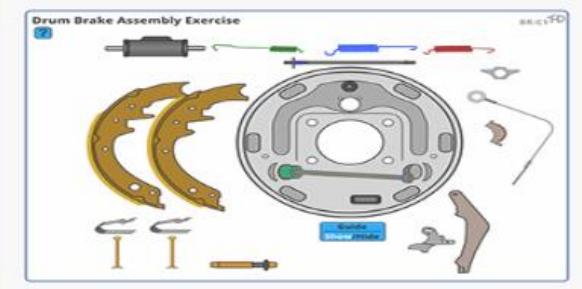
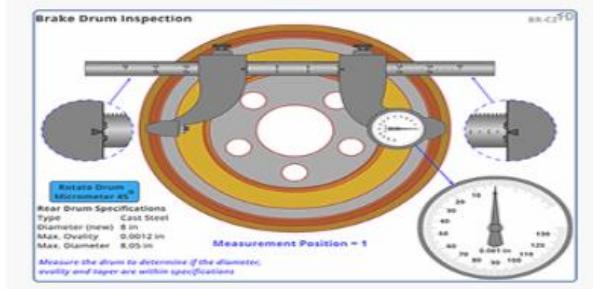
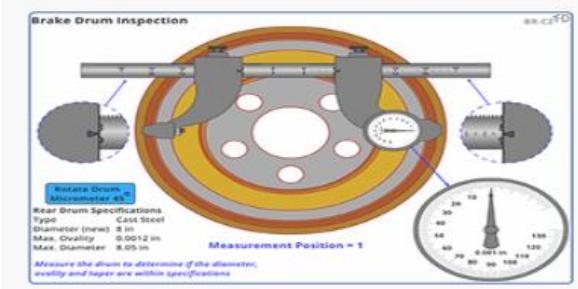
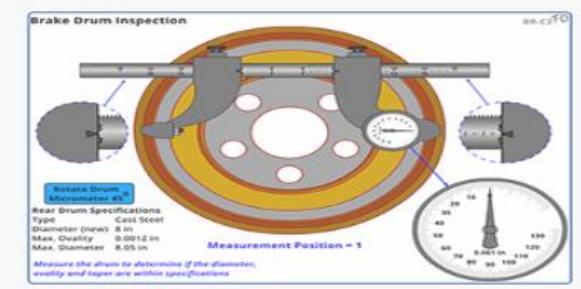
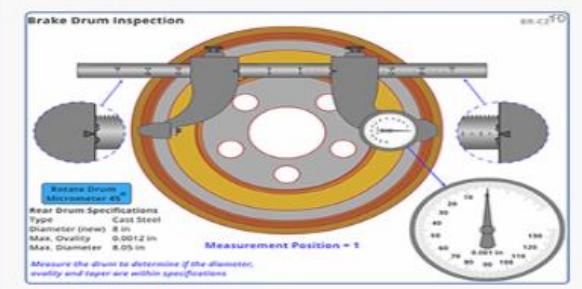
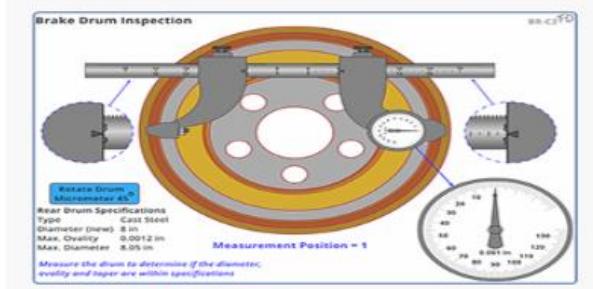


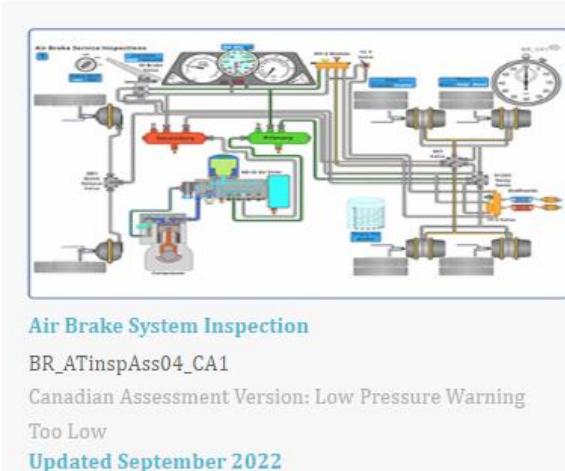
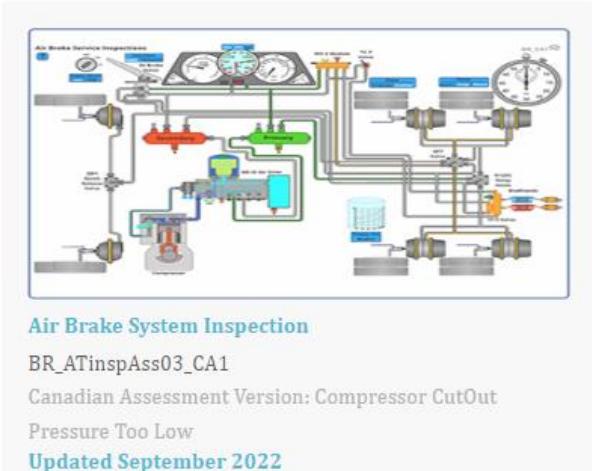
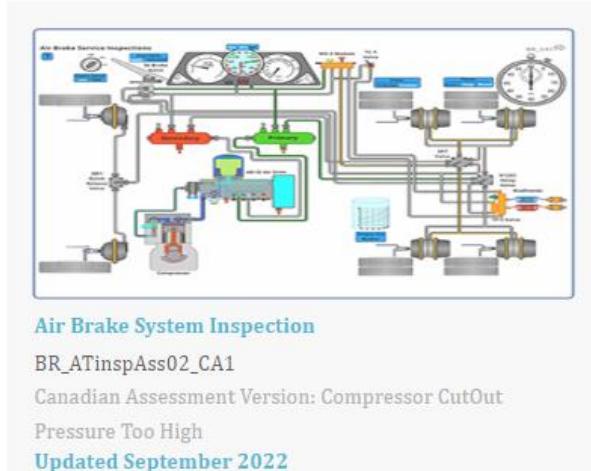
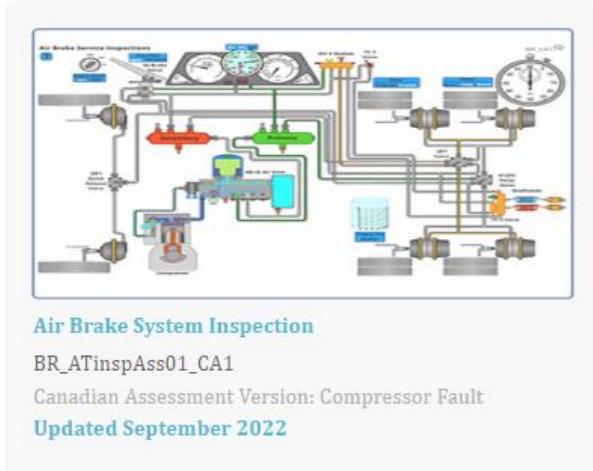
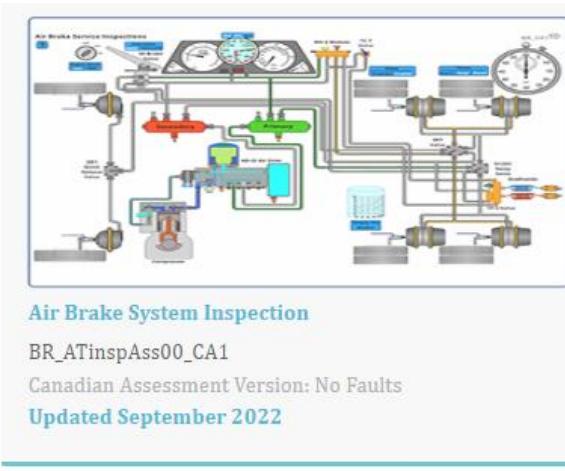
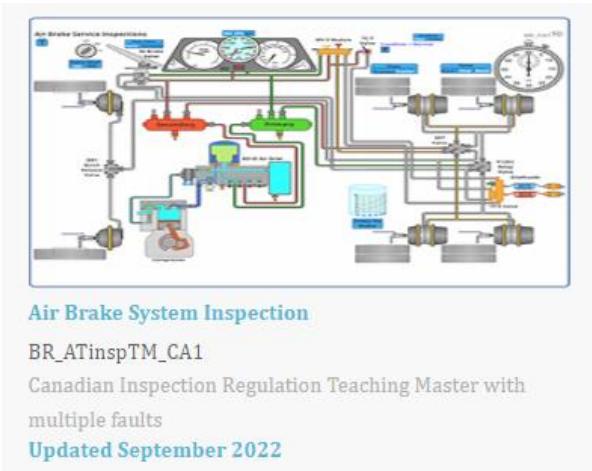
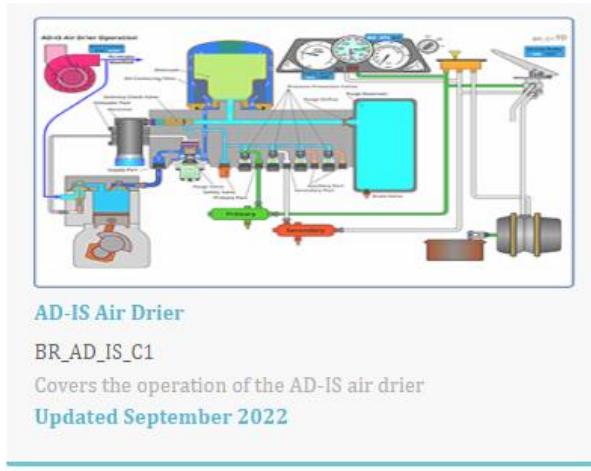
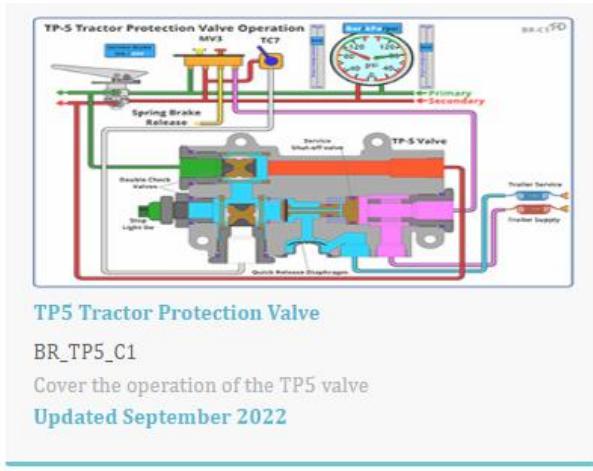
### Brake Drum Measurement

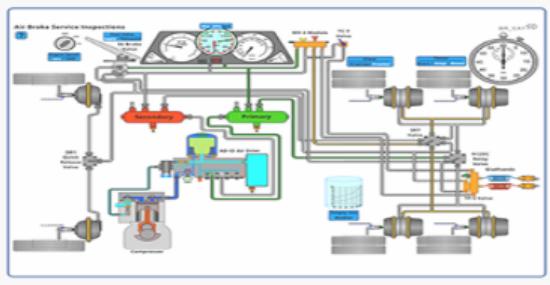
BR\_BDrumAssIn03\_C1

Brake Drum Assessment (O/S 0.005")

Updated September 2022





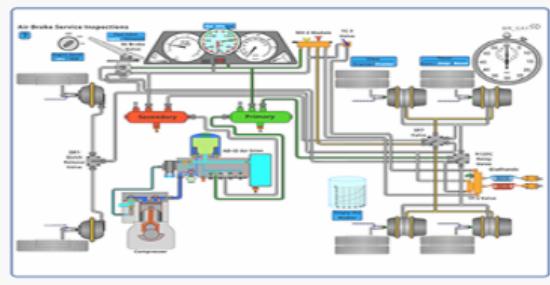


### Air Brake System Inspection

BR\_ATinspAss05\_CA1

Canadian Assessment Version: Low Pressure Warning  
Too High

Updated September 2022

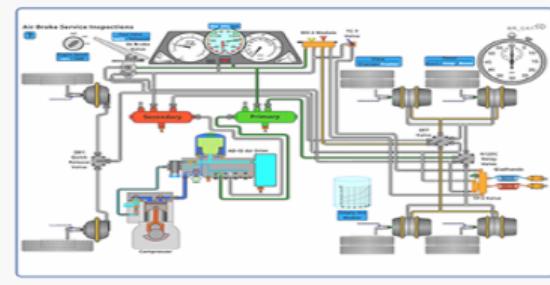


### Air Brake System Inspection

BR\_ATinspAss06\_CA1

Canadian Assessment Version: Low Pressure Warning not  
working

Updated September 2022

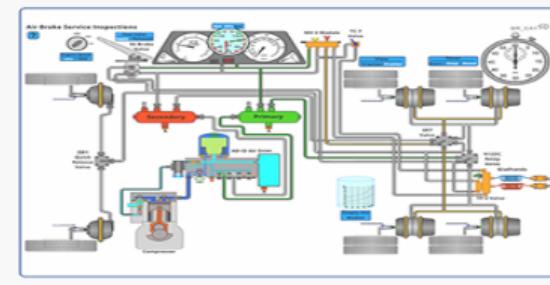


### Air Brake System Inspection

BR\_ATinspAss07\_CA1

Canadian Assessment Version: Spring Brake CutIN  
pressure too high

Updated September 2022

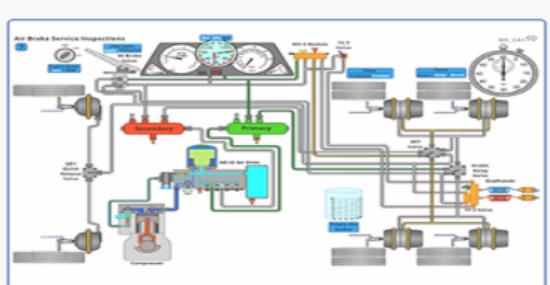


### Air Brake System Inspection

BR\_ATinspAss08\_CA1

Canadian Assessment Version: Spring Brake CutIN  
pressure too low

Updated September 2022

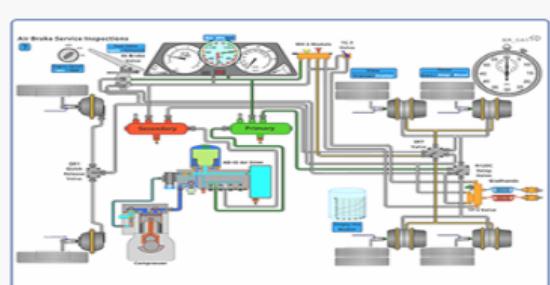


### Air Brake System Inspection

BR\_ATinspAss09\_CA1

Canadian Assessment Version: Tractor Brake Adjustment  
excessive travel

Updated September 2022

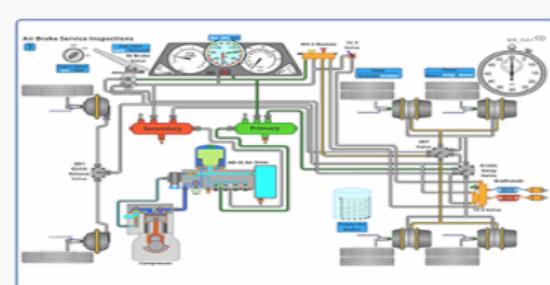


### Air Brake System Inspection

BR\_ATinspAss10\_CA1

Canadian Assessment Version: Trailer Brake Adjustment  
excessive travel

Updated September 2022

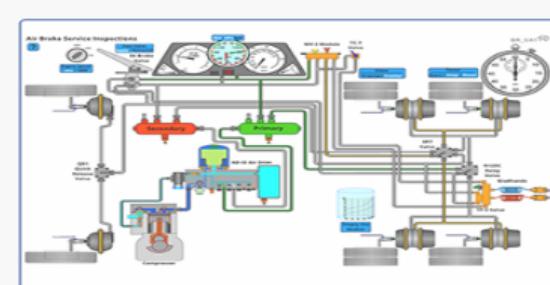


### Air Brake System Inspection

BR\_ATinspAss11\_CA1

Canadian Assessment Version: Air Leak Tractor Primary  
Circuit

Updated September 2022

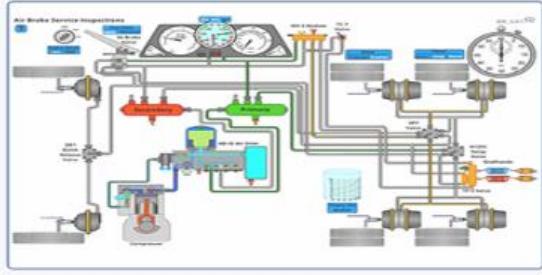


### Air Brake System Inspection

BR\_ATinspAss12\_CA1

Canadian Assessment Version: Air Leak Tractor  
Secondary Circuit

Updated September 2022

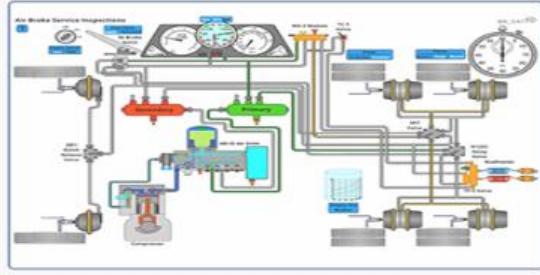


### Air Brake System Inspection

BR\_ATinspAss13\_CA1

Canadian Assessment Version: Air Leak Tractor Spring  
Brake Release Circuit

**Updated September 2022**

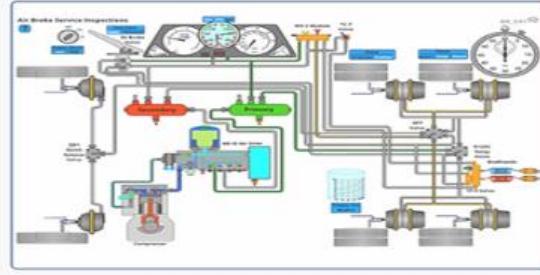


### Air Brake System Inspection

BR\_ATinspAss14\_CA1

Canadian Assessment Version: Air Leak Trailer Spring  
Brake Release Circuit

**Updated September 2022**

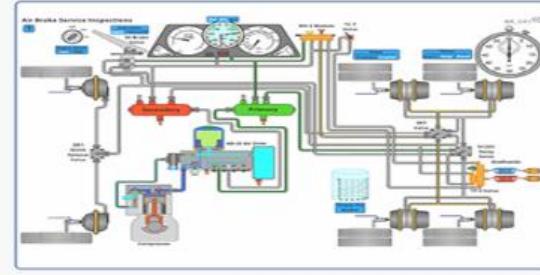


### Air Brake System Inspection

BR\_ATinspAss15\_CA1

Canadian Assessment Version: Air Leak Trailer Service  
Brake Circuit

**Updated September 2022**

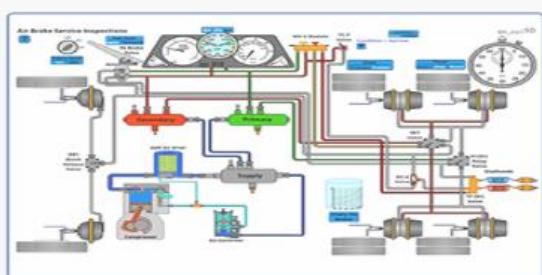


### Air Brake System Inspection

BR\_ATinspAss16\_CA1

Canadian Assessment Version: SR5 Valve Fault

**Updated September 2022**

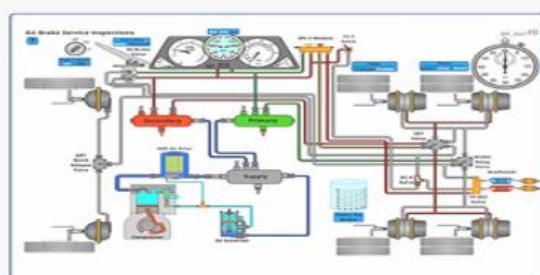


### Air Brake System Inspection

BR\_ATinspTM\_AU1

Australian Inspection Regulation Teaching Master with  
multiple faults

**Updated September 2022**

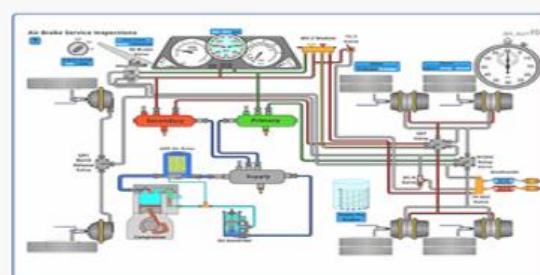


### Air Brake System Inspection

BR\_ATinspAss00\_AU1

Australian Assessment Version: No Faults

**Updated September 2022**

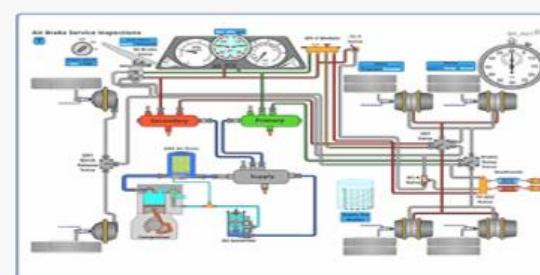


### Air Brake System Inspection

BR\_ATinspAss01\_AU1

Australian Assessment Version: Compressor Fault

**Updated September 2022**

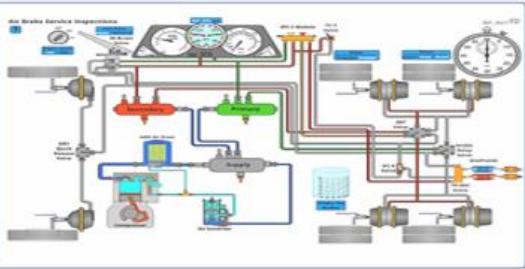


### Air Brake System Inspection

BR\_ATinspAss02\_AU1

Australian Assessment Version: Compressor CutOut  
Pressure Too High

**Updated September 2022**

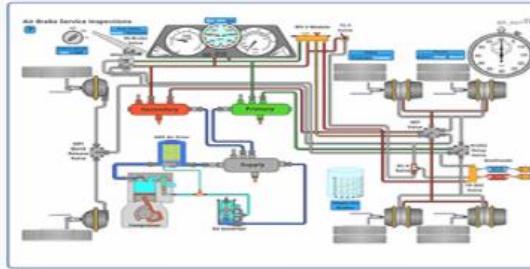


#### Air Brake System Inspection

BR\_ATinspAss03\_AU1

Australian Assessment Version: Compressor CutOut  
Pressure Too Low

**Updated September 2022**

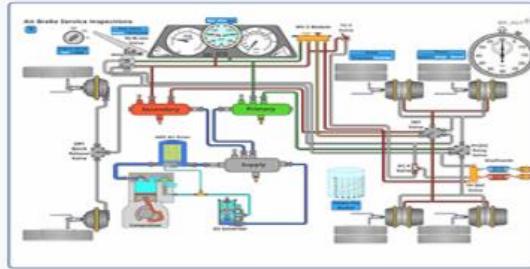


#### Air Brake System Inspection

BR\_ATinspAss04\_AU1

Australian Assessment Version: Low Pressure Warning  
Too Low

**Updated September 2022**

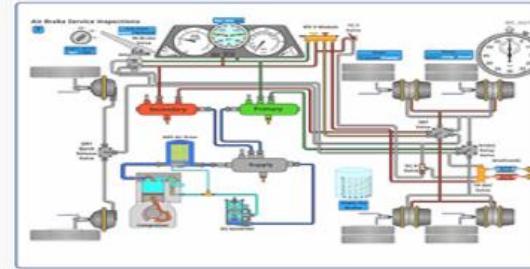


#### Air Brake System Inspection

BR\_ATinspAss05\_AU1

Australian Assessment Version: Low Pressure Warning  
Too High

**Updated September 2022**

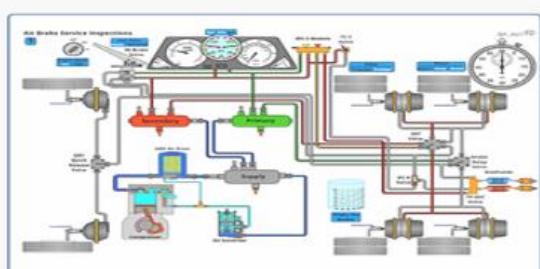


#### Air Brake System Inspection

BR\_ATinspAss06\_AU1

Australian Assessment Version: Low Pressure Warning  
not working

**Updated September 2022**

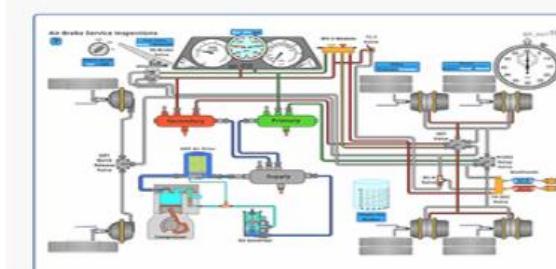


#### Air Brake System Inspection

BR\_ATinspAss07\_AU1

Australian Assessment Version: Spring Brake CutIN  
pressure too high

**Updated September 2022**

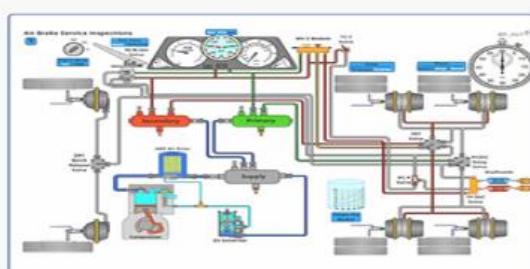


#### Air Brake System Inspection

BR\_ATinspAss08\_AU1

Australian Assessment Version: Spring Brake CutIN  
pressure too low

**Updated September 2022**

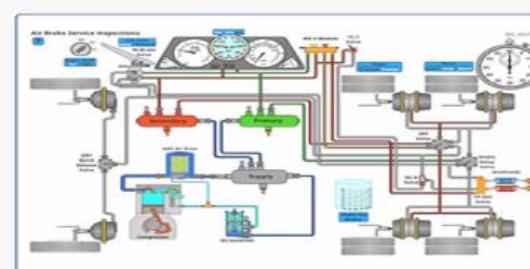


#### Air Brake System Inspection

BR\_ATinspAss09\_AU1

Australian Assessment Version: Tractor Brake  
Adjustment excessive travel

**Updated September 2022**

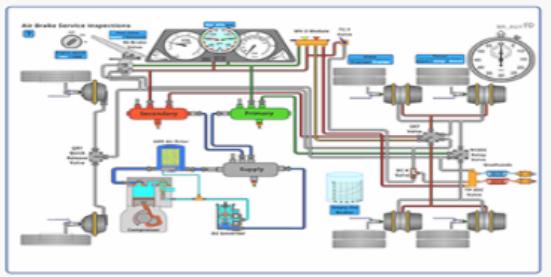


#### Air Brake System Inspection

BR\_ATinspAss10\_AU1

Australian Assessment Version: Trailer Brake Adjustment  
excessive travel

**Updated September 2022**

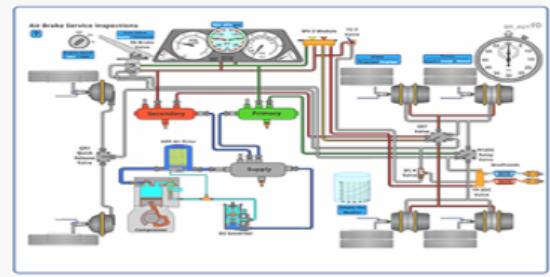


### Air Brake System Inspection

BR\_ATinspAss11\_AU1

Australian Assessment Version: Air Leak Tractor Primary Circuit

Updated September 2022

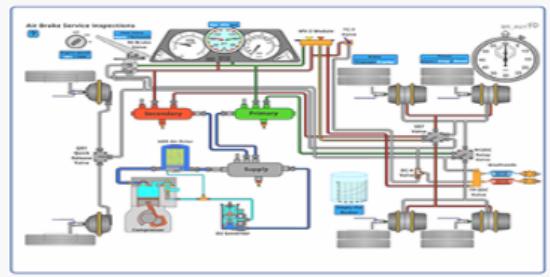


### Air Brake System Inspection

BR\_ATinspAss12\_AU1

Australian Assessment Version: Air Leak Tractor Secondary Circuit

Updated September 2022

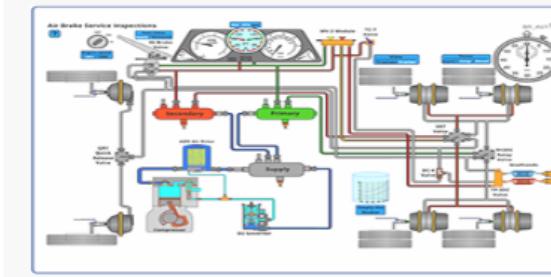


### Air Brake System Inspection

BR\_ATinspAss13\_AU1

Australian Assessment Version: Air Leak Tractor Spring Brake Release Circuit

Updated September 2022

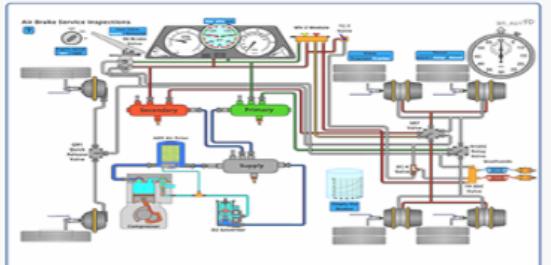


### Air Brake System Inspection

BR\_ATinspAss14\_AU1

Australian Assessment Version: Air Leak Trailer Spring Brake Release Circuit

Updated September 2022

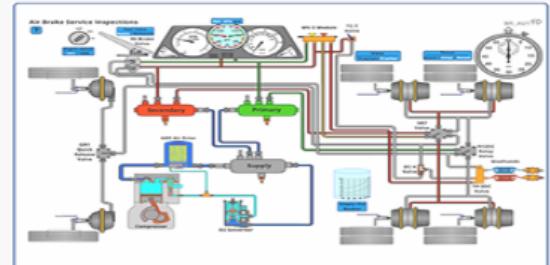


### Air Brake System Inspection

BR\_ATinspAss15\_AU1

Australian Assessment Version: Air Leak Trailer Service Brake Circuit

Updated September 2022

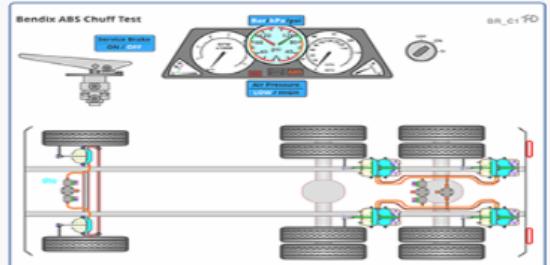


### Air Brake System Inspection

BR\_ATinspAss16\_AU1

Australian Assessment Version: SR5 Valve Fault

Updated September 2022

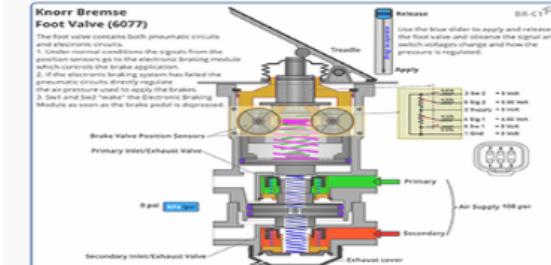


### Bendix CHUFF Test

BR\_ChuffTst\_C1

Demonstrates the CHUFF test checking the operation of the brake modulation valves

Updated September 2022

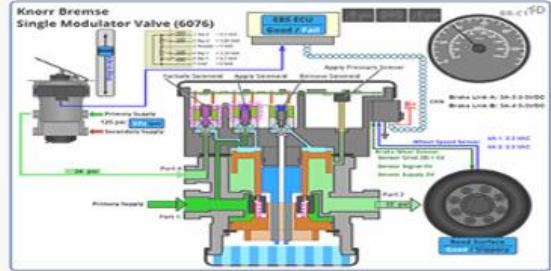


### Knorr Bremse Foot Valve (6077)

BR\_FtVlv6077\_C1

Description

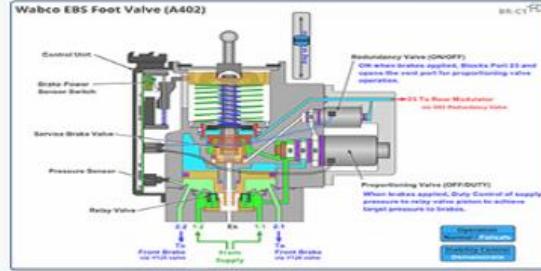
Updated September 2022



BR\_MVs6076\_C1

Description

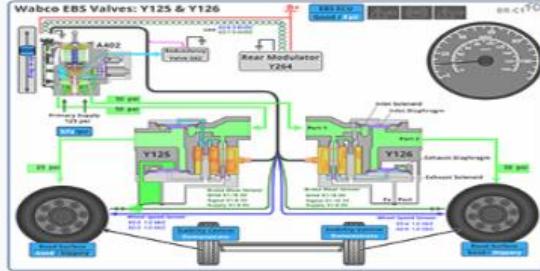
Updated September 2022



BR\_WabcoA402\_C1

Description

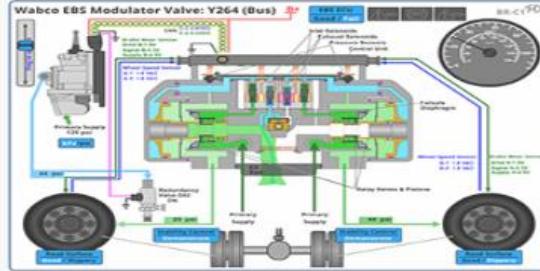
Updated September 2022



BR\_WabcoY125\_C1

Description

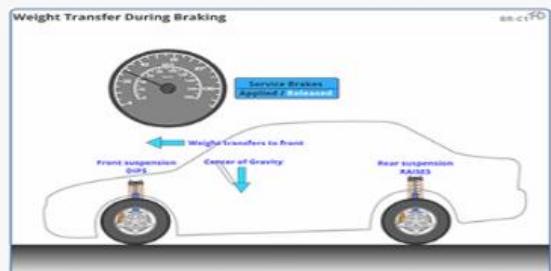
Updated September 2022



BR\_WabcoY264\_C1

Description

Updated September 2022



BR\_WTBD\_C1

Description

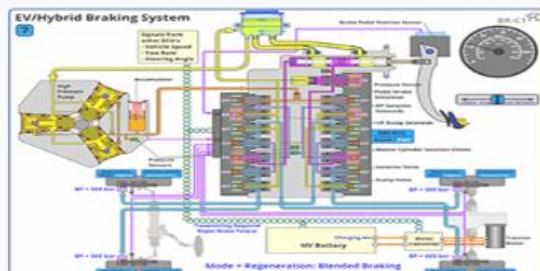
Updated September 2022



BR\_DBSA\_C1

Description

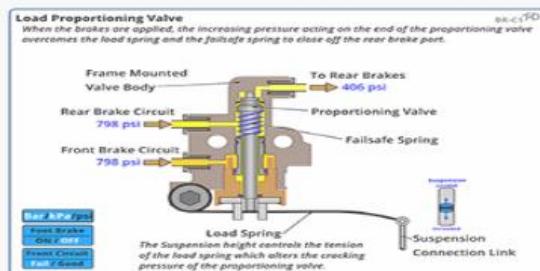
Updated September 2022



BR\_EvBrkSys\_C1

Description

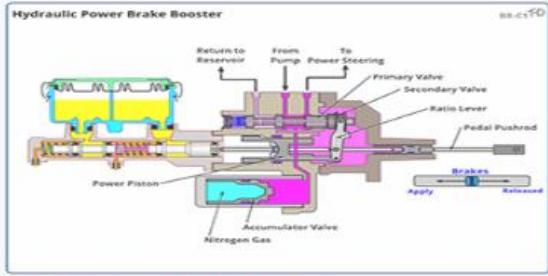
Updated September 2022



BR\_LdPv\_C1

Description

Updated September 2022

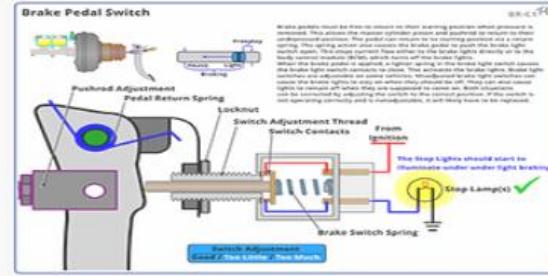


## Hydraulic Power Brake Booster

BR\_HydBrkBooster\_C1

Description

Updated September 2022

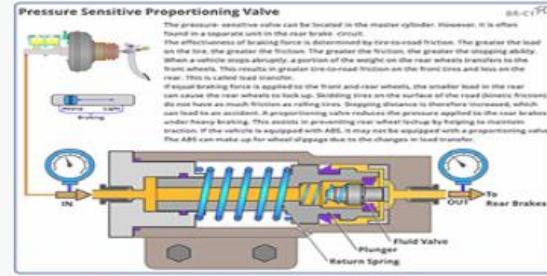


## Brake Switch Operation

BR\_BrkSw\_C1

Covers the operation and correct adjustment of brake pedal switches

Updated September 2022

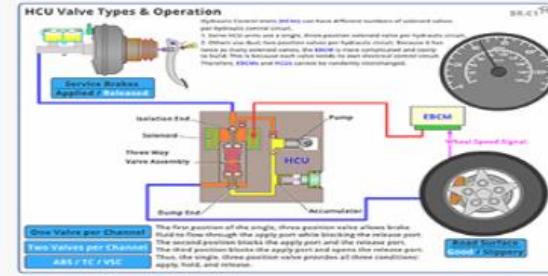


## Pressure Sensitive Proportioning Valve

BR\_PrPropVlv\_C1

Covers the operation and pressure split characteristics of a pressure sensitive proportioning valve

Updated September 2022

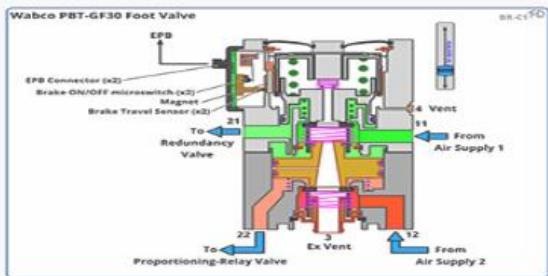


## HCU Valve Types

BR\_AbsVlvT\_C1

Covers the difference in operation between ABS HCU valves, One Valve per channel & Two Valves per channel.

Updated September 2022

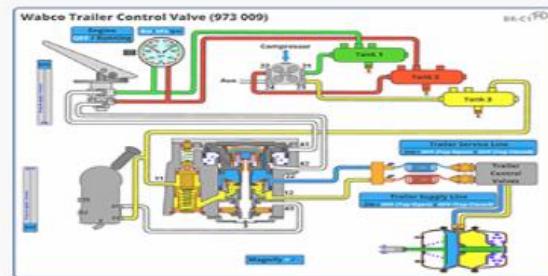


## Wabco PBT-GF Foot Valve

BR\_WabcoPBT\_GF30\_C1

Covers the pneumatic and electrical operation of the PBT-GF foot valve.

Updated September 2022



## Wabco Trailer Control Valve

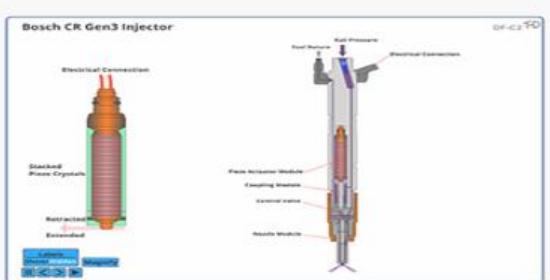
BR\_WabcoTrCntrlVlv\_C1

Covers the operation of a Wabco Trailer Control Valve with Park on Air Function.

Updated September 2022

# DF Series

# Diesel Fuel Systems

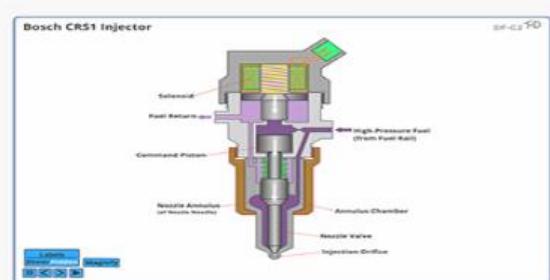


**Bosch CR Gen 3 Injector**

DF\_BoschCRgen3injector\_C1

Description

Updated October 2022

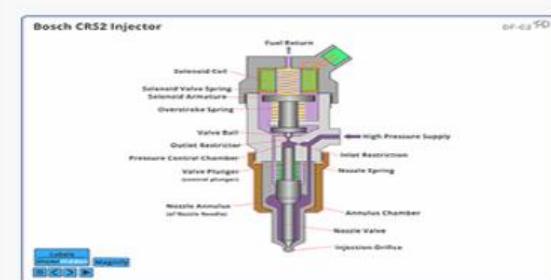


**Bosch CRS1 Injector**

DF\_BoschCRS1injector\_C1

Description

Updated October 2022

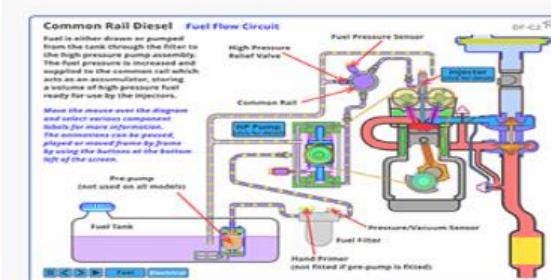


**Bosch CRS2 Injector**

DF\_BoschCRS2injector\_C1

Description

Updated October 2022

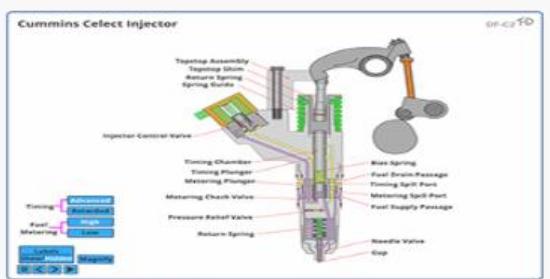


**Common Rail Diesel**

DF\_CommonRailDiesel\_C1

Description

Updated October 2022

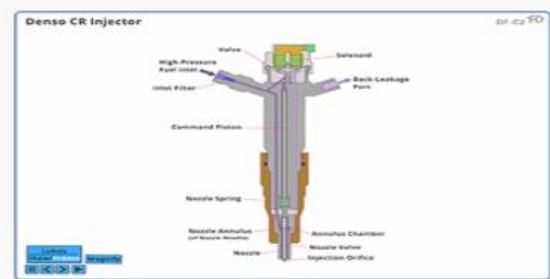


**Cummins Celect Injector**

DF\_CumminsCelectInjector\_C1

Description

Updated October 2022

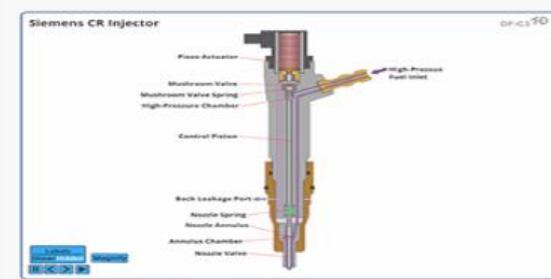


**Denso CR Injector**

DF\_DensoCRinjector\_C1

Description

Updated October 2022

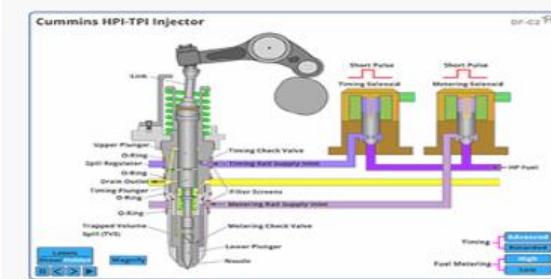


**Siemens CR Injector**

DF\_SiemensCRinjector\_C1

Description

Updated October 2022

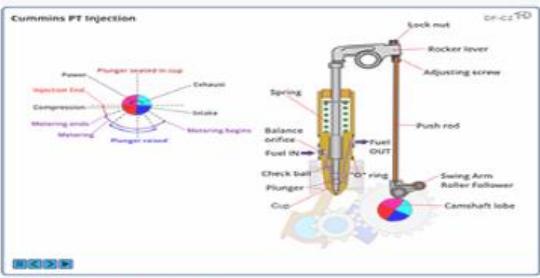


**Cummins HPI-TPI Injector**

DF\_CumminsHPITPIInjector\_C1

Description

Updated October 2022

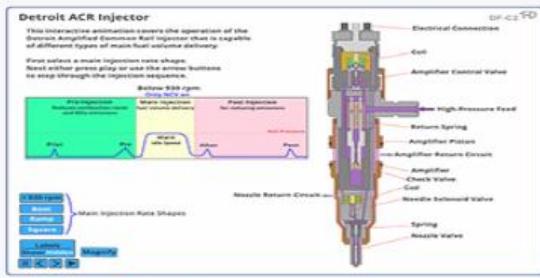


Cummins PT Injection

DF\_CumminPT\_C1

Description

Updated October 2022

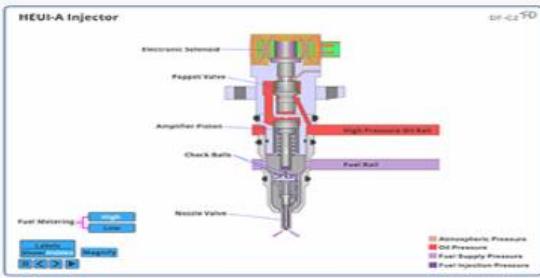


Detroit ACR Injector

DF\_DetroitACRinjector\_C1

Description

Updated October 2022

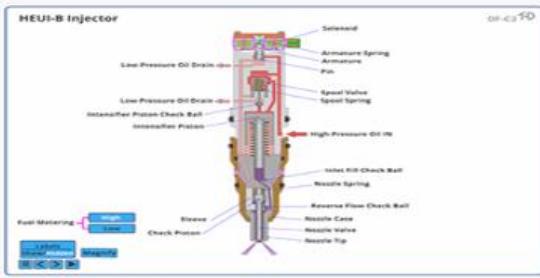


HEUI-A Injector

DF\_HEUI\_A\_C1

Description

Updated October 2022

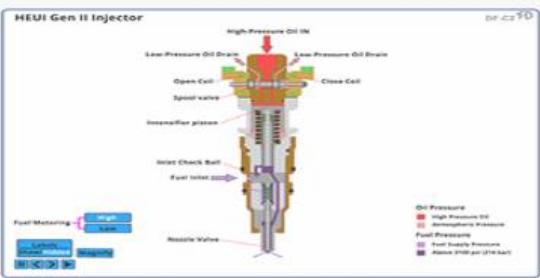


HEUI-B Injector

DF\_HEUI\_B\_C1

Description

Updated October 2022

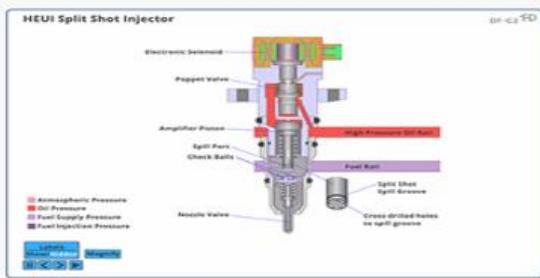


HEUI Gen II Injector

DF\_HEUI\_GenII\_C1

Description

Updated October 2022

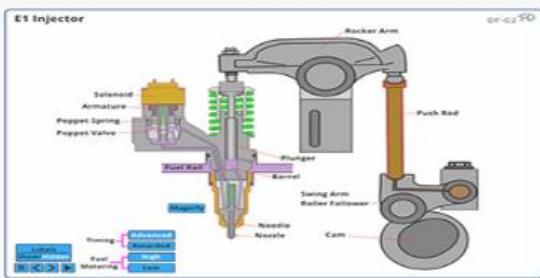


HEUI Split Shot Injector

DF\_HEUI\_SplitShot\_C1

Description

Updated October 2022

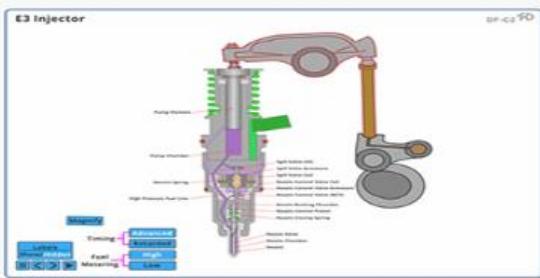


E1 Injector

DF\_InjectorE1\_C1

Description

Updated October 2022

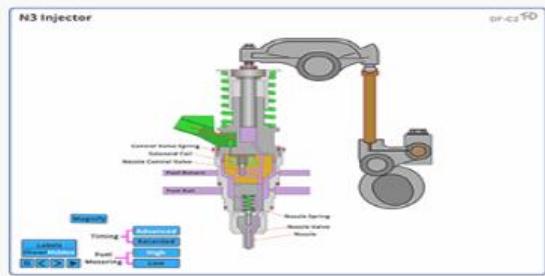


E3 Injector

DF\_InjectorE3\_C1

Description

Updated October 2022

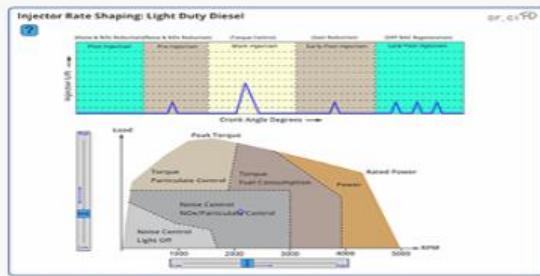


### N3 Injector

DF\_InjectorN3\_C1

Description

Updated October 2022

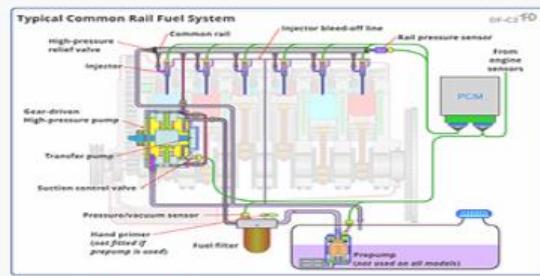


### Injector Rate Shaping Light Duty Diesel

DF\_InjRateShaping\_C1

Description

Updated October 2022

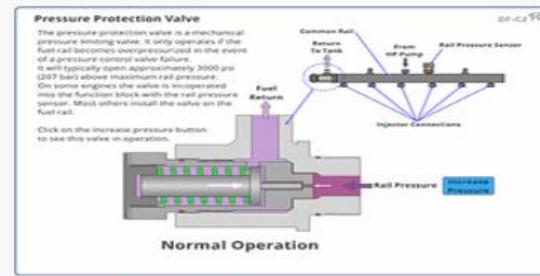


### Typical Common Rail Fuel System

DF\_TypicalMHTCommonRail\_C1

Description

Updated October 2022

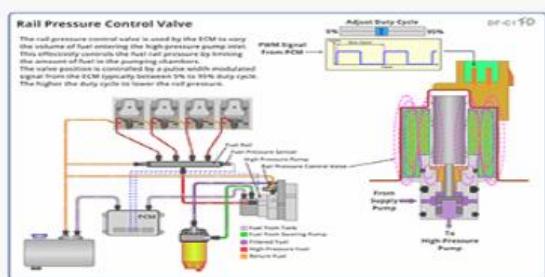


### Pressure Protection Valve

DF\_PressureProtectionValve\_C1

Description

Updated October 2022

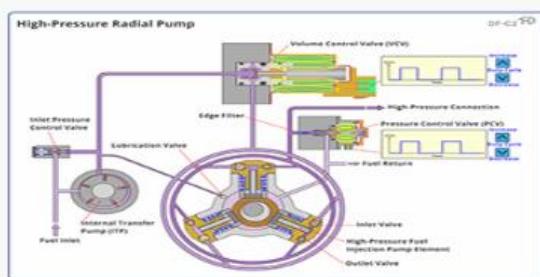


### Rail Pressure Control Valve

DF\_RailPressureControlValve\_C1

Description

Updated October 2022

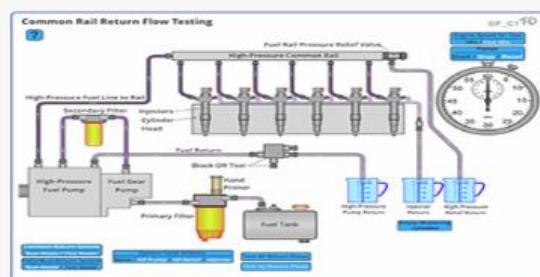


### High Pressure Radial Pump

DF\_SiemensRadialPump\_C1

Description

Updated October 2022

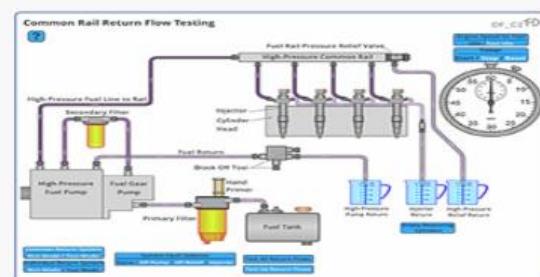


### Common Rail Return Flow Testing

DF\_ReturnFlowTest\_C1

Description

Updated October 2022

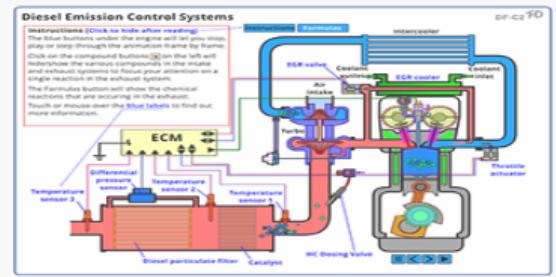


### Common Rail Return Flow Testing

DF\_ReturnFlowTest\_C2

Description

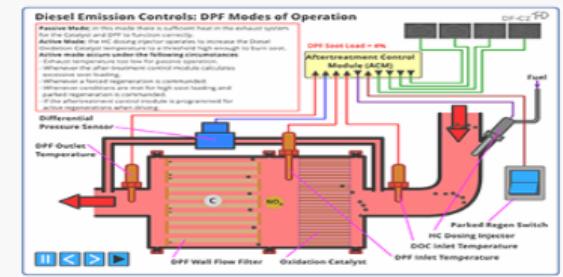
Updated October 2022



## Diesel Emission Control Systems

Description

Updated October 2022

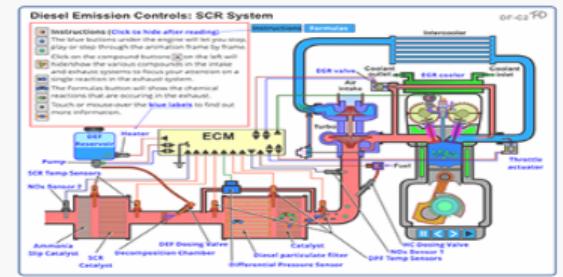


## Diesel Emission Controls; DPF Modes of Operation

DF\_DPFoperation\_C1

Description

Updated October 2022

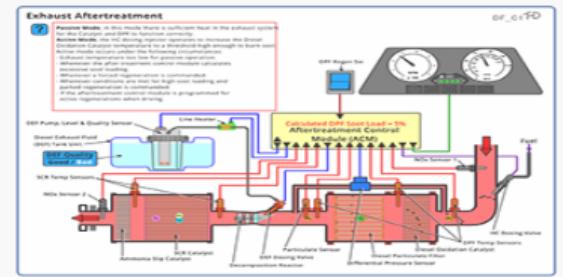


## Diesel Emission Controls; SCR System

DF\_SRC-EmissionControl\_C1

Description

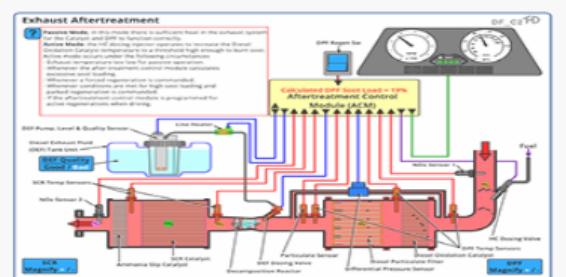
Updated October 2022



## Exhaust Aftertreatment

Description

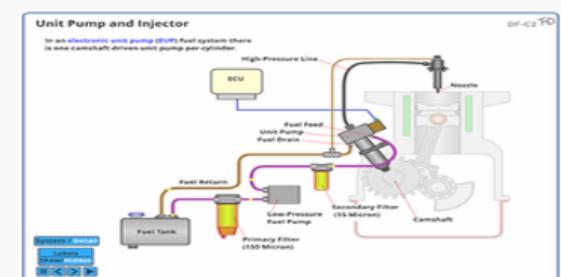
Updated October 2022



## Exhaust Aftertreatment

Description

Updated October 2022

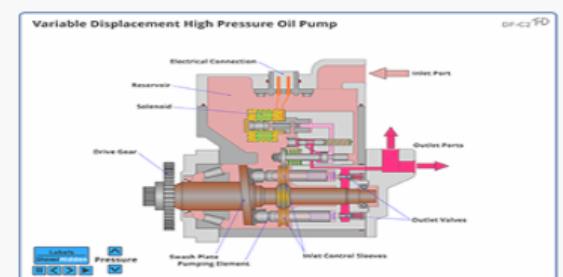


## Unit Pump and Injector

DF\_UnitPumpInjector\_C1

Description

Updated October 2022

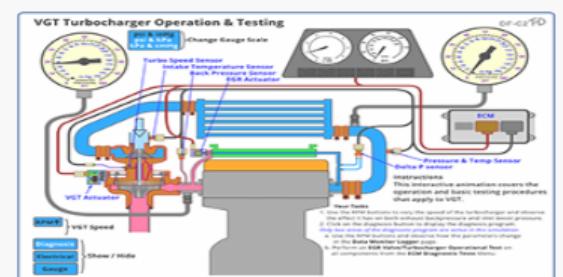


## Variable Displacement High Pressure Oil Pump

DF\_VariablePump\_C1

Description

Updated October 2022

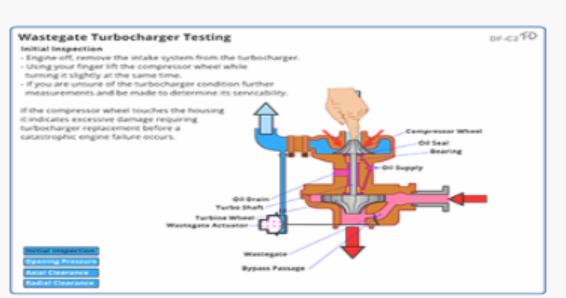


## VGT Turbocharger Operation and Testing

DF\_VGTExhaustTesting\_C1

Description

Updated October 2022

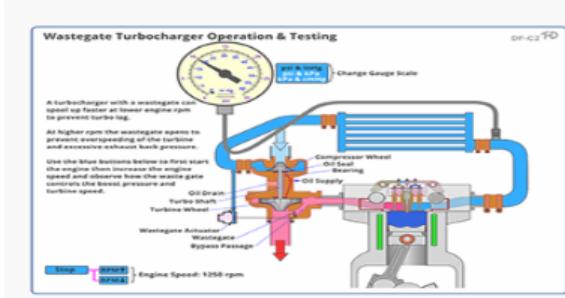


## Wastegate Turbocharger Testing

DF\_WastgateTurboInspectTest\_C1

Description

Updated October 2022

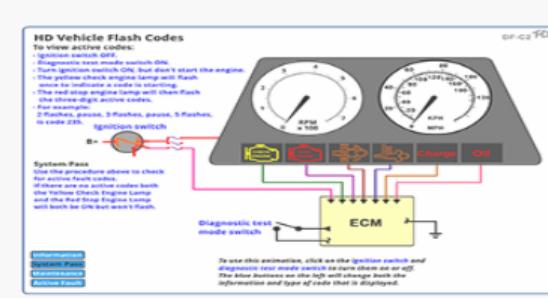


## Wastegate Turbocharger Operation and Testing

DF\_WastgateTurboOperation\_C1

Description

Updated October 2022

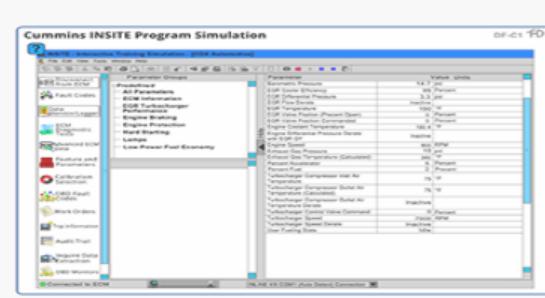


## HD Vehicle Flash Codes

DF\_EngineFaultCodes\_C1

Description

Updated October 2022

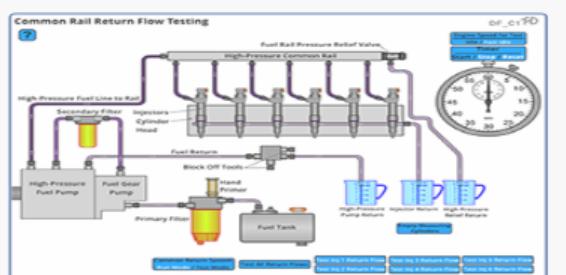


## Cummins INSITE Program Simulator

DF\_CumminsDiagnosisECMtests\_C1

Description

Updated October 2022

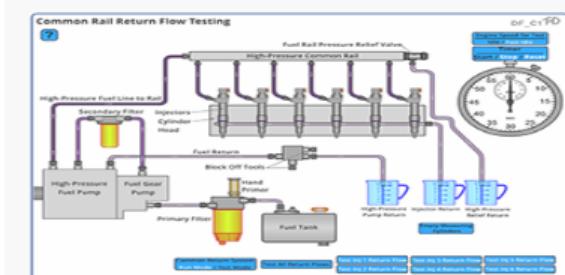


## Return Flow Testing

DF\_ReturnFlowTestAs01\_C1

Common Return: Normal Operation

Updated October 2022

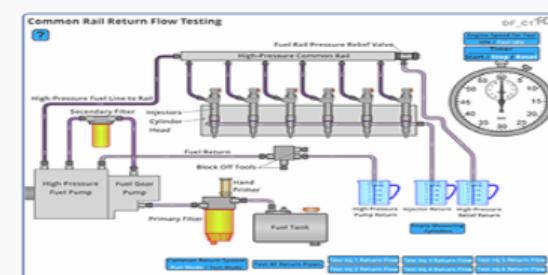


## Return Flow Testing

DF\_ReturnFlowTestAs02\_C1

Common Return: Pump Fault

Updated October 2022

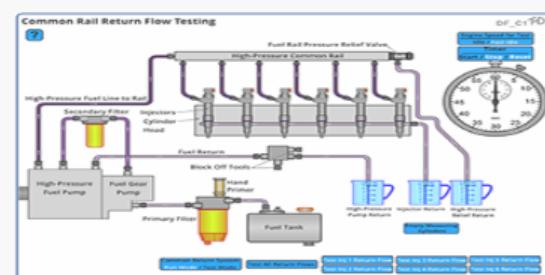


## Return Flow Testing

DF\_ReturnFlowTestAs03\_C1

Common Return: Relief Valve Fault

Updated October 2022

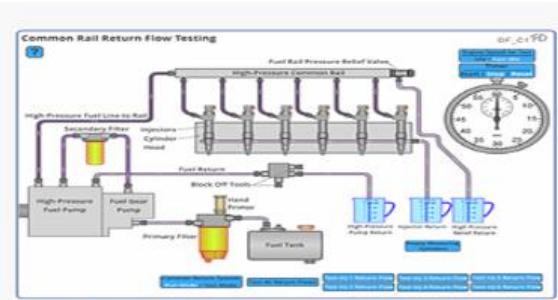


## Return Flow Testing

DF\_ReturnFlowTestAs04\_C1

Common Return: No1 Inj Fault

Updated October 2022

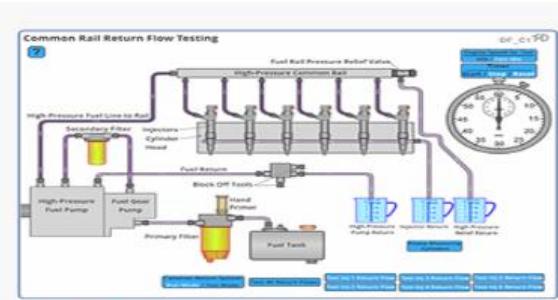


### Return Flow Testing

DF\_ReturnFlowTestAs05\_C1

Common Return: No2 Inj Fault

**Updated October 2022**

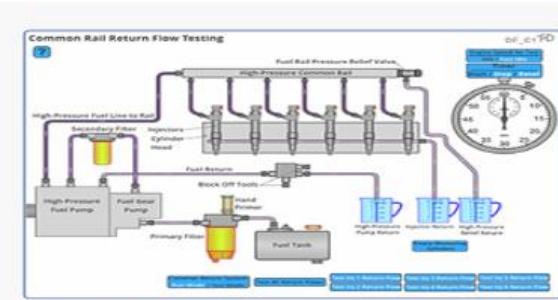


### Return Flow Testing

DF\_ReturnFlowTestAs06\_C1

Common Return: No3 Inj Fault

**Updated October 2022**

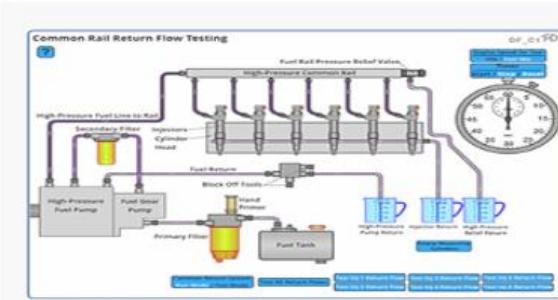


### Return Flow Testing

DF\_ReturnFlowTestAs07\_C1

Common Return: No4 Inj Fault

**Updated October 2022**

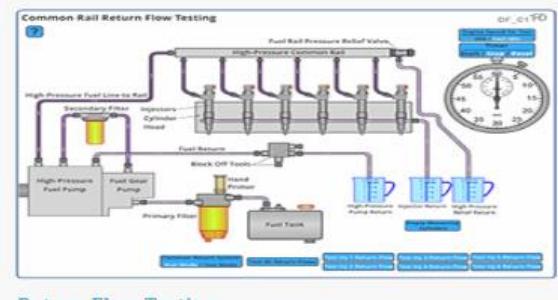


### Return Flow Testing

DF\_ReturnFlowTestAs08\_C1

Common Return: No5 Inj Fault

**Updated October 2022**

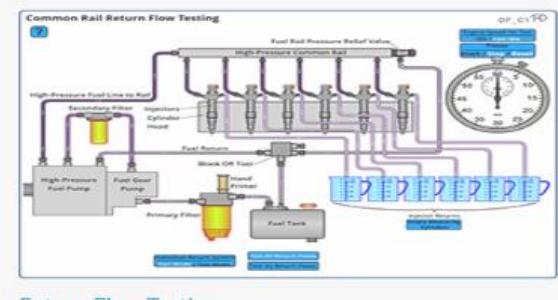


### Return Flow Testing

DF\_ReturnFlowTestAs09\_C1

Common Return: No6 Inj Fault

**Updated October 2022**

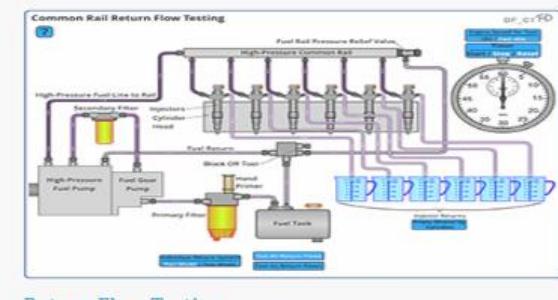


### Return Flow Testing

DF\_ReturnFlowTestAs10\_C1

Individual Return: Normal Operation

**Updated October 2022**

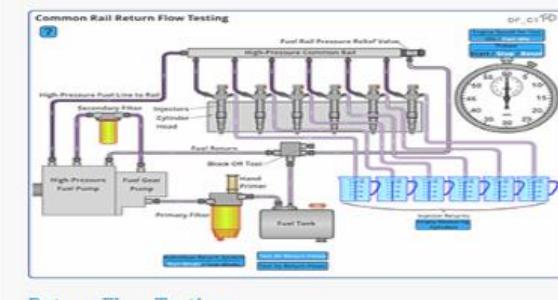


### Return Flow Testing

DF\_ReturnFlowTestAs11\_C1

Individual Return: Pump Fault

**Updated October 2022**

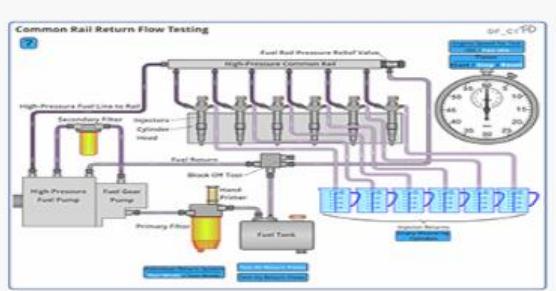


### Return Flow Testing

DF\_ReturnFlowTestAs12\_C1

Individual Return: Relief Valve Fault

**Updated October 2022**

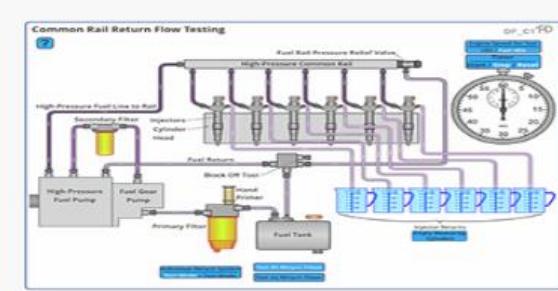


### Return Flow Testing

DF\_ReturnFlowTestAs13\_C1

Individual No1 Inj Fault

**Updated October 2022**

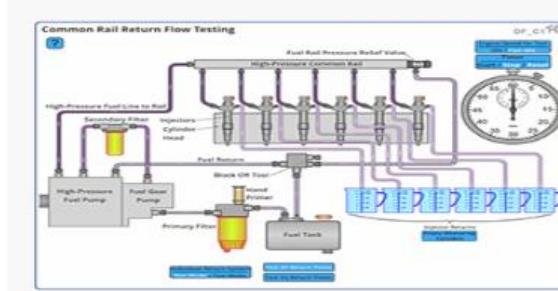


### Return Flow Testing

DF\_ReturnFlowTestAs14\_C1

Individual No2 Inj Fault

**Updated October 2022**

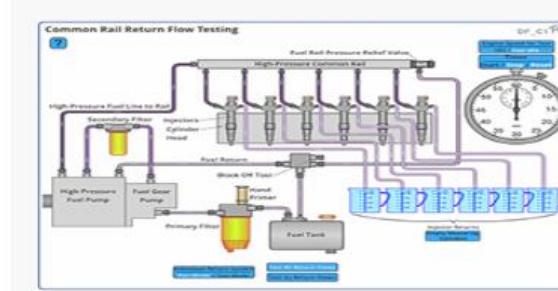


### Return Flow Testing

DF\_ReturnFlowTestAs15\_C1

Individual No3 Inj Fault

**Updated October 2022**

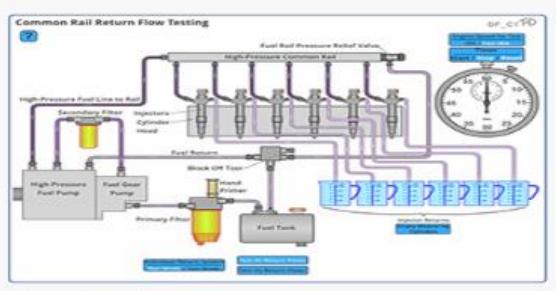


### Return Flow Testing

DF\_ReturnFlowTestAs16\_C1

Individual No4 Inj Fault

**Updated October 2022**

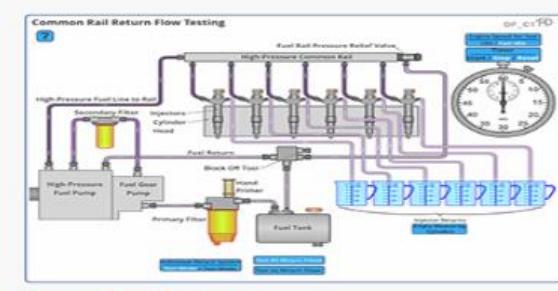


### Return Flow Testing

DF\_ReturnFlowTestAs17\_C1

Individual No5 Inj Fault

**Updated October 2022**

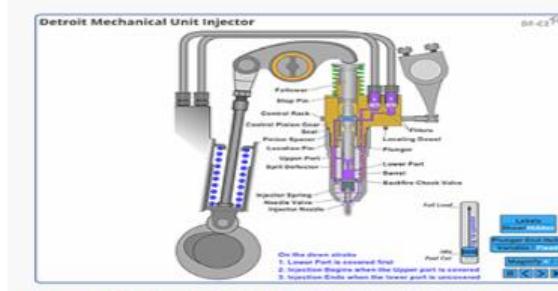


### Return Flow Testing

DF\_ReturnFlowTestAs18\_C1

Individual No6 Inj Fault

**Updated October 2022**

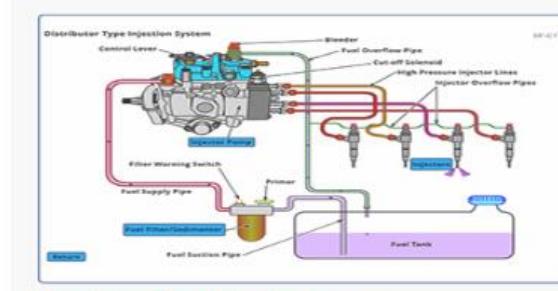


### Detroit Mechanical Unit Injector

DF\_DetroitMULinjected\_C1

Description

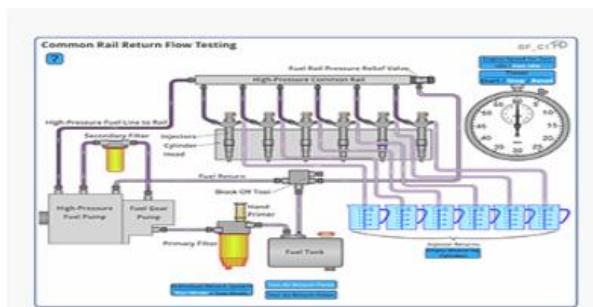
**Updated October 2022**



### Distributor Type Injection System

DF\_BoschVE\_C1

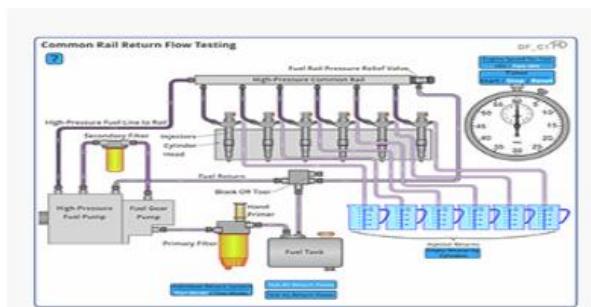
Covers the operation of the Bosch Distributor Injector Pump and hydraulic type injectors.  
**Updated October 2022**



### Return Flow Testing

DF\_ReturnFlowTestAs17\_C1

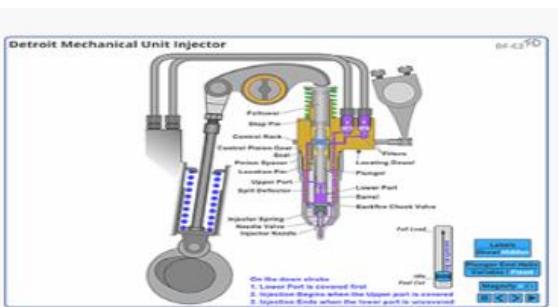
Individual No5 Inj Fault  
Updated October 2022



### Return Flow Testing

DF\_ReturnFlowTestAs18\_C1

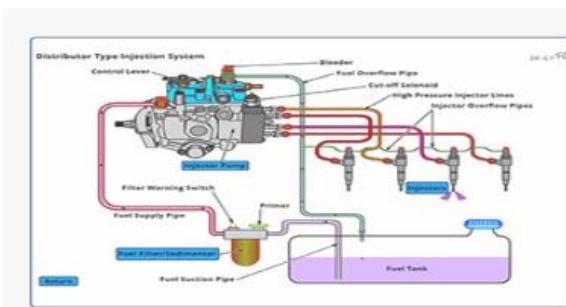
Individual No6 Inj Fault  
Updated October 2022



### Detroit Mechanical Unit Injector

DF\_DetroitMUIinjector\_C1

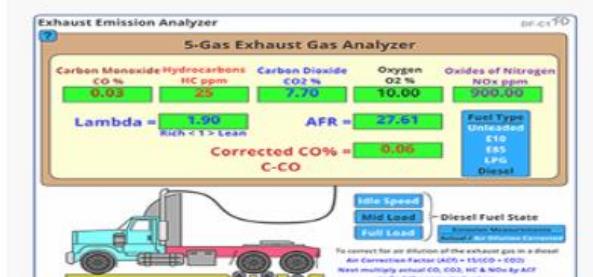
Description  
Updated October 2022



### Distributor Type Injection System

DF\_BoschVE\_C1

Covers the operation of the Bosch Distributor Injector Pump and hydraulic type injectors.  
Updated October 2022

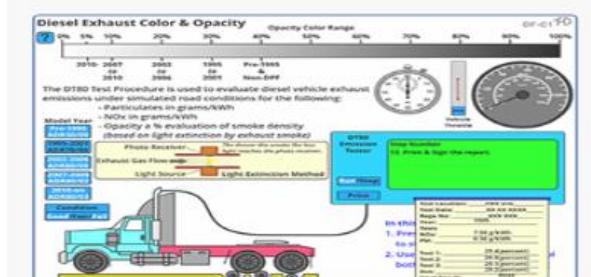


### Exhaust Emission Analyzer

DF\_ExGasAnalyzer\_C1

5-Gas Exhaust Gas Analyzer with added Diesel Mode to compare actual reading to Air Dilution Corrected Readings.

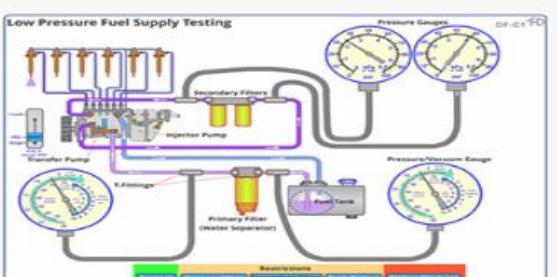
Updated October 2022



### Diesel Exhaust Color & Opacity

DF\_ExhOpacTst\_C1

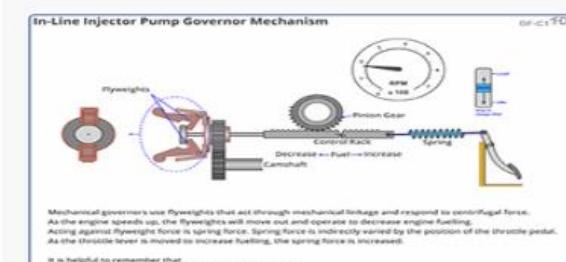
Covers Exhaust Emission Standards and the DT80 Emission Test Procedure.  
Updated October 2022



### Low Pressure Fuel Supply Testing

DF\_LwFpTs\_C1

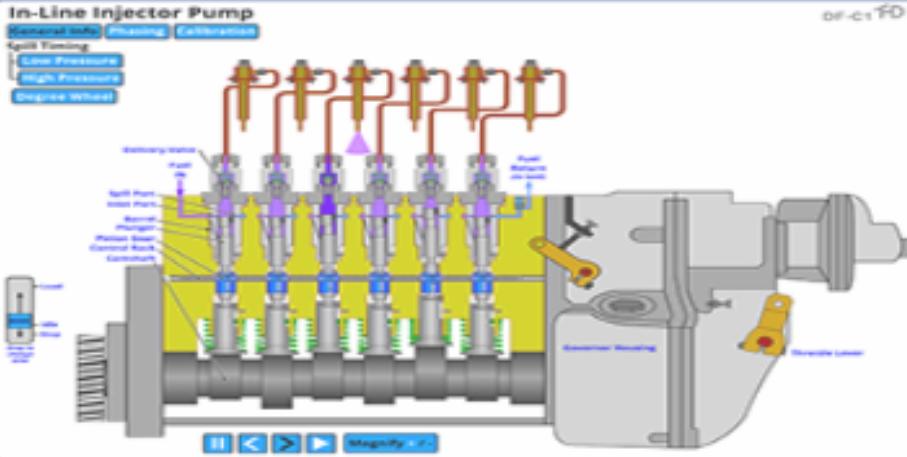
Testing for faults in the low pressure fuel supply system to a hydraulic injection system.  
Published March 2023



### Mechanical Governor

DF\_InLineGov\_C1

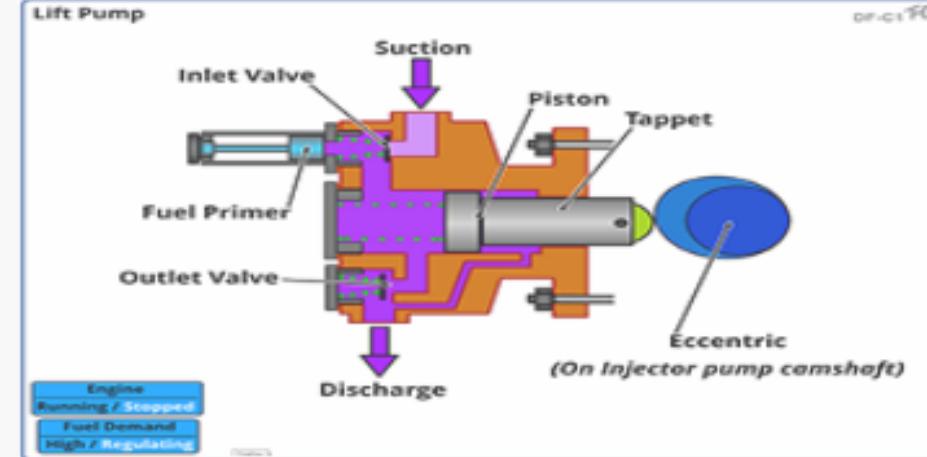
Demonstrates the operating principle of a mechanical governor as used in an inline injector pump.  
Published March 2023



**Inline Injector Pump**

DF\_InLineIP\_C1

Internal operation of the control rack, plungers and delivery valves.



**Lift Pump**

DF\_LftPmp\_C1

Internal operation of a typical lift pump as fitted to an Inline Injector Pump.

# DL Series

# Drivelines & Final Drives

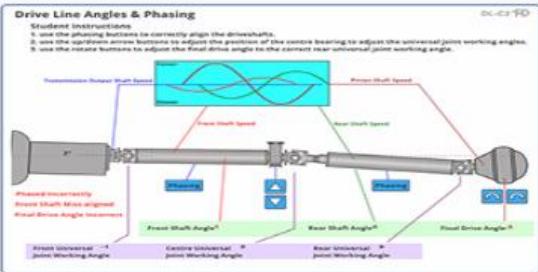


### Hypoid Final Drive with Conventional Differential

DL\_IRShypoidFinalDrive\_C1

Description

Updated October 2022

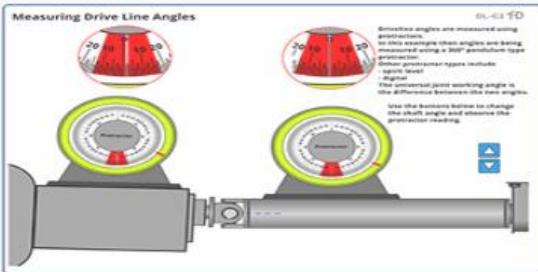


### Driveline Angles and Phasing

DL\_DrivelineAlignment\_C1

Description

Updated October 2022

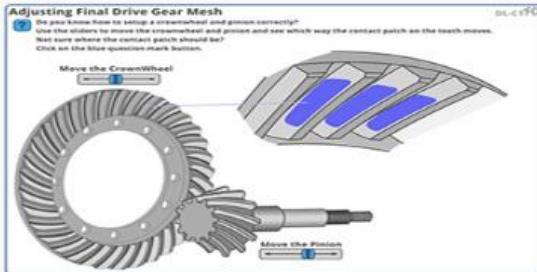


### Measuring Driveline Angles

DL\_MeasureDrivelineAngles\_C1

Description

Updated October 2022

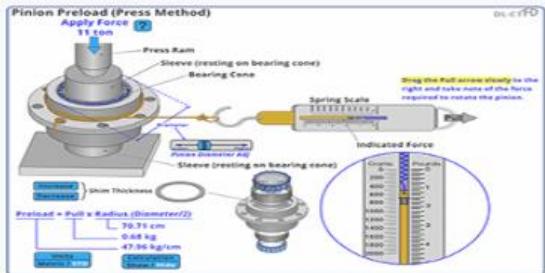


### Adjusting Final Drive Mesh

DL\_FDadj\_C1

Description

Updated October 2022

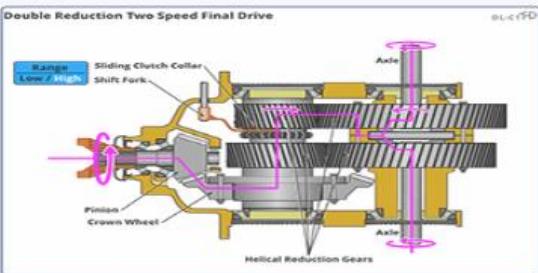


### Pinion Preload (Press Method)

DL\_PinionPrLoad\_C1

Description

Updated October 2022

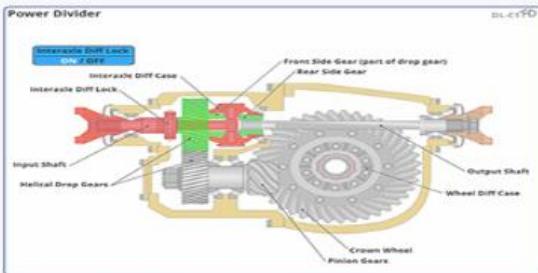


### Double Reduction Two Speed Final Drive

DL\_DbRedTwSpd\_C1

Description

Updated October 2022

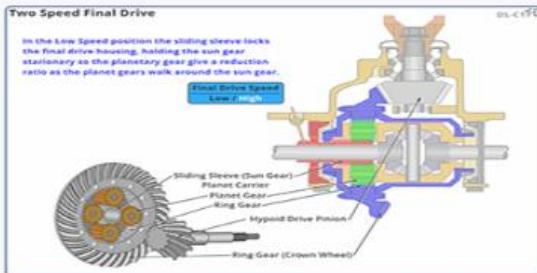


### Power Divider Operation

DL\_PwrDivider\_C1

Description

Updated October 2022

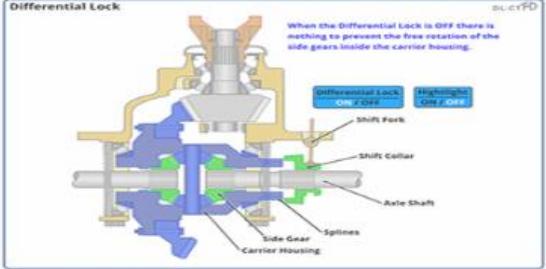


### Two Speed Final Drive

DL\_TwSpdFd\_C1

Description

Updated October 2022

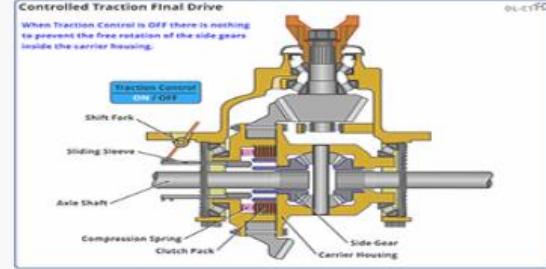


### Differential Lock

DL\_DiffLck\_C1

Description

Updated October 2022

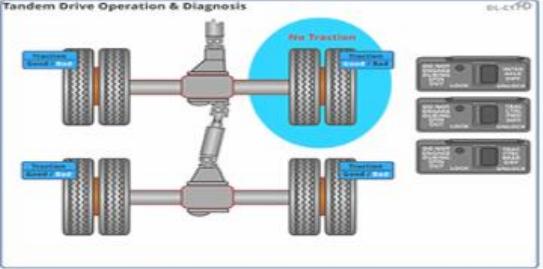


### Controlled Traction Final Drive

DL\_CntrlTract\_C1

Description

Updated October 2022

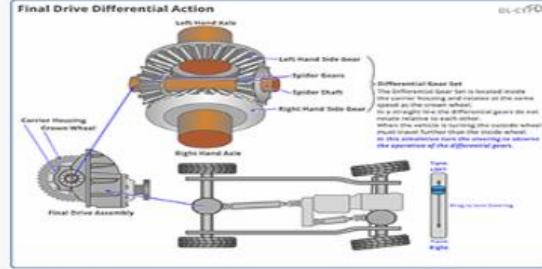


### Tandem Drive Operation & Diagnosis

DL\_TandamDiag\_C1

Description

Updated October 2022

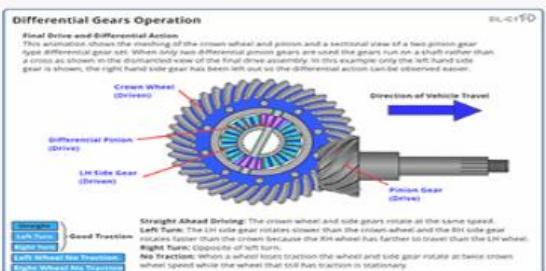


### Final Drive Differential Operation

DL\_DiffAct\_C1

Description

Updated October 2022

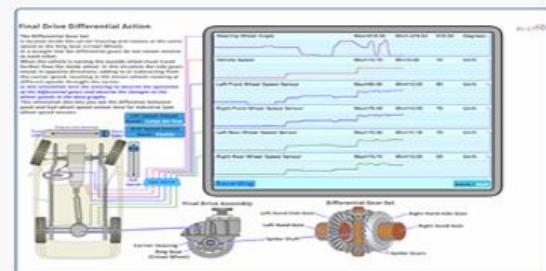


### Differential Gears Operation

DL\_DiffAct2\_C1

Covers the operation of the differential gears during straight ahead operation, turning and loss of traction in one of the drive wheels

Updated October 2022

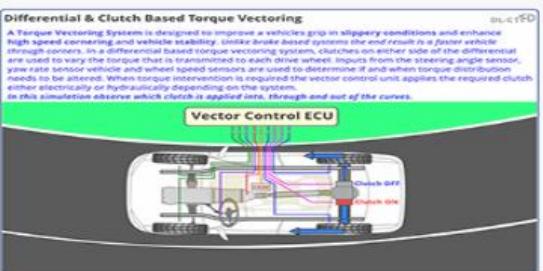


### Differential Gears Operation

DL\_DiffAct3\_C1

Covers the operation of the differential gears during normal driving and shows the wheel speed sensor data variation during cornering as well as faulty sensor data

Updated October 2022

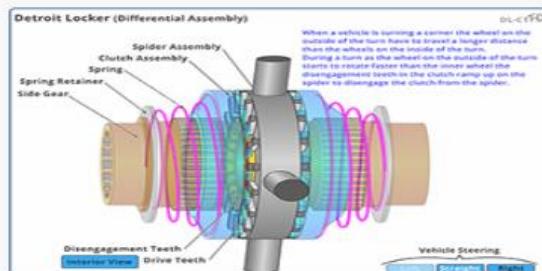


### Differential Based Torque Vectoring System

DL\_TqVct\_C1

Covers the theory of operation of the differential based torque vectoring system through high speed cornering

Updated October 2022

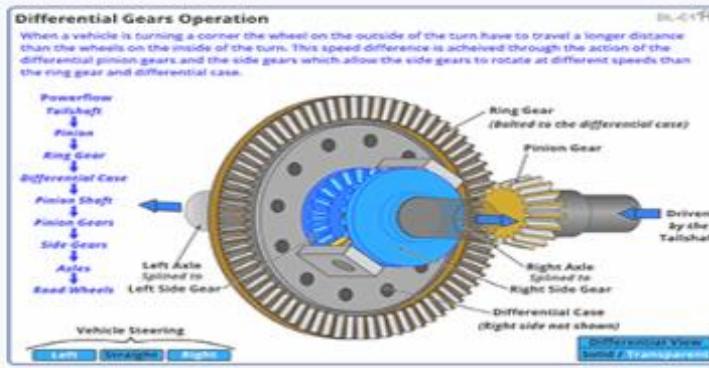


### Detroit Locker (Differential Assembly)

DL\_DetroitLck\_C1

Covers the operation of the detroit locker.

Updated October 2022

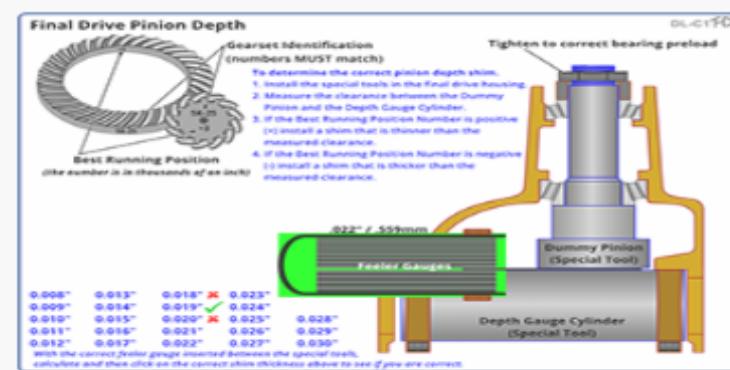


## Differential Gears Operation

DL\_DiffAct4\_C1

Shows the internal operation of the differential gear set during straight ahead driving and turning left or right.

Updated October 2022



## Final Drive Pinion Depth

DL\_PinionSt\_C1

Demonstrates how to use the special tools needed to choose the correct shim to set the Pinion Depth Correctly



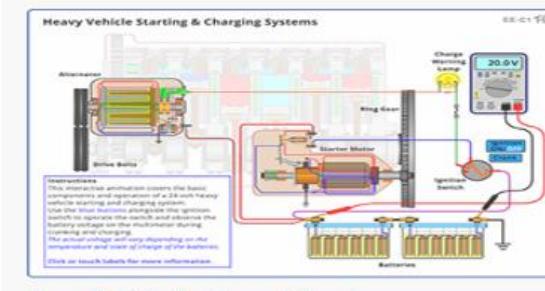
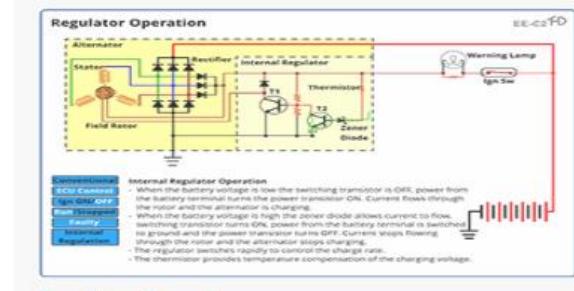
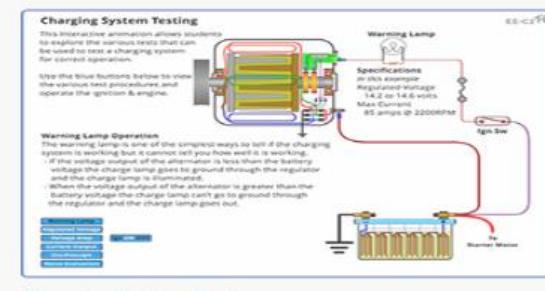
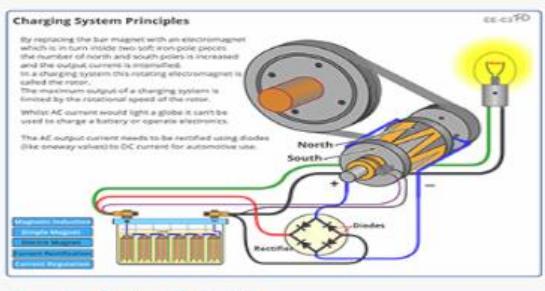
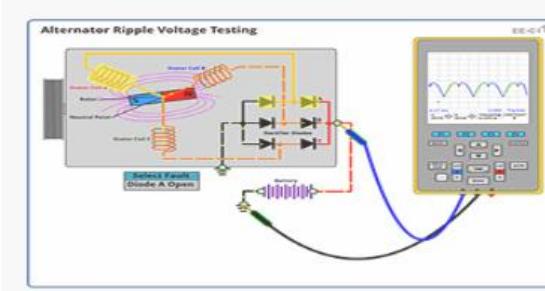
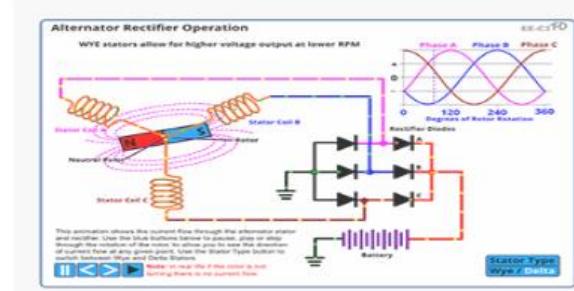
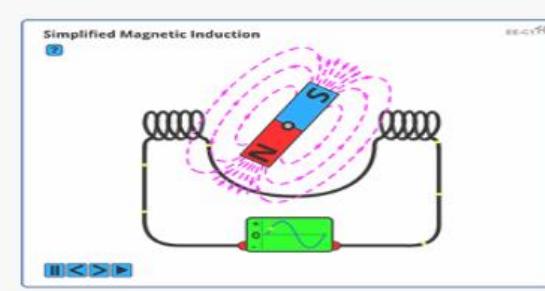
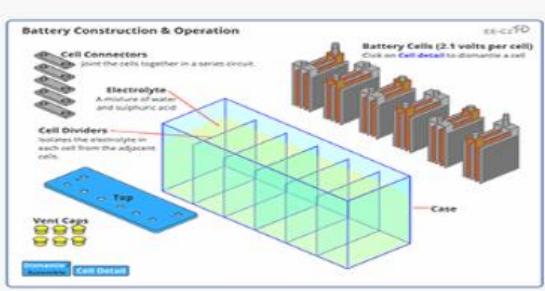
## Pinion Installation & Preload

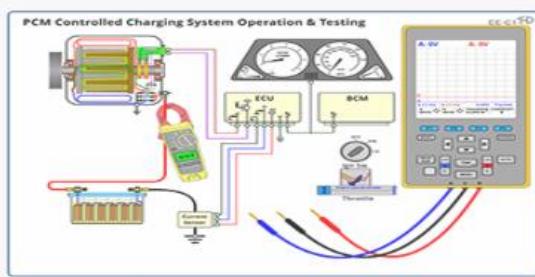
DL\_PnPldLV\_C1

Demonstrates assembling a pinion shaft into the final drive housing, then checking and adjusting the bearing preload.

# EE Series

# Engine Electrical



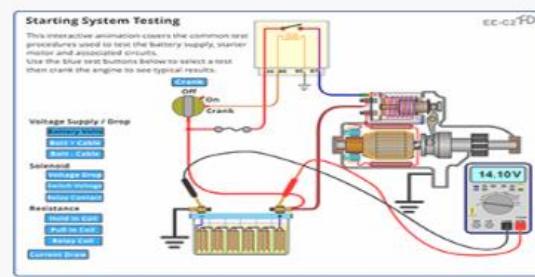


**PCM Controlled Charging System Operation and Testing**

EE\_ChargePCM\_C1

Description

Updated October 2022

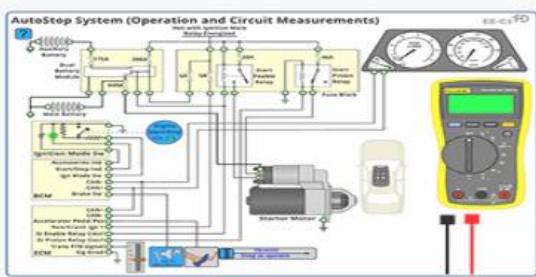


**Starting System Testing**

EE\_StarterMotorTesting\_C1

Description

Updated October 2022

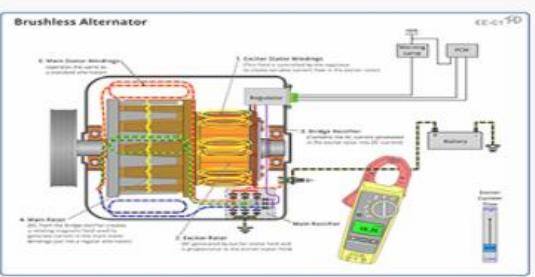


**Auto Stop System**

EE\_AutoStopCircuit\_C1

Description

Updated October 2022

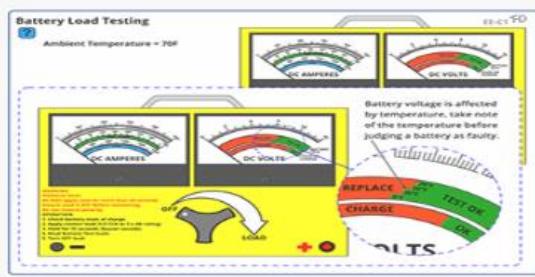


**Brushless Alternator**

EE\_BrushlessAlternator\_C1

Description

Updated October 2022

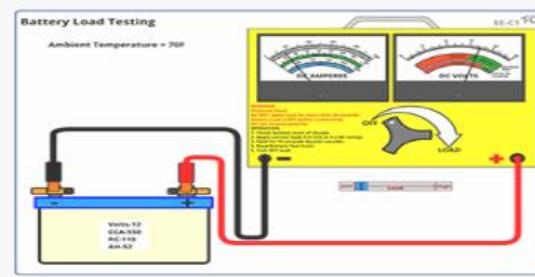


**Battery Load Testing**

EE\_BattLoadTstAss00\_C1

Teaching Resource the ability to change battery CCA and test parameters

Updated October 2022

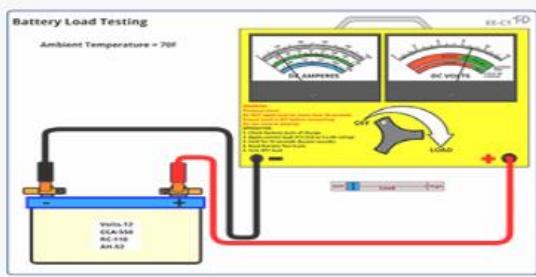


**Battery Load Testing**

EE\_BattLoadTstAss01\_C1

Battery Testing assessment 550CCA @ 70F: Pass

Updated October 2022

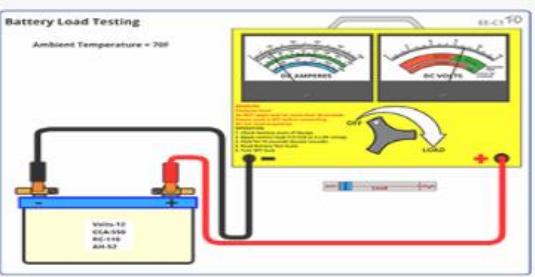


**Battery Load Testing**

EE\_BattLoadTstAss02\_C1

Battery Testing assessment 550CCA @ 70F: Fail

Updated October 2022

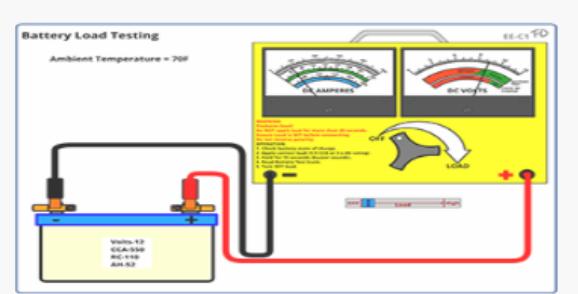


**Battery Load Testing**

EE\_BattLoadTstAss03\_C1

Battery Testing assessment 550CCA @ 30F: Pass

Updated October 2022

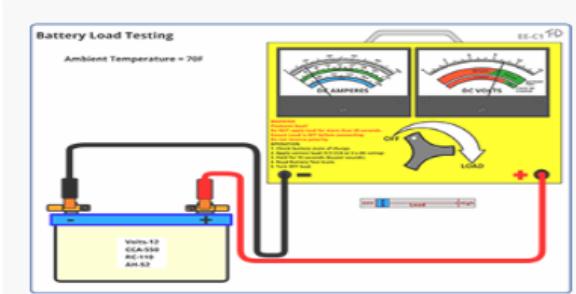


### Battery Load Testing

EE\_BattLoadTstAss04\_C1

Battery Testing assessment 550CCA @ 30F: Fail

**Updated October 2022**

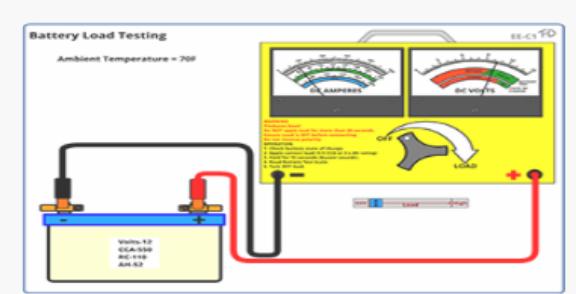


### Battery Load Testing

EE\_BattLoadTstAss05\_C1

Battery Testing assessment 560CCA @ 70F: Pass

**Updated October 2022**

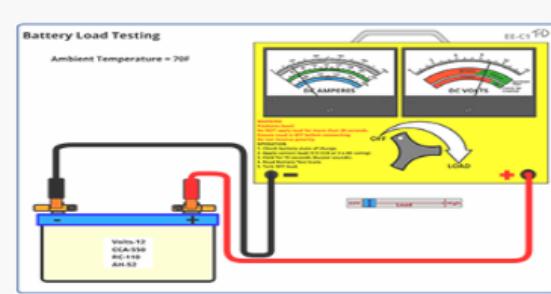


### Battery Load Testing

EE\_BattLoadTstAss06\_C1

Battery Testing assessment 560CCA @ 70F: Fail

**Updated October 2022**

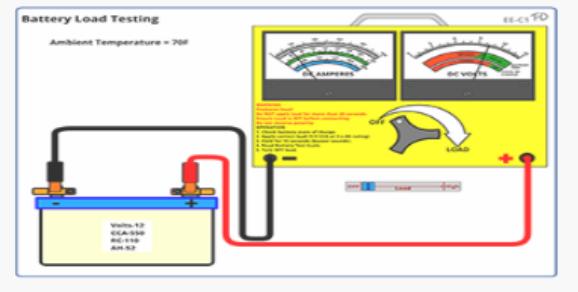


### Battery Load Testing

EE\_BattLoadTstAss07\_C1

Battery Testing assessment 560CCA @ 50F: Pass

**Updated October 2022**

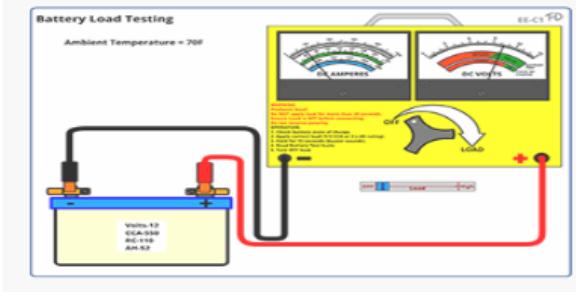


### Battery Load Testing

EE\_BattLoadTstAss08\_C1

Battery Testing assessment 560CCA @ 50F: Fail

**Updated October 2022**

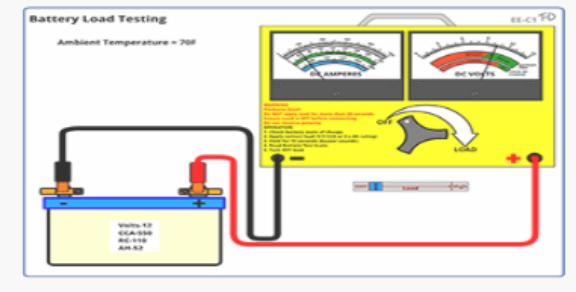


### Battery Load Testing

EE\_BattLoadTstAss09\_C1

Battery Testing assessment 800CCA @ 70F: Pass

**Updated October 2022**

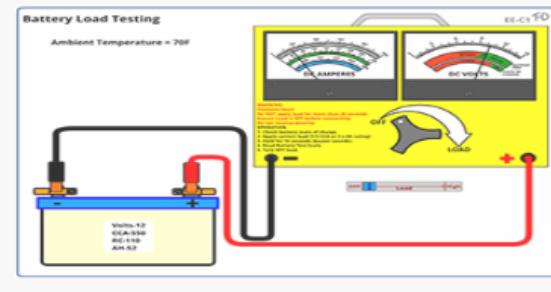


### Battery Load Testing

EE\_BattLoadTstAss10\_C1

Battery Testing assessment 800CCA @ 70F: Fail

**Updated October 2022**

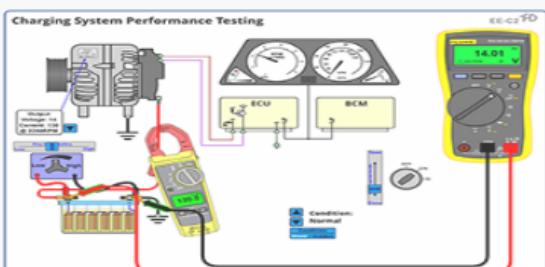
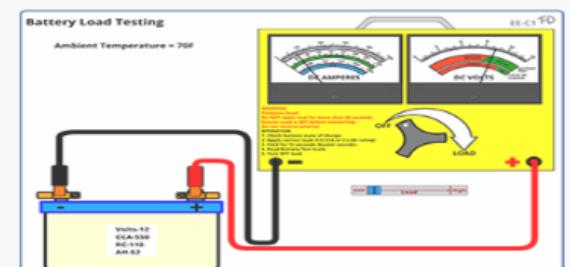
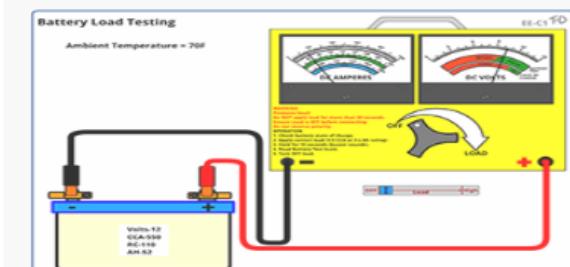
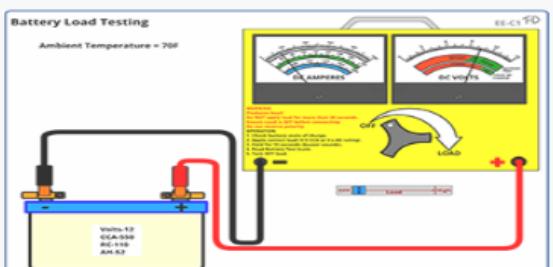
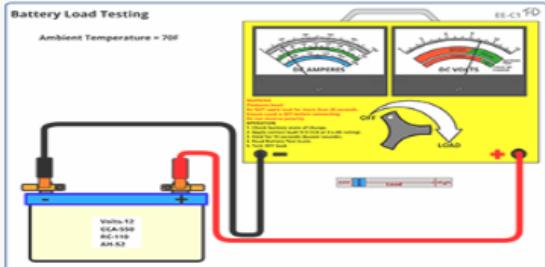
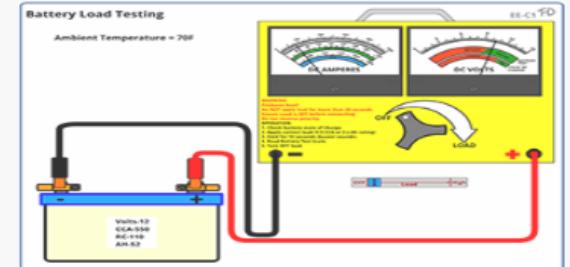
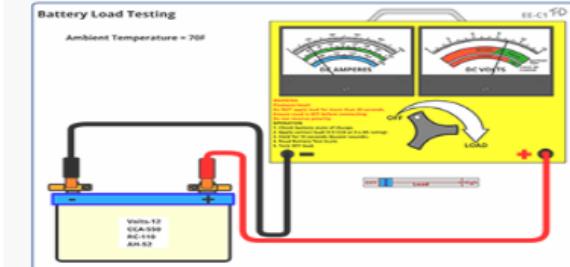
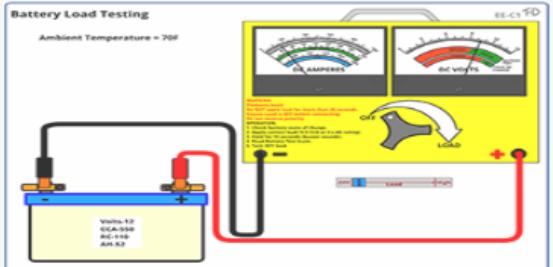


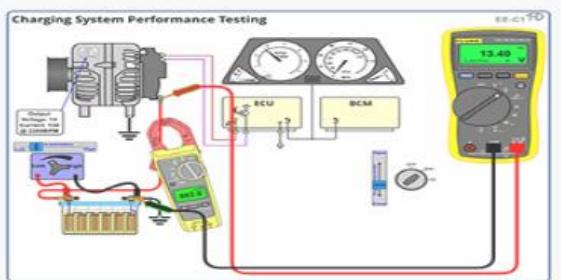
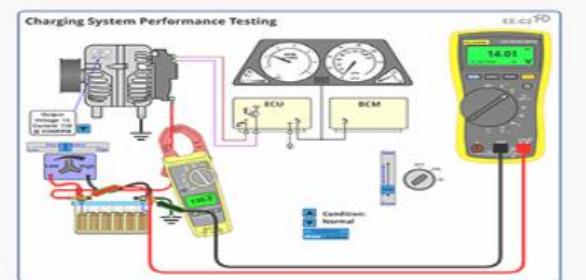
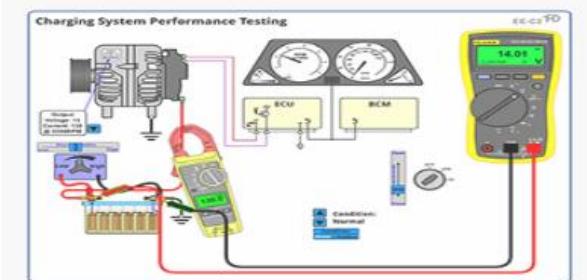
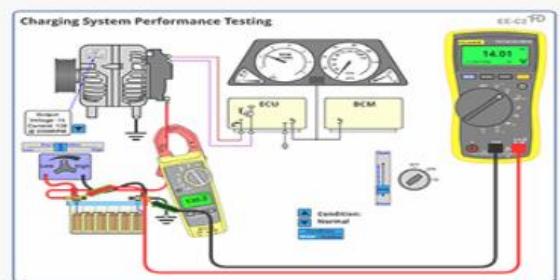
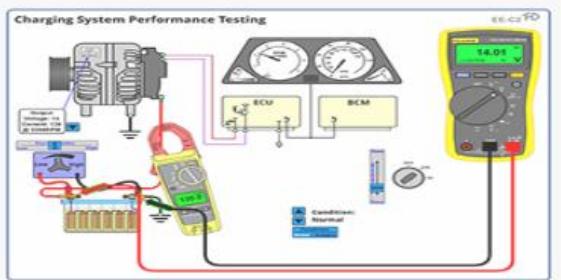
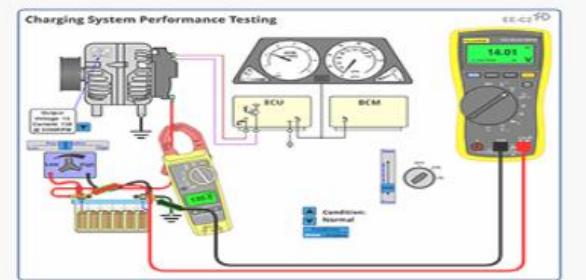
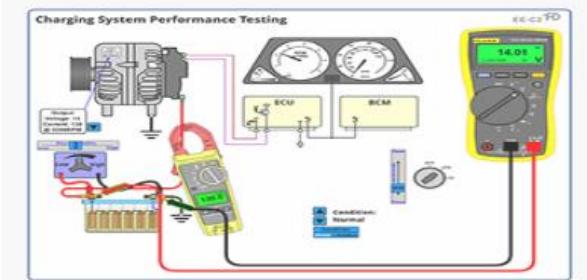
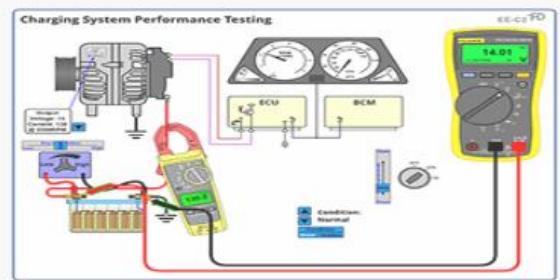
### Battery Load Testing

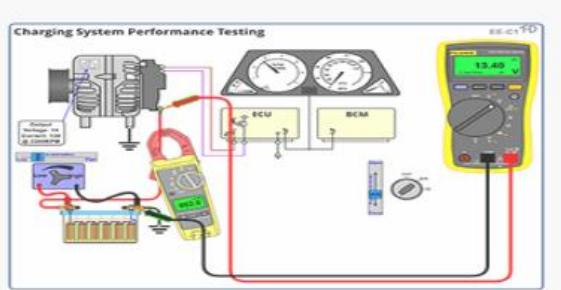
EE\_BattLoadTstAss11\_C1

Battery Testing assessment 800CCA @ 0F: Pass

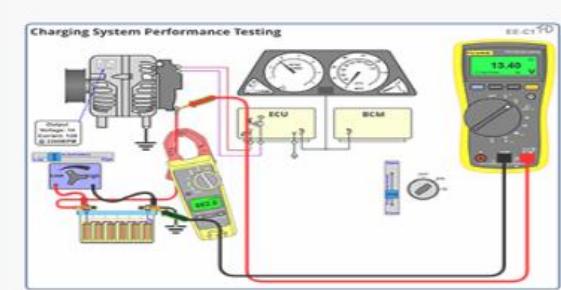
**Updated October 2022**



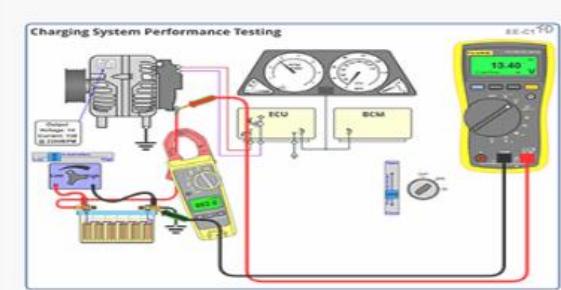




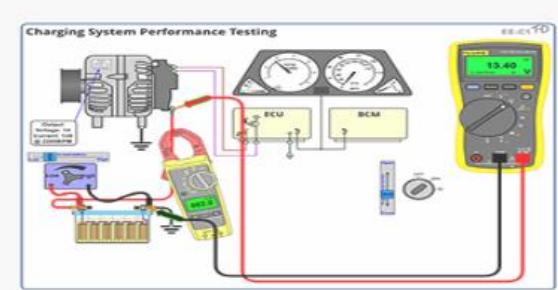
**Charging System Performance Testing**  
EE\_AltOutTstAss10\_C1  
14V 80A@1500: 5% below spec, alternator  
**Updated March 2023**



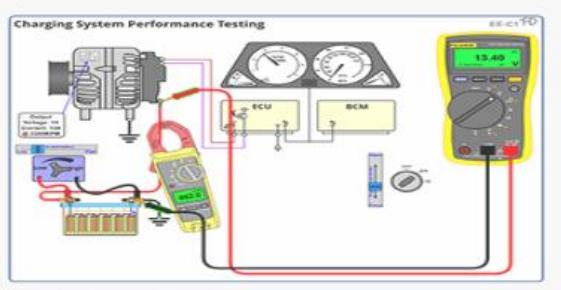
**Charging System Performance Testing**  
EE\_AltOutTstAss11\_C1  
14V 80A@1500: 5% below spec, volt drop on charge wire  
**Updated March 2023**



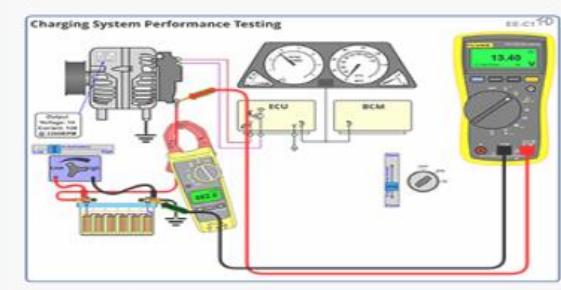
**Charging System Performance Testing**  
EE\_AltOutTstAss12\_C1  
14V 80A@1500: 10% below spec, alternator  
**Updated March 2023**



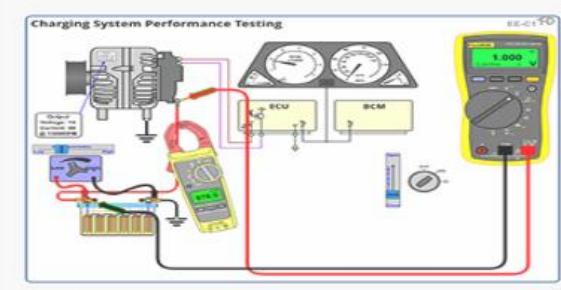
**Charging System Performance Testing**  
EE\_AltOutTstAss13\_C1  
14V 80A@1500: 10% below spec, volt drop on charge wire  
**Updated March 2023**



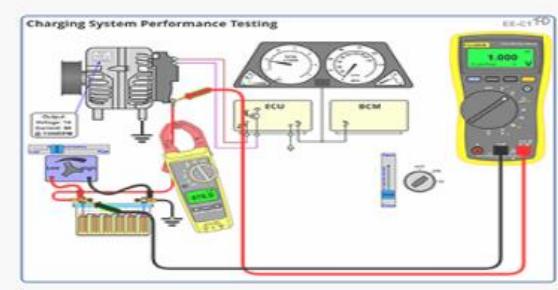
**Charging System Performance Testing**  
EE\_AltOutTstAss14\_C1  
14V 80A@1500: no output, Purple Reg Wire Open  
**Updated March 2023**



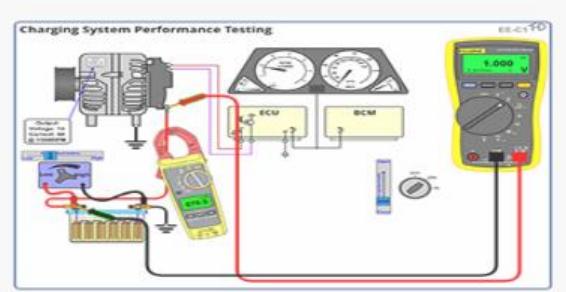
**Charging System Performance Testing**  
EE\_AltOutTstAss15\_C1  
14V 80A@1500: no output, Brown Reg Wire Open  
**Updated March 2023**



**Charging System Performance Testing**  
EE\_AltOutTstAss16\_C1  
14V 100A@4500: Pass  
**Updated March 2023**



**Charging System Performance Testing**  
EE\_AltOutTstAss17\_C1  
14V 100A@4500: 5% below spec, alternator  
**Updated March 2023**

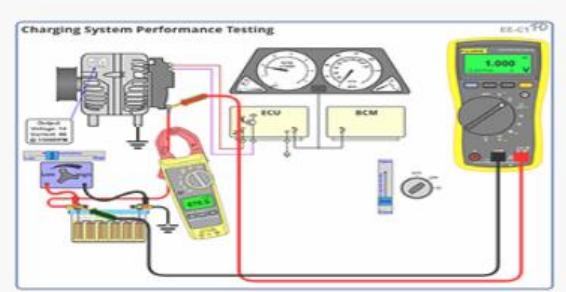


### Charging System Performance Testing

EE\_AltOutTstAss18\_C1

14V 80A@1500: 5% below spec, volt drop on charge wire

Updated March 2023

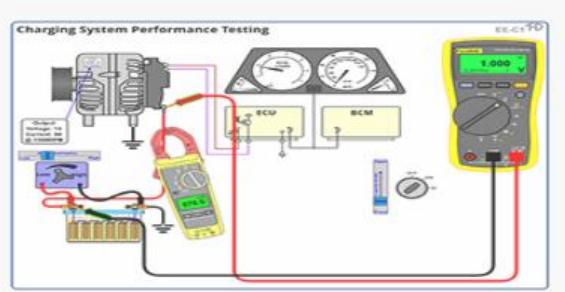


### Charging System Performance Testing

EE\_AltOutTstAss19\_C1

14V 80A@1500: 10% below spec, alternator

Updated March 2023



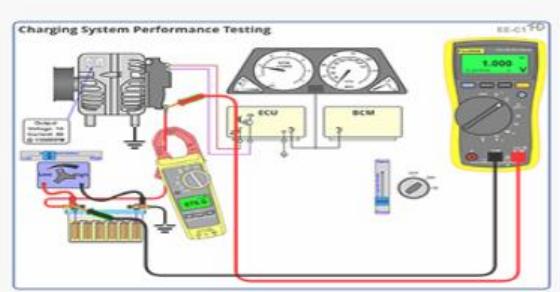
### Charging System Performance Testing

EE\_AltOutTstAss20\_C1

14V 100A@4500: 10% below spec, volt drop on charge

wire

Updated March 2023

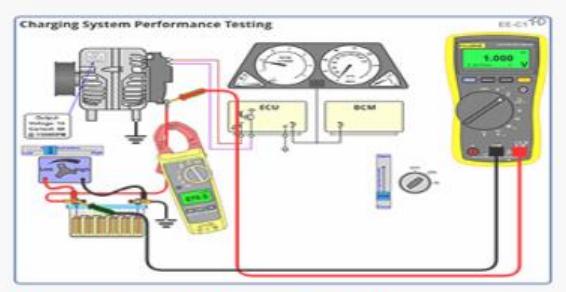


### Charging System Performance Testing

EE\_AltOutTstAss21\_C1

14V 100A@4500: no output, Purple Reg Wire Open

Updated March 2023

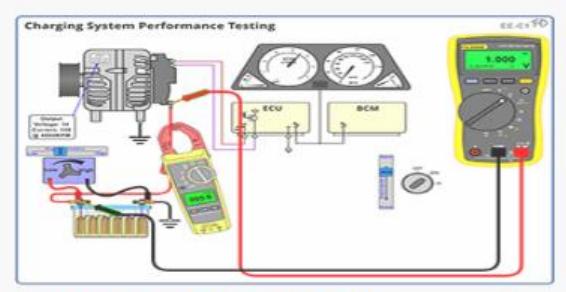


### Charging System Performance Testing

EE\_AltOutTstAss22\_C1

14V 100A@4500: no output, Brown Reg Wire Open

Updated March 2023

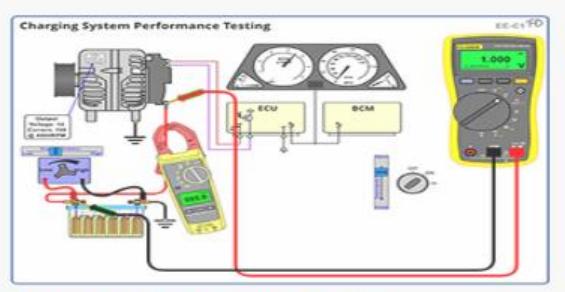


### Charging System Performance Testing

EE\_AltOutTstAss23\_C1

14V 100A@2200: Pass

Updated March 2023

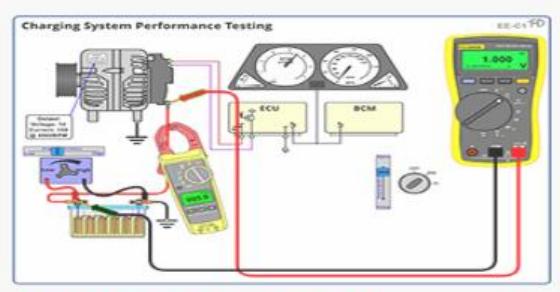


### Charging System Performance Testing

EE\_AltOutTstAss24\_C1

14V 100A@2200: 5% below spec, alternator

Updated March 2023



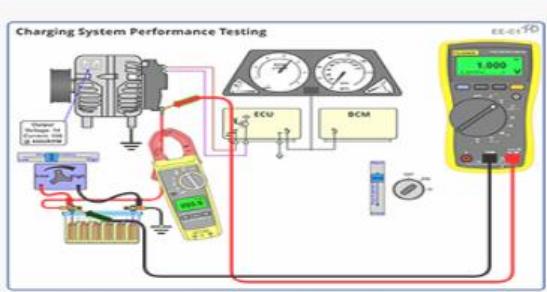
### Charging System Performance Testing

EE\_AltOutTstAss25\_C1

14V 100A@2200: 5% below spec, volt drop on charge

wire

Updated March 2023

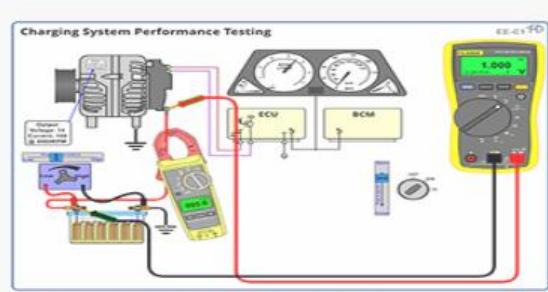


### Charging System Performance Testing

EE\_AltOutTstAss26\_C1

14V 100A@2200: 10% below spec, alternator

Updated March 2023

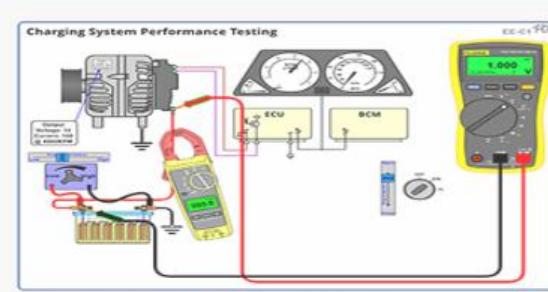


### Charging System Performance Testing

EE\_AltOutTstAss27\_C1

14V 100A@2200: 10% below spec, volt drop on charge wire

Updated March 2023

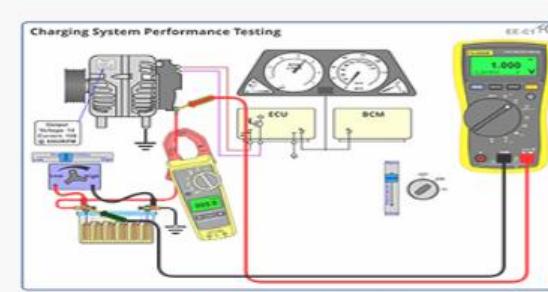


### Charging System Performance Testing

EE\_AltOutTstAss28\_C1

14V 100A@2200: no output, Purple Reg Wire Open

Updated March 2023

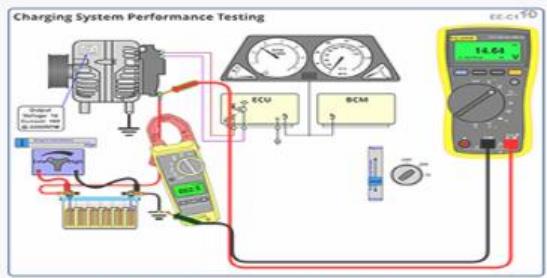


### Charging System Performance Testing

EE\_AltOutTstAss29\_C1

14V 100A@2200: no output, Brown Reg Wire Open

Updated March 2023

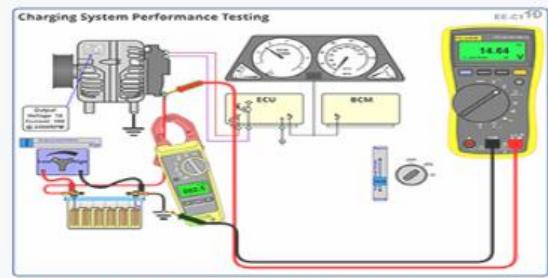


### Charging System Performance Testing

EE\_AltOutTstAss30\_C1

14V 95A@2000: Pass

Updated March 2023

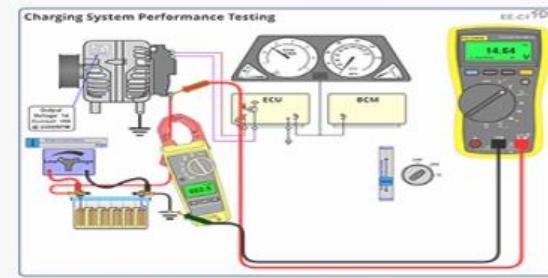


### Charging System Performance Testing

EE\_AltOutTstAss31\_C1

14V 95A@2000: 5% below spec, alternator

Updated March 2023

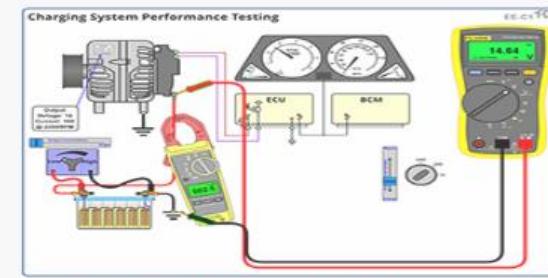


### Charging System Performance Testing

EE\_AltOutTstAss32\_C1

14V 95A@2000: 5% below spec, volt drop on charge wire

Updated March 2023

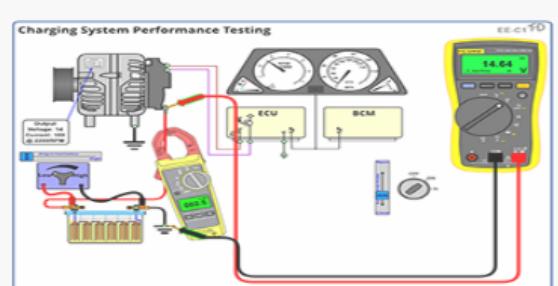


### Charging System Performance Testing

EE\_AltOutTstAss33\_C1

14V 95A@2000: 10% below spec, alternator

Updated March 2023

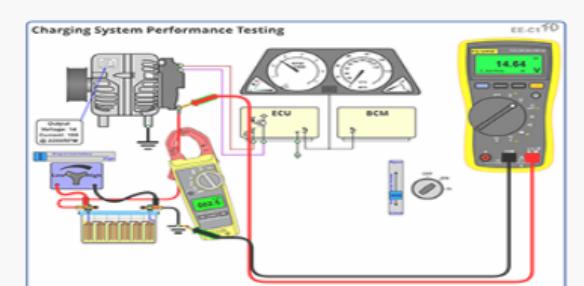


### Charging System Performance Testing

EE\_AltOutTstAss34\_C1

14V 95A@2000: 10% below spec, volt drop on charge wire

**Updated March 2023**

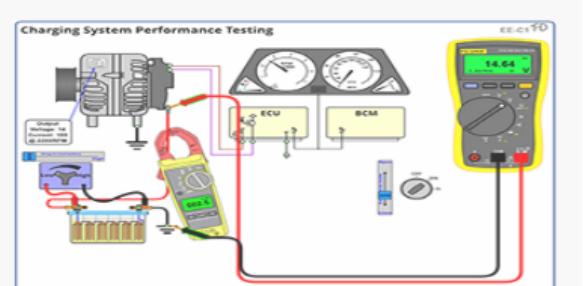


### Charging System Performance Testing

EE\_AltOutTstAss35\_C1

14V 95A@2000: no output, Purple Reg Wire Open

**Updated March 2023**

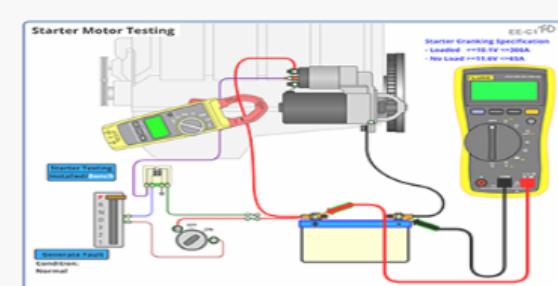


### Charging System Performance Testing

EE\_AltOutTstAss36\_C1

14V 95A@2000: no output, Brown Reg Wire Open

**Updated March 2023**

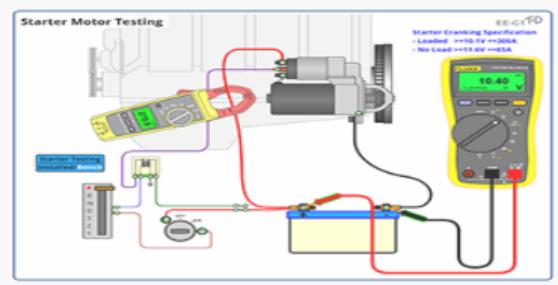


### Starter Motor Testing

EE\_StartTstAss00\_C1

Teacher Version of Starter Motor Testing with multiple faults

**Updated October 2022**

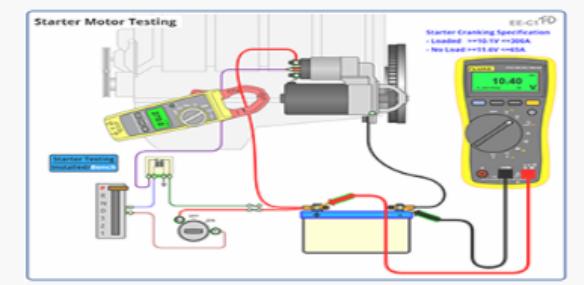


### Starter Motor Testing

EE\_StartTstAss01\_C1

Assessment Version: Normal Operation

**Updated October 2022**

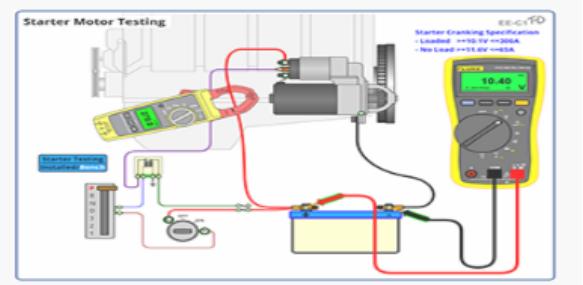


### Starter Motor Testing

EE\_StartTstAss02\_C1

Assessment Version: Relay Coil Open

**Updated October 2022**

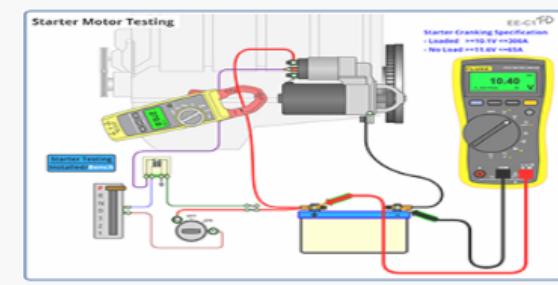


### Starter Motor Testing

EE\_StartTstAss03\_C1

Assessment Version: Relay Contacts Open

**Updated October 2022**

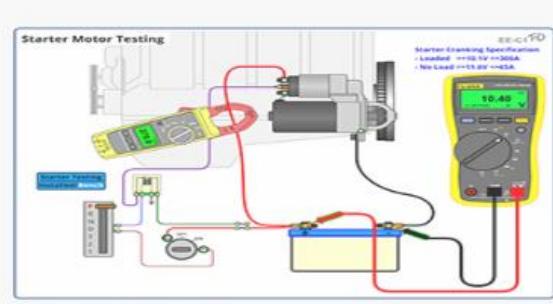


### Starter Motor Testing

EE\_StartTstAss04\_C1

Assessment Version: Solenoid Contacts Open

**Updated October 2022**

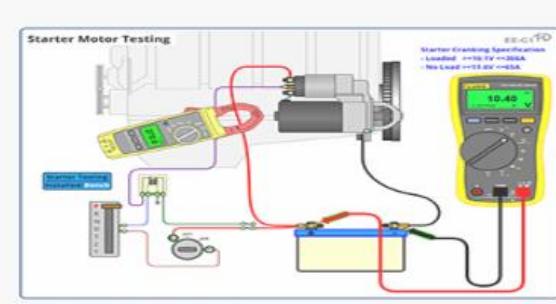


### Starter Motor Testing

EE\_StartTstAss05\_C1

Assessment Version: Hold-IN Coil Open

Updated October 2022

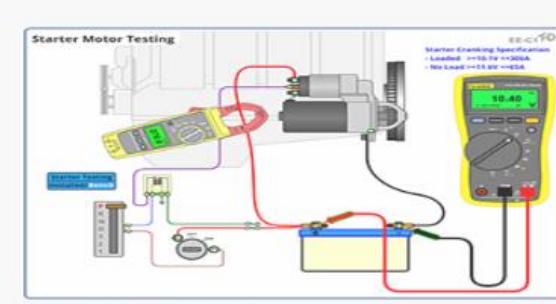


### Starter Motor Testing

EE\_StartTstAss06\_C1

Assessment Version: Pull-IN Coil Open

Updated October 2022

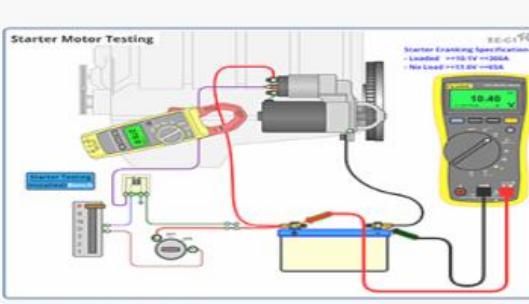


### Starter Motor Testing

EE\_StartTstAss07\_C1

Assessment Version: P/N Switch Open

Updated October 2022

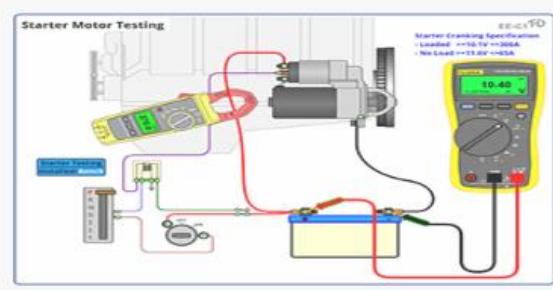


### Starter Motor Testing

EE\_StartTstAss08\_C1

Assessment Version: Starting Motor Open

Updated October 2022

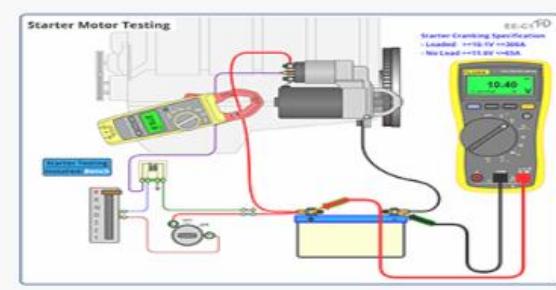


### Starter Motor Testing

EE\_StartTstAss09\_C1

Assessment Version: Voltage drop solenoid contacts

Updated October 2022

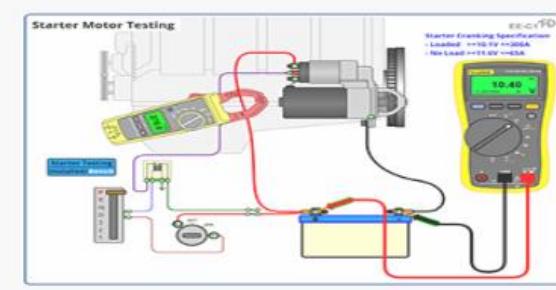


### Starter Motor Testing

EE\_StartTstAss10\_C1

Assessment Version: Voltage drop Power Cable

Updated October 2022

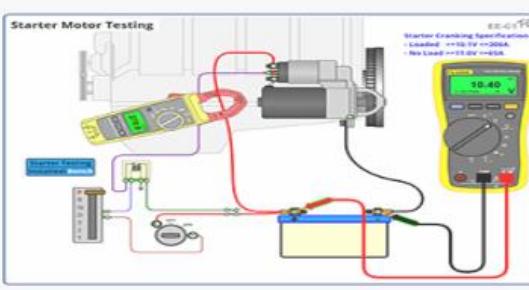


### Starter Motor Testing

EE\_StartTstAss11\_C1

Assessment Version: Voltage drop Ground Cable

Updated October 2022

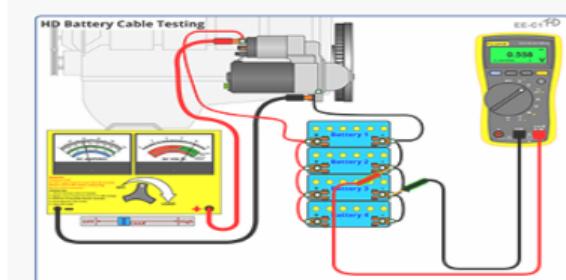
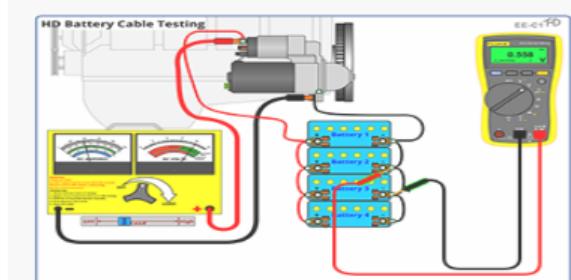
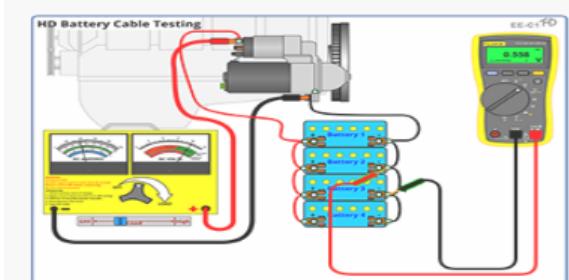
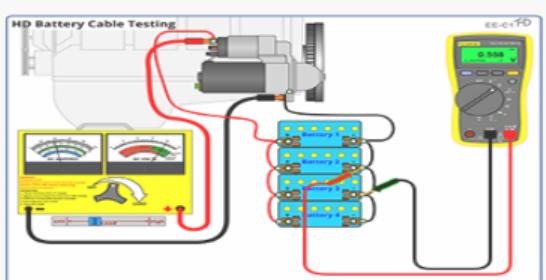
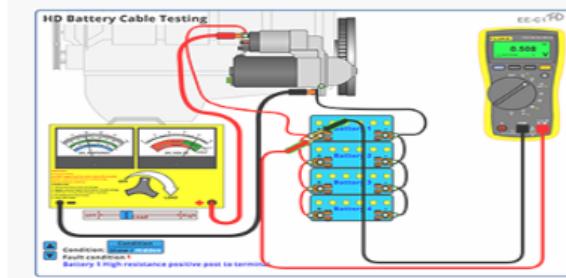
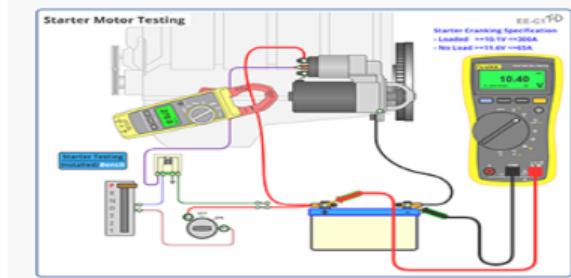
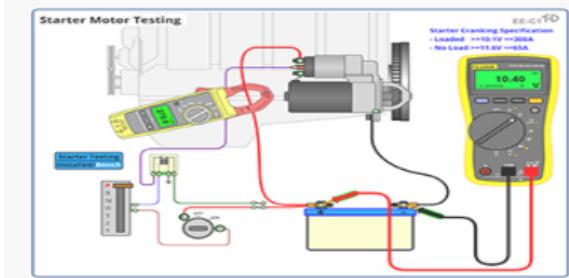
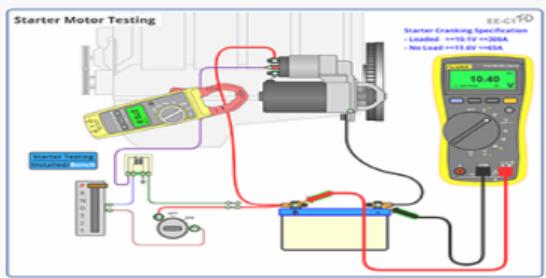


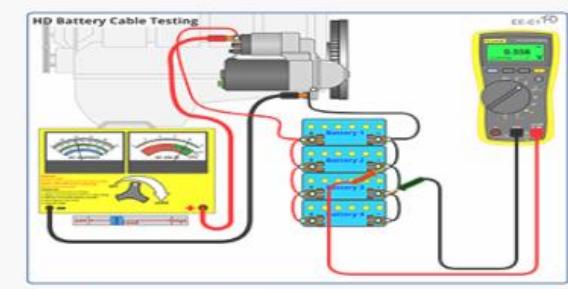
### Starter Motor Testing

EE\_StartTstAss12\_C1

Assessment Version: Motor Poling

Updated October 2022



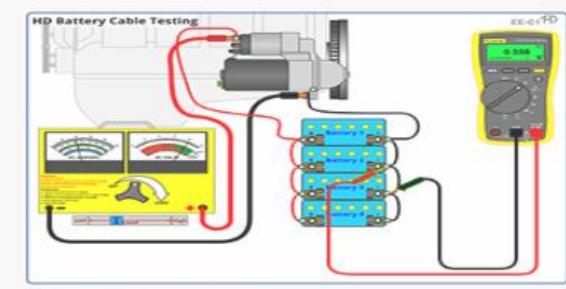


#### HD Battery Cable Testing

EE\_HDStChCbAss04\_C1

Assessment Version: Excessive voltage drop Batt 2 Neg post to terminal

Updated October 2022

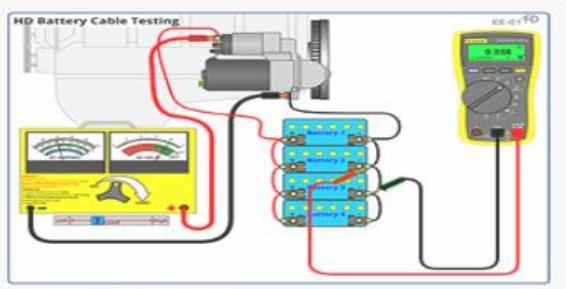


#### HD Battery Cable Testing

EE\_HDStChCbAss05\_C1

Assessment Version: Excessive voltage drop Batt 3 Pos post to terminal

Updated October 2022

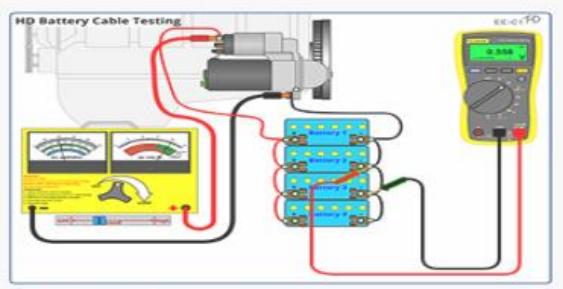


#### HD Battery Cable Testing

EE\_HDStChCbAss06\_C1

Assessment Version: Excessive voltage drop Batt 3 Neg post to terminal

Updated October 2022

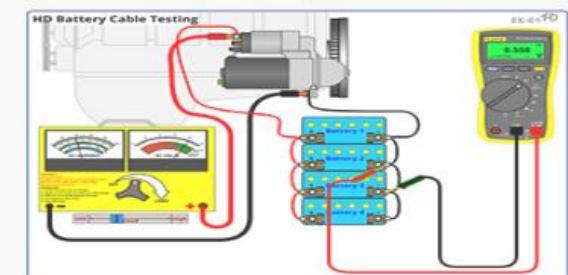


#### HD Battery Cable Testing

EE\_HDStChCbAss07\_C1

Assessment Version: Excessive voltage drop Batt 4 Pos post to terminal

Updated October 2022

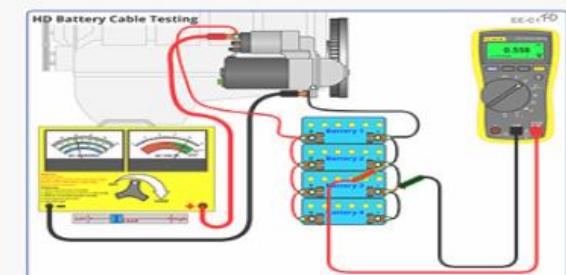


#### HD Battery Cable Testing

EE\_HDStChCbAss08\_C1

Assessment Version: Excessive voltage drop Batt 4 Neg post to terminal

Updated October 2022

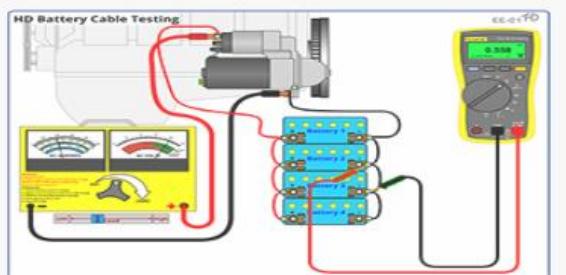


#### HD Battery Cable Testing

EE\_HDStChCbAss09\_C1

Assessment Version: Excessive voltage drop Batt Pos cable to starter motor

Updated October 2022

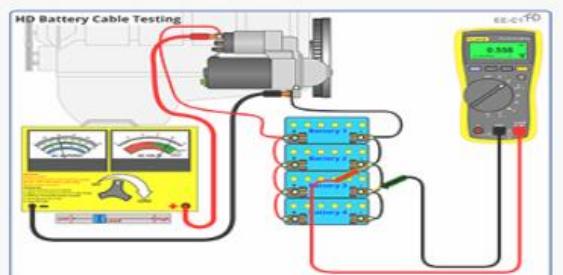


#### HD Battery Cable Testing

EE\_HDStChCbAss10\_C1

Assessment Version: Excessive voltage drop Batt Neg cable from starter to battery 1

Updated October 2022

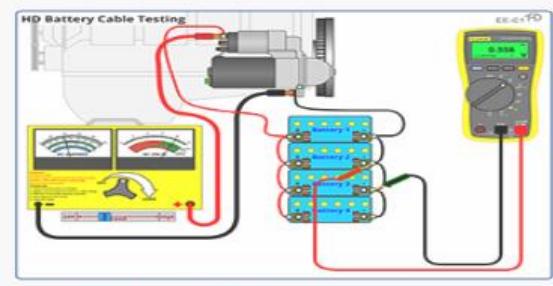


#### HD Battery Cable Testing

EE\_HDStChCbAss11\_C1

Assessment Version: Excessive voltage drop Pos jumper cable Batt 1 to Batt 2

Updated October 2022

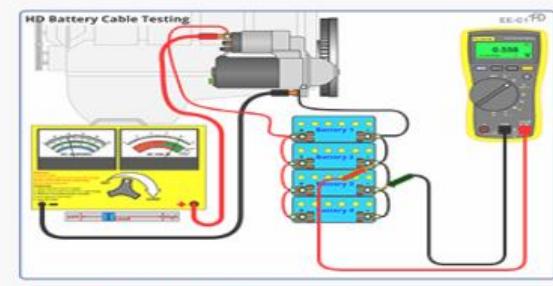


#### HD Battery Cable Testing

EE\_HDStChCbAss12\_C1

Assessment Version: Excessive voltage drop Pos jumper cable Batt 2 to Batt 3

**Updated October 2022**

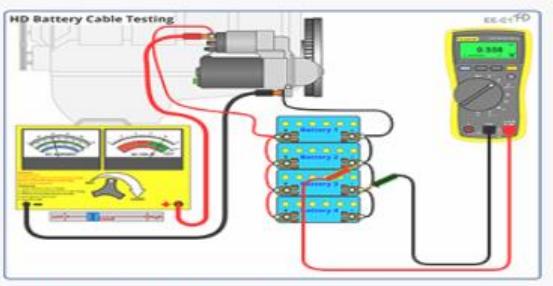


#### HD Battery Cable Testing

EE\_HDStChCbAss13\_C1

Assessment Version: Excessive voltage drop Pos jumper cable Batt 3 to Batt 4

**Updated October 2022**

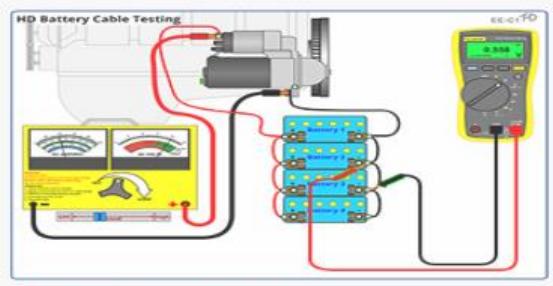


#### HD Battery Cable Testing

EE\_HDStChCbAss14\_C1

Assessment Version: Excessive voltage drop Neg jumper cable Batt 1 to Batt 2

**Updated October 2022**

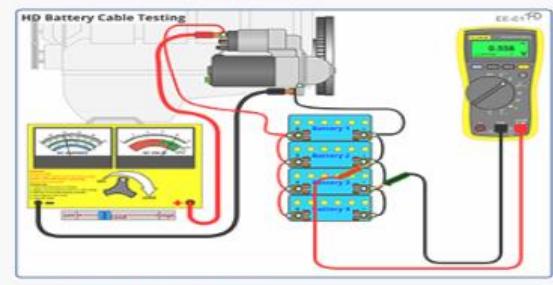


#### HD Battery Cable Testing

EE\_HDStChCbAss15\_C1

Assessment Version: Excessive voltage drop Neg jumper cable Batt 2 to Batt 3

**Updated October 2022**

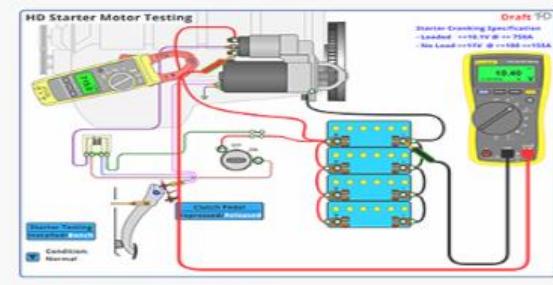


#### HD Battery Cable Testing

EE\_HDStChCbAss16\_C1

Assessment Version: Excessive voltage drop Neg jumper cable Batt 3 to Batt 4

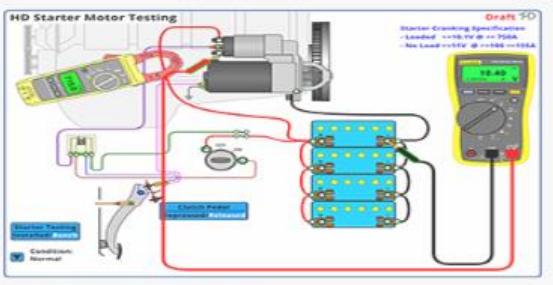
**Updated October 2022**



#### HD Starter Motor Testing

EE\_HDstrtTstTM\_C1

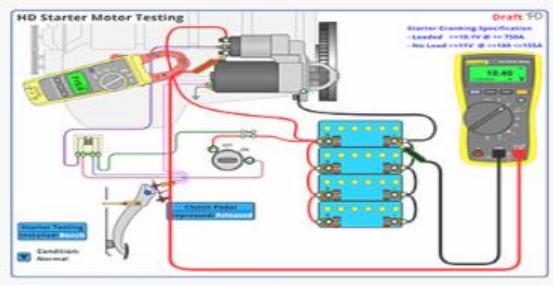
Teaching Master Versions with multiple faults  
Updated October 2022



#### HD Starter Motor Testing

EE\_HDstrtTstAss00\_C1

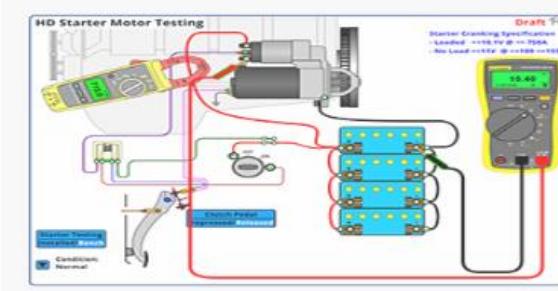
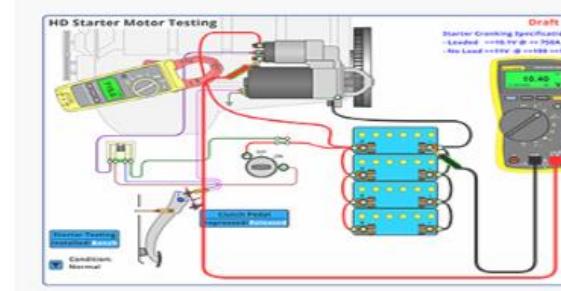
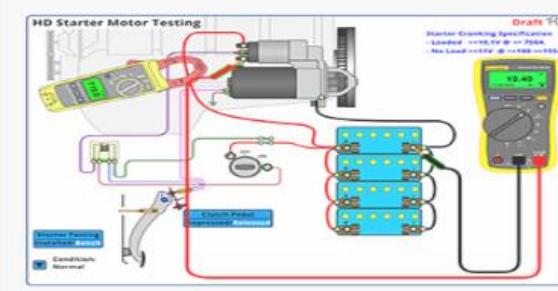
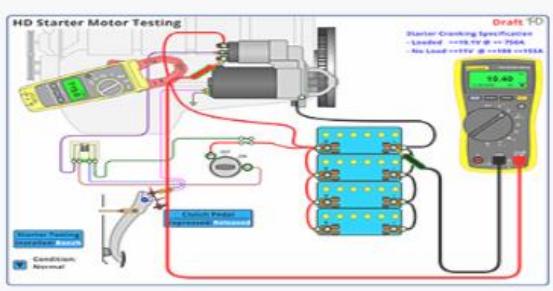
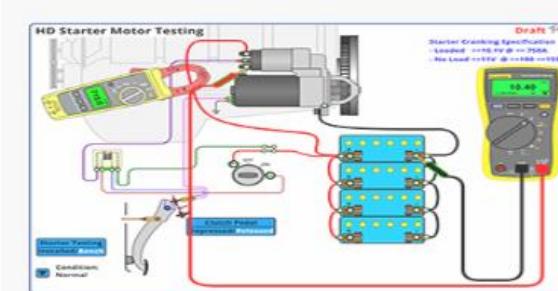
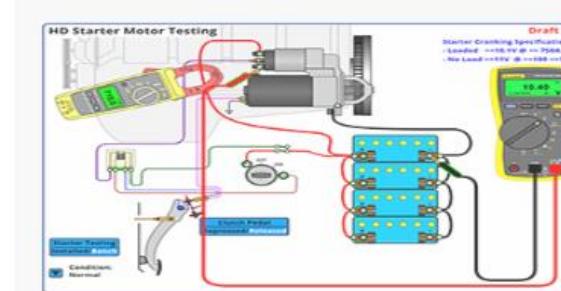
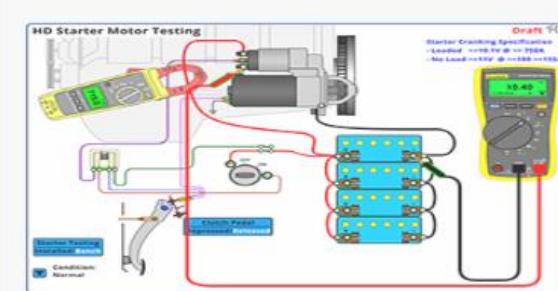
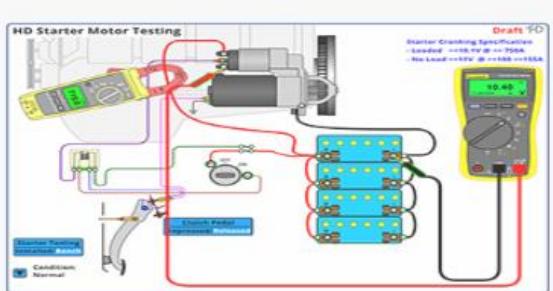
Assessment Version: Normal Operation  
Updated October 2022

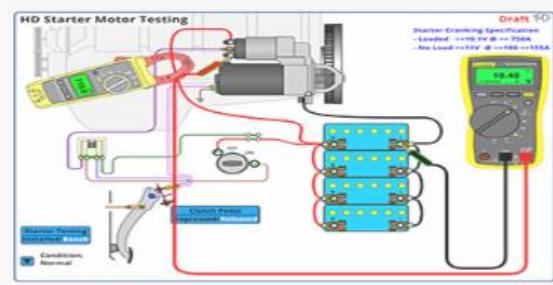


#### HD Starter Motor Testing

EE\_HDstrtTstAss01\_C1

Assessment Version: Open Relay Coil  
Updated October 2022



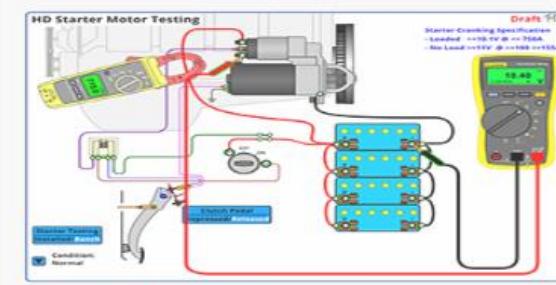


### HD Starter Motor Testing

EE\_HDstrtTstAss10\_C1

Assessment Version: Voltage drop negative starter cable

**Updated October 2022**

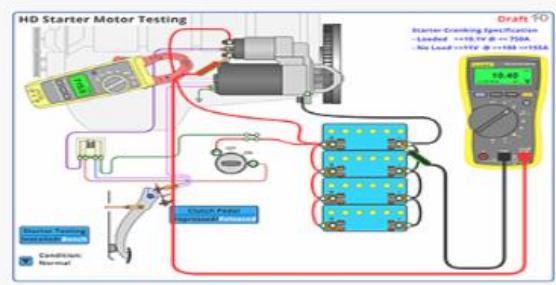


### HD Starter Motor Testing

EE\_HDstrtTstAss11\_C1

Assessment Version: Worn Armature bushes

**Updated October 2022**

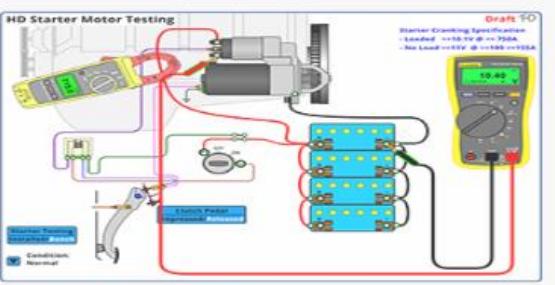


### HD Starter Motor Testing

EE\_HDstrtTstAss12\_C1

Assessment Version: Tight Engine

**Updated October 2022**

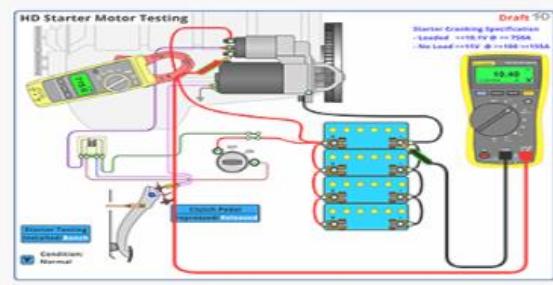


### HD Starter Motor Testing

EE\_HDstrtTstAss13\_C1

Assessment Version: Pre-engagement linkage failure

**Updated October 2022**

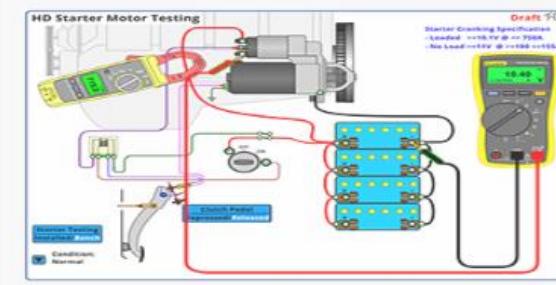


### HD Starter Motor Testing

EE\_HDstrtTstAss14\_C1

Assessment Version: Faulty Clutch Switch

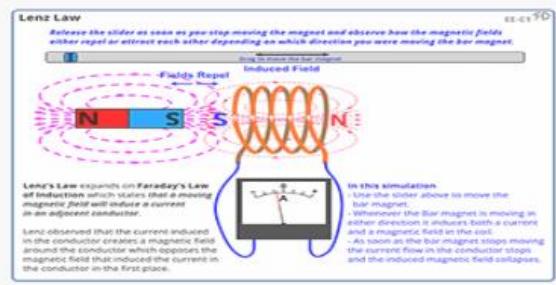
**Updated October 2022**



### HD Starter Motor Testing

EE\_HDstrtTstAss15\_C1

Assessment Version: Fully Over Crank Switch

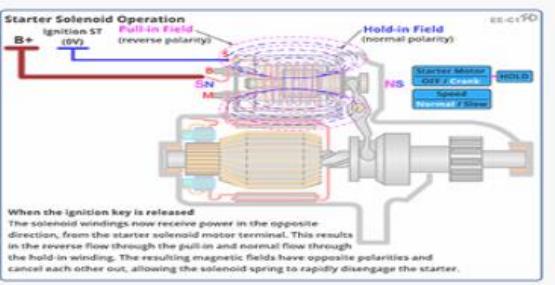


### Lenz's Law

EE\_LenzLaw\_C1

Description

**Updated October 2022**

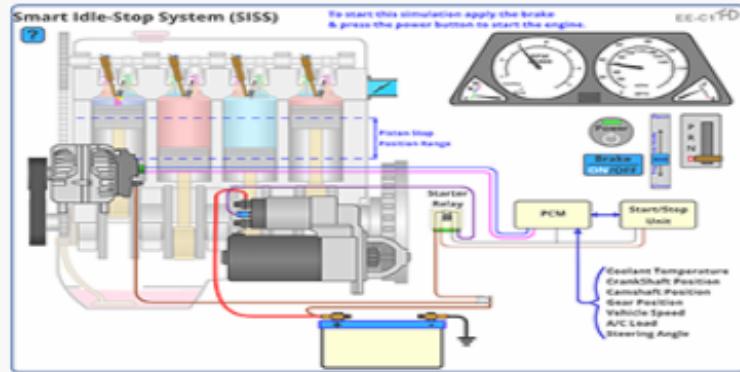


### Starter Solenoid Operation

EE\_STSOLOP\_C1

Description

**Updated October 2022**

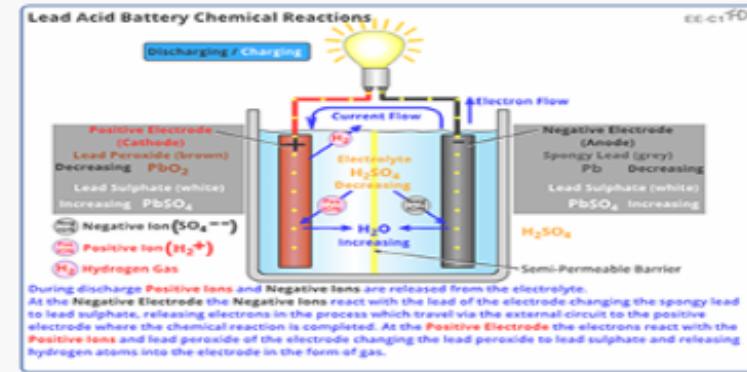


### Smart Idle-Stop System

EE\_IntAutoStop\_C1

Description

Updated October 2022



### Lead Acid Battery Chemistry

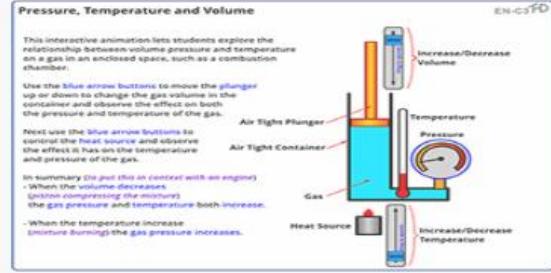
EE\_LABattChem\_C1

Description

Updated October 2022

# EN Series

# Engines & Engine Sub-Systems

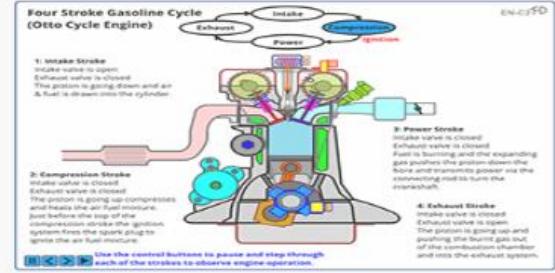


## Pressure, Temperature and Volume

EN\_PressureTemp\_C1

Description

Updated October 2022

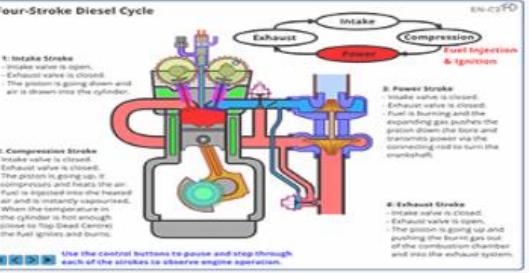


## Four Stroke Gasoline Cycle

EN\_GasFourStrokeCycle\_C1

Description

Updated October 2022

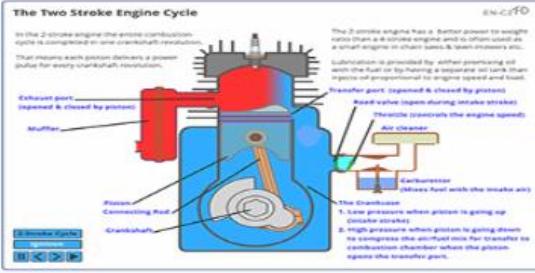


## Four Stroke Diesel Cycle

EN\_Clengine\_C1

Description

Updated October 2022

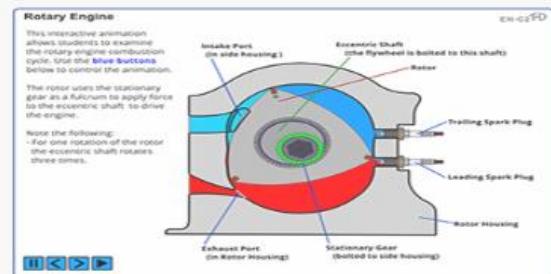


## The Two Stroke Cycle

EN\_TwoStrokeCycle\_C1

Description

Updated October 2022

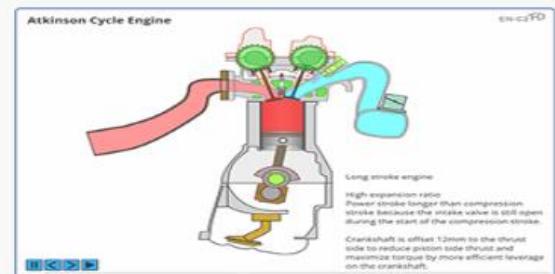


## Rotary Cycle

EN\_RotaryCycle\_C1

Description

Updated October 2022

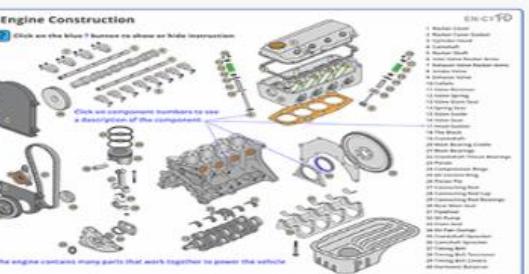


## Atkinson Cycle Engine

EN\_AtkinsonCycle\_C1

Description

Updated October 2022

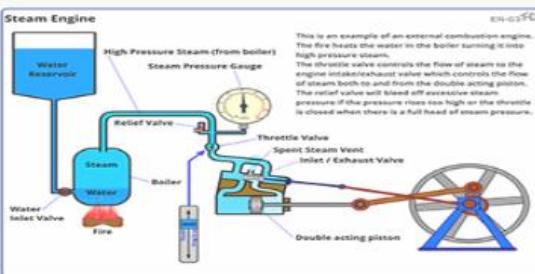


## SI Engine Components

EN\_SIEngineAssy\_C1

Description

Updated October 2022

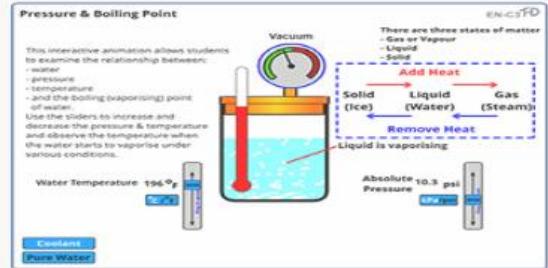


## Steam Engine

EN\_SteamEngine\_C1

Description

Updated October 2022

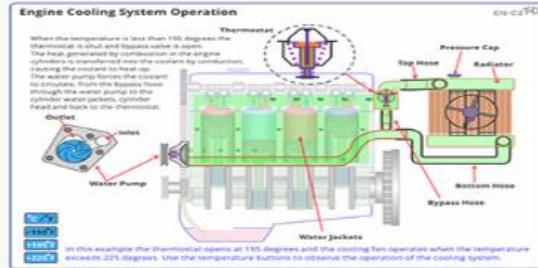


## Pressure and Boiling Point

EN\_CoolantPressureTemp\_C1

Description

Updated October 2022

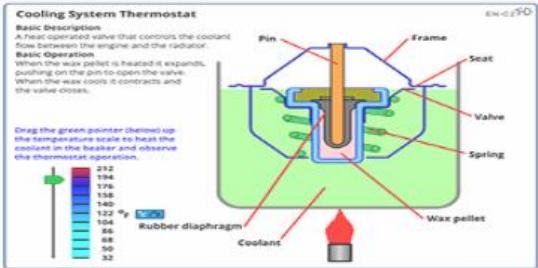


## Engine Cooling System Operation

EN\_CoolingSystem\_C1

Description

Updated October 2022

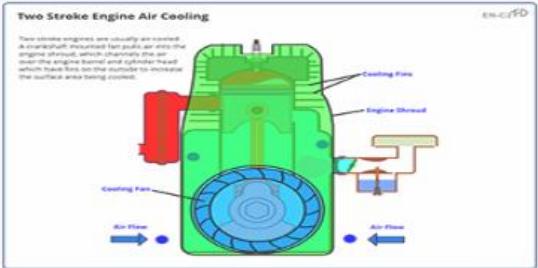


## Cooling System Thermostat

EN\_Thermostat\_C1

Description

Updated October 2022

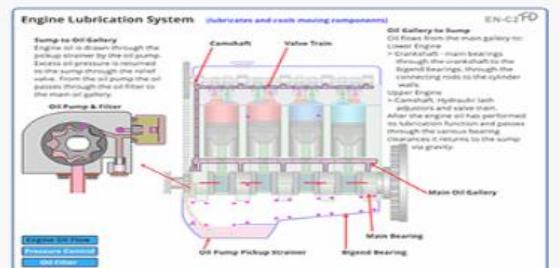


## Two Stroke Engine Air Cooling

EN\_AirCooled\_C1

Description

Updated October 2022

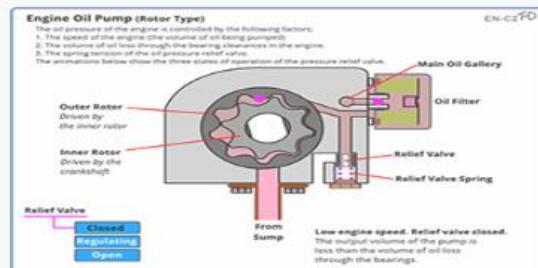


## Engine Lubrication System

EN\_EngineLube\_C1

Description

Updated October 2022

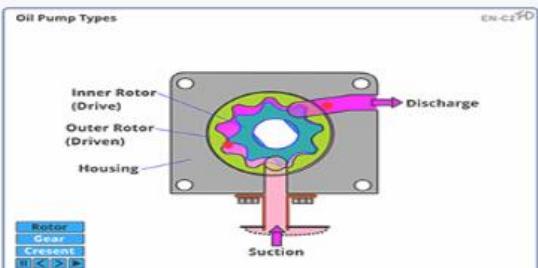


## Engine Oil Pump

EN\_OilPressureCntrl\_C1

Description

Updated October 2022

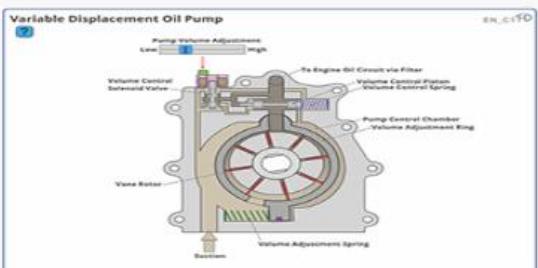


## Oil Pump Types

EN\_OilPumpTypes\_C1

Description

Updated October 2022

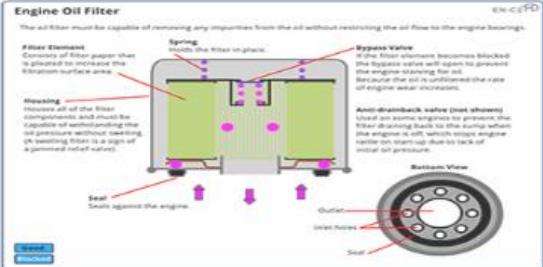


## Variable Displacement Oil Pump

EN\_VarOilPump\_C1

Description

Updated October 2022

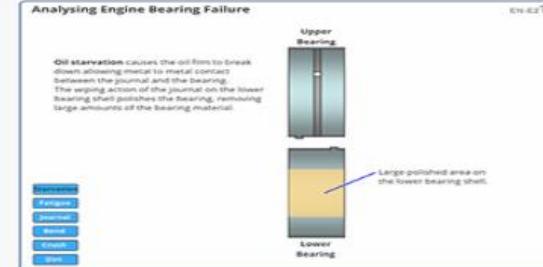


## Engine Oil Filter

EN\_OilFilter\_C1

Description

**Updated October 2022**

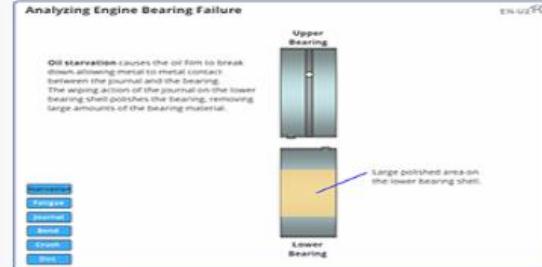


## Analysing Engine Bearing Failure

EN\_BearingAnalysis\_E1

Description

**Updated October 2022**

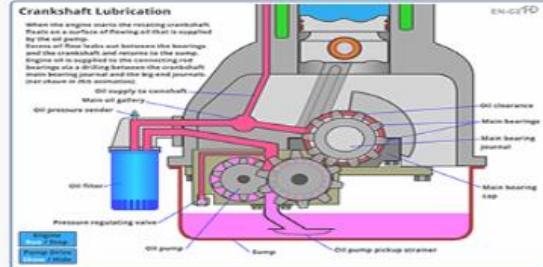


## Analyzing Engine Bearing Failure

EN\_BearingAnalysis\_U1

Description

**Updated October 2022**

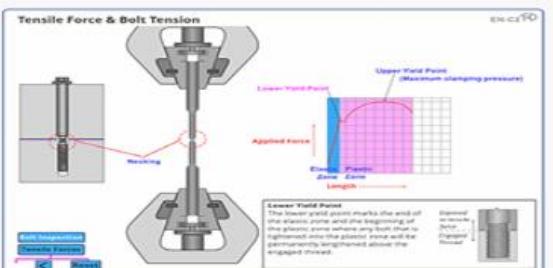


## Crankshaft Lubrication

EN\_CrankshaftLubrication\_C1

Description

**Updated October 2022**

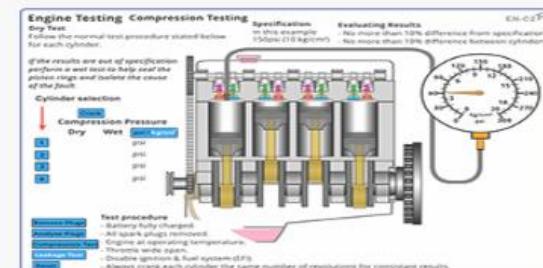


## Tensile Force and Bolt Tension

EN\_BoltInspection\_C1

Description

**Updated October 2022**

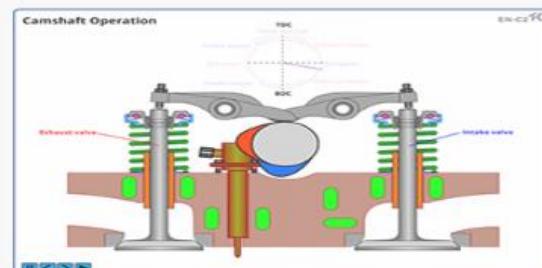


## Engine Mechanical Testing

EN\_MechanicalTesting\_C1

Description

**Updated October 2022**

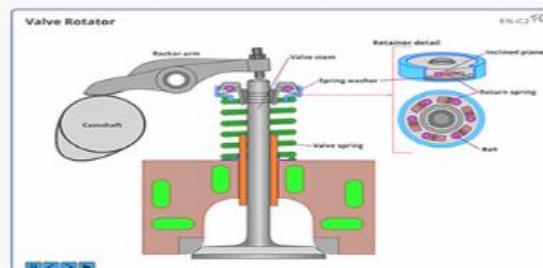


## Camshaft Operation

EN\_DieselCamshaftOperation\_C1

Description

**Updated October 2022**

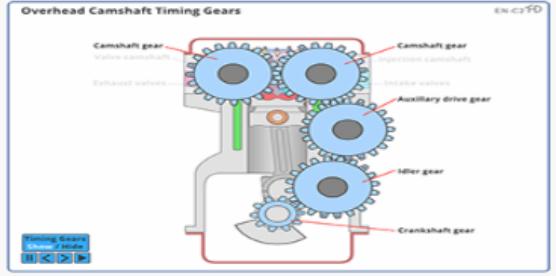


## Valve Rotator

EN\_ValveRotator\_C1

Description

**Updated October 2022**

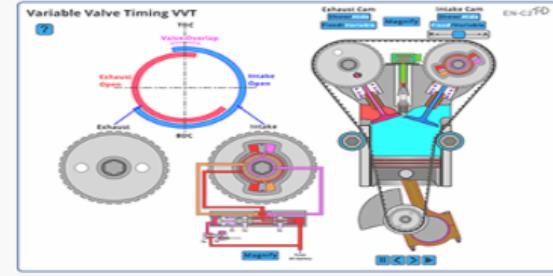


### Overhead Camshaft Timing Gears

EN\_CumminsOHCTimingGears\_C1

Description

Updated October 2022

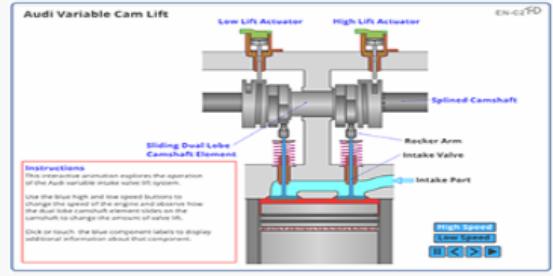


### Variable Valve Timing VVT

EN\_VariableValveTiming\_C1

Description

Updated October 2022

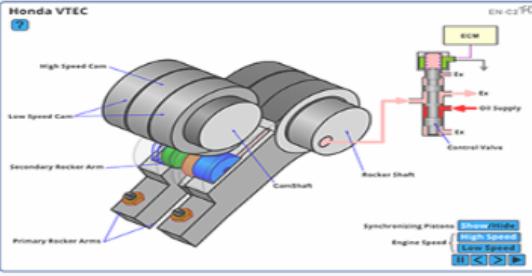


### Audi Variable Valve Lift

EN\_AudiVariableValveLift\_C1

Description

Updated October 2022

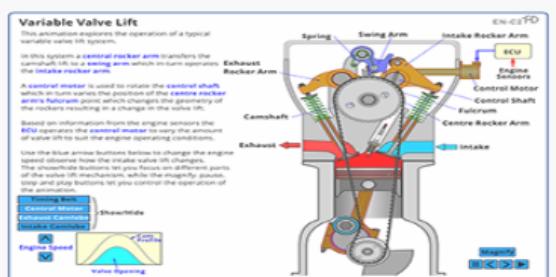


### Honda VTEC

EN\_HondaVTEC\_C1

Description

Updated October 2022

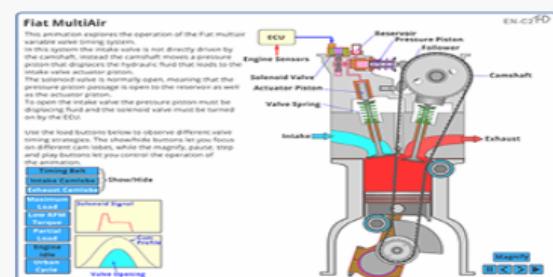


### Variable Valve Lift

EN\_VariableValveLift\_C1

Description

Updated October 2022

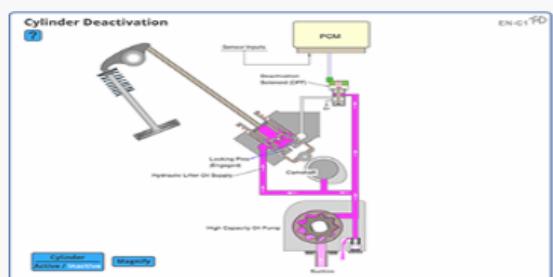


### Fiat MultiAir

EN\_FiatMultiAir\_C1

Description

Updated October 2022

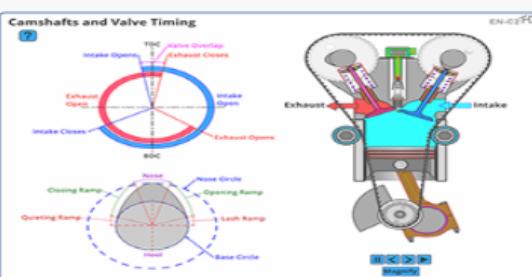


### Cylinder Deactivation

EN\_CylDeactivate\_C1

Description

Updated October 2022

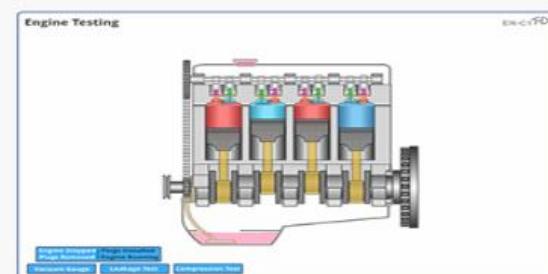
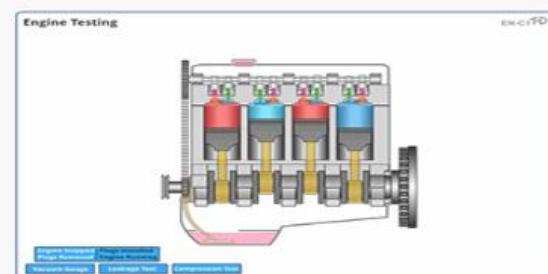
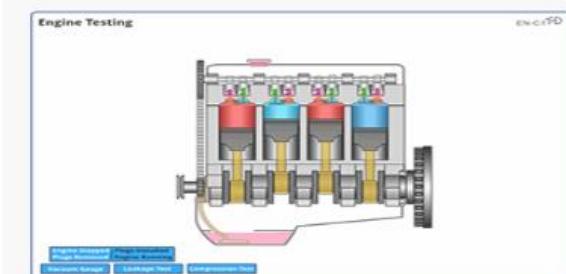
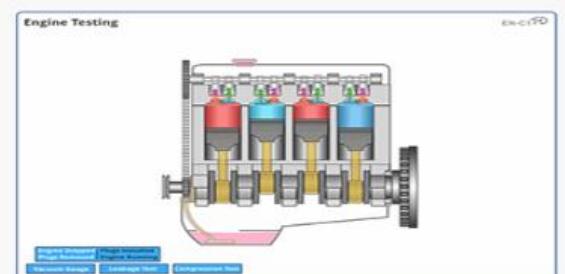
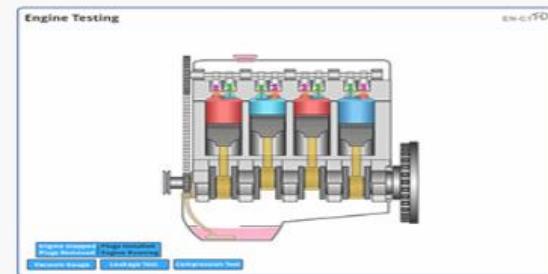
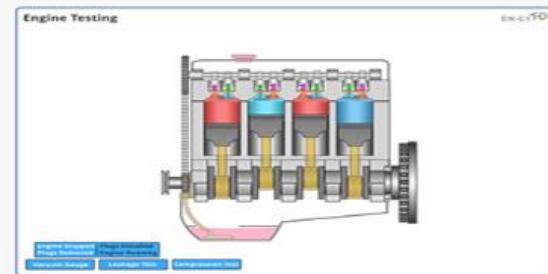
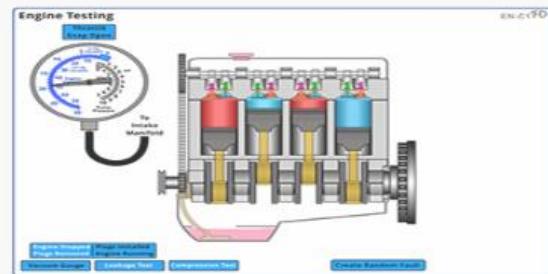
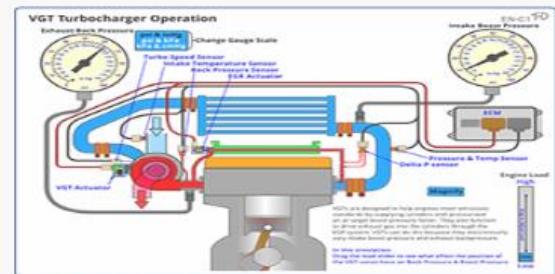


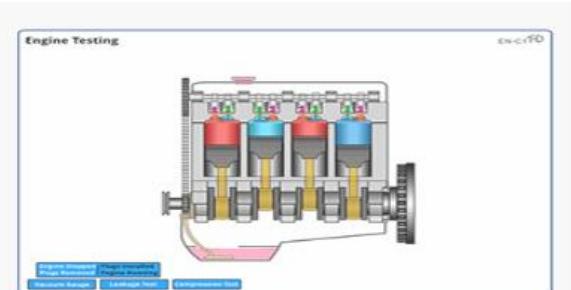
### Camshafts and Valve Timing

EN\_Cams\_ValveTiming\_C1

Description

Updated October 2022



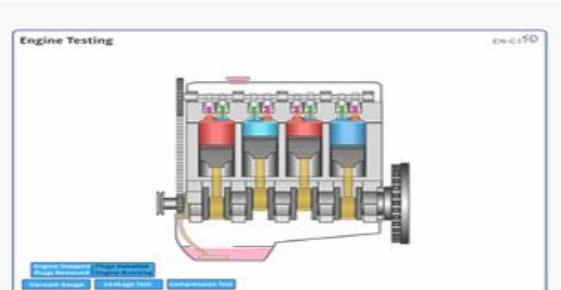


### Engine Testing

EN\_MechAs07\_C1

No 3 Exhaust Valve leaking

Updated October 2022

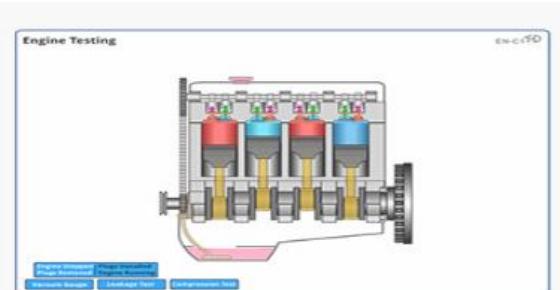


### Engine Testing

EN\_MechAs08\_C1

No 3 Intake Valve Leaking

Updated October 2022

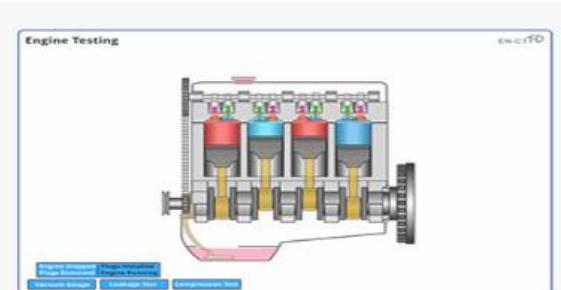


### Engine Testing

EN\_MechAs09\_C1

No 4 Exhaust Valve leaking

Updated October 2022

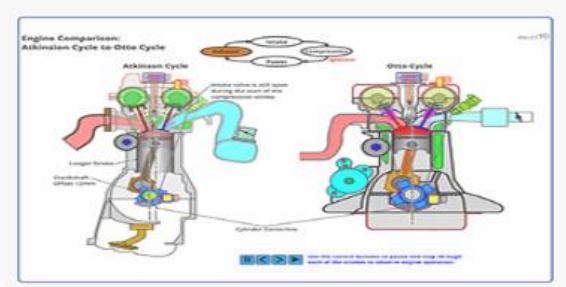


### Engine Testing

EN\_MechAs10\_C1

No 4 Intake Valve Leaking

Updated October 2022

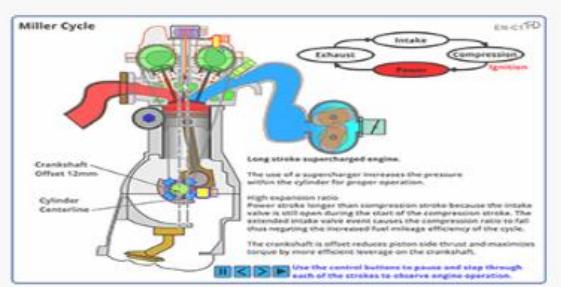


### Engine Comparison: Atkinson to Otto Cycle

EN\_AtkinOttoComp\_C1

Description

Updated October 2022

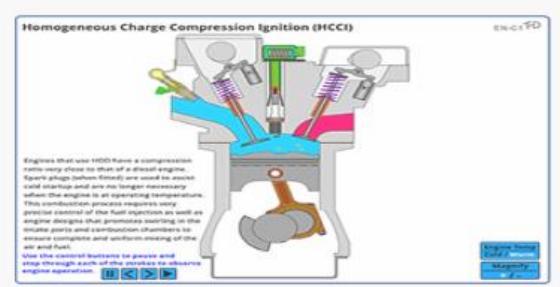


### Miller Cycle

EN\_MillerCycle\_C1

Description

Updated October 2022

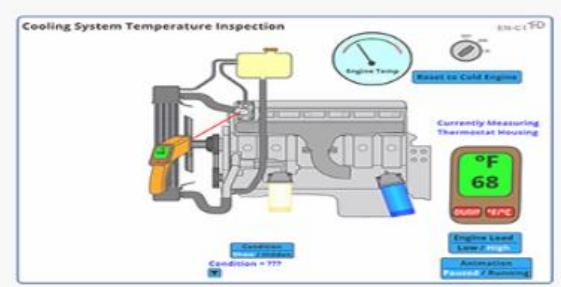


### HCCI Combustion Cycle

EN\_HCClcycle\_C1

Description

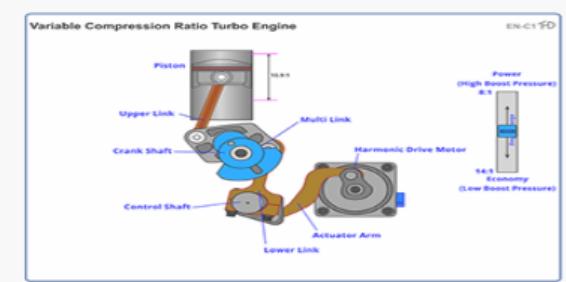
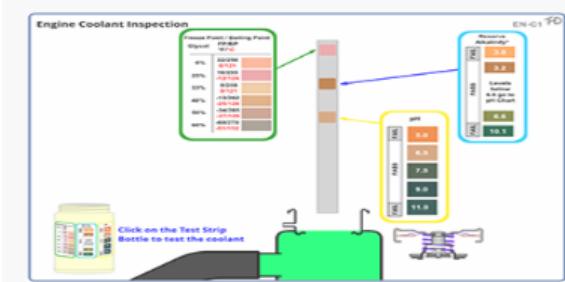
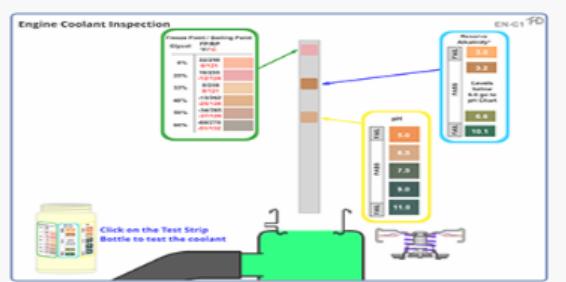
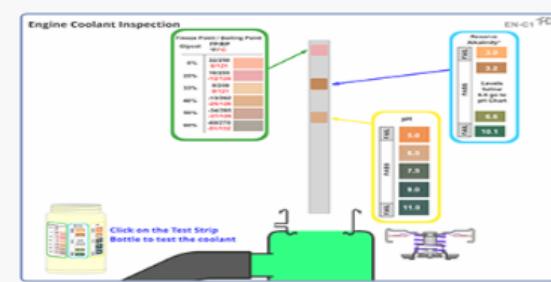
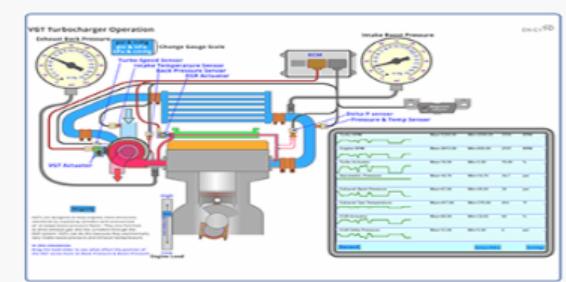
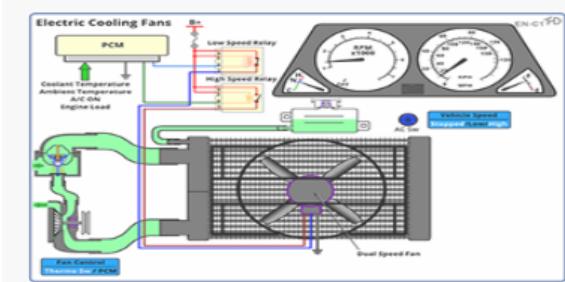
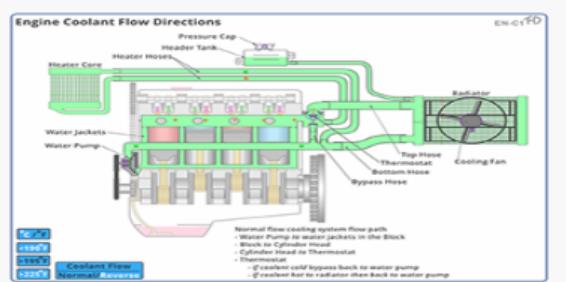
Updated October 2022



### Cooling System Temperature Inspection

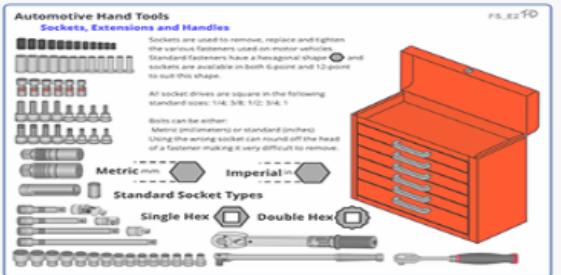
EN\_EngTmpTst\_C1

Covers the testing of cooling system component temperatures under varying conditions  
Updated October 2022



# FS Series

## Automotive Fundamentals & Safety

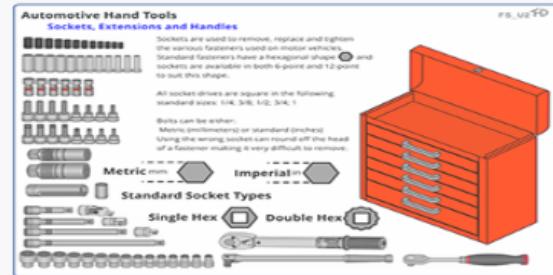


## Automotive Hand Tools

FS\_HandTools\_E1

Description

Updated October 2022

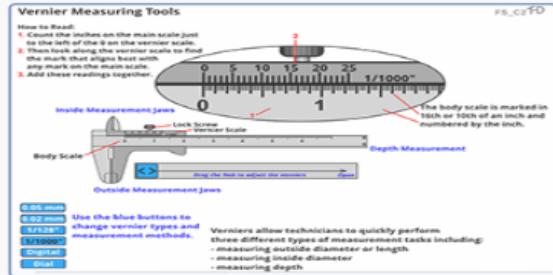


## Automotive Hand Tools

FS\_HandTools\_U1

Description

Updated October 2022

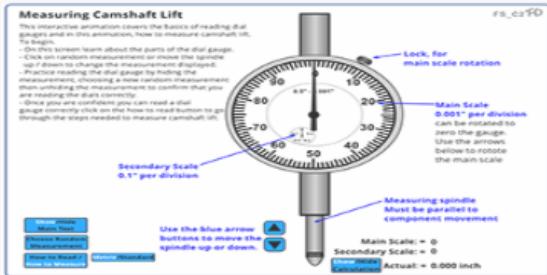


## Vernier Measuring Tools

FS\_Vernier\_C1

Description

Updated October 2022

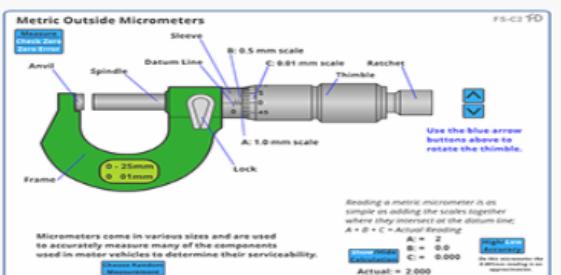


## Dial Gauge, Measuring Camshaft Lift

FS\_DialGauge\_C1

Description

Updated October 2022

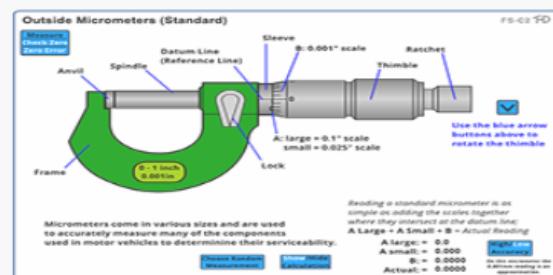


## Outside Micrometer, Metric

FS\_MetricMicrometer\_C1

Description

Updated October 2022

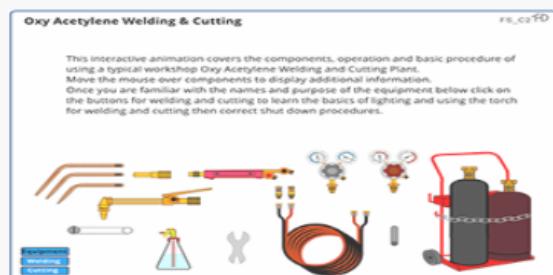


## Outside Micrometer, Standard

FS\_StdMicrometer\_C1

Description

Updated October 2022



## Oxy Acetylene Welding and Cutting

FS\_OxyAcetylene\_C1

Description

Updated October 2022

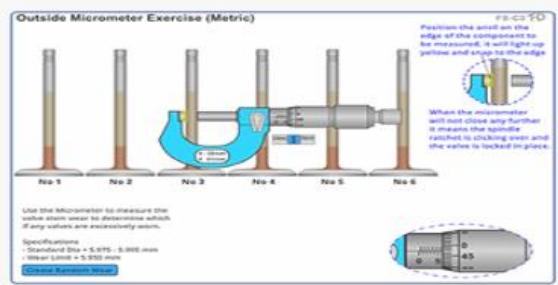


## Vehicle Manouevring in Workshops

FS\_VehOnHoist\_C1

Description

Updated October 2022

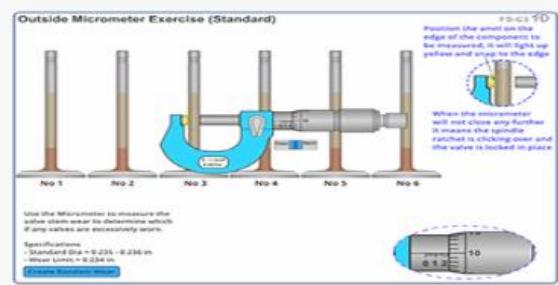


### Outside Micrometer Exercise 01 (Metric)

FS\_MicMeEx01\_C1

Description

Updated October 2022

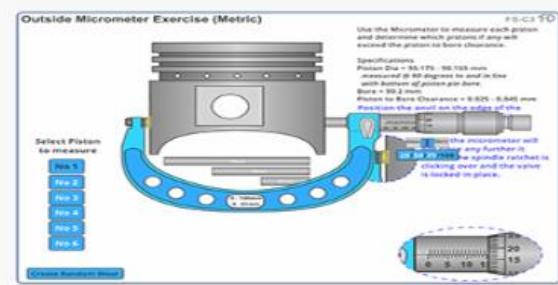


### Outside Micrometer Exercise 01 (Standard)

FS\_MicStdEx01\_C1

Description

Updated October 2022

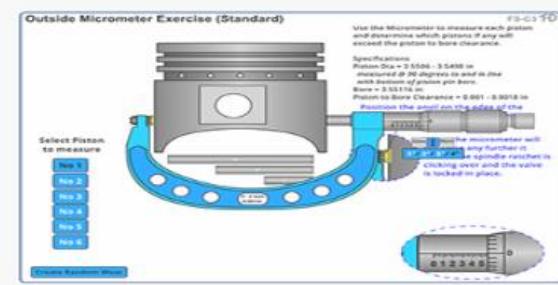


### Outside Micrometer Exercise 02 (Metric)

FS\_MicMeEx02\_C1

Description

Updated October 2022

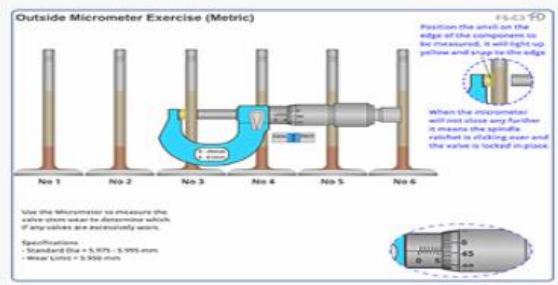


### Outside Micrometer Exercise 02 (Standard)

FS\_MicStdEx02\_C1

Description

Updated October 2022

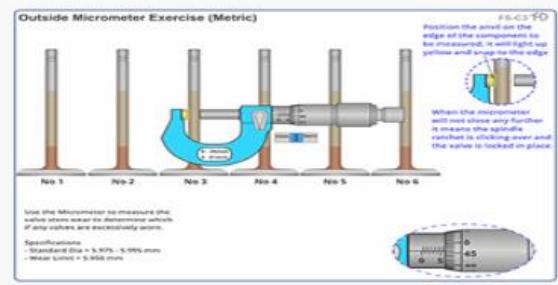


### Outside Micrometer Exercise

FS\_MicMeEx01a\_C1

All Valves in Spec

Updated October 2022

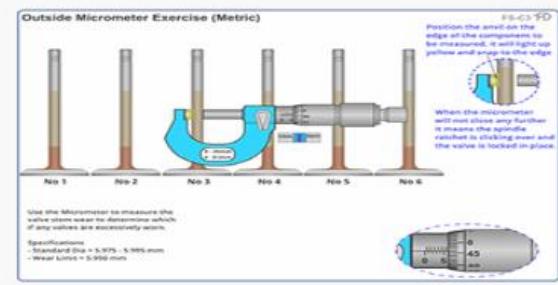


### Outside Micrometer Exercise

FS\_MicMeEx01b\_C1

No1 Valve below Spec

Updated October 2022

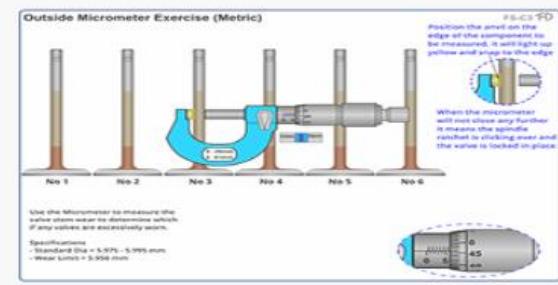


### Outside Micrometer Exercise

FS\_MicMeEx01c\_C1

No2 Valve below Spec

Updated October 2022

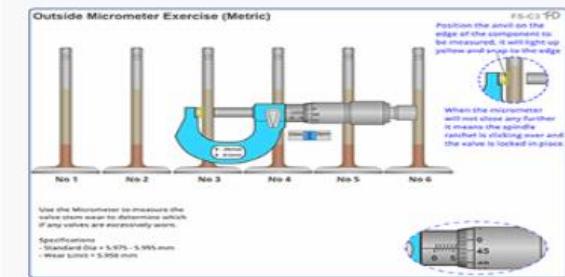


### Outside Micrometer Exercise

FS\_MicMeEx01d\_C1

No3 Valve below Spec

Updated October 2022

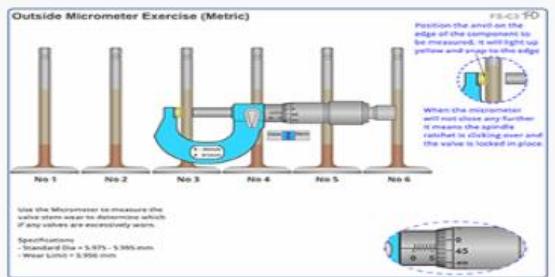


### Outside Micrometer Exercise

FS\_MicMeEx01e\_C1

No4 Valve below Spec

Updated October 2022

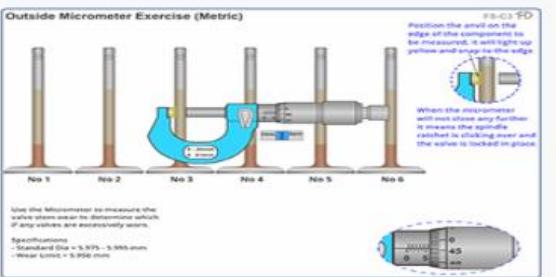


### Outside Micrometer Exercise

FS\_MicMeEx01f\_C1

No5 Valve below Spec

Updated October 2022

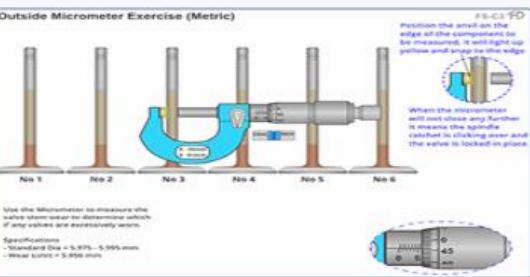


### Outside Micrometer Exercise

FS\_MicMeEx01g\_C1

No6 Valve below Spec

Updated October 2022

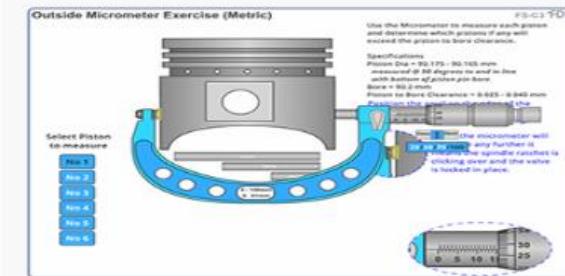


### Outside Micrometer Exercise

FS\_MicMeEx01h\_C1

All Valves below Spec

Updated October 2022

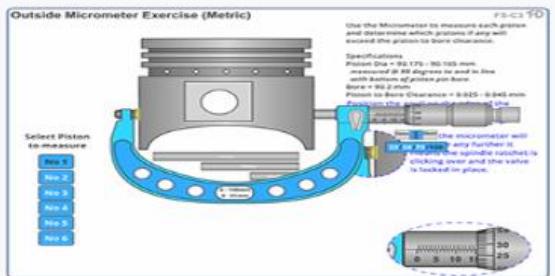


### Outside Micrometer Exercise

FS\_MicMeEx02a\_C1

All Pistons in Spec

Updated October 2022

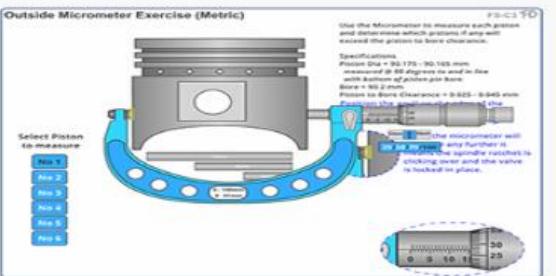


### Outside Micrometer Exercise

FS\_MicMeEx02b\_C1

No1 Piston below Spec

Updated October 2022

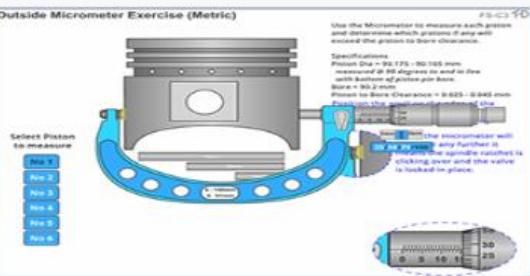


### Outside Micrometer Exercise

FS\_MicMeEx02c\_C1

No2 Piston below Spec

Updated October 2022

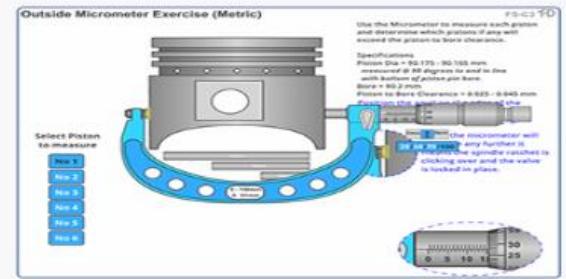


### Outside Micrometer Exercise

FS\_MicMeEx02d\_C1

No3 Piston below Spec

Updated October 2022

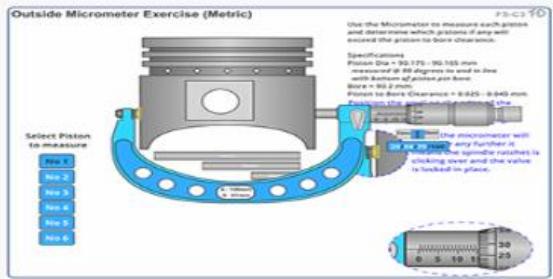


### Outside Micrometer Exercise

FS\_MicMeEx02e\_C1

No4 Piston below Spec

Updated October 2022

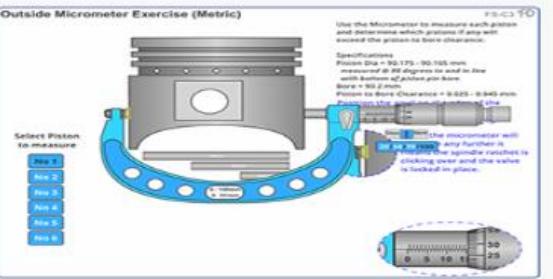


### Outside Micrometer Exercise

FS\_MicMeEx02f\_C1

No5 Piston below Spec

Updated October 2022

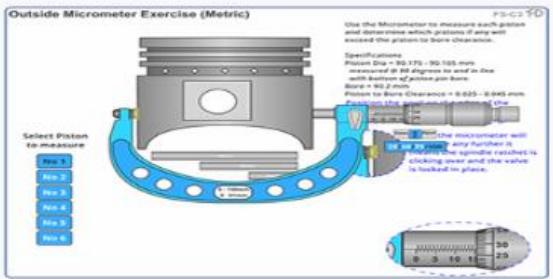


### Outside Micrometer Exercise

FS\_MicMeEx01g\_C1

No6 Piston below Spec

Updated October 2022

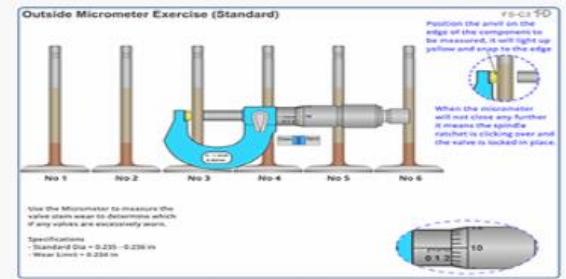


### Outside Micrometer Exercise

FS\_MicMeEx02h\_C1

All Pistons below Spec

Updated October 2022

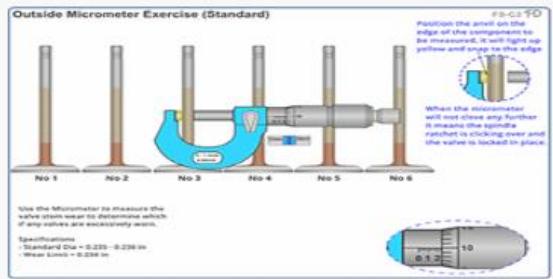


### Outside Micrometer Exercise

FS\_MicStdEx01a\_C1

All Valves in Spec

Updated October 2022

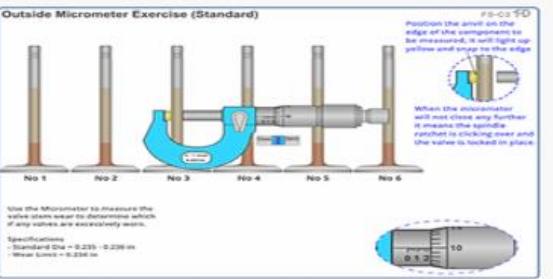


### Outside Micrometer Exercise

FS\_MicStdEx01b\_C1

No1 Valve below Spec

Updated October 2022

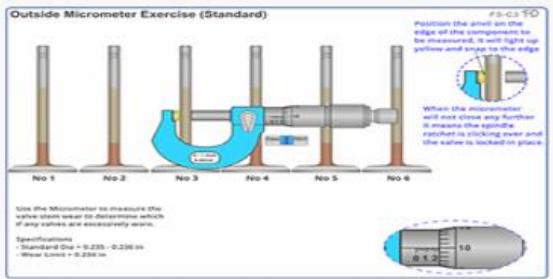


### Outside Micrometer Exercise

FS\_MicStdEx01c\_C1

No2 Valve below Spec

Updated October 2022

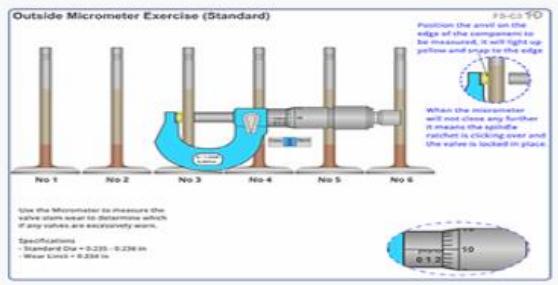


### Outside Micrometer Exercise

FS\_MicStdEx01d\_C1

No3 Valve below Spec

Updated October 2022

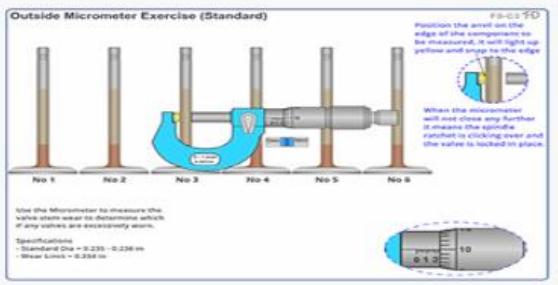


### Outside Micrometer Exercise

FS\_MicStdEx01e\_C1

No4 Valve below Spec

Updated October 2022

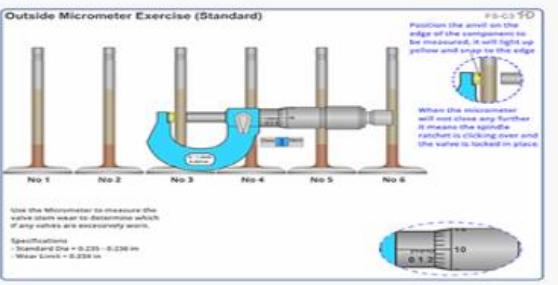


### Outside Micrometer Exercise

FS\_MicStdEx01f\_C1

No5 Valve below Spec

Updated October 2022

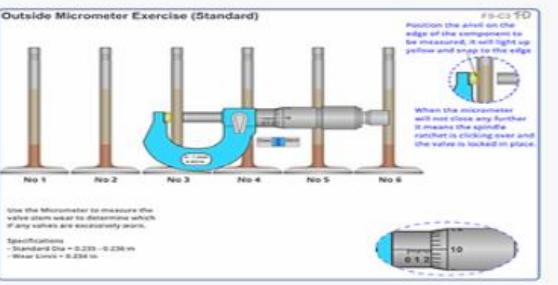


### Outside Micrometer Exercise

FS\_MicStdEx01g\_C1

No6 Valve below Spec

Updated October 2022

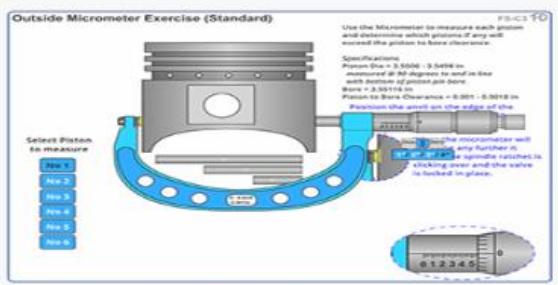


### Outside Micrometer Exercise

FS\_MicStdEx01h\_C1

All Valves below Spec

Updated October 2022

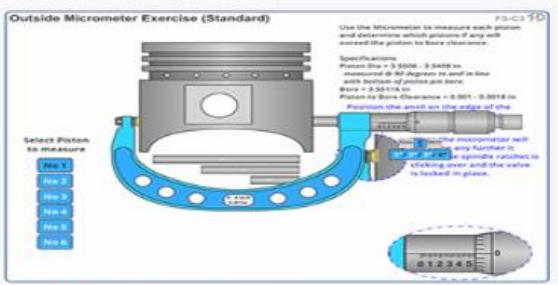


### Outside Micrometer Exercise

FS\_MicStdEx02a\_C1

All Pistons in Spec

Updated October 2022

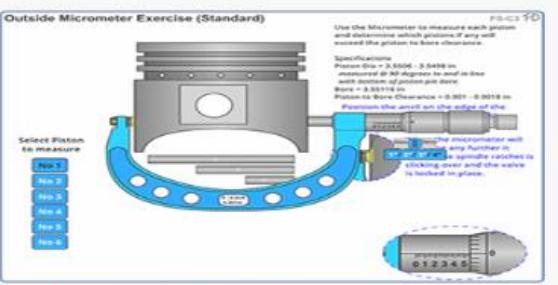


### Outside Micrometer Exercise

FS\_MicStdEx02b\_C1

No1 Piston below Spec

Updated October 2022

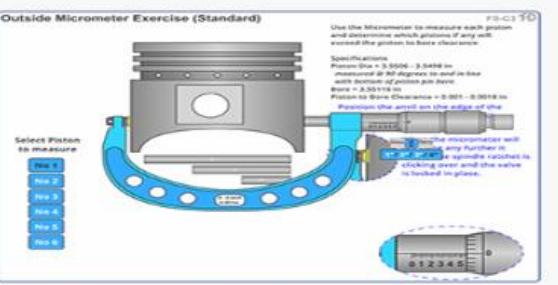


### Outside Micrometer Exercise

FS\_MicStdEx02c\_C1

No2 Piston below Spec

Updated October 2022

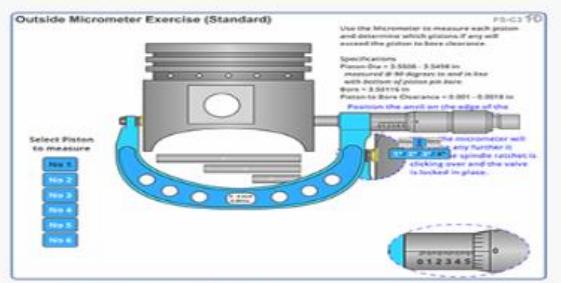


### Outside Micrometer Exercise

FS\_MicStdEx02d\_C1

No3 Piston below Spec

Updated October 2022

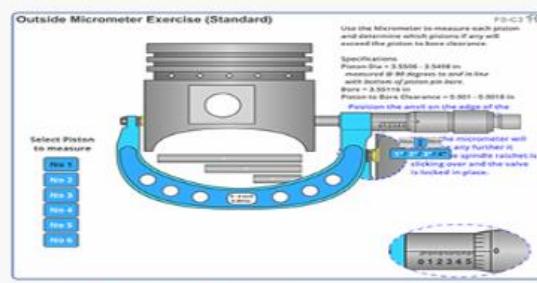


### Outside Micrometer Exercise

FS\_MicStdEx02e\_C1

No4 Piston below Spec

Updated October 2022

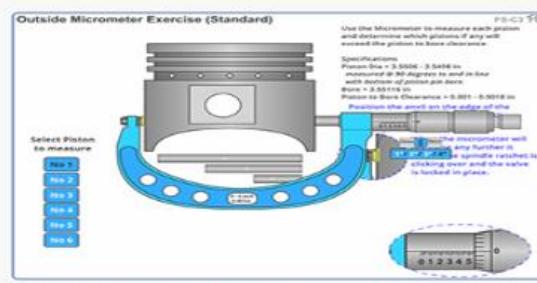


### Outside Micrometer Exercise

FS\_MicStdEx02f\_C1

No5 Piston below Spec

Updated October 2022

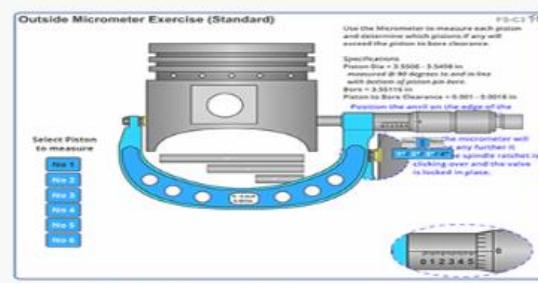


### Outside Micrometer Exercise

FS\_MicStdEx02g\_C1

No6 Piston below Spec

Updated October 2022

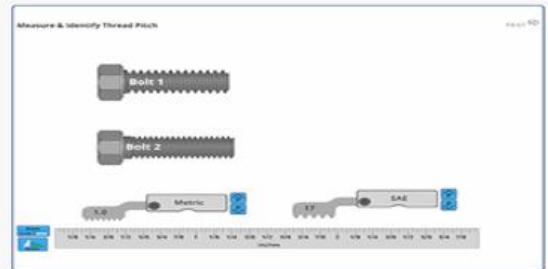


### Outside Micrometer Exercise

FS\_MicStdEx02h\_C1

All Pistons below Spec

Updated October 2022



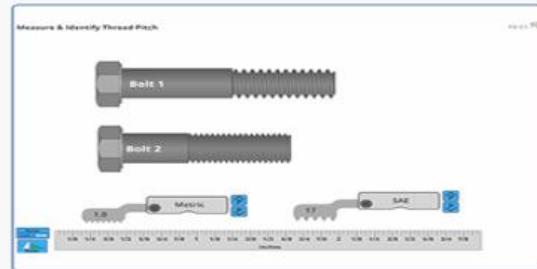
### Measure and Identify Thread Pitch

FS\_TPClass\_01\_C1

Bolt1: 1/4 x 20 x 3/4in

Bolt2: M6 x 1.0 x 20mm

Updated October 2022



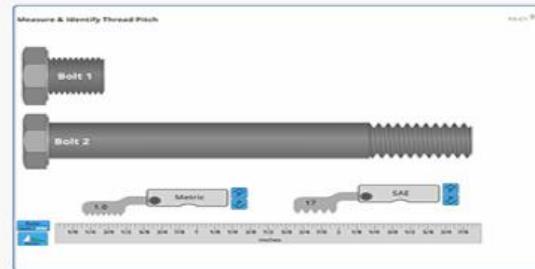
### Measure and Identify Thread Pitch

FS\_TPClass\_02\_C1

Bolt1: 5/16 x 18 x 1 1/2in

Bolt2: M8 x 1.25 x 30mm

Updated October 2022



### Measure and Identify Thread Pitch

FS\_TPClass\_03\_C1

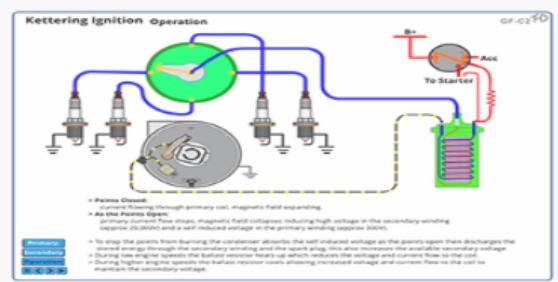
Bolt1: M10 x 1.0 x 10mm

Bolt2: 3/8 x 16 x 3in

Updated October 2022

# GF Series

# Gasoline Fuel Systems

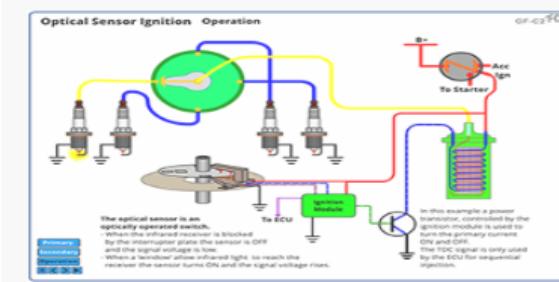


### Kettering Ignition System

GF\_PointsIgn\_C1

Description

Updated October 2022

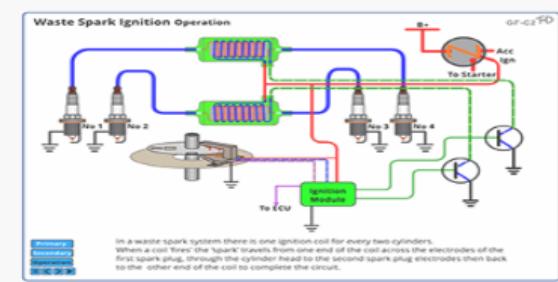


### Optical Ignition System

GF\_OpticalSensor\_C1

Description

Updated October 2022

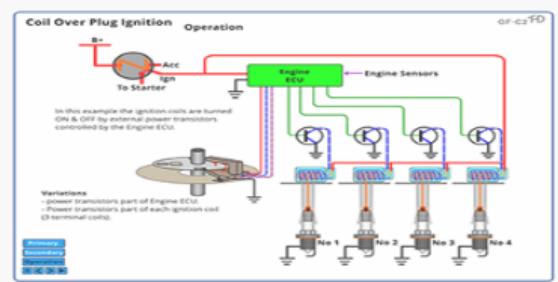


### Waste Spark Ignition System

GF\_WasteSpark\_C1

Description

Updated October 2022

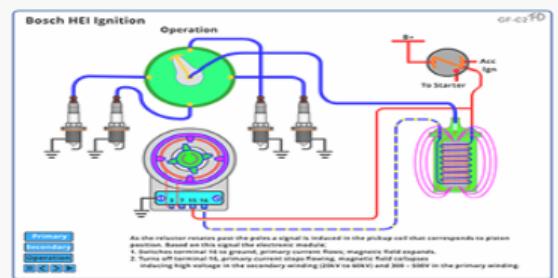


### Coil Over Plug Ignition System

GF\_CoilOverPlug\_C1

Description

Updated October 2022

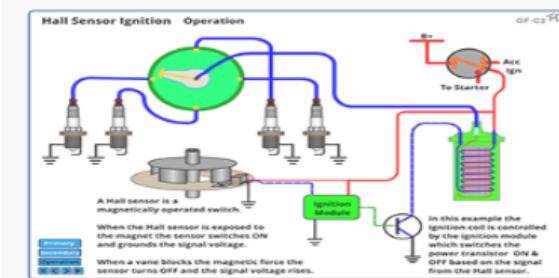


### Bosch HEI Ignition

GF\_BoschHEI\_Ignition\_C1

Description

Updated October 2022

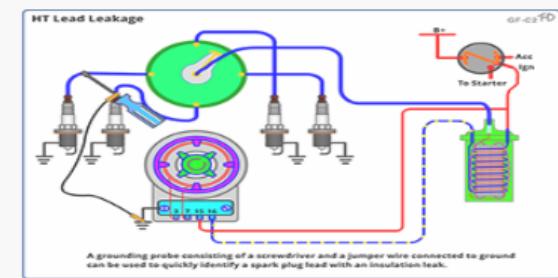


### Hall Sensor Ignition

GF\_HallSensor\_C1

Description

Updated October 2022

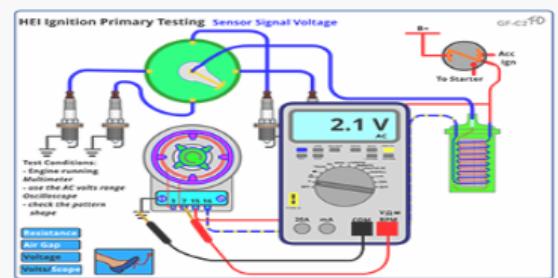


### HT Lead Leakage

GF\_LeadLeakage\_C1

Description

Updated October 2022

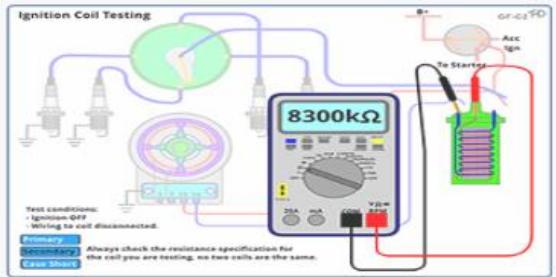


### HEI Ignition Primary Circuit Testing

GF\_ElectronicIgnPrimaryTesting\_C1

Description

Updated October 2022

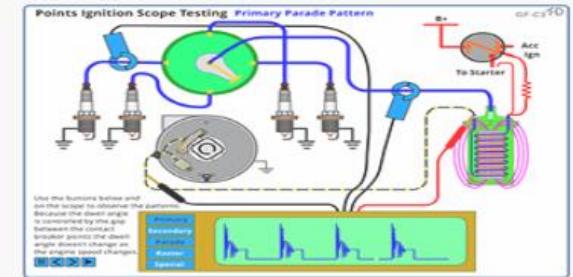


## Ignition Coil Testing

GF\_CoilTesting\_C1

Description

Updated October 2022

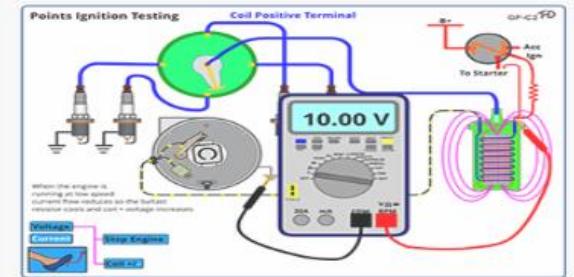


## Points Ignition Scope Testing

GF\_PointsScope\_C1

Description

Updated October 2022

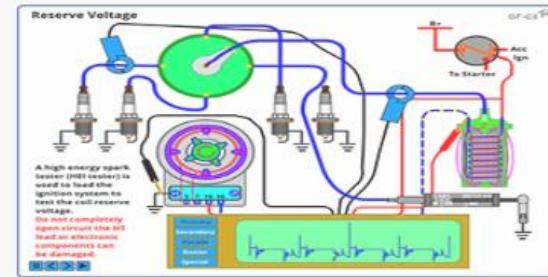


## Points Ignition Testing

GF\_PointsTesting\_C1

Description

Updated October 2022

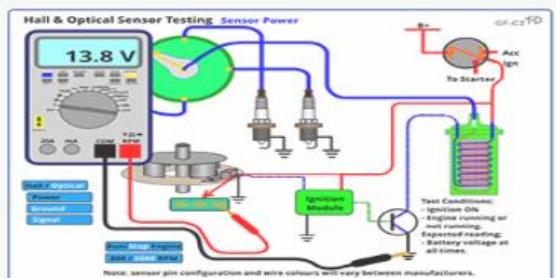


## Reserve Voltage

GF\_ReserveVoltage\_C1

Description

Updated October 2022

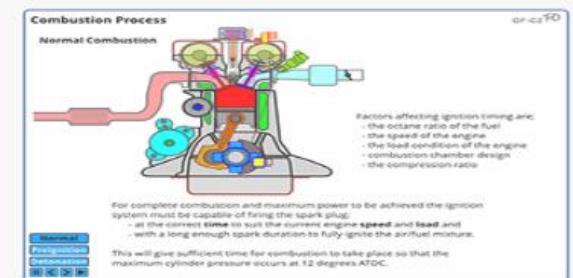


## Hall and Optical Sensor Testing

GF\_HallOpticalTesting\_C1

Description

Updated October 2022

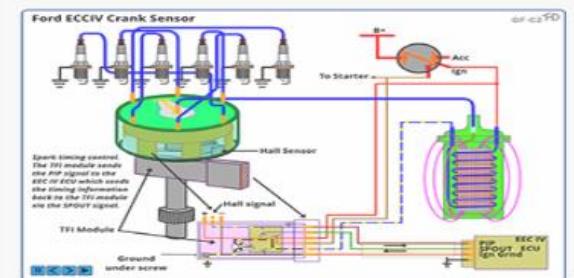


## Combustion Process

GF\_CombustionNormalAbnormal\_C1

Description

Updated October 2022

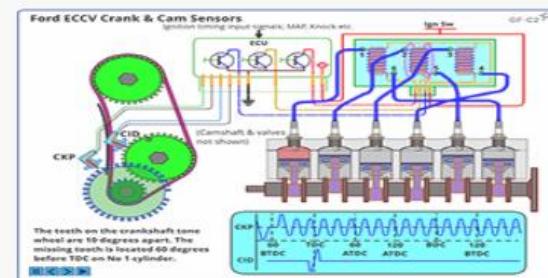


## Ford ECCIV Ignition

GF\_FordTFLIgnition\_C1

Description

Updated October 2022

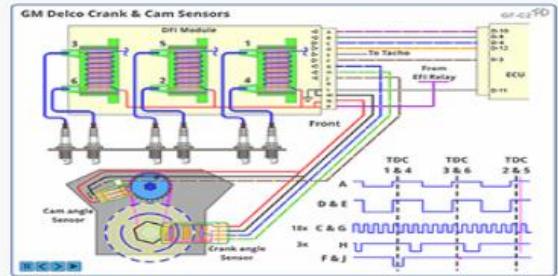


## Ford ECCV Ignition

GF\_FordAUIgnition\_C1

Description

Updated October 2022

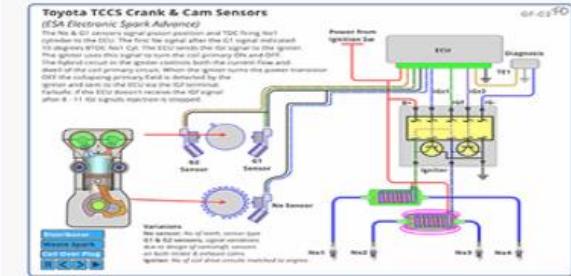


### GM Delco Ignition

GF\_GM\_V6\_Ignition\_C1

Description

Updated October 2022

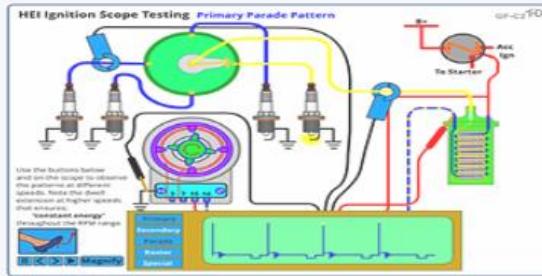


### Toyota TCCS Ignition

GF\_Toyotalignition\_C1

Description

Updated October 2022

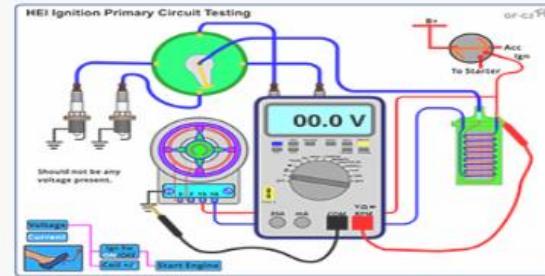


### HEI Ignition Scope Testing

GF\_BoschHEI\_Scope\_C1

Description

Updated October 2022

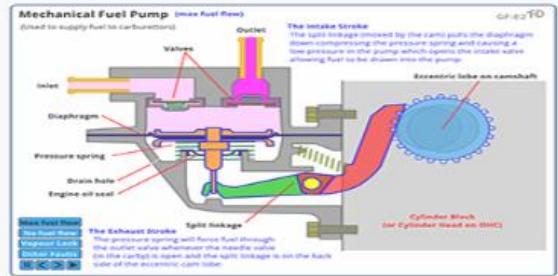


### HEI Ignition Primary Testing

GF\_BoschHEI\_Testing\_C1

Description

Updated October 2022

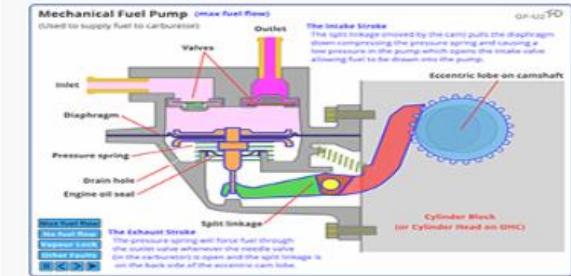


### Mechanical Fuel Pump

GF\_MechanicalFuelPump\_E1

Description

Updated October 2022

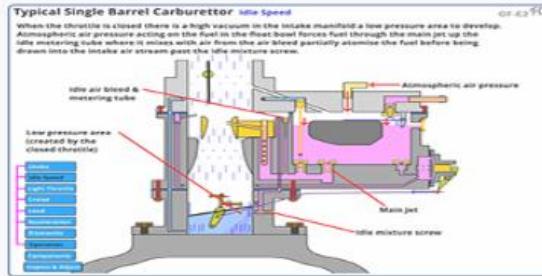


### Mechanical Fuel Pump

GF\_MechanicalFuelPump\_U1

Description

Updated October 2022

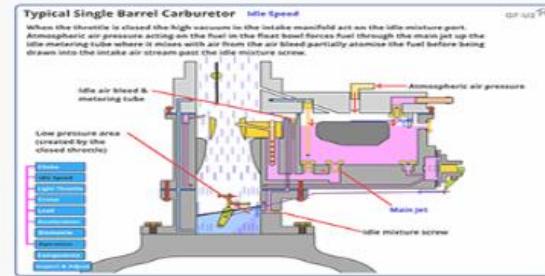


### Typical Carburetor

GF\_Carburettor\_E1

Description

Updated October 2022

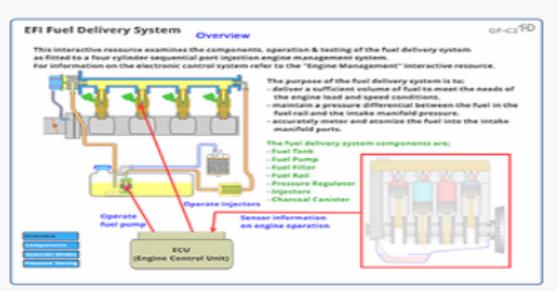


### Typical Carburetor

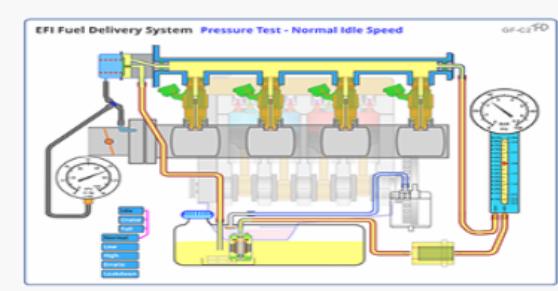
GF\_Carburettor\_U1

Description

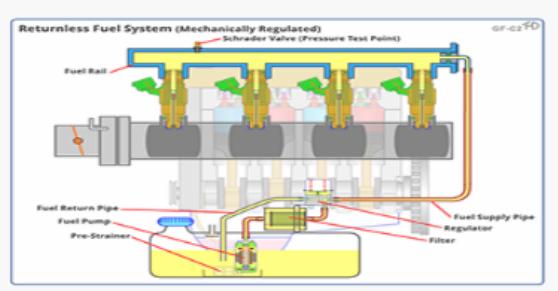
Updated October 2022



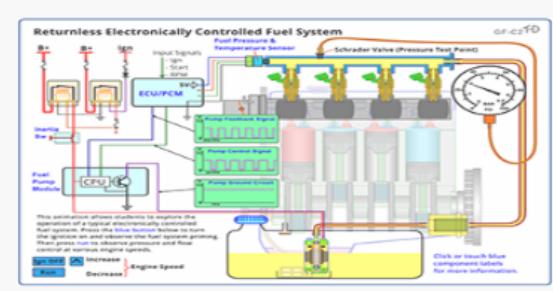
**EFI Fuel Delivery System**  
GF\_GasEFIOperationTesting\_C1  
Description  
**Updated October 2022**



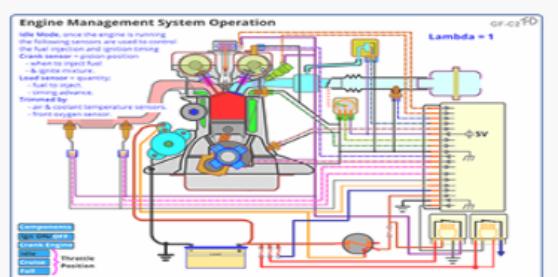
**EFI Fuel Pressure Testing**  
GF\_FuelPressureTesting\_C1  
Description  
**Updated October 2022**



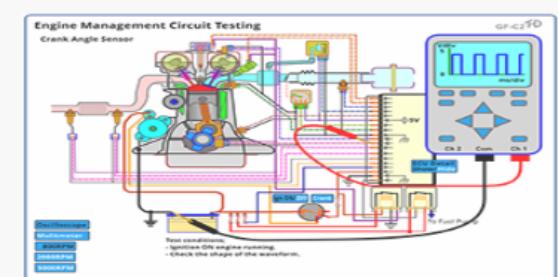
**Returnless Fuel System (Mechanically Regulated)**  
GF\_RtnlessMechFuelOperation\_C1  
Description  
**Updated October 2022**



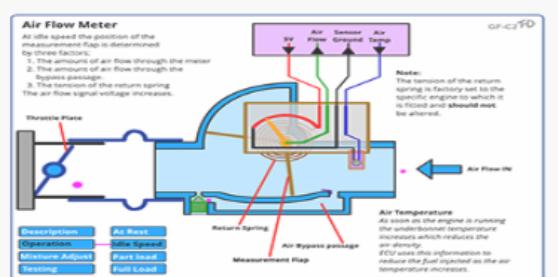
**Returnless Fuel System (Electronically Regulated)**  
GF\_RtnlessElecFuelOperation\_C1  
Description  
**Updated October 2022**



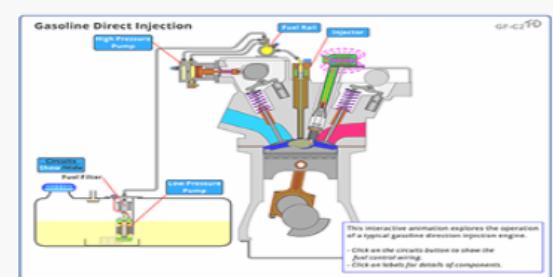
**Engine Management System Operation**  
GF\_EngManageOperation\_C1  
Description  
**Updated October 2022**



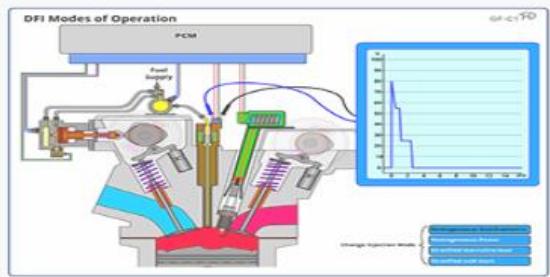
**Engine Management Circuit Testing**  
GF\_EngManageTesting\_C1  
Description  
**Updated October 2022**



**Vane Air Flow Meter**  
GF\_Air Measurement\_C1  
Description  
**Updated October 2022**



**Gasoline Direct Injection**  
GF\_GDI\_C1  
Description  
**Updated October 2022**

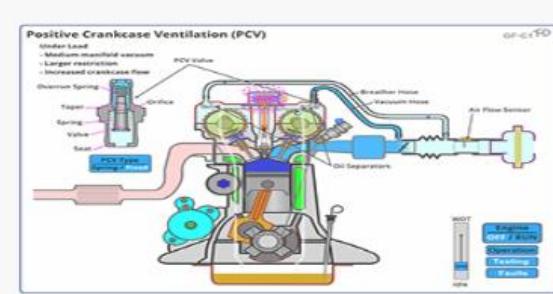


#### DFI Modes of Operation

GF\_DFImodes\_C1

Description

Updated October 2022

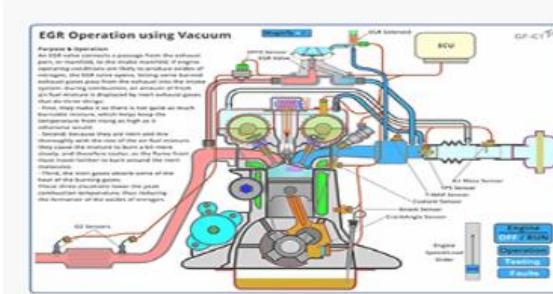


#### Positive Crankcase Ventilation

GF\_PCVsys\_C1

Description

Updated October 2022

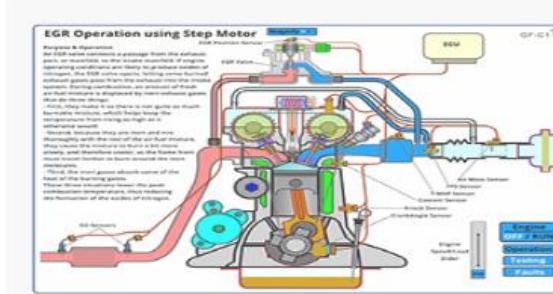


#### EGR using Vacuum

GF\_EGRsysVac\_C1

Description

Updated October 2022

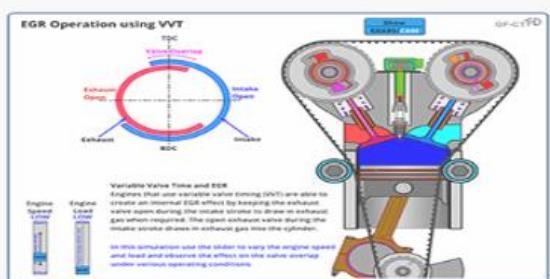


#### EGR using Stepper Motor

GF\_EGRsysStep\_C1

Description

Updated October 2022

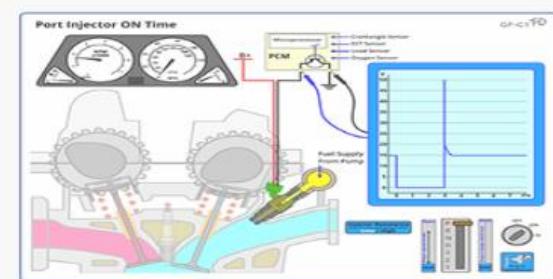


#### EGR using VVT

GF\_EGRvarVlvTime\_C1

Description

Updated October 2022

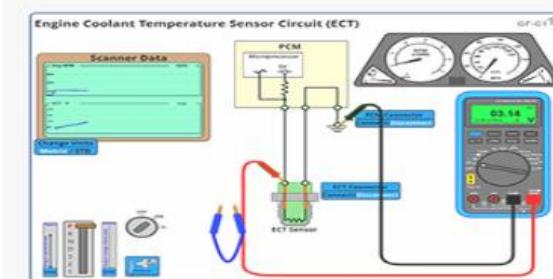


#### Port Injector ON Time

GF\_PortFuelOnTime\_C1

Description

Updated October 2022

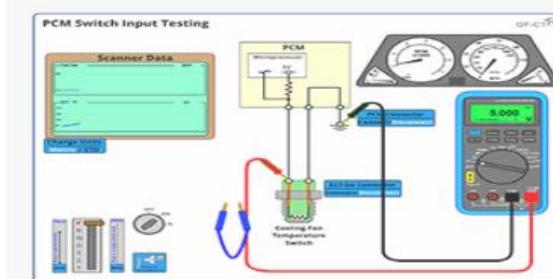


#### Engine Coolant Sensor Circuit Test

GF\_ECTcircuitTest\_C1

Description

Updated October 2022

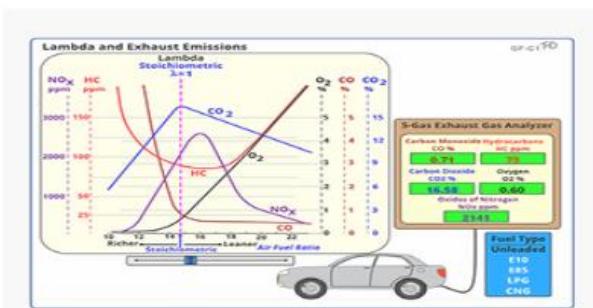


#### PCM Switch Circuit Test

GF\_PCMswCircuit\_C1

Description

Updated October 2022

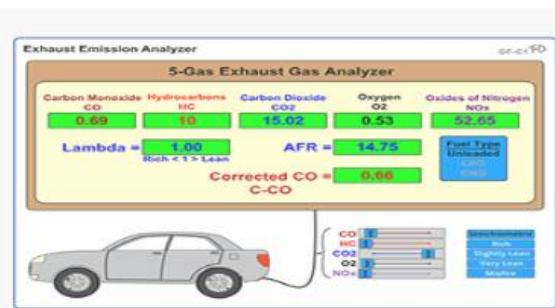


### Lambda and Exhaust Emissions

GF\_LambdaEmissionValues\_C1

Description

Updated October 2022

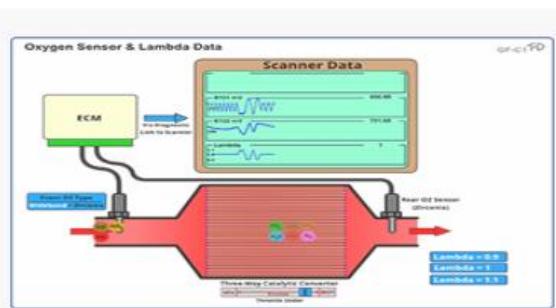


### Exhaust Emission Analyzer

GF\_ExGasAnalyzer\_C1

Description

Updated October 2022

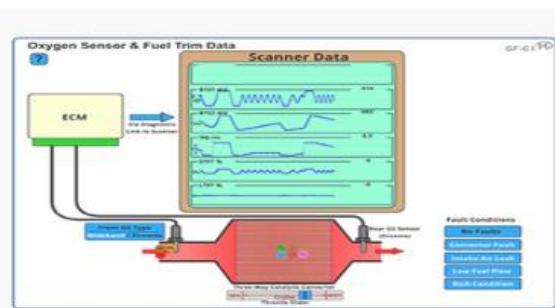


### Oxygen Sensor and Lambda Data

GF\_O2SLambda\_C1

Description

Updated October 2022

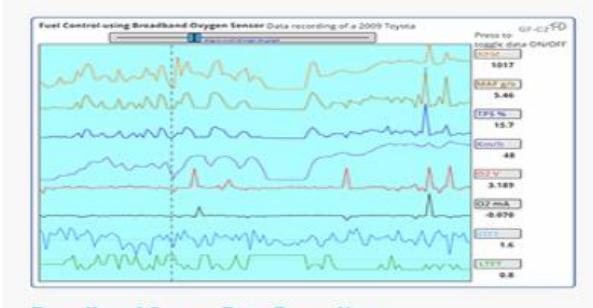


### Oxygen Sensor and Fuel Trim Data

GF\_O2STrim\_C1

Description

Updated October 2022

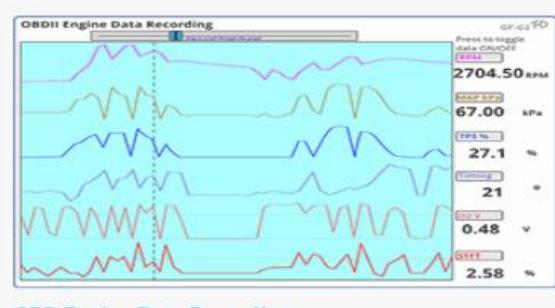


### Broadband Sensor Data Recording

GF\_BroadbandSignals\_C1

Description

Updated October 2022

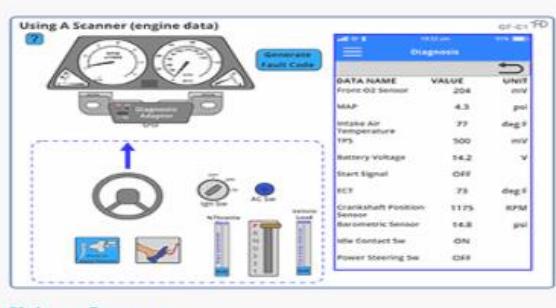


### OBD Engine Data Recording

GF\_OBDII\_Data\_C1

Description

Updated October 2022

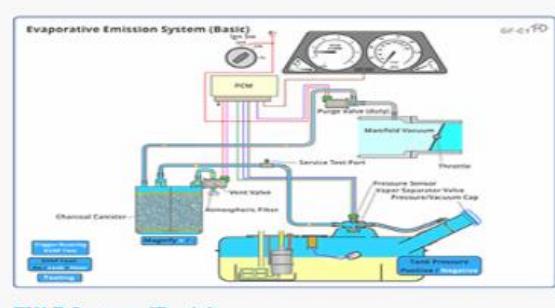


### Using a Scanner

GF\_Scanner\_C1

Description

Updated October 2022

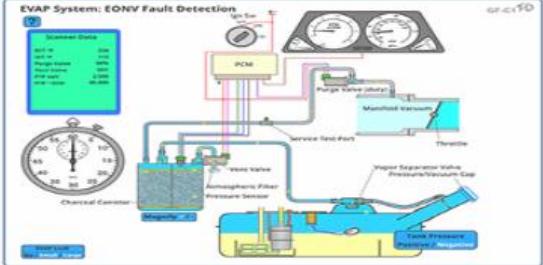


### EVAP System (Basic)

GF\_EVAPbasicSys\_C1

Description

Updated October 2022

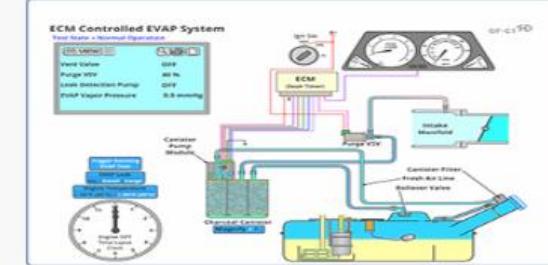


**EVAP System (EONV Fault Detection)**

GF\_EVAP\_EONV\_C1

Description

Updated October 2022

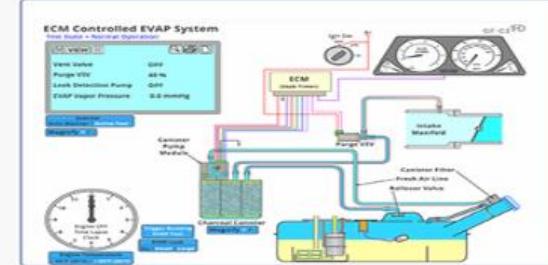


**EVAP System; ECM Control Version 1**

GF\_EVAP\_C1

Description

Updated October 2022

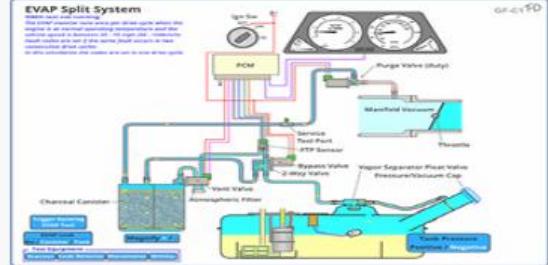


**EVAP System; ECM Control Version 2**

GF\_EVAP\_C2

Description

Updated October 2022

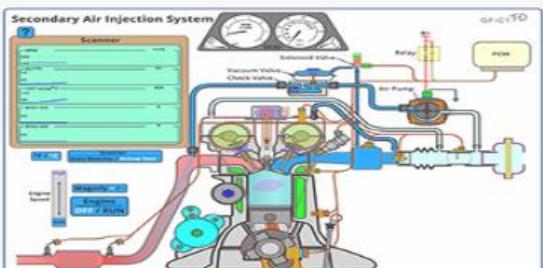


**EVAP Split System**

GF\_EVAPSPLITSYS\_C1

Description

Updated October 2022

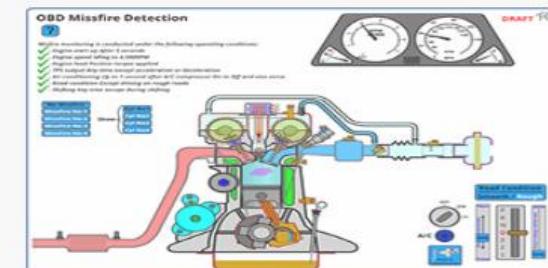


**Secondary Air Injection**

GF\_AirInjection\_C1

Description

Updated October 2022



**Missfire Monitor**

GF\_MissfireMon\_C1

Description

Updated October 2022

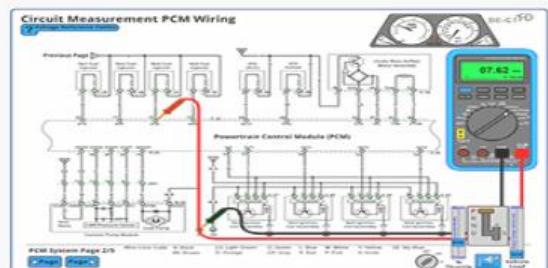


**PCM Circuit Tracing**

GF\_WireSOtrace02\_C1

Description

Updated October 2022

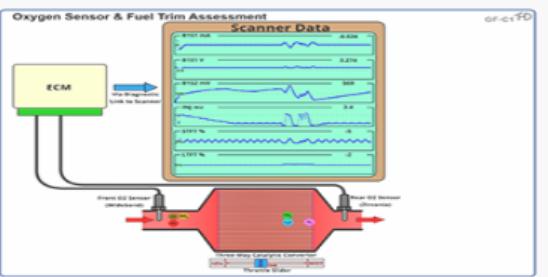


**PCM Circuit Measurement**

GF\_ECMwiringTest\_C1

Description

Updated October 2022

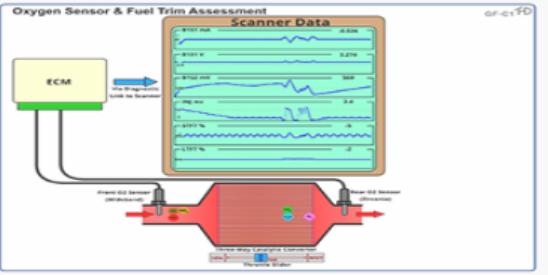


### 02 Sensor & Trim Inspection

GF\_O2FT\_Ass01\_C1

Normal Operation

Updated October 2022

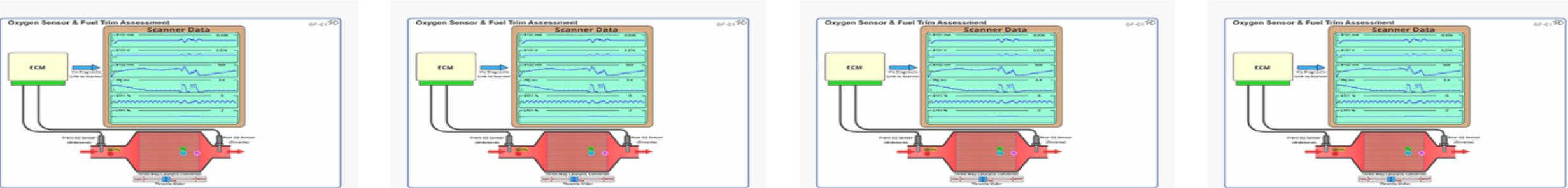


### 02 Sensor & Trim Inspection

GF\_O2FT\_Ass05\_C1

Rich Condition

Updated October 2022

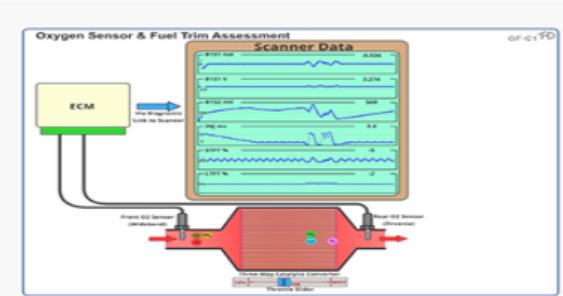


### 02 Sensor & Trim Inspection

GF\_O2FT\_Ass02\_C1

Catalyst Faulty

Updated October 2022

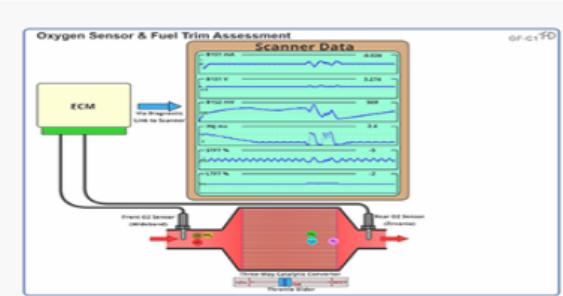


### 02 Sensor & Trim Inspection

GF\_O2FT\_Ass03\_C1

Intake Air Leak

Updated October 2022

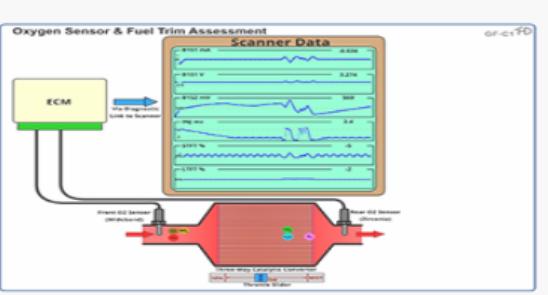


### 02 Sensor & Trim Inspection

GF\_O2FT\_Ass04\_C1

Low Fuel Flow

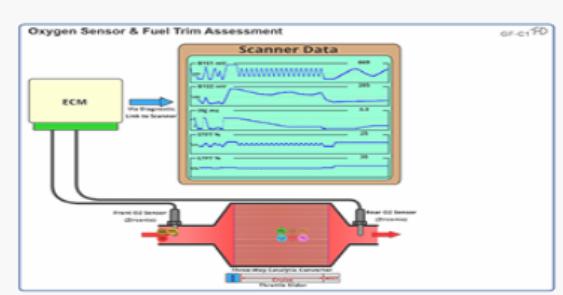
Updated October 2022



### 02 Sensor & Trim Inspection

GF\_O2FT\_Ass06\_C1

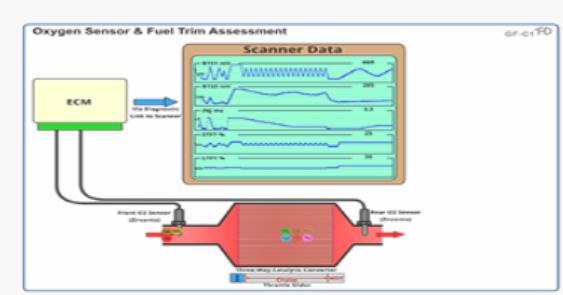
Normal Operation



### 02 Sensor & Trim Inspection

GF\_O2FT\_Ass07\_C1

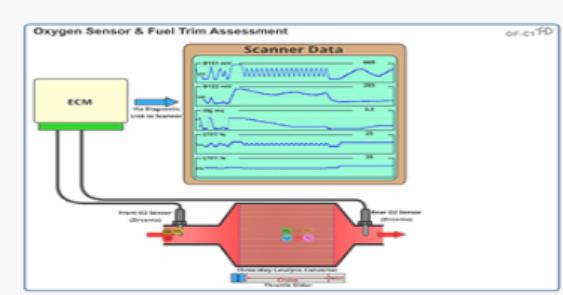
Catalyst Faulty



### 02 Sensor & Trim Inspection

GF\_O2FT\_Ass08\_C1

Intake Air Leak

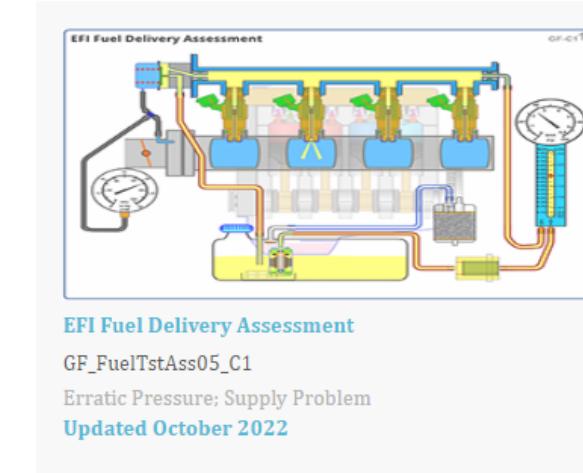
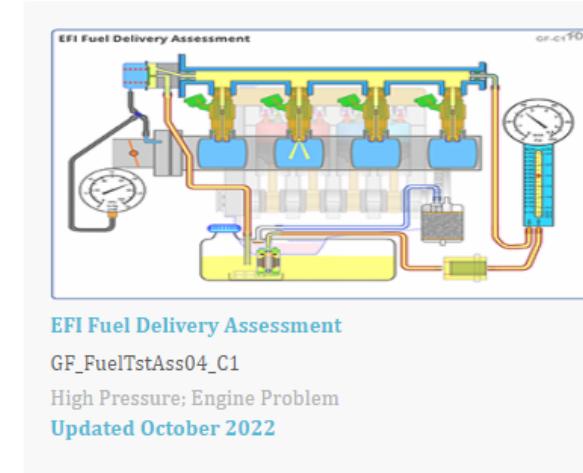
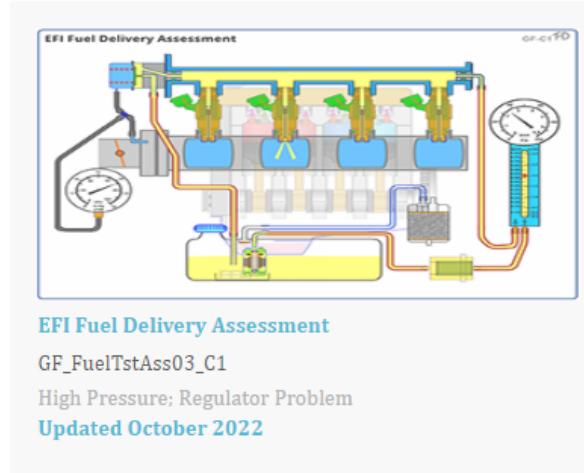
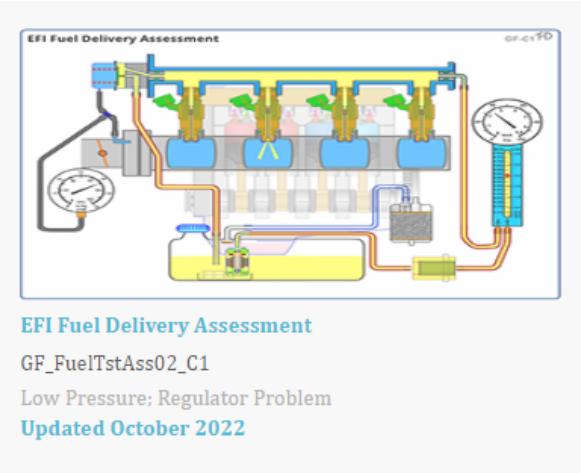
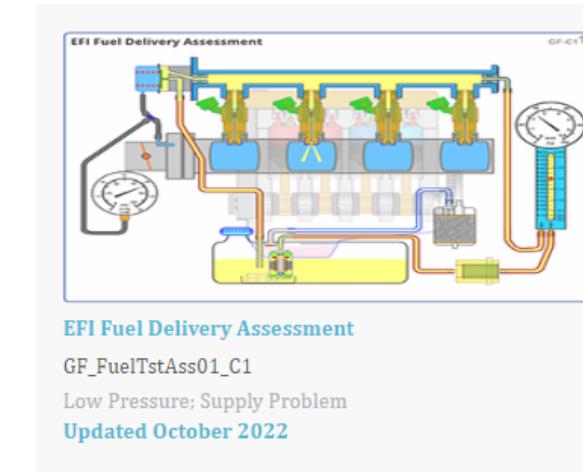
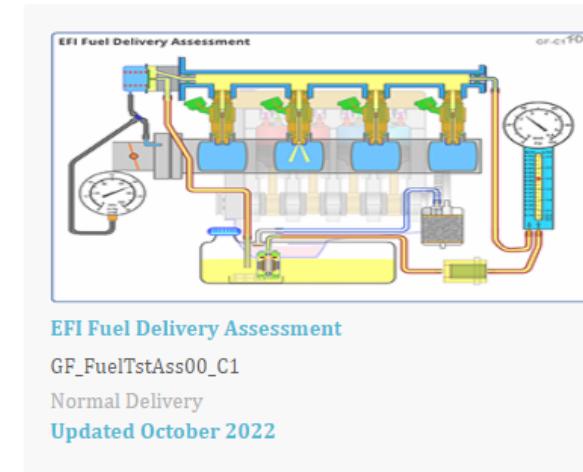
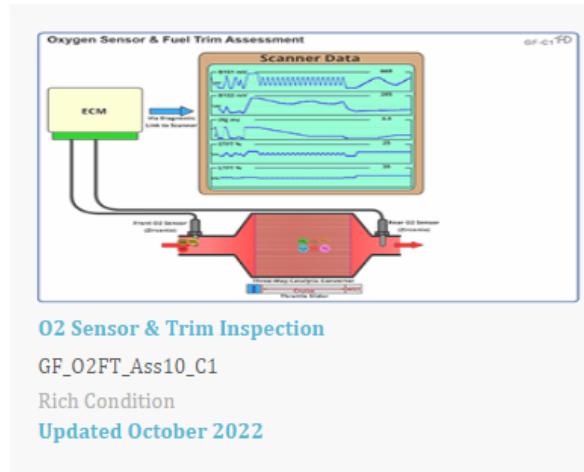
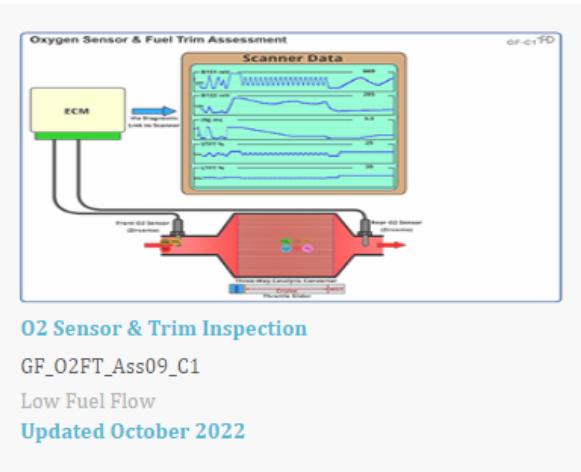


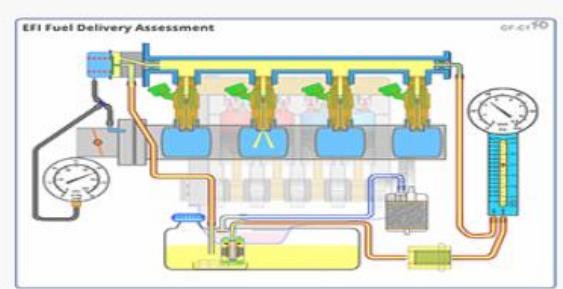
### 02 Sensor & Trim Inspection

GF\_O2FT\_Ass09\_C1

Low Fuel Flow

Updated October 2022



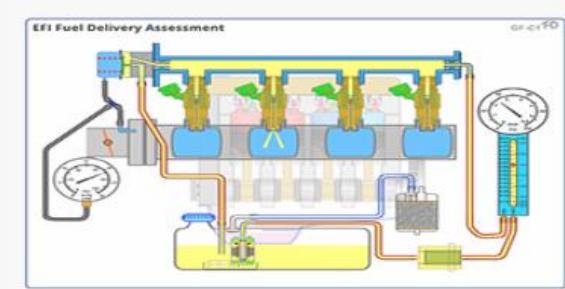


### EFI Fuel Delivery Assessment

GF\_FuelTstAss06\_C1

Erratic Pressure; Regulator Problem

**Updated October 2022**

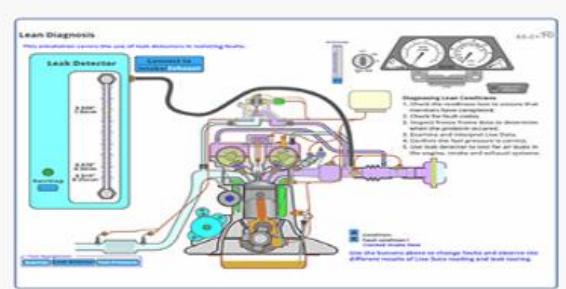


### EFI Fuel Delivery Assessment

GF\_FuelTstAss07\_C1

Erratic Pressure; Engine Problem

**Updated October 2022**

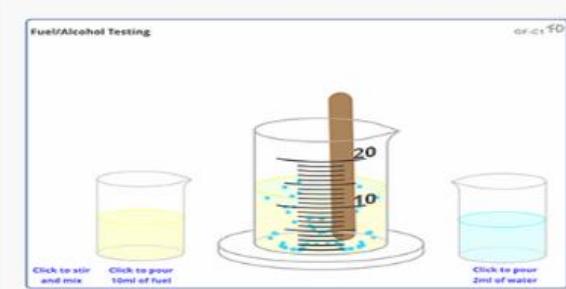


### Lean Running Engine Diagnosis

GF\_LeanDiag\_C1

Covers the use of Leak Machines to aid Diagnosis

**Updated October 2022**

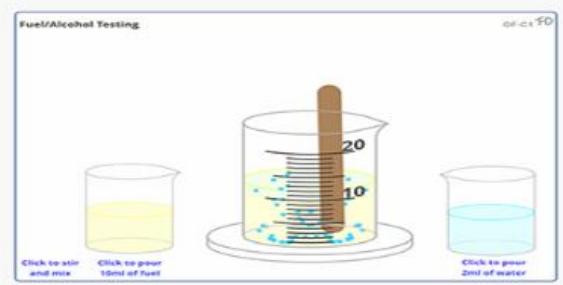


### Testing Alcohol Content of Fuel

GF\_FuelAlcoholAss01\_C1

10%

**Updated October 2022**

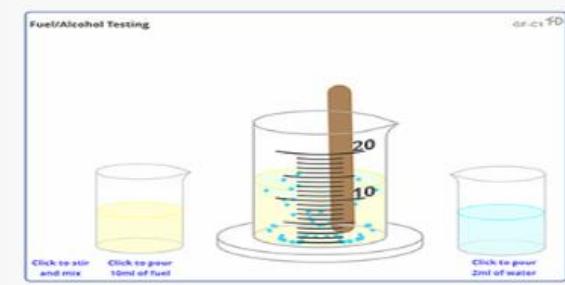


### Testing Alcohol Content of Fuel

GF\_FuelAlcoholAss02\_C1

50%

**Updated October 2022**

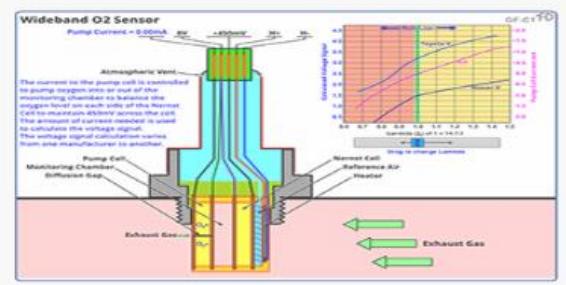


### Testing Alcohol Content of Fuel

GF\_FuelAlcoholAss03\_C1

90%

**Updated October 2022**

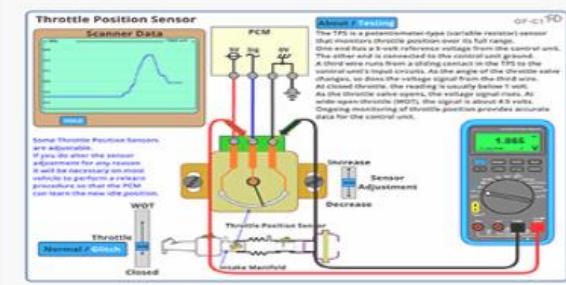


### Wideband O<sub>2</sub> Sensor

GF\_WbO2\_C1

Description

**Updated October 2022**



### Throttle Position Sensor

GF\_TPS\_C1

Demonstrates the operation and testing of a TPS sensor.

**Updated October 2022**

**Accelerator Pedal Position Sensor (APPS)**

APP sensors are used on vehicles with an electronic throttle control. The APP sensor sends signals about the position, direction, and speed of the throttle to the PCM. This information is used to calculate the engine power needed. The APP sensor comprises two TFSes that typically have two readings, with one reading from low voltage to high voltage. The other one moves from high voltage to low voltage. This creates a redundant circuit of opposite readings. The PCM can then quickly identify a problem with one or both of the APP sensor signals.

**GF\_AcPdSen\_C1**  
Demonstrates the operation and testing of an APPS sensor.  
**Updated October 2022**

**Manifold Absolute Pressure Sensor (MAP)**

To test a MAP sensor, measure the voltage of the signal return wire or compare the Scanner MAP data to the manifold vacuum (either to the chart below as a reference).

**GF\_MAP\_C1**  
Demonstrates the operation and testing of a MAP sensor.  
**Updated October 2022**

**Mass Airflow Sensor (MAF)**

To test a MAF sensor, measure the voltage of the signal return wire or view the scanner data. The scanner data clearly shows the MAF signal. The signal will be voltage, grams-per second (GPM) or both.

**GF\_HtWire\_C1**  
Demonstrates the operation and testing of a MAF sensor.  
**Updated October 2022**

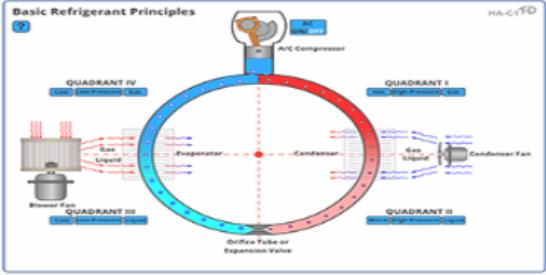
**Karman Vortex Sensor (KVS)**

The Air Flow Signal of all Karman Vortex Sensors is a variable-frequency 5-volt digital signal. The frequency varies directly with the volume of air that flows through the sensor.

**GF\_VortexSnsr\_C1**  
Demonstrates the operation and testing of a Karman Vortex sensor.  
**Updated October 2022**

# HA Series

# Heating & Air Conditioning

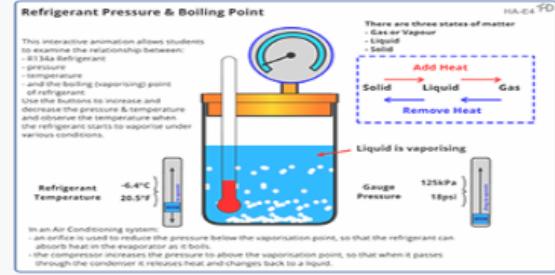


## Basic Refrigerant Principles

HA\_BasicPrinciples\_C1

Description

Updated October 2022

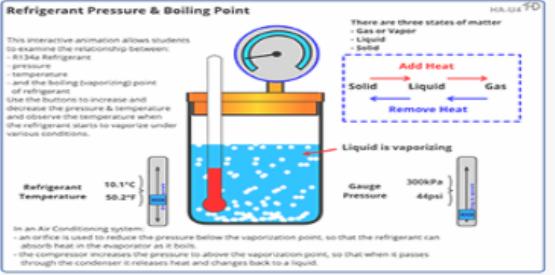


## Refrigerant Pressure and Boiling Point

HA\_R134aPressTemp\_E1

International English Version

Updated October 2022

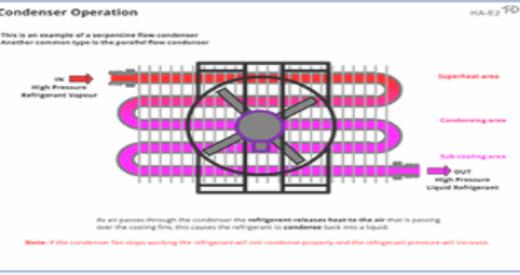


## Refrigerant Pressure and Boiling Point

HA\_R134aPressTemp\_U1

US English Version

Updated October 2022

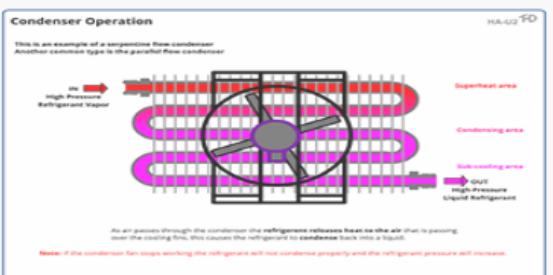


## Condenser Operation

HA\_Condenser\_E1

International English Version

Updated October 2022

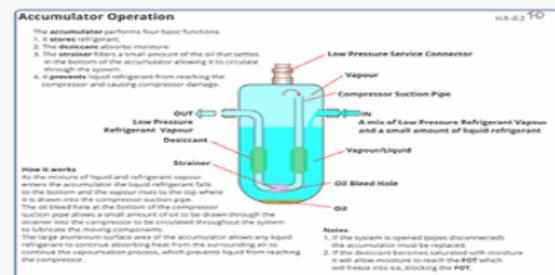


## Condenser Operation

HA\_Condenser\_U1

US English Version

Updated October 2022

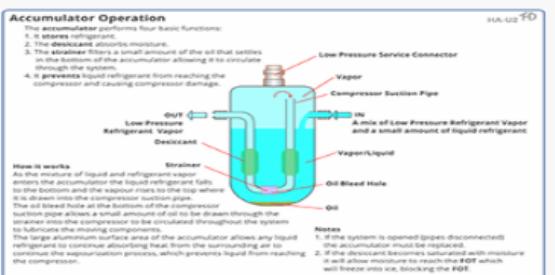


## Accumulator Operation

HA\_AccumulatorOperation\_E1

International English Version

Updated October 2022

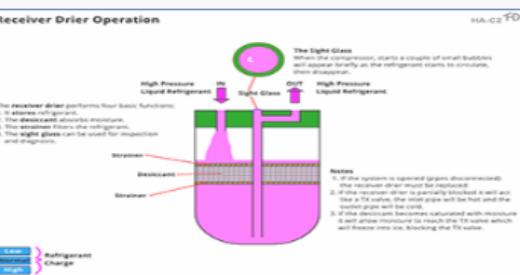


## Accumulator Operation

HA\_AccumulatorOperation\_U1

US English Version

Updated October 2022



## Receiver Drier Operation

HA\_ReceiverDrierOp\_C1

Description

Updated October 2022

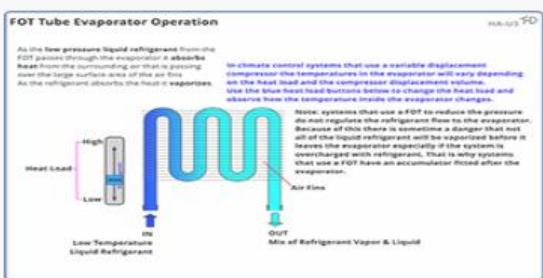


## FOT Tube Evaporator

HA\_FOTevaporator\_E1

International English Version

Updated October 2022

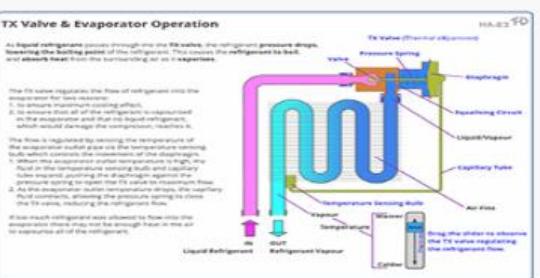


## FOT Tube Evaporator

HA\_FOTevaporator\_U1

US English Version

Updated October 2022

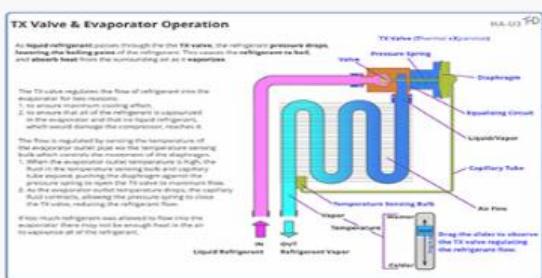


## TX Valve and Evaporator

HA\_TXevaporatorDetail\_E1

International English Version

Updated October 2022

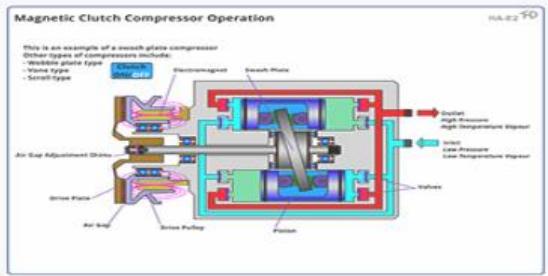


## TX Valve and Evaporator

HA\_TXevaporatorDetail\_U1

US English Version

Updated October 2022

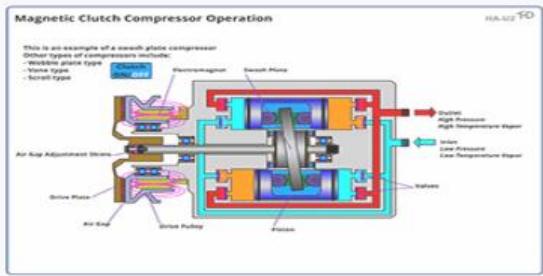


## Magnetic Clutch Compressor

HA\_MagClutchCompressor\_E1

International English Version

Updated October 2022

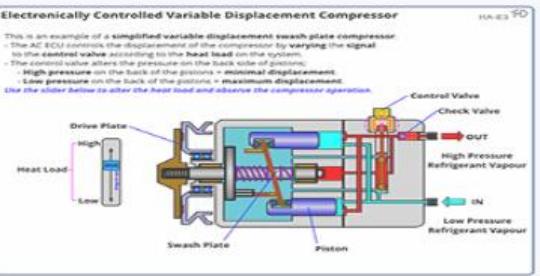


## Magnetic Clutch Compressor

HA\_MagClutchCompressor\_U1

US English Version

Updated October 2022

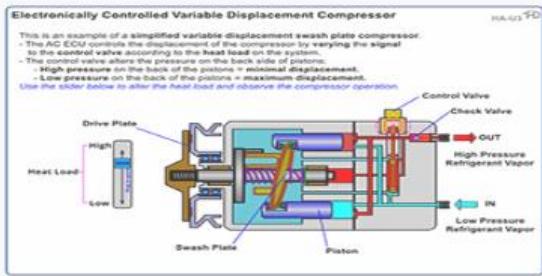


## Electronic Variable Displacement Compressor

HA\_VarDispCompressElec\_E1

International English Version

Updated October 2022

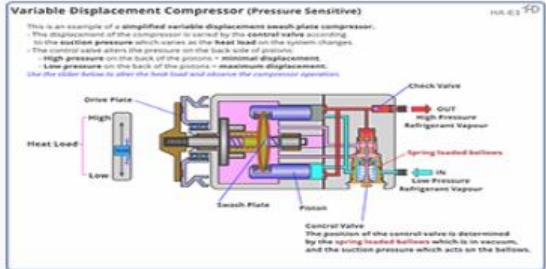


## Electronic Variable Displacement Compressor

HA\_VarDispCompressElec\_U1

US English Version

Updated October 2022

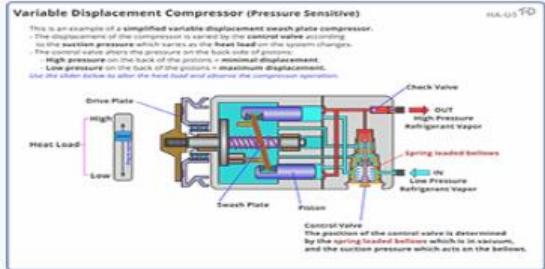


### Pressure Sensitive Variable Displacement Compressor

HA\_VarDispCompressPress\_E1

International English Version

Updated October 2022

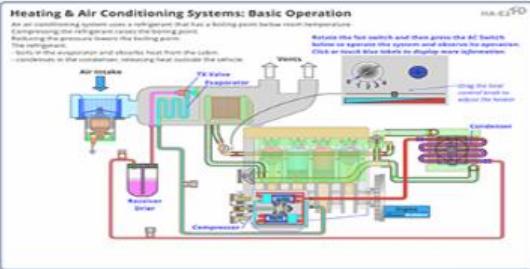


### Pressure Sensitive Variable Displacement Compressor

HA\_VarDispCompressPress\_U1

US English Version

Updated October 2022

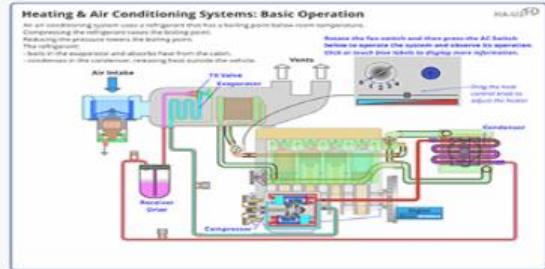


### TX AC System Basic Operation

HA\_TXsysOperation\_E1

International English Version

Updated October 2022

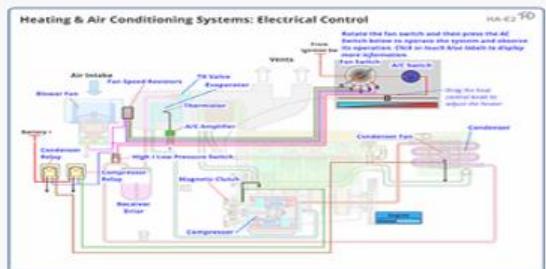


### TX AC System Basic Operation

HA\_TXsysOperation\_U1

US English Version

Updated October 2022

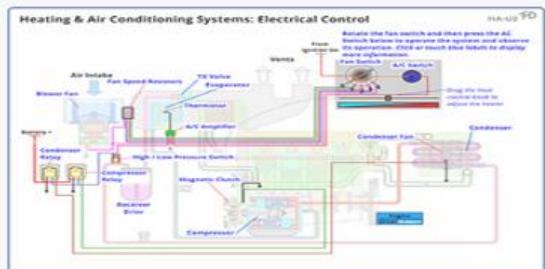


### TX AC System Electrical Control

HA\_TxsysElectrical\_E1

International English Version

Updated October 2022

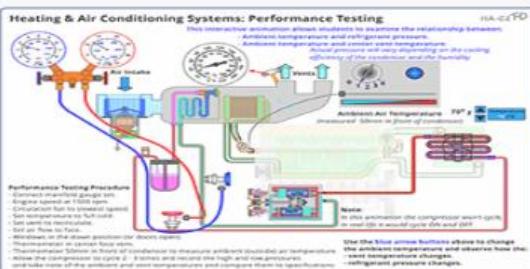


### TX AC System Electrical Control

HA\_TxsysElectrical\_U1

US English Version

Updated October 2022

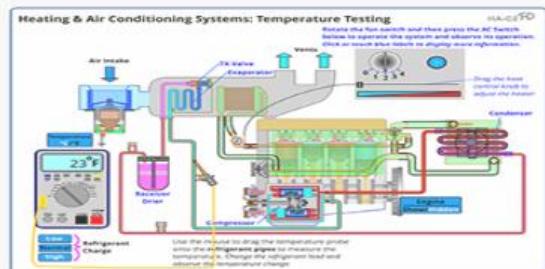


### Performance Testing

HA\_ACPerformanceTesting\_C1

Description

Updated October 2022

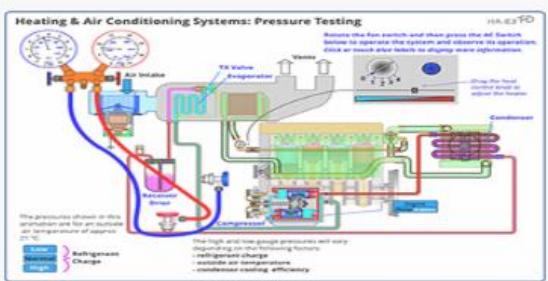


### Temperature Testing

HA\_ACtempTesting\_C1

Description

Updated October 2022

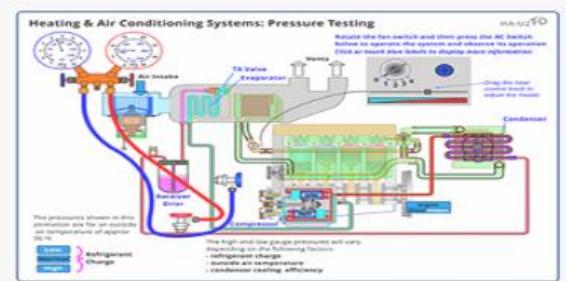


## Pressure Testing

HA\_ACpressureTesting\_E1

International English Version

**Updated October 2022**

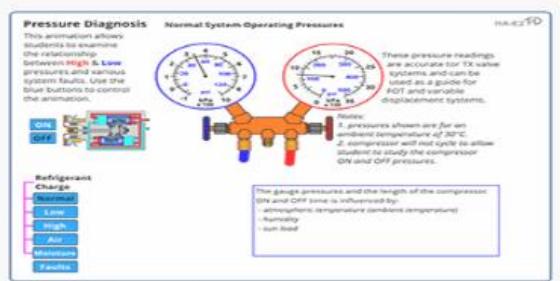


## Pressure Testing

HA\_ACpressureTesting\_U1

US English Version

**Updated October 2022**

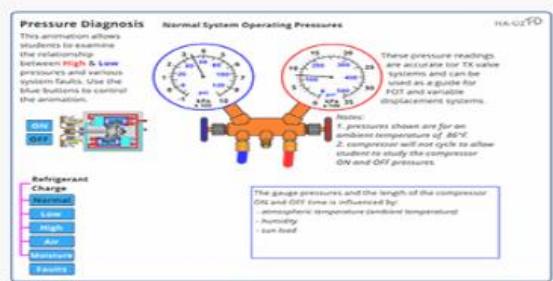


## Pressure Diagnosis

HA\_ACpressureDiagnosis\_E1

International English Version

**Updated October 2022**

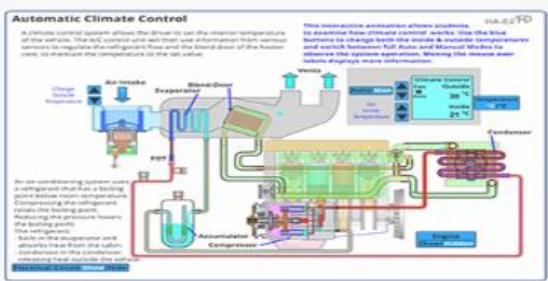


## Pressure Diagnosis

HA\_ACpressureDiagnosis\_U1

US English Version

**Updated October 2022**

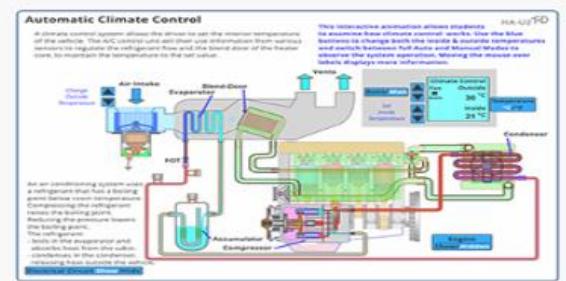


## Automatic Climate Control

HA\_AutoClimateControl\_E1

International English Version

**Updated October 2022**

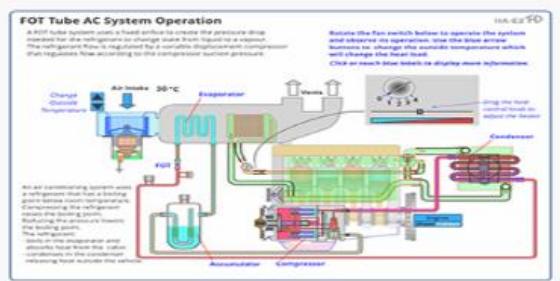


## Automatic Climate Control

HA\_AutoClimateControl\_U1

US English Version

**Updated October 2022**

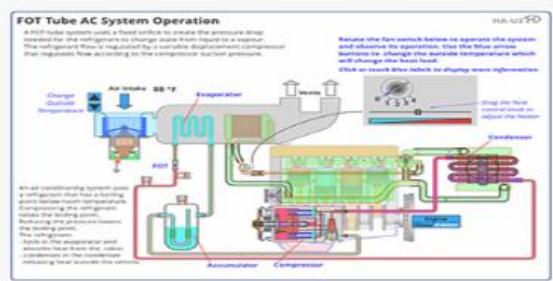


## FOT Tube AC System Operation

HA\_FOTsystemOp\_E1

International English Version

**Updated October 2022**

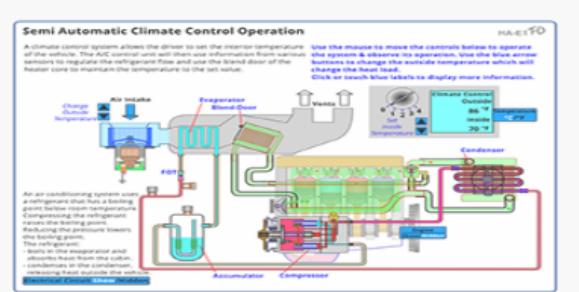


## FOT Tube AC System Operation

HA\_FOTsystemOp\_U1

US English Version

**Updated October 2022**

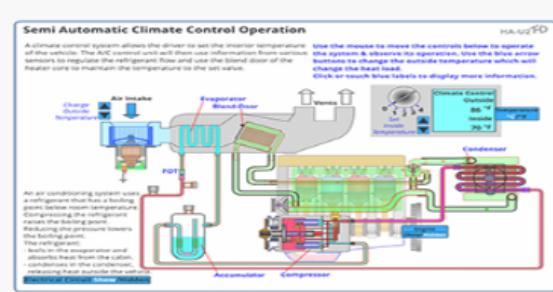


## Semi-Automatic Climate Control

HA\_SemiAutoClimateControl\_E1

International English Version

Updated October 2022

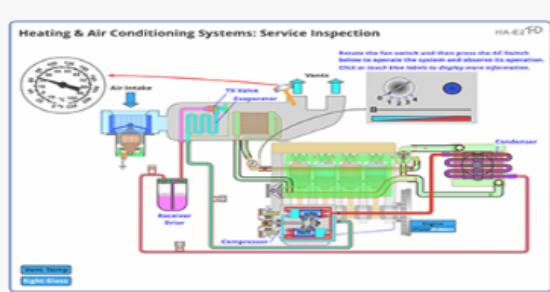


## Semi-Automatic Climate Control

HA\_SemiAutoClimateControl\_U1

US English Version

Updated October 2022

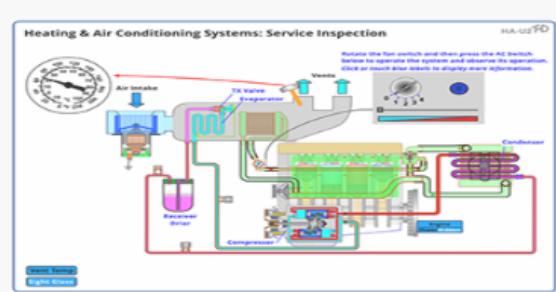


## Service Inspection

HA\_TXinspection\_E1

International English Version

Updated October 2022

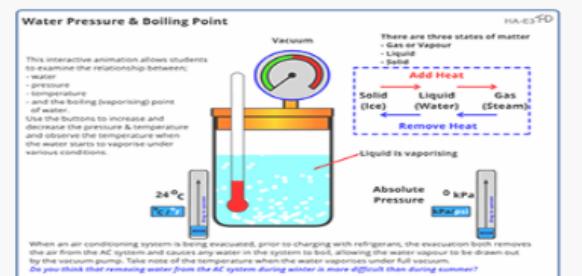


## Service Inspection

HA\_TXinspection\_U1

US English Version

Updated October 2022

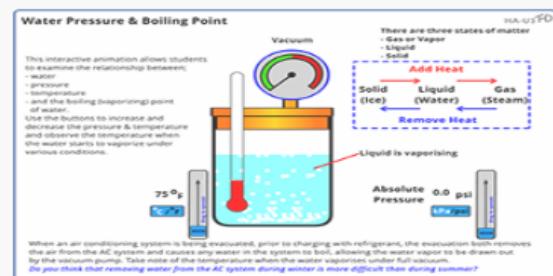


## Water Pressure and Boiling Point

HA\_WaterPressTempEvac\_E1

International English Version

Updated October 2022

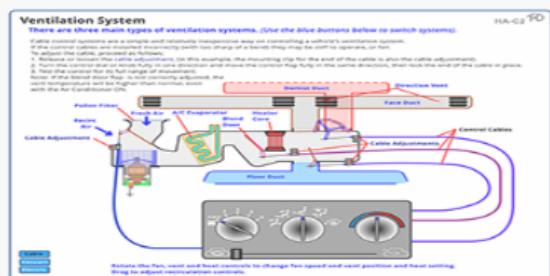


## Water Pressure and Boiling Point

HA\_WaterPressTempEvac\_U1

US English Version

Updated October 2022

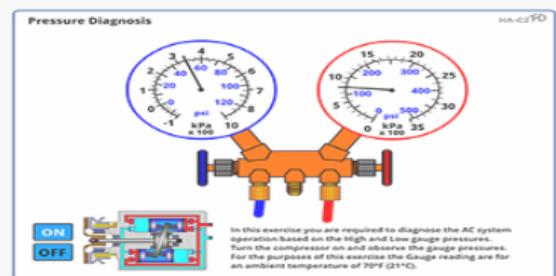


## Ventilation System

HA\_Ventilation\_C1

Description

Updated October 2022

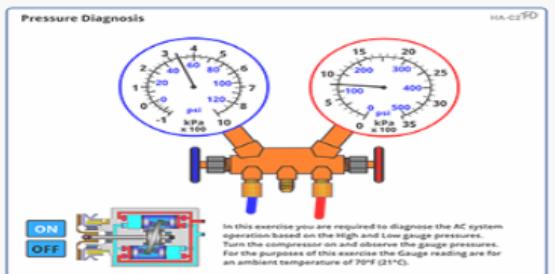


## Pressure Diagnosis 01

HA\_PressureDiag01\_C1

Normal Refrigerant Charge

Updated October 2022

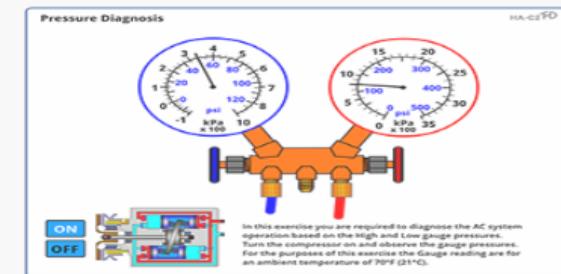


### Pressure Diagnosis 02

HA\_PressureDiag02\_C1

Slightly Low Refrigerant Charge

Updated October 2022

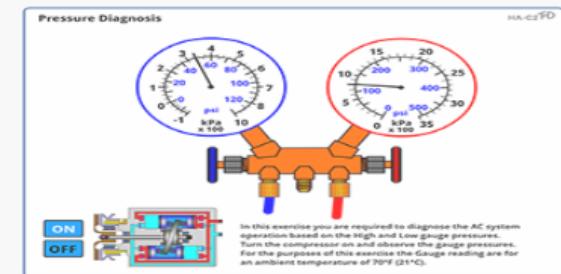


### Pressure Diagnosis 03

HA\_PressureDiag03\_C1

Very Low Refrigerant Charge

Updated October 2022

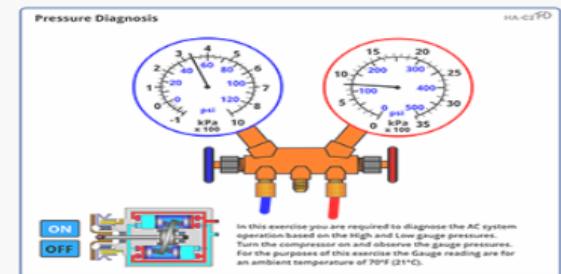


### Pressure Diagnosis 04

HA\_PressureDiag04\_C1

High Refrigerant Charge

Updated October 2022

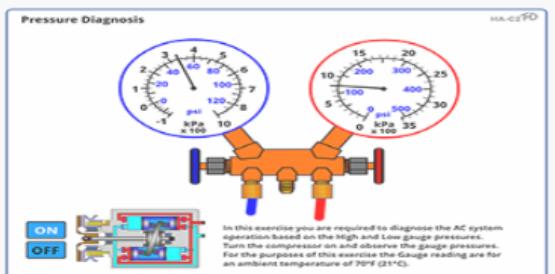


### Pressure Diagnosis 05

HA\_PressureDiag05\_C1

Small amount of Air in Refrigerant

Updated October 2022

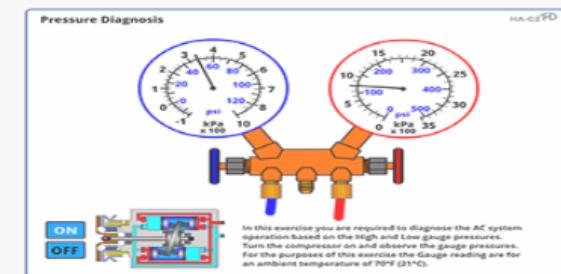


### Pressure Diagnosis 06

HA\_PressureDiag06\_C1

Lots of Air in Refrigerant

Updated October 2022

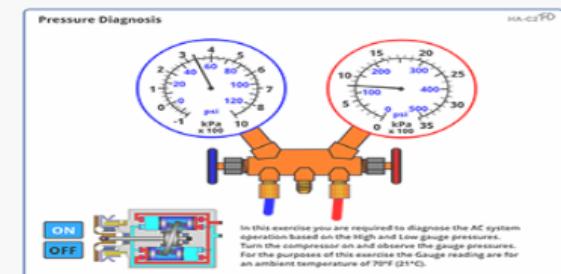


### Pressure Diagnosis 07

HA\_PressureDiag07\_C1

Moisture in Refrigerant

Updated October 2022

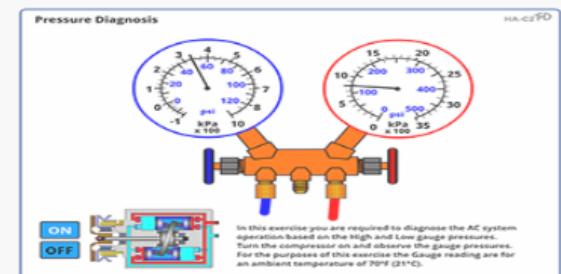


### Pressure Diagnosis 08

HA\_PressureDiag08\_C1

TX Valve Open

Updated October 2022

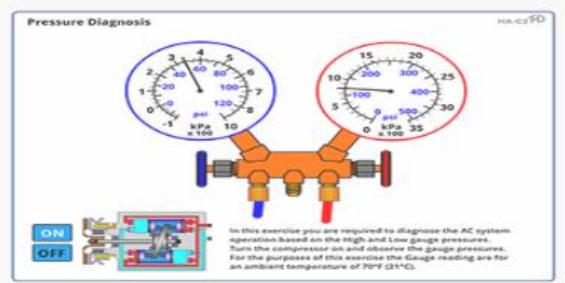


### Pressure Diagnosis 09

HA\_PressureDiag09\_C1

TX Valve Closed

Updated October 2022

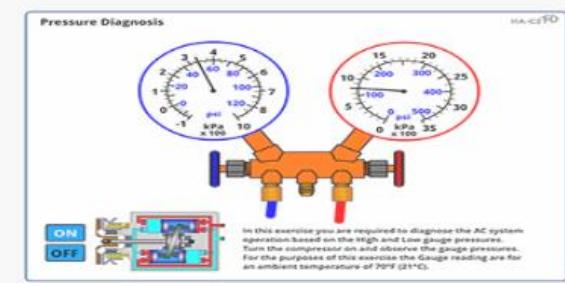


### Pressure Diagnosis 10

HA\_PressureDiag10\_C1

Thermo Sw Fault

Updated October 2022

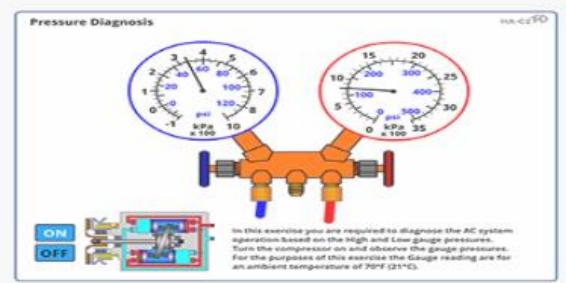


### Pressure Diagnosis 11

HA\_PressureDiag11\_C1

Thermo Sw Adjustment

Updated October 2022

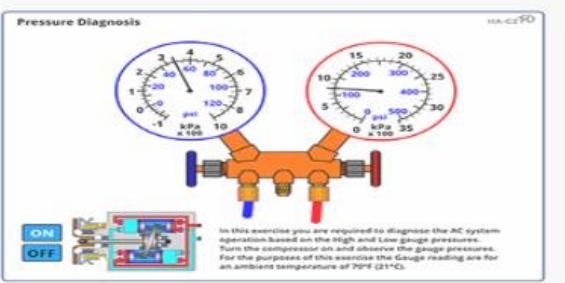


### Pressure Diagnosis 12

HA\_PressureDiag12\_C1

Compressor Fault

Updated October 2022

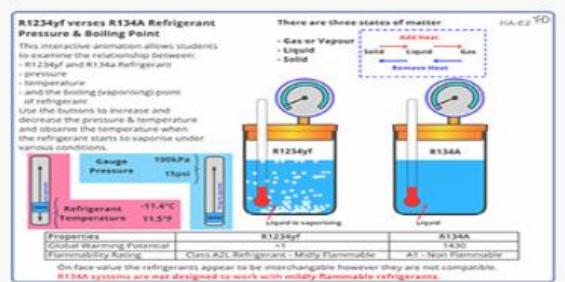


### Pressure Diagnosis 13

HA\_PressureDiag13\_C1

Restriction

Updated October 2022

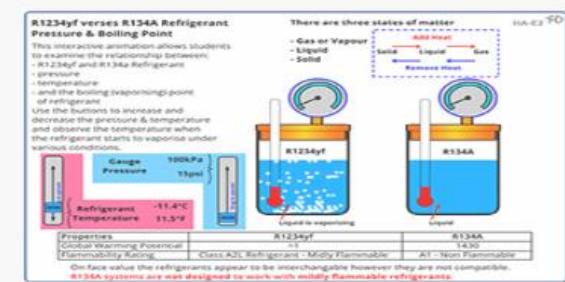


### R1234yf versus R134A Pressure & Boiling Point

HA\_R1234\_R134\_U1

US Language Version

Updated October 2022

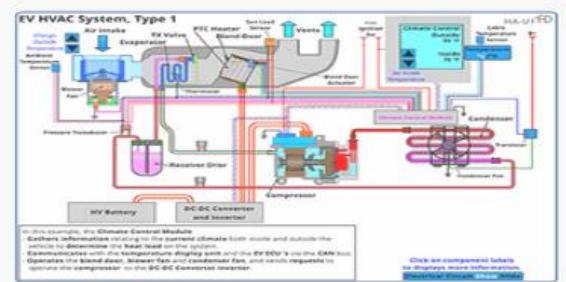


### R1234yf versus R134A Pressure & Boiling Point

HA\_R1234\_R134\_E1

International English Version

Updated October 2022

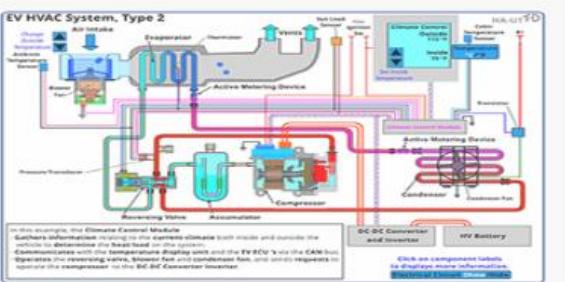


### EV HVAC Type 1

HA\_EV\_HVAC\_T1\_C1

A/C & PTC Heating

Updated October 2022



### EV HVAC Type 2

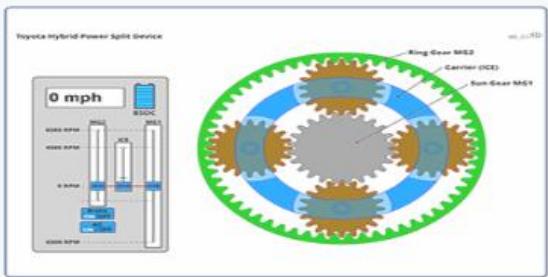
HA\_EV\_HVAC\_T2\_C1

Reverse Cycle System

Updated October 2022

# HE Series

# Hybrid & Electric Vehicles

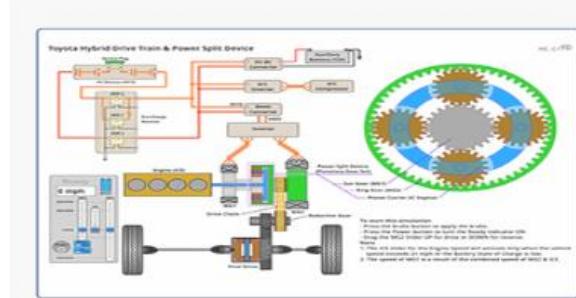


**Toyota Hybrid Power Split Device**

HE\_PriusPowerSplit\_C1

Description

Updated October 2022

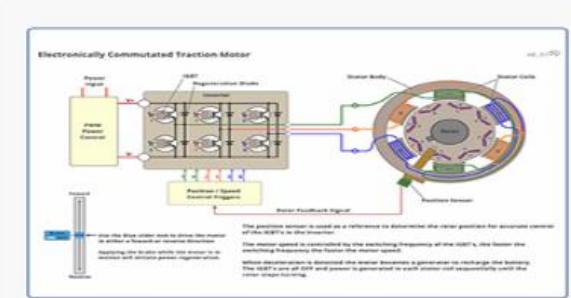


**Toyota Hybrid Drive Train and Power Split Device**

HE\_ToyDrTrainPowerSplit\_C1

Description

Updated October 2022

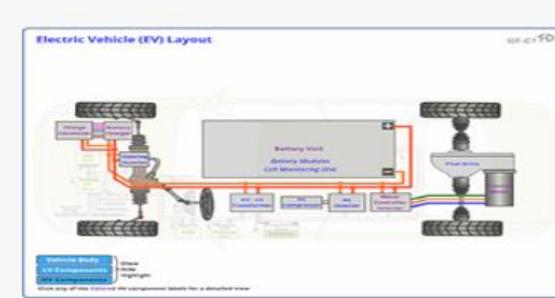


**Electronically Commutated Traction Motor**

HE\_ElecComTracMtr\_C1

Description

Updated October 2022

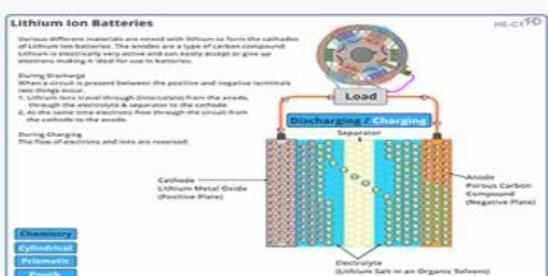


**Electric Vehicle (EV) Layout**

HE\_EVlayout\_C1

Description

Updated October 2022

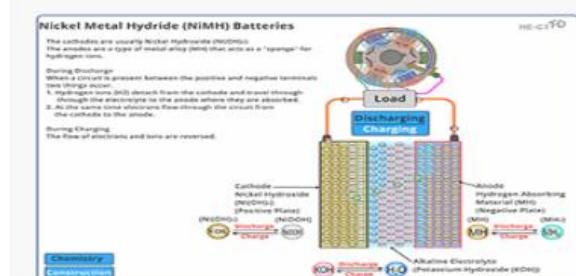


**Lithium Ion Batteries**

HE\_LitonBatt\_C1

Description

Updated October 2022

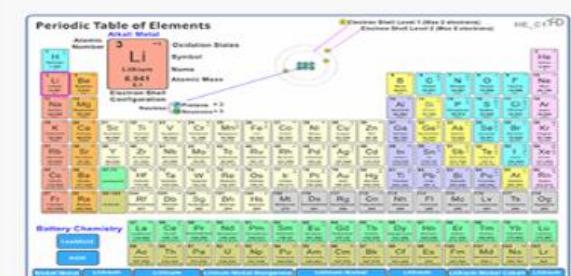


**Nickel Metal Hydride Batteries**

HE\_NiMHbatt\_C1

Description

Updated October 2022

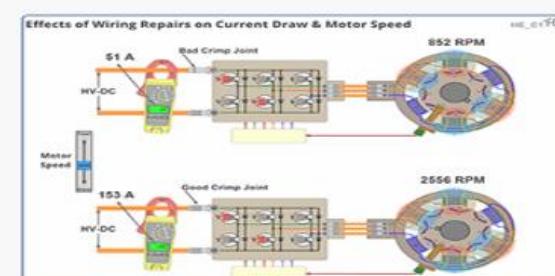


**Periodic Table of Elements**

HE\_PTE\_C1

Focusing on battery chemistry

Updated October 2022

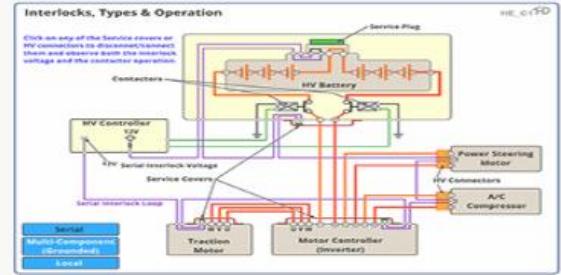


**Effects of Wiring Repairs**

HE\_WrAmpCmp\_C1

Description

Updated October 2022

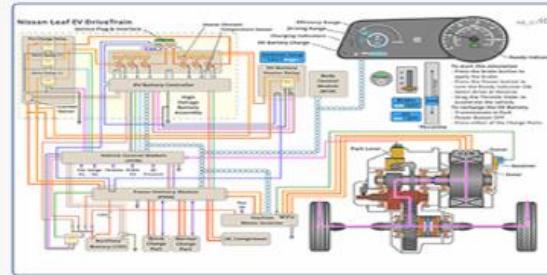
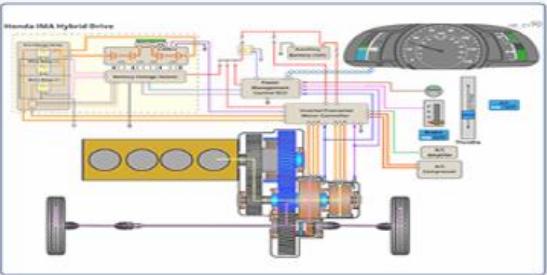
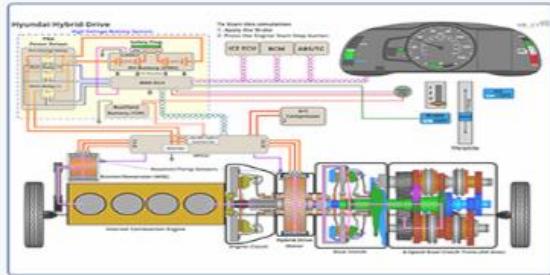
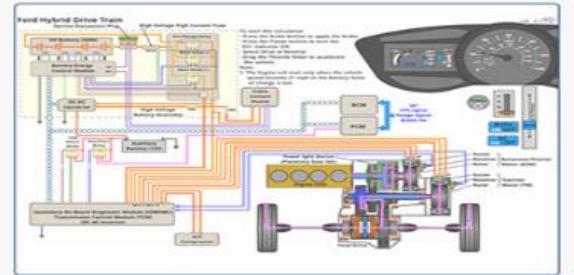
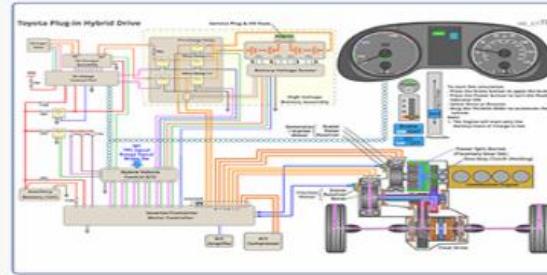
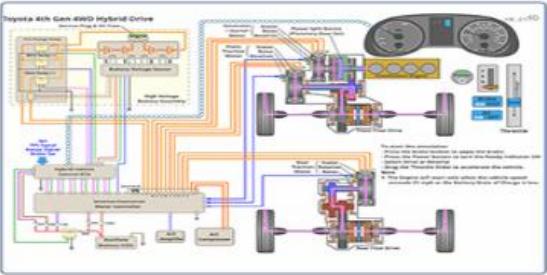
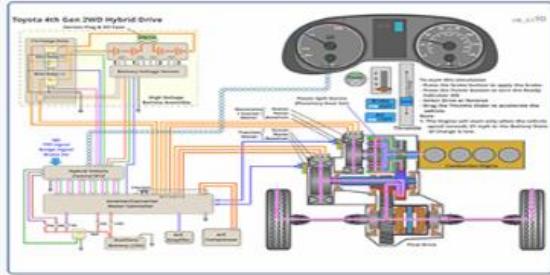


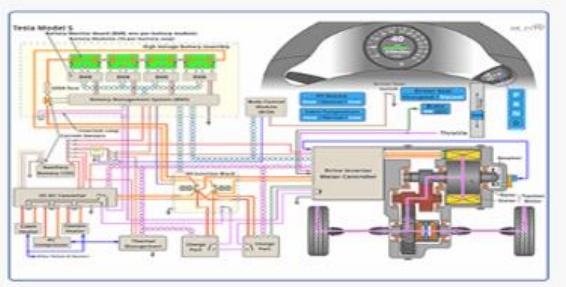
## Interlocks

HE\_Interlocks\_C1

Description

Updated October 2022



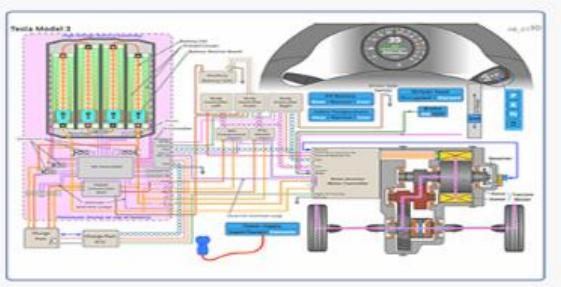


**Tesla Model S**

HE\_TeslaS\_C1

Description

Updated October 2022

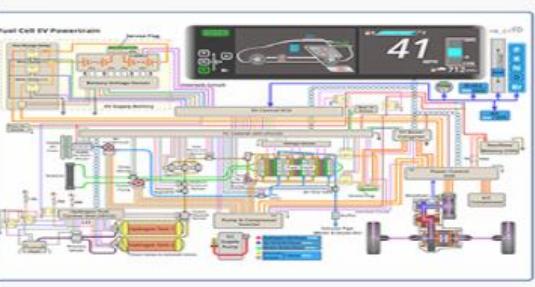


**Tesla Model 3**

HE\_Tesla3\_C1

Description

Updated October 2022

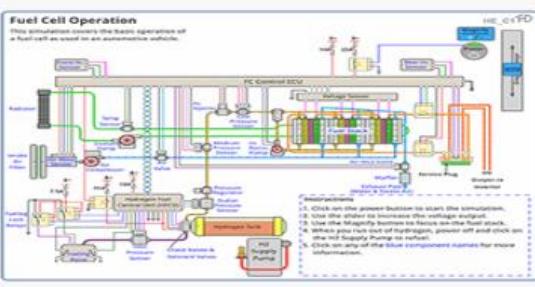


**Fuel Cell EV Drivetrain**

HE\_FC\_DrTrain\_C1

Description

Updated October 2022

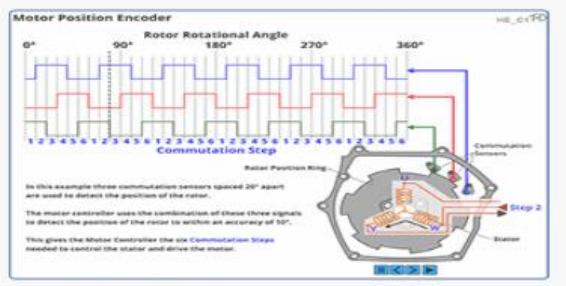


**Fuel Cell Operation**

HE\_FuelCell\_C1

Description

Updated October 2022

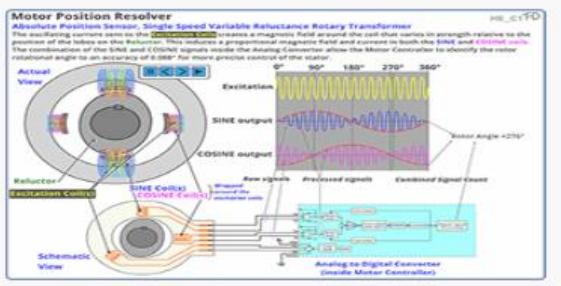


**Motor Position Encoder**

HE\_Encoder\_C1

Demonstrates how the Encoder works in a Honda IMA traction motor

Updated October 2022

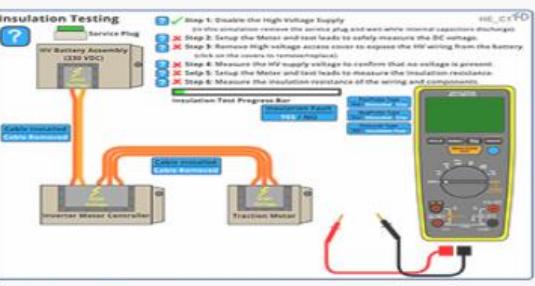


**Motor Position Resolver**

HE\_Resolver\_C1

Description

Updated October 2022

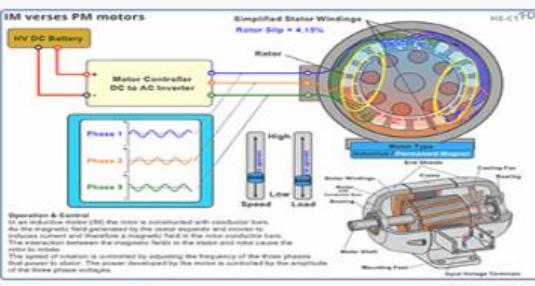


**Insulation Testing**

HE\_InsulTest\_C1

Description

Updated October 2022

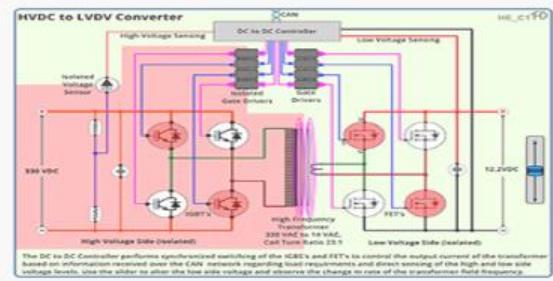


**IM verses PM Motors**

HE\_IM\_PM\_mtrs\_C1

Description

Updated October 2022

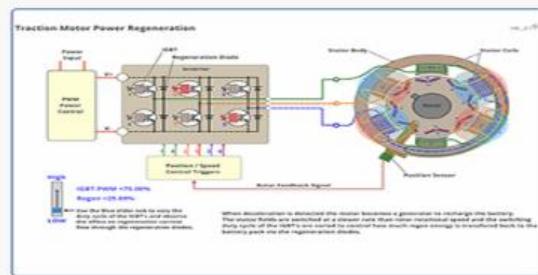


### DC to DC Converter

HE\_DCDCConverter\_C1

Description

Updated October 2022

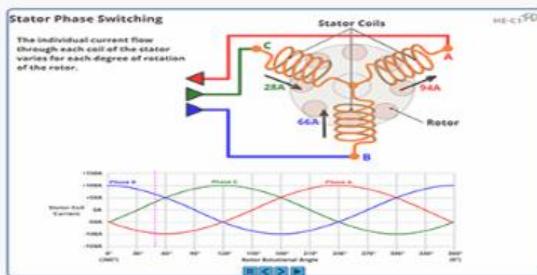


### Traction Motor Regeneration

HE\_TracMtrRegen\_C1

Description

Updated October 2022

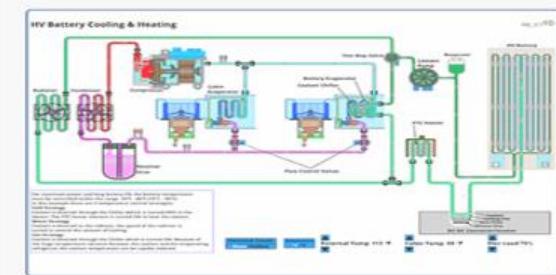


### Stator Phase Switching

HE\_StatPhSw\_C1

Description

Updated October 2022

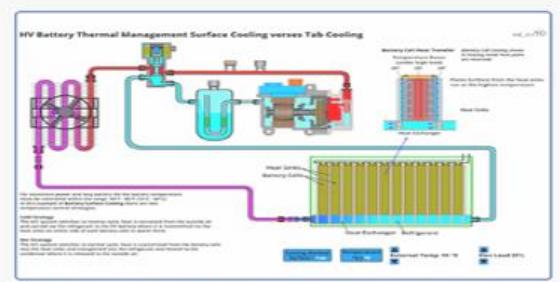


### HV Battery Cooling & Heating

HE\_HVbattTM\_C1

Description

Updated October 2022

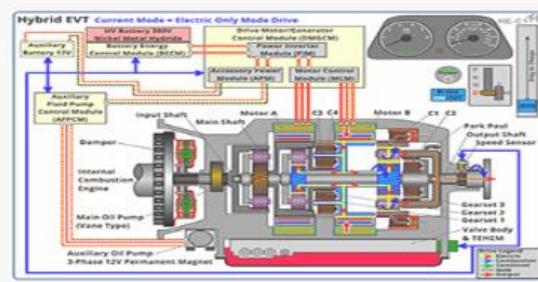


### HV Battery Thermal Management: Surface Cooling versus TAB cooling

HE\_HVbattTM\_C1

Description

Updated October 2022

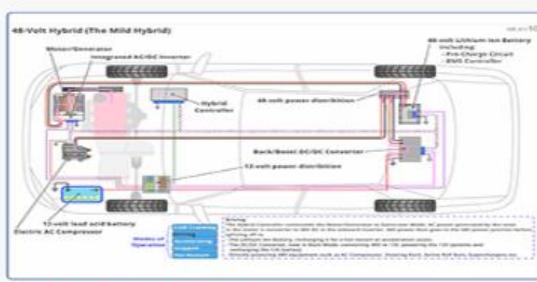


### Hybrid EVT

HE\_HybridEVT\_C1

Description

Updated October 2022

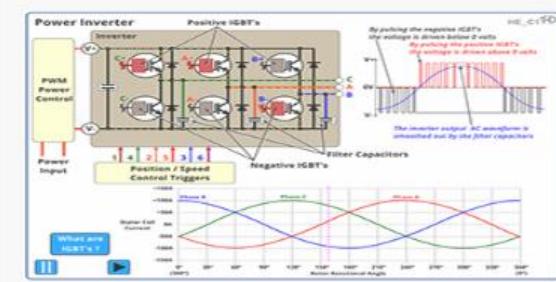


### 48-Volt Hybrid (The Mild Hybrid)

HE\_48VHS\_C1

Description

Updated October 2022

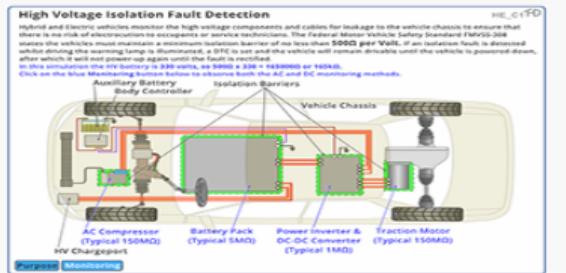


### Power Inverter

HE\_PwrInvt\_C1

Demonstrates how The Power Inverters creates the AC needed to drive a motor from a DC supply

Updated October 2022

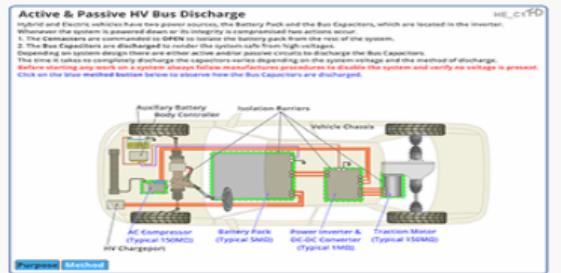


### Isolation Fault Testing

HE\_IsoTst\_C1

Demonstrates the two fault detection methods for insulation faults

Updated October 2022

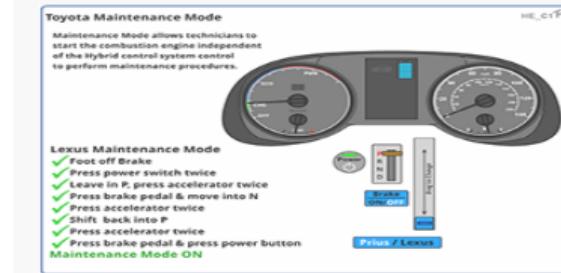


### Active & Passive HV Bus Discharge

HE\_BusDis\_C1

Demonstrates the two most common methods of discharging the bus capacitors

Updated October 2022

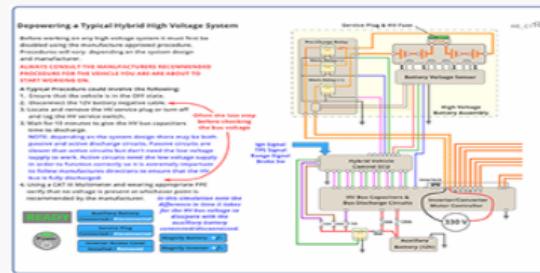


### Toyota Hybrid Maintenance Mode

HE\_ToyMatMde\_C1

Covers the sequence to enter maintenance mode for the combustion engine.

Updated October 2022



### Depowering a Typical Hybrid High Voltage System

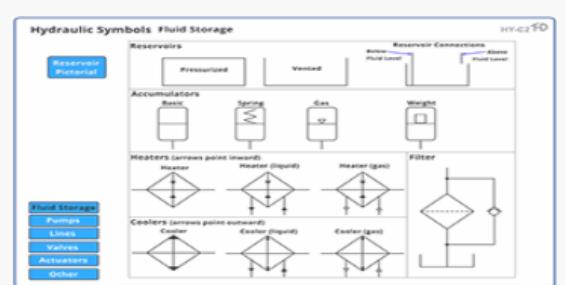
HE\_DePwr\_C1

Covers a typical depower sequence. Has two discharge rates if done in incorrect order.

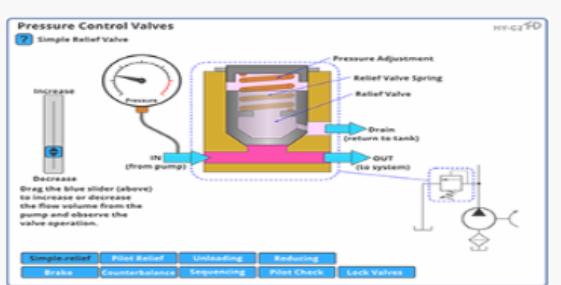
Updated March 2023

# HY Series

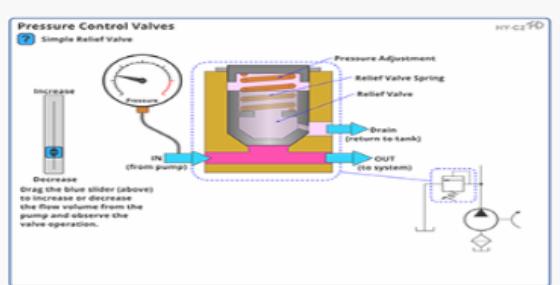
# Hydraulics for Mobile Equipment



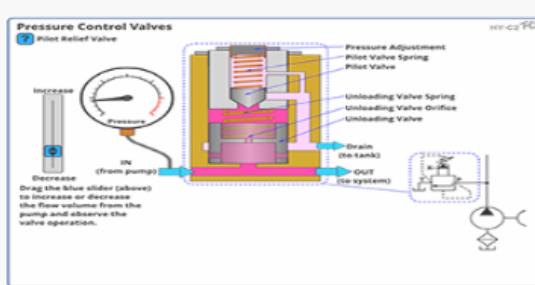
**Hydraulic Symbols**  
HY\_HydraulicSymbols\_C1  
Description  
Updated September 2022



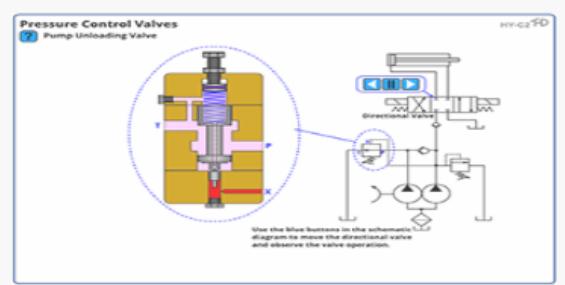
**Pressure Control Valves (all in one)**  
HY\_PressureValves\_C1  
Description  
Updated September 2022



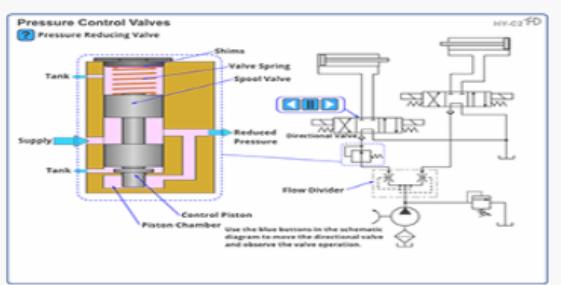
**Simple Relief Valve**  
HY\_SimpleReliefValve\_C1  
Description  
Updated September 2022



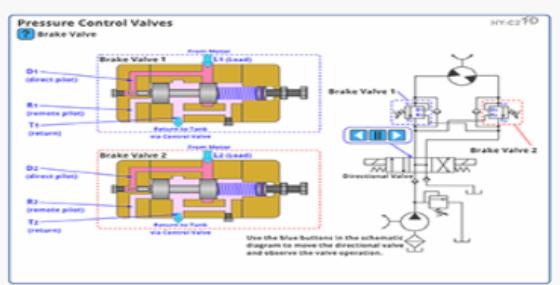
**Pilot Relief Valve**  
HY\_PilotReliefValve\_C1  
Description  
Updated September 2022



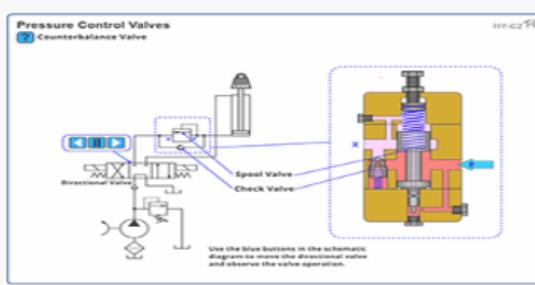
**Pump Unloading Valve**  
HY\_PumpUnloadingValve\_C1  
Description  
Updated September 2022



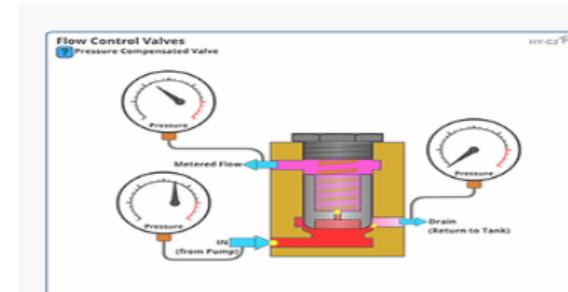
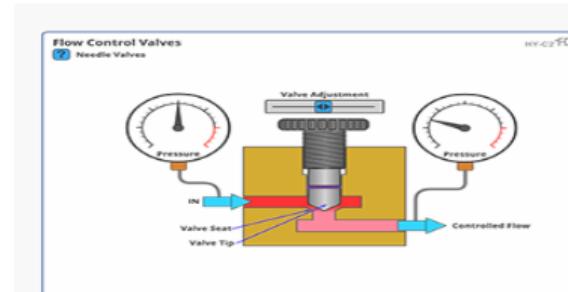
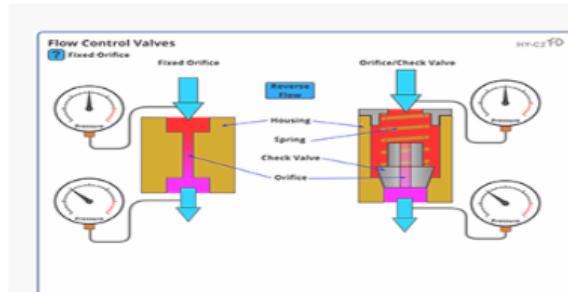
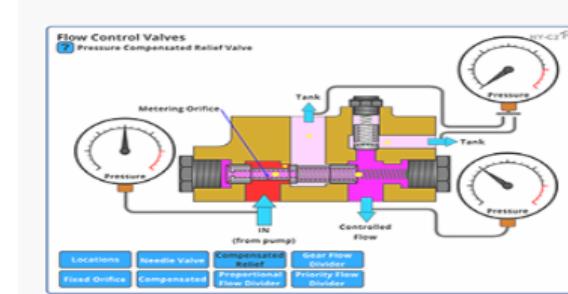
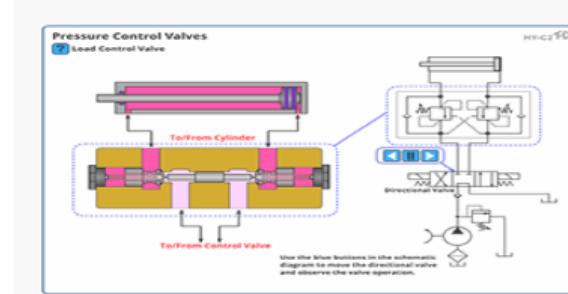
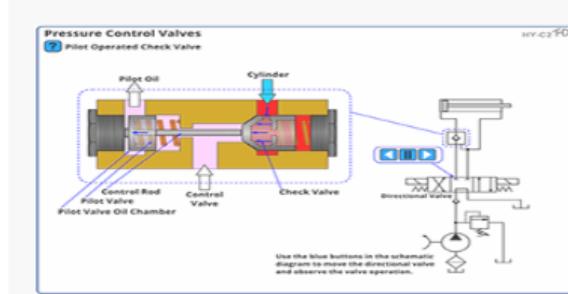
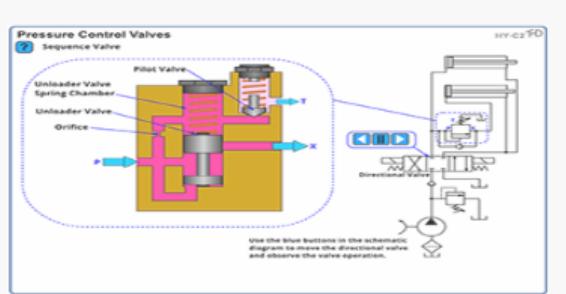
**Pressure Reducing Valve**  
HY\_PressureReducingValve\_C1  
Description  
Updated September 2022

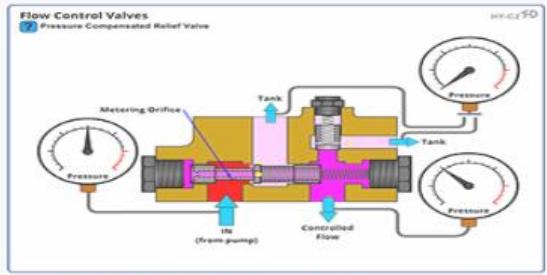


**Brake Valve**  
HY\_BrakeValves\_C1  
Description  
Updated September 2022



**Counterbalance Valve**  
HY\_CounterbalanceValve\_C1  
Description  
Updated September 2022



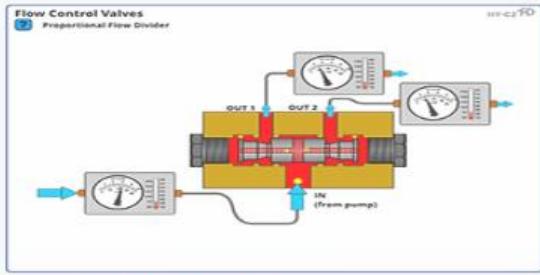


### Pressure Compensated Relief Valve

HY\_CompReliefFlowValves\_C1

Description

Updated September 2022

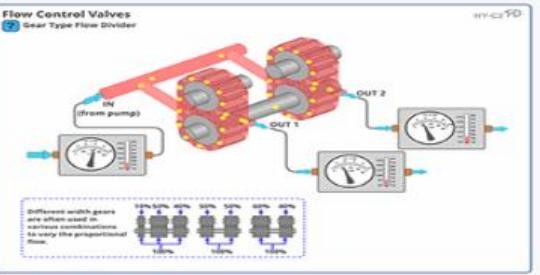


### Proportional Flow Divider

HY\_ProportionalDivideValves\_C1

Description

Updated September 2022

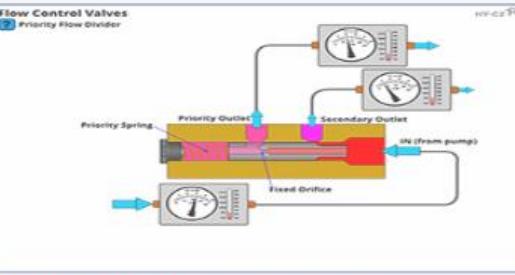


### Gear Type Flow Divider

HY\_GearDivideValves\_C1

Description

Updated September 2022

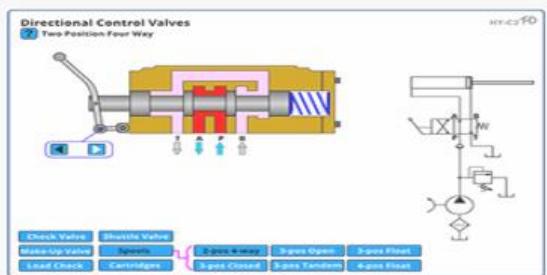


### Priority Flow Divider

HY\_PriorityDivideValves\_C1

Description

Updated September 2022

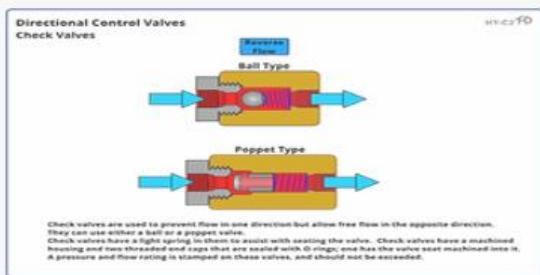


### Directional Control Valves (all in one)

HY\_DirectionalValves\_C1

Description

Updated September 2022

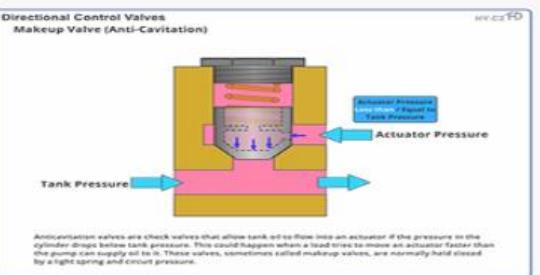


### Check Valves

HY\_CheckValves\_C1

Description

Updated September 2022

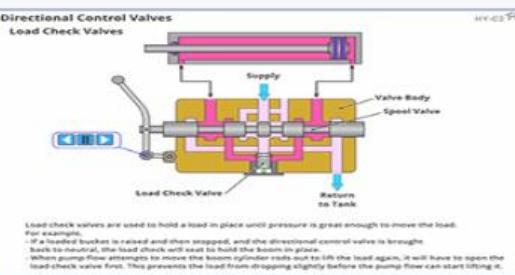


### Makeup Valve

HY\_MakeupValves\_C1

Description

Updated September 2022

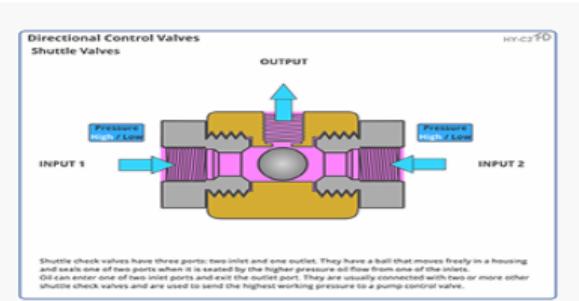


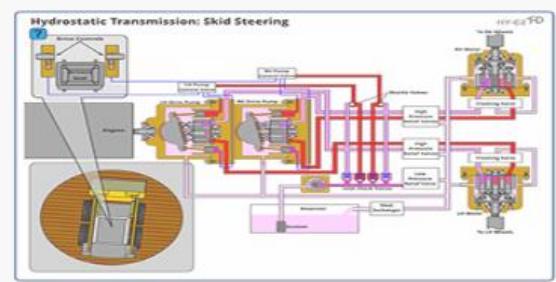
### Load Check Valve

HY\_LoadCheckValves\_C1

Description

Updated September 2022



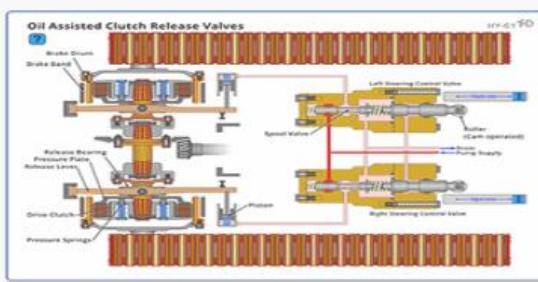


### Hydrostatic Steering

HY\_HydrostaticSteering\_C1

Description

Updated September 2022

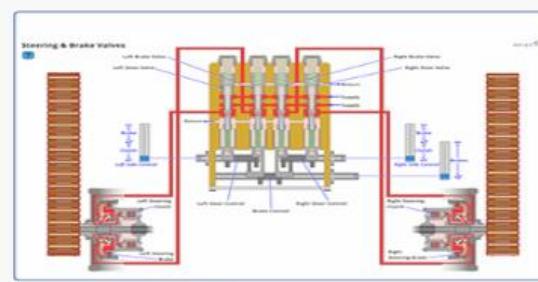


### Oil Assisted Clutch Release Valves

HY\_SteeringControlValves\_C1

Description

Updated September 2022

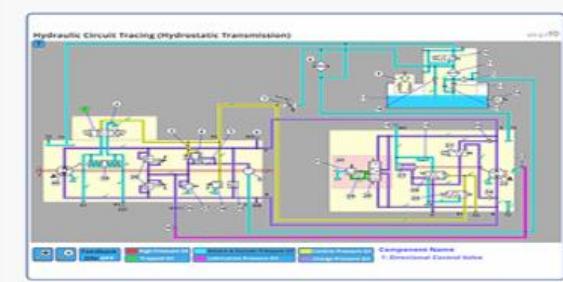


### Steering and Brake Valves

HY\_SteeringBrakeValves\_C1

Description

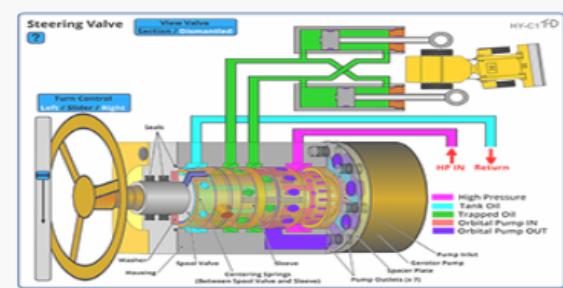
Updated September 2022



### Hydrostatic Transmission Circuit Tracing

HY\_HydrostaticCircuit\_C1

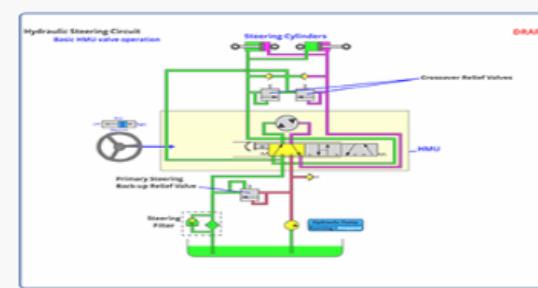
Hydraulic circuit tracing with feedback.



### Hydraulic Steering

HY\_HydSteer\_C1

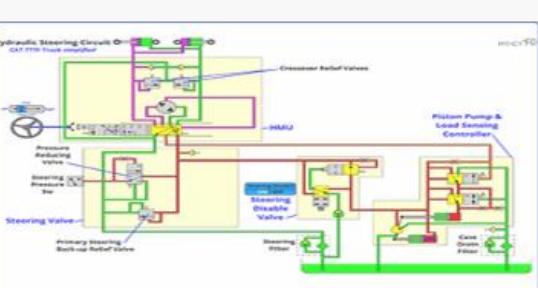
Demonstrates the internal working of an orbital steering valve



### Hydraulic Steering Circuit Basic HMU

HY\_HydSteerCirc1\_C1

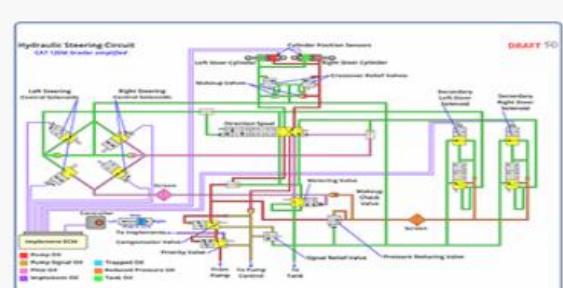
A hydraulic circuit diagram showing to operation of the basic HMU steering system.



### Hydraulic Steering CAT 777F Simplified

HY\_HydSteerCirc2\_C1

A hydraulic circuit diagram showing to operation of the HMU, Pump load control & steering disable valves.



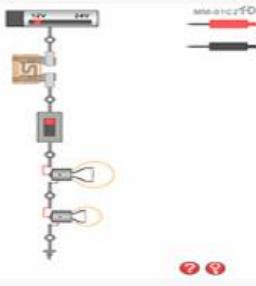
### Hydraulic Steering CAT 777F Simplified

HY\_HydSteerCirc3\_C1

A hydraulic circuit diagram showing to operation of a solenoid controlled steering system.

# MM-D Series

# 30 Multimeter Experiments

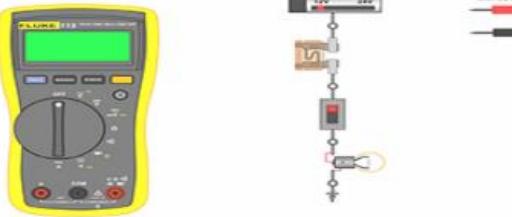


Multimeter Experiment 01

MM\_01\_D

Learning to Use Ranges

Updated October 2022

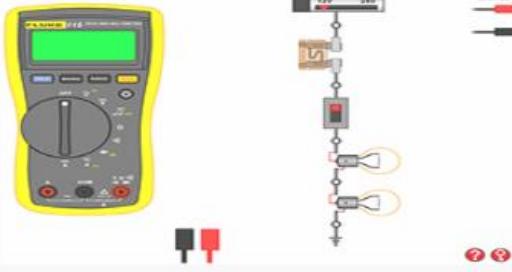


Multimeter Experiment 02

MM\_02\_D

Learning how voltage drops in a circuit

Updated October 2022



Multimeter Experiment 03

MM\_03\_D

Learning how voltage drops across multiple loads

Updated October 2022

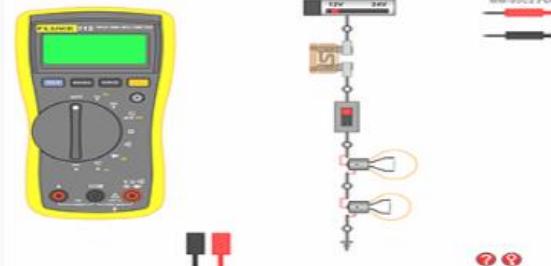


Multimeter Experiment 04

MM\_04\_D

Learning how voltage drops across unequal loads

Updated October 2022



Multimeter Experiment 05

MM\_05\_D

Learning to measure current

Updated October 2022



Multimeter Experiment 06

MM\_06\_D

Learning how current flow does work

Updated October 2022

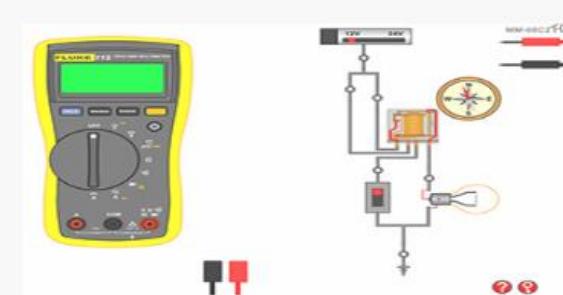


Multimeter Experiment 07

MM\_07\_D

Learning how voltage affects current

Updated October 2022

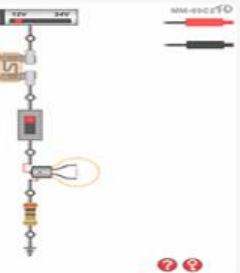


Multimeter Experiment 08

MM\_08\_D

Learning about current flow and magnetic fields

Updated October 2022

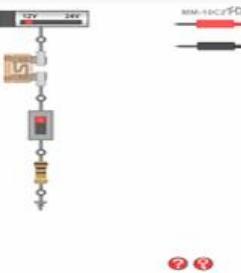


Multimeter Experiment 09

MM\_09\_D

Learning to measure resistance

Updated October 2022

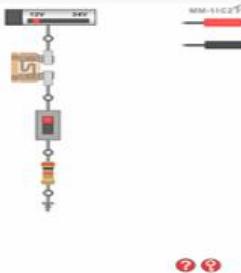


Multimeter Experiment 10

MM\_10\_D

Circuit Resistance Experiment 1

Updated October 2022

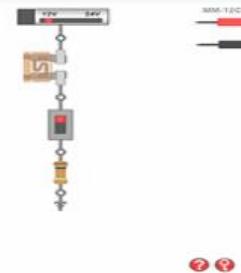


Multimeter Experiment 11

MM\_11\_D

Circuit Resistance Experiment 2

Updated October 2022

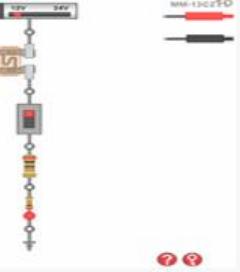


Multimeter Experiment 12

MM\_12\_D

Circuit Resistance Experiment 3

Updated October 2022

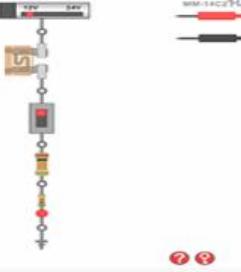


Multimeter Experiment 13

MM\_13\_D

Circuit Resistance Experiment 4

Updated October 2022

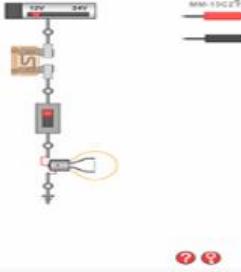


Multimeter Experiment 14

MM\_14\_D

Circuit Resistance Experiment 5

Updated October 2022

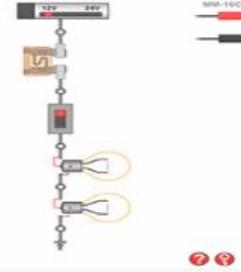


Multimeter Experiment 15

MM\_15\_D

Learning how series circuits work, Experiment 1

Updated October 2022

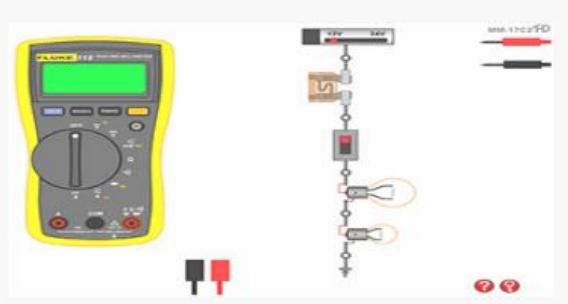


Multimeter Experiment 16

MM\_16\_D

Learning how series circuits work, Experiment 2

Updated October 2022



Multimeter Experiment 17

MM\_17\_D

Learning how series circuits work, Experiment 3

Updated October 2022

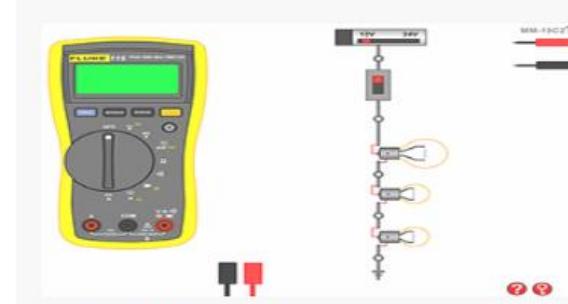


Multimeter Experiment 18

MM\_18\_D

Learning how series circuits work, Experiment 4

Updated October 2022

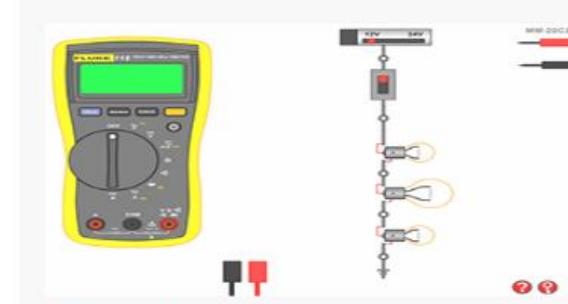


Multimeter Experiment 19

MM\_19\_D

Learning how series circuits work, Experiment 5

Updated October 2022

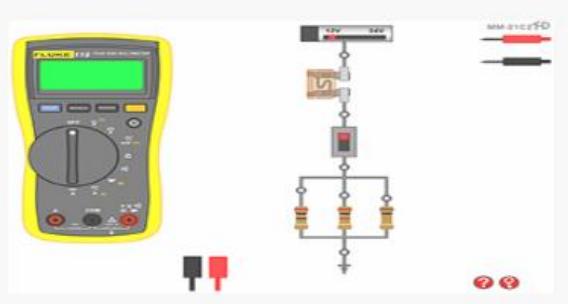


Multimeter Experiment 20

MM\_20\_D

Learning how series circuits work, Experiment 6

Updated October 2022

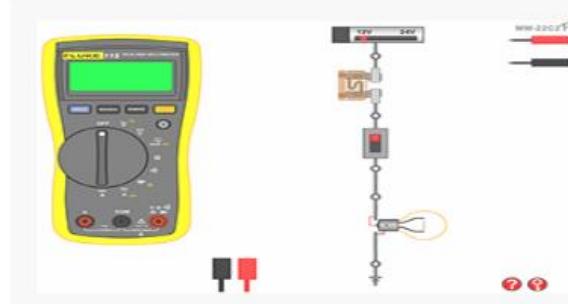


Multimeter Experiment 21

MM\_21\_D

Learning about parallel circuits, Experiment 1

Updated October 2022

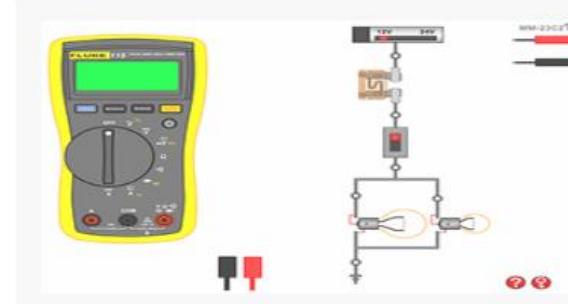


Multimeter Experiment 22

MM\_22\_D

Learning about parallel circuits, Experiment 2

Updated October 2022

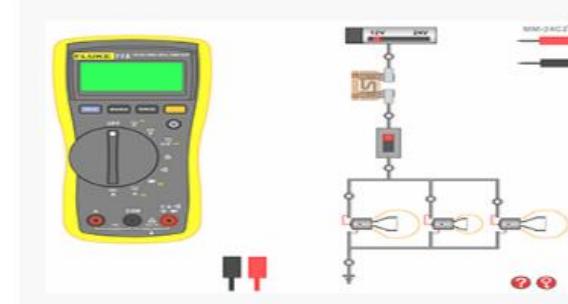


Multimeter Experiment 23

MM\_23\_D

Learning about parallel circuits, Experiment 3

Updated October 2022



Multimeter Experiment 24

MM\_24\_D

Learning about parallel circuits, Experiment 4

Updated October 2022

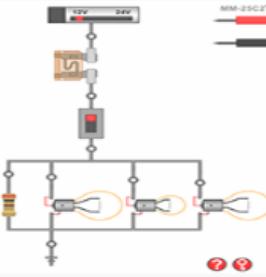


Multimeter Experiment 25

MM\_25\_D

Learning about parallel circuits, Experiment 5

Updated October 2022

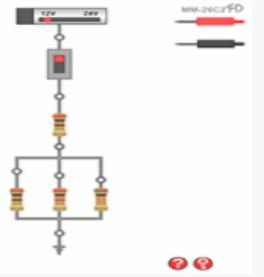


Multimeter Experiment 26

MM\_26\_D

Learning about series/parallel circuits

Updated October 2022

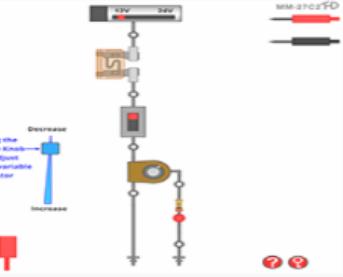


Multimeter Experiment 27

MM\_27\_D

Learning how potentiometers work, Experiment 1

Updated October 2022



Multimeter Experiment 28

MM\_28\_D

Learning how potentiometers work, Experiment 2

Updated October 2022

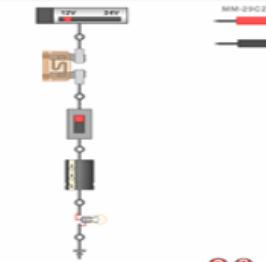


Multimeter Experiment 29

MM\_29\_D

Learning about capacitors

Updated October 2022

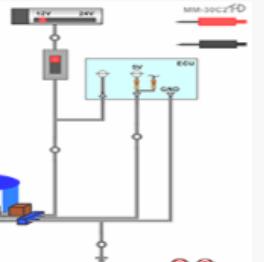


Multimeter Experiment 30

MM\_30\_D

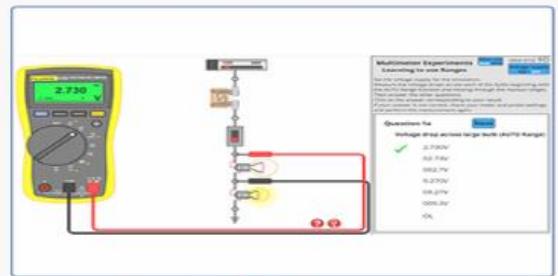
Learning how to use the Maximum Minimum Function

Updated October 2022



# MM-E Series

## 7 Multimeter Experiments

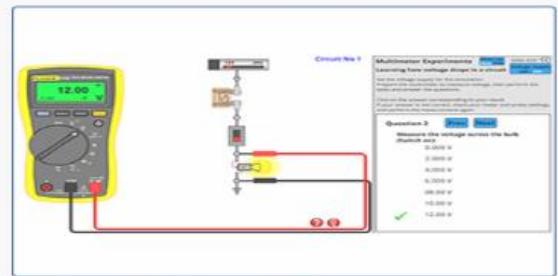


### Multimeter Experiment 01\_E

MM\_01\_E

New version of using ranges

Published January 2023

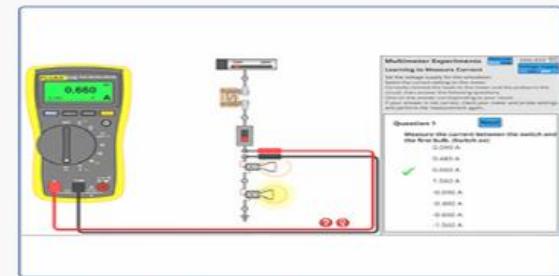


### Multimeter Experiment 02\_E

MM\_02\_E

Combines D-Series experiments on voltage drop 2, 3 & 4

Published January 2023



### Multimeter Experiment 03\_E

MM\_03\_E

Combines D-Series experiments on current 5, 6, 7 & 8

Published January 2023



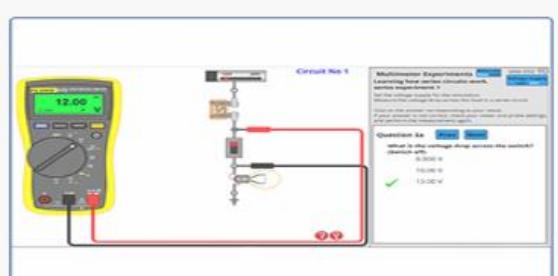
### Multimeter Experiment 04\_E

MM\_04\_E

Combines D-Series experiments on resistance

9,10,11,12,13 & 14 & Potentiometer experiments 27 & 28

Published January 2023



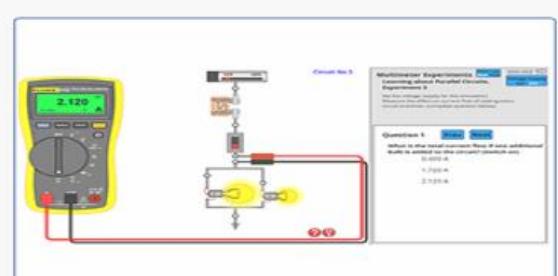
### Multimeter Experiment 05\_E

MM\_05\_E

Combines D-Series experiments on series circuits

15,16,17,18,18 & 20

Published January 2023

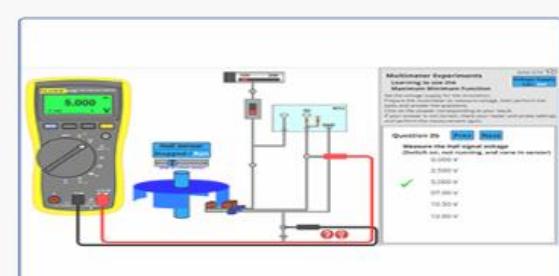


### Multimeter Experiment 06\_E

MM\_06\_E

Combines D-Series experiments on parallel & series/parallel circuits 21,22,23,24,25 & 26

Published January 2023



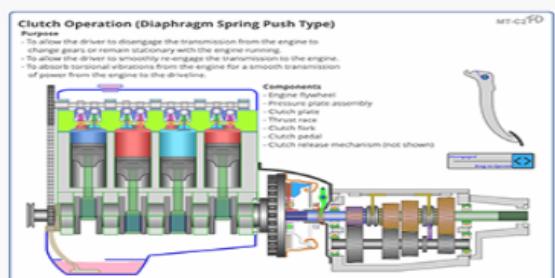
### Multimeter Experiment 07\_E

MM\_07\_E

New version of using Max/Min/Ave function

Published January 2023

# MT Series Manual Transmissions

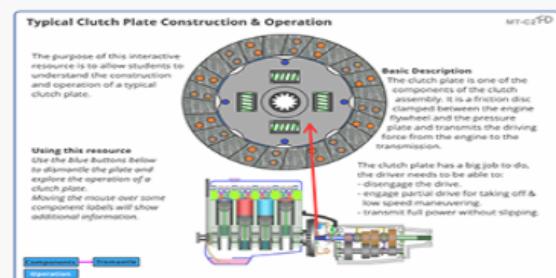


## Clutch Operation

MT\_ClutchPurposeOp\_C1

Description

Updated October 2022

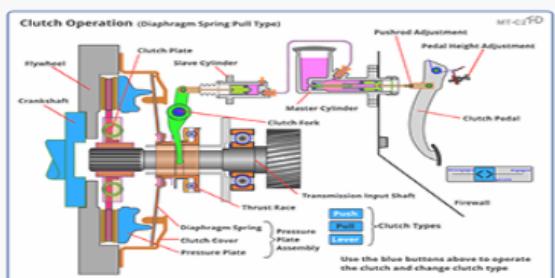


## Typical Clutch Plate Construction and Operation

MT\_ClutchPlateConstructOp\_C1

Description

Updated October 2022

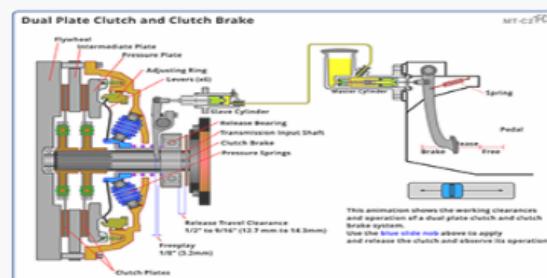


## Clutch Types and Operation

MT\_ClutchTypesOp\_C1

Description

Updated October 2022

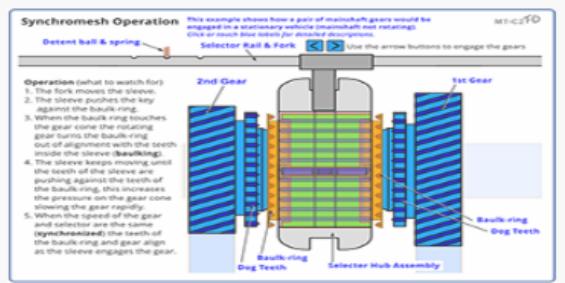


## Dual Plate Clutch and Clutch Brake

MT\_TwinPlateClutch\_C1

Description

Updated October 2022

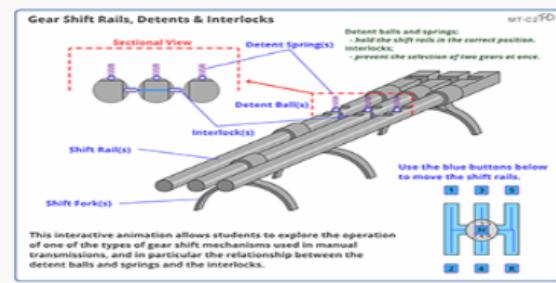


## Synchromesh Operation

MT\_SyncroMeshOperation\_C1

Description

Updated October 2022

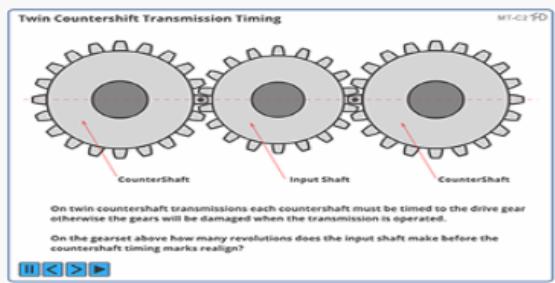


## Gear Shift Rails, Detents and Interlocks

MT\_GearSelectorsInterlocks\_C1

Description

Updated October 2022

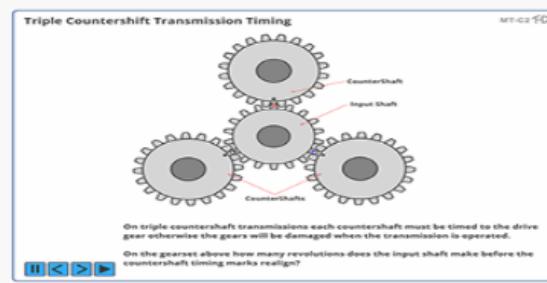


## Twin Countershaft Gears

MT\_TwinCountershaftGears\_C1

Description

Updated October 2022

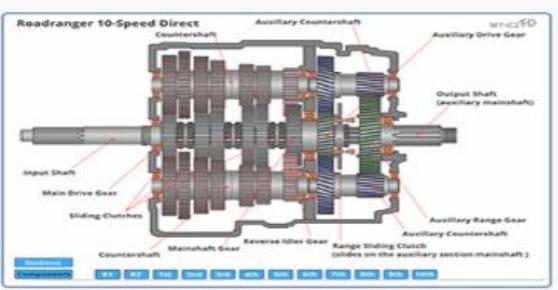


## Triple Countershaft Gears

MT\_TripleCountershaftGears\_C1

Description

Updated October 2022

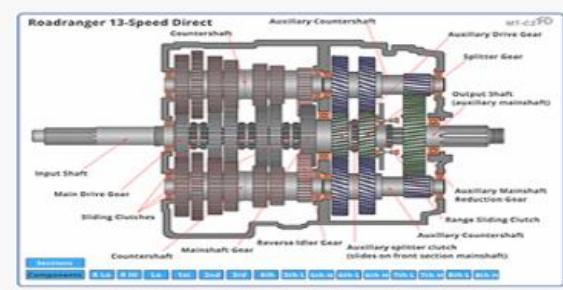


RoadRanger 10 Speed Direct

MT\_10\_SpeedRoadranger\_C1

Description

Updated October 2022

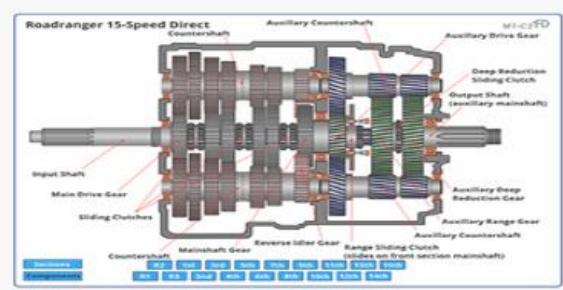


RoadRanger 13 Speed Direct

MT\_13\_SpeedRoadranger\_C1

Description

Updated October 2022

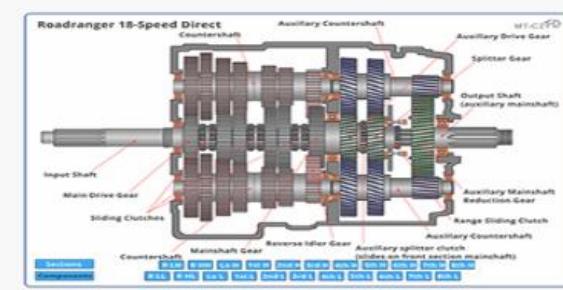


RoadRanger 15 Speed Direct

MT\_15\_SpeedRoadranger\_C1

Description

Updated October 2022

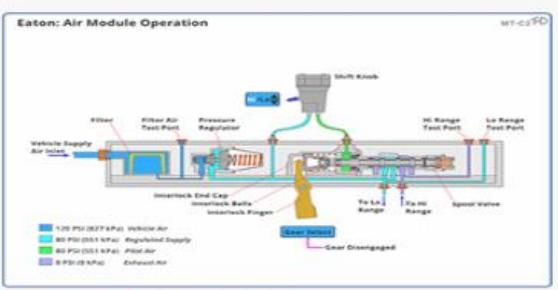


RoadRanger 18 Speed Direct

MT\_18\_SpeedRoadranger\_C1

Description

Updated October 2022

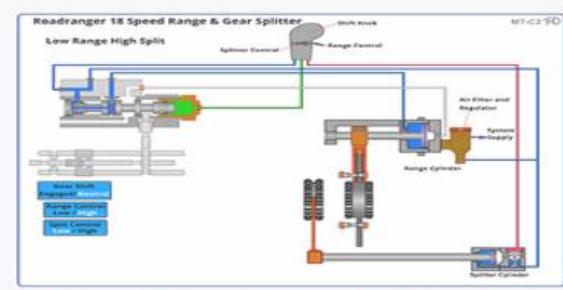


Eaton Air Module Operation

MT\_Roadranger\_Air\_Module\_C1

Description

Updated October 2022

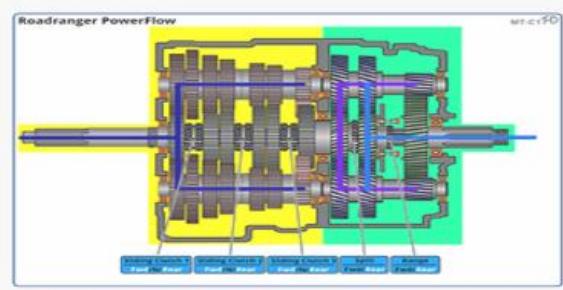


RoadRanger 18 speed Range and Gear Splitter

MT\_RoadRangerSplitter\_C1

Description

Updated October 2022



RoadRanger Power Flow

MT\_RT18PwrFlw\_C1

An interactive animation for use in question banks for assessing student understanding of powerflow in a direct transmission

Updated October 2022

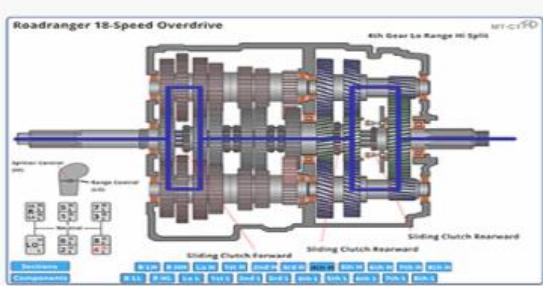


RoadRanger 13 speed Overdrive

MT\_13\_OD\_RR\_C1

Description

Updated October 2022

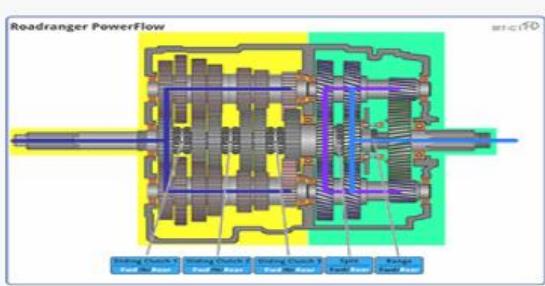


### RoadRanger 18 speed Overdrive

MT\_18\_OD\_RR\_C1

Description

Updated October 2022

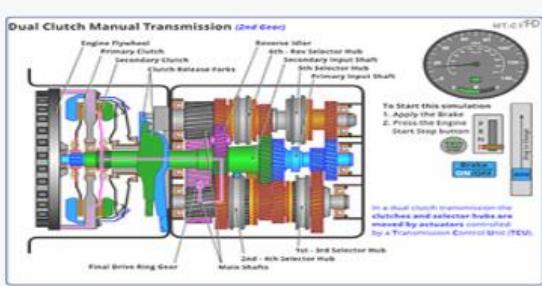


### RoadRanger Power Flow

MT\_RT18PwrFlw2\_C1

An interactive animation for use in question banks for assessing student understanding of powerflow in an overdrive transmission

Updated October 2022

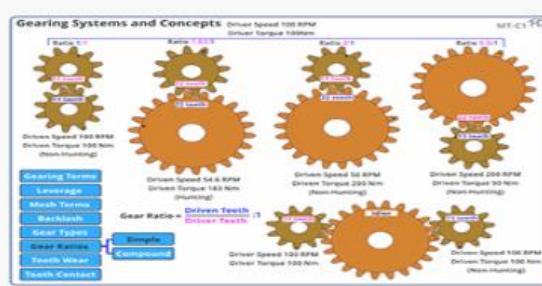


### Dual Clutch Transmission

MT\_DCMT\_C1

Description

Updated October 2022

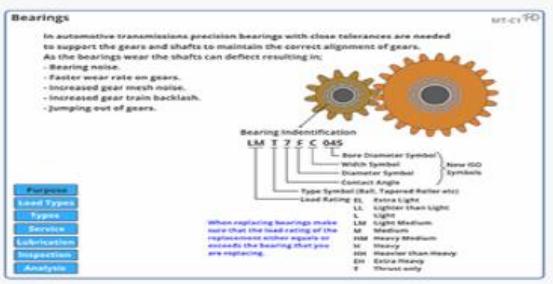


### Gearing Systems & Concepts

MT\_Gears\_C1

Description

Updated October 2022

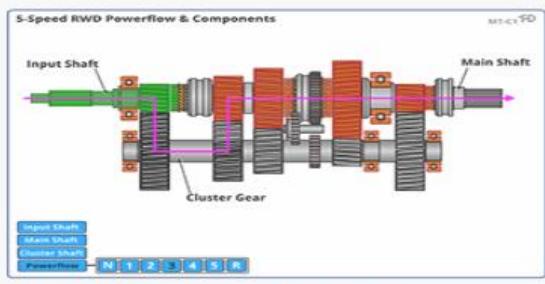


### Bearings

MT\_Bearings\_C1

Covers anti-friction bearing as used in transmissions, types, servicing, inspection & analysis.

Updated October 2022

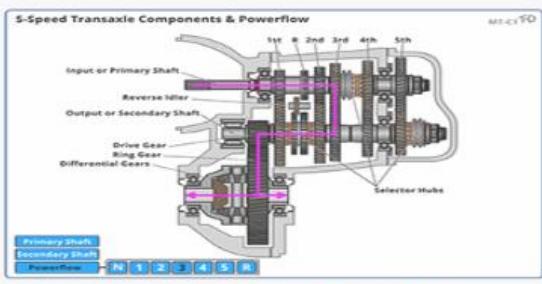


### 5-Speed RWD Components & Powerflow

MT\_5spdPwFlw\_C1

Demonstrates the powerflow through a typical 5-speed RWD transmission and exploded view of the shafts.

Updated October 2022

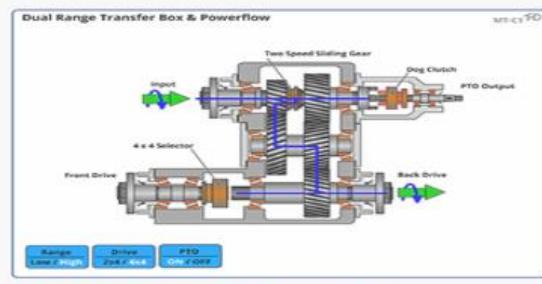


### 5-Speed Transaxle Components & Powerflow

MT\_TransAxPwFlw\_C1

Demonstrates the powerflow through a typical 5-speed transaxle and exploded view of the shafts.

Updated October 2022



### Dual Range Transfer Box & Powerflow

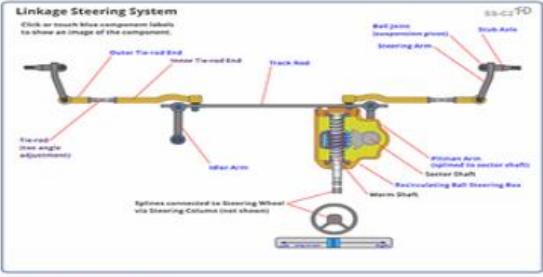
MT\_HVtransCase\_C1

Demonstrates the powerflow through a typical Dual Range Transfer Box with PTO.

Published February 2023

# SS Series

## Steering & Suspension

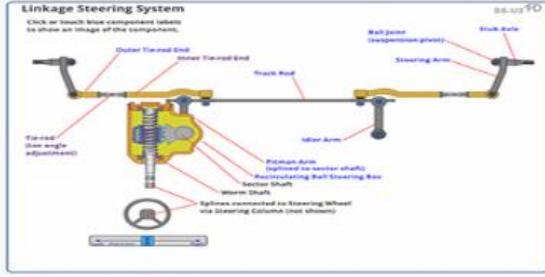


## Linkage Steering

SS\_LinkageSteering\_E1

Right Hand Drive

Updated October 2022

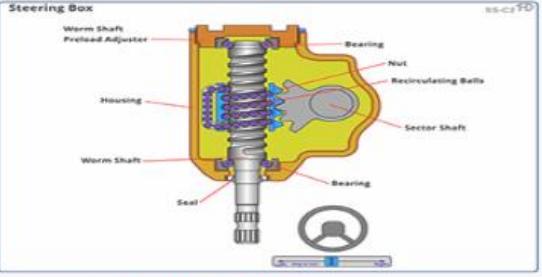


## Linkage Steering

SS\_LinkageSteering\_U1

Left Hand Drive

Updated October 2022

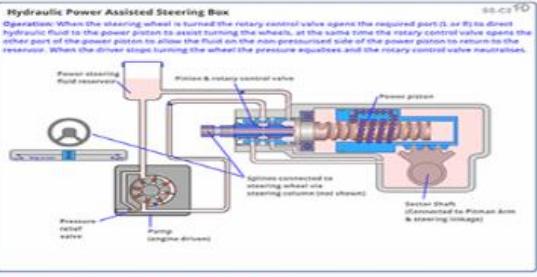


## Recirculating Ball Steering Box

SS\_SteeringBox\_C1

Description

Updated October 2022

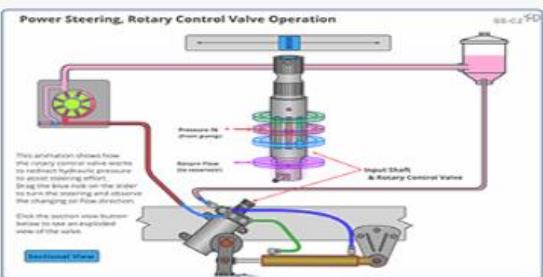


## Hydraulic Power Steering Box

SS\_PowerSteeringBox\_C1

Description

Updated October 2022

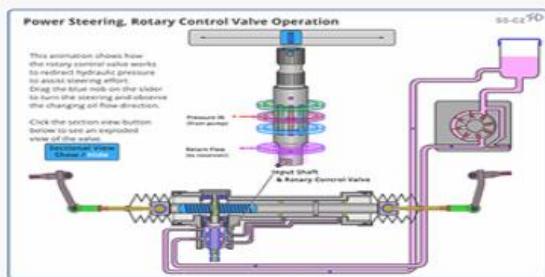


## Power Steering Rotary Control Valve

SS\_PwBoxControlValve\_C1

Description

Updated October 2022

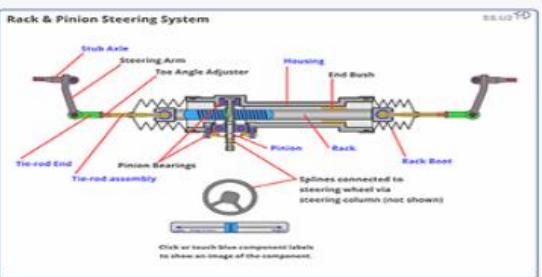


## Power Steering Rotary Control Valve

SS\_PwRackControlValve\_C1

Description

Updated October 2022

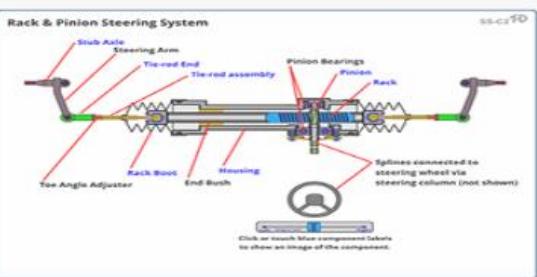


## Manual Rack and Pinion Steering

SS\_ManualSteeringRack\_U1

Left Hand Drive

Updated October 2022

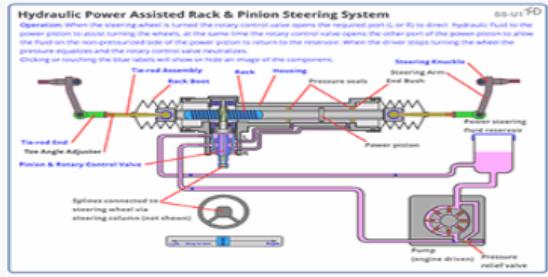


## Manual Rack and Pinion Steering

SS\_ManualSteeringRack\_E1

Right Hand Drive

Updated October 2022

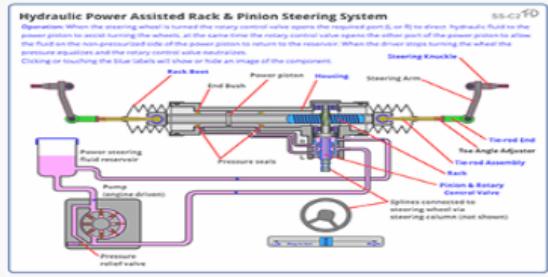


### Hydraulic Power Steering Rack

SS\_PowerSteeringRack\_U1

Left Hand Drive

Updated October 2022

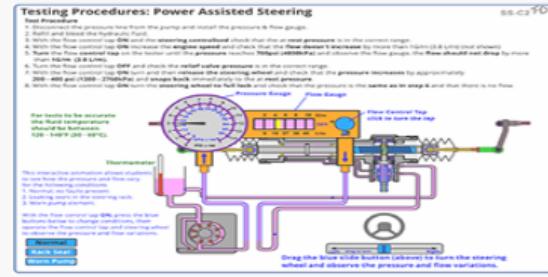


### Hydraulic Power Steering Rack

SS\_PowerSteeringRack\_E1

Right Hand Drive

Updated October 2022

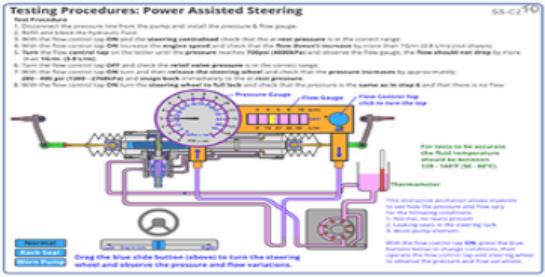


### Hydraulic Power Steering Testing

SS\_PowerSteeringTesting\_E1

Right Hand Drive

Updated October 2022



### Hydraulic Power Steering Testing

SS\_PowerSteeringTesting\_U1

Left Hand Drive

Updated October 2022

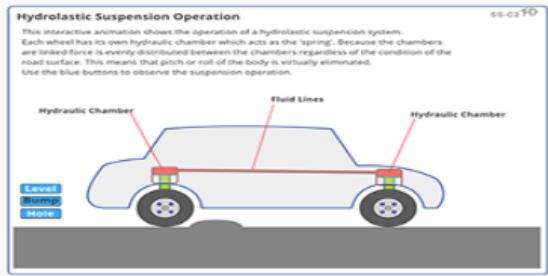


### Steering Axis Inclination

SS\_Hilux\_SAI\_C1

Description

Updated October 2022

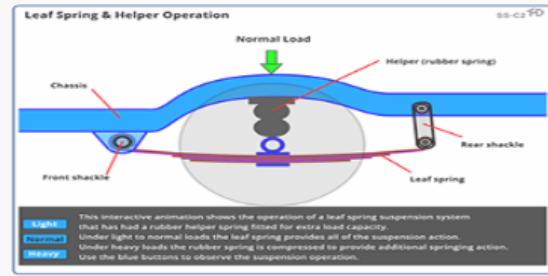


### Hydroelastic Suspension

SS\_HydroelasticSuspension\_C1

Description

Updated October 2022

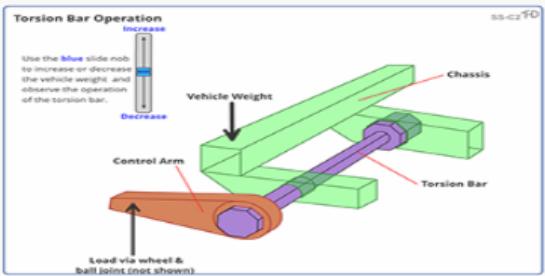


### Leaf Spring and Helper

SS\_LeafSpring\_C1

Description

Updated October 2022

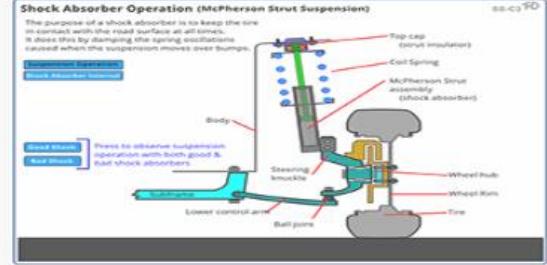


### Torsion Bar Operation

SS\_TorsionBar\_C1

Description

Updated October 2022



### Shock Absorber Operation

SS\_ShockAbsorber\_C1

Description

Updated October 2022



### Metalastic Suspension Bush Operation

SS\_MetalasticBush\_C1

Description

Updated October 2022



### Suspension Inspection (floor jack)

SS\_InspectionUsingJack\_C1

Description

Updated October 2022

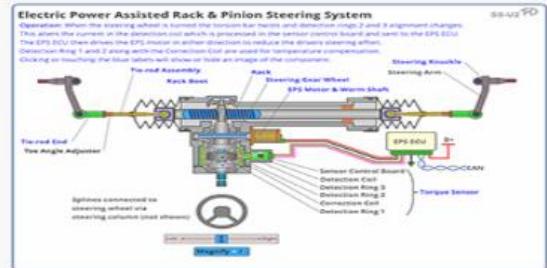


### Suspension Inspection (hoist)

SS\_InspectionUsingHoist\_C1

Description

Updated October 2022

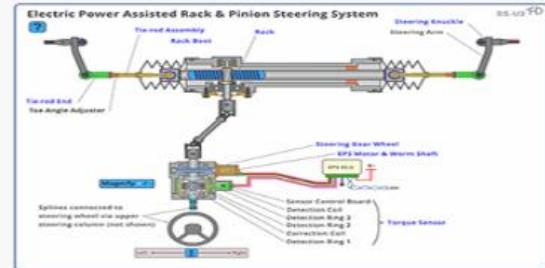


### Electric Assist Steering

SS\_StRackElectric01\_U1

Description

Updated October 2022

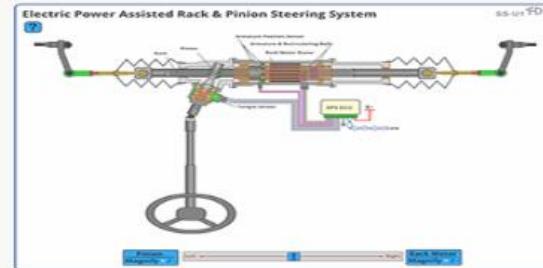


### Electric Assist Steering

SS\_StRackElectric02\_U1

Description

Updated October 2022

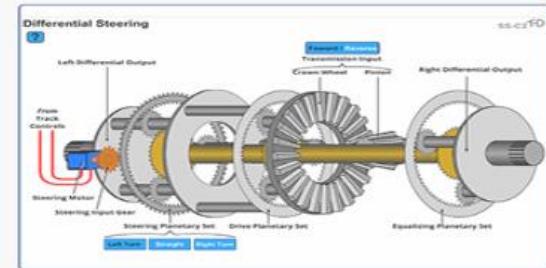


### Electric Assist Steering

SS\_StRackElectric03\_U1

Description

Updated October 2022



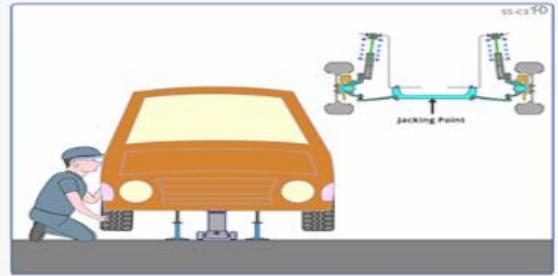
### Differential Steering

SS\_DifferentialSteering\_C1

Description

Updated October 2022



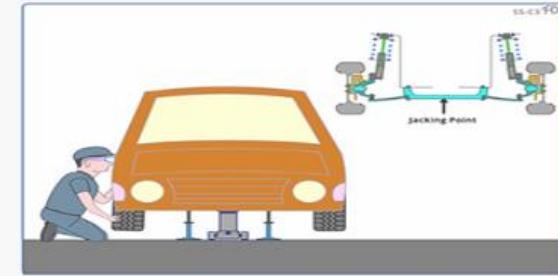


### Suspension Inspection

SS\_SusInsp\_AS2\_C1

In-Out Play

Updated October 2022

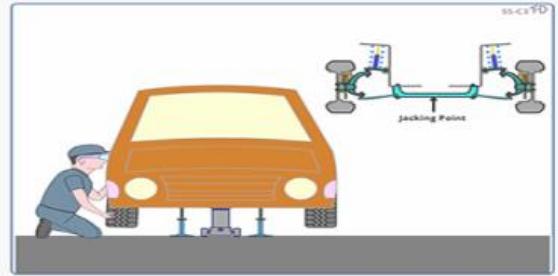


### Suspension Inspection

SS\_SusInsp\_AS3\_C1

Up-Down Play

Updated October 2022

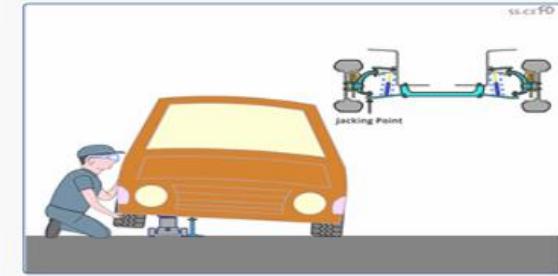


### Suspension Inspection

SS\_SusInsp\_AS4\_C1

Up-Down Play

Updated October 2022

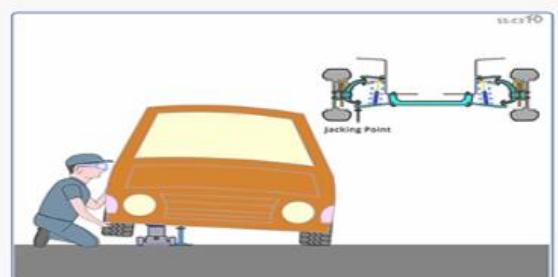


### Suspension Inspection

SS\_SusInsp\_AS5\_C1

In-Out Play

Updated October 2022



### Suspension Inspection

SS\_SusInsp\_AS6\_C1

Up-Down Play

Updated October 2022

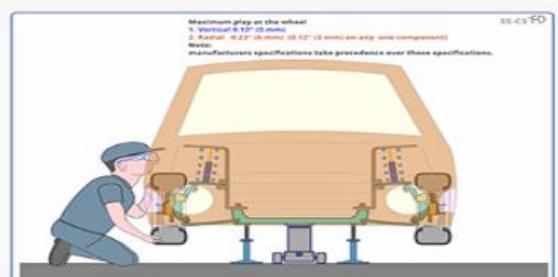


### Suspension Inspection

SS\_SusInsp\_AS1a\_C1

Normal

Updated October 2022



### Suspension Inspection

SS\_SusInsp\_AS1b\_C1

Upper Ball Joint Wear

Updated October 2022



### Suspension Inspection

SS\_SusInsp\_AS1c\_C1

Lower Ball Joint Wear

Updated October 2022

Maximum play at the wheel  
1. Vertical: 0.12" (3 mm)  
2. Radial: 0.23" (6 mm) (0.12" (3 mm) on any one component)  
Note:  
Manufacturers specifications take precedence over these specifications.

SS-C3-FD



### Suspension Inspection

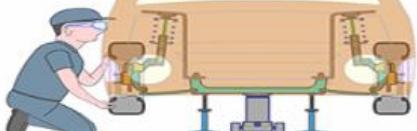
SS\_SusInsp\_AS1d\_C1

Wheel Bearing Wear

Updated October 2022

Maximum play at the wheel  
1. Vertical: 0.12" (3 mm)  
2. Radial: 0.23" (6 mm) (0.12" (3 mm) on any one component)  
Note:  
Manufacturers specifications take precedence over these specifications.

SS-C3-FD



### Suspension Inspection

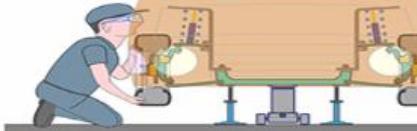
SS\_SusInsp\_AS2c\_C1

Lower Ball Joint Wear

Updated October 2022

Maximum play at the wheel  
1. Vertical: 0.12" (3 mm)  
2. Radial: 0.23" (6 mm) (0.12" (3 mm) on any one component)  
Note:  
Manufacturers specifications take precedence over these specifications.

SS-C3-FD



### Suspension Inspection

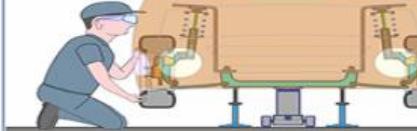
SS\_SusInsp\_AS1e\_C1

Lower Control Arm Inner Bush Wear

Updated October 2022

Maximum play at the wheel  
1. Vertical: 0.12" (3 mm)  
2. Radial: 0.23" (6 mm) (0.12" (3 mm) on any one component)  
Note:  
Manufacturers specifications take precedence over these specifications.

SS-C3-FD



### Suspension Inspection

SS\_SusInsp\_AS2a\_C1

Normal

Updated October 2022

Maximum play at the wheel  
1. Vertical: 0.12" (3 mm)  
2. Radial: 0.23" (6 mm) (0.12" (3 mm) on any one component)  
Note:  
Manufacturers specifications take precedence over these specifications.

SS-C3-FD



### Suspension Inspection

SS\_SusInsp\_AS2b\_C1

Suspension Strut Wear

Updated October 2022

Maximum play at the wheel  
1. Vertical: 0.12" (3 mm)  
2. Radial: 0.23" (6 mm) (0.12" (3 mm) on any one component)  
Note:  
Manufacturers specifications take precedence over these specifications.

SS-C3-FD



### Suspension Inspection

SS\_SusInsp\_AS2d\_C1

Wheel Bearing Wear

Updated October 2022

Maximum play at the wheel  
1. Vertical: 0.12" (3 mm)  
2. Radial: 0.23" (6 mm) (0.12" (3 mm) on any one component)  
Note:  
Manufacturers specifications take precedence over these specifications.

SS-C3-FD



### Suspension Inspection

SS\_SusInsp\_AS2e\_C1

Lower Control Arm Inner Bush Wear

Updated October 2022

Maximum play at the wheel  
1. Vertical: 0.12" (3 mm)  
2. Radial: 0.23" (6 mm) (0.12" (3 mm) on any one component)  
Note:  
Manufacturers specifications take precedence over these specifications.

SS-C3-FD



### Suspension Inspection

SS\_SusInsp\_AS3a\_C1

Normal

Updated October 2022



Maximum play at the wheel:  
1. Vertical 0.12" (3 mm)  
2. Radial 0.25" (6 mm) (0.12" (3 mm) on any one component)  
Notes:  
Manufacturers specifications take precedence over these specifications.

SS\_CxTD

### Suspension Inspection

SS\_SusInsp\_AS3b\_C1

Lower Ball Joint Wear

Updated October 2022



Maximum play at the wheel:  
1. Vertical 0.12" (3 mm)  
2. Radial 0.25" (6 mm) (0.12" (3 mm) on any one component)  
Notes:  
Manufacturers specifications take precedence over these specifications.

SS\_CxTD

### Suspension Inspection

SS\_SusInsp\_AS3c\_C1

Upper Ball Joint Wear

Updated October 2022



Maximum play at the wheel:  
1. Vertical 0.12" (3 mm)  
2. Radial 0.25" (6 mm) (0.12" (3 mm) on any one component)  
Notes:  
Manufacturers specifications take precedence over these specifications.

SS\_CxTD

### Suspension Inspection

SS\_SusInsp\_AS3d\_C1

Upper Control Arm Inner Bush Wear

Updated October 2022



Maximum play at the wheel:  
1. Vertical 0.12" (3 mm)  
2. Radial 0.25" (6 mm) (0.12" (3 mm) on any one component)  
Notes:  
Manufacturers specifications take precedence over these specifications.

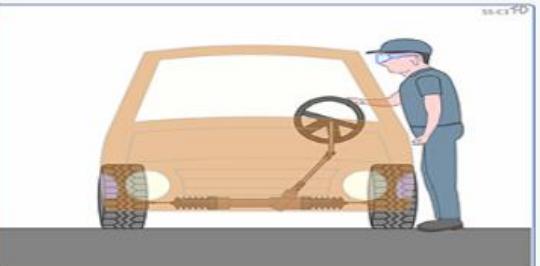
SS\_CxTD

### Suspension Inspection

SS\_SusInsp\_AS3e\_C1

Wheel Bearing Wear

Updated October 2022

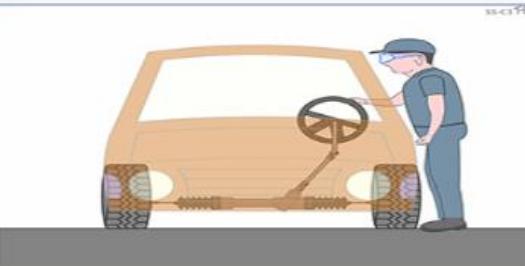


### Steering Inspection

SS\_SteerInsp\_AS1a\_C1

Normal

Updated October 2022

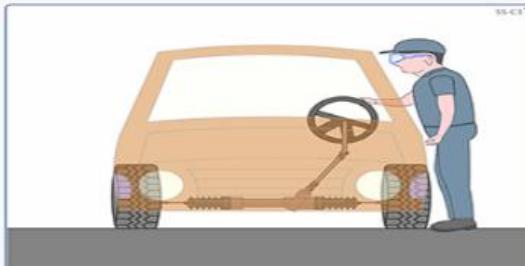


### Steering Inspection

SS\_SteerInsp\_AS1b\_C1

Right Hand Outer Tie Rod End Worn

Updated October 2022

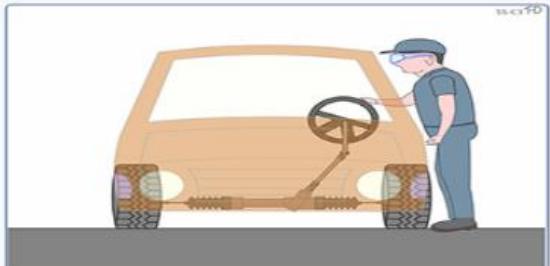


### Steering Inspection

SS\_SteerInsp\_AS1c\_C1

Right Hand Inner Tie Rod End Worn

Updated October 2022

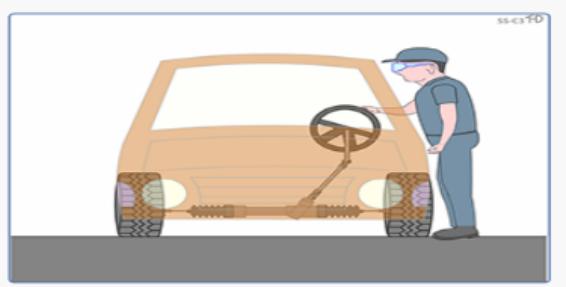


### Steering Inspection

SS\_SteerInsp\_AS1d\_C1

Left Hand Outer Tie Rod End Worn

Updated October 2022

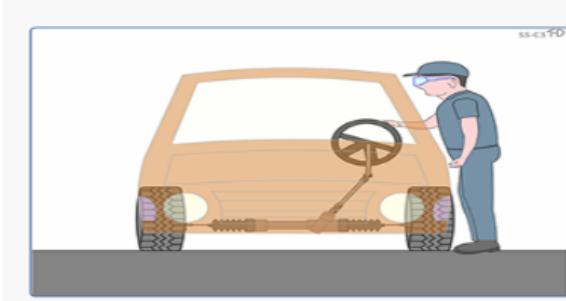


### Steering Inspection

SS\_SteerInsp\_AS1e\_C1

Left Hand Inner Tie Rod End Worn

Updated October 2022

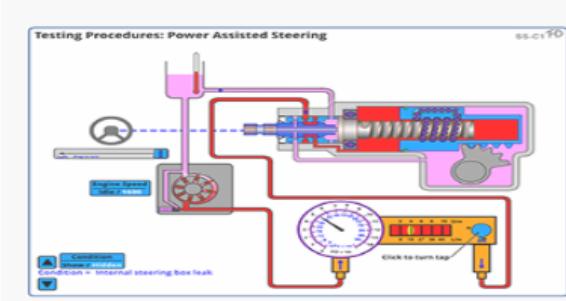


### Steering Inspection

SS\_SteerInsp\_AS1f\_C1

Rack Worn

Updated October 2022

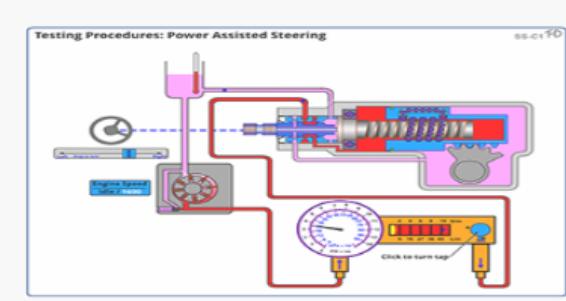


### Testing Procedures Power Assisted Steering

SS\_HDpwrStrTestTM\_C1

Teaching Master version with multiple faults

Updated October 2022

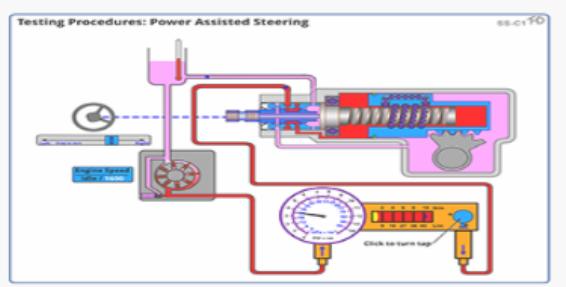


### Testing Procedures Power Assisted Steering

SS\_HDpwrStrTestAss01\_C1

Assessment Version: Normal Operation

Updated October 2022

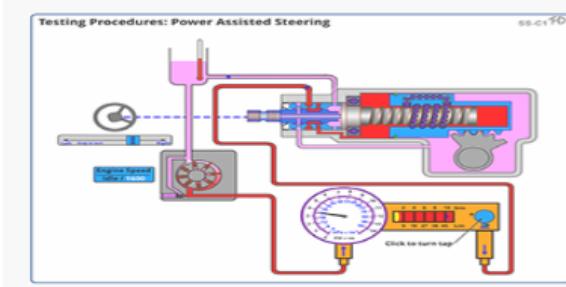


### Testing Procedures Power Assisted Steering

SS\_HDpwrStrTestAss02\_C1

Assessment Version: Internal Steering Box Leakage

Updated October 2022

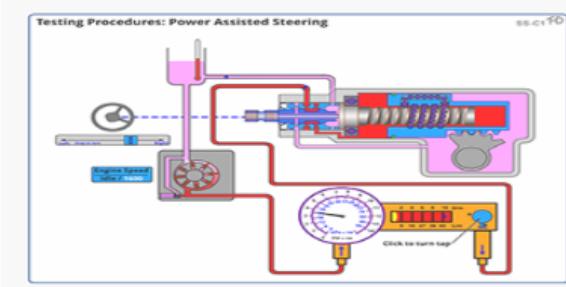


### Testing Procedures Power Assisted Steering

SS\_HDpwrStrTestAss03\_C1

Assessment Version: Worn Pump

Updated October 2022

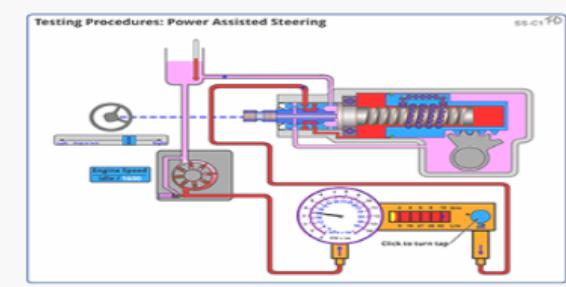


### Testing Procedures Power Assisted Steering

SS\_HDpwrStrTestAss04\_C1

Assessment Version: Relief Valve Stuck Open

Updated October 2022

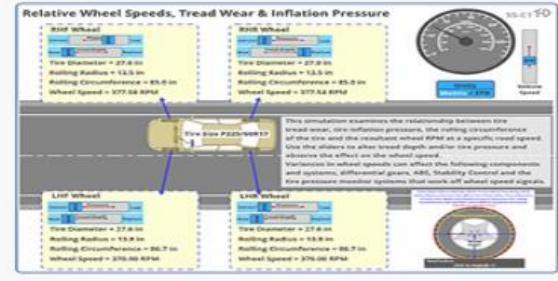
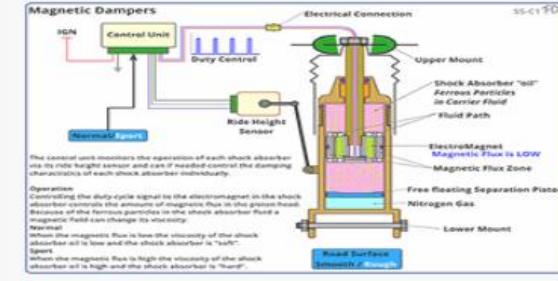
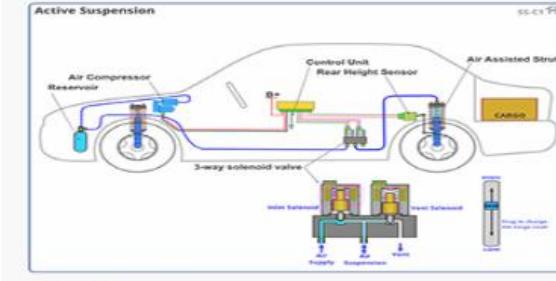
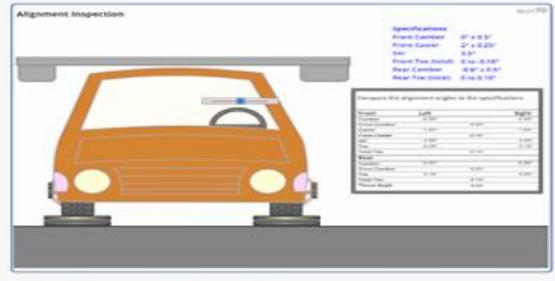
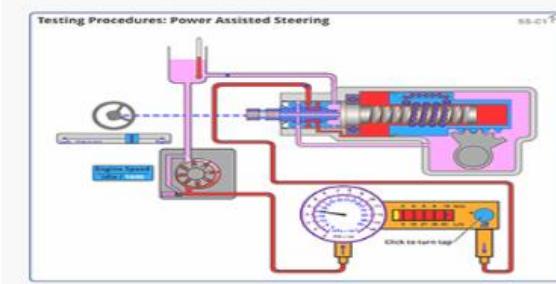
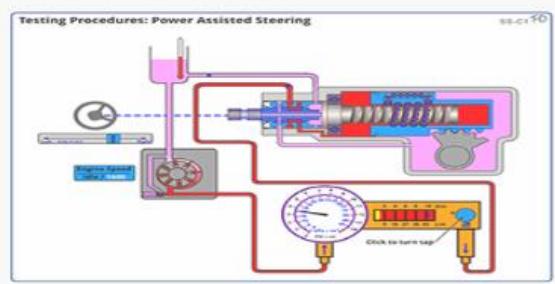


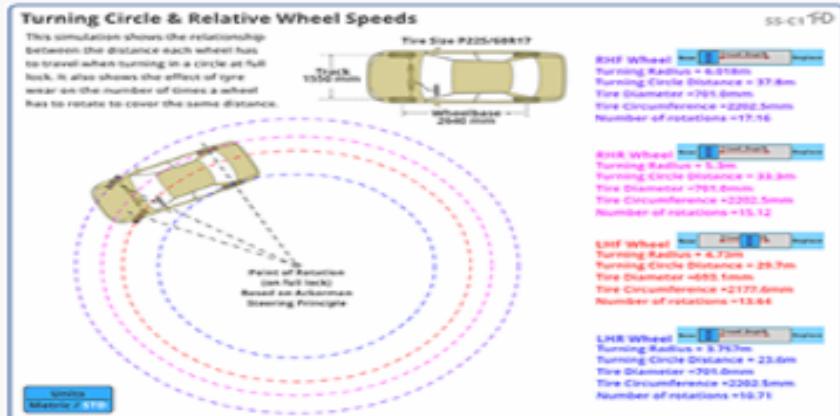
### Testing Procedures Power Assisted Steering

SS\_HDpwrStrTestAss05\_C1

Assessment Version: Restriction in System

Updated October 2022



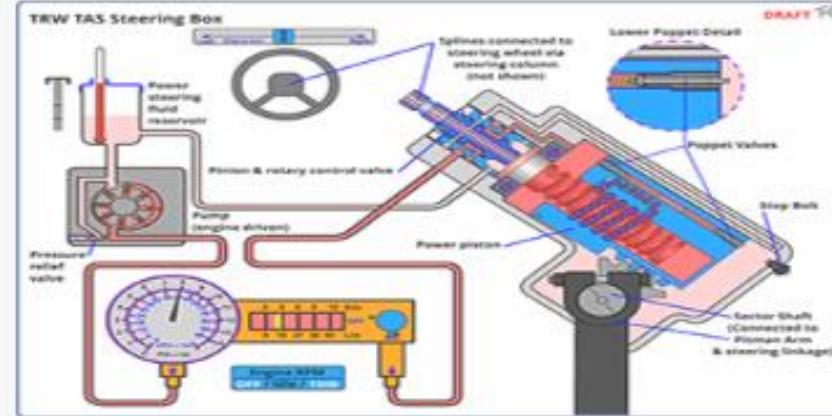


## Turning Circle & Relative Wheel Speeds

SS\_WStrns\_C1

Demonstrates how wheels have to travel different distances when a vehicle is turning a corner and the relationship between tyre wear and wheel speed.

Updated October 2022



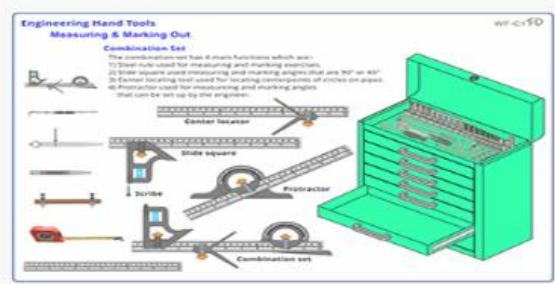
## TRW Power Steering Testing

SS\_TRW800StBx\_C1

Testing procedure of TRW Power Steering.

# WF Series

# Welding & Fabrications

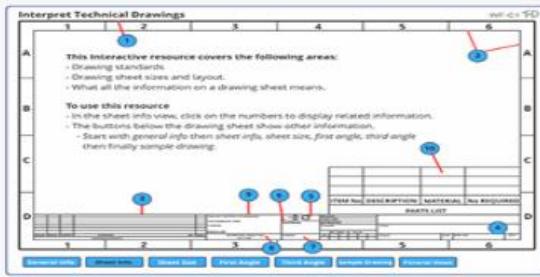


## Engineering Hand Tools

WF\_HandTools\_C1

Description

Updated December 2022

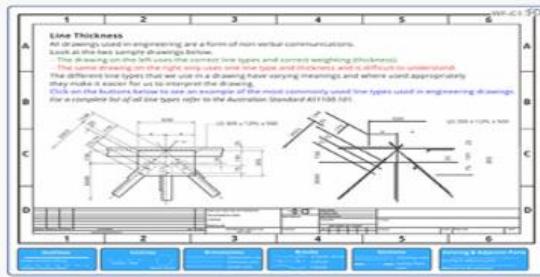


## Interpret Technical Drawing Sheets

WF\_InterpretTechDrawing\_C1

Description

Updated December 2022



## Interpret Technical Drawing Line Types

WF\_InterpretTechDrawingLines\_C1

Description

Updated December 2022

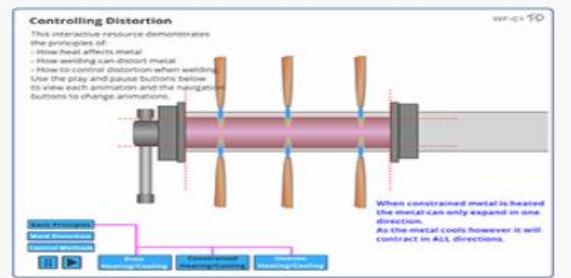


## Interpret Technical Drawings Welding Symbols

WF\_WeldSymbols\_C1

Description

Updated December 2022

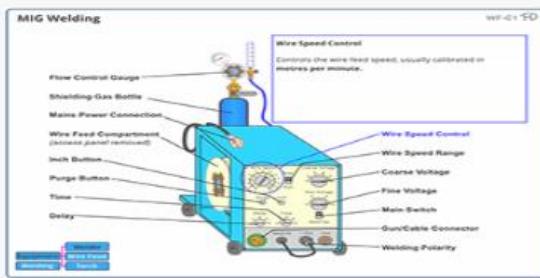


## Controlling Distortion

WF\_ControllingDistortion\_C1

Description

Updated December 2022

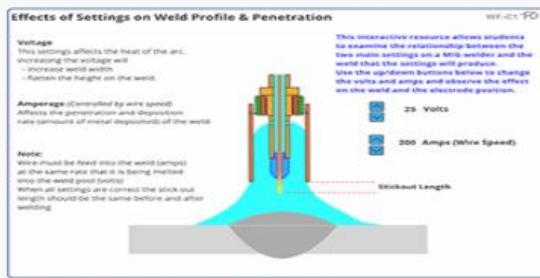


## MIG Welder

WF\_MIGWelder\_C1

Description

Updated December 2022

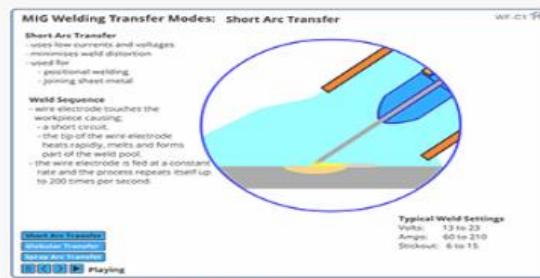


## Effects of Settings on Weld Profile

WF\_MIGVariables\_C1

Description

Updated December 2022

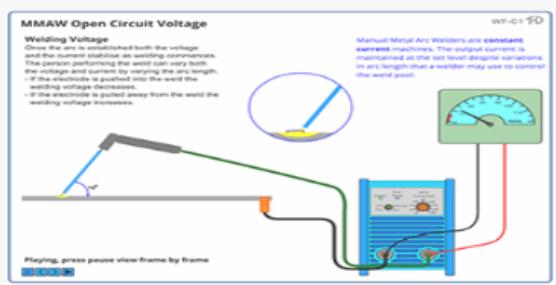


## MIG Welding Transfer Modes

WF\_MIGTransferModes\_C1

Description

Updated December 2022



## MMAW Open Circuit Voltage

WF\_MMAWopenCircuitVolts\_C1

Description

Updated December 2022



## TIG / MMAW Welder Basic Operation

WF\_TIGStickWelder\_C1

Description

Updated December 2022

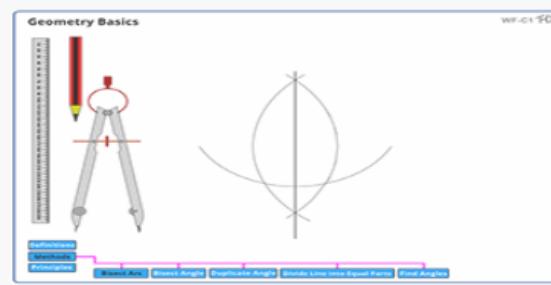


## Welding Calculator

WF\_WeldingCalculator\_C1

Description

Updated December 2022



## Geometric Development Basics

WF\_GeometryBasics\_C1

Description

Updated December 2022

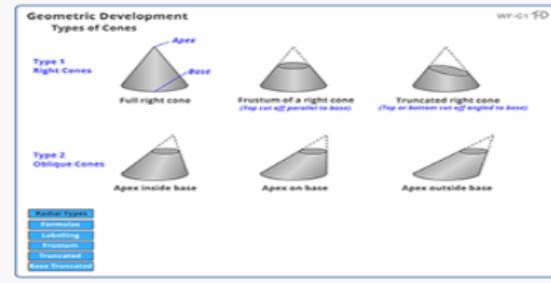


## Geometric Parallel Development

WF\_GeometryParallel\_C1

Description

Updated December 2022

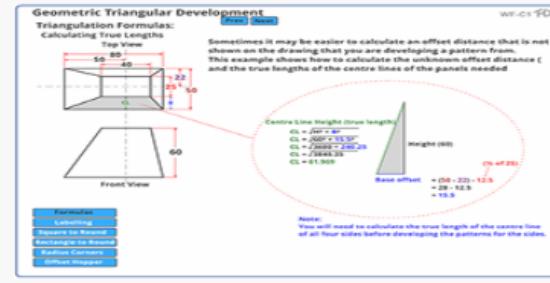


## Geometric Radial Development

WF\_GeometryRadial\_C1

Description

Updated December 2022



## Geometric Triangular Development

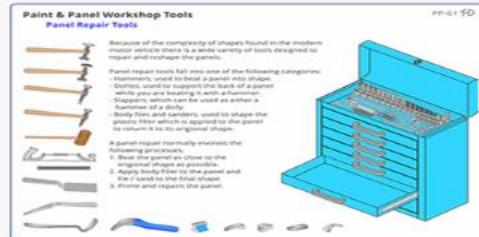
WF\_GeometryTriangular\_C1

Description

Updated December 2022

# PP Series

# Automotive Paint & Panel

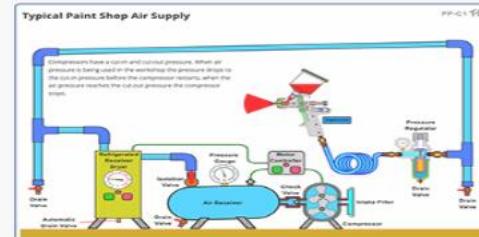


## Paint and Panel Hand Tools

PP\_HandTools\_C1

Description

Updated November 2022

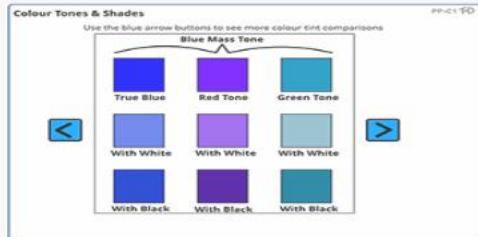


## Shop Air Supply

PP\_ShopAirSupply\_C1

Description

Updated November 2022

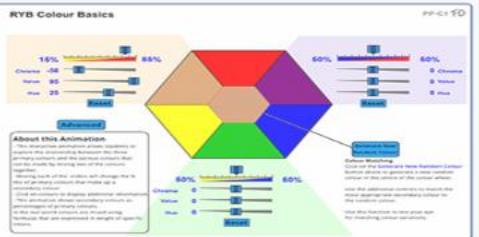


## Color Tones and Shades

PP\_ColorToneShade\_C1

Description

Updated November 2022

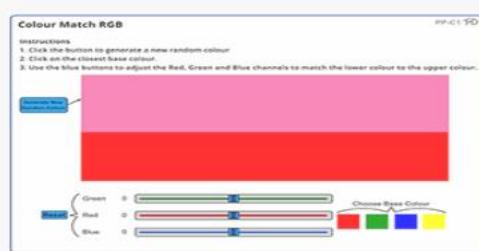


## RYB Color Basics

PP\_RYBcolor\_C1

Description

Updated November 2022

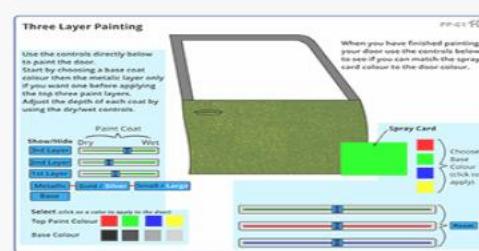


## Color Match RYB

PP\_RYBColorMatch\_C1

Description

Updated November 2022

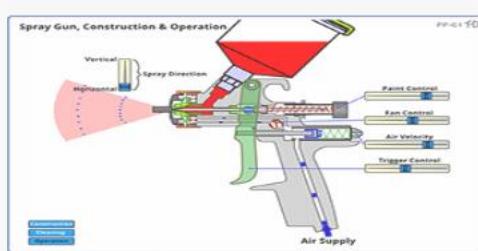


## Three Layer Painting

PP\_ThreeLayerPaint\_C1

Description

Updated November 2022

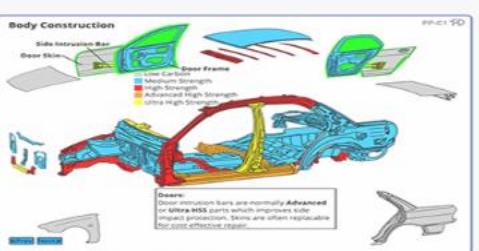


## Spray Gun Operation

PP\_SprayGun\_C1

Description

Updated November 2022

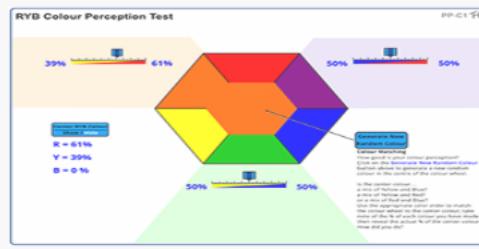


## Vehicle Body Construction

PP\_VehBodyConstruct\_C1

Description

Updated November 2022



## RYB Colour Perception Test

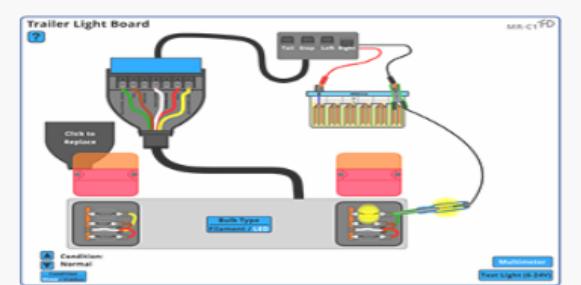
PP\_RYBAssTM\_C1

Generates 300 different colours on the central card and provides feedback to students on their colour perception skills.

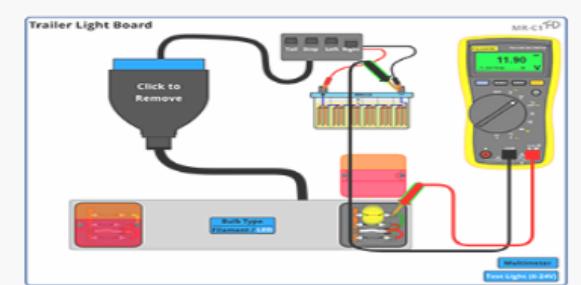
Updated November 2022

# MR Series

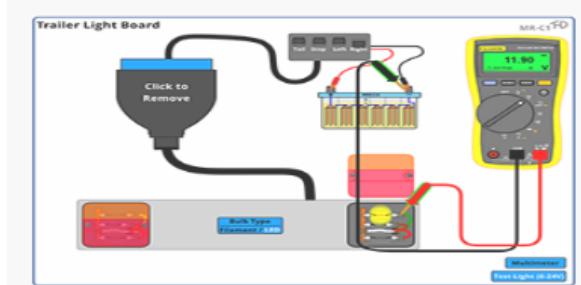
# Marine Specific Systems



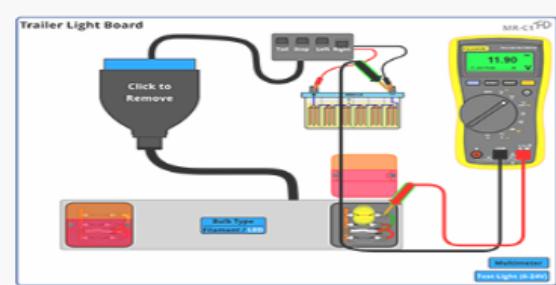
**Trailer Light Board**  
MR\_TrLbTM\_C1  
Teaching Master with multiple faults  
Updated December 2022



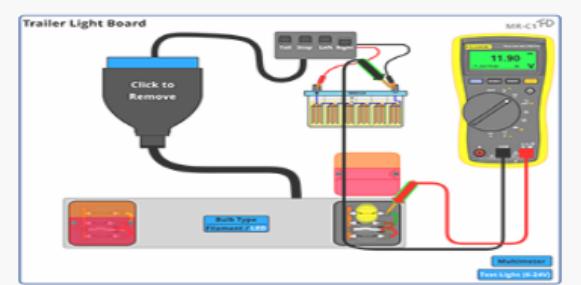
**Trailer Light Board**  
MR\_TrLb00\_C1  
Student Version: No Faults  
Updated December 2022



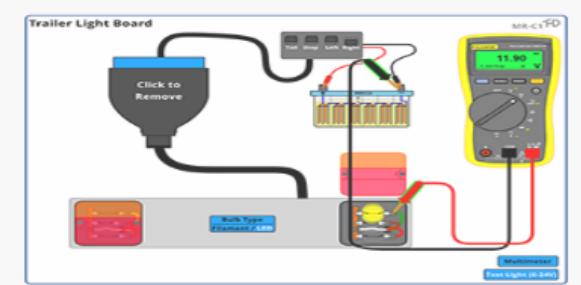
**Trailer Light Board**  
MR\_TrLb01\_C1  
Assessment Version: Left hand stop light bulb faulty.  
Updated December 2022



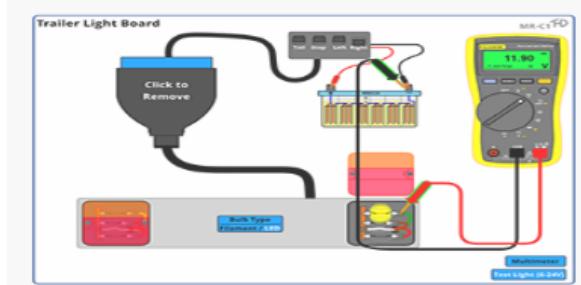
**Trailer Light Board**  
MR\_TrLb02\_C1  
Assessment Version: Right hand lamp ground open.  
Updated December 2022



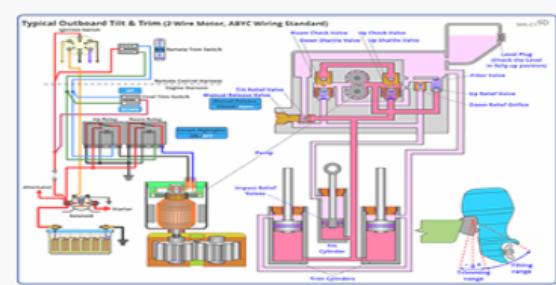
**Trailer Light Board**  
MR\_TrLb03\_C1  
Assessment Version: Tail light wiring open circuit.  
Updated December 2022



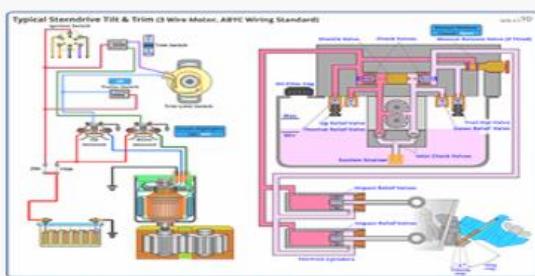
**Trailer Light Board**  
MR\_TrLb04\_C1  
Assessment Version: High resistance right hand indicator  
bulb holder.  
Updated December 2022



**Trailer Light Board**  
MR\_TrLb05\_C1  
Assessment Version: High resistance in ground wire.  
Updated December 2022



**Marine Outboard Tilt & Trim**  
MR\_TltTrm\_C1  
Description  
Updated December 2022

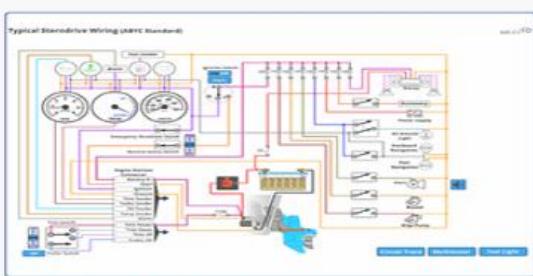


**Marine Sterndrive Tilt & Trim**

MR\_TltTrm2\_C1

Description

Updated December 2022

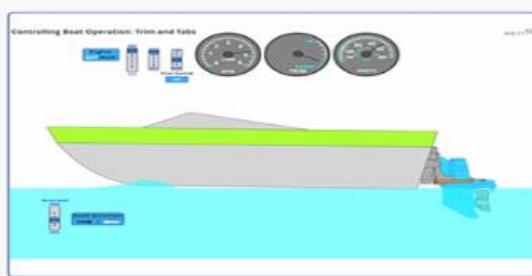


**Marine Sterndrive Wiring**

MR\_MrWire01\_C1

Description

Updated December 2022

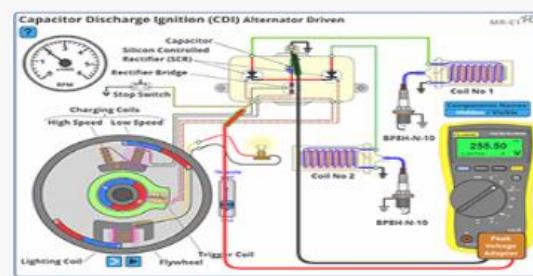


**Marine Trim Operation**

MR\_TrAttitude\_C1

Description

Updated December 2022

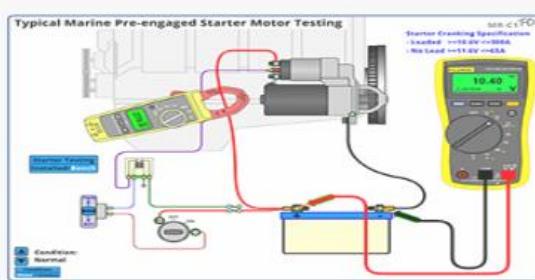


**Capacitor Discharge Ignition**

MR\_IgnSys\_C1

Description

Updated December 2022

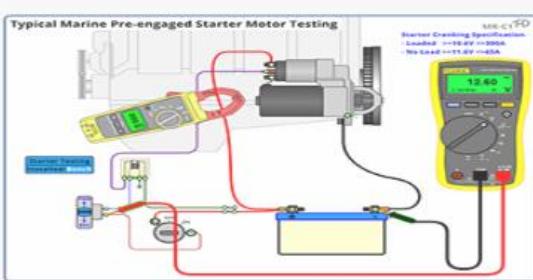


**Marine Pre-engaged Starter Motor Testing**

MR\_SdStTstAss00\_C1

Teaching Master: Multiple Faults

Updated December 2022

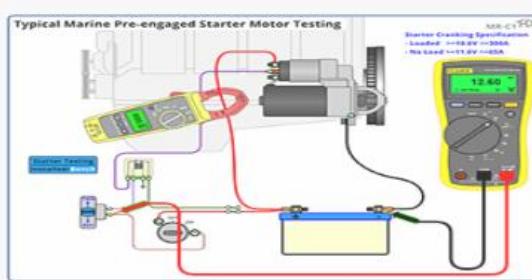


**Marine Pre-engaged Starter Motor Testing**

MR\_SdStTstAss01\_C1

Student Version: No Faults

Updated December 2022

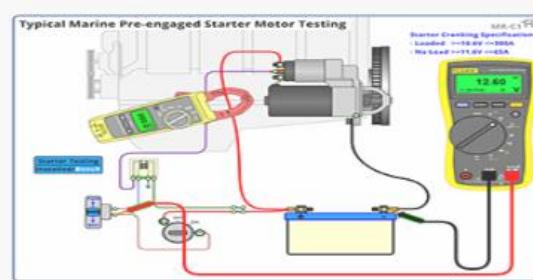


**Marine Pre-engaged Starter Motor Testing**

MR\_SdStTstAss02\_C1

Assessment: Open circuit relay coil

Updated December 2022

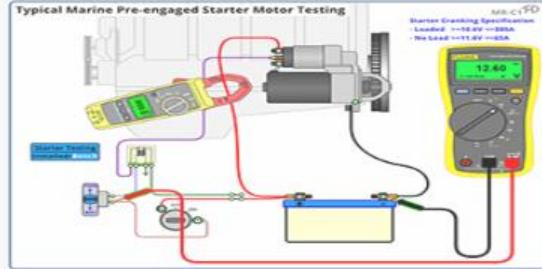


**Marine Pre-engaged Starter Motor Testing**

MR\_SdStTstAss03\_C1

Assessment: Relay Contacts Open Circuit

Updated December 2022

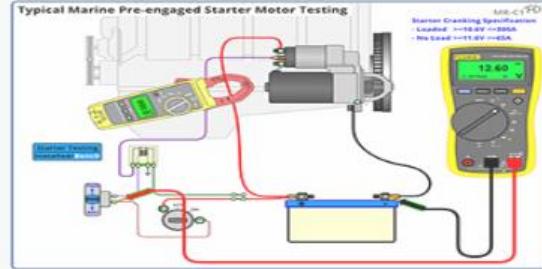


Marine Pre-engaged Starter Motor Testing

MR\_SdStTstAss04\_C1

Assessment: Solenoid Contacts Open Circuit

Updated December 2022

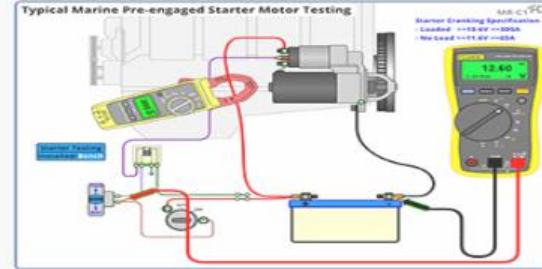


Marine Pre-engaged Starter Motor Testing

MR\_SdStTstAss05\_C1

Assessment: Hold-in Winding open circuit

Updated December 2022

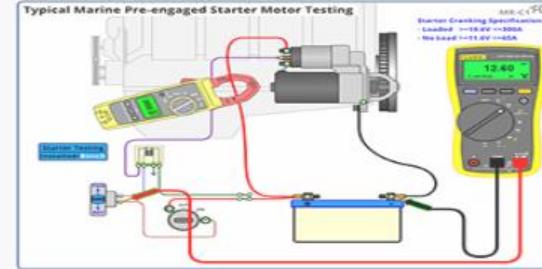


Marine Pre-engaged Starter Motor Testing

MR\_SdStTstAss06\_C1

Assessment: Pull-in winding open circuit

Updated December 2022

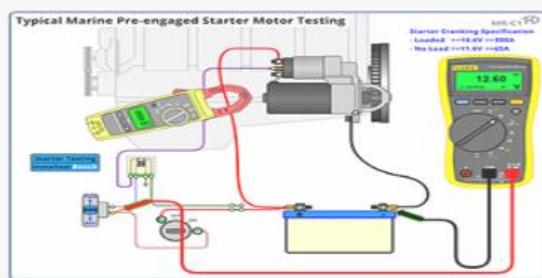


Marine Pre-engaged Starter Motor Testing

MR\_SdStTstAss07\_C1

Assessment: Start in Gear Sw open circuit

Updated December 2022

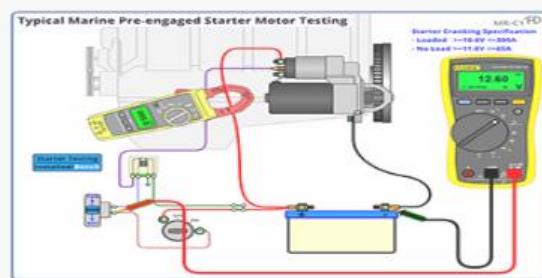


Marine Pre-engaged Starter Motor Testing

MR\_SdStTstAss08\_C1

Assessment: Open Circuit in motor

Updated December 2022

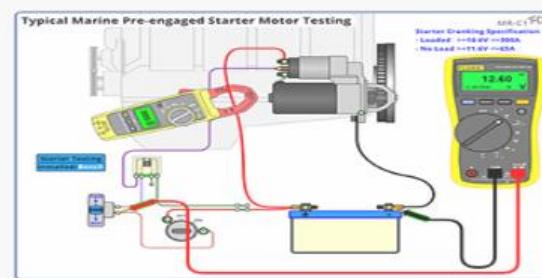


Marine Pre-engaged Starter Motor Testing

MR\_SdStTstAss09\_C1

Assessment: Solenoid Contacts High Resistance & Voltage Drop

Updated December 2022

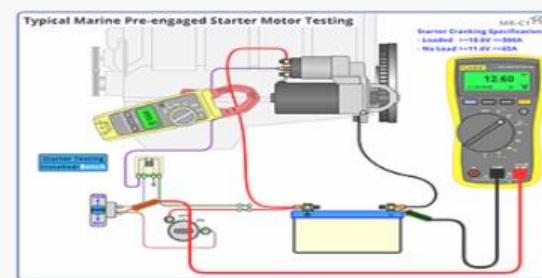


Marine Pre-engaged Starter Motor Testing

MR\_SdStTstAss10\_C1

Assessment: High Voltage drop in positive cable

Updated December 2022

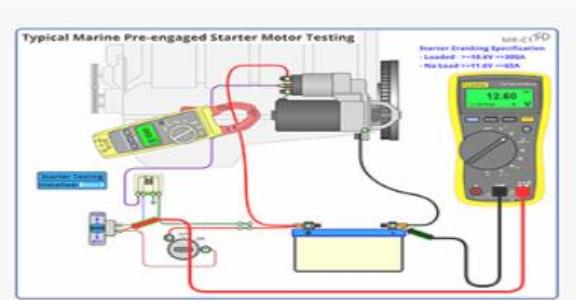


Marine Pre-engaged Starter Motor Testing

MR\_SdStTstAss11\_C1

Assessment: High Voltage drop in ground cable

Updated December 2022

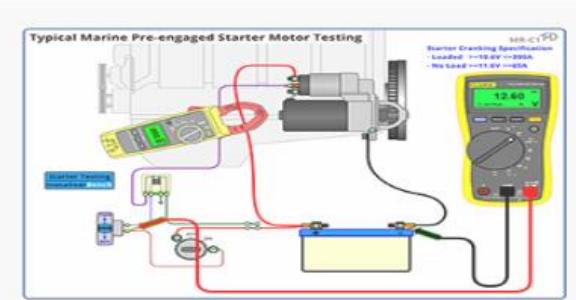


Marine Pre-engaged Starter Motor Testing

MR\_SdStTstAss12\_C1

Assessment: Motor poling

Updated December 2022

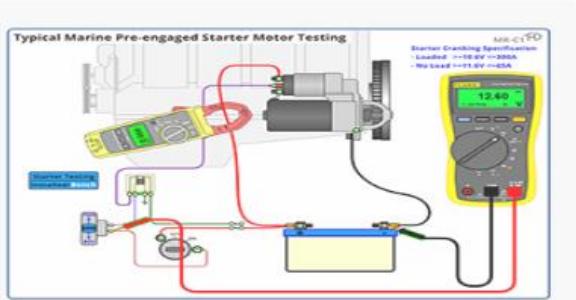


Marine Pre-engaged Starter Motor Testing

MR\_SdStTstAss13\_C1

Assessment: Tight Engine (excessive friction)

Updated December 2022

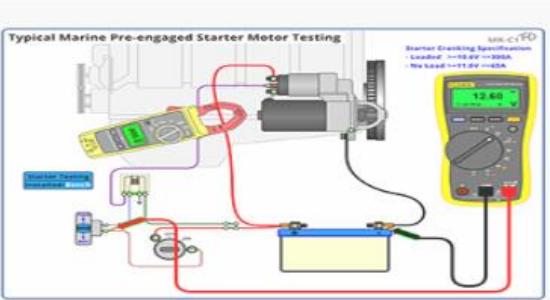


Marine Pre-engaged Starter Motor Testing

MR\_SdStTstAss14\_C1

Assessment: Pre-engagement Linkage failure

Updated December 2022

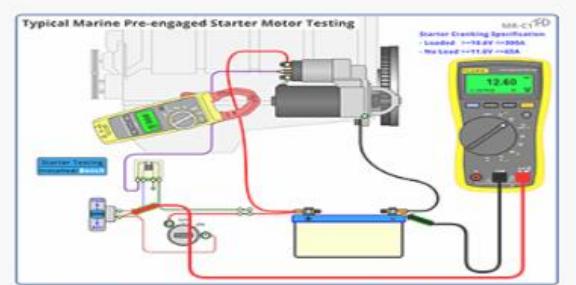


Marine Pre-engaged Starter Motor Testing

MR\_SdStTstAss15\_C1

Assessment: Faulty Battery

Updated December 2022

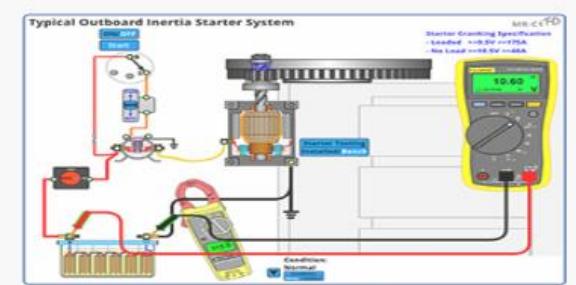


Marine Pre-engaged Starter Motor Testing

MR\_SdStTstAss16\_C1

Assessment: Not Shifted Correctly into Neutral

Updated December 2022

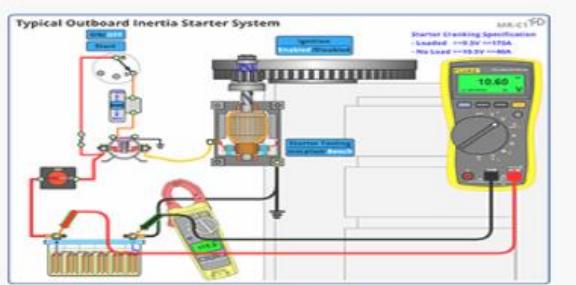


Typical Outboard Inertia Starter System

MR\_ObStarterTM\_C1

Teaching Master: Multiple Faults

Updated December 2022

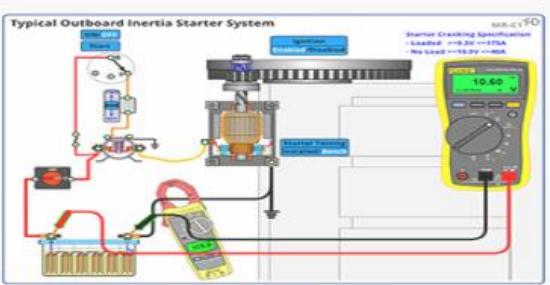


Typical Outboard Inertia Starter System

MR\_ObStarter00\_C1

Student Version: Normal Operation

Updated December 2022

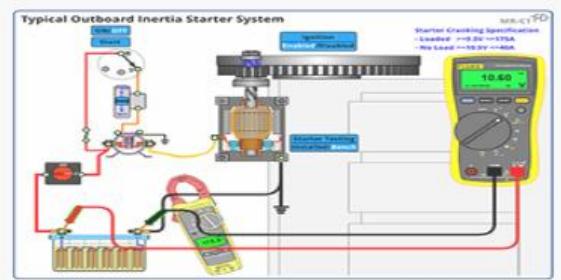


Typical Outboard Inertia Starter System

MR\_ObStarter01\_C1

Assessment: Gearshift just in gear.

Updated December 2022

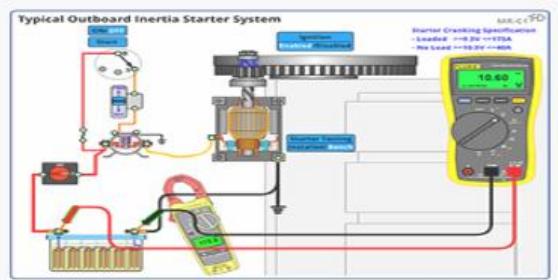


Typical Outboard Inertia Starter System

MR\_ObStarter02\_C1

Assessment: Faulty Ignition Switch.

Updated December 2022

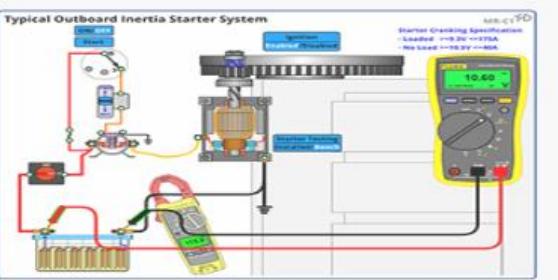


Typical Outboard Inertia Starter System

MR\_ObStarter03\_C1

Assessment: Flat Battery.

Updated December 2022

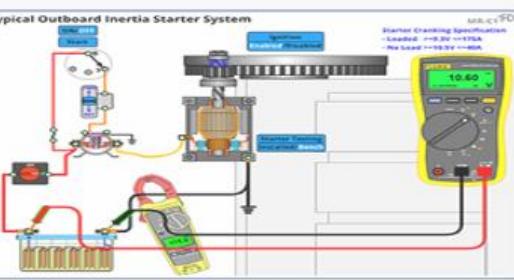


Typical Outboard Inertia Starter System

MR\_ObStarter04\_C1

Assessment: Tight Engine (excessive friction).

Updated December 2022

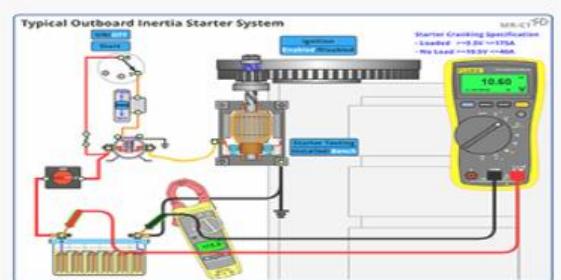


Typical Outboard Inertia Starter System

MR\_ObStarter05\_C1

Assessment: Pinion not going into mesh - rust on the spiral.

Updated December 2022

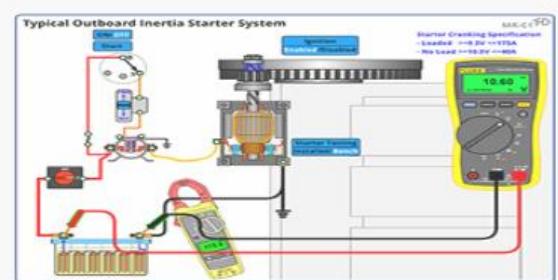


Typical Outboard Inertia Starter System

MR\_ObStarter06\_C1

Assessment: Open circuit in solenoid winding.

Updated December 2022

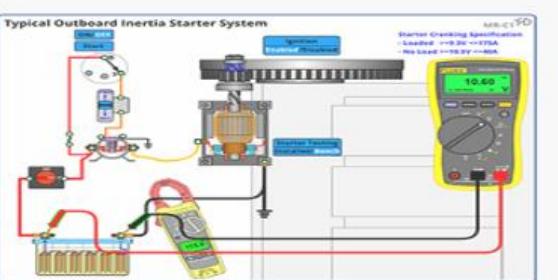


Typical Outboard Inertia Starter System

MR\_ObStarter07\_C1

Assessment: Corrosion on solenoid contacts - Open Circuit.

Updated December 2022

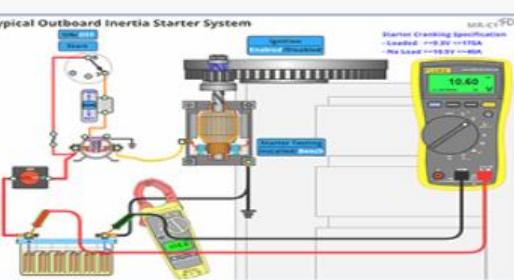


Typical Outboard Inertia Starter System

MR\_ObStarter08\_C1

Assessment: Motor Open Circuit - worn/stuck brush.

Updated December 2022

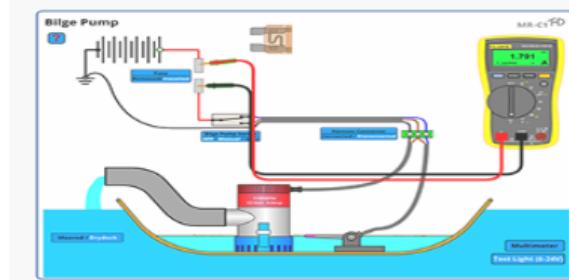
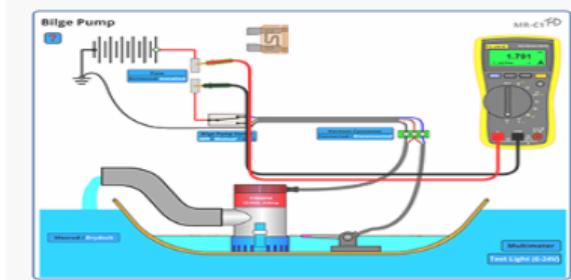
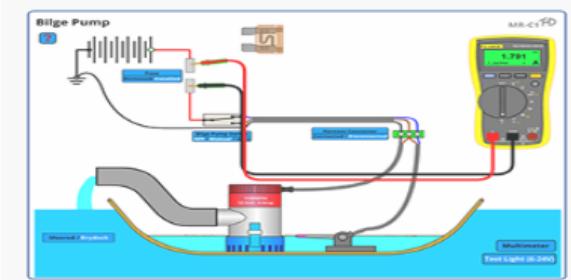
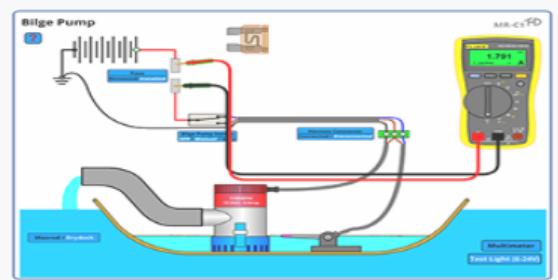
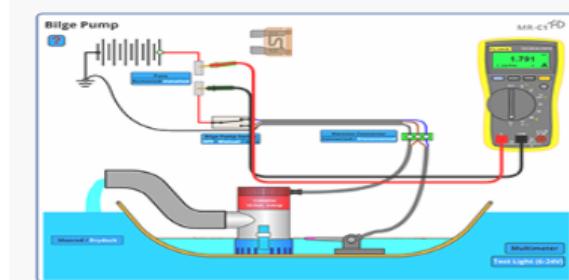
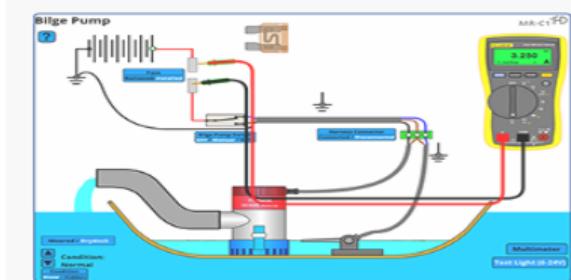
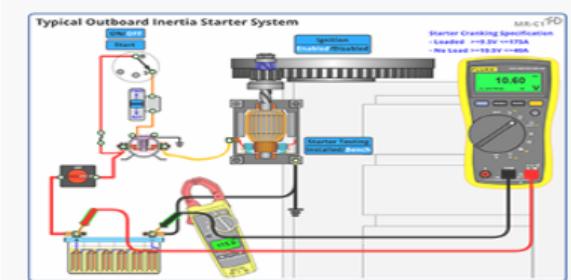
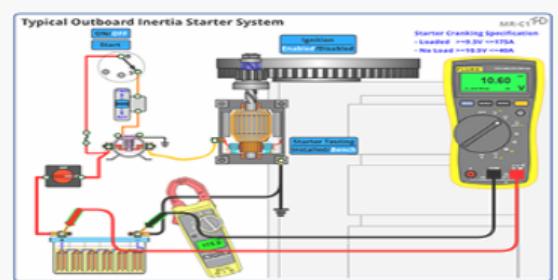


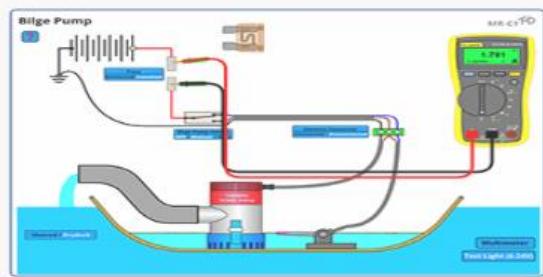
Typical Outboard Inertia Starter System

MR\_ObStarter09\_C1

Assessment: Slow cranking speed - Armature poling.

Updated December 2022





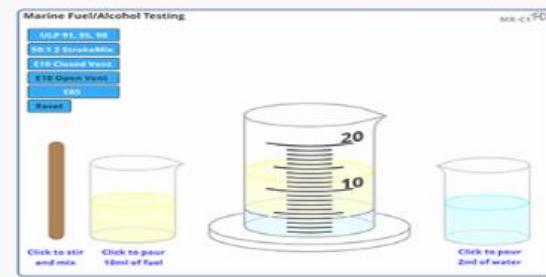
### Bilge Pump

MR\_BilgeDiag05\_C1

Bilge pump Assessment Fault No4: Bilge pump won't pump.

Cause: Broken wire in bilge pump harness.

**Updated December 2022**



### Fuel/Alcohol Testing

MR\_FuelTst\_C1

Description.

**Updated December 2022**

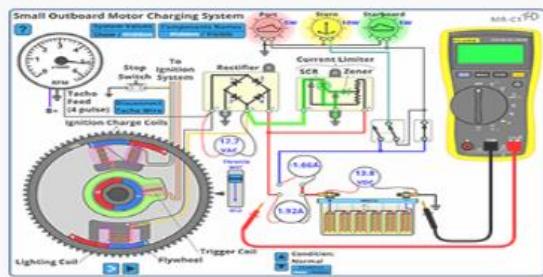


### Peak Voltage versus RMS Voltage

MR\_RMSvPV\_C1

Description

**Updated December 2022**

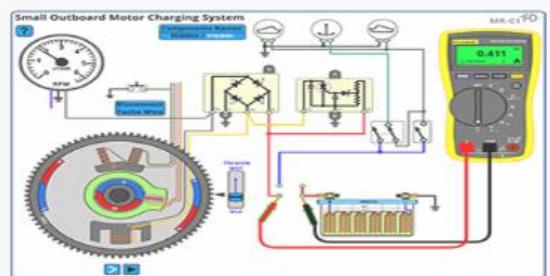


### Small Outboard Motor Charging System

MR\_ObChgTM\_C1

**Teaching Master with Multiple Faults**

**Updated December 2022**

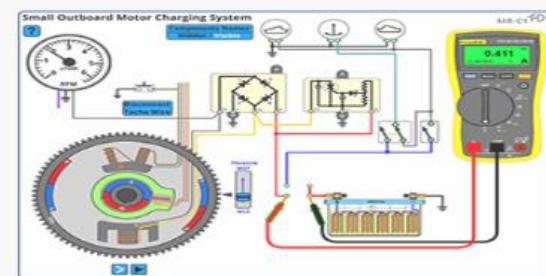


### Small Outboard Motor Charging System

MR\_ObChg00\_C1

**Student Version: No faults**

**Updated December 2022**



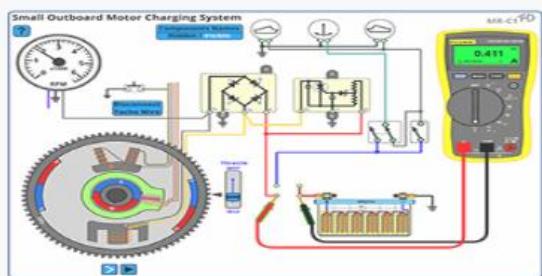
### Small Outboard Motor Charging System

MR\_ObChg01\_C1

Assessment Fault No1: Battery goes flat with general use.

Rectifier faulty - diode 4 open circuit.

**Updated December 2022**



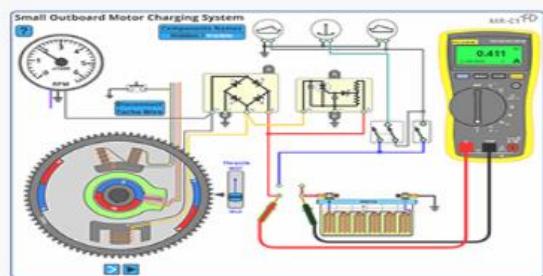
### Small Outboard Motor Charging System

MR\_ObChg02\_C1

Assessment Fault No2: Tacho not working and battery goes flat.

Rectifier faulty - diode 3 shorted.

**Updated December 2022**



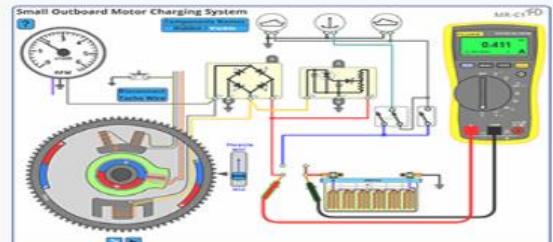
### Small Outboard Motor Charging System

MR\_ObChg03\_C1

Assessment Fault No3: Tacho not working & battery goes flat.

Tacho sensing wire grounded.

**Updated December 2022**



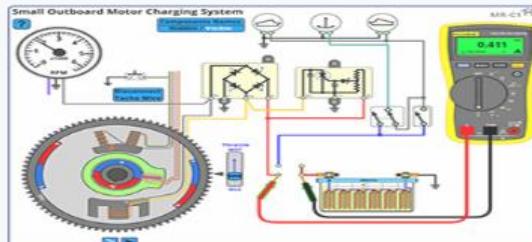
### Small Outboard Motor Charging System

MR\_ObChg04\_C1

Assessment Fault No4: Battery goes flat.

Lighting coil shorted to ground.

**Updated December 2022**



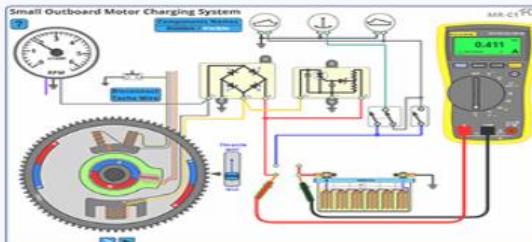
### Small Outboard Motor Charging System

MR\_ObChg05\_C1

Assessment Fault No5: Battery goes flat.

Current limiter faulty - shorted to ground.

**Updated December 2022**



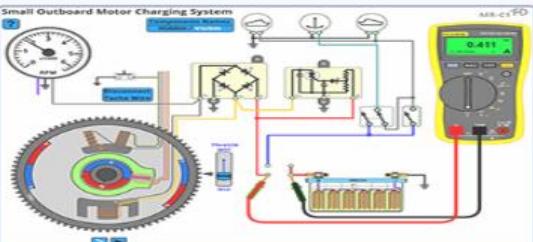
### Small Outboard Motor Charging System

MR\_ObChg06\_C1

Assessment Fault No6: Battery fluid need constant topping up.

Current limiter faulty - open circuit.

**Updated December 2022**

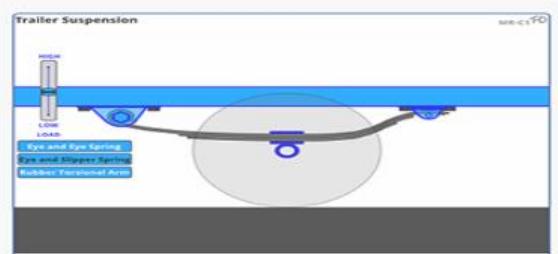


### Small Outboard Motor Charging System

MR\_ObChg07\_C1

Assessment Fault No7: No charging & Tacho not working. Rectifier & current limiter both faulty - burnt.

**Updated December 2022**

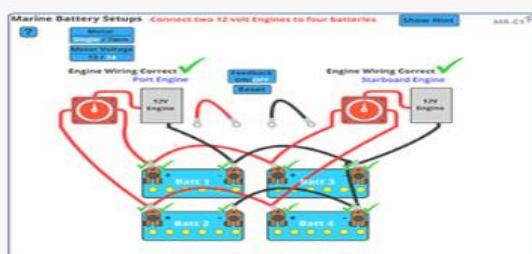


### Trailer Suspension

MR\_TrSusp\_C1

Covers the different types of suspensions used in boat trailers.

**Updated December 2022**

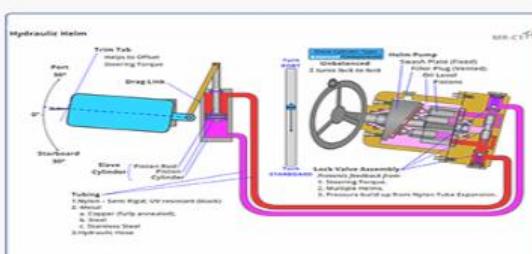


### Marine Battery Setups

MR\_BattSetup\_C1

Covers the different ways that batteries can be connected in series and parallel to connect to both single and twin engines.

**Updated December 2022**

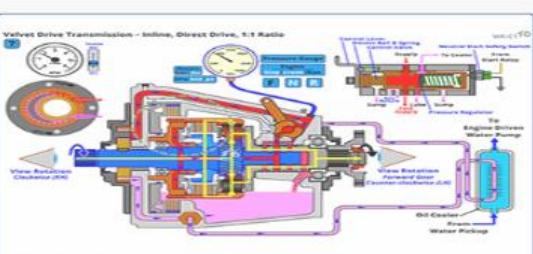


### Hydraulic Helm

MR\_HydHelm\_C1

Covers the operation of a Hydraulic Helm.

**Updated December 2022**

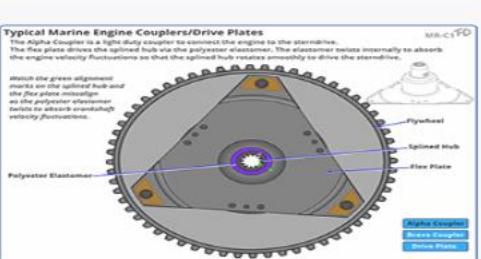


### Velvet Drive Transmission

MR\_VvtDrv\_C1

Covers the operation of the direct drive transmission.

**Updated December 2022**



### Marine Engine Couplers/Drive Plates

MR\_VvtDrvPlate\_C1

Covers the different types of couplers used between marine engines and sterndrives/trnasmissions.

**Updated December 2022**

# DSC Series

# Diagnostic Scenarios

| Priority  | Severity | Recency |
|---|----------|---------|
| Engine runs rough - steady misfire.   |          |         |
| Symptoms  |          |         |
| mis. light, oxygen sensor set and catalytic converter gets extremely hot.   |          |         |
| <b>What Should You Do?</b>  |          |         |
| Read PCM codes with scan tool.<br>Measure required torque to turn over engine by hand, compare to specs.<br>Check oil pressure.<br>Start engine and listen to motor with a stethoscope.<br>Check fuel for contaminants.<br>Perform emissions test.<br>Test idle RPM.<br>Perform emissions test. |          |         |
| <b>Results</b>  |          |         |

### Engine Repair Diagnostic Scenario

DSC\_EN01\_C1

Engine Runs Rough - steady misfire

**Updated November 2022**

| Priority  | Severity | Recency |
|---|----------|---------|
| Engine makes abnormal noise.  |          |         |
| Symptoms  |          |         |
| mis. light, oxygen sensor set and catalytic converter gets extremely hot.   |          |         |
| <b>What Should You Do?</b>  |          |         |
| Read PCM codes with scan tool.<br>Measure required torque to turn over engine by hand, compare to specs.<br>Check oil pressure.<br>Start engine and listen to motor with a stethoscope.<br>Check fuel for contaminants.<br>Perform emissions test.<br>Test idle RPM.<br>Perform emissions test. |          |         |
| <b>Results</b>  |          |         |

### Engine Repair Diagnostic Scenario

DSC\_EN02\_C1

Engine makes abnormal noise.

**Updated November 2022**

| Priority  | Severity | Recency |
|---|----------|---------|
| Engine exhaust is an unusual color.   |          |         |
| Symptoms  |          |         |
| white exhaust, Engine runs hot/oil overheats.   |          |         |
| <b>What Should You Do?</b>  |          |         |
| Check for vacuum leaks with smoke machine.<br>Check oil pressure.<br>Check for compression loss.<br>Start engine and listen to motor with a stethoscope.<br>Read PCM codes with scan tool.<br>Measure required torque to turn over engine by hand, compare to specs.<br>Test idle RPM.<br>Perform emissions test. |          |         |
| <b>Results</b>  |          |         |

### Engine Repair Diagnostic Scenario

DSC\_EN03\_C1

Engine exhaust is an unusual color.

**Updated November 2022**

| Priority   | Severity | Recency |
|--|----------|---------|
| Engine cranks very slowly or not at all - starting system working properly.  |          |         |
| Symptoms   |          |         |
| mis. light, oxygen sensor set and catalytic converter gets extremely hot.  |          |         |
| <b>What Should You Do?</b>   |          |         |
| Start engine and listen for noise with a stethoscope.<br>Check oil pressure.<br>Start engine and observe color and odor of exhaust.<br>Perform cooling system pressure check.<br>Perform emissions test. |          |         |
| <b>Results</b>   |          |         |

### Engine Repair Diagnostic Scenario

DSC\_EN04\_C1

Engine cranks very slowly or not at all - starting system working properly.

**Updated November 2022**

| Priority  | Severity | Recency |
|---|----------|---------|
| Engine has low power.   |          |         |
| Symptoms  |          |         |
| mis. light, oxygen sensor set.  |          |         |
| <b>What Should You Do?</b>  |          |         |
| Check for vacuum leaks with smoke machine.<br>Start engine and listen to motor with a stethoscope.<br>Check oil pressure.<br>Start engine and observe color and odor of exhaust.<br>Test idle RPM.<br>Read PCM codes with scan tool.<br>Measure required torque to turn over engine by hand, compare to specs.<br>Perform emissions test. |          |         |
| <b>Results</b>  |          |         |

### Engine Repair Diagnostic Scenario

DSC\_EN05\_C1

Engine has low power.

**Updated November 2022**

| Priority  | Severity | Recency |
|---|----------|---------|
| Engine runs rough (steady misfire).   |          |         |
| Symptoms  |          |         |
| mis. light, oxygen sensor set and catalytic converter gets extremely hot.   |          |         |
| <b>What Should You Do?</b>  |          |         |
| Read PCM codes with scan tool.<br>Measure required torque to turn over engine by hand, compare to specs.<br>Check oil pressure.<br>Start engine and observe temperature gauge.<br>Check fuel pressure and volume tank.<br>Perform emissions test. |          |         |
| <b>Results</b>  |          |         |

### Engine Repair Diagnostic Scenario

DSC\_EN06\_C1

Engine runs rough (steady misfire).

**Updated November 2022**

| Priority  | Severity | Recency |
|---|----------|---------|
| Engine Misfire (steady misfire).  |          |         |
| Symptoms  |          |         |
| mis. light, oxygen sensor set and catalytic converter gets extremely hot.   |          |         |
| <b>What Should You Do?</b>  |          |         |
| Find spark at spark plug.<br>Perform compression test.<br>Measure engine operating temperature with infrared temperature gun.<br>Find spark at spark plug.<br>Calculate fuel economy.<br>Start engine and observe temperature gauge.<br>Measure fuel pressure and volume tank.<br>Perform emissions test. |          |         |
| <b>Results</b>  |          |         |

### Engine Repair Diagnostic Scenario

DSC\_EN07\_C1

Engine Misfire (steady misfire).

**Updated November 2022**

| Priority  | Severity | Recency |
|---|----------|---------|
| Poor fuel economy.  |          |         |
| Symptoms  |          |         |
| mis. light, oxygen sensor set and catalytic converter gets extremely hot.   |          |         |
| <b>What Should You Do?</b>  |          |         |
| Find spark at spark plug.<br>Perform compression test.<br>Measure engine operating temperature with infrared temperature gun.<br>Find spark at spark plug.<br>Calculate fuel economy.<br>Start engine and observe temperature gauge.<br>Measure fuel pressure and volume tank.<br>Perform emissions test. |          |         |
| <b>Results</b>  |          |         |

### Engine Repair Diagnostic Scenario

DSC\_EN08\_C1

Poor fuel economy.

**Updated November 2022**



| Verify   | Identify  | Rectify   |
|--|---|---|
| <b>Problem:</b><br>Pedal sinks.  | <b>Symptoms:</b><br>The brake pedal sinks during application. | <b>What Should You Do?</b><br>Check for fluid leaks.<br><br>Raise vehicle on hoist. Check for locking action on each wheel on light pedal application.<br><br>Press brake pedal hard. Check for firmness.<br><br>Turn ignition key to "Run" position. Apply and release parking brake.<br><br>Test Drive for specified condition.<br><br>Visual inspection of fluid levels.<br><br>Diagnose brake pedal with light to moderate pressure. Check for locking pedal. |
| <b>Score: 10/10</b>  |   |   |
| <b>Objectives:</b><br>Use your automotive knowledge to identify the problem and the procedure without making incorrect choices and verify the solution using the best procedure to verify the information. If you make incorrect choices, you will be prompted to choose again. If you make increased choices, you will be prompted to choose again. If you make decreased choices, you will be prompted to choose again. If you make correct choices, a hard self cause will give you bonus points. |   |   |
| <b>Results:</b>  |   |   |

### Brake Repair Diagnostic Scenario

DSC\_BR05\_C1

Pedal sinks

Updated November 2022

| Verify   | Identify   | Rectify  |
|--|--|--|
| <b>Problem:</b><br>Excessive stopping distance.  | <b>Symptoms:</b><br>Excessive stopping distance. | <b>What Should You Do?</b><br>Perform power brake operation test.<br><br>Turn ignition key to "Run" position. Apply and release parking brake.<br><br>Check master cylinder for internal leaks.<br><br>Visual inspection of fluid level. |
| <b>Score: 10/10</b>  |  |  |
| <b>Objectives:</b><br>Use your automotive knowledge to identify the problem and the procedure without making incorrect choices and verify the solution using the best procedure to verify the information. If you make incorrect choices, you will be prompted to choose again. If you make increased choices, you will be prompted to choose again. If you make decreased choices, you will be prompted to choose again. If you make correct choices, a hard self cause will give you bonus points. |  |  |
| <b>Results:</b>  |  |  |

### Brake Repair Diagnostic Scenario

DSC\_BR06\_C1

Spongy pedal

Updated November 2022

| Verify   | Identify   | Rectify   |
|--|--|---|
| <b>Problem:</b><br>Low pedal.  | <b>Symptoms:</b><br>Excessive stopping distance. | <b>What Should You Do?</b><br>Turn ignition key to "Run" position. Apply and release parking brake.<br><br>Press brake pedal hard. Check for firmness.<br><br>Turn ignition key to "Run" position. Apply and release parking brake.<br><br>Diagnose brake pedal with light to moderate pressure. Check for locking pedal. |
| <b>Score: 10/10</b>  |  |   |
| <b>Objectives:</b><br>Use your automotive knowledge to identify the problem and the procedure without making incorrect choices and verify the solution using the best procedure to verify the information. If you make incorrect choices, you will be prompted to choose again. If you make increased choices, you will be prompted to choose again. If you make decreased choices, you will be prompted to choose again. If you make correct choices, a hard self cause will give you bonus points. |  |   |
| <b>Results:</b>  |  |   |

### Brake Repair Diagnostic Scenario

DSC\_BR07\_C1

Low pedal

Updated November 2022

| Verify   | Identify  | Rectify  |
|--|---|--|
| <b>Problem:</b><br>One wheel locks up (Non-ABS).   | <b>Symptoms:</b><br>Wheel locks during brake application. | <b>What Should You Do?</b><br>Visual inspection of fluid level.<br><br>Test Drive for specified condition.<br><br>Check for fluid leaks.<br><br>Raise vehicle on hoist. Check for locking action on each wheel on light pedal application.<br><br>Press brake pedal hard. Check for firmness.<br><br>Turn ignition key to "Run" position. Apply and release parking brake.<br><br>Diagnose brake pedal with light to moderate pressure. Check for locking pedal. |
| <b>Score: 10/10</b>  |   |  |
| <b>Objectives:</b><br>Use your automotive knowledge to identify the problem and the procedure without making incorrect choices and verify the solution using the best procedure to verify the information. If you make incorrect choices, you will be prompted to choose again. If you make increased choices, one point if you do not pick the correct choice, two points if you pick the correct choice. If you make decreased choices, one point if you do not pick the correct choice, two points if you pick the correct choice. If you make correct choices, a hard self cause will give you bonus points. |   |  |
| <b>Results:</b>  |   |  |

### Brake Repair Diagnostic Scenario

DSC\_BR08\_C1

One wheel locks up (Non-ABS)

Updated November 2022

| Verify   | Identify  | Rectify   |
|--|---|---|
| <b>Problem:</b><br>Brakes pull to one side.  | <b>Symptoms:</b><br>During normal brake application the vehicle "drives" to one side. | <b>What Should You Do?</b><br>Turn ignition key to "Run" position. Apply and release parking brake.<br><br>Diagnose brake pedal with light to moderate pressure. Check for locking pedal. |
| <b>Score: 10/10</b>  |   |   |
| <b>Objectives:</b><br>Use your automotive knowledge to identify the problem and the procedure without making incorrect choices and verify the solution using the best procedure to verify the information. If you make incorrect choices, you will be prompted to choose again. If you make increased choices, you will be prompted to choose again. If you make decreased choices, you will be prompted to choose again. If you make correct choices, a hard self cause will give you bonus points. |   |   |
| <b>Results:</b>  |   |   |

### Brake Repair Diagnostic Scenario

DSC\_BR09\_C1

Brakes pull to one side

Updated November 2022

| Verify   | Identify   | Rectify  |
|--|--|--|
| <b>Problem:</b><br>Vehicle wont start.   | <b>Symptoms:</b><br>Vehicle ignition is not ready and a main attempt, nothing happens. | <b>What Should You Do?</b><br>Raise hood and test battery and connections for any voltage. |
| <b>Score: 10/10</b>  |  |  |
| <b>Objectives:</b><br>Use your automotive knowledge to identify the problem and the procedure without making incorrect choices and verify the solution using the best procedure to verify the information. If you make incorrect choices, you will be prompted to choose again. If you make increased choices, you will be prompted to choose again. If you make decreased choices, you will be prompted to choose again. If you make correct choices, a hard self cause will give you bonus points. |  |  |
| <b>Results:</b>  |  |  |

### Brake Repair Diagnostic Scenario

DSC\_BR10\_C1

Brake warning lamp on when ignition is on

Updated November 2022

| Verify   | Identify  | Rectify  |
|--|---|--|
| <b>Problem:</b><br>Vehicle wont start.   | <b>Symptoms:</b><br>Lights do not operate, all other lights operate normally. | <b>What Should You Do?</b><br>Check headlights to check the bulb, check the ground connection, check the amperage, check the fuse box and connections for any package. |
| <b>Score: 10/10</b>  |   |  |
| <b>Objectives:</b><br>Use your automotive knowledge to identify the problem and the procedure without making incorrect choices and verify the solution using the best procedure to verify the information. If you make incorrect choices, you will be prompted to choose again. If you make increased choices, one point if you do not pick the correct choice, two points if you pick the correct choice. If you make decreased choices, one point if you do not pick the correct choice, two points if you pick the correct choice. If you make correct choices, a hard self cause will give you bonus points. |   |  |
| <b>Results:</b>  |   |  |

### Electrical Repair Diagnostic Scenario

DSC\_EE01\_C1

Vehicle wont start

Updated November 2022

| Verify   | Identify  | Rectify  |
|--|---|--|
| <b>Problem:</b><br>Brake lamps dont work.  | <b>Symptoms:</b><br>Light does not come on when the brake pedal is depressed. | <b>What Should You Do?</b><br>Check headlights to check the bulb, check the ground connection, check the amperage, check the fuse box and connections for any package. |
| <b>Score: 10/10</b>  |   |  |
| <b>Objectives:</b><br>Use your automotive knowledge to identify the problem and the procedure without making incorrect choices and verify the solution using the best procedure to verify the information. If you make incorrect choices, you will be prompted to choose again. If you make increased choices, one point if you do not pick the correct choice, two points if you pick the correct choice. If you make decreased choices, one point if you do not pick the correct choice, two points if you pick the correct choice. If you make correct choices, a hard self cause will give you bonus points. |   |  |
| <b>Results:</b>  |   |  |

### Electrical Repair Diagnostic Scenario

DSC\_EE02\_C1

Brake lamps dont work

Updated November 2022

| Verify   | Identify   | Rectify             |
|--|--|---------------------|
| <b>Problem</b><br>Starter clicks once but does not crank engine.   | <b>Symptoms</b><br>Dash lights and dome light are very dim.  | <b>Score: 10/10</b> |
| <b>Objectives</b><br>Use your automotive knowledge to diagnose and fix the problem, without making incorrect choices or losing points. Start by narrowing the best procedure to verify the best choice, but you can try again, if you make incorrect choices, one point if you do not pack the correct answer. If you make incorrect choices, one point if you do not pack the correct answer. If you make incorrect choices, one point if you do not pack the correct answer. | <b>What Should You Do?</b><br>Check engine for mechanical lock-ups.<br>Check for parasitic battery drain.<br>Check for alternator safety switch.<br>Check fuse links or main fuse, voltage drop when switch in start position.<br>Check engine with startup until it stops to check for good cranking speed.<br>Check for poor intake battery drain.<br>Check for motor safety switch.<br>Check fuse links or main fuse, voltage drop when switch in start position.<br>Check a resistor switch for power to ignition.<br>Check for poor intake battery drain.<br>Check alternator safety switch and connections for any voltage drop. | <b>Results</b>      |

### Electrical Repair Diagnostic Scenario

DSC\_EE03\_C1

Starter clicks but engine wont crank

Updated November 2022

| Verify   | Identify   | Rectify             |
|--|--|---------------------|
| <b>Problem</b><br>Starter clicks once but does not crank engine.   | <b>Symptoms</b><br>Dash lights and dome light are very dim.  | <b>Score: 10/10</b> |
| <b>Objectives</b><br>Use your automotive knowledge to diagnose and fix the problem, without making incorrect choices or losing points. Start by narrowing the best procedure to verify the best choice, but you can try again, if you make incorrect choices, one point if you do not pack the correct answer. If you make incorrect choices, one point if you do not pack the correct answer. | <b>What Should You Do?</b><br>Check engine for mechanical lock-ups.<br>Check for parasitic battery drain.<br>Check for alternator safety switch.<br>Check fuse links or main fuse, voltage drop when switch in start position.<br>Check engine with startup until it stops to check for good cranking speed.<br>Check for poor intake battery drain.<br>Check for motor safety switch.<br>Check fuse links or main fuse, voltage drop when switch in start position.<br>Check a resistor switch for power to ignition.<br>Check for poor intake battery drain. | <b>Results</b>      |

### Electrical Repair Diagnostic Scenario

DSC\_EE04\_C1

Starter clicks once but does not crank

Updated November 2022

| Verify   | Identify  | Rectify             |
|--|---|---------------------|
| <b>Problem</b><br>Horn doesn't operate.  | <b>Symptoms</b><br>No horn's signal when depressed.   | <b>Score: 10/10</b> |
| <b>Objectives</b><br>Use your automotive knowledge to diagnose and fix the problem, without making incorrect choices or losing points. Start by narrowing the best procedure to verify the best choice, but you can try again, if you make incorrect choices, one point if you do not pack the correct answer. If you make incorrect choices, one point if you do not pack the correct answer. | <b>What Should You Do?</b><br>Check for parasitic battery drain.<br>Check horn's wiring harness.<br>Check horn's mounting hardware.<br>Check horn's fuse or circuit voltage drop. | <b>Results</b>      |

### Electrical Repair Diagnostic Scenario

DSC\_EE05\_C1

Horn doesn't operate

Updated November 2022

| Verify   | Identify  | Rectify             |
|--|---|---------------------|
| <b>Problem</b><br>No airflow through the ventilation system sometimes.   | <b>Symptoms</b><br>Driver knows motor does not work on medium speed, but works on all others.   | <b>Score: 10/10</b> |
| <b>Objectives</b><br>Use your automotive knowledge to diagnose and fix the problem, without making incorrect choices or losing points. Start by narrowing the best procedure to verify the best choice, but you can try again, if you make incorrect choices, one point if you do not pack the correct answer. If you make incorrect choices, one point if you do not pack the correct answer. | <b>What Should You Do?</b><br>Perform a history critique at some points before starting a diagnostic.<br>Perform a history critique at some points before starting a diagnostic.<br>Check for parasitic battery drain.<br>Check for alternator safety switch.<br>Check horn's fuse or circuit voltage drop. | <b>Results</b>      |

### Electrical Repair Diagnostic Scenario

DSC\_EE06\_C1

No airflow through ventilation system sometimes

Updated November 2022

| Verify   | Identify  | Rectify             |
|--|---|---------------------|
| <b>Problem</b><br>All lights are glimmer than normal and have a short lifespan.  | <b>Symptoms</b><br>Lights are unusually bright, potential for multiple lamps to fail.   | <b>Score: 10/10</b> |
| <b>Objectives</b><br>Use your automotive knowledge to diagnose and fix the problem, without making incorrect choices or losing points. Start by narrowing the best procedure to verify the best choice, but you can try again, if you make incorrect choices, one point if you do not pack the correct answer. If you make incorrect choices, one point if you do not pack the correct answer. | <b>What Should You Do?</b><br>Check for parasitic battery drain.<br>Check for alternator safety switch.<br>Check fuse links or main fuse, voltage drop when switch in start position.<br>Check engine with startup until it stops to check for good cranking speed.<br>Check for motor safety switch.<br>Check for low voltage drain.<br>Check for low voltage drain. | <b>Results</b>      |

### Electrical Repair Diagnostic Scenario

DSC\_EE07\_C1

All lights unusually bright and have a short lifespan

Updated November 2022

| Verify   | Identify  | Rectify             |
|--|---|---------------------|
| <b>Problem</b><br>Starter may not crank engine at all intermittently.  | <b>Symptoms</b><br>Starter may not crank engine at all intermittently.  | <b>Score: 10/10</b> |
| <b>Objectives</b><br>Use your automotive knowledge to diagnose and fix the problem, without making incorrect choices or losing points. Start by narrowing the best procedure to verify the best choice, but you can try again, if you make incorrect choices, one point if you do not pack the correct answer. If you make incorrect choices, one point if you do not pack the correct answer. | <b>What Should You Do?</b><br>Check engine for mechanical lock-ups.<br>Check fuse links or main fuse, voltage drop when switch in start position.<br>Check engine with startup until it stops to check for good cranking speed.<br>Check for poor intake battery drain.<br>Check for motor safety switch.<br>Check for low voltage drain. | <b>Results</b>      |

### Electrical Repair Diagnostic Scenario

DSC\_EE08\_C1

Engine cranks slow and may not start

Updated November 2022

| Verify   | Identify  | Rectify             |
|--|---|---------------------|
| <b>Problem</b><br>Charge warning lamp ON when engine is running.   | <b>Symptoms</b><br>Lights are dim and dashboard indicators illuminate.  | <b>Score: 10/10</b> |
| <b>Objectives</b><br>Use your automotive knowledge to diagnose and fix the problem, without making incorrect choices or losing points. Start by narrowing the best procedure to verify the best choice, but you can try again, if you make incorrect choices, one point if you do not pack the correct answer. If you make incorrect choices, one point if you do not pack the correct answer. | <b>What Should You Do?</b><br>Perform a history critique at some points before starting a diagnostic.<br>Perform a history critique at some points before starting a diagnostic.<br>Check for parasitic battery drain.<br>Check for alternator safety switch.<br>Check horn's fuse or circuit voltage drop. | <b>Results</b>      |

### Electrical Repair Diagnostic Scenario

DSC\_EE09\_C1

Charge warning lamp ON when engine is running

Updated November 2022

| Verify   | Identify  | Rectify             |
|--|---|---------------------|
| <b>Problem</b><br>Vehicle pulls to one side.   | <b>Symptoms</b><br>Uneven tire wear.  | <b>Score: 10/10</b> |
| <b>Objectives</b><br>Use your automotive knowledge to diagnose and fix the problem, without making incorrect choices or losing points. Start by narrowing the best procedure to verify the best choice, but you can try again, if you make incorrect choices, one point if you do not pack the correct answer. If you make incorrect choices, one point if you do not pack the correct answer. | <b>What Should You Do?</b><br>Wait drive the vehicle to ensure that the steering wheel self centers by itself when driving.<br>Perform a "bounce test" to check shock absorber condition.<br>Check wheel alignment. | <b>Results</b>      |

### Steering & Suspension Diagnostic Scenario

DSC\_SS01\_C1

Vehicle pulls to one side

Updated November 2022

| Verify   | Identify            | Rectify  |
|--|---------------------|--|
| <b>Problem:</b><br>Steering wheel turning effort is uneven.<br><b>Symptoms:</b><br>Bumping noise from under hood when steering turned from lock to lock.   |                     |  |
| <b>What Should You Do?</b><br>Test drive vehicle to establish if the vehicle is pulling to one side.<br>Test drive vehicle to ensure that the steering wheel self centers by itself when driving.<br>Perform "bounce test" to check shock absorber condition.<br>Check wheel alignment.<br>Test drive vehicle to check for shimming at different speeds.<br>Test drive vehicle for drivability issues.<br>Test drive vehicle to determine if the vehicle is wandering or either direction. | <b>Score: 10/10</b> | <b>Objective:</b><br>Utilize automotive knowledge to diagnose and fix the problem without making incorrect choices and losing points. Start by selecting the best procedure to verify the steering effort is uneven. If you make a mistake here, you will lose points. If you do not pick the best choice, but you can try again, you will have the chance to earn back lost points. But you will still have some points deducted. |
| <b>Results:</b>  |                     |  |

### Steering & Suspension Diagnostic Scenario

DSC\_SS02\_C1

Steering wheel turning effort is uneven

Updated November 2022

| Verify  | Identify            | Rectify   |
|---|---------------------|---|
| <b>Problem:</b><br>Steering effort too high.<br><b>Symptoms:</b><br>Squeaking noise from under hood.  |                     |   |
| <b>What Should You Do?</b><br>Test drive vehicle to establish if the vehicle pulls in either direction.<br>Test drive vehicle to ensure that the steering wheel self centers by itself when driving.<br>Perform "bounce test" to check shock absorber condition.<br>Check wheel alignment.<br>Test drive vehicle to check for shimming at different speeds.<br>Test drive vehicle for drivability issues.<br>Test drive vehicle to determine if the vehicle is wandering or either direction. | <b>Score: 10/10</b> | <b>Objective:</b><br>Utilize automotive knowledge to diagnose and fix the problem without making incorrect choices and losing points. Start by selecting the best procedure to verify the steering effort is too high. If you make a mistake here, you will lose points. If you do not pick the best choice, but you can try again, you will have the chance to earn back lost points. Accepting a wrong answer here will lose some points. |
| <b>Results:</b>   |                     |   |

### Steering & Suspension Diagnostic Scenario

DSC\_SS03\_C1

Steering effort too high

Updated November 2022

| Verify  | Identify            | Rectify  |
|---|---------------------|--|
| <b>Problem:</b><br>Steering wheel return to center.   |                     |  |
| <b>Symptoms:</b><br>Vehicle wanders.  |                     |  |
| <b>What Should You Do?</b><br>Test drive vehicle to establish if the steering pulls in either direction.<br>Test drive vehicle to check for shimming at different speeds.<br>Test drive vehicle to evaluate shock absorber operation on different road conditions.<br>Test drive vehicle to check for shimming at different speeds. | <b>Score: 10/10</b> | <b>Objective:</b><br>Utilize automotive knowledge to diagnose and fix the problem without making incorrect choices and losing points. Start by selecting the best procedure to verify the steering wheel does not return to center. If you make a mistake here, you will lose points. If you do not pick the best choice, but you can try again, you will have the chance to earn back lost points. Accepting a wrong answer here will lose some points. |
| <b>Results:</b>   |                     |  |

### Steering & Suspension Diagnostic Scenario

DSC\_SS04\_C1

Poor steering wheel return to center

Updated November 2022

| Verify  | Identify            | Rectify   |
|---|---------------------|---|
| <b>Problem:</b><br>Tires worn unevenly.   |                     |   |
| <b>Symptoms:</b><br>One tire wears on the outside edge.   |                     |   |
| <b>What Should You Do?</b><br>Test drive vehicle to establish that the steering effort is not unusually high when driving.<br>Test drive vehicle to check for shimming at different speeds.<br>Inspect condition of wheels/tires. | <b>Score: 10/10</b> | <b>Objective:</b><br>Utilize automotive knowledge to diagnose and fix the problem without making incorrect choices and losing points. Start by selecting the best procedure to verify the tires are worn unevenly. If you make a mistake here, you will lose points. If you do not pick the best choice, but you can try again, you will have the chance to earn back lost points. Accepting a wrong answer here will lose some points. |
| <b>Results:</b>   |                     |   |

### Steering & Suspension Diagnostic Scenario

DSC\_SS05\_C1

Tires worn unevenly

Updated November 2022

| Verify  | Identify            | Rectify  |
|---|---------------------|--|
| <b>Problem:</b><br>Both front tire tread is worn unevenly.  |                     |  |
| <b>Symptoms:</b><br>Both front tire tread is worn unevenly.   | <b>Score: 10/10</b> | <b>Objective:</b><br>Utilize automotive knowledge to diagnose and fix the problem without making incorrect choices and losing points. Start by selecting the best procedure to verify the both front tire tread is worn unevenly. If you make a mistake here, you will lose points. If you do not pick the best choice, but you can try again, you will have the chance to earn back lost points. Accepting a wrong answer here will lose some points. |
| <b>What Should You Do?</b><br>Perform "bounce test" to check shock absorber condition.<br>Check wheel alignment.<br>Test drive vehicle to evaluate shock absorber operation on different road conditions.<br>Test drive vehicle for drivability through different speed ranges.<br>Test drive vehicle to determine if unusually high effort is required to turn when driving.<br>Test drive vehicle to establish that the steering has no unusual feel when driving.<br>Test drive vehicle to ensure that the steering wheel self centers by itself when driving. |                     |  |
| <b>Results:</b>   |                     |  |

### Steering & Suspension Diagnostic Scenario

DSC\_SS06\_C1

Steering wheel shimmy

Updated November 2022

| Verify   | Identify            | Rectify  |
|--|---------------------|--|
| <b>Problem:</b><br>Both front tire tread is worn unevenly.   |                     |  |
| <b>Symptoms:</b><br>Both front tire tread is worn unevenly.  | <b>Score: 10/10</b> | <b>Objective:</b><br>Utilize automotive knowledge to diagnose and fix the problem without making incorrect choices and losing points. Start by selecting the best procedure to verify the both front tire tread is worn unevenly. If you make a mistake here, you will lose points. If you do not pick the best choice, but you can try again, you will have the chance to earn back lost points. Accepting a wrong answer here will lose some points. |
| <b>What Should You Do?</b><br>Perform "bounce test" to check shock absorber condition.<br>Check wheel alignment.<br>Test drive vehicle to check for shimming at different speeds.<br>Test drive vehicle to evaluate shock absorber operation on different road conditions.<br>Test drive vehicle for drivability issues.<br>Test drive vehicle to determine if the vehicle is pulling to one side. |                     |  |
| <b>Results:</b>  |                     |  |

### Steering & Suspension Diagnostic Scenario

DSC\_SS07\_C1

Both front tire treads are worn unevenly

Updated November 2022

| Verify   | Identify            | Rectify  |
|--|---------------------|--|
| <b>Problem:</b><br>Steering wheel return to center.  |                     |  |
| <b>Symptoms:</b><br>Vehicle wanders.   |                     |  |
| <b>What Should You Do?</b><br>Test drive vehicle to establish if the steering effort is too high when driving.<br>Test drive vehicle to evaluate shock absorber operation on different road conditions.<br>Test drive vehicle to check for shimming at different speeds. | <b>Score: 10/10</b> | <b>Objective:</b><br>Utilize automotive knowledge to diagnose and fix the problem without making incorrect choices and losing points. Start by selecting the best procedure to verify the steering wheel does not return to center. If you make a mistake here, you will lose points. If you do not pick the best choice, but you can try again, you will have the chance to earn back lost points. Accepting a wrong answer here will lose some points. |
| <b>Results:</b>  |                     |  |

### Steering & Suspension Diagnostic Scenario

DSC\_SS08\_C1

Tires worn unevenly

Updated November 2022

| Verify   | Identify            | Rectify   |
|--|---------------------|---|
| <b>Problem:</b><br>Tires worn unevenly.  |                     |   |
| <b>Symptoms:</b><br>Scratching pattern on the inside of left-front tire.   |                     |   |
| <b>What Should You Do?</b><br>Test drive vehicle to evaluate shock absorber operation on different road conditions.<br>Test drive vehicle to check for shimming at different speeds. | <b>Score: 10/10</b> | <b>Objective:</b><br>Utilize automotive knowledge to diagnose and fix the problem without making incorrect choices and losing points. Start by selecting the best procedure to verify the tires are worn unevenly. If you make a mistake here, you will lose points. If you do not pick the best choice, but you can try again, you will have the chance to earn back lost points. Accepting a wrong answer here will lose some points. |
| <b>Results:</b>  |                     |   |

### Steering & Suspension Diagnostic Scenario

DSC\_SS09\_C1

Tires worn unevenly

Updated November 2022

| Severity   | Intensity | Reliability |
|--|-----------|-------------|
| <b>Problem:</b><br>Clutch slips under moderate load.   |           |             |
| <b>Symptoms:</b><br>Squeaking, rattling, bumping, smells.  |           |             |
| <b>What Should You Do?</b>   |           |             |
| Test drive vehicle to establish any excessive noise from the transmission in top gear.<br>[Impact clutch fluid level]<br>Test drive vehicle to establish any excessive noise from the driveline.<br>Check clutch pedal adjustment.<br>Check clutch fluid level.<br>Test drive vehicle for vehicle performance and drivability.<br>[Impact transmission fluid level]<br>Test drive the vehicle to establish noises on the clutch side of the transmission.<br>Check clutch fluid level.<br>Test drive vehicle to establish noises during shifting gears.<br>Results |           |             |
| <b>Score: 10/10</b>  |           |             |

### Manual Transmission Diagnostic Scenario

DSC\_MT01\_C1

Clutch slips under moderate load.

Updated November 2022

| Severity  | Intensity | Reliability |
|---|-----------|-------------|
| <b>Problem:</b><br>Clutch slips under heavy load.   |           |             |
| <b>Symptoms:</b><br>Squeaking, rattling, bumping, smells.   |           |             |
| <b>What Should You Do?</b>  |           |             |
| Test drive vehicle to establish any excessive noise from the driveline.<br>[Impact clutch fluid level]<br>Test drive vehicle to establish any excessive noise from the direction.<br>Check clutch pedal adjustment.<br>Check clutch fluid level.<br>Test drive vehicle to establish noises on the clutch side of the transmission.<br>Check clutch fluid level.<br>Test drive vehicle to establish noises during shifting gears.<br>Results |           |             |
| <b>Score: 10/10</b>   |           |             |

### Manual Transmission Diagnostic Scenario

DSC\_MT02\_C1

Clutch slips under heavy load.

Updated November 2022

| Severity   | Intensity | Reliability |
|--|-----------|-------------|
| <b>Problem:</b><br>Excessive noise in one or more gears.   |           |             |
| <b>Symptoms:</b><br>Squeaking, rattling, bumping, smells.  |           |             |
| <b>What Should You Do?</b>   |           |             |
| Test drive the vehicle to establish noises on the clutch side of the transmission.<br>[Impact final drive fluid]<br>Test drive vehicle to establish noises during shifting gears.<br>Check clutch pedal adjustment.<br>Check clutch fluid level.<br>Test drive vehicle to establish any excessive noise from the direction.<br>Test drive vehicle to establish any excessive noise from the transmission in top gear.<br>Results |           |             |
| <b>Score: 10/10</b>  |           |             |

### Manual Transmission Diagnostic Scenario

DSC\_MT03\_C1

Excessive noise in one or more gears

Updated November 2022

| Severity  | Intensity | Reliability |
|---|-----------|-------------|
| <b>Problem:</b><br>Clunking noise while turning at low speeds, driveline whine.   |           |             |
| <b>Symptoms:</b><br>Squeaking, rattling, bumping, smells.   |           |             |
| <b>What Should You Do?</b>  |           |             |
| Check clutch pedal adjustment.<br>Test drive vehicle in a circular fashion at low speed.<br>[Impact transmission fluid level]<br>Test drive to establish noises on the clutch side of the transmission.<br>Check clutch fluid level.<br>Test drive vehicle to establish any excessive noise from the transmission in top gear.<br>Test drive vehicle to establish any excessive noise from the transmission in top gear.<br>Results |           |             |
| <b>Score: 10/10</b>   |           |             |

### Manual Transmission Diagnostic Scenario

DSC\_MT04\_C1

Clunking noise when turning at low speeds

Updated November 2022

| Severity  | Intensity | Reliability |
|---|-----------|-------------|
| <b>Problem:</b><br>Squeaking noise, most apparent during low speeds, then other drive cycles.   |           |             |
| <b>Symptoms:</b><br>Vibration through vehicle when moving through the gears at different speeds.  |           |             |
| <b>What Should You Do?</b>  |           |             |
| Identify where to listen for any excessive noise from the driveline.<br>[Impact transmission fluid level]<br>Test drive the vehicle to establish noises on the clutch side of the transmission.<br>Check clutch fluid level.<br>Test drive to establish noises during shifting gears.<br>Test drive vehicle to establish any excessive noise from the transmission in top gear.<br>Check clutch pedal adjustment.<br>Check clutch fluid level.<br>Test drive vehicle on a circular fashion at low speed.<br>Results |           |             |
| <b>Score: 10/10</b>   |           |             |

### Manual Transmission Diagnostic Scenario

DSC\_MT05\_C1

Squeaking noise, most apparent at low speeds.

Updated November 2022

| Severity  | Intensity | Reliability |
|---|-----------|-------------|
| <b>Problem:</b><br>Hard upshifting and downshifting.  |           |             |
| <b>Symptoms:</b><br>Gears grind or clash when shifting.   |           |             |
| <b>What Should You Do?</b>  |           |             |
| Test drive vehicle to establish noises on the clutch side of the transmission.<br>Check clutch fluid level.<br>Test drive vehicle to see if the clutch slips under heavy load.<br>Test drive vehicle to establish any excessive noise from the transmission in top gear.<br>Check clutch fluid level.<br>Test drive vehicle to establish any excessive noise from the direction.<br>Test drive vehicle to establish any excessive noise from the transmission in all gears.<br>[Impact transmission fluid level]<br>Test drive vehicle to see if the clutch slips under heavy load.<br>Test drive vehicle to establish noises during shifting gears.<br>Check clutch pedal adjustment.<br>Results |           |             |
| <b>Score: 10/10</b>   |           |             |

### Manual Transmission Diagnostic Scenario

DSC\_MT06\_C1

Hard upshifting and downshifting.

Updated November 2022

| Severity   | Intensity | Reliability |
|--|-----------|-------------|
| <b>Problem:</b><br>Vehicle makes a growling noise.   |           |             |
| <b>Symptoms:</b><br>Notch from clutch heaving when engine is running in neutral.   |           |             |
| <b>What Should You Do?</b>   |           |             |
| Identify where to listen for any excessive behavior at low speeds.<br>[Impact transmission fluid level]<br>Test drive the vehicle to establish noises on the clutch side of the transmission.<br>Check clutch pedal adjustment.<br>Check clutch fluid level.<br>Test drive vehicle to see if the clutch slips under heavy load.<br>Test drive vehicle to establish any excessive noise from the transmission in top gear.<br>Check clutch pedal adjustment.<br>Results |           |             |
| <b>Score: 10/10</b>  |           |             |

### Manual Transmission Diagnostic Scenario

DSC\_MT07\_C1

Vehicle makes a growling noise.

Updated November 2022

| Severity   | Intensity | Reliability |
|--|-----------|-------------|
| <b>Problem:</b><br>Unusual noise when clutch pedal is depressed.   |           |             |
| <b>Symptoms:</b><br>Notch from clutch heaving when engine is running in neutral.   |           |             |
| <b>What Should You Do?</b>   |           |             |
| Identify where to listen for any excessive behavior at low speeds.<br>[Impact clutch fluid level]<br>Test drive the vehicle to establish noises on the clutch side of the transmission.<br>Check clutch pedal adjustment.<br>Check clutch fluid level.<br>Test drive vehicle to see if the clutch slips under heavy load.<br>Test drive vehicle to establish any excessive noise from the transmission in top gear.<br>Check clutch pedal adjustment.<br>Results |           |             |
| <b>Score: 10/10</b>  |           |             |

### Manual Transmission Diagnostic Scenario

DSC\_MT08\_C1

Unusual noise when clutch pedal is depressed.

Updated November 2022

| Verify   | Identify  | Rectify             |
|--|---|---------------------|
| <b>Problem:</b><br>Vehicle very sluggish when accelerating from a stop. Inertialessly Shifted Transmissions.   | <b>Symptoms:</b><br>Vehicle starts to overheat when accelerating up hills.  |                     |
| <b>What Should You Do?</b><br>Check gear selector linkage for proper adjustments.<br>Inspect condition of transmission mounts.<br>Test drives vehicle for upshifts or downshifts.<br>Test drives vehicle to determine any unusual transmission noises.<br>Check fluid level and conditions.<br>Test drives vehicle for upshifts and downshifts operation on drive.<br>Check gear selector linkage for proper adjustments.<br>Inspect condition of transmission mounts.<br>Test drives vehicle for operation when cold.<br>Test drives vehicle for vehicle performance and drivability.<br><br><b>Results</b> | <b>Objectives:</b><br>Test your automotive knowledge to diagnose and fix the problem without making incorrect choices and causing further damage. Picking the best procedure to verify the vehicle's performance will earn you one point. If you do not pick the best procedure, you may lose points.<br>If you make incorrect choices, you will earn less points. Incorrect choices will cause you to lose points. | <b>Score: 10/10</b> |

### Automatic Transmission Diagnostic Scenario

DSC\_AT01\_C1

Vehicle very sluggish when accelerating from a stop.

Updated November 2022

| Verify  | Identify  | Rectify             |
|---|---|---------------------|
| <b>Problem:</b><br>Delayed engagement when first shifted into drive. Inertia shifts when fluid is cold.   | <b>Symptoms:</b><br>Vehicle starts to overheat when accelerating up hills.  |                     |
| <b>What Should You Do?</b><br>Check gear selector linkage for proper adjustments.<br>Inspect condition of transmission mounts.<br>Test drives vehicle for upshifts or downshifts.<br>Test drives vehicle to determine any unusual transmission noises.<br>Check fluid level and conditions.<br>Test drives vehicle for upshifts and downshifts operation on drive.<br>Check gear selector linkage for proper adjustments.<br>Inspect condition of transmission mounts.<br>Test drives vehicle fully warmed up for initial movement from a standstill and full shifts.<br>Perform converter "wash" test.<br>Test drives vehicle for vehicle performance and drivability.<br><br><b>Results</b> | <b>Objectives:</b><br>Test your automotive knowledge to diagnose and fix the problem without making incorrect choices and causing further damage. Picking the best procedure to verify the vehicle's performance will earn you one point. If you do not pick the best procedure, you may lose points.<br>If you make incorrect choices, you will earn less points. Incorrect choices will cause you to lose points. | <b>Score: 10/10</b> |

### Automatic Transmission Diagnostic Scenario

DSC\_AT02\_C1

Delayed engagement when first shifted into drive when cold.

Updated November 2022

| Verify   | Identify  | Rectify             |
|--|---|---------------------|
| <b>Problem:</b><br>No upshift when driven in drive. Inertialessly Shifted Transmissions.   | <b>Symptoms:</b><br>Vehicle does not upshift on one of positions.   |                     |
| <b>What Should You Do?</b><br>Check gear selector linkage for proper adjustments.<br>Inspect condition of transmission mounts.<br>Test drives vehicle to determine any unusual transmission noises.<br>Check fluid level and conditions.<br>Test drives vehicle for vehicle performance and drivability.<br><br><b>Results</b> | <b>Objectives:</b><br>Test your automotive knowledge to diagnose and fix the problem without making incorrect choices and causing further damage. Picking the best procedure to verify the vehicle's performance will earn you one point. If you do not pick the best procedure, you may lose points.<br>If you make incorrect choices, you will earn less points. Incorrect choices will cause you to lose points. | <b>Score: 10/10</b> |

### Automatic Transmission Diagnostic Scenario

DSC\_AT03\_C1

No upshift when driven in drive.

Updated November 2022

| Verify  | Identify  | Rectify             |
|---|---|---------------------|
| <b>Problem:</b><br>Transmission slips in reverse. Inertialessly Shifted Transmissions.  | <b>Symptoms:</b><br>When driving the vehicle in reverse there appears to be little drive & high engine RPM.   |                     |
| <b>What Should You Do?</b><br>Check gear selector linkage for proper adjustments.<br>Inspect condition of transmission mounts.<br>Test drives vehicle for upshift and downshift operation on drive.<br>Test drives vehicle for operations under initial movements from a standstill and hot starts.<br>Test drives vehicle for vehicle performance and drivability.<br><br><b>Results</b> | <b>Objectives:</b><br>Test your automotive knowledge to diagnose and fix the problem without making incorrect choices and causing further damage. Picking the best procedure to verify the vehicle's performance will earn you one point. If you do not pick the best procedure, you may lose points.<br>If you make incorrect choices, you will earn less points. Incorrect choices will cause you to lose points. | <b>Score: 10/10</b> |

### Automatic Transmission Diagnostic Scenario

DSC\_AT04\_C1

Transmission slips in reverse.

Updated November 2022

| Verify   | Identify  | Rectify             |
|--|---|---------------------|
| <b>Problem:</b><br>Transmission doesn't shift as well as it used to. Inertialessly Shifted Transmissions.  | <b>Symptoms:</b><br>Vehicle seems sluggish between shift changes when driven.   |                     |
| <b>What Should You Do?</b><br>Check gear selector linkage for proper adjustments.<br>Inspect condition of transmission mounts.<br>Test drives vehicle for upshifts or downshifts operation on drive.<br>Test drives vehicle for the separation under initial movements from a standstill and hot starts.<br>Test drives vehicle for operation when cold.<br>Test drives vehicle for vehicle performance and drivability.<br><br><b>Results</b> | <b>Objectives:</b><br>Test your automotive knowledge to diagnose and fix the problem without making incorrect choices and causing further damage. Picking the best procedure to verify the vehicle's performance will earn you one point. If you do not pick the best procedure, you may lose points.<br>If you make incorrect choices, you will earn less points. Incorrect choices will cause you to lose points. | <b>Score: 10/10</b> |

### Automatic Transmission Diagnostic Scenario

DSC\_AT05\_C1

Transmission doesn't shift as well as it used to.

Updated November 2022

| Verify  | Identify  | Rectify             |
|---|---|---------------------|
| <b>Problem:</b><br>Vehicle won't move in any forward or reverse gears. Inertialessly Shifted Transmissions.   | <b>Symptoms:</b><br>Vehicle has no drive in either forward or reverse.  |                     |
| <b>What Should You Do?</b><br>Check gear selector linkage for proper adjustments.<br>Inspect condition of transmission mounts.<br>Test drives vehicle for upshifts and downshifts operation on drive.<br>Test drives vehicle for the separation under initial movements from a standstill and hot starts.<br>Test drives vehicle for operation when cold.<br><br><b>Results</b> | <b>Objectives:</b><br>Test your automotive knowledge to diagnose and fix the problem without making incorrect choices and causing further damage. Picking the best procedure to verify the vehicle's performance will earn you one point. If you do not pick the best procedure, you may lose points.<br>If you make incorrect choices, you will earn less points. Incorrect choices will cause you to lose points. | <b>Score: 10/10</b> |

### Automatic Transmission Diagnostic Scenario

DSC\_AT06\_C1

Vehicle wont move in foward or reverse.

Updated November 2022

| Verify  | Identify  | Rectify             |
|---|---|---------------------|
| <b>Problem:</b><br>Vehicle won't move in any forward or reverse gears. Transmission recently overheated.  | <b>Symptoms:</b><br>Vehicle has no drive in either forward or reverse.  |                     |
| <b>What Should You Do?</b><br>Check gear selector linkage for proper adjustments.<br>Inspect condition of transmission mounts.<br>Test drives vehicle to determine any unusual transmission noises.<br>Check fluid level and conditions.<br>Test drives vehicle for upshifts or downshifts.<br><br><b>Results</b> | <b>Objectives:</b><br>Test your automotive knowledge to diagnose and fix the problem without making incorrect choices and causing further damage. Picking the best procedure to verify the vehicle's performance will earn you one point. If you do not pick the best procedure, you may lose points.<br>If you make incorrect choices, you will earn less points. Incorrect choices will cause you to lose points. | <b>Score: 10/10</b> |

### Automatic Transmission Diagnostic Scenario

DSC\_AT07\_C1

Vehicle wont move in foward or reverse.

Updated November 2022

| Verify   | Identify  | Rectify             |
|--|---|---------------------|
| <b>Problem:</b><br>Vehicle won't move in any forward or reverse. Inertialessly Shifted Transmissions.  | <b>Symptoms:</b><br>Vehicle has no drive in either forward or reverse.  |                     |
| <b>What Should You Do?</b><br>Check gear selector linkage for proper adjustments.<br>Check fluid levels.<br>Check fluid level and conditions.<br>Inspect condition of transmission mounts.<br>Minimum PCM voltages.<br>Test drives vehicle for upshift and downshift operation on drive.<br>Test drives vehicle for operations under initial movements from a standstill and hot starts.<br>Perform converter "wash" test.<br><br><b>Results</b> | <b>Objectives:</b><br>Test your automotive knowledge to diagnose and fix the problem without making incorrect choices and causing further damage. Picking the best procedure to verify the vehicle's performance will earn you one point. If you do not pick the best procedure, you may lose points.<br>If you make incorrect choices, you will earn less points. Incorrect choices will cause you to lose points. | <b>Score: 10/10</b> |

### Automatic Transmission Diagnostic Scenario

DSC\_AT08\_C1

Vehicle wont move in foward or reverse.

Updated November 2022

| Venue   | Intensity | Rarity |
|---|-----------|--------|
| <b>Problem:</b><br>Transmission shift quality problem, after cold start transmission.   |           |        |
| <b>Symptoms:</b><br>Transmission shift quality difference when cold but better when the vehicle warms up.   |           |        |
| <b>What Should You Do?</b>  |           |        |
| Check fault codes.<br>Check fluid level and condition.<br>Check transmission fluid temperature.<br>Check condition of transmission mounts.<br>Test drive vehicle for vehicle performance and drivability.<br>Manually inspect the transmission for fluid leaks and condition of the wiring harnesses.<br>Perform converter "leak" test.<br>Perform transmission pressure tests. |           |        |
| <b>Results:</b>   |           |        |

### Automatic Transmission Diagnostic Scenario

DSC\_AT09\_C1

Transmission shift quality problem when cold.

**Updated November 2022**

| Venue   | Intensity | Rarity |
|---|-----------|--------|
| <b>Problem:</b><br>Transmission shift problems, after cold start transmission.  |           |        |
| <b>Symptoms:</b><br>Transmission shift quality difference when cold but better when the vehicle warms up.   |           |        |
| <b>What Should You Do?</b>  |           |        |
| Measure PCM voltage.<br>Test drive vehicle for vehicle performance and drivability.<br>Manually inspect the transmission for fluid leaks and condition of the wiring harnesses.<br>Perform converter "leak" test.<br>Perform transmission pressure tests. |           |        |
| <b>Results:</b>   |           |        |

### Automatic Transmission Diagnostic Scenario

DSC\_AT10\_C1

Transmission shift problem, only one forward gear.

**Updated November 2022**

| Venue  | Intensity | Rarity |
|--|-----------|--------|
| <b>Problem:</b><br>Lack of cooling.  |           |        |
| <b>Symptoms:</b><br>Vehicle overheating, AC compressor area.   |           |        |
| <b>What Should You Do?</b>   |           |        |
| Check the A/C electrical system switching devices.<br>Perform a visual inspection.<br>Check the A/C compressor drive devices.<br>Check the A/C pipe system components for mechanical security.<br>Performance test the A/C system.<br>Check cabin mechanical devices.<br>Check condition of any air-flow filter devices.<br>Check the main A/C operating components. |           |        |
| <b>Results:</b>  |           |        |

### HVAC Diagnostic Scenario

DSC\_HA01\_C1

Lack of cooling 1.

**Updated November 2022**

| Venue   | Intensity | Rarity |
|---|-----------|--------|
| <b>Problem:</b><br>Lack of cooling.   |           |        |
| <b>Symptoms:</b><br>Vehicle overheating on hot days.  |           |        |
| <b>What Should You Do?</b>  |           |        |
| Performance test the A/C system.<br>Check cabin mechanical devices.<br>Check condition of any surface filter devices.<br>Check the main A/C operating components.<br>Check the A/C electrical system switching devices.<br>Perform a visual inspection.<br>Check the A/C compressor drive devices.<br>Check the A/C pipe system components for mechanical security. |           |        |
| <b>Results:</b>   |           |        |

### HVAC Diagnostic Scenario

DSC\_HA02\_C1

Lack of cooling 2.

**Updated November 2022**

| Venue   | Intensity | Rarity |
|---|-----------|--------|
| <b>Problem:</b><br>Lack of cooling.   |           |        |
| <b>Symptoms:</b><br>Noise from A/C compressor area.   |           |        |
| <b>What Should You Do?</b>  |           |        |
| Check the A/C compressor drive devices.<br>Check the A/C pipe system components for mechanical security.<br>Performance test the A/C system.<br>Check cabin mechanical devices.<br>Check condition of any airflow filter devices.<br>Check the main A/C operating components.<br>Check the A/C electrical system switching devices.<br>Perform a visual inspection. |           |        |
| <b>Results:</b>   |           |        |

### Automatic Transmission Diagnostic Scenario

DSC\_HA03\_C1

Lack of cooling 3.

**Updated November 2022**

| Venue  | Intensity | Rarity |
|--|-----------|--------|
| <b>Problem:</b><br>Lack of cooling.  |           |        |
| <b>Symptoms:</b><br>Error message on climate display: Compressor cycles normally.  |           |        |
| <b>What Should You Do?</b>   |           |        |
| Check the A/C pipe system components for mechanical security.<br>Performance test the A/C system.<br>Check the relative temperature of A/C pipes and hoses in the engine compartment.<br>Check condition of any airflow filter devices.<br>Check the main A/C operating components.<br>Check the A/C electrical system switching devices.<br>Perform a visual inspection.<br>Check the A/C compressor drive devices. |           |        |
| <b>Results:</b>  |           |        |

### Automatic Transmission Diagnostic Scenario

DSC\_HA04\_C1

Lack of cooling 4.

**Updated November 2022**

| Venue   | Intensity | Rarity |
|---|-----------|--------|
| <b>Problem:</b><br>Lack of cooling.   |           |        |
| <b>Symptoms:</b><br>Error message on climate display.   |           |        |
| <b>What Should You Do?</b>  |           |        |
| Check the main A/C operating components.<br>Check the relative temperature of A/C pipes and hoses in the engine compartment.<br>Perform a visual inspection.<br>Check the A/C compressor drive devices.<br>Check the A/C pipe system components for mechanical security.<br>Performance test the A/C system.<br>Check cabin mechanical devices.<br>Check condition of any airflow filter devices. |           |        |
| <b>Results:</b>   |           |        |

### HVAC Diagnostic Scenario

DSC\_HA05\_C1

Lack of cooling 5.

**Updated November 2022**

| Venue  | Intensity | Rarity |
|--|-----------|--------|
| <b>Problem:</b><br>Lack of cooling.  |           |        |
| <b>Symptoms:</b><br>Lock of air flow into passenger compartment.   |           |        |
| <b>What Should You Do?</b>   |           |        |
| Check the A/C pipe system components for mechanical security.<br>Performance test the A/C system.<br>Check cabin mechanical devices.<br>Check the main A/C operating components.<br>Check the relative temperature of A/C pipes and hoses in the engine compartment.<br>Check the A/C electrical system switching devices.<br>Perform a visual inspection. |           |        |
| <b>Results:</b>  |           |        |

### HVAC Diagnostic Scenario

DSC\_HA06\_C1

Lack of cooling 6.

**Updated November 2022**

| Verify   | Identify            | Resolve |
|--|---------------------|---------|
| <b>Problem:</b><br>Unusual noise.<br><b>Symptoms:</b><br>Normal.<br><b>What Should You Do?</b><br>Use your automotive knowledge<br>to identify the cause of the noise without making incorrect choices.<br>Perform a visual inspection.<br>Check the relative temperature of A/C pipes and hoses in the engine compartment.<br>Check the A/C pipe system components for mechanical security.<br>Performance test the A/C system.<br>Check cabin mechanical devices.<br>Check condition of any airflow filter devices.<br><b>Results:</b> | <b>Score: 10/10</b> |         |

### Automatic Transmission Diagnostic Scenario

DSC\_HA07\_C1

Lack of cooling 7.

Updated November 2022

| Verify  | Identify            | Resolve |
|---|---------------------|---------|
| <b>Problem:</b><br>Unusual knocking noise when A/C is enabled.<br><b>Symptoms:</b><br>Poor A/C cooling.<br><b>What Should You Do?</b><br>Use your automotive knowledge<br>to identify the cause of the noise without making incorrect choices.<br>Perform a visual inspection.<br>Check the relative temperature of A/C pipes and hoses in the engine compartment.<br>Check the A/C pipe system components for mechanical security.<br>Performance test the A/C system.<br>Check cabin mechanical devices.<br>Check condition of any airflow filter devices.<br><b>Results:</b> | <b>Score: 10/10</b> |         |

### Automatic Transmission Diagnostic Scenario

DSC\_HA08\_C1

Unusual noise 1.

Updated November 2022

| Verify   | Identify            | Resolve |
|--|---------------------|---------|
| <b>Problem:</b><br>Poor cooling.<br><b>Symptoms:</b><br>Poor performance of A/C system.<br><b>What Should You Do?</b><br>Use your automotive knowledge<br>to identify the cause of the noise without making incorrect choices.<br>Perform a visual inspection.<br>Check the A/C compressor drive devices.<br>Check the A/C pipe system components for mechanical security.<br>Performance test the A/C system.<br>Check cabin mechanical devices.<br><b>Results:</b> | <b>Score: 10/10</b> |         |

### HVAC Diagnostic Scenario

DSC\_HA09\_C1

Unusual noise 1.

Updated November 2022

| Verify   | Identify            | Resolve |
|--|---------------------|---------|
| <b>Problem:</b><br>Poor cooling.<br><b>Symptoms:</b><br>Normal.<br><b>What Should You Do?</b><br>Use your automotive knowledge<br>to identify the cause of the noise without making incorrect choices.<br>Perform a visual inspection.<br>Check the A/C compressor drive devices.<br>Check the relative temperature of A/C pipes and hoses in the engine compartment.<br>Check the A/C pipe system components for mechanical security.<br>Performance test the A/C system.<br>Check cabin mechanical devices.<br><b>Results:</b> | <b>Score: 10/10</b> |         |

### HVAC Diagnostic Scenario

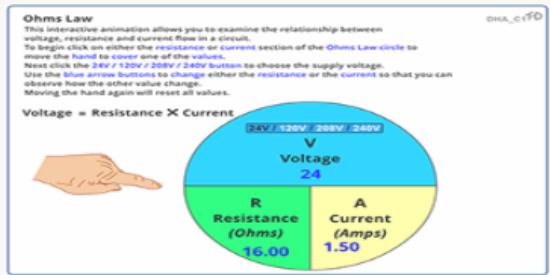
DSC\_HA10\_C1

Unusual noise 3.

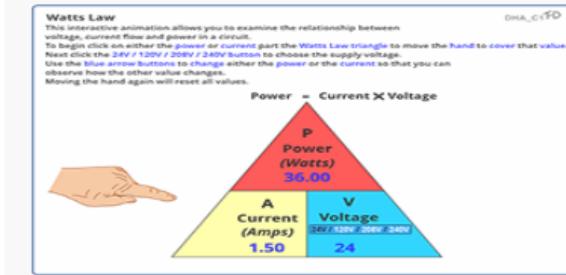
Updated November 2022

# DHA Series

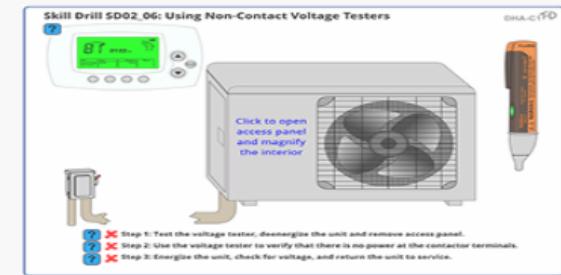
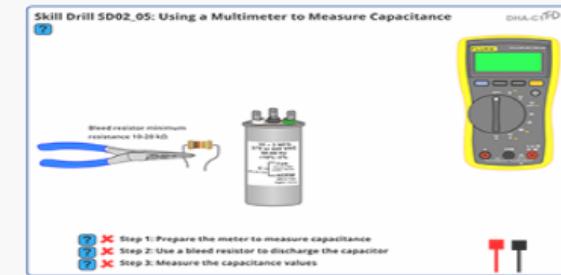
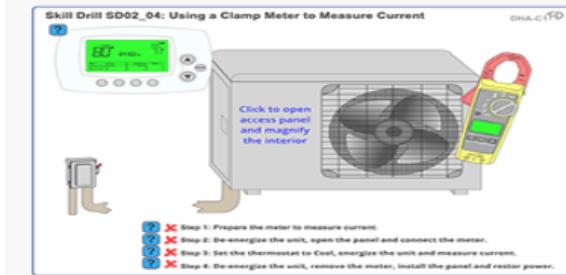
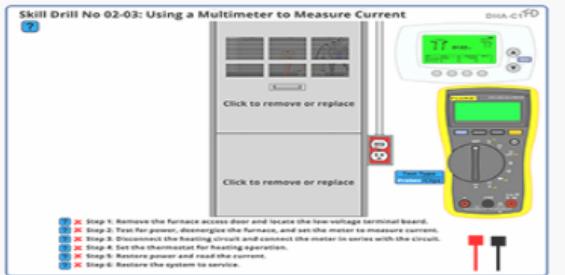
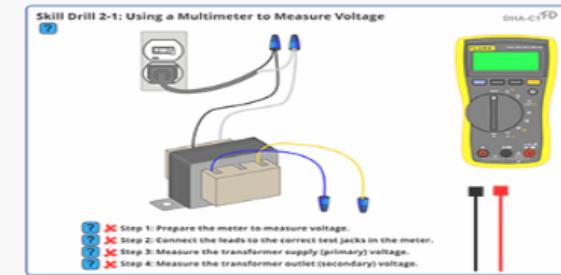
# Electricity for HVACR Technicians



Description  
Updated November 2022



Description  
Updated November 2022



**Skill Drill SD04\_01: Calculate Voltage in a Series Circuit** DHA-C1FD

In a series DC circuit, there is a voltage applied to the circuit and four total resistances of  $9\ \Omega$ . What is the current flow through the circuit?

Step 1  
Click on the generate circuit button above to generate a new set of circuit values.  
Use the proper arrangement of Ohm's law, with voltage alone on one side of the equation:  
 $E = I \times R$

Step 2  
Current, voltage, and resistance values are given.  
Subtract the voltage from one side of the equation:  
 $E = 10V - 9\ \Omega \times I$

Step 3  
Divide the two sides to calculate the voltage across the load:  
 $E = 1.00\ V - 9\ \Omega \times I$

Instructions:  
Click on the generate circuit button above to generate a new set of circuit values.  
Use the proper arrangement of Ohm's law formula to calculate the current flow (Anamp) through the circuit.  
Remember to use the formula  $I = E / R$  to calculate the current flow through the circuit.  
Click on the Check Answer button to verify your answer.  
If you do not have a calculator handy use the Ohm's Law Current Calculator on the right.

Answer Field:  Check Answer

## SD04-01 Calculate Voltage in a Series Circuit

DHA\_SD04\_01\_C1

Description

Updated November 2022

**Skill Drill SD04\_02: Calculate Current in a Series Circuit** DHA-C1FD

In a series DC circuit that has a voltage applied to the circuit and four total resistances of  $250\ \Omega$ . What is the current flow through the circuit?

Step 1  
Click on the generate circuit button above to generate a new set of circuit values.  
Use the proper arrangement of Ohm's law, with current alone on one side of the equation:  
 $I = E / R$

Step 2  
Subtract the voltage and resistance values from the equation:  
 $I = 9\text{ VDC} - 250\ \Omega$

Instructions:  
Click on the generate circuit button above to generate a new set of circuit values.  
Use the proper arrangement of Ohm's law formula to calculate the current flow (Anamp) through the circuit.  
Remember to use the formula  $I = E / R$  to calculate the current flow through the circuit.  
Click on the Check Answer button to verify your answer.  
If you do not have a calculator handy use the Ohm's Law Current Calculator on the right.

Answer Field:  Check Answer

## SD04-02 Calculate Current in a Series Circuit

DHA\_SD04\_02\_C1

Description

Updated November 2022

**Skill Drill SD04\_03: Calculate Resistance in a Series Circuit** DHA-C1FD

In a series DC circuit that has a voltage applied to the circuit and four total resistances of  $36\ \Omega$ . What is the total resistance of the load in the circuit?

Step 1  
Click on the generate circuit button above to generate a new set of circuit values.  
Use the proper arrangement of Ohm's law, with current alone on one side of the equation:  
 $R = E / I$

Step 2  
Subtract the voltage and resistance values from the equation:  
 $R = 36\ \Omega$

Instructions:  
Click on the generate circuit button above to generate a new set of circuit values.  
Use the proper arrangement of Ohm's law formula to calculate the resistance of the load in the circuit.  
Remember to use the formula  $R = E / I$  to calculate the total resistance of the load through the circuit.  
Click on the Check Answer button to verify your answer.  
If you do not have a calculator handy use the Ohm's Law Resistance Calculator on the right.

Answer Field:  Check Answer

## SD04-03 Calculate Resistance in a Series Circuit

DHA\_SD04\_03\_C1

Description

Updated November 2022

**Skill Drill SD04\_04: Calculate Total Resistance in a Parallel Circuit** DHA-C1FD

In a parallel DC circuit with four different resistance values, what is the total resistance of the load in the circuit?

Step 1  
Click on the generate circuit button above to generate a new set of circuit values.  
Use the proper arrangement of Ohm's law, with voltage alone on one side of the equation:  
 $\frac{1}{R_{T}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}$

Step 2  
Divide the reciprocal of each resistance value:  
 $\frac{1}{R_{T}} = \frac{1}{20\ \Omega} + \frac{1}{30\ \Omega} + \frac{1}{40\ \Omega} + \frac{1}{50\ \Omega}$

Instructions:  
Click on the generate circuit button above to generate a new set of circuit values.  
Use the proper arrangement of Ohm's law to calculate the total resistance of the load in the circuit.  
Remember to use the formula  $\frac{1}{R_{T}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}$  to calculate the total resistance of the load through the circuit.  
Click on the Check Answer button to verify your answer.  
If you do not have a calculator handy use the Parallel Resistance Calculator on the right.

Answer Field:  Check Answer

## SD04-04 Calculate Total Resistance in a Parallel Circuit

DHA\_SD04\_04\_C1

Description

Updated November 2022

**Skill Drill SD04\_05: Calculate Total Current Flow in a Parallel Circuit** DHA-C1FD

In a parallel DC circuit that has a total current flow of  $12.50\text{ A}$  in the circuit and six total resistances of  $9.6\ \Omega$ . What is the total voltage applied to the circuit?

Step 1  
Click on the generate circuit button above to generate a new set of circuit values.  
Use the proper arrangement of Ohm's law, with current alone on one side of the equation:  
 $I = E / R$

Step 2  
Divide the current by the resistance to calculate the current through the circuit:  
 $I = 12\text{ VDC} / 9.6\ \Omega$

Instructions:  
Click on the generate circuit button above to generate a new set of circuit values.  
Use a calculator to determine the total resistance.  
Use a calculator to determine the total current.  
Remember to use the formula  $I = E / R$  to calculate the current through the circuit.  
Click on the Check Answer button to verify your answer.  
If you do not have a calculator handy use the Parallel Resistance Calculator on the right.

Answer Field:  Check Answer

## SD04-05 Calculate Total Current in a Parallel Circuit

DHA\_SD04\_05\_C1

Description

Updated November 2022

**Skill Drill SD04\_06: Calculate Supply Voltage in a Parallel Circuit** DHA-C1FD

In a parallel DC circuit that has a total current flow of  $1.25\text{ A}$  in the circuit and six total resistances of  $12\ \Omega$ . What is the total voltage applied to the circuit?

Step 1  
Click on the generate circuit button above to generate a new set of circuit values.  
Use the proper arrangement of Ohm's law, with current alone on one side of the equation:  
 $E = I \times R$

Step 2  
Multiply the total resistance and subtract the current and resistance values into the equation:  
 $E = 1.25\text{ A} \times 12\ \Omega$

Instructions:  
Click on the generate circuit button above to generate a new set of circuit values.  
Use a calculator to determine the total resistance.  
Use a calculator to determine the total current.  
Remember to use the formula  $E = I \times R$  to calculate the voltage applied to the circuit.  
Click on the Check Answer button to verify your answer.  
If you do not have a calculator handy use the Parallel Resistance Calculator on the right.

Answer Field:  Check Answer

## SD04-06 Calculate Supply Voltage in a Parallel Circuit

DHA\_SD04\_06\_C1

Description

Updated November 2022

**Skill Drill SD05\_01: Locking Out an HVACR Unit** DHA-C1FD

Notify Relevant Parties

- Electrical Utility
- Home Owner
- Contractor
- Building Manager
- Work Colleagues on Site
- 60 Minutes
- Gas Company
- The Local Mayor's Office

**Safe Equipment**  
Click on the lock icon to lock the equipment safely to prevent unauthorized access.

**Power Requirements**

- Notify relevant parties and shut down equipment.
- Verify all voltage is present to condensing unit.
- Verify no voltage is present to power and neutral wires.
- Verify no voltage is present in the inline unit.

**Power Requirements**

- Notify relevant parties and shut down equipment.
- Refer to Table 210.10(D)(2) in the current NEC® Handbook and identify the voltage for copper conductors.
- Identify and record which wire size is required.
- Verify the conductor is a minimum of 12 AWG.
- Verify the conductor is a minimum of 12 AWG and has the correct ampacity for the equipment.

## SD05-01 Locking Out an HVACR Unit

DHA\_SD05\_01\_C1

Description

Updated November 2022

**Skill Drill SD06\_01: Selecting Correct Wire Size Based on Ampacity** DHA-C1FD

Steps to Choose the Correct Wire Size

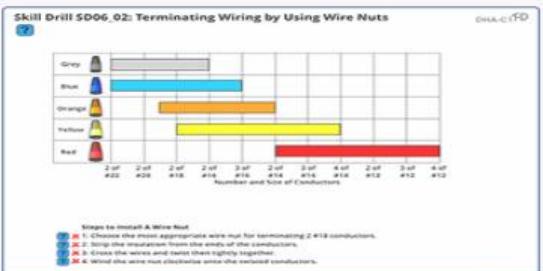
1. Notify relevant parties and record the amperage value in the Notes area.
2. Refer to Table 210.10(D)(2) in the current NEC® Handbook and identify the voltage for copper conductors.
3. Identify and record which wire size is required.
4. Verify the conductor is a minimum of 12 AWG.
5. Verify the conductor is a minimum of 12 AWG and has the correct ampacity for the equipment.

## SD06-01 Selecting Correct Wire Size based on Ampacity

DHA\_SD06\_01\_C1

Description

Updated November 2022



### SD06-02 Terminating Wiring by Using Wire Nuts

DHA\_SD06\_02\_C1

Description

Updated November 2022

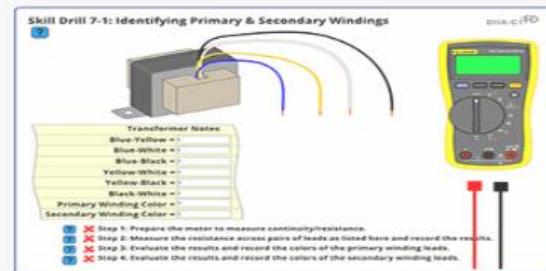


### SD06-02 Terminating Wiring by Using Common Crimp Connectors

DHA\_SD06\_03\_C1

Description

Updated November 2022

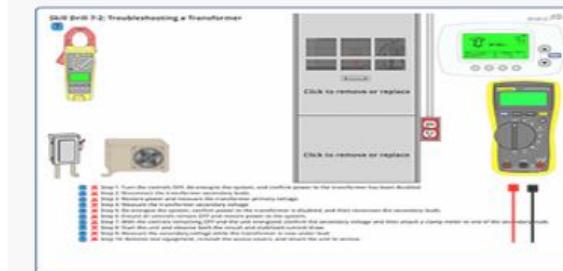


### SD07-01 Identifying Primary and Secondary Windings

DHA\_SD07\_01\_C1

Description

Updated November 2022



### SD07-02 Troubleshooting a Transformer

DHA\_SD07\_02\_C1

Description

Updated November 2022



### SD08-02 Troubleshooting a Relay

DHA\_SD08\_02\_C1

Description

Updated November 2022

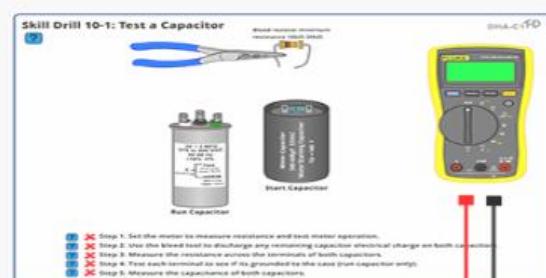


### SD09-02 Troubleshooting a Contactor

DHA\_SD09\_02\_C1

Description

Updated November 2022



### SD10-01 Test a Capacitor

DHA\_SD10\_01\_C1

Description

Updated November 2022

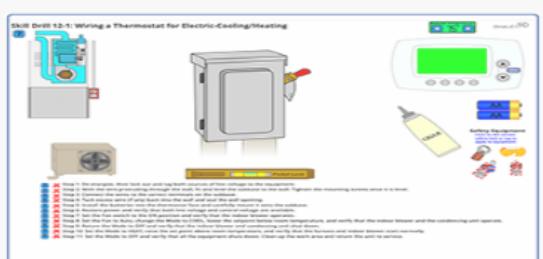


### SD11-01 Troubleshooting Solid State Control Device

DHA\_SD11\_01\_C1

Description

Updated November 2022

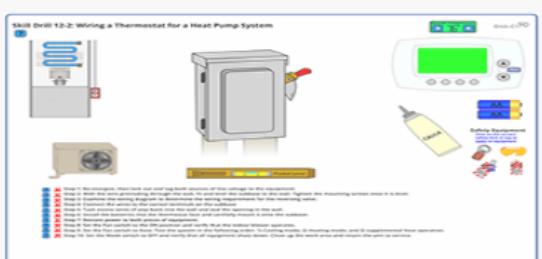


### SD12-01 Wiring a Thermostat for Electric-Cooling/Heating

DHA\_SD12\_01\_C1

Description

Updated November 2022

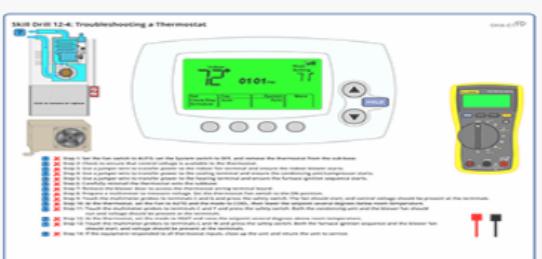


### SD12-01 Wiring a Thermostat for a Heat Pump System

DHA\_SD12\_02\_C1

Description

Updated November 2022

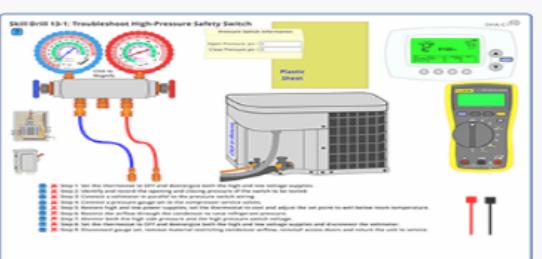


### SD12-04 Troubleshooting a Thermostat

DHA\_SD12\_04\_C1

Description

Updated November 2022

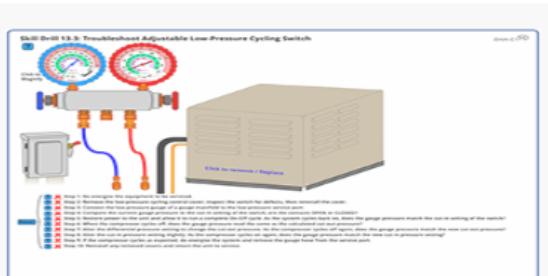


### SD13-01 Troubleshooting High Pressure Safety Switch

DHA\_SD13\_01\_C1

Description

Updated November 2022



### SD13-03 Troubleshooting Adjustable Low-Pressure Cycling Switch

DHA\_SD13\_03\_C1

Description

Updated November 2022

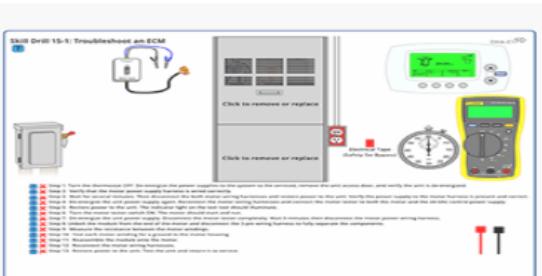


### SD14-01 Troubleshooting Single Phase Motor

DHA\_SD14\_01\_C1

Description

Updated November 2022

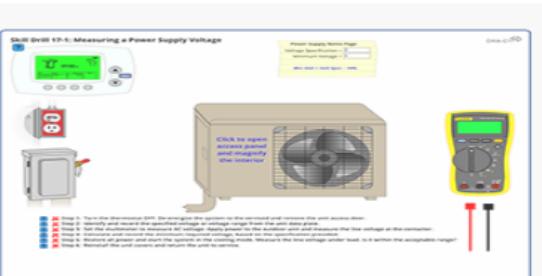


### SD15-01 Troubleshooting an ECM

DHA\_SD15\_01\_C1

Description

Updated November 2022

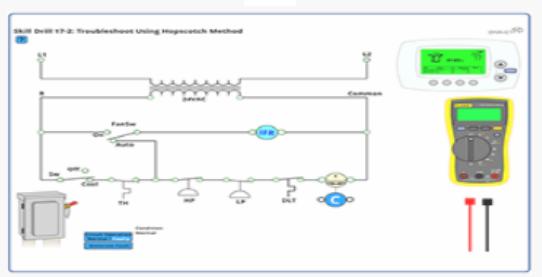


### SD17-01 Measuring a Power Supply Voltage

DHA\_SD17\_01\_C1

Description

Updated November 2022



### SD17-02 Troubleshoot Using Hopscotch Method

DHA\_SD17\_02\_C1

Description

Updated November 2022