

## Chapter 18

### STARTER MOTOR, ROTAX, TYPE C5301

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#### LEADING PARTICULARS

Stores Ref. ... ..	37F/5000
Voltage ... ..	24
B.H.P. (peak) ... ..	6
Direction of rotation (viewed from driving end) ... ..	Clockwise
Brush grade ... ..	CMSH
Brush spring pressure ... ..	24 to 32 oz.
Rating at 10 lb./ft. ... ..	60 sec.
Weight ... ..	20 lb.
Resistances at 20° C	
Armature ... ..	0.0064 ohms ± 10 per cent
Field—series ... ..	0.00275 ohms ± 10 per cent
shunt ... ..	20 ohms ± 10 per cent
Supply characteristic ... ..	1 volt drop per 70 amp.

#### Introduction

1. The Rotax starter motor, Type C5301 (*fig. 1*), is designed for 24-volt operation and has a nominal time rating of one minute at a rated torque of 10 lb.ft. The armature is wave-wound and the field assembly comprises a yoke (which also forms the body of the machine), four pole pieces secured to the yoke, and a compound winding comprised of four series coils connected in series-parallel and four shunt coils connected in series. Information on the reduction gearing will be found in the relevant engine handbook.

#### DESCRIPTION

2. Each starter comprises three main assemblies (*fig. 2*), the driving end frame, the body or yoke and the commutator end frame.

3. The armature is supported in two ball bearings, one carried by the driving end frame and the other by the commutator end frame, each being secured to the armature shaft by a nut. The driving end frame bearing is fed with oil from the engine, an oil seal being fitted at its rear. The brush gear assembly is carried by the commutator end frame; brush pressure is obtained from four clock-type springs.

#### Driving end frame assembly

4. The driving end frame assembly contains the front ball bearing (32, *fig. 3*) and the oil seal (29). The end frame, which forms the mounting whereby the starter is attached to the engine, is fixed to the yoke by eight screws and tab-washers. The ball bearing and the oil seal are carried in a housing which is riveted to the end frame. The bearing is

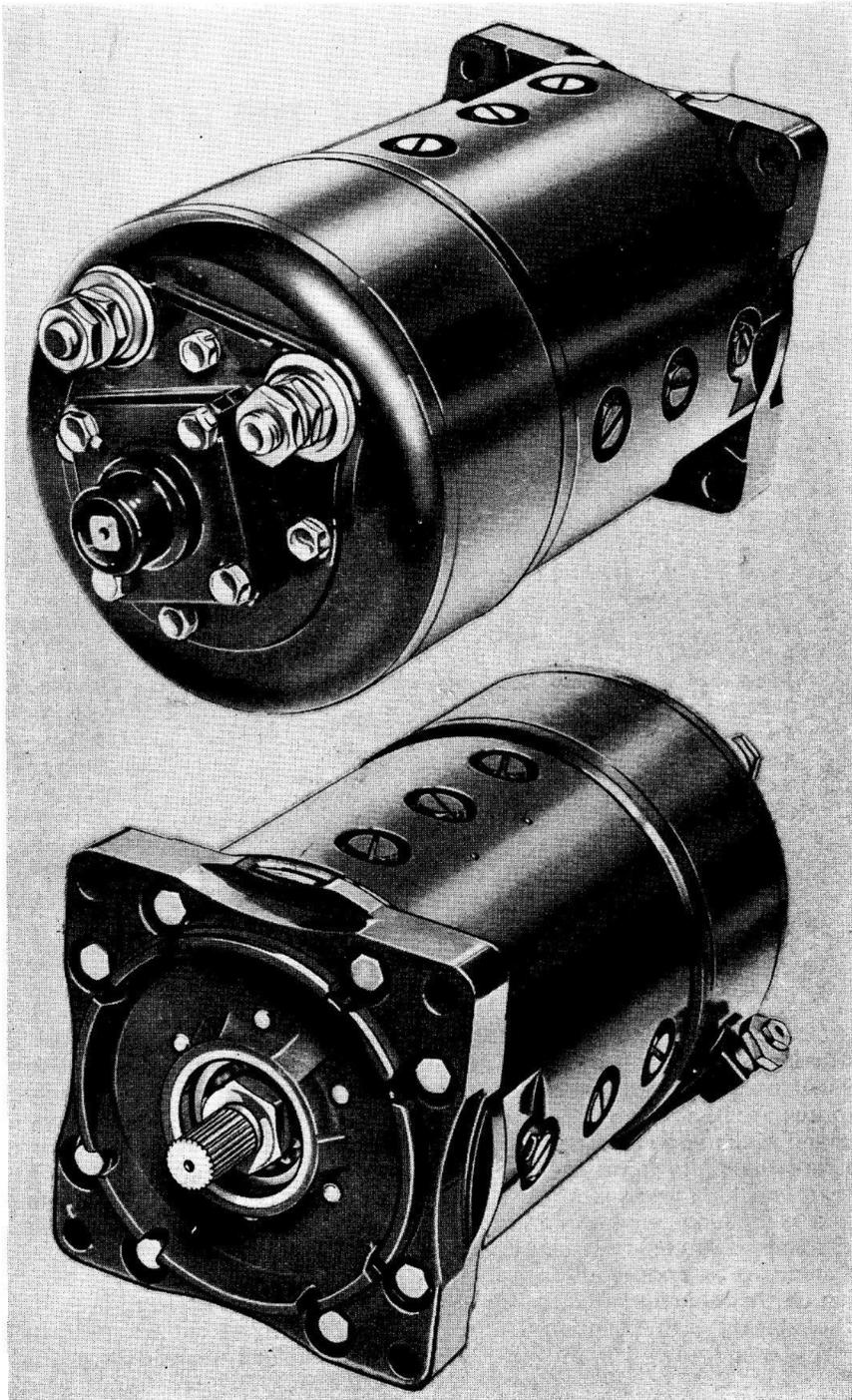


Fig. 1. External views of starter motor, Type C5301

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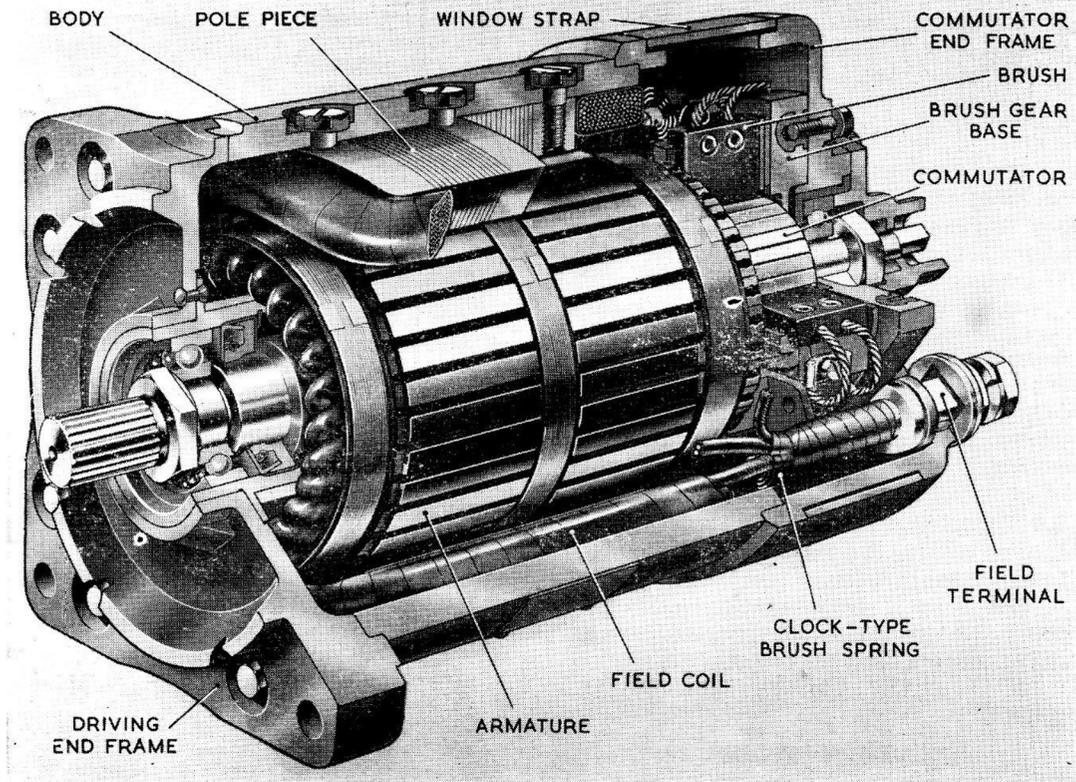


Fig. 2. Sectional view of starter motor, Type C530I

secured to the armature shaft by a nut and a tab-washer and the oil seal is retained by an internal circlip or spring ring.

#### Body assembly

5. The body assembly includes the armature (27, *fig. 3*), the field coils, the pole pieces and the body (5).

6. The armature shaft is splined at its front end for engagement with the reduction gear carried by the engine; at its rear, beyond the commutator, it has a squared end for hand-starting purposes.

7. The four pole pieces (3, *fig. 3*) are each secured to the yoke by three screws and tab-washers.

#### Commutator end frame assembly

8. The commutator end frame assembly

includes the brush gear assembly and the bearing cap. The end frame (10, *fig. 3*) is fixed to the body by four screws locked by tab-washers, and the brush gear base plate is fixed to the end frame by four screws, plain washers and tab-washers.

9. The four brushes (25, *fig. 3*) with pigtailed and tags are mounted on the brush gear base plate, each tag being fixed by a screw and a spring washer. The brushes are mounted in spring boxes screwed to the base plate. Each of the brushes is spring-loaded by a clock-type spring (9) having its free end bearing on the brush so holding it against the commutator.

10. The brush terminal (23, *fig. 3*) fixed to the brush gear assembly is fitted with a back insulating washer (24), an insulating bush

(22), a front insulating washer (21), a plain washer, a spring washer, a nut, and a second spring washer and nut. The field terminal (8) is provided with a similar set of parts (13). These two terminal extend through the commutator end frame to form connections for external cables.

11. Each brush (25, *fig. 3*) is electrically connected to the one diametrically opposite to it. Access to the brushes is gained by the removal of a cover band or window strap (14) secured by a knurled nut and lined with a packing piece. The brush diametrically opposite to the one connected to the brush terminal (23) has the free end of the shunt winding fixed to its brush box. The free end of the series winding is fixed to the brush box opposite that to which the field terminal is connected.

12. The bearing cap (16) is fixed to the rear of the nut which retains the rear ball bearing by four screws, plain washers and tab-washers. A spacer (19) is interposed between the ball bearing and the commutator.

#### INSTALLATION AND OPERATION

13. The appropriate aircraft and engine handbooks should be consulted before installing or operating the starter. Ensure that the correct leads are attached to the motor terminals and that the terminal nuts are securely tightened. Mechanically, installation consists of bolting the driving end frame to the engine, the drive being by means of reduction gearing which engages the splined end of the armature shaft. The aircraft battery should not be used if a ground starter system is available.

#### SERVICING

14. Reference should be made, if necessary, to the chapter on the care and servicing of starter motors in A.P.4343, Vol. 1, Sect. 15.

15. The rear bearing of this starter is packed with grease at the maker's works and will, under normal circumstances, require re-packing only during major servicing. The front bearing is initially lubricated with oil and in service is fed with oil from the engine.

#### KEY TO FIG. 3

- 1 NUT SECURING DRIVING END BALL RACE
- 2 FIELD COIL
- 3 POLE PIECE
- 4 THREE SCREWS FIXING EACH POLE PIECE
- 5 YOKE OR BODY
- 6 END OF SHUNT COIL
- 7 END OF SERIES COIL
- 8 FIELD TERMINAL (COMMON TO ENDS OF SERIES AND SHUNT WINDINGS)
- 9 FOUR CLOCK-TYPE SPRINGS EACH HAVING ONE END BEARING ON BRUSH
- 10 COMMUTATOR END FRAME
- 11 FOUR SCREWS FIXING COMMUTATOR END FRAME TO BODY
- 12 FOUR SCREWS FIXING BRUSH GEAR BASE PLATE TO COMMUTATOR END FRAME
- 13 FIELD TERMINAL ASSEMBLY
- 14 WINDOW STRAP
- 15 FOUR SCREWS SECURING BEARING CAP TO COMMUTATOR END FRAME
- 16 BEARING CAP CONTAINING FELT RING
- 17 NUT SECURING BALL RACE
- 18 COMMUTATOR END BALL BEARING
- 19 BEARING SPACER
- 20 BRUSH TERMINAL WASHER
- 21 FRONT INSULATING WASHER
- 22 INSULATING BUSH
- 23 BRUSH TERMINAL
- 24 BACK INSULATING WASHER
- 25 BRUSH WITH PIGTAILS AND TAG
- 26 COMMUTATOR
- 27 ARMATURE
- 28 INTERNAL CIRCLIP
- 29 OIL SEAL
- 30 DRIVING END FRAME
- 31 EIGHT SCREWS FIXING DRIVING END FRAME TO BODY
- 32 DRIVING END BALL BEARING

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16. Routine servicing should cover checking the condition of the brush gear, commutator, and terminals, and the security of the locking devices. The minimum length of a brush should be such that when the brush is in position in its box, the top of the brush should not come below the top of the box. The brush tension should be checked and should lie within the limits of 24 to 32 oz. with the brush in position. The spring tension when the spring is level with the top of the brush box, should not be less than 24 oz.

17. The commutator must be kept clean and in good order, oil or grease being removed with a clean rag moistened with gasoline (no lead) or primer thinners.

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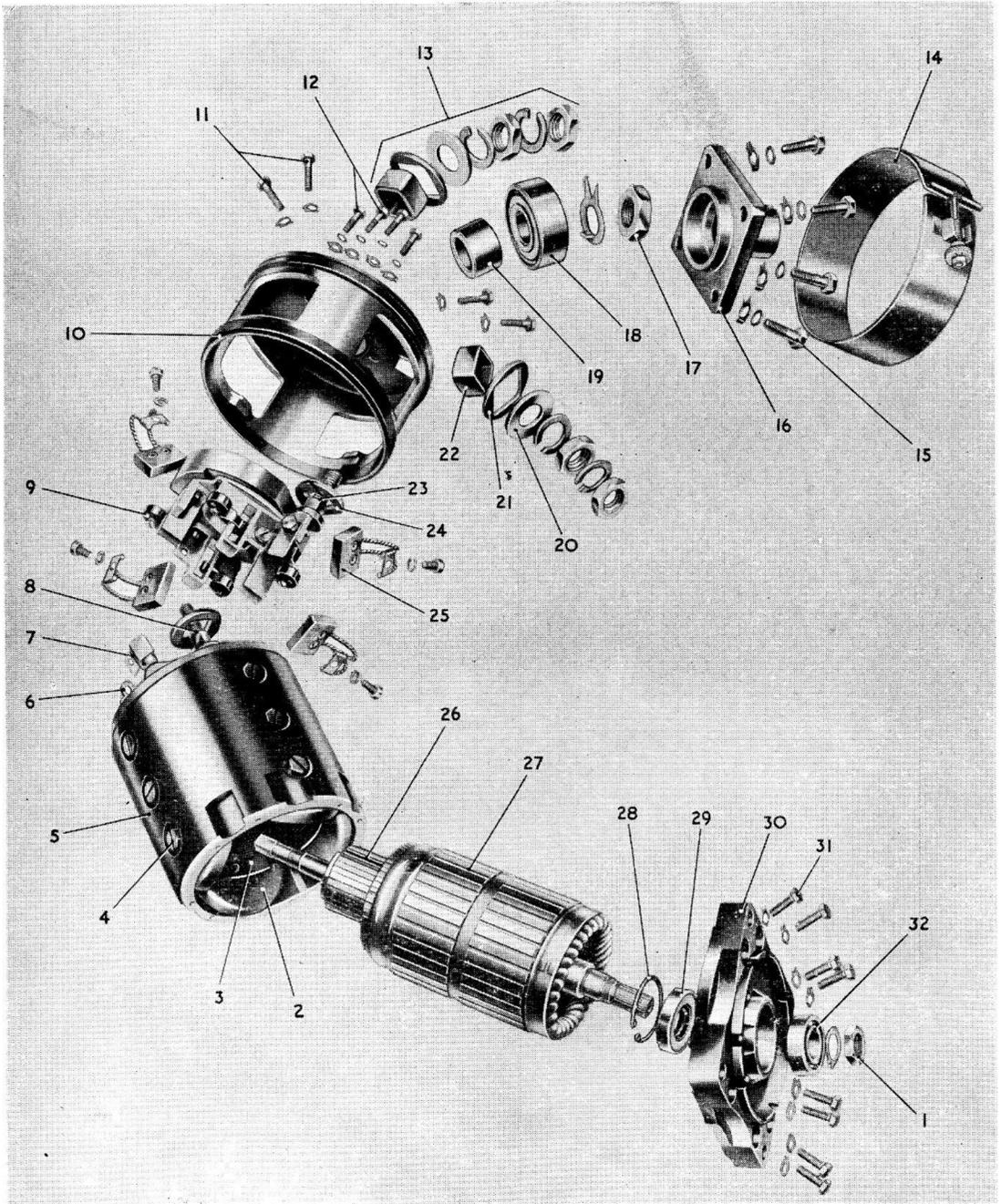
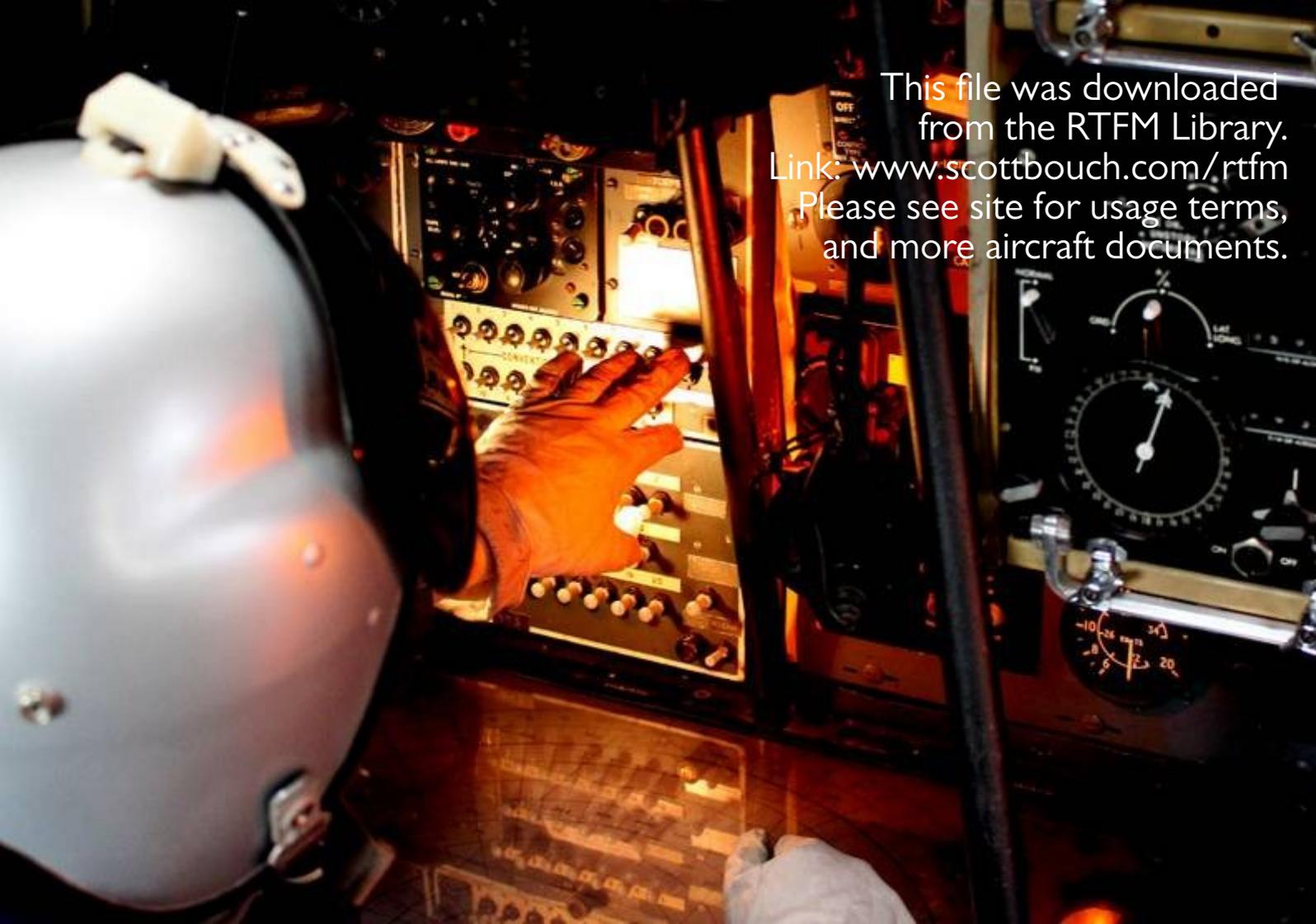


Fig. 3. Exploded view of starter motor, C5301



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