THE STARTING SYSTEM

Start With A Review ... What you’ve learned in the classroom is just the start. Here’s your chance to show what you know in the shop. To meet your learning objectives, there are five “jobs” to perform on The Starting System. This page reviews some key concepts.

MOTOR TERMINALS

TERMINAL “50”

TERMINAL “C”

TERMINAL “30”

CURRENT DRAW TEST

VOLTAGE DROP TESTS

MOTOR CIRCUIT

CONTROL CIRCUIT

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Identify Starting System Components And Their Functions

YOUR JOB (READ ALL INSTRUCTIONS BEFORE STARTING!)
1. Refer to page 119 in your workbook.

2. Identify the numbered starting system components by placing the correct number next to the component name below.

   ______ Battery          ______ Starter Relay          ______ Magnetic Switch
   ______ Fusible Link     ______ Clutch Switch         ______ Starter Motor
   ______ Ignition Switch  ______ 4WD Safety Cancel Switch

3. Then, place the number of the correct component next to the phrase that best describes its function in the starting system.

   ______ Turns the control circuit on and off.  ______ Drives the flywheel through gears.
   ______ Turns the motor circuit on and off.    ______ Closes when the clutch switch closes.
   ______ Provides energy for the system.        ______ Protects the system from overloads.
   ______ Prevents cranking when the clutch is not depressed.  ______ Allows starting without clutch depressed.

4. Complete this job within 5 minutes.

Stop here and have instructor signoff.
Job 1 complete: _________________________________
Identify Starter Motor Parts And Their Functions

YOUR JOB  *(READ ALL INSTRUCTIONS BEFORE STARTING!)*

1. Refer to page 121 in your workbook.

2. Identify the numbered starter motor parts by placing the correct number next to the part name below.

   ____ Magnetic Switch   ____ Pinion Gear   ____ Over-Running Clutch
   ____ Plunger           ____ Armature      ____ Reduction Gear
   ____ Ring Gear

3. Then, place the number of the correct part next to the phrase that best describes its function in the starter motor.

   ____ Final drive gear.  ____ Increases starter motor torque.
   ____ Driven gear, connected to flywheel.  ____ Turns the motor on and off.
   ____ Prevents engine from destroying the starter motor.  ____ Produces mechanical energy.
   ____ Causes the drive gear to mesh with the flywheel gear.

4. Complete this job within 5 minutes.

**Stop here and have instructor signoff.**
**Job 2 complete: _______________________________**

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Perform A Starter Current-Draw Test

CAUTION: Wear safety glasses while doing this job.

YOUR JOB  (READ ALL INSTRUCTIONS BEFORE STARTING!)

1. Measure the starter current draw on the vehicle assigned.
   - Follow the Performance Procedures.
   - Record your findings as indicated.
2. Refer to page 127 in your workbook.
3. Refer to the proper Toyota Repair Manual for specifications.
4. Complete this job within 15 minutes.

TOOLS/EQUIPMENT
1. VAT-40 Tester
2. Vehicle
3. Safety Glasses

PERFORMANCE PROCEDURES
1. Insure that engine is at operating temperature.
2. Insure that battery is serviceable (at least 50% charged).
3. Insure that all lights and accessories are off. (Doors closed.)
4. Prepare VAT-40 tester according to manufacturer’s instructions.
5. Connect test leads to battery terminals. [Red to (+) and Black to (−)].
6. “Zero” ammeter; connect amps pickup clamp around battery ground cable.
7. Set Test Selector switch to “Starting” position.
8. Disable ignition. (Disconnect “IIA” plug or plug to remote igniter.)
9. Crank engine and note voltmeter and ammeter readings; record readings.
10. Disconnect VAT-40 and connect ignition plug.

SPECIFICATIONS
Vehicle: ___________  Starter Motor: ___ Conventional  ___ Gear Reduction
Current Draw: _____ amps  Cranking Voltage: _____ volts  Cranking Speed: _____ rpm

TEST RESULTS
Current Draw: _____ amps  Cranking Voltage: _____ volts  Cranking Speed: _____ rpm

RECOMMENDATIONS: _____ Test within specs, starter is OK.
_____ Test outside specs, replace starter motor.
_____ Test outside specs, further testing required.
   Explain: ________________________________________________

Stop here and have instructor signoff.
Job 3 complete: ________________________________
Perform Starting System Voltage-Drop Tests

**YOUR JOB** *(READ ALL INSTRUCTIONS BEFORE STARTING!)*

1. Measure the voltage drop in the starter motor circuit and starter control circuit on the assigned vehicle.
   - Follow the Performance Procedures.
   - Record your findings as indicated.
2. Refer to pages 128 and 129 in your workbook.
3. Complete this job within 15 minutes.

**TOOLS/EQUIPMENT**

1. Voltmeter
2. Vehicle

**PERFORMANCE PROCEDURES:**

**Motor Circuit:**

1. Disable ignition. (Disconnect "IIA" plug or plug to remote igniter.)
2. Connect voltmeter, crank engine and note reading in each of four tests as shown.
3. Write voltage reading on meter face in diagram.

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**VOLTAGE DROP TESTS: MOTOR CIRCUIT**

1. **BATTERY (+) TO TERMINAL "C"**
   - Test for high resistance in motor circuit from battery through the magnetic switch.
   - Spec: Less than 0.5V

2. **TERMINAL "C" TO TERMINAL "30"**
   - Test for high resistance in magnetic switch contacts.
   - Spec: Less than 0.3V

3. **BATTERY (+) TO TERMINAL "30"**
   - Test for high resistance battery cable and its connections.
   - Spec: Less than 0.2V

4. **BATTERY (-) TO STARTER HOUSING**
   - Test for high resistance in the starter to engine connection and battery ground cable.
   - Spec: Less than 0.2V

*(Go on the the next page)*
Motor Circuit – Continued

RECOMMENDATIONS: _____ Test within specs.
_____ Test outside specs, further testing required.
Explain: ____________________________________________

Control Circuit:

4. With the ignition disabled (disconnect "I1A" plug or plug to remote igniter), connect the voltmeter as shown in the diagram.

5. Crank engine and note the voltage reading on the meter face in the diagram.

6. Fill in the blanks in “Test Results.”

![Voltage Drop Test: Control Circuit Diagram]

TEST RESULTS

1. Voltage During Cranking: _____ V

RECOMMENDATIONS: _____ Test within specs.
_____ Test outside specs, further testing required.
Explain: ____________________________________________

Stop here and have instructor signoff.
Job 4 complete: ______________________________

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