Chapter 21

NOSE UNDERCARRIAGE UP-LOCK JACK

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LIST OF ILLUSTRATIONS

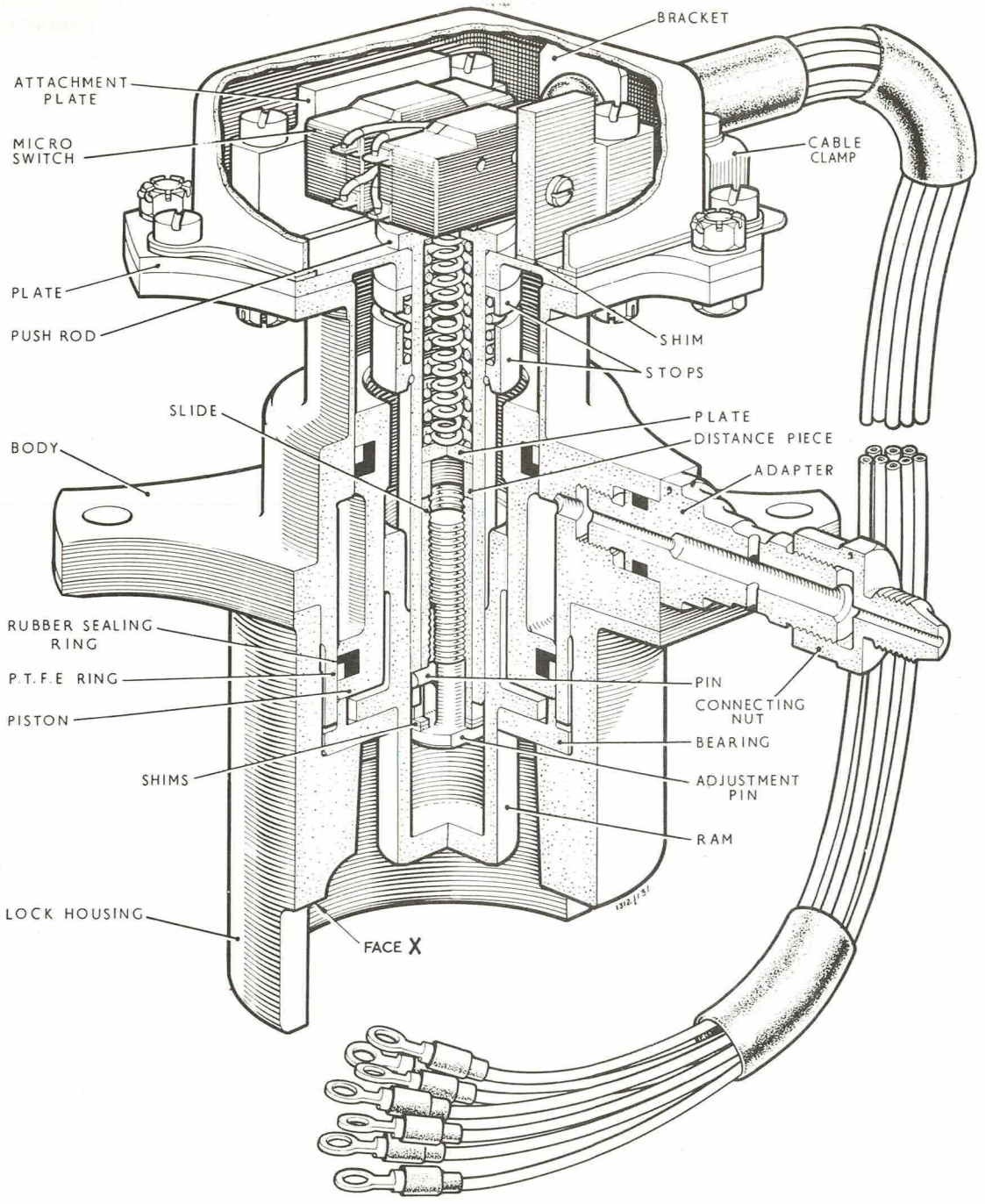

Fig. 1 Nose undercarriage up-lock jack

Introduction

1. This unit is attached to the airframe, where it receives the spring-loaded plunger of the nose undercarriage lock bolt, in order to maintain the undercarriage in the retracted position. The lock bolt is engaged mechanically and released hydraulically, and its position is indicated by a visual warning through two switches mounted on the jack. ◀A basic type of unit is described and illustrated in the chapter and all variants to this are given in the appendices.▶

Description (fig. 1)

2. The jack consists basically of an open ended body in which is housed a piston and a ram, and to which is attached a lock housing that receives the undercarriage lock bolt. Housed in the ram is a spring-loaded push rod that operates the two switches.

3. The body is formed with a fluid port into which is screwed an adapter that receives a connecting nut and is fitted with a banjo connection when the unit is installed; a sleeve is fitted for storage and transportation.▶ ◀ To ensure positive location of flanges formed on both the body and housing, holes in the flanges accommodate the airframe attachment bolts, and screws through the flanges secure the two parts together.

4. Resting on an internal flange at the lower end of the lock housing is a bearing that forms a stop for the hollow ram in its downward stroke. The head of the ram is closed to form a striking face and its stem is located in the piston. Two flanges on the piston are each fitted with a rubber ring and a backing ring that seal it on the body.

5. Located within the ram is the push rod which in turn houses a spring-loaded slide and a slotted adjustment pin; a shim is located at the head of the pin and is adjusted to govern the amount of travel of the ram. The slide is retained in the push rod by a pin that passes through the slots in the adjustment pin. Movement of the push rod is limited by two opposing spring-loaded stops fitted to its upper end; the lower one is held in position by a circlip, while the upper one abuts the under side of a plate. This plate is bolted to a flange on the body and, besides locating the flanged head of the push rod, has mounted on it two attachment plates to which are mounted the switches. A cover encases the switches and is secured to the plate by four screws. Fitted through the cover is a grommet through which passes a cable assembly. Two half clamps secured to the body hold the grommet rigid.

Functioning (fig. 2)

6. When the nose undercarriage is retracted, the plunger of its lock bolt is depressed against its spring as it contacts the cut-away face of the lock housing. This cut-away portion allows the lock bolt to enter the bore of the housing under the action of its spring and in doing so securely holds the undercarriage in the 'UP' position (A in fig. 2).

7. The upward movement of the lock bolt plunger moves the ram and piston, until near the end of their travel the ram lifts the push rod to actuate the switches to give warning that the lock is made.

8. To release the nose undercarriage, hydraulic pressure is applied to the jack where it acts on the piston to extend the ram (B in fig. 2) which then depresses the plunger of the lock bolt to free the undercarriage from restraint. The movement of the ram permits the push rod to be spring-returned to its original position and allows the contacts of the switches to change over, thus giving warning that the undercarriage is released.

SERVICING

TABLE 1

Special tools

Part No.	Description
MT.1339	Fixture for test purposes

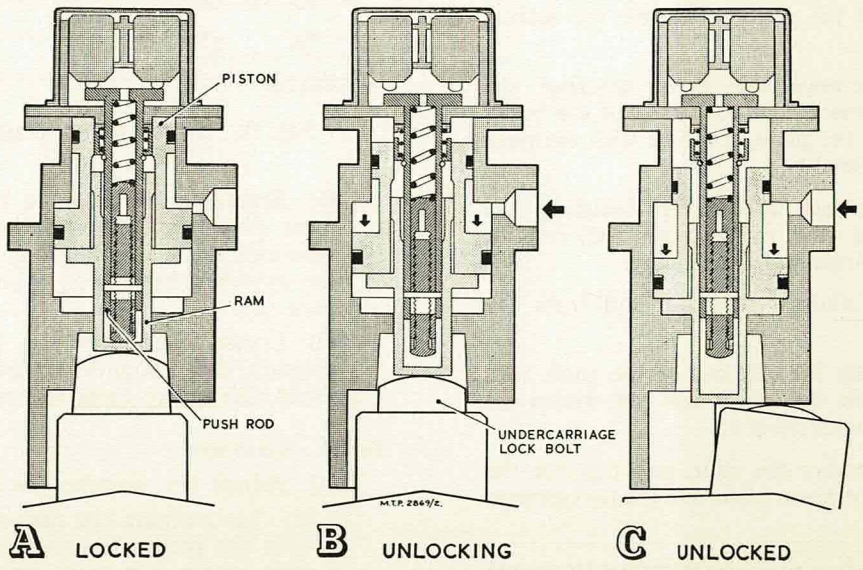

Fig. 2. Functional diagram

Leakage

9. Any leakage around the body flanges will indicate a faulty piston seal which must be renewed.

Dismantling

10. (1) Remove the screws securing the cable half clamps.

(2) Remove the screws securing the cover, lift the cover and gasket off the body.

(3) Remove the screws securing the bracket to the body. Remove the screws securing the attachment plates, and lift off the complete switch assembly. Identify the shims located under the plate with their respective plate.

(4) Disconnect the leads from the switches and remove the switches from the attachment plates.

(5) Remove the adapter from the body and unscrew the connecting nut.

(6) Remove the countersunk screws from the underside of the lock housing. Rotate the housing until it dis-engages from the body. Withdraw the ram, together with the bearing, and then extract the piston. Remove the sealing rings.

(7) Remove the bolts securing the attachment plate to the top of the body, lift off the plate, complete with the push rod assembly.

(8) Extract the circlip securing the bottom stop to the push rod, remove both stops and their spring.

(9) Withdraw the push rod from the plate.

(10) Tap the pin out of the push rod. Unscrew the adjustment pin; retain the shims with the pin.

(11) Extract the slide, and tap out the distance piece, plate, and the two springs.

Assembling

11. All sealing rings should be lightly coated with grease XG–315 (34B/9100519).

(1) Insert the two concentric springs into the push rod, followed by the plate and distance piece.

(2) Insert the slide into the push rod and align the pin holes. Fit the shims to the adjustment pin, then screw the pin into the slide, ensuring that the slot is aligned with the pin holes. Insert the pin.

(3) Fit the plate over the push rod until it abuts the flange, follow with small stop, spring, and the large stop. Retain the large stop with a circlip.

(4) Secure the plate to the small flange of the body with the bolts and castellated nuts. Lock the nuts with split pins.

(5) Solder the cable leads to the switches as shown in fig. 3, using solder to BS.219F and flux to DTD.599, wipe off excess flux.

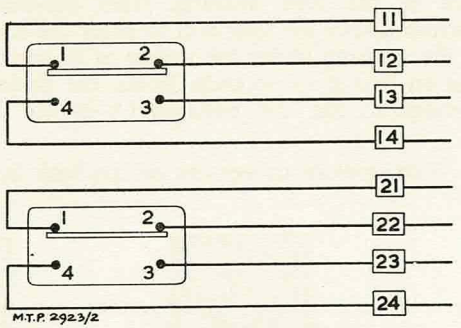

Fig. 3. Switch wiring diagram

(6) Secure the switches to the attachment plates with the screws. Do not wire-lock the screws together until after the switches have been adjusted, sub-para. (8).

(7) Locate the shims on the plate, position the attachment plates on the shims and secure them with the screws.

Switch adjustment

(8) Adjust the switches as follows:—

(a) Maintaining the push rod square with the plate, depress the rod until each switch just trips with the faces of both stops firmly abutting. Adjust the shims under the attachment plates to obtain this condition.

Note . . .

The shims are of the laminated peel-off type and are $\frac{3}{64}$ in. thick when new; each lamination is 0·002 in. thick.

(b) Remove a further 0·006 in. from the shims.

(c) With the push rod still depressed, check that a 0·008 in. feeler gauge can be inserted between the push rod and each switch button.

(d) Wire-lock the switch retaining screws together in pairs.

(9) Fit the grommet to the cable and the bracket to the grommet. Secure the bracket to the body with two screws.

(10) Position the gasket on the plate, followed by the cover. Secure the cover with the four screws. Wire-lock the screws together in pairs.

(11) Secure the lower half clamp to the mounting plate and fit the upper half clamp over the cable and secure it with two screws.

(12) Insert the piston, minus both sets of seals into the body, with the small flange leading.

(13) Insert the ram into the piston and fit the bearing to the ram.

◀(14) Fit the lock housing to the body and secure it with the two countersunk screws.▶

Final switch adjustment

(15) Carry out final adjustment of the switches as follows:—

(a) Depress the ram; the switches must trip when the ram has travelled 0·555 to 0·585 in. from face X, fig. 1.

(b) Adjust the shim on the adjustment pin to obtain the correct amount of travel. The adjustment pin must be screwed in tight.

(16) Remove the piston and fit a stepped rubber ring and a backing ring to the two flanges, and then re-assemble the unit.

(17) Fit a rubber ring on to the adapter, screw the adapter into the body and screw the connecting nut on to the adapter.

TESTING

12. All tests should be carried out with inhibiting fluid ZX–19; if not available, use oil OM–15. The following equipment will be required to test this unit.

(1) A static hydraulic test rig.

(2) A 24–29 V.dc. power supply.

(3) 500 volt megger.

(4) An electrical test circuit as shown in *fig.* 4.

(5) Test fixture MT.1339, and the means of measuring a compression load of 125 lb. on the ram. Prior to the commencement of the tests bolt the lock housing and the body together, using the airframe attachment holes.

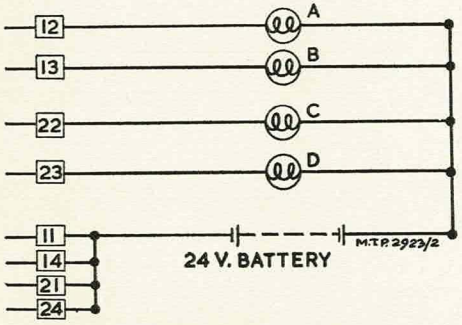

Fig. 4. Electrical test diagram

Insulation resistance test

13. (1) Using a 500 volt megger, carry out the following checks, during which the insulation resistance must not be less than 100 megohms. If the instrument has no megohm division the needle must approach infinity.

(*a*) Between the switch cover and any lead.

(*b*) Between leads 11–14, 12–13, 21–24 and 22–23.

(*c*) Between leads 13–14, and 23–24 with ram extended.

(*d*) Between leads 11–12 and 21–22 with ram depressed.

Proof test

14. Apply a pressure of 4,050 lb/in² at the connection, for two minutes. There must be no leakage.

Functioning tests

15. Connect the unit to an electrical test circuit as shown in *fig.* 4 and mount it in test fixture MT.1339 in an upright position so that a compression load of 125 lb. can be applied to the ram.

(1) Throughout the following tests, the lamp indications must be as follows:—

(*a*) With the ram extended; lamps A and C must be ON and lamps B and D OUT.

(*b*) With the ram depressed; lamps B and D must be ON and lamps A and C OUT.

(*c*) Lamps B and D must come on when the ram has moved in 0·555 to 0·585 in. from face X, *fig.* 1.

(2) Apply a load of 125 lb. on the ram, then apply an increasing pressure to extend the ram. The maximum pressure to extend the ram must not exceed 275 lb/in². Hold this pressure without leakage for one minute. Increase the pressure to 3,000 lb/in² and hold without leakage for a further minute. Reduce the pressure to zero. Carry out five complete operations and then remove the load.

(3) Connect the unit to a hydraulic test circuit as shown in fig. 5 with the connecting pipes as short as possible. The accumulator must not be less than 160 cu. in. capacity. Carry out the following tests:—

(*a*) Pump a small quantity of oil into the accumulator, then pressurise the accumulator with NITROGEN to 100 lb/in².

(*b*) With the ram extended, apply a load of 125 lb² on the ram, compression of the ram to the position where lamps A and C go OUT and lamps B and D come ON, must occur within one second.

(*c*) Carry out five complete operations of (*a*) and (*b*).

(4) Remove the bolts from the airframe attachment holes.

Installation

16. Install the unit as directed in the appropriate aircraft manual.

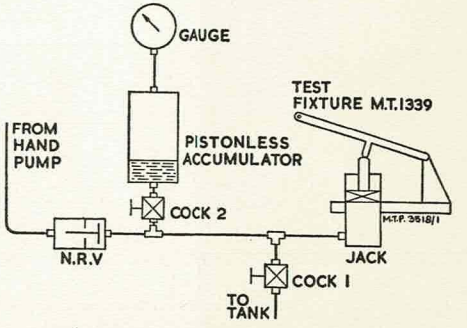

Fig. 5. Hydraulic test diagram

Appendix 1 NOSE UNDERCARRIAGE UP-LOCK JACKS

Type No. 1.01190.001
1.01190.002
◀1.01190.003▶

◀Introduction

1. These units are basically identical to that described in the chapter. Type No. 1.01190.002 and 1.01190.003 differ from Type No. 1.01190.001 in that the unit bodies and electrical cable lengths have minor dimensional differences together with the fitment of low temperature seals. ▶

Appendix 2 NOSE UNDERCARRIAGE DOWN-LOCK JACKS

Type No. 1.01117.001
1.01117.002

Introduction

1. These units are similar to that described in the chapter, except for the adapter and connecting nut which is not fitted, and the electrical terminal tags which are the quick release type. The units differ only in that Type No. 1.01117.002 is fitted with low temperature seals, and a body with small dimensional differences.

2. Refer to the chapter for all servicing and test instructions.

Appendix 3 NOSE UNDERCARRIAGE DOWN-LOCK JACKS

Type No. 1.01118.001
1.01118.002
◀1.01118.003 ▶

◀Introduction

1. These units, similar to that described in the chapter differ mainly in that 'Burgess' micro switches are fitted, introducing differences in the electrical circuit as shown in fig. 1 of this appendix. Type No. 1.01118.002 and 1.01118.003 differ from Type No. 1.01118.001 in that low temperature seals and bodies with minor dimensional differences are fitted; Type No. 1.01118.003 differs from1.01118.002 only in the overall length of electrical cable fitted.

Switch adjustment

2. Carry out instructions given in the chapter, para. 11, sub-para. (8), but removing 0·005/0·007 from the shims (ref. (b)) and checking with a 0·007 feeler gauge (ref. (c)). ▶

TESTING

Test equipment

3. To carry out the following tests the equipment listed below will be required.

(1) A static hydraulic test rig

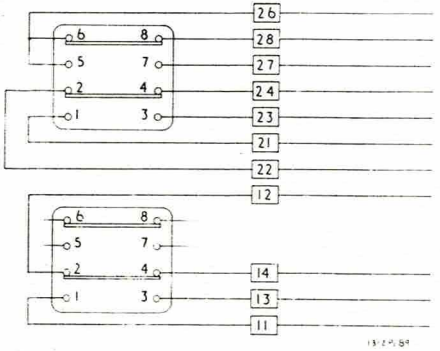

Fig. 1 Wiring diagram

(2) A 24—29 volt D.C. power supply

(3) A 500 volt megger.

(4) An electrical test circuit as shown in Fig. 2.

(5) Test fixture MT.1339 and weights to a value of 25 lb.

Proof test

Note . . .

Prior to carrying out any test the unit body must be secured to the lock housing by four bolts.

4. (1) Connect the hydraulic test rig supply line to the unit input connection. Apply and maintain a pressure of 4,050 lb/in^2 without leakage for two minutes. Release the pressure.

Functioning tests

5. Secure the unit in the test fixture and connect it to an electrical circuit as shown in fig. 2.

(1) Apply a load of 125 lb. to the ram by attaching a weight of 25 lb. to the lever.

(2) Apply a pressure at the inlet to extend the ram. The pressure to fully extend the ram should not exceed 275 lb/in^2, hold for one minute, then increase to 3,000 lb/in^2 and maintain without leakage for a further two minutes.

(3) Release the pressure slowly to allow the ram to close.

(4) Repeat operations (2) and (3) five times.

(5) Check that lamps B, D and F are on when the ram is closed, and that they go off (and lamps A, C and E come on) when the ram is extended.

(6) Check that lamps B, D and F come on (and lamps A, C and E go off) when the end face of the ram is 0·55 to 0·585 in. from the end face of the lock housing.

(7) Connect a pistonless accumulator (of not less than 160 in^3 capacity) in the supply line to the unit, mounted vertically with the hydraulic connections downwards. Pump a small quantity of oil into the accumulator and inflate it to 70 lb/in^2.

(8) Remove the 25 lb. from the lever and ensure that the ram is fully extended.

(9) Hang the weight on the lever, check that closure of the ram to the position when the lamps A, C and E go out (and B, D and F come on) occurs within one second. Repeat this test to complete five operations. Disconnect the unit from the test rig.

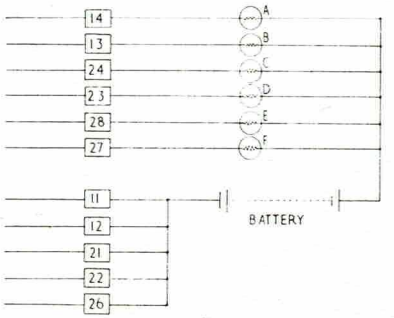

Fig. 2 Test diagram

Insulation test

6. Disconnect the unit from the electrical test circuit and, using a 500 volt megger, measure the insulation resistance between the following points (fig. 1); no reading may be less than 100 megohms; if the instrument has no 100 megohms division the needle must approach infinity.

(1) Between the switch casing and each wire.

(2) Between 11—12, 13—14, 21—22, 23—24 and 27—28.

(3) With the ram extended—between 11—13 and 21—23.

(4) With the ram closed—between 22—24 and 12—14.

Appendix 4 NOSE UNDERCARRIAGE UP-LOCK JACK

Type No. 1.01116.001
1.01116.002

Introduction

1. These units are similar to that described in the chapter, except for the terminal tags which are the quick release type. The two units differ only in that type 1.01116.002 is fitted with low temperature seals, and a body with small dimensional differences.

2. Refer to the chapter for all servicing and test instructions.

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