

Toyota Engine 2h 12ht Repair Manual

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TOYOTA

2H, 12H-T

ENGINE

REPAIR MANUAL

Nov., 1985



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Pub No. RM02EE

FOREWORD

This repair manual has been prepared to provide information covering general service repairs for the 2H and 12H-T engines mounted on the TOYOTA LAND CRUISER (Heavy-Duty).

Applicable models:

HJ60, 61, 75 series

All information contained in this manual is the most up-to-date at the time of publication. However, specifications and procedures are subject to change without notice.

TOYOTA MOTOR CORPORATION

TOYOTA 2H, 12H-T ENGINE REPAIR MANUAL

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INTRODUCTION

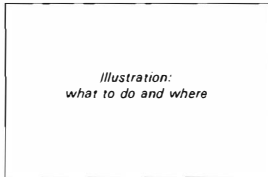
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IN

The procedures are presented in a step-by-step format:

- The illustration shows *what* to do and *where* to do it.
- The task heading tells *what* to do.
- The detailed text tells *how* to perform the task and gives other information such as specifications and warnings.

Example:



Task heading: what to do

REMOVE INJECTION NOZZLES

Using SST, remove the timer.

SST 09260-47010 (09267-76020)

Set part No. *Components part NO.*

Install and torque the round nut.

Torque: 750 kg-cm (54 ft-lb, 74 N·m) *Detailed text: how to do task*

Torque Specification

This format enables the experienced technician with a FAST TRACK to the information needed. The upper case heading can be read at a glance and only when necessary, the text below it provides detailed information. Important specifications and warnings always stand out in bold type.

REFERENCES

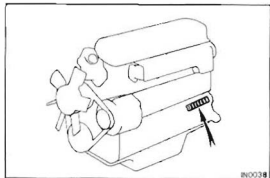
References have been kept to a minimum. However, when they are required you are given the *page* to go to.

SPECIFICATIONS

Specifications are presented in bold type throughout the text in the applicable step. You never have to leave the procedure to look up your specs. All specifications are also found in Appendix A, specifications, for quick reference.

WARNINGS, CAUTIONS, NOTES:

- **WARNINGS** are presented in bold type, and indicate there is a possibility of injury to you or other people.
- **CAUTIONS** are also presented in bold type and indicate there is a possibility of damage to the components being repaired.
- **NOTES** are separated from the text but do not appear in bold. They provide additional information to help you efficiently perform the repair.



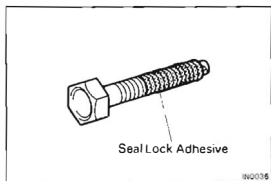
IDENTIFICATION INFORMATION

ENGINE SERIAL NUMBER

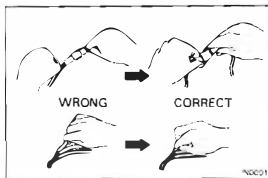
The engine serial number is stamped on the left side of the cylinder block

GENERAL REPAIR INSTRUCTIONS

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in order to facilitate reassembly.
3. Observe the following
 - (a) Before performing electrical work, disconnect the negative cable from the battery terminal.
 - (b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative (-) terminal which is grounded to the vehicle body.
 - (c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable straight up without twisting it or prying it.
 - (d) Clean the battery terminal posts and cable terminal with a shop rag. Do not scrape them with a file or other abrasive object.
 - (e) Install the cable terminal to the battery post with the nut loose and tighten the nut after installation. Do not use a hammer to tap the terminal onto the post.
 - (f) Be sure the cover for the positive (+) terminal is properly in place.
4. Check hose and wiring connectors to make sure they are securely and correctly connected
5. Non-reusable parts
 - (a) Always replace cotter pins, gaskets, O-rings, oil seals etc. with new ones.
 - (b) Non-reusable parts are indicated in the component illustrations by the "◆" symbol.



6. **Precoated Parts**
- Precoated parts are the bolts, nuts, etc. Which are coated with a seal lock adhesive at the factory.
- If a precoated part is tightened, loosened or caused to move in any way, it must be precoated with the specified adhesive
 - Recoating of Precoating Parts**
 - Clean off the old adhesive from the bolts, nut or installation part threads.
 - Dry with compressed air.
 - Apply the specified seal lock adhesive to the bolt or nut threads.
 - Precoated parts are indicated in the component illustrations by the "★" symbol.
7. When necessary, use a sealer on gaskets to prevent leaks.
8. Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.
9. Use of special service tools (SST) and special service materials (SSM) may be required depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found at the back of this manual
10. When replacing fuses, be sure the new fuse is the correct amperage rating. **DO NOT** exceed the fuse amp rating or use one of a lower rating.
11. Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations.
- If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels in order to ensure safety.
 - After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on the vehicle raised on one jack alone, even for a small job that can be finished quickly



12. Observe the following precautions to avoid damage the parts:
- To disconnect vacuum hoses, pull on the end, not the middle of the hose.
 - To pull apart electrical connectors, pull on the connector itself, not the wires.
 - Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.

- (d) When steam cleaning an engine, protect the air filter and injection pump from water.
 - (e) Never use an impact wrench to remove or install thermo switches or thermo sensors.
 - (f) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.
 - (g) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step-down adapter instead. Once the hose has been stretched, it may leak.
13. After removing and reinstalling the injection pump and fuel hoses, clean off the fuel on engine components. In particular, be sure to check the radiator hose and by-pass hose, because they deteriorate easily if they come into contact with fuel.

ABBREVIATIONS USED IN THIS MANUAL

| | |
|------|-------------------------------------|
| A/C | Air Conditioner |
| A/T | Automatic Transmission |
| ATDC | After Top Dead Center |
| BDC | Bottom Dead Center |
| BTDC | Before Top Dead Center |
| EDIC | Electrical Diesel Injection Control |
| EX | Exhaust |
| HAC | High Altitude Compensator |
| IN | Intake |
| LH | Left-hand |
| M/T | Manual Transmission |
| MP | Multipurpose |
| O/S | Oversize |
| PCV | Positive Crankcase Ventilation |
| PS | Power Steering |
| RH | Right-hand |
| SSM | Special Service Materials |
| SST | Special Service Tools |
| STD | Standard |
| TDC | Top Dead Center |
| U/S | Undersize |
| VSV | Vacuum Switching Valve |
| w/ | With |
| w/o | Without |

ENGINE MECHANICAL

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EM

DIESEL ENGINE DIAGNOSIS

1. GENERAL

Diesel engine problems are usually caused by the engine or fuel system. The injection pump is very rarely the cause of fuel system problems.

Before beginning fuel system tests, first check that the engine compression, valve timing and other major systems are within specifications.

2. PRELIMINARY CHECKS

- (a) Before performing fuel system checks, insure that the engine is in good running condition. If necessary, first check the compression, timing and major components or systems
- (b) Check the air filter and clean or replace as necessary.
- (c) Check for sufficient fuel in the tank
- (d) Check if the fuel is contaminated with gasoline or other foreign elements. Only high-quality diesel fuel should be used.
- (e) Bleed air from the system by pumping the priming pump.
- (f) Check for water in the sedimenter and fuel tank, and drain as necessary.
- (g) If the engine will not crank or if it cranks slowly, troubleshoot the electrical system

PRECAUTION

1. The basic troubleshooting procedures for the diesel engine (valve clearance, compression, bearings, valves, pistons, etc.) are the same checks you would make for a gasoline engine.
2. The repair of the injection pump requires considerable skill and use of a special test bench.

ENGINE WILL NOT CRANK**(Possible Cause)****(Check Procedure and Correction Method)**

1. **LOOSE OR CORRODED BATTERY CABLES**

Check cables from battery to starter and make necessary repairs.

2. **DISCHARGED BATTERY**

Check the alternator output and the drive belt. Repair as necessary. (See page CH-6)

3. **INOPERATIVE STARTER**

Check for battery voltage at starter terminals 30 and 50.
If Okay, see **STARTING SYSTEM** page (ST-11) for repair procedure.

ENGINE CRANKS SLOWLY-WILL NOT START

**NOTE: Minimum cranking speed: 100rpm Cold
150rpm Hot**

(Possible Cause)**(Check Procedure and Correction Method)**

1. **LOOSE OR CORRODED BATTERY CABLES**

Refer to items 1 and 2 of **ENGINE WILL NOT CRANK**.

2. **DISCHARGED BATTERY**

Check engine oil.

3. **IMPROPER ENGINE OIL**

If improper viscosity, drain and refill with oil of viscosity recommended by manufacturer. (See page LU-4)

ENGINE CRANKS NORMALLY BUT WILL NOT START**(Possible Cause)****(Check Procedure and Correction Method)****1. NO FUEL TO INJECTION NOZZLE**

Loosen any one injection pipe union nut from its nozzle.
Crank the engine for about 5 seconds while confirming that fuel is being discharged from the pipe.
If fuel is coming out, begin diagnosis from item 4.
If not, begin from item 2.

2. NO FUEL INTO INJECTION PUMP

Disconnect inlet hoses to the feed pump and feed clean fuel from separate container directly into feed pump.
If engine starts, either the sedimenter or fuel line between the fuel tank and feed pump is clogged and should be repaired.
If the engine still does not start, check the fuel filter or line between feed pump and injection pump.
If normal, the feed pump or injection pump is faulty and should be repaired.
NOTE: When feeding fuel directly into pump, keep container at same level as vehicle fuel tank.

3. FUEL LEAKAGE FROM INJECTION PIPE

Check for loose unions or cracks.
If leaking, tighten to specified torque or, if necessary, replace pipe(s).

4. [2H] INOPERATIVE PRE-HEATING OPERATION

With the starter switch turned ON and the glow plug indicator light illuminated, check that there is voltage applied to the glow plug.
If not, refer to ELECTRICAL DIAGNOSIS and repair as necessary. (See page EM-11)

5. [12H-T] INOPERATIVE PRE-HEATING OPERATION

With the ignition switch turned ON and the intake heater indicator light illuminated, check that there is voltage applied to the intake heater.
If not, refer to ELECTRICAL DIAGNOSIS and repair as necessary. (See page EM-13)

6. [2H] FAULTY GLOW PLUG OPERATION

Check the glow plug for continuity. (See page ST-5)
If no continuity, a broken wire is indicated and the glow plug should be replaced.

7. [12H-T] FAULTY INTAKE HEATER OPERATION

Check the intake heater continuity. (See page ST-9)
If no continuity, a broken wire is indicated and intake heater should be replaced.

8. IMPROPER INJECTION TIMING

Check the injection timing. (See page EM-23)

Injection timing: 2H 18° BTDC
12H-T 11° BTDC

If not as specified, injection timing must be readjusted.

9. FAULTY INJECTION NOZZLE

Check the injection pressure with nozzle tester. (See page FU-4 or 10)

Opening pressure:

2H 105 – 125 kg/cm²
(1,493 – 1,778 psi)
(10,296 – 12,258 kPa)
12H-T 180 – 210 kg/cm²
(2,560 – 2,987 psi)
(17,652 – 20,594 kPa)

If not within specification, nozzle adjustment is improper and pressure should be readjusted
If pressure cannot be adjusted to specification, replace nozzle.

ROUGH IDLE WITH WARM ENGINE

(Possible Cause)

(Check Procedure and Correction Method)

1. IMPROPER ADJUSTMENT OF ACCELERATOR CABLE

With the accelerator pedal released, check that the adjusting lever is in contact with the idle adjusting screw. Also, check if the accelerator cable is catching on something.

If necessary, adjust so lever is in contact with the screw, or make other required repairs.

2. IDLE SPEED TOO LOW

Check the idle speed as specified below. (See page EM-26 or 28)

Idle speed: MT 650 rpm
AT (2H) 750 rpm
AT (12H-T) 770 rpm

If not, adjust with the idle speed adjusting screw.

NOTE: If less than specified, idling would normally be rough.

3. FUEL LEAKAGE

Check for leaks in the injection pump connections, feed pump, nozzle holder and delivery valve. Tighten any loose connections to specified torque or replace parts as necessary.

4. IMPROPER INJECTION TIMING

Refer to item 6 of ENGINE CRANKS NORMALLY BUT WILL NOT START, above

5. IMPROPER OPERATION OF INJECTION NOZZLE OR DELIVERY

With the engine idling, loosen the injection pipe to each cylinder in order, and check if the idle speed changes.

If no change, a faulty cylinder is indicated. Check according to the following procedure.

- Faulty Nozzle

Check the nozzle with nozzle tester. (See page FU-4 or 10)

Opening pressure:

2H 105 – 125 kg/cm²
(1,493 – 1,778 psi)
(10,296 – 12,258 kPa)

12H-T 180 – 210 kg/cm²
(2,560 – 2,987 psi)
(17,652 – 20,594 kPa)

If not within specification, the nozzle is faulty and injection pressure should be readjusted.

- Faulty Delivery Valve

If injection pressure is within specification, the delivery valve is defective and should be replaced.

ENGINE SUDDENLY STOPS

(Possible Cause)

(Check Procedure and Correction Method)

1. ENGINE WILL NOT RE-START

Check to see if engine re-starts according to prescribed procedure.

If not, refer to ENGINE CRANKS NORMALLY BUT WILL NOT START, above, and repair as necessary.

2. ROUGH IDLE

If idle is not stable, refer to ROUGH IDLE WITH WARM ENGINE and repair accordingly.

3. NO FUEL INTO INJECTION PUMP

Refer to item 2 of ENGINE CRANKS NORMALLY BUT WILL NOT START, above.

LACK OF POWER

NOTE:

1. First check that the air cleaner is not clogged or the engine overheating.
2. Not applicable if the customer desires an output power higher than specified for that vehicle.
For accuracy, adjust with a chassis dynamo.

(Possible Cause)

(Check Procedure and Correction Method)

**1. IMPROPER ACCELERATOR
CABLE ADJUSTMENT**

With accelerator fully depressed, check that the adjusting lever is in contact with the maximum speed adjusting screw. (See page EM-26 or 28)
If not, adjust accordingly.

**2. INSUFFICIENT
MAXIMUM SPEED**

Start engine, depress the accelerator pedal to the floor and check that maximum speed is as specified below. (See page EM-26 or 28)

Maximum speed:

w/ Fluid coupling 4,170 rpm

w/o Fluid coupling 4,100 rpm

If not, adjust with the maximum speed adjusting screw.

3. FUEL LEAKAGE

Refer to item 3 of ROUGH IDLE WITH WARM ENGINE.

4. CLOGGED FUEL FILTER

Disconnect the injection pump inlet hose and outlet pipe of the feed pump, and connect directly with a suitable pipe. Then pour clean fuel into the inlet side of the feed pump.

If the engine condition improves, the fuel filter is clogged and should be replaced. (See page FU-2)

NOTE: When feeding fuel directly into the pump, keep container at same level as vehicle fuel tank.

If no increase in engine condition after replacing the fuel filter, check the feed pump or perform other necessary repairs.

5. IMPROPER INJECTION TIMING

Refer to item 8 of ENGINE CRANKS NORMALLY BUT WILL NOT START.

6. FAULTY INJECTION NOZZLE

Refer to item 9 of ENGINE CRANKS NORMALLY BUT WILL NOT START.

EXCESSIVE EXHAUST SMOKE

NOTE:

1. Check that the air cleaner is not clogged.
2. Check with the customer whether or not oil consumption has been excessive.

(Possible Cause)

(Check Procedure and Correction Method)

1. IMPROPER INJECTION TIMING

Refer to item 8 of ENGINE CRANKS NORMALLY BUT WILL NOT START.

NOTE: Black smoke indicates advanced timing while white smoke indicates retarded timing. Adjustments should be made accordingly.

2. CLOGGED FUEL FILTER

Refer to item 5 of LACK OF POWER.

NOTE: At high speed (2,000 – 3,000 rpm), a clogged filter tends to make the exhaust smoke white.

3. FAULTY INJECTION NOZZLE

Refer to item 9 of ENGINE CRANKS NORMALLY BUT WILL NOT START.

NOTE: Excessive exhaust smoke is often caused by nozzle pressure being too low.

EXCESSIVE FUEL CONSUMPTION

NOTE: Check whether the clutch slips, brakes grab, whether the tires are the wrong size or the air filter is clogged.

(Possible Cause)

(Check Procedure and Correction Method)

1. FUEL LEAKAGE

Refer to item 3 of ROUGH IDLE WITH WARM ENGINE.

2. IDLE SPEED TOO HIGH

After sufficiently warming up engine, check that idle speed is as specified below. (See page EM-26 or 28)

Idle speed:

| | |
|-------------|---------|
| M/T | 650 rpm |
| A/T (2H) | 750 rpm |
| A/T (12H-T) | 770 rpm |

If not, adjust with the idle speed adjusting screw.

3. MAXIMUM SPEED TOO HIGH

Start engine, depress the accelerator pedal to the floor and check that maximum speed is as specified below. (See page EM-26 or 28)

Maximum speed:

| | |
|--------------------|-----------|
| w/ Fluid coupling | 4,170 rpm |
| w/o Fluid coupling | 4,100 rpm |

If not, adjust with the maximum speed adjusting screw.

4. IMPROPER INJECTION TIMING

Refer to item 8 of ENGINE CRANKS NORMALLY BUT WILL NOT START.

5. FAULTY INJECTION NOZZLE

Refer to item 9 of ENGINE CRANKS NORMALLY BUT WILL NOT START.

ENGINE NOISE WHEN WARM**(Cranking Noise with Excessive Vibration)****(Possible Cause)****(Check Procedure and Correction Method)****1. COOLANT TEMPERATURE TOO LOW**

Check coolant temperature with coolant temperature gauge.
If not sufficiently warm, thermostat is faulty and should be replaced.

2. IMPROPER INJECTION TIMING

Refer to item 8 of ENGINE CRANKS NORMALLY BUT WILL NOT START.

3. FAULTY INJECTION NOZZLE

Refer to item 9 of ENGINE CRANKS NORMALLY BUT WILL NOT START.

ENGINE WILL NOT RETURN TO IDLE**(Possible Cause)****(Check Procedure and Correction Method)****BINDING ACCELERATOR CABLE**

Operate adjusting lever on side of injection pump and check if engine returns to idle.
If so, the accelerator cable is binding or improperly adjusted and should be repaired accordingly.
If engine does not return to idle, the injection pump is faulty and should be repaired.

Toyota Engine 2h 12ht Repair Manual

EM-10

ENGINE MECHANICAL – Diesel Engine Diagnosis

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ENGINE WILL NOT SHUT OFF WITH STOP BUTTON OR KEY

(Possible Cause)

(Check Procedure and Correction Method)

1. [2H M/T (w/o EDIC SYSTEM)]
BINDING STOP CABLE

Operate stop lever (adjusting lever) on side of injection pump and check if engine stops.
If so, stop cable is binding or maladjusted and should be repaired accordingly.
If engine does not stop, injection pump is faulty and should be replaced. (See page FU-29)

2. [2H M/T (w/ EDIC SYSTEM)]
IMPROPER EDIC SYSTEM

Operate stop lever (adjusting lever) on side of injection pump and check if engine stops.
If so, EDIC system is faulty and should be repaired. (See page ST-21)
If engine does not stop, injection pump is faulty and should be repaired. (See page FU-29)

3. [2H A/T AND 12H-T]
IMPROPER INTAKE SHUTTER
OPERATION

Close the intake shutter and check if engine stops.
If it does, the intake shutter system is faulty and should be repaired. (See page EM-33 or 34)