

## Chapter 9.—MISCELLANEOUS AND E.C.U. COMPONENTS

*Note.—This chapter applies to Avon Mk. 10701, 10901, 11301, 11501, 12101 and 12201 Engine Change Units and Associated Jet Pipes*

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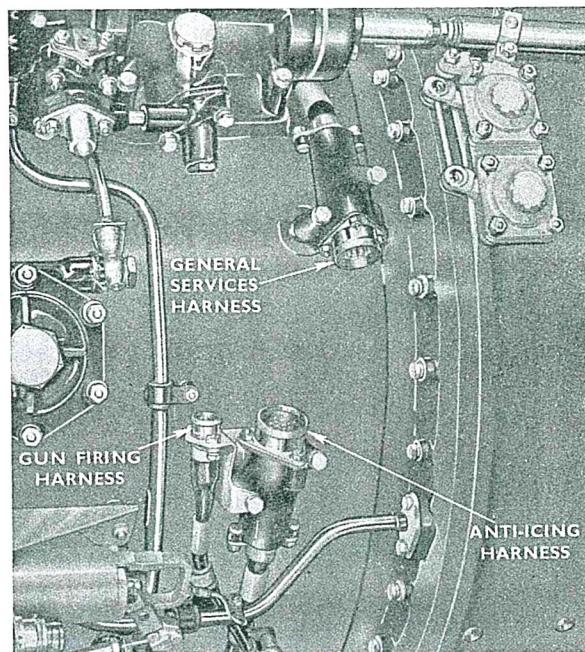
## L.T. HARNESSES AND STARTER WIRING

1. The general services, anti-icing and gun-firing harnesses, and the starter wiring, supply all electrical services on the engine except the high-energy supply to the igniter plugs. The location of the pick-up sockets is shown in fig. 1.

2. Mk. 109 engines incorporate an aircraft pick-up harness which is an extension of the general services and anti-icing harnesses, and some engines have additional short harnesses to serve the fuel pressure warning light switch and oil pressure transmitter; the two latter harnesses are extensions of the general services harness.

### *Removal and Replacement*

3. The removal and replacement of the l.t. harnesses is straightforward; removal and replacement of the starter wiring is more complex and involves the removal of the starter



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Fig. 1 L.t. harness pick-up sockets

fairing and anti-icing hot air manifold. If the engine is installed in the aircraft ensure that the aircraft electric supply is off before attempting to handle a harness; ensure also that all cartridges are removed from the starter before making any checks. After fitting a new harness, or before rejecting a harness as unserviceable, checks for external damage, continuity and insulation should be made.

#### External damage

4. If any external damage is observed, the continuity and insulation checks described later in the chapter should be made; if the results of the checks are unsatisfactory, the harness should be changed. Distorted socket pins or loose inserts would also be causes for rejection. A special gauge, listed in Section 1, is provided for checking socket inserts; place the gauge in the insert and check that it does not drop out when held vertically downwards. If the socket does not pass this test, change the harness.

5. To avoid damage to socket inserts, the test connections must not be of greater diameter or length than the pin which normally mates with the socket.

#### Continuity checks

6. Continuity checks should be made with an approved ohmmeter (*maximum potential of 4.5V*). The method of checking is similar for all harnesses; differences exist in the numbering and lettering of harness leads, but tables and wiring diagrams (*fig. 2, 3, 4 and 5*) are provided so that circuits can be traced.

7. It is only necessary to expose the terminal pins (*or the aircraft pick-up harness terminal, on Mk. 109 engines*) to check the general services, anti-icing and gun-firing harnesses; the harness branch sockets should remain connected to the units they serve.

8. Check for continuity as indicated in the following tables and paragraphs:—

CONTINUITY CHECK — GENERAL SERVICES HARNESS

Leads being checked	Terminal pins	Approximate reading
Oil pressure transmitter	EC, EG, GC	50 ohms 100 ohms
Fuel pump isolating solenoid (a) Pre-Mod. 1070 (b) Mod. 1070	2D 2D	30 ohms 12 megohms ( <i>minimum</i> )
Tachometer generator	FH, HK, FK	20 ohms
Fuel pressure warning light switch	LM	0.5 ohm
Fuel de-icing switch	LM	20 megohms ( <i>minimum</i> )

To check the starter for continuity, remove the breech caps and connect one lead of the ohmmeter to the starter contact inside the breech and the other lead to the corresponding harness terminal pin, i.e. starter contact A, B and C to terminal pins A, B and J, respectively. Check that the ohmmeter reading is 8 to 10 ohms.



## CONTINUITY CHECK — ANTI-ICING HARNESS

Leads being checked	Terminal pins	Approximate reading
Gate valve actuator	* FE DA	1 ohm 9 ohms
Top temperature control (Mk. 115, 121 and 122)	† BJ, BK JK	8 ohms 1 ohm

\* In addition to checking circuits FE and DA, it is necessary to disconnect the gate valve actuator socket and check for continuity between point B at this socket and pin H at the harness terminal. The ohmeter reading should not exceed 0.5 ohm.

† In addition to checking circuits BJ, BK and JK, it is necessary to disconnect the top temperature control socket and check for continuity between point C at this socket and pin C at the harness terminal. The ohmeter reading should be approximately 0.5 ohm.

*Gun-firing harness*

9. Connect the ohmeter to the harness terminal pins A and B, and check that the reading is 15 ohms. Disconnect the harness socket at the fuel dip and air dip units in turn and check that the ohmeter reading is approximately 30 ohms.

*Checking individual harness leads*

10. If any of the specified ohmeter readings are not obtained, disconnect the appropriate socket from the component served and check the individual harness leads, using the wiring diagrams (fig. 2, 3, 4 and 5) as a guide. The ohmeter reading should be very low, e.g. 0.1 to 0.2 ohms. If the readings obtained are still unsatisfactory, the harness should be changed.

**Insulation checks**

11. Insulation checks should be made with an approved 500V Megger; the starter breech caps should be fitted, but ensure that all cartridges are removed before making any checks. The method of checking is the same for all harnesses; one lead of the Megger should be earthed and the other connected to each terminal pin in turn. The Megger readings should be not less than 12 megohms, with the

exception of the starter terminals A, B and J, where the readings obtained should be not less than 1 megohm.

12. It is only necessary to expose the terminal pins (or the aircraft pick-up harness terminal on Mk. 109 engines) to check the general services, anti-icing and gun-firing harnesses; the harness branch sockets should remain connected to the units they serve.

*Checking individual harness leads*

13. If the specified Megger readings are not obtained, disconnect the appropriate socket from the component served and repeat the insulation check. If the minimum values are not obtained, change the harness.

**Replacement of units**

14. If the harness is checked as described and found to be serviceable, a faulty unit is indicated. Change the unit and transfer the adapter to the replacement unit, using the appropriate adapter tool listed in Sect. 1.

**Ground running check**

15. Ground run the engine as described in Vol. 1, Part 2, Sect. 2, and check that all electrical services are functioning correctly.

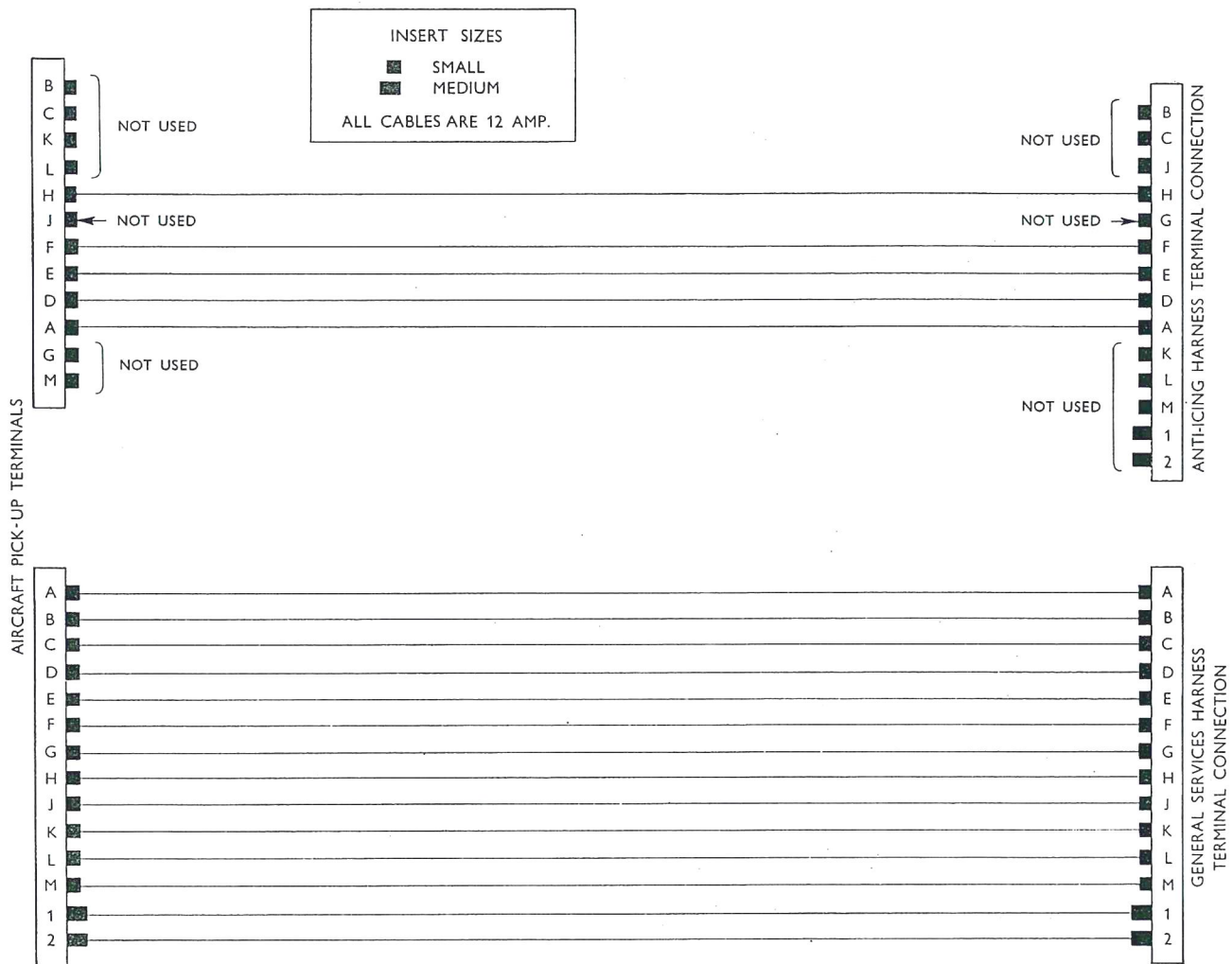


Fig. 2 Aircraft pick-up harness (Mk. 109)—wiring diagram

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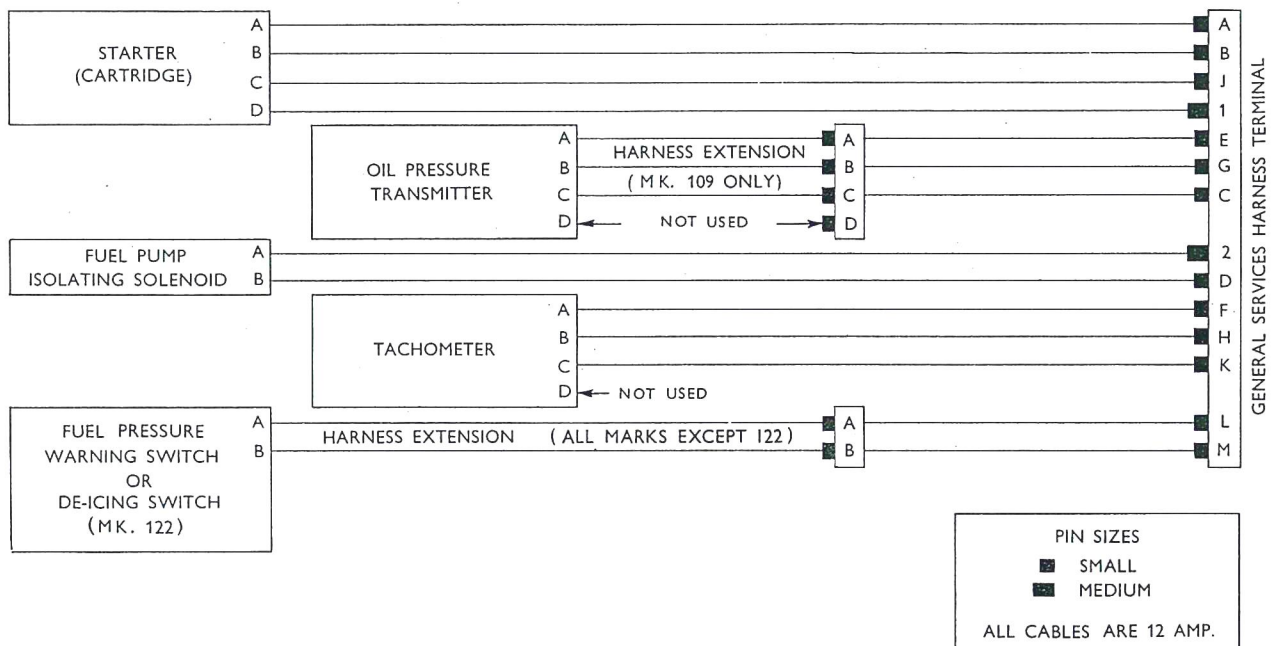


Fig. 3 General services harness (all Marks) wiring diagram

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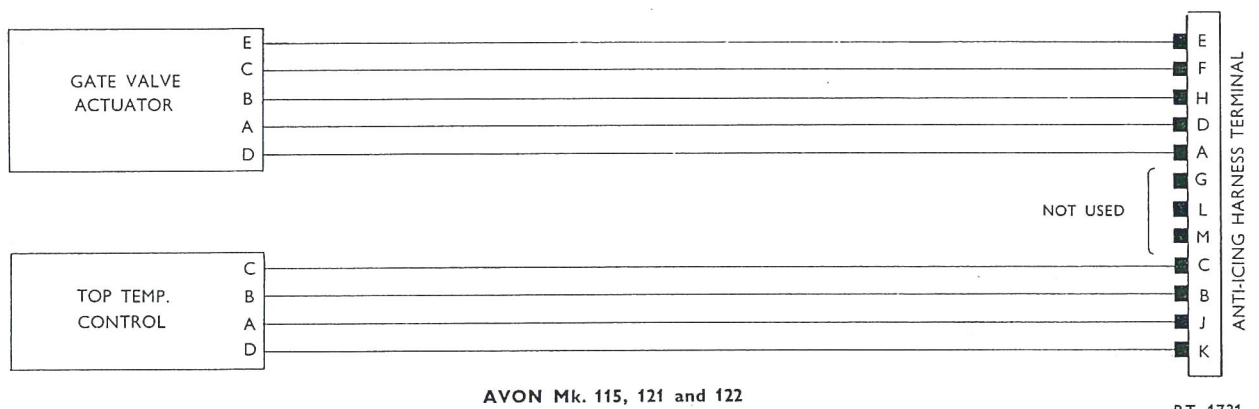
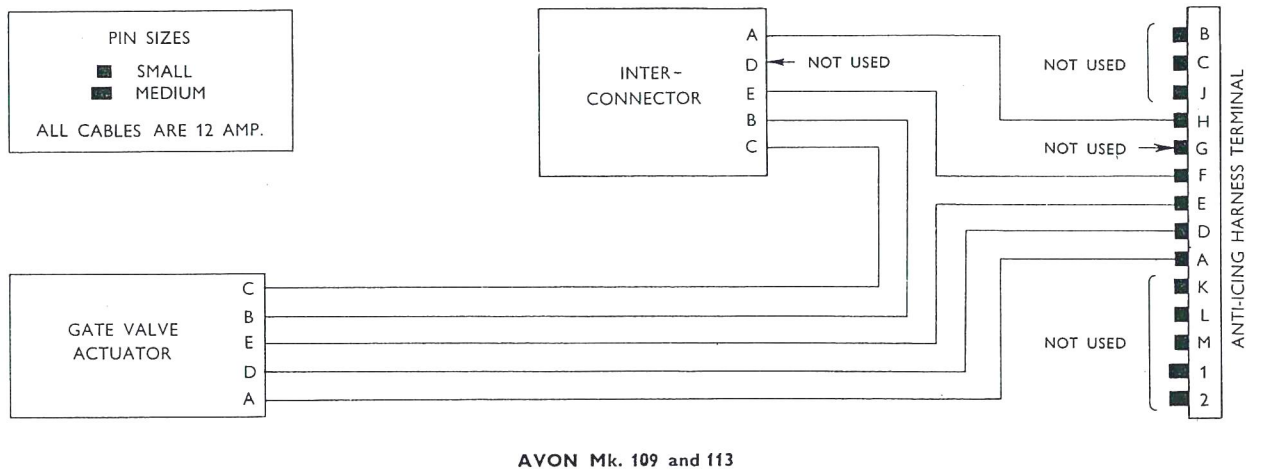


Fig. 4 Anti-icing harness wiring diagram

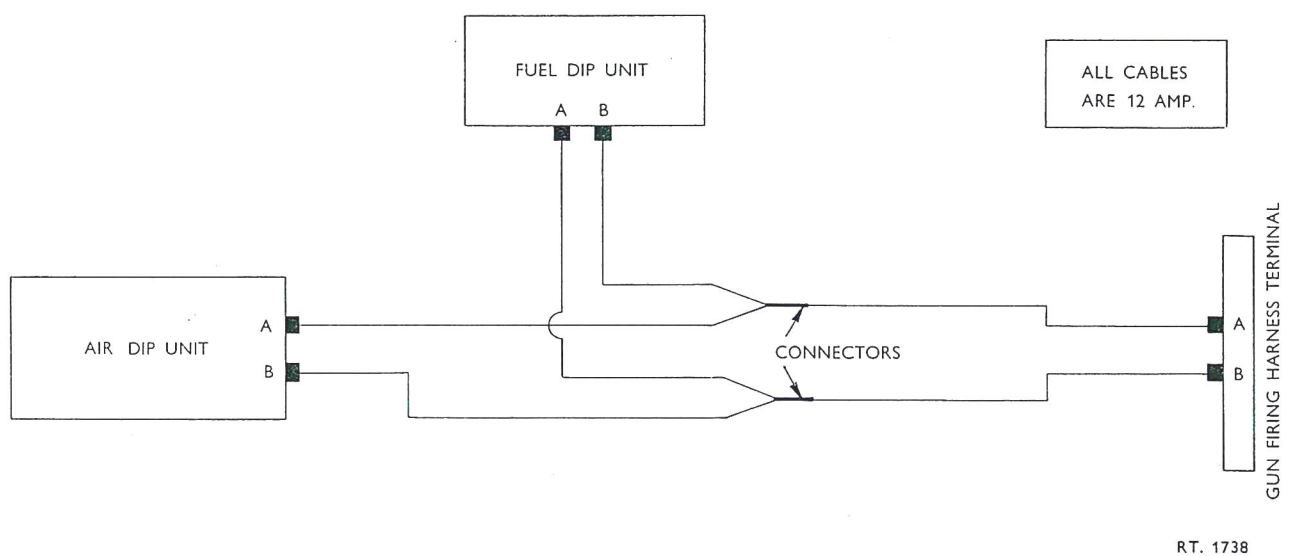


Fig. 5 Gun-firing harness line wiring diagram



## Supplement 1.— Mk. 10701, 10901, 11301, 11501, 12101 and 12201 ENGINE CHANGE UNITS

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#### LOW PRESSURE WARNING SWITCH

1. Mk. 12201 engine change units do not feature a low fuel pressure warning switch, but on all other Marks the switch is attached by a banjo bolt to the outlet elbow on the l.p. filter casing and its renewal is straightforward.

##### *Serviceability check*

2. With the l.p. cock turned on, switch the l.p. pump on and off, and check that the warning indicator operates satisfactorily.

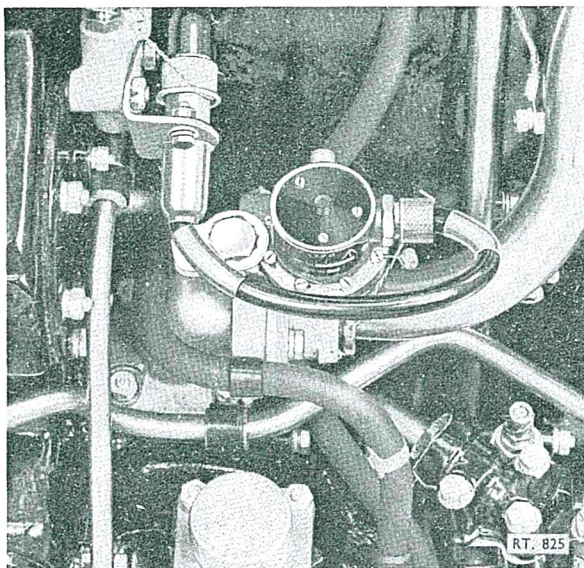


Fig. 1 Low pressure warning switch

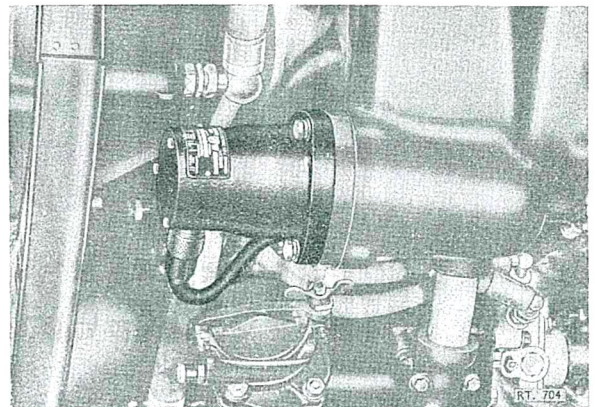


Fig. 2 Tachometer generator

#### TACHOMETER GENERATOR

3. Using the spanner listed in Sect. 1 for the flange securing setscrews, the renewal of a tachometer generator is straightforward. Ensure that the splines on the replacement generator shaft are a good sliding fit in the shaft in the wheelcase.

##### *Serviceability check*

4. Run the engine up to governed speed, carefully observing the jet pipe temperature, and check that the rev/min is indicated correctly and consistently by reference to a master indicator.



SUPPLEMENT 2 - MK.12201 ENGINE CHANGE UNITS  
(pre-Mod.5428)

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1. Low pressure nozzle guide vane clamping ring

A. General

- (1) During engine life it may be necessary to re-tighten the nuts securing the one-piece low pressure nozzle guide vane (l.p. n.g.v.) clamping ring (pre-Mod.5428) to the approved torque loading (para.2.A.(3)).
- (2) Gain access to the l.p. n.g.v. clamping ring by removing the exhaust unit and fire extinguisher rail. Refer to Chap.5.
- (3) If, on inspection, the clamping ring is found to be cracked beyond acceptable limits (para.2.B.) it must be removed and a serviceable ring fitted (para.4); this will involve the removal of the low pressure (l.p.) turbine wheel (para.3.A.).

2. Retighten the l.p. n.g.v. clamping ring securing nuts

- A. Unlock the tabwashers and remove the nuts securing the clamping ring to the nozzle box.

B. Inspection

- (1) A clamping ring which is completely cracked through at not more than three places is acceptable provided the cracks do not occur at stud holes and each segment is secured by at least four studs.

- (2) Cracking from stud holes is acceptable providing the cracks radiate EITHER inwards OR outwards but NOT in BOTH directions from any stud hole.

C. If the ring is acceptable, use engine oil as a lubricant, then fit and tighten the nuts to a torque loading of 35 lbf in., increasing to a maximum of 55 lbf in. if necessary to enable the tabwashers to lock.

CAUTION: WHEN REFITTING CLAMPING RING SECURING NUTS IT IS ESSENTIAL THAT THE CORRECT NUTS (KB.18327, 36 VV/18908) ARE FITTED.

3. Remove the l.p. n.g.v. clamping ring from the nozzle box

A. Remove the l.p. turbine wheel

- (1) Mark the l.p. wheel and nozzle box with correlation marks, using an approved marking medium for hot-end components, to assist in aligning the master driving dog when re-assembling. Apply penetrating oil to the threads of the sleeve bolt and allow five minutes to elapse before attempting to unscrew the retaining nut.
- (2) Unlock and remove the setscrews securing the retaining nut locking plate then, using the extractor (Sect.1) withdraw the locking plate.
- (3) Fit the extension socket (Sect.1) to the retaining nut.
- (4) Bolt the 10:1 reduction unit to the dogging fixture (Sect.1), engage the drive of the 10:1 reduction unit with the extension socket then locate the pins of the dogging fixture in the three holes of the l.p. wheel balancing plug flange and secure the dogging fixture clamps.
- (5) Using the hand wrench (Sect.1) slacken the l.p. wheel retaining nut. Remove the reduction unit and dogging fixture then remove the retaining nut and washer.
- (6) Support the l.p. wheel and using the extractor (Sect.1) withdraw the wheel from the sleeve bolt until it is almost clear of the interstage seal then, still supporting the wheel, remove it from the engine.

B. Remove the l.p. n.g.v. clamping ring

- (1) Fit suitable setscrews to the extractor holes then apply even pressure to ease the clamping ring from its seating and remove the ring from the nozzle box.

4. Replace the l.p. n.g.v. clamping ring

- A. Before replacing the l.p. n.g.v. clamping ring, inspect the retaining studs for looseness, damaged threads and stretching.

- B. If it is necessary to fit a replacement stud use engine oil as a lubricant and torque tighten the stud to between 45 and 70 lbf in. The projection of the stud must be within 0.387 in. and 0.412 in.

NOTE: The clamping ring is provided with four stud holes to accommodate the four stepped studs introduced by Mod.5320. As pre-Mod.5320 nozzle boxes will not feature the four studs nor will new production nozzle boxes, the four holes, which can be identified by their unequal pitch in relation to adjacent holes, may be considered redundant.

- C. Replace the clamping ring, fit new tabwashers, then fit and torque tighten the nuts as described in para.2.B.(3) and lock the tabwashers.

D. Replace the l.p. turbine wheel

- (1) Inspect the sleeve bolt and retaining nut for damage and ensure that the locking plate is free from distortion.
- (2) Support the l.p. wheel, make use of the correlation marks (para.3.A.(1)) to align the master driving dog, then press the wheel on to the sleeve bolt.
- (3) Lubricate the threads of the sleeve bolt with anti-seize compound ZX-38 (34B/9437518). Ensure that the extension socket is fully engaged with the splines of the retaining nut then fit the 10:1 reduction unit and dogging fixture assembly (para.3.A.(4)), set the torque wrench (Sect.1) to between 83 and 90 lbf ft. and tighten the retaining nut to a torque load of 825 to 900 lbf ft.
- (4) Fit the serrated locking plate to the retaining nut then secure it with the setscrews and lock the tabwashers.
- (5) Spin the turbine to ensure that it rotates freely with no sound of rubbing. Replace the exhaust unit and fire extinguisher rail (Chap.5) and repeat the spin check.



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