MODULE CONTENT

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| Unit of Competency | **DIAGNOSE AND REPAIR IGNITION SYSTEM** |
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| Module Title | **DIAGNOSING AND REPAIRING IGNITION SYSTEM** |
| Module Descriptor | This unit covers the knowledge, skills and attitudes required to basic diagnosing and repairing the ignition system such as ignition switch, spark plug, high tension wires/cables cables/ignition coil, and distributor. |
| 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 ignition system | |
| LO2. Diagnose ignition system | |
| LO3. Repair ignition system | |
| LO4. Complete work processes | |

**LEARNING EXPERIENCES**

**LEARNING OUTCOMES NO. 3**

**REPAIR IGNITION SYSTEM**

| **Learning Activities** | **Special Instructions** |
| --- | --- |
| Read Information Sheet 3.1-1 Repair ignition 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 ignition 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 ignition 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 ignition system | Remember the step-by-step procedure of the Repair ignition 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**

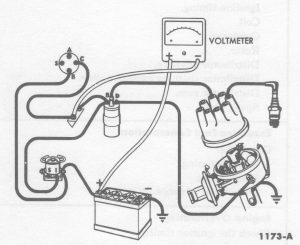
**REPAIR IGNITION SYSTEM**

**Learning Objectives:**

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

1. Performed ignition system inspection.
2. Compared inspection results.
3. Identified faults.
4. Determined causes of faults.
5. Reported findings and recommendations for necessary repairs or adjustments.
6. Applied safety practices.

BATTERY TO COIL TEST



FFig. 02: battery to resistor test

Connect the negative lead of a voltmeter to the battery terminal of the resistor and the positive lead to the positive terminal of the battery (Fig. 2). If the voltage drop is 0.2 volts or less, the primary circuit from the battery to the coil is satisfactory.

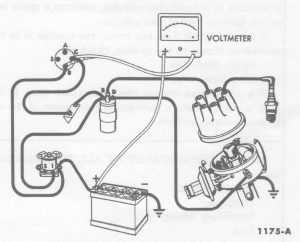


Fig. 03: battery to switch test

If the voltage drop exceeds this limit, leave the positive lead of the voltmeter connected to the positive terminal of the battery and touch the voltmeter negative lead to the coil terminal of the ignition switch (Fig. 3). If there is no change in the reading, the circuit is satisfactory. Next, touch the voltmeter negative lead to the battery terminal of the ignition switch (Fig. 3). If the reading drops there is excessive resistance in the switch.

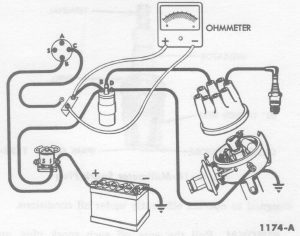


Fig. 04: resistor test

Check the primary resistor by connecting an ohmmeter across its terminals (Fig. 4). Disconnect the battery wire at the resistor to prevent damage to the ohmmeter. The specified resistance is 1.3-1.4 ohms. If the reading is over or under this limit replace the resistor.

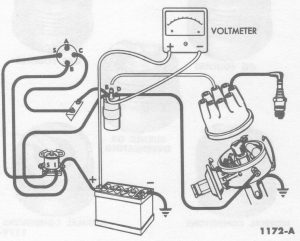


Fig. 05: starting ignition circuit test

Check the resistance in the starting ignition circuit by connecting the voltmeter positive lead to the positive terminal of the battery and the negative lead to the battery terminal of the coil (Fig. 5). Disconnect the high-tension lead at the coil and Crank the engine while observing the voltage drop. It should not exceed 0.1 volt. If the voltage drop is excessive, clean and tighten the terminals or replace wiring as necessary.

BATTERY TO GROUND TEST

Connect the positive lead of the voltmeter to the distributor terminal of the coil, and the negative lead to ground. The voltage drop should not exceed 0.1 volt. If the voltage drop is excessive, test the voltage drop of each of the following:

Coil to distributor wire.

Distributor primary terminal and the movable breaker point.

The movable breaker point and the breaker plate.

The breaker plate and the distributor housing.

The distributor housing and engine ground.

Spark Intensity

Disconnect one spark plug wire at a time and install a terminal adapter in the wire terminal. Hold the adapter approximately %6 inch from the exhaust manifold and crank the engine. The spark should jump the gap regularly.

If the spark intensity of all leads is satisfactory, the coil, condenser, rotor, distributor cap, and the high-tension cables are probably satisfactory.

If the spark is good at only some leads, perform a high resistance test of the faulty leads.

If the spark is equal at all leads, but weak or intermittent, make a high resistance check of the coil, distributor cap, and the coil to distributor high-tension lead. Follow the instructions of the test set manufacturer when making the test.

Coil

Coil tests can be made with the coil installed on the engine or on a test set. The coil tests include coil heat, secondary continuity, and coil capacity.

A coil may break down after it has reached operating temperature; therefore, a coil heat test is made to test the coil at operating temperature. The coil secondary continuity test is performed to test the coil secondary windings for high resistance. The coil capacity test is made to determine the condition of the windings of the coil.

Perform all tests following the instructions of the test set manufacturer.

REMOVAL

Disconnect the high-tension lead and the primary leads from the coil. Remove the coil mounting screws and remove the coil. If necessary, disconnect the resistor wires and remove the resistor.

INSTALLATION

Place the coil and resistor in position and install the mounting screws. Insert the high-tension lead into the coil socket. Push the weather seal tight against the socket. Connect the primary wires to the coil and resistor. Be sure the wires are properly installed.

Resistor

The resistor is checked for excessive resistance as previously explained under “Battery To Coil Test.”

Spark Plugs

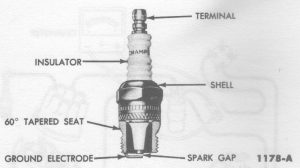


Fig. 06: 18mm spark plug

An 18-millimeter spark plug (Fig. 6) is used in all engines. This plug does not require a gasket and is designed to operate efficiently under all conditions.

REMOVAL

Pull the wire off each spark plug, and clean the area around each spark plug with compressed air, then remove the plugs.

CLEANING AND INSPECTION

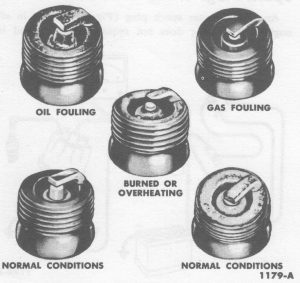


Fig. 07: visual inspection spark plugs

Examine the firing ends of the plugs, noting the type of deposits and the degree of electrode erosion. The various types of spark plug fouling and the normal condition of the spark plug after usage is shown in Fig. 7.

Oil fouling (Fig. 7) is usually identified by wet, sludgy deposits. These are traceable to excessive oil entering the combustion chamber through worn rings and pistons, excessive clearance between the valve guides and stems, or worn or loose bearings.

Gas fouling (Fig. 7) is usually identified by dry, black, fluffy deposits, which result from incomplete combustion. Too rich a fuel-air mixture can cause incomplete burning. In addition, a defective coil, defective breaker points, or a defective ignition cable can reduce the voltage supplied to the spark plug and cause misfiring.

Burned or overheated spark plugs (Fig. 7) are usually identified by a white, burned, or blistered insulator nose and badly eroded electrodes. Inefficient engine cooling, improper ignition timing, the wrong type of fuel, or loose spark plugs can cause general overheating.

Normal conditions (Fig. 7 left) where regular or unleaded gasolines have been used are usually identified by a rusty-brown to grayish-tan, powdery deposit and minor electrode erosion, indicating proper ignition and combustion conditions.

Normal conditions (Fig. 7 right) where highly leaded gasolines have been used are usually identified by white, powdery deposits. If the spark plugs are cleaned at recommended intervals and normal service conditions are encountered, these deposits have little effect on plug performance. However, prolonged high-speed, high load operation will fuse these deposits to form a yellowish glaze. At high temperatures, this glaze may be conductive, resulting in spark plug “missing” or fouling.

Clean the plugs on a sand blast cleaner, following the manufacturer’s instructions. Do not prolong the use of the abrasive blast as it will wear the insulator. Remove carbon and other deposits from the threads with a stiff wire brush. These threads are the means of carrying the heat away from the plug. Any deposits will retard the heat flow from the plug to the cylinder head, causing spark plug overheating and pre-ignition.

Clean the electrode surface with a small file. Dress the electrodes to secure flat parallel surfaces on both the center and side electrode. Do not file the ground electrode too thin as pre-ignition may result.

After cleaning, examine the plug carefully for cracked or broken insulators, badly pitted electrodes, or other signs of failure. Replace as required.

ADJUSTMENT

Set the spark plug gap (0.032-0.036 inch) by bending the ground electrode.

TESTING

Set the gap, then test the plugs on a testing machine. Compare the sparking efficiency of the cleaned and regapped plug with a new plug. Replace the plug if it fails to meet requirements.

Test the plugs for compression leakage at the insulator seal. Apply a coating of oil to the shoulder of the plug where the insulator projects through the shell, and to the top of the plug, where the center electrode and terminal project from the insulator. Place the plug under pressure. Leakage is indicated by air bubbling through the oil. If the test indicates compression leakage, replace the plug. If the plug is satisfactory, wipe it clean.

INSTALLATION

Clean the area around the spark plug port to insure proper seating of the plug. Install the plugs, then tighten each plug to 15-20 foot-poundf torque.

High Tension (Secondary) Wires

The high tension wires include the wires connecting the distributor cap to the spark plugs and the wire connecting the center terminal of the distributor cap to the center terminal of the ignition coil.

At regular intervals, clean and inspect the wires for cracked insulation and loose terminals. Repair or replace the wires as required.

To remove the wires from the spark plugs, grasp the molded cap only. Do not pull on the wire, as this may separate the wire connection inside the cap or damage the weather seal.

REPLACEMENT—6-CYLINDER ENGINE

Fig. 08: ignition wiring - 6-Cylinder Engine

Fig. 08: ignition wiring – 6-Cylinder Engine

A spark plug wire set (Fig. 8) is available for service.

Removal

Disconnect the wires at the spark plugs and at the distributor cap. Remove the weather seals on the distributor end of the wires and the rubber rings. Discon-nect the ignition coil to distributor high tension wire assembly from the coil and distributor cap.

Installation

Install a rubber ring on the No. 3 and 4 wires, and on No. 5 and 6 wires. Connect the wires to the proper spark plugs.

Install the weather seals on the distributor end of the wires, and insert the ends of the wires in the correct sockets in the distributor cap. Be sure the wires are forced all the way down into their sockets and that they are held firmly in position. Each socket is identified on the cap. Install the wires in a clockwise direction in the firing order 1-5-3-6-2-4.

Install the coil to distributor wire, and push all weather seals into position

REPLACEMENT—8-CYLINDER ENGINE

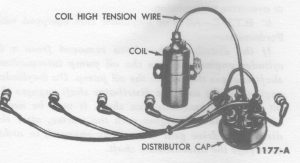


Fig. 09: ignition wiring – 8-Cylinder Engine

A spark plug wire set (Fig. 9) is available for service.

Removal

Remove the mounting brackets, disconnect the wires from the spark plugs and distributor cap. Pull the wires from the brackets and remove the wires.

Installation

Install new wires in the brackets. Be sure the wires are positioned correctly in the bracket. Install weather seals on the distributor ends of the wires.

Insert each wire in the proper distributor cap socket. Be sure the wires are forced all the way down into their sockets. The No. 1 socket is identified by the number “1” stamped on the cap. Install the wires in a counterclockwise direction in the firing order 1-5-4-8-6-3-7-2. Cylinders are numbered from front to rear-right bank, 1-2-3-4; left bank, 5-6-7-8.

Connect the wires to the proper spark plugs, then install the coil to distributor high tension lead. Push all weather seals into position.

Ignition Timing

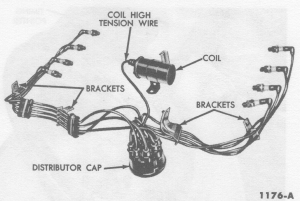


Fig. 10: timing marks – 6-cylinder engine

The 6-cylinder engine is equipped with a crankshaft damper having five timing marks (Fig. 10). The long mark represents top dead center (T.D.C.) and each succeeding mark represents 3°, 5°, 7°, and 9°, respectively, before top dead center (B.T.D.C). These marks, and a pointer welded to the cylinder front cover, are used to time the engine.

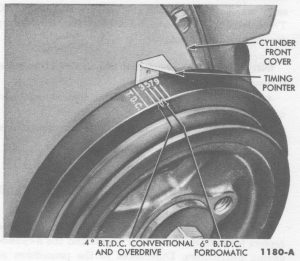


Fig. 11: timing marks – 8-cylinder engine

The 8-cylinder engine is equipped with a crankshaft damper having six timing marks (Fig. 11). The long mark represents T.D.C. and each succeeding mark represents 2°, 4°, 6°, 8°, and 10°, respectively, B.T.D.C. These marks and a pointer, bolted to the water pump, are used to time the engine.

INITIAL TIMING

The initial timing should be set as follows:

4° B.T.D.C.—6-cylinder cars with a conventional drive or overdrive transmission.

3° B.T.D.C—8-cylinder cars with a conventional drive or overdrive transmission.

6° B.T.D.C.—All 6 or 8-cylinder cars equipped with Fordomatic.

If the distributor has been removed from a 6-cylinder engine, be sure the oil pump intermediate shaft engages the seat in the oil pump. On 8-cylinderengines, make sure the distributor shaft engages the oil pump intermediate hex shaft. It may be necessary to crank the engine with the starter, after the distributor drive gear is partially engaged, in order to engage the intermediate shaft.

CHECKING TIMING WITH A TIMING LIGHT

Disconnect the distributor vacuum line, then connect the timing light high tension lead to the No. 1 spark plug and the other two leads of the timing light to the battery terminals.

Clean the dirt from the timing marks, and if necessary, chalk the proper mark and the pointer to improve legibility.

Operate the engine at idle speed. The timing light should flash just as the proper mark lines up with the pointer, indicating correct timing The operator’s eye should be in line with the center of the damper and the timing pointer.

If the proper timing mark and the pointer do not line up, rotate the distributor until the correct mark and the pointer are in line. On 6-cylinder cars, timing is advanced by counter-clockwise rotation of the distributor body, and retarded by clockwise rotation. On 8-cylinder cars, the timing is advanced by clockwise rotation of the distributor body, and retarded by counterclockwise rotation.

After the ignition timing has been properly set, connect the distributor vacuum line, then check the distributor to determine if the advance mechanism is operating. To do this, hold the timing light so that the timing marks and pointer can be seen, and accelerate the engine. If no advance is evident, one of the following is the probable cause; no vacuum available at the distributor, vacuum advance diaphragm leaking or disconnected from the breaker plate, centrifugal advance not functioning properly (8-cylinder engine), breaker plate binding in the housing or on the bushing.