MODULE CONTENT

MODULE CONTENT

| Unit of Competency | **DIAGNOSE AND REPAIR STARTING SYSTEM** |
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| Module Title | **DIAGNOSING AND REPAIRING STARTING SYSTEM** |
| Module Descriptor | This unit covers the knowledge, skills and attitudes required to diagnose and repair starting system and its component. |
| Nominal Duration | **hours** |
| Summary of the Learning Outcomes: | |
| Upon completion of this module the student must be able to: | |
| LO1. Prepare to diagnose and repair starting system | |
| LO2. Diagnose starting system | |
| LO3. Repair starting system | |
| LO4. Complete work processes | |

**LEARNING EXPERIENCES**

**LEARNING OUTCOMES NO. 3**

**REPAIR STARTING SYSTEM**

| **Learning Activities** | **Special Instructions** |
| --- | --- |
| Read Information Sheet 3.1-1 Repair starting system | If you have some problem with the content of the information sheet don’t hesitate to approach your Trainer.  If you feel that you are now knowledgeable on the content of the information sheet, you can now answer the self-check provided in the module. |
| Answer Self-Check 3.1-1 on Repair starting system | Try to answer the Self-check without looking at the Answer Key  Compare your answer to Answer Key 3.1-1 |
| Observe Trainer’s demonstration on Task Sheet 3.1-1 on Repair starting system | Listen carefully and attentively so that you may be able to perform a task correctly  Ask questions if are in doubt for clarification |
| Perform the Task Sheet 3.1-1 on Repair starting system | Remember the step-by-step procedure of the Repair starting system |
| Evaluate the performance using the Performance Criteria Checklist 3.1-1 | Repeat the task in case fail to meet the criteria |

**INFORMATION SHEET 1.1-1**

**REPAIR STARTING SYSTEM**

**Learning Objectives:**

After reading this **Information Sheet**, you must be able to:

1. Inspection of starter motor components operation
2. Repair and replacement of starter motor
3. Inspection and repair of starting system circuit

**STARTING SYSTEM**

**Removing the Starter Motor**

If you testing indicates that the starter must be removed, the first step is to disconnect the negative cable at the battery and wrap the clamp with the electrical tape. It may be necessary to place the vehicle on a lift to gain access to the starter. Before lifting the vehicle, disconnect all wires fasteners, and so on that can be reached from under the hood.

Disconnect the wires leading to the solenoid terminals. To avoid confusion when reinstalling the starter, it is wise to mark the wires so they can reinstall on their correct terminals.

On some vehicles you may need to disconnect the exhaust system to be able to remove the starter. Loosen the starter mounting bolts and remove all but one. Support the starter out and away from the flywheel. Once the starter is free, remove the last bolt and the starter.

Once the starter is out, inspect the starter drive pinion gear and the flywheel ring gear **(Figure 18-25).** When the teeth of the starter drive are abnormally worn, make sure you inspect the entire circumference of the flywheel. If the starter drive or the flywheel ring gear show sighs of wear or damage, they must be replaced.

**Figure 18-25** Starter drive and flywheel ring gear wear patterns.

Reverse the procedure to install the starter. Make sure all electrical connections are tight. If you are installing a new or manufactured starter, sand away the paint at the mounting point before install it. Also, make sure you have a good hold on the starter while installing it.

Many General Motors starters use shims between the starter and the mounting pad **(Figure 18-26).** To check this clearance, install the starter and insert a flat blade screwdriver into the access slot on the side of the drive housing. Pry the drive pinion gear into the engaged position. Use a wire feeler gauge or a piece of 0.020-inch (.5080-mm) diameter wire to check the clearance between the gears **(Figure 18-27).**

**Figure 18-26** Shimming the starter to obtain proper pinion-to-ring gear clearance.

**Figure 18-27** Checking the clearance between the pinion gear and the ring gear.

If the clearance between the two gears is incorrect shims will need to be added or subtracted to bring the clearance within specs. If the clearance is excessive, the starter will produce a high-pitched whine while it is cranking the engine. If the clearance is too small, the starter will make a high-pitched whine after the engine starts and the ignition switch is returned to the RUN position.

**Free Speed (No-Load) Test**

Every starter should be bench tested after it is removed and before it is installed. To conduct a free speed or no load test on a starter, follow these steps:

**PROCEDURE**

**Free Speed or No-Load Test**

**STEP 1** *Clamp the starter firmly in a bench vise.*

**STEP 2** *Connect an ammeter to the battery cable and the starter to a battery. This should cause the motor to run.*

**STEP 3***Check current draw and motor speed and compare them to specifications. If they meet specs when the battery has at least 11.5 volts, the starter is working properly.*

If the current draw was excessive or the motor speed too low, the excessive physical resistance, which be caused by worn bushing or bearings, a shorted armature, shorted field windings or bent armature.

If the was no current draw and the starter did not rotate the problem could be caused by open field windings, open armature coils, broken brushed, or broken brush springs.

Low armature speed with low current draw indicates excessive resistance. There may be a poor connection between the commutator and the brushes, or the connections to the starter are bad. If the speed and current draw are both high, check for a shorted field winding.

| **Operation Sheet**  **No. 1** | **Unit** | **Service Starting Systems** |
| --- | --- | --- |
| **Module** | **Servicing Starting Systems** |

**LO1**: **Test systems/components and identify faults**

**VOLTAGE DROP TESTING OF A STARTER CIRCUIT**

The tools required to measure the voltage Connect the positive lead of the meter to

drop at various points within the starter the positive battery post. If at all possible

circuit are fender covers, a DMM, and a do not connect it to the battery clamp.

remote starter switch.

Connect the negative lead to the main Set the voltmeter to the scale that is close

battery connection at the starter. to, but greater than, battery voltage.

Disable the ignition and/or connect a remote Crank the engine and read the voltmeter.

starter switch. This reading shows the voltage drop on the

positive side of the starter circuit.

This reading showed excessive resistance in Crank the engine and observe drop the

the circuit. To locate the resistance, move the reading on the meter. This is the voltage

meter’s negative lead to the next location drop across the positive circuit from the

toward the battery. In this case it is the battery to the output of the relay.

starter side of the starter relay

There is still too much voltage drop, so we Crank the engine and observe the reading

continue test by moving the negative lead on the meter. This is the voltage drop a

to the battery side of the relay. across the cable from the battery to the

relay. Notice that hardly any voltage was

dropped. This cable is okay.

Now connect the meter across the relay Ignore any voltage reading you may have

with the red lead on the battery side and at this point.

black lead on the starter side.

Crank the engine and observe the reading

on The reading was higher than normal;

the meter.

This voltage drop across the contact therefore the starter relay has high

inside the relay. resistance and needs to be replaced.