Landrover V8 Series III

Engine Tuning Specifications
Light Grade Repairs

Introduction

1. This is a reprint of the instruction originally issued as NZ P98 V 271-8. Experience gained by New Zealand Motor Corporation (NZMC) indicates that correct retuning for NZ conditions results in a vast improvement to the performance of the V8 LandRover.

2. The most commonly found faults on the production line were:

   a. the ignition timing too far retarded for satisfactory performance,

   b. the engine idle speed far too slow, the average was 500-600 rpm, and

   c. the CO and HC levels were far too lean due to the carburettors being tuned to UK conditions at assembly.

3. After tuning to the specifications detailed below the most noticeable improvements have been:

   a. the use of the choke can be kept to a minimum during starting and its prolonged used during warm up is eliminated;

   b. improved acceleration and better pulling power in third and top gears; and

   c. apparent elimination of the prevalent engine misfire problem.

Equipment Required

4. The following equipment is required to accurately tune the V8 engine.

   a. Tunescope or Engine Analyser.

   b. Infrared Exhaust Gas Analyser.

   c. Carburettor Jet Adjusting Tool (NSN 5120-98-856-0006).

   d. Carburettor Balancer (NSN 5120-99-820-6911).

Specifications

5. The specifications are as follows:

   a. Carbonmonoxide (CO): 4.5%.

   b. Hydrocarbon (HC): 400 - 500 rpm.

   c. Ignition Timing: 6° BTDC (Dynamic), or TDC (Static).

   d. Idle Speed: 720 - 732 rpm.

6. To further reduce plug fouling the RSN12Y spark plug is to be replaced with the RSN8 plug (0.030" gap).

7. After any adjustments the engine should be run at 2200 rpm to allow everything to stabilise before rechecking.

Landrover V8 Electronic Ignition

Replacement Modification
Engineering Change Instruction

[illegible] Engineering Authority (Date)

General

1. **Introduction.** Although the replacement programme is under way for the Land Rover V8, there is still a requirement to maintain some vehicles within operational units until a replacement is identified. Parts can not be obtained for the Mallory electronic ignition currently fitted, to this end an interim solution is to fit a Mallory twin points system.

2. **Estimated Man-hours to Perform.** 3 hours.

3. **Priority.** Group 2.

4. **Modification to be applied to.** All Land Rover V8 with ignition faults, which are unrepairable due to the unavailability of repair parts.

5. **Item Affected.** NSN 2920-98-AXO-0509, Kit, Electronic Ignition System.

6. **Action Required.** RNZALR workshops authorised to carry out medium grade repairs are to action this modification when the repair parts are unavailable.

7. **Drawings Required.** All drawings /diagrams required are included in this instruction.

8. **Stores Required.** The stores required are supplied in a modification kit as listed at Table 1. RNZALR Wksps are to purchase Item 1, Table 1, from Segedin Auto Spares Auckland, Attention Shane Johnson, 0800 800 385. "NZ Army V8 Landrover Distributor Modification". Item 3, Table 1 purchased from any electronics wholesaler.

Table 1 – Stores Required

Ser	NSN	Designation	Qty
1		NZ ARMY V8 LANDROVER DISTRIBUTOR KIT	1
2	5945 98 107 9589	LOAD SHEDDING RELAY	1
3		6.8 OHM 100 WATT RESISTOR (AVAILABLE LOCAL PURCHASE, MUST HAVE COOLING FINS.)	2

9. **Stores Removed.** Stores removed are listed at Table 2.

Table 2 – Stores Removed

Ser	NSN	Designation	Qty
1	2920 01 390 5148	COIL, IGNITION	1
2	2920 01 390 6277	REV LIMITER, ASSY	1
3	2920 01 390 6279	ELECTRONIC IGNITION CONTROL UNIT	1
4	2920 98 DAA 8776	OPTO-ELECTRONIC BASE PLATE	1
5	5340 98 204 1695	COVER ACCESS	1

10. **Special Tools, Jigs and Fixtures.** Nil.

Detail

11. **Modification Procedure:**

a. **Electronic Control Unit:**

(1) Rotate engine to TDC No 1.

(2) Remove electronic control box (ECU) from L/H fender.

(3) Remove all components from ECU base plate leaving rubber feet.

(4) Mount 1x load shedding relay on upper left of base plate.

(5) Mount 2x 6.8 ohm resistors on lower left with connectors facing down.

(6) Mount Ignition coil on base plate with mounting bracket on centre line of base plate

(7) Wire components as per Fig. 1 Wiring and Layout Template.

(a) Use black wire from one battery only (12 Volt) to relay terminal 30/51.

(b) White Ignition feed wire is connected to relay terminal 85.

(c) Relay terminal 86 is ground.

(d) Relay terminal 87 is connected to resistors.

(e) Resistors are connected to Coil positive terminal and negative to common connection of points and capacitor in distributor.

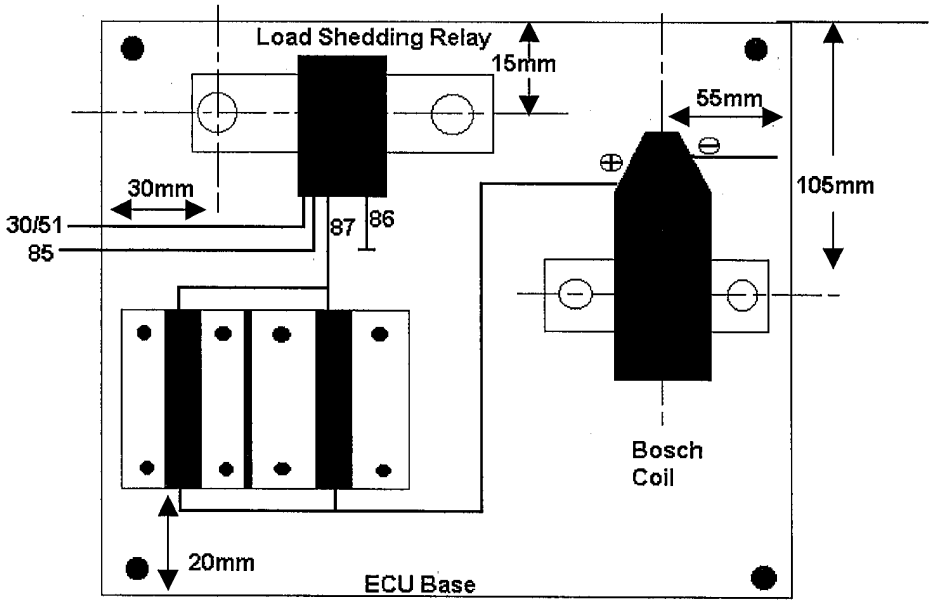


Figure 10 – Wiring and Layout Template.

(8) Re-mount base plate on L/H fender.

b. **Distributor:**

(1) Remove distributor.

(2) Remove Cap, Rotor, Optical switch and Vacuum advance canister.

(3) Remove base plate grub screws then remove base plate

(4) Remove rotor cam.

(5) Inspect centrifugal weight advance assembly. If unserviceable replace weights and springs from kit. Set up advance curve as per NZ P98 B 279-38.

(6) Refit cam and secure.

(7) Fit dual points ignition points plate.

(8) Install points set and set gap to 0.022 inch each

(9) Insert 30 mm screw through wiring harness hole in distributor body with an insulation bush on each side of distributor body, with dual points wired to inside end and capacitor wired to outside end.

(10) Refit vacuum canister to distributor body using right hand screw to mount capacitor to distributor. Refit vacuum canister arm to points plate.

(11) Refit distributor into engine, Static time.

(12) Start engine and tune to NZ P98 B 279-38.

12. **Recording of Modification.** This modification is to be recorded in the Vehicle Record Book (AB54) as " Mod B 270- FITTING OF DUAL POINTS IGNITION SYSTEM".

13. **Financial Detail.** All costs associated with embodying this modification are to be charged as a normal repair quoting Classification Code 6699.

Landrover V8 Series III

Electronic Ignition Fault Diagnostic Procedure Miscellaneous Instruction

CAUTION

WHERE POSSIBLE BEFORE ANY ELECTRONIC IGNITION TESTING IS DONE, THE CHARGING SYSTEM IS TO BE TESTED FOR PROPER OPERATION AND VOLTAGE OUTPUT. THE VOLTAGE OUTPUT SHOULD BE BETWEEN 27.5 AND 28.5 VOLTS (IF OUTSIDE THIS RANGE ADJUST IT TO 28.2 VOLTS). IF THE CHARGING SYSTEM IS SUSPECTED OF BEING THE CAUSE OF THE ELECTRONIC IGNITION FAILURE, IT IS TO BE RECTIFIED IMMEDIATELY OR IGNITION FAILURE WILL REOCCUR ONCE THE VEHICLE IS STARTED.

Introduction

1. The purpose of this instruction is to inform RNZEME mechanics of safety and diagnostic procedures when testing the V8 electronic ignition system.

2. **Basic Operation.** The V8 electronic ignition uses an opto-electronic switch in the distributor to send on/off pulses to an electronic control unit which turns the ignition coil on/off, allowing a spark to be produced by mutual induction (Lumenition Principle, pg 2).

Detail

3. **Safety Brief.** All electronic ignition systems are dangerous. When working on or near them ensure either the ignition key is turned off or the battery is disconnected. Such work includes:

   a. replacing components such as sparkplugs, ignition coils, distributors, HT leads and modules;

   b. connecting test equipment such as timing lights, tunescopes and dwell/tachometers;

   c. when testing the ignition system with the key on hazardous voltages are present throughout, such tests should only be conducted by RNZEME vehicle mechanics;

   d. never hold HT leads with pliers when checking for spark, always use a dummy sparkplug.

Note

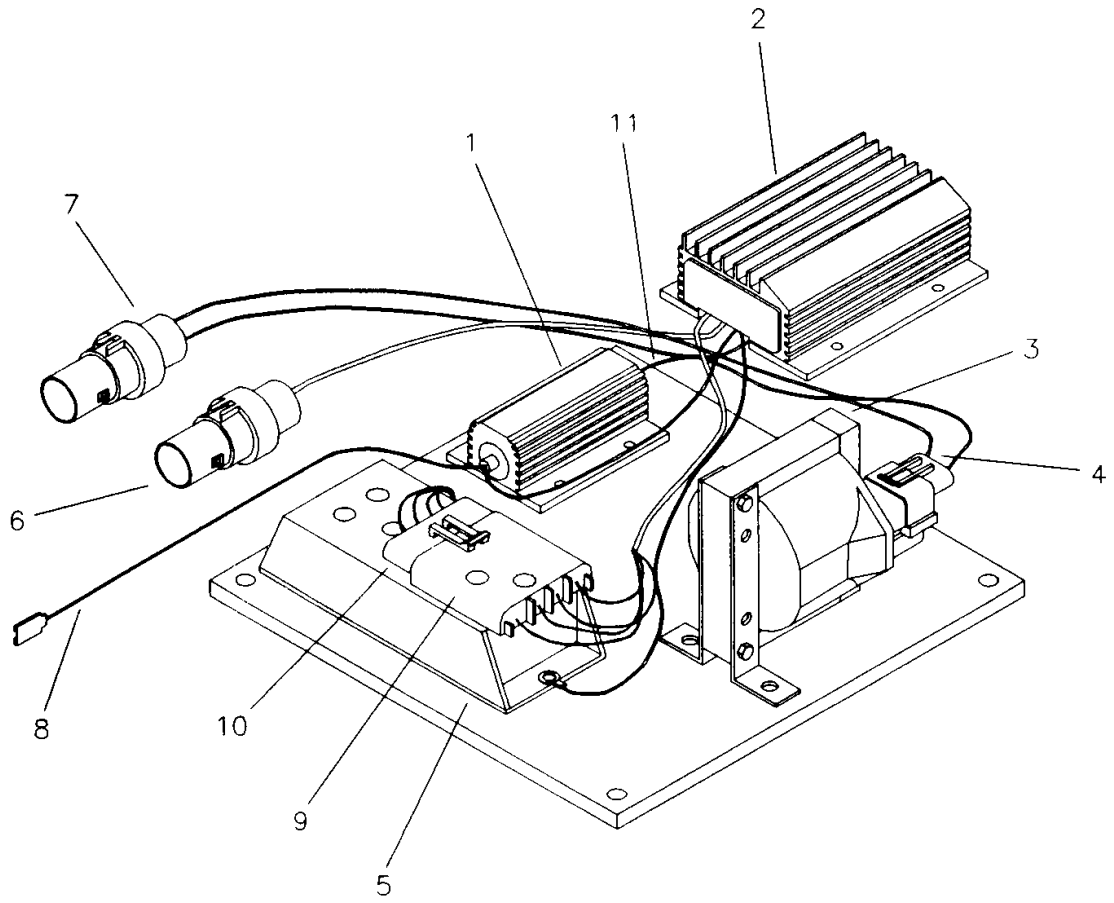
A dummy sparkplug is a normal plug fitted with an alligator clip, used to reduce high voltages in the high tension circuit to a safer value.

4. This section will be covered as follows:

   a. No Spark Condition.

   b. Distributor tests.

   c. Control assembly internal checks.



1. Ballast Resistor
2. Control Module
3. Coil
4. Coil Negative Terminal (Yellow)
   Coil Positive Terminal (Red)
5. Rev-limiter Module
6. Distributor LED Information Socket
7. LT Information Socket (Coil Negative)
8. Ignition Supply 24 V
9. Rev-limiter Test Socket Connector
10. Alternative Rev-limiter Control
11. Post Ballast Coil Supply

Figure 1 — R462 Control Assembly

5. **No Spark Condition:**

   a. Conduct a visual inspection of all connections, this includes HT leads, distributor cap, control unit, wiring and opto-electronic switch. (Check also that the rotor turns.)

   b. **Test One.** Check voltage at input wire to Terminal 8 Fig 1 (White Cable). **Result.** 24V should be available with the key on. If not check ignition switch and wiring and repair as required.

   c. Check resistance of the control unit earth connection is less than 1Ω.

   d. Remove the coil HT lead from the distributor cap, fit a dummy sparkplug and check for spark whilst cranking engine. **Result. If there is spark,** the fault is in the distributor cap, rotor, HT leads or sparkplugs. **If the spark is weak or absent**, carry out the following tests.

Distributor Tests

6. Conduct Distributor tests as follows:

a. **Test One.** Check continuity of the coil HT lead (key off) (between distributor cap and ignition coil). **Result.** Should be less than 4 kΩ, replace if required, then test for spark. Normal results will be less than 1 k to a maximum of 4 kΩ.

b. **Test Two.** Opto-electronic switch test (key off). With the coil Ht lead still connected to the dummy sparkplug, remove the distributor cap/rotor. Turn on the ignition key and place the rotor side on between the opto-electronic switch. By simulating the slots in the rotor (ie, moving the rotor between the opto-electronic switch) a spark should be produced.

Result Distributor Tests:

(1) **Spark.** Check:

(a) distributor cap for tracking and its contacts for corrosion,

(b) HT leads using an ohmmeter,

(c) sparkplugs, and

(d) rotor (by substitution).

(2) **No Spark.** Go to Test Three.

c. **Test Three.** Leave the dummy spark plug in position and **turn off** the key. Bridge the clear and white terminals on the distributor LED info socket (6) and have an assistant turn on the key whilst you observe the dummy spark plug. **Result. Spark.** Replace the electro-optical switch, reconnect the distributor LED info socket and conduct test Two again. If there is still no spark proceed to the control assembly checks.

Control Assembly Internal Checks

7. Remove the R462 control unit **ensuring the earth wire is connected firmly to earth**, and the dummy spark plug is still connected as in test Two, Distributor Tests.

8. Remove the R462 control assembly lid.

9. **Test One.** Battery voltage at (8). Ensure 24V is available at terminal 8 with the key on. **Result.** 24V should be available at R462, if not check earth connection and ignition supply. If battery voltage is available proceed with next test.

10. **Test Two.** Ballast resistor test:

a. Turn off the ignition key.

b. Disconnect the ignition coil plug (4).

c. Check battery voltage is available on both sides of ballast/damper resistor (1) and at terminal 4 (red wire, key on).

d. Turn off key. **Result.** If low or no voltage is available, the ballast resistor or wiring is at fault. If battery voltage is available go to test three.

11. **Test Three.** Coil Check:

a. Remove the coil plug (4).

b. Check continuity across the small input coil terminals. **Result.** 0.4-2.04Ω, if not replace coil.

c. Check continuity of HT coil circuit (across HT terminal and a small input terminal). **Result.** 3.2-6 kΩ if the results are significantly higher or lower replace the ignition coil. Proceed with next test.

12. **Test Four.** Speed limiter/spark control module test. Disconnect plug (9), turn on the ignition key and place the rotor side on between the opto-electronic switch. By simulating the slots in the rotor (ie, moving the rotor between the opto-electronic switch) check for spark. **Result.** If **spark is available** the speed limiter (5) is at fault. If there is still **no spark** replace the spark control module (2).

Landrover V8 Series III

Ignition Distributor Adjustments
Miscellaneous Instruction

Introduction

1. Faults of pre-ignition, detonation and poor engine performance may be evident after basic timing adjustments. These faults can be a result of faulty centrifugal or vacuum advance mechanisms.

2. In order to identify the fault both mechanisms need to be tested in isolation.

3. All specifications are detailed at the end of this instruction.

4. **Centrifugal advance checks:**

   a. Disconnect and seal off the vacuum advance line at the distributor end.

   b. Fit a timing light and adjust engine timing to 12° ATDC. This is to provide a means of checking engine timing versus RPM.

   c. Connect tachometer to engine.

   d. Start and warm up the engine.

   e. The engine should advance and retard smoothly, within tolerances, throughout the entire speed range. **See specifications**.

   f. If results are outside the specifications conduct the following procedure.

5. **Centrifugal advance adjustment procedure:**

   a. Turn off the engine and key.

   b. Remove the distributor cap and rotor.

   c. Loosen the distributor and rotate to expose the screws on the vacuum advance unit.

   d. Remove the two screws and circlip securing the vacuum advance unit.

   e. Remove the vacuum advance unit.

   f. Remove optical switch and clamp from the vacuum advance plate.

   g. Loosen the two allen screws holding the vacuum advance plate enough to clear for removal.

   h. Remove the vacuum advance plate from the distributor.

   i. Remove circlip and washer (Item A, Fig 1) from the centrifugal advance plate (Item B, Fig 1).

   j. Remove the centrifugal advance plate (Item B, Fig 1)from the distributor.

Note

Check position of both the heavy and light centrifugal advance springs to aid further adjustments.

k. Inspect springs and weights for serviceability.

l. Insert degree key into advance slot to indicate 28° centrifugal advance (advance shown on degree key is in crankshaft degrees advance as shown in Fig 2) to set maximum advance.

m. If adjustment is required loosen screws (Item D, Fig 1) so advance control arms (Item C, Fig 1) can be moved.

n. Push control arms (Item C, Fig 1 or 2) tight against advance key and tighten screws (Item D, Fig 1 or 2) using Loctite 262.

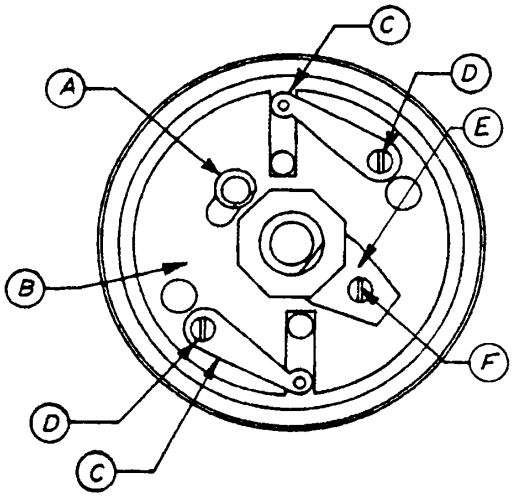


Figure 1 – Distributor Bowl

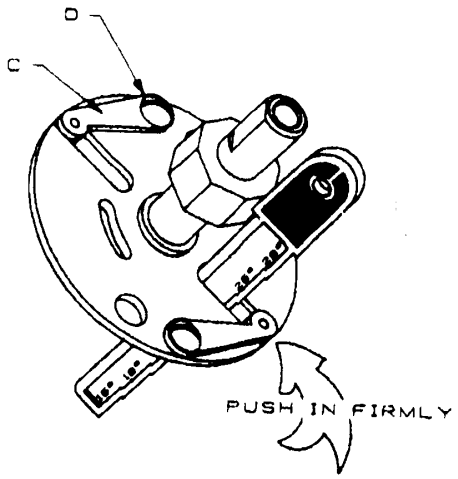


Figure 2 – Centrifugal Advance Adjustment

o. Adjust other control arm to 28°.

p. Reassemble distributor.

NOTES

1. There is a small shim washer on the distributor shaft which may come off the shaft when advance plate and cam are removed. Ensure this shim washer is installed on the shaft before re-installing advance plate and cam assembly.

2. The advance weights will have to be moved out so advance pins fit into advance plate slots correctly.

q. Retest the centrifugal advance to ensure it is adjusted to specifications.

r. If fault is still present after this procedure conduct the following additional adjustments.

6. **Spring Mount Adjustment Procedure:**

a. Carefully adjust the distributor shaft spring mounts through their adjustment holes using a flat tip screwdriver as indicated below. Move the spring pivots a maximum of ½ mm each time:

(1) **Advance begins too early.** Move the small spring pivot out.

(2) **Advance begins too late.** Move the small spring pivot inwards.

(3) **Intermediate advance over 19º.** Move the large spring pivot outwards.

(4) **Intermediate advance under 19º.** Move the small spring pivot inwards

(5) **Maximum advance is under 28º.** Move the large spring pivot inwards.

b. It may be required to adjust both springs if faults still occur within the mid range (intermediate advance). If so make minor adjustments to both spring pivots and recheck entire centrifugal advance, on completion of adjustments.

c. Retest the centrifugal advance to ensure it is adjusted to specifications.

d. Readjust engine timing to 6^0 BTDC.

7. **Vacuum advance checks:**

a. Conduct visual inspection:

(1) Turn off engine and key.

(2) Ensure vacuum line is serviceable.

(3) The optical switch cable is secure and can move freely with the vacuum advance plate unrestricted.

b. **Function Tests:**

(1) Disconnect the vacuum advance tube at the distributor.

(2) Fit Mityvac tester to the vacuum advance tube.

(3) Fit Tachometer and Timing Light to the engine.

(4) Start/warm up the engine and check no vacuum is found at the vacuum port on the RH carburettor at idle speeds.

Note

If any vacuum is found at the vacuum port adjust throttle synchronisation of carburettors, or check for restrictions in the inlet tracts.

(5) Increase speed to 1500-2000 rpm and note vacuum increasing to around 20” ±2” Hg.

(6) Adjust engine timing to TDC:

(7) Reposition Mityvac to the vacuum advance unit and seal off the vacuum advance line.

(8) Start engine and allow it to warm up at idle speed (750 ±50 rpm).

(9) Pump the Mityvac tester up to 25” Hg and note maximum vacuum advance using the timing light.

(10) Ensure no more than 12° engine advance is obtained at any stage of testing.

8. **Vacuum Advance Adjustment Procedure:**

a. Remove the Mityvac tester from vacuum advance unit.

b. Fit a 3/32 Allen key into the tube end of the vacuum advance unit:

c. Turn anti clockwise to reduce vacuum advance.

d. Turn clockwise to increase vacuum advance.

e. Recheck engine advance is no more than 12° using the Mityvac tester and timing light, at idle.

f. Reset timing to 6° BTDC.

g. Remove Tachometer and Mityvac tester and refit vacuum advance line.

9. **Specifications:**

a. **Centrifugal Advance:**

(1) Up to 1200 rpm - no centrifugal advance.

(2) 2500 rpm - 19° Intermediate centrifugal advance.

(3) 3200 rpm 24° maximum centrifugal advance.

b. **Centrifugal Advance Tolerances:**

(1) Up to 1500 rpm - ±½ degree.

(2) 1500 - 3700 rpm - ±1 degree.

c. **Weight Spring Tensions:**

(1) Small - 1 lb at 30 mm.

(2) Large - 2 lb at 30 mm.

10. **Degree Keys:**

a. Replacement degree keys are available from:

W.L. White
36A Vernon Terrace
St Martins
CHRISTCHURCH
Phone: (03) 3321546
Fax: (03) 3321546
Cell Phone: (021) 335568