

Chapter 3

NOSE UNDERCARRIAGE JACK UNIT

Type No. 1.00431.002

incorporating—

Swivel pipe units, 11859YAO2
11860YAO2
1.00430.002

with *Shuttle valve*
and *Restrictor*

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Introduction

1. This jack consists essentially of a piston assembly operating in a cylinder assembly. The fluid connections for extending and closing the jack are carried on separate swivel pipe units; the swivel pipe through which fluid is passed to extend the jack is duplicated to provide for normal and emergency use, and a shuttle valve which functions to close the normal supply passage is incorporated in the jack. The swivel pipe unit carrying fluid to close the jack is fitted with a restrictor valve which reduces the speed of piston travel, and a snubber, located in the cylinder reduces the speed of piston travel as it approaches the end of the closing stroke.

2. The description and servicing of the swivel pipe units are given in A.P. 1803D, Vol. 1, Book 5, Sect. 12.

Description

3. One end of the cylinder is closed by a gland nut fitted with a wiper ring and screwed into the cylinder to retain a gland ring against a spacer. This end of the cylinder is formed with two bosses, one of which receives a special plug screwed in against a bonded seal and fitted with a bleeder screw. The other boss receives the spigot connection of the swivel pipe and restrictor valve unit which is secured to the cylinder by set-screws. An end fitting, which screws over the opposite end of the cylinder, is fitted with a sealing ring and backing ring.

4. The end fitting is formed with a shuttle valve housing to which the normal and emergency swivel pipe units are spigoted and bolted. The cylindrical shuttle which operates in the housing is fitted with a sealing ring and has a rubber seating ring bonded to each end. A diagonal hole through the shuttle prevents the possibility of a hydraulic lock. A fluid passage connects the bore in which the shuttle moves with that in the end fitting and is blanked off at the outer end by a set-screw and bonded seal. A lug formed on the end fitting houses a split-spherical-bearing for an airframe attachment point, and the fitting receives a plug screwed in against a bonded seal and fitted with a bleeder screw. A locking

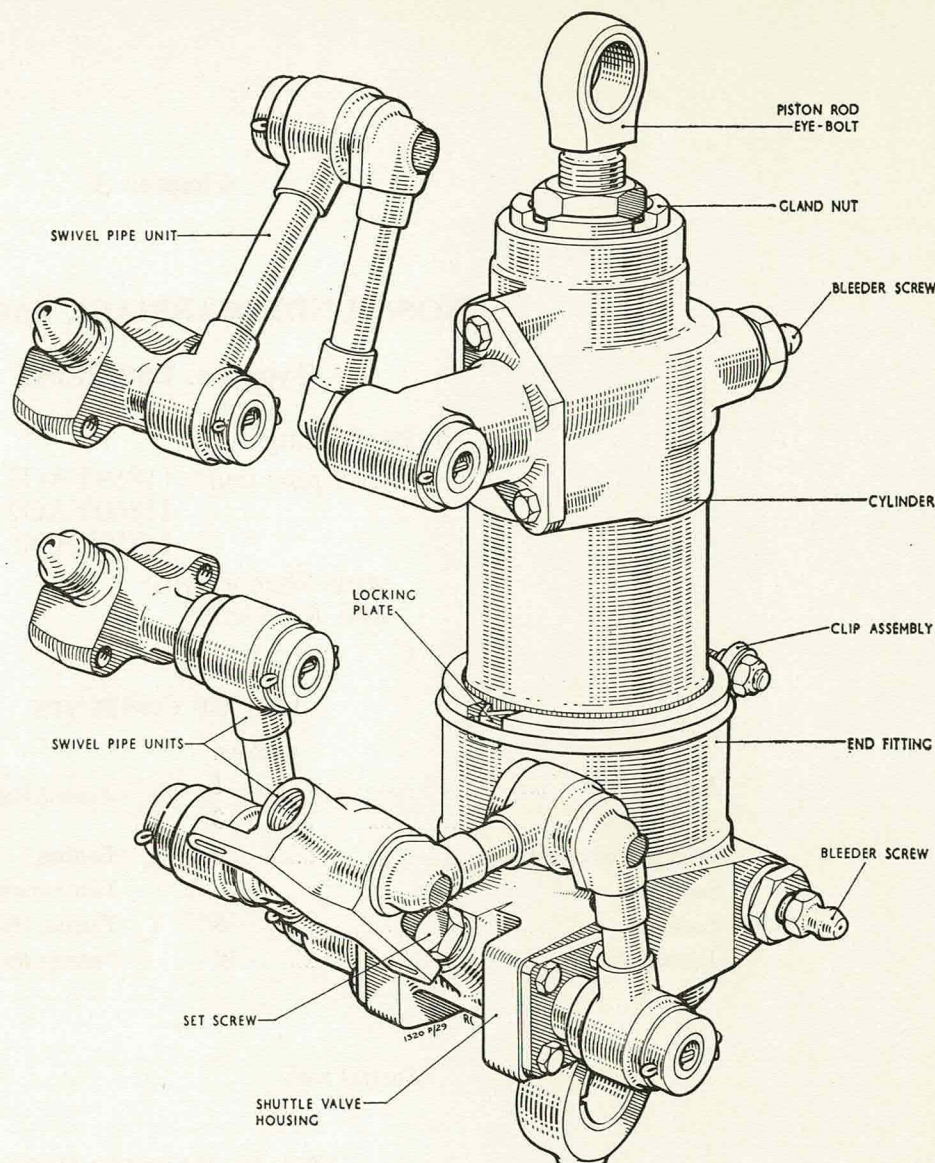


Fig. 1. Nose undercarriage jack unit

plate, located in a slot of the end fitting, engages with serrations on a shoulder of the cylinder and is retained by a wire clip and bolt assembly.

5. The snubber, which is retained by the

end fitting against the end of the cylinder, has a flanged base and a hollow stem projecting into the piston rod. The flange is grooved for a sealing ring and a transverse slot intersects the drilling in the stem to permit the passage of fluid to and from the cylinder. The stem,

which is grooved for a sealing ring at the inner end, has three small radial holes intersecting the main hole which is tapped to facilitate withdrawal from the end fitting. Shims are fitted under the base of the snubber to eliminate any slackness between the snubber and the cylinder after adjustment.

6. The inner end of the piston rod is integral with a piston head fitted with a sealing ring and two supporting rings. The outer end of the rod is slotted for a spanner grip and threaded for the attachment of a bushed eye-bolt fitted with a lock-nut. At the inner end, the piston receives the stem of the snubber when the jack is in the closed position.

Principle of operation

7. Fluid entering the jack by the normal or emergency swivel pipe units, forces the shuttle along the shuttle housing to seal off the inoperative pipe line. The piston rod extends, but displaced fluid is restricted by the valve in the swivel pipe unit at the piston rod end of the cylinder. The speed of extension is thus reduced.

8. Fluid entering via the swivel pipe unit to close the jack is again restricted by the valve in the swivel pipe unit, thus reducing the rate of piston travel. The piston continues its inward stroke until the stem of the snubber enters the piston rod, whereupon the flow of displaced fluid through the central hole of the snubber is confined to the small radial holes in the snubber stem, which are progressively covered by the moving piston. The restriction thus imposed ensures smooth operation of the jack as the piston approaches the end of the closing stroke.

SERVICING

Leakage

9. External leakage will indicate a faulty seal which must be renewed. Internal leakage past the piston head sealing ring will be shown by sluggish action of the jack in service or loss of pressure during test. Renew the sealing ring. Leakage past the shuttle may be due to dirt

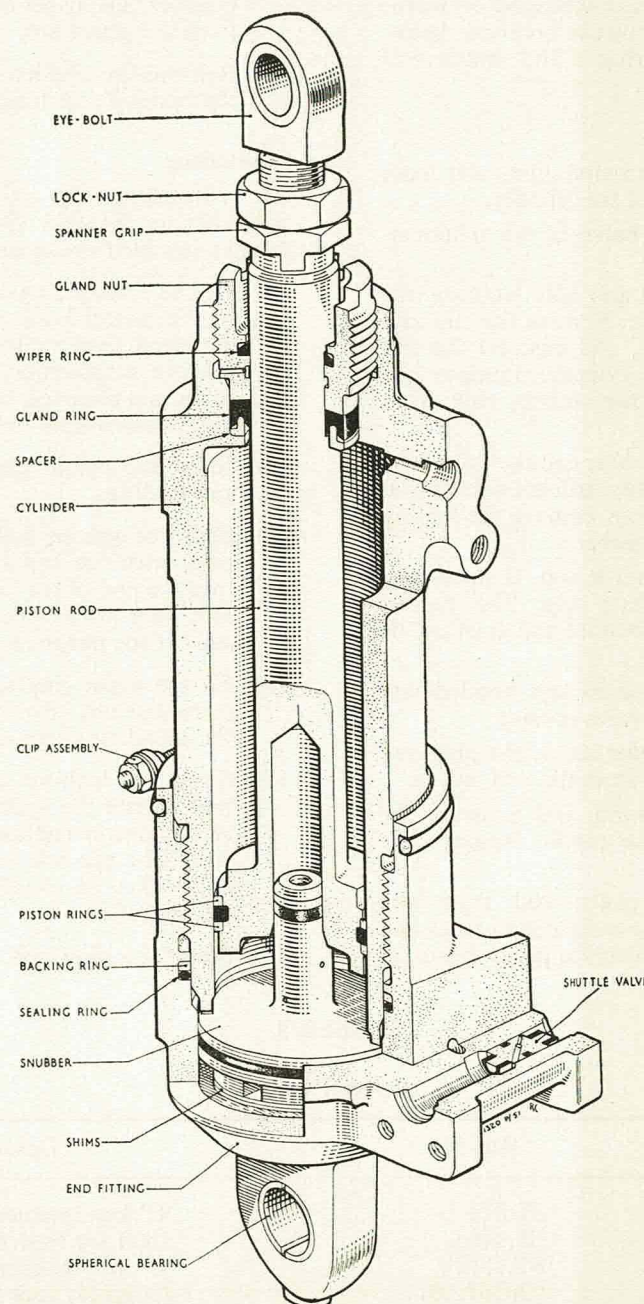


Fig. 2. Jack assembly

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between the bonded rubber rings and the seats in the shuttle bore, or by scored seats. If the bonded rubber rings are damaged or worn, the complete shuttle must be renewed. Leakage past the sealing ring of the shuttle will necessitate a new ring.

Dismantling

10. (1) Remove the swivel pipe units from the end fitting and the cylinder.
- (2) Remove the two halves of the spherical-bearing.
- (3) Slacken the nut and bolt securing the wire clip assembly. Remove the clip and the locking plate, and unscrew the end fitting from the cylinder. Remove the sealing ring and the backing ring from the end fitting.
- (4) Withdraw the snubber and the shim. The snubber is tapped to facilitate withdrawal from the end fitting. Remove the sealing rings from the snubber.
- (5) Withdraw the shuttle and, if necessary, remove the sealing ring. The rubber seating rings are bonded and must not be removed.
- (6) Remove the set-screw and bonded seal from the shuttle valve housing.
- (7) Remove the bleeder screw, the plug and the bonded seal from the end fitting.
- (8) Slacken the lock-nut and unscrew the eye-bolt from the piston. Remove the spanner grip.
- (9) Withdraw the piston rod from the cylinder and remove the piston rings and the sealing ring from the piston head.

- (10) Unscrew the gland nut and withdraw the gland ring and the spacer from the cylinder. The wiper ring may be removed from the gland nut.
- (11) Remove the bleeder screw, the plug and the bonded seal from the cylinder.

Assembling

11. All sealing rings are to be lightly coated with Grease XG-315 (34B/9100519) before being assembled in the unit.

- (1) Fit the sealing ring and the piston rings to the piston head. If new piston rings are fitted, they are to be gapped 0.009 to 0.012 in. on assembly and the sharp edges at the gap removed, on the flat faces only, up to a maximum radius of $\frac{1}{64}$ in.
- (2) Insert the piston into the cylinder, rod end leading.
- (3) Slide the spacer, followed by the gland ring, with the lips of the ring leading, over the end of the piston rod and ensure that they are correctly bedded together against the flange in the cylinder.
- (4) Fit the wiper ring to the gland nut and screw the nut into the cylinder to retain the gland ring against the spacer.
- (5) Screw the lock-nut fully on to the eye-bolt, locate the spanner grip to the end of the piston rod and screw in the eye-bolt. The eye-bolt will be finally adjusted and locked on installation of the jack in the aircraft.
- (6) Screw the plug into the cylinder against

a bonded seal and screw the bleeder screw into the plug.

- (7) Liberally coat the surfaces of the spherical-bearing with Grease XG-275 (34B/9100512) and insert the bearing into the lug of the end fitting.
- (8) Fit the sealing ring and the backing ring to the end fitting. The backing ring should be adjacent to the threads with the rough face towards the sealing ring. Fit the sealing rings to the snubber and insert the shims and the snubber into the end fitting.
- (9) Fit the sealing ring to the shuttle and insert the shuttle into the bore of the housing. Screw the set-screw into the shuttle housing against a bonded seal. Screw the plug into the end fitting against a bonded seal and screw the bleeder screw into the plug.
- (10) Screw the end fitting hard on to the cylinder. Adjust the end fitting until the shuttle valve housing is positioned relative to the swivel pipe attachment boss of the cylinder as shown in *fig. 2*, adding or subtracting the requisite number of shims to eliminate any slackness between the snubber and the cylinder. After adjustment, position the locking plate and secure it with the wire clip and bolt assembly.
- (11) Ensure that the sealing rings are fitted to the spigot connections of the swivel pipe units, and secure the fully tested swivel pipe units to their respective faces of the end fitting and cylinder with the set-screws.
- (12) On assembly, the pin centre dimension of the jack in the closed position should be adjusted to within the limits of 9.80 to 10.10 in. with the jack fully compressed. The travel is 4.53 to 4.63 in. with the jack fully extended.
- (13) After final assembly and test, the following items must be positively wire-locked.
 - (a) The bleeder screws to the plugs and the plugs to the cylinder and end fitting respectively.

TABLE 1

Special tools

Ref. No.	Part No.	Description
27Q/9106	ST.872	'C' key spanner for gland nut
27Q/12310	ST.1403	Drift for bush in eye-bolt
27Q/13594	ST.1512	'C' key spanner for end fitting
27Q/	03026TA01	Assembly tool for gland ring

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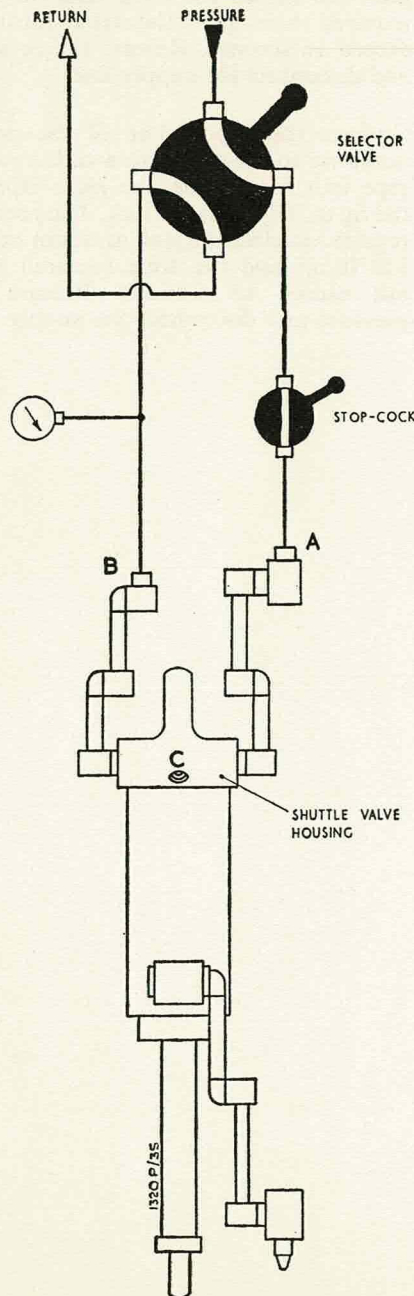


Fig. 3. Test circuit

- (b) The heads of the set-screws securing the swivel pipe units together.
- (c) The set-screw to the shuttle valve housing.
- (d) The gland nut to the cylinder.

TESTING

Test requirements

12. For testing the jack, a static hydraulic test rig and a power pump rig fitted with a pump capable of delivering 3.45 gall. per minute are required. All pipes between the jack and the rigs are to be $\frac{3}{8}$ in. outside diameter for metal pipes or $\frac{3}{8}$ in. nominal for flexible hose. The jack is to be hydraulically operated at least six times in each direction before testing to expel all air.

13. For testing the shuttle valve, a combined hand and power pump rig, fitted with a selector valve and a by-pass valve, is required.

Testing the shuttle valve

14. (1) The jack should be fully extended and connected to the test circuit as shown in fig. 3, with a stop-cock fitted between the selector and the connection A to the jack. A pressure gauge should be fitted between the selector and connection B.
- (2) Remove the set-screw at C (fig. 3) to enable the flow from this point to be conveniently observed.
- (3) Operate the power pump and adjust the by-pass valve of the rig to control the pressure to 100 lb/in² with the selector valve in the neutral position.
- (4) Select pressure to connection A and fluid should flow freely from connection C. Reverse the selection to connection B and fluid should continue to flow from connection C.
- (5) Repeat operation (4) at least three times to ensure that the shuttle is operating freely. Stop the power pump and screw the set-screw, fitted with a bonded seal, into the tapping at C.

- (6) Disconnect the pipe line from connection A and connect it to connection B. Select pressure to connection B and operate the power pump. An initial spurt of fluid from connection A is permissible due to the movement of the shuttle. Stop the power pump.
- (7) Operate the hand pump and apply a pressure of 300 lb/in², gradually increasing it to 6000 lb/in². Leakage is not permissible. Release the pressure.
- (8) Disconnect the pipe line from connection B and connect it to connection A. Select pressure to connection A and operate the power pump, applying a pressure of 100 lb/in². The shuttle should move across, which will be indicated by a spurt of fluid from connection B and subsequent build up of pressure. Stop the power pump.
- (9) Operate the hand pump and apply a pressure of 300 lb/in², gradually increasing it to 6000 lb/in². Leakage is not permissible. Release the pressure.
- (10) Disconnect the pipe line from connection A and connect it to connection B. Select pressure to connection B and operate the power pump, applying a pressure of 100 lb/in². The shuttle should move across, which will be indicated by a spurt of fluid from connection A and subsequent build up of pressure. Stop the power pump.
- (11) Operate the hand pump and apply a pressure of 300 lb/in², gradually increasing it to 6000 lb/in². Leakage is not permissible. Release the pressure.
- (12) Repeat operations (8) to (11) alternately three times.
- (13) Close the jack and connect the pipe lines from the connections A and B to the opposite ports of the selector valve. With the shuttle positioned to allow a flow of fluid from connection A to connection C, close the stop-cock to trap fluid at zero pressure at connection A.

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- (14) Operate the power pump. The jack should extend and a stable pressure should be registered on the pressure gauge. By means of the stop-cock open connection A to the return line. Leakage is not permissible, except for a possible initial spurt of fluid through this connection. Release the pressure and repeat this test five times.

Testing the jack

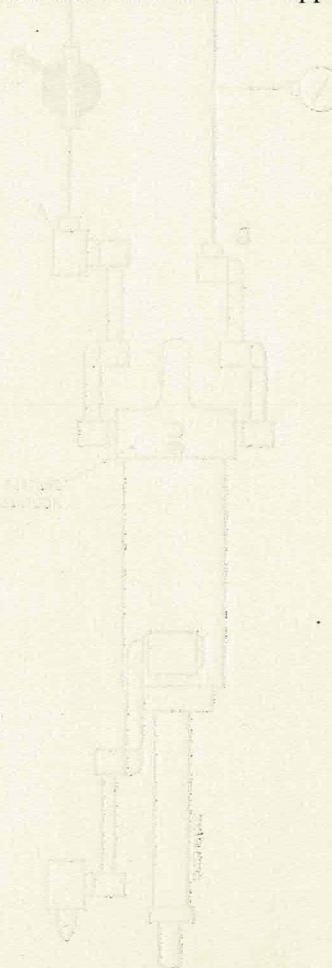
15. (1) Connect the supply line of the static hydraulic test rig to the connection of one of the swivel pipe units for extending

the jack. Apply a pressure to fully extend the jack and then gradually increase the pressure to 6000 lb/in². Leakage is not permissible. Release the pressure and disconnect the supply line.

- (2) Connect the supply line to the connection of the swivel pipe unit for closing the jack. Apply pressure to fully close the jack and then gradually increase the pressure to 6000 lb/in². Leakage is not permissible. Release the pressure and disconnect the supply line.
- (3) Connect the supply line of the power pump rig to the connection of one of the

swivel pipe units for extending the jack. The pressure required to extend the jack must not exceed 150 lb/in² and the time required to complete the stroke must not exceed 16 seconds. Release the pressure and disconnect the supply line.

- (4) Connect the supply line of the power pump rig to the connection of the swivel pipe unit for closing the jack. Operate the rig to fully close the jack. The pressure required to close the jack must not exceed 150 lb/in² and the time required must not exceed 18 seconds. Release the pressure and disconnect the supply line.



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