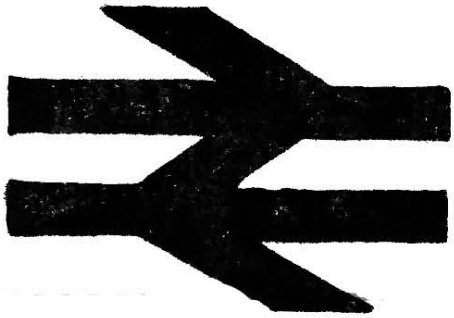
H.I.N.T.S.

FOR MAINTENANCE STAFF



IN THE LONDON AREA

WESTERN REGION

INCLUDES:- 1) INJECTION PUMP SETTING

2) ENGINE SYNCHRONISATION

APRIL 1989

HELPFUL INFORMATION AND NOTES ON TRAIN SERVICING

Ref:Bobsbook

INTRODUCTION

Welcome to your first issue of H.I.N.T.S.

This journal has been produced by the London Area Technical Team at Old Oak Common and is intended for issue to maintenance staff in the London Area. It is hoped that the contents will act as a guide to the better understanding of maintenance procedures and the reasons for them, and hopefull engender some discussion and even some correspondence on the subject.

It is planned to produce the journal periodically in response to any particular demand for a subject as a result of an apparent need resulting from the analysis of our "in service failures".

H.I.N.T.S. is primarily targeted at D.M.U. maintenance, but future editions may branch out to other topics as the need arises.

The first issue concentrates on the fuel pump and its control. This subject has been chosen because of the significant number of "in service failures" associated with this equipment. Also included is a brief note on two recent amendments to the maintenance schedule which have been initiated by the London Area Team in response to the high number of associated failures, plus a point of clarification on fluid couplings.

I look forward to receiving your comments.

The Editor
H.I.N.T.S.
C/o A.M.& E.E. London
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CHAPTER ONE

LEYLAND FUEL INJECTION PUMP CHANGE/SETTING DESCRIPTION GENERAL INFORMATION

There are now two types of 680 Leyland engine and three types of fuel pump.

The two engine types are:-

1st	Leyland 150 HP Engine	680/1539	Early type
2nd	Leyland 150 HP Engine	680/1595	Latest type

The three fuel injection pump types are:-

1st Is for the early type Leyland 680/1539 the pump is easily identifiable as its governor has its own oil sump which is filled or topped manually.

2nd Is for the latest type Leyland 680/1595. This pump governor has its oil supply fed from the engine lub oil system, and is identifiable by adaptors for oil pipes.

3rd Friedmann & Maierag type. This type of pump can be found fitted to the latest type Leyland 680/1595 only. This pump also has a feed of oil from the engine lub oil system.

If one of these pumps is not available. The engine can be converted back to take the second type above.

To identify the commencement of injection marks:-

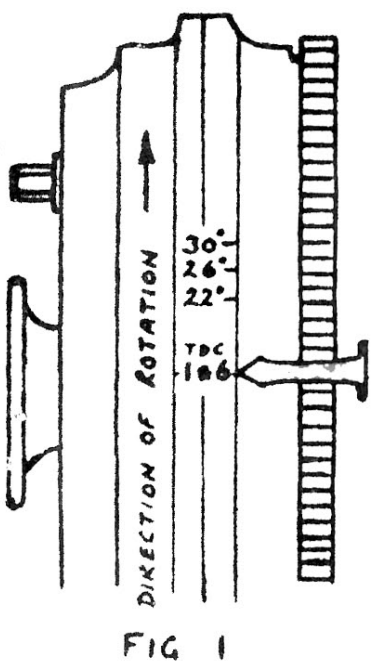


FIG 1

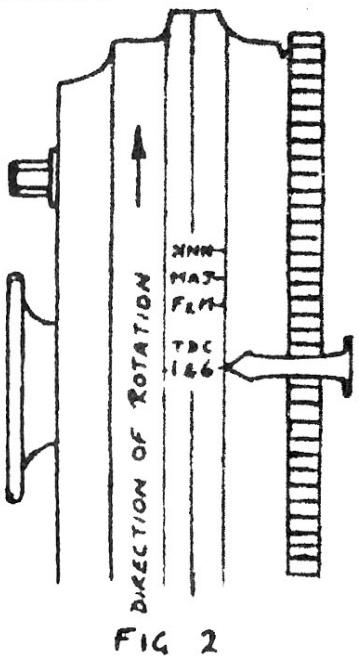


FIG 2

22° - F & M Friedman & Maierag

26° - MA or MAJ new type Leyland 680/1595

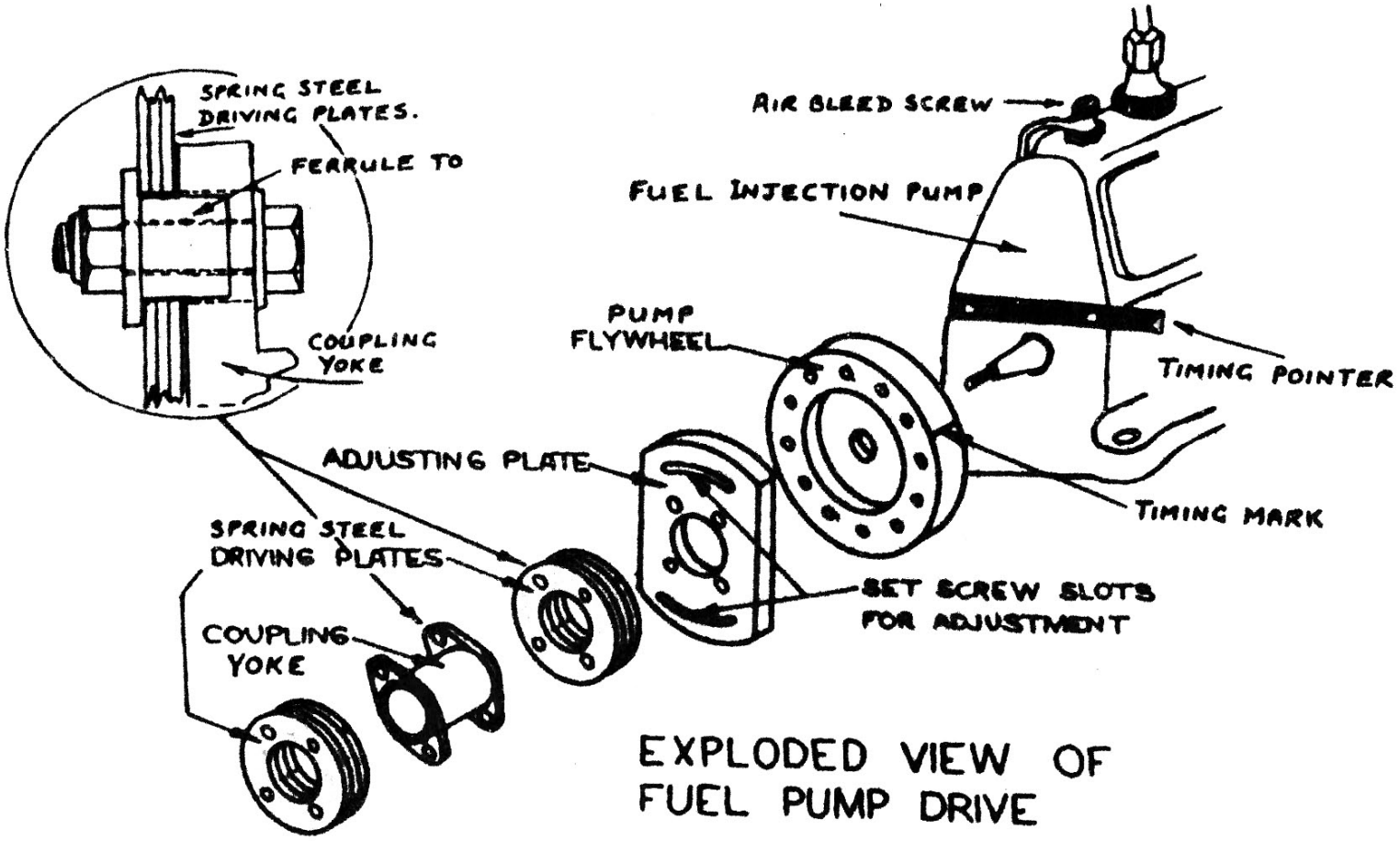
30° - NNN Early type Leyland 680/1539

Various combinations of the above injection marks will be found. Some have all three marks with lettering as in Fig. 2. Some have all three marks notated in degrees of rotation stamped on as in Fig.1. Others may have two or all three marks but only one identified with letters. The plain marks can easily be deciphered given the above information.

FITTING A NEW INJECTION PUMP

Remove the old, defective pump and note its type. Draw from the stores a pump of similar identification.

Examine the drive coupling for signs of burred or elongated holes, loose nuts and bolts or cracked or otherwise damaged spring steel plates, renew coupling components as necessary. Note that if "Nylock" nuts are fitted ensure that there is sufficient bolt thread protruding through the nuts, if not fit longer bolts to suit.



EXPLODED VIEW OF FUEL PUMP DRIVE

Examine the timing mark pointer on the engine and if bent or damaged repair or straighten as necessary. If the pointer is missing or irreparable the pump will have to be spill timed. Only rarely should spill timing be necessary so details will not be included here but should details be required instructions can be found in diesel engine manuals or alternatively advice can be sought from the technical team on 00-31261.

Remove both rocker covers. From outside the pit, face the rocker gear, lean in and pull the flywheel upwards until pistons 1 & 6 are at Top Dead Centre with no.1 on the firing stroke, ie with both valves closed and push rods and rockers loose, and No.6 on "the rock" ie the two rockers moving equally up and down as the cylinder passes from exhaust stroke to inlet stroke. Note that No.1 cylinder is at the free end, and when viewed at the free end the above direction of rotation is clockwise which is the correct direction of rotation for setting purposes as it takes up the backlash in the gear train etc.

When it is established that No. 1 piston is at the correct T.D.C. then proceed to set the flywheel at the correct commencement of injection mark as identified in the Description and General Information Section. Note that if you come past the mark then take the flywheel back at least 60 and approach the mark again by rotating in the clockwise direction in order to ensure that the back-lash remains taken up correctly.

Now turn the Fuel Pump Flywheel until the timing mark on it is in line with the pointer fixed to the pump body.

Offer the new pump up to its position on the engine entering the mounting bolts but not tightening them. Push the pump up to the coupling and ensure that the adjusting plate lines up and fits into the pump flywheel. Fit the set bolts and tighten, then tighten the mounting bolts. The sequence of bolting up the plates before the mounting bolts will ensure that the coupling plates are not pre-stressed when assembled - we do find that we have a number of pump couplings fail in service due to being poorly fitted and pre-stressed.(Note that the coupling must be fitted with 3 plates either side of the yoke)

Remove all the plastic sealing caps from the pipe adaptors on the newly fitted pump and transfer them to the old pump, so as to ensure minimum contamination en-route to overhaul. Now couple all fuel and oil pipes etc. and finally connect up the stop solenoid and return spring (if fitted).

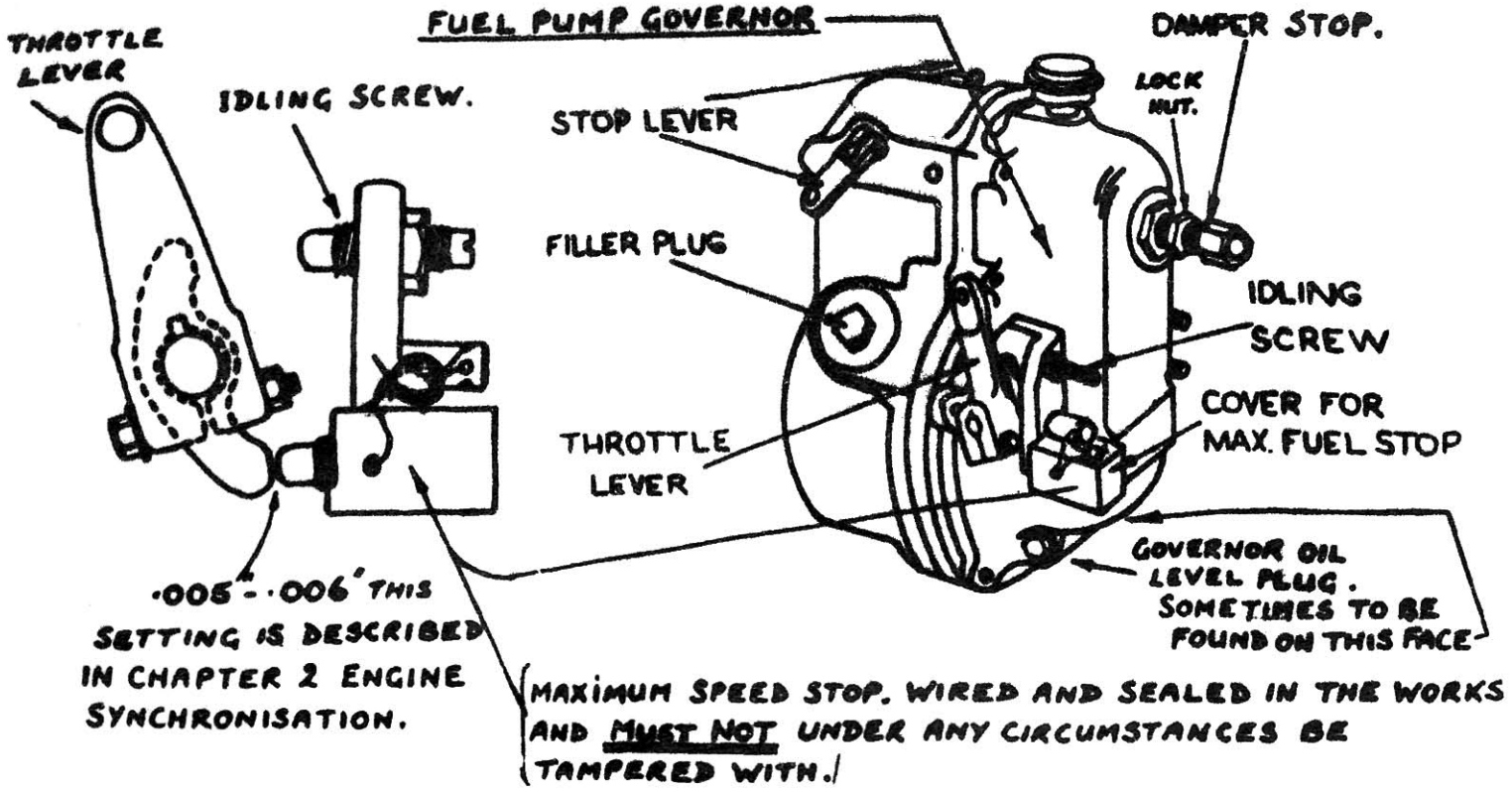
Bleed the air from the pump through the air vent by operating the lever on the lift pump until bubble free fuel is emitted. Note that if no resistance is felt at the hand lever and no fuel is pumped then the lift pump cam is probably on "Full Stroke", turn the engine flywheel until the cam backs off and the lever becomes operative. On the early type Leyland 680/1539 engine the injection pump sump should be filled with engine oil through the filler plug until it comes out of the level plug.

Setting up the Fuel Injection Pump

This must be undertaken with the engine warmed up, so couple up the throttle motor control rod and start the engine.

Obviously the engine will warm up quicker if you blank off the radiator with a sack or sheet of newspaper. When warmed up, disconnect the throttle rod again, slacken the locknut on the governor damper stop and screw the damper - well out!

The engine revs are adjusted using the idling screw on the governor, so check the speed with a hand tachometer on the crankshaft fan pulley - NOT the cab gauge - and adjust if necessary to 410 - 420 rpm and retighten the lock nut.



The next job is the governor damper. Remember, this is NOT the means of adjusting engine idling speed and must not be used as such. On the end of the damper screw is a spring loaded plunger which bears on the end of the injection pump rack to stabilise it as idling speed and stop the engine hunting.

Screw the damper in until the engine runs slightly faster, then screw out again until the revs are back to normal, and then screw out a further half-turn. Tighten the lock nut on the damper stop. In order to prove the settings made to the damper stop, proceed as follows:- With engines idling and the desk commissioned, select 1st gear and check that engines do not stall. If either engine stalls then further fine adjustment may be carried out to the damper stop (clockwise direction).

Now the fuel injection pump is set up, and we have one more check to do. Race the engine up to full speed and see that it drops smoothly and quickly back to idling and does not hang back, if it does this is a serious condition and can cause excessive wear or damage to the associated transmission in particular when one end of a set returns normally to idle and the other end hangs back. If by dropping the engine R.P.M. to the minimum idle figure it is still slow to return the pump will have to be changed again. It is possible to make adjustments to the fuel injection pump governor weights in order to cure the slow return to idle but this should be done under controlled conditions and also may contravene warranty arrangements so should not generally be undertaken.

With the setting up complete, the next job is to set up the throttle motor - this is described in Chapter 2.

CHAPTER TWO

ENGINE SYNCHRONISATION

REASONS FOR CHECKING ENGINE SYNCHRONISATION

1. Reports in repair book of engine speeds being wrong.

2. After changing components, e.g. ENGINE. FUEL PUMP. THROTTLE MOTOR.

3. Repairs which may have altered length of throttle, etc. *

4. Check on "C", "D" and "E" Exams.

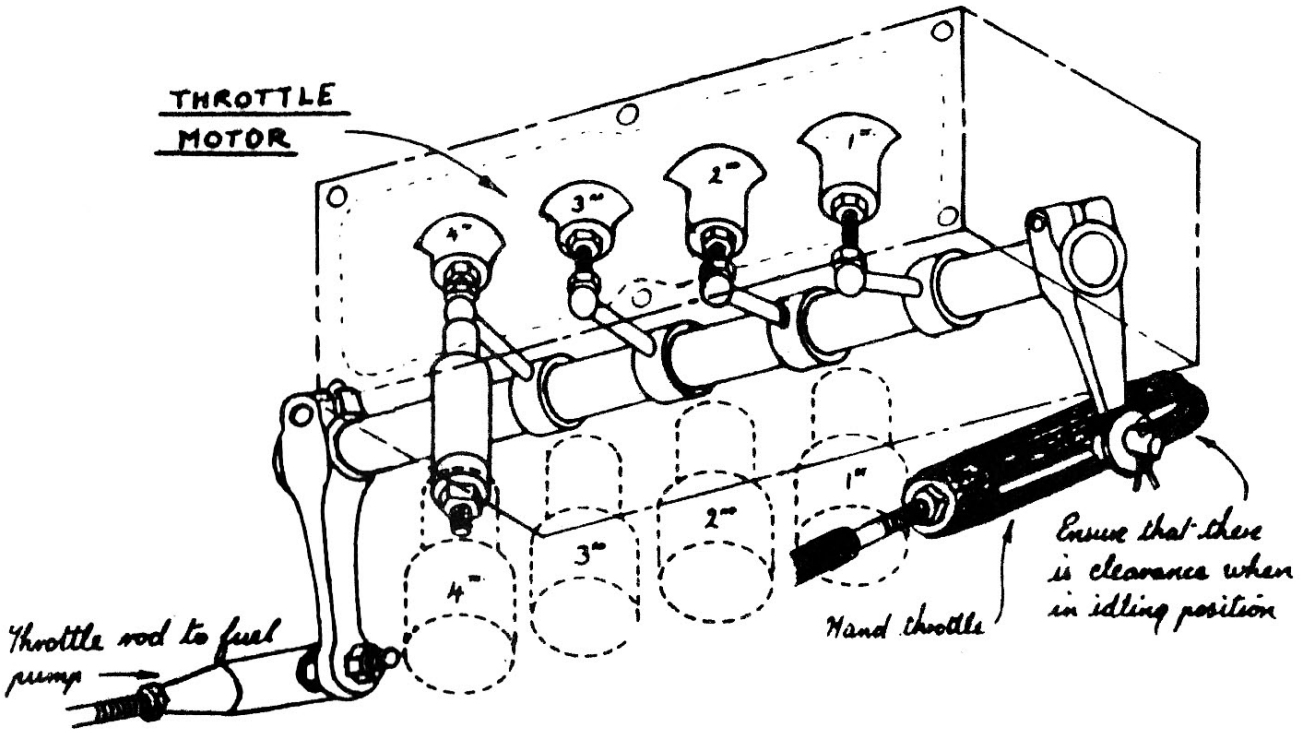
Although only adjustment may be needed at times, it is thought best to describe setting up from scratch. Once this has been grapsed, adjustments will come easy.

SETTING UP SYNCHRONISATION FROM SCRATCH

OBEY SAFETY PRECAUTIONS.

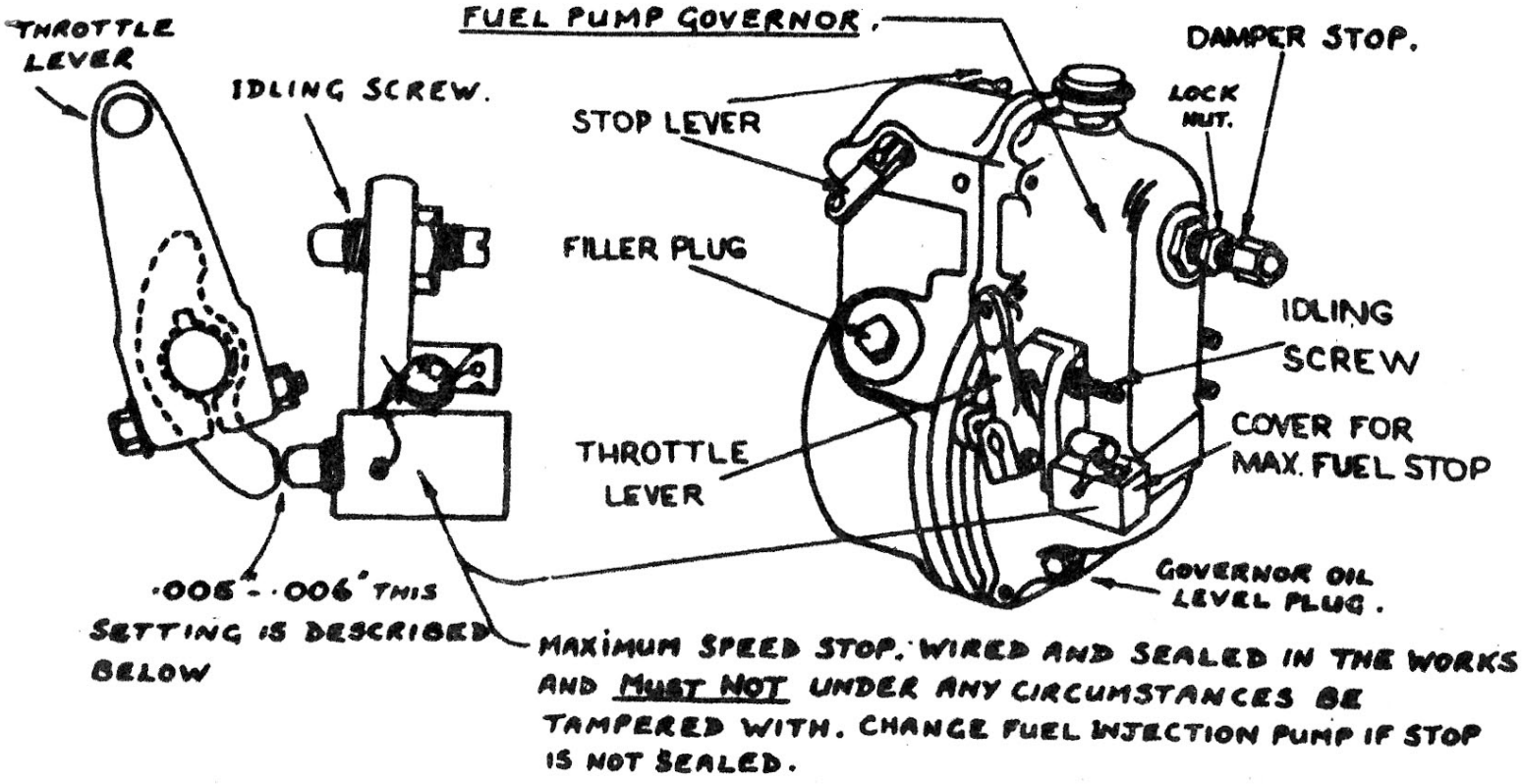
1. Ensure that engine idling speed is not being influenced by the fuel pump damper stop or the hand throttle cable fork end.

   Slacken back the damper stop and if necessary remove clevis pin and adjust hand throttle cable fork end to give some clearance as shown in the drawing of the throttle motor below.



2. Check the engine idling speed using a hand tachometer (speed should be 410-420 r.p.m.) and compare this with cab tachometer. If necessary, correct the speed by adjusting the idling screw.

3. Screw in damper stop until engine revs just start to increase, slack back until revs are back to normal and then a further half turn. Tighten the lock nut.



4. Ensure air system is charged. Remove throttle motor cover. Select first throttle speed and check that the engine speed is within the range 550-560 r.p.m. without a tendency to run away.

If first throttle speed is incorrect, proceed as follows:

Speed too low:

(i) Screw first speed throttle motor stop in until 550-560 r.p.m. are obtained.

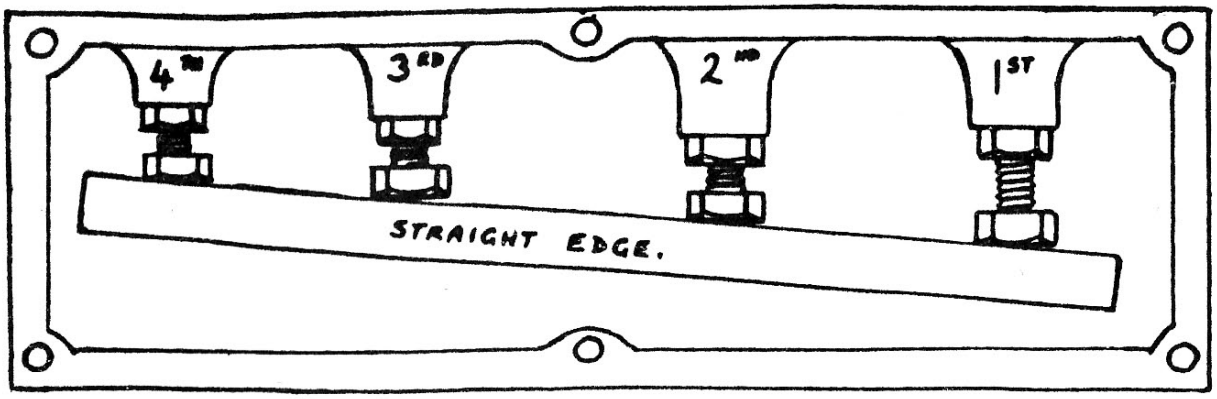
Speed too high:

(ii) Screw first speed throttle motor stop out until 550-560 r.p.m. are obtained.

See note 7. regarding correct method of adjusting screw stops.

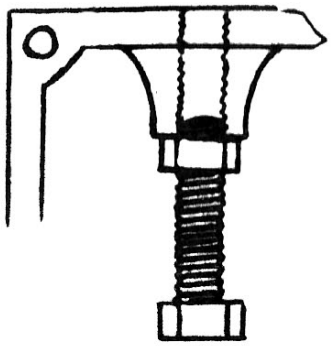
5. Shut down and isolate the engines. Select fourth throttle speed by operating the EP valve manually. Check the clearance between the fuel pump maximum speed stop and the pawl which is operated by the throttle lever. This should be 0.005" to 0.006". If this clearance is excessive, screw up the 4th speed stop in the throttle motor until the 0.005" to 0.006" is obtained at the fuel pump pawl. With air on the piston this adjustment is a simple operation. If there is no clearance this is a serious condition because damage to the maximum speed stop can result and the stop in the throttle motor must be screwed out until the correct clearance is obtained. Release 4th throttle EP valve. De-isolate and start the engines.

6. Line up by eye or put a small straight edge in the throttle motor, resting up against the first and fourth speed stops. Adjust the second and third speed stops to give a nice line as below. Go through the throttle speeds one by one on the controller, noting that the two engines climb in revs together, using the desk tachometer switch. Setting the 2nd and 3rd speed stops in line should be sufficient but some final adjustment may be needed.

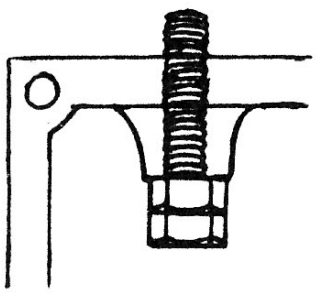


7. It will sometimes be found that it is not possible to obtain the correct speeds when adjusting the throttle motor owing to no more adjustment left on the stop as shown in (a) and (b) below. The ideal stop in the motor is shown in (c) below.

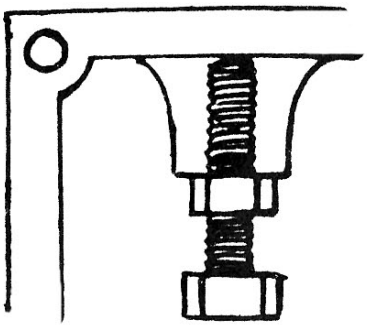
(a)



(b)



(c)



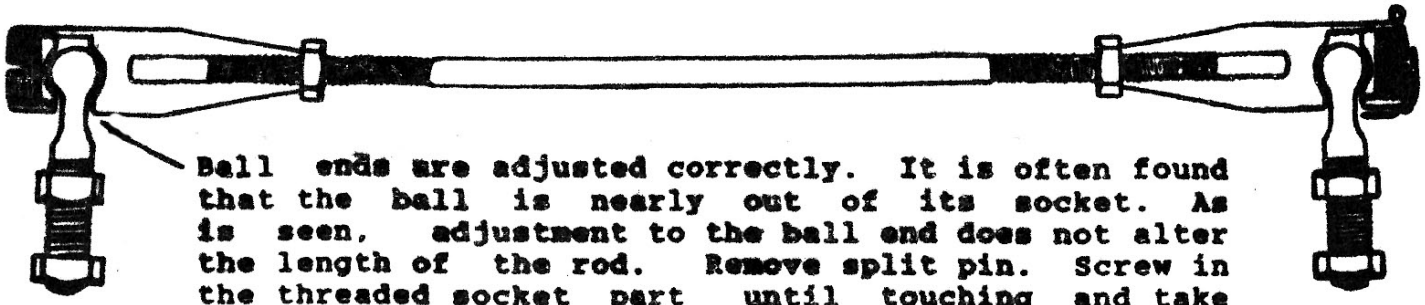
The following is an easy way of remembering the method of overcoming the difficulty shown in (a) and (b):

To shorten the stop - shorten the throttle rod.

To lengthen the stop - lengthen the throttle rod.

Before adjusting the length of the throttle rod, note the amount of thread protruding from each ball end. Try to keep the amounts equal when adjusting. If before adjusting, or at any other time, it is noted that the amount of threads protruding are very unequal, then these should be equalised by slackening the lock nuts and turning the rod.

Also, when dealing with the throttle rod, check that the



Ball ends are adjusted correctly. It is often found that the ball is nearly out of its socket. As is seen, adjustment to the ball end does not alter the length of the rod. Remove split pin. Screw in the threaded socket part until touching and take back approx quarter of a turn to line up slot and holes for split pin.

CHAPTER 3

MAINTENANCE SCHEDULE ITEMS

A) Coolant Leaks

We have been suffering from a high number of casualties recently due to coolant loss. One of the mediums for engine coolant leakage, especially when engines are cold, is from hoses. In order to combat this job 10.1 for B exams and above has been re written locally and a copy of this is included below:-

SUPPLEMENTARY SHEET D.M.U. B,C,D,& E EXAMS

JOB 101 EXTENSION OF ITEM 4
TIGHTENING OF ALL HOSE CLIPS ON
D.M.U. COOLING SYSTEMS

PROCEDURE:-

OBEY SAFETY PRECAUTIONS

1) Check coolant hoses for signs of deterioration, renew as necessary.

2) Check all coolant hose Jubilee clips for position and damage. Any found badly positioned to be re-positioned and damaged clips to be renewed.

3) Ensure tightness of all coolant hose Jubilee clips by attempting to tighten them, using a small open jaw or ring spanner (normally 3BA or 7mm), regardless of whether there is evidence of coolant leakage or not. Note that when a Jubilee clip has not been disturbed for a long time it can take some effort to start the screw. However, once started, they will often take up a number of turns.

CHECK NO _____ TIME ON _____

TIME OFF _____

B) SMITHS HEATERS

Attention to heaters is a major cause of delays to trains in the winter months, many of the delays being attributable to apparent glow plug failures. Whilst we are changing glow plugs at A exams, often it is fouling up of the glow plug shroud which is the root cause of the inability of the plug to ignite the fuel.

In order to address the situation the wording of Job No: 811 in the W.R. work content guides has been altered locally to re-emphasise the importance of the shroud and also the clarity of the fuel drain. A copy of this is included below:-

Job No 811

Observe safety precautions

1) Remove the glow plug.

2) Examine the fixed shroud in situ for any carbon build up. if it cannot be established that the shroud is unblocked then it must be removed and cleaned.

3) Refit cleaned shroud if removed during (2)

4) Fit new or overhauled glow plug.

5) Check that the fuel drain on the underside of the heater is clear. Remove the drain for this if necessary.

Then continue to Job 801 - "Heater Test".

C) FLUID COUPLING LEVEL CHECK

It has been brought to our attention that there is some confusion over the topping of the coupling, and in order to clarify the position, included here is a copy of Job No. 106 which refers to couplings with the white mark. In addition we have added the procedure for when no white line exists.

DMU

JOB NO. 106
FLUID COUPLING LEVEL CHECK

SAFETY CONDITION 1

The following must NOT be carried out whilst the coupling is hot.

1. Set the white mark on the coupling opposite the timing pointer.

2. Clean around the uppermost filler plug, remove it and fill the coupling to capacity with the specified fluid.

3. Refit the filler plug securely.

If no white mark exists on the coupling, proceed as follows:

1. Set the fluid coupling so that the filler plug is at the 12 o'clock position, then rotate coupling anti-clockwise by 4 and a half pitches of periphery bolts. This should bring the filler plug around the 10 o'clock position.

2. Clean around uppermost filler plug, remove it and fill the coupling to the level of the plug with the specified fluid.

3. Re-fit the filler plug securely.

NOTE that it is essential that the coupling is neither over nor underfilled and that the correct fluid is used, otherwise damage will result.