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Chapter 7

CAPACITOR AND JUNCTION BOX, TYPE 700

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Capacitor and junction box, type B.700 - 2	Ref.No.5UC/6114
Value of each capacitor in bank	0.5 μF
Total capacitance in filter circuit	6.0 μF
Total capacitance in resonant circuit	22.5 μF
Inductance of filter inductor	70 μH
Maximum inductor current	14 A

Maximum operating temperature	70° C
Cooling oil (Gulfsil B.30 to BS.148) Transformer oil, OM.16 ...	2.1/3 pints approx.
Overall dimensions	
Length	11½ in.
Height (including pedestal)	8 in.
Width	11.3/8 in.
Weight	18 lb.
Fixing centres	
(Clearance holes for ¼ in. dia. studs)	5.2 in. x 4.95 in.

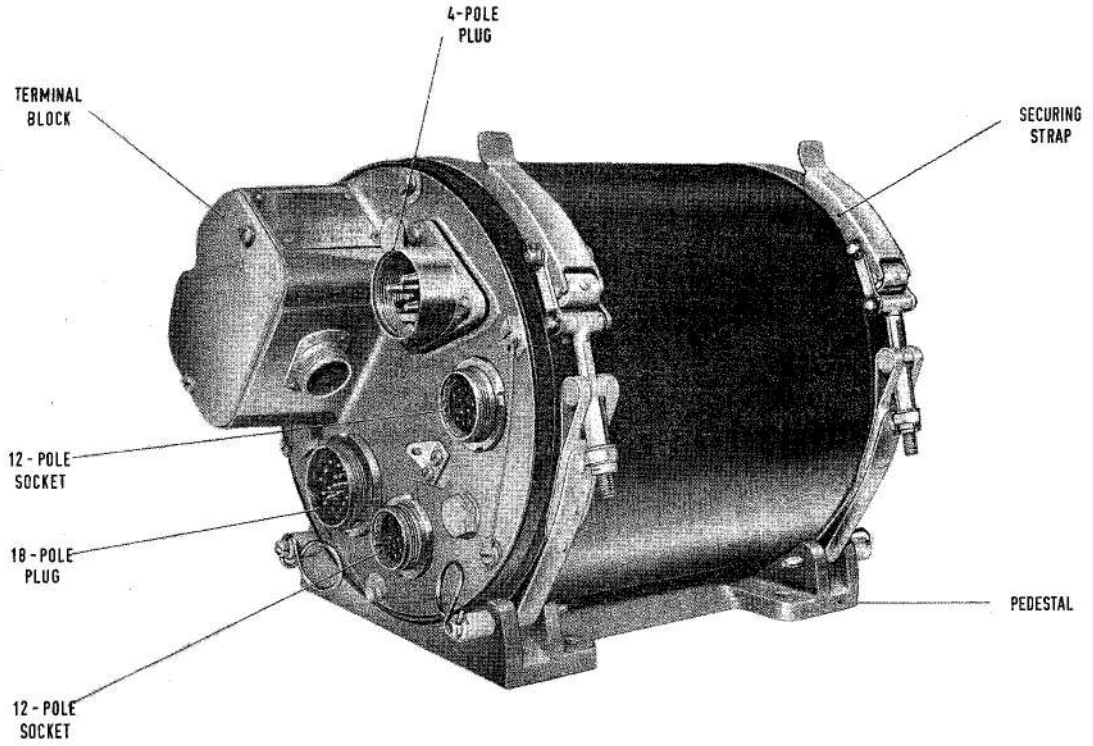


Fig.1 Capacitor and junction box

Introduction

1. The capacitor and junction box, type 700 is used in conjunction with the de Havilland hydraulic-motor a.c. generators types B.503 and B.504, details of which will be found in A.P.4343A, Vol.1, Sect.2. The unit contains the resonating and filter capacitances and the inductor associated with these a.c. generators and provides also a junction box for the generator, its control unit and the associated aircraft wiring.

2. The type B.503 and B.504 a.c. generators are of the polar inductor type having a relatively high internal impedance. The resonating capacitance is connected in series with the generator output windings to form a series resonant circuit. This type of circuit has a low impedance at its resonant frequency and the value of the capacitance is such that the resonant frequency is 2400 c/s which is the nominal output frequency of the generators.

3. At frequencies other than 2400 c/s,

the impedance is increased with the result that when non-linear loads are connected (e.g. rectifiers, magnetic amplifiers etc.) the harmonic content of the output voltage waveform is also increased. A filter circuit consisting of a series connected capacitance and inductor, tuned to the third harmonic frequency, is therefore connected across the load. This presents a low impedance shunt path at the frequency of the most prominent harmonic voltage thereby reducing the voltage waveform distortion.

DESCRIPTION

4. The assembly consists of a circular aluminium bulkhead on which all the electrical connectors are mounted, a synthetic resin canister and a cylindrical housing, channelled on its outer face for cooling purposes. The complete assembly is secured to a pedestal mounting by two metal straps fitted with quick-release screws.

5. Inside the housing there are three cylindrical 'potted' blocks of capacitors and the filter inductor, all of which are supported by three studs passing through inserts moulded into the blocks. The studs pass through the bulkhead and are secured by wire-locked cap nuts and sealing washers. In addition to being held by the studs, the filter inductor is also clamped to an intermediate supporting plate.

6. Each capacitance block contains nineteen 0.5μ F capacitors in two separate banks of twelve and seven, each bank being connected in parallel to give 6μ F and 3.5μ F respectively. The 6μ F bank in one of the blocks is connected separately to form part of the filter circuit, the remaining 3.5μ F bank in this block is connected in parallel with the banks in the other two blocks to form the 22.5μ F main resonating capacitance.

7. The filter inductor is a simple air-cooled toroid having a negligible external field and a large current carrying capacity. Because of its small external field, its close proximity to the metal housing has no appreciable effect on its characteristics.

8. The capacitor and junction box is partially filled with Transformer oil OM.16 (Gulfsil B30) to provide a good transference of heat from the capacitors and filter coil to the housing. Cooling air is admitted through a 7/16 in. pipe connection at the domed end of the canister and is then ducted around the exterior of the housing to exhaust holes at the bulkhead end. The oil filler plug is situated at the rounded end of the housing and is accessible when the cooling air inlet pipe is removed.

9. The two output leads from the a.c. generator are connected to a terminal block on the bulkhead, access to which is gained after a small cover plate is removed. The bulkhead carries also an 18-pole plug, for cable connection to the control unit, two 12-pole sockets for cable connections to the motor-generator, and a 4-way, 37 A heavy-duty plug, of which only pins 1 and 3 are used, for the generator output.

INSTALLATION

10. The capacitor and junction box can be rotated through 360 deg. on its pedestal

mounting after the quick-release screws have been removed from the securing straps. The fixing centres for the pedestal are contained in the Leading Particulars.

11. When the unit is being installed, care must be taken to ensure sufficient clearance for the connection and disconnection of cables. The unit should preferably be installed horizontal to the aircraft's line of flight axis but where this cannot be achieved, the unit should be fitted with the bulkhead uppermost. Installation in positions other than the foregoing may result in the filter inductor, which is situated at the end of the unit remote from the bulkhead, becoming overheated due to lack of heat transference through the oil.

12. The length of the cables connecting the capacitor and junction box to the motor-generator unit must not exceed six feet. This cable length was taken into consideration in the computation of the filter and resonant circuit component values together with the permissible voltage drop in the cable.

SERVICING

General

13. Routine servicing consists of periodic examinations of the installed unit in accordance with the instructions contained in the relevant Aircraft Servicing Schedule. The following servicing can be done with the unit installed in an aircraft.

(1) Check the security of the attachment between the unit and the mounting pedestal.

(2) Examine all electrical connectors for for cleanliness and security.

(3) Ensure that the cooling air inlet connection is secure.

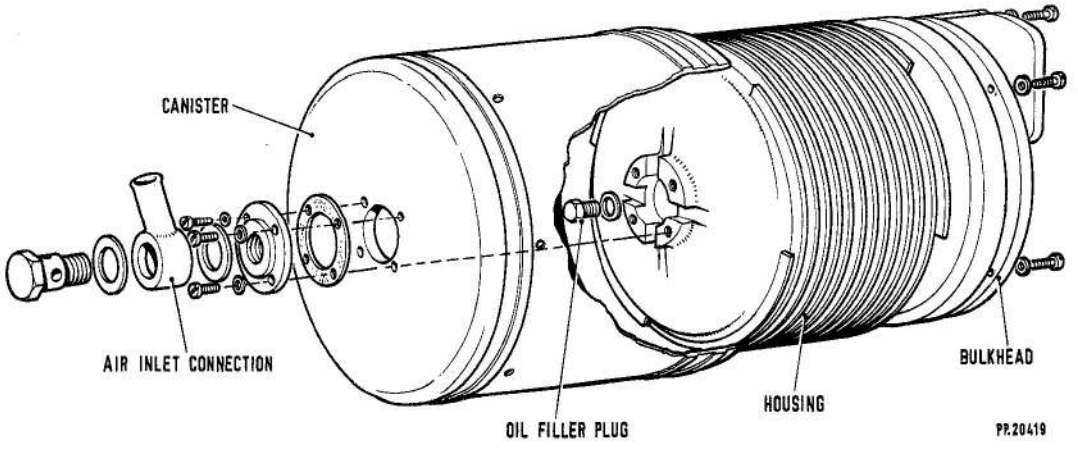


Fig.2 Canister and housing - exploded view

(4) Check the security of all screws and locking wire.

(5) Examine the unit for signs of oil leakage. Where such indications are present, tighten the bulkhead retaining screws. Should the leakage persist after the screws are tightened, the unit should be removed from the aircraft, dismantled and fitted with a new sealing ring.

DISMANTLING

Canister *(fig.2)*

14. The removal of the canister is effected as follows:-

(1) Unpeen and remove the four, 4 BA screws from the air inlet connection, then remove the connection and gasket. Retain the screws and discard the gasket.

(2) Free the canister carefully and remove it from the housing.

Housing *(fig.2)*

15. The housing should be removed from the bulkhead as follows:-

(1) Cut and remove the locking wire on the oil filler plug, then remove the plug and discard the sealing washer.

(2) Drain all the oil from the housing.

(3) Cut the locking wire and remove the six, 4BA screws that secure the housing to the bulkhead.

(4) Remove the housing from the bulkhead giving a small twist to free the sealing ring.

NOTE . . .

Aluminium-alloy castings are used for both the housing and the bulkhead and irreparable damage will result if undue force is used; care must also be taken to avoid damaging the sealing ring.

Bulkhead *(fig.3)*

16. Remove the bulkhead as follows:-

(1) Disconnect the terminal connections from the capacitor block assembly.

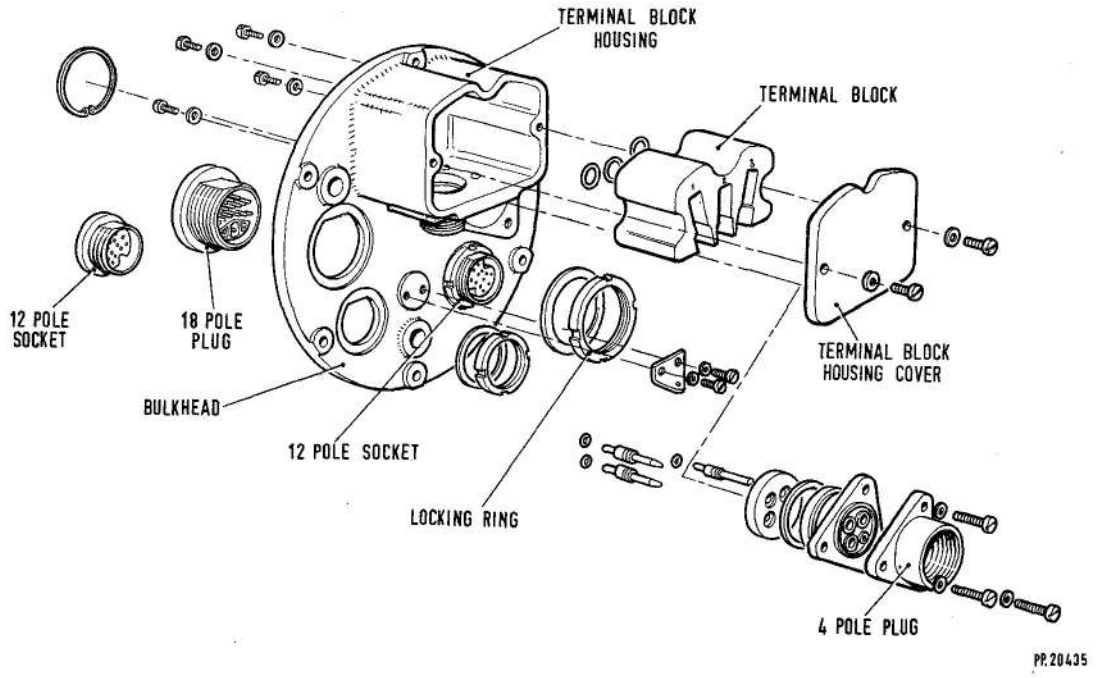
(2) Cut the locking wire on the three cap bolts, remove and retain the cap bolts, discard the sealing washers, then disengage the bulkhead from the studs.

(3) Remove the sealing ring from its seat on the bulkhead.

(4) Remove the two 4BA screws from the terminal block housing cover, and remove the cover.

(5) Remove the four, 4BA screws and spring washers from the terminal block, withdraw the terminal block from its housing and discard the sealing rings on each terminal extension.

(6) Unscrew the three 4BA screws that secure the 4-pole plug to the bulkhead, unsolder and remove the connections, remove the plug and discard the gasket.



Fig,3 Bulkhead - exploded view

(7) Before proceeding, unsolder the connecting wires from the 12-pole sockets and 18-pole plug.

(8) Unscrew the locking rings of the two 12-pole sockets and the 18-pole plug, remove the sockets and plug and discard the gaskets.

Capacitor blocks and toroidal choke *(fig.4)*

17. Separate the capacitor blocks and toroidal choke as follows:-

(1) Remove the nuts and washers from the three studs which retain the assembly and remove the capacitor block assembly from the studs.

(2) Remove the nine 4BA nuts and washers that secure the bus bars to the capacitor blocks, remove the toroidal choke connecting tag, remove the bus bars and separate the capacitor blocks.

(3) Remove the three nuts and washers that secure the toroidal choke assembly mounting plate to the studs and disengage the choke assembly from the studs.

(4) Unscrew the six self-locking nuts and washers which retain the toroidal choke assembly clamp plate, remove the clamp plate from the toroidal choke and the choke from its mounting plate.

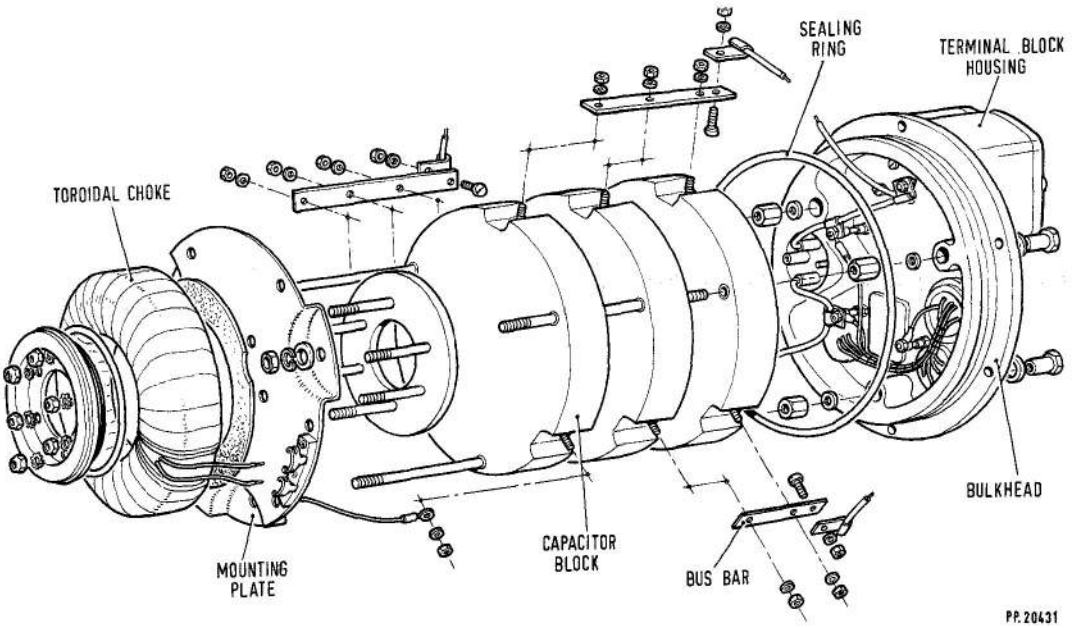


Fig.4 Capacitor block and toroidal choke - exploded view

Assembly

Capacitor blocks and toroidal choke *(fig.4)*

18. Assemble the capacitor blocks and toroidal choke as follows:-

(1) Locate the toroidal choke over the studs of the mounting plate, position the clamp plate to the choke and retain the clamp plate with six self locking nuts and washers. Tighten the nuts evenly and sufficiently to hold the toroidal choke firmly in position.

(2) Locate the toroidal choke mounting plate over the studs and retain it with three nuts and washers, taking care not to damage the choke. Ensure that when the nuts have been tightened there is at least 1/8 in. clearance between the stud end and the choke; lock each nut with varnish V130/1 to T.5188.

(3) Assemble the busbars to the capacitor blocks ensuring that the red spots on each capacitor block are aligned, and secure the bars with nine, 4BA nuts and washers.

(4) Locate the assembly over the studs ensuring that the projecting parts of the hollow pillars in the capacitor blocks face the bulkhead and with the red spots (common terminals) positioned to line up with the 4-pole plug on the bulkhead.

(5) Retain the assembly with the three

securing nuts.

(6) Connect the tag of the choke assembly to the capacitor block assembly.

Bulkhead

19. To assemble the bulkhead proceed as follows:-

(1) Assemble the two 12-pole sockets and the 18-pole plug to the bulkhead using new gaskets and retain them with the locking rings.

(2) Fit a new sealing ring to the 4-pole plug, assemble the plug to the bulkhead and secure the plug with three, 4BA screws.

(3) Locate new sealing rings on each terminal extension of the terminal block, locate the terminal block in its housing and fit four, 4BA screws and spring washers.

(4) Position the terminal block housing cover and retain it with two, 4BA screws and washers.

(5) Ensure that the ring seal seating of the bulkhead is clean and free from foreign matter. Engage a new ring seal in the seating and ensure that it is correctly fitted over the entire circumference.

(6) Locate the bulkhead over the studs, assemble new sealing washers and secure the bulkhead with the three cap bolts.

(7) Connect the terminal connections to the capacitor block assembly.

Housing

20. To assemble the housing proceed as follows:-

(1) Smear the sealing ring with transformer oil and locate the housing to the bulkhead taking care not to damage the sealing ring.

(2) Secure the bulkhead to the housing with six, 4BA screws.

(3) Pour 2 1/3 pt. of transformer oil, OM.16 (Gulfsil B30 to BS148) into the housing through the oil filler hole, fit a new sealing ring to the oil filler plug, screw the oil filler plug into the housing finally locking it with 22 s.w.g. locking wire.

Canister

21. The canister should be assembled as follows:-

(1) Fit the canister carefully on to the bulkhead.

(2) Fit a new gasket to the air inlet connection, position the connection to the canister and both the connection and the canister to the housing with the four, 4 BA screws.

Locking

22. When the unit has been tested satisfactorily the screws securing the air inlet connection should be locked by peening and 22 s.w.g. locking wire should be used to lock the bulkhead retaining screws together and also to lock the cap bolts to the nearest bulkhead retaining screw.

Testing

General

23. The capacitor and junction box should be tested after bay servicing in accordance with the instructions contained in the following paragraphs.

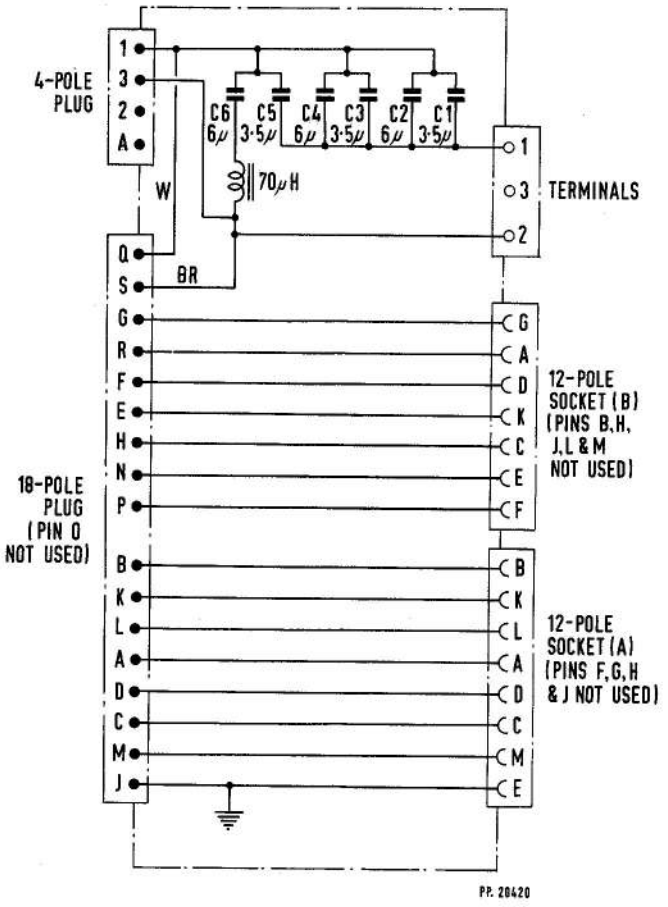


Fig.5 Wiring diagram

Test equipment

24. The equipment required to make the necessary tests is as follows:-

(1) Ammeter 0 - 100A a.c. calibrated at 2400 c/s.

(2) Voltmeter 0 - 150V a.c. calibrated at 2400 c/s.

(3) Insulation resistance tester, 200V d.c.

(4) Inductance bridge, 10 kc/s with 0 - 100 μH scale *(e.g. Marconi universal bridge TF 868 or one of similar accuracy).*

Wiring

25. The wiring of the capacitor and junc-

tion box should be tested for continuity and all soldered connections examined to ensure they are correctly made and that adequate clearance is left between adjacent terminals. Wiring showing signs of damage or deterioration should be renewed.

Pressure test

26. With the capacitor and junction box filled to the correct level with transformer oil, an air pressure of 20 lb/in.^{2} should be applied through the oil filler plug aperture. The pressure should remain constant for 10 minutes with no leakage of oil.

Electrical tests

27. The following electrical tests should be made on the unit.

(1) Connect terminals 1 and 2 on the terminal block with a copper link having a minimum cross-sectional area of 0.015 in.^{2} and apply a voltage of 125V r.m.s. at 2400 c/s to pins 1 and 3 of the 4-pole plug through a 0 - 100A a.c. ammeter. The voltage should be maintained for 15 minutes and the current of 55A ± 5% must not deviate from its initial value by more than 1A throughout the 15 minute test period.

(2) With terminals 1 and 2 still connected, measure the insulation resistance between pins 1 and 3 of the 4-pole plug at 200V d.c. After one minute the insulation resistance value must not be less than 50 megohms.

(3) With terminals 1 and 2 still connected, measure the insulation resistance between the metal canister (earth) and pins 1 and 3 of the 4-pole plug joined together. After one minute at 200v d.c. the insulation resistance should not be less than 100 megohms.

(4) Remove the link between terminals 1 and 2 of the terminal block and connect a 10 kc/s inductance bridge across terminals 1 and 3 of the 4-pole plug. The inductance should be 25 μH ± 5 μH.

Locking

28. When testing is satisfactorily completed, the screws securing the air inlet connection should be locked by peening and the bulkhead retaining screws and cap bolts with 22 s.w.g. locking wire.

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