AP 109D-0203-1
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DROGUE GUNS
TYPES 4,5,9 TO 11,17 TO 20,24 AND 25
(MARTIN-BAKER)
GENERAL AND TECHNICAL INFORMATION

BY COMMAND OF THE DEFENCE COUNCIL

Ministry of Defence

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AP 100N-0101 (RN)
AP 100B-01 Order 0504 (RAF)

GENERAL AND TECHNICAL INFORMATION

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INTRODUCTION

1 The various drogue guns described in this publication are similar in construction and operation. They all incorporate a time-delay of 0.5 s with the following exceptions, Type 17 Mk 1 and Type 24 Mk 1 and Mk 2, 0.75 s Type 18 Mk 1 and Mk 2, 1 s and Type 25 Mk 1, 0.55 s. All types of drogue guns, except Types 4 and 5 in this publication embody the larger diameter barrel and piston used in conjunction with the 100 grain cartridges. Table 1 lists the various types and marks of drogue guns and their differences.

TABLE 1 DROGUE GUN APPLICABILITY

Type and Mark	Remarks	Seat Type
4 Mk 2	Intro by Mod ES2657 to Type 4 Mk 1	-
5 Mk 2	Intro by Mod ES2657 to Type 5 Mk 1	-
6 Mk 2	Intro by Mod ES2657 to Type 6 Mk 1	-
9 Mk 2	Intro by Mod ESA 3 to Types 4 and 5 Mk 2	2HA(N),3CS, 3CT,3LS, 3KS, 4QS.
11 Mk 1	Intro by Mod ESA 3 to Type 7 Mk 1	4HA 1/2
12 Mk 1	Intro by Mod DG 5 to Type 7 Mk 1 (RN seats only)	4HA(N) 1/2
17 Mk 1	Intro for Type 6MSA -1/2 seats	6MSB 1/2
18 Mk 2	Intro by Mod ESA 11 to Type 9 Mk 2	2CA 1/2
19 Mk 2	Intro by Mos ESA 7 to Type 6 Mk 2	4P 1/2, 4PA 1/2, 4PB 1/2
20 Mk 1	Intro for Type 9A Mk 1 ejection seats	9A, 9D 1/2
24 Mk 1	Intro for Type 7A 1/2 Mk 1 ejection seats	7A 1/2 Mk 1
24 Mk 2	Intro by Mod ES2657 to Type 24 Mk 1	7A 1/2 Mks 2/3
25 Mk 1	Intro for Type 9B ejection seats	9B, 9B 1/2

NOTES...

(1) Barrel assemblies introduced by Mod No DG 5 (RN) and the Type 17 Mk 1, 20 Mk 1, 24 Mk 1 and 2 and 25 Mk 1 drogue guns dispense with the cartridge retaining clip. The cartridge No 2, Mk 1 used in conjunction with these types of barrels and guns is of the same diameter as the pre Mod cartridges No 1 Mk 1 and 2.

(2) Barrel assemblies introduced by Mod No ESA 3 (RAF) incorporate a cartridge retaining clip and the cartridge used, No 3 Mk 1, is smaller in diameter than the pre Mod cartridges No 1 Mk 1 and 2.

(3) Drogue gun modification DG 18 introduced a water seal for the drogue gun barrel and breech on drogue guns Type 20, 24 and 25. Barrel assemblies on drogue guns Type 20 and 24 were replaced with barrel assemblies machined to accept the water seal.

DESCRIPTION

2 The drogue gun (fig 1) is a mechanism which deploys the drogue assembly after an appropriate delay when seat ejection has taken place. It consists of a body containing the time-delay mechanism, into which is screwed a barrel. The barrel contains a drogue piston secured in position by a special shear pin. The lower end of the barrel contains the cartridge. The upper end of the piston is shaped to receive the shackle or spool-end of the drogue withdrawal line.

3 The complete assembly is attached to the port side of the seat structure.

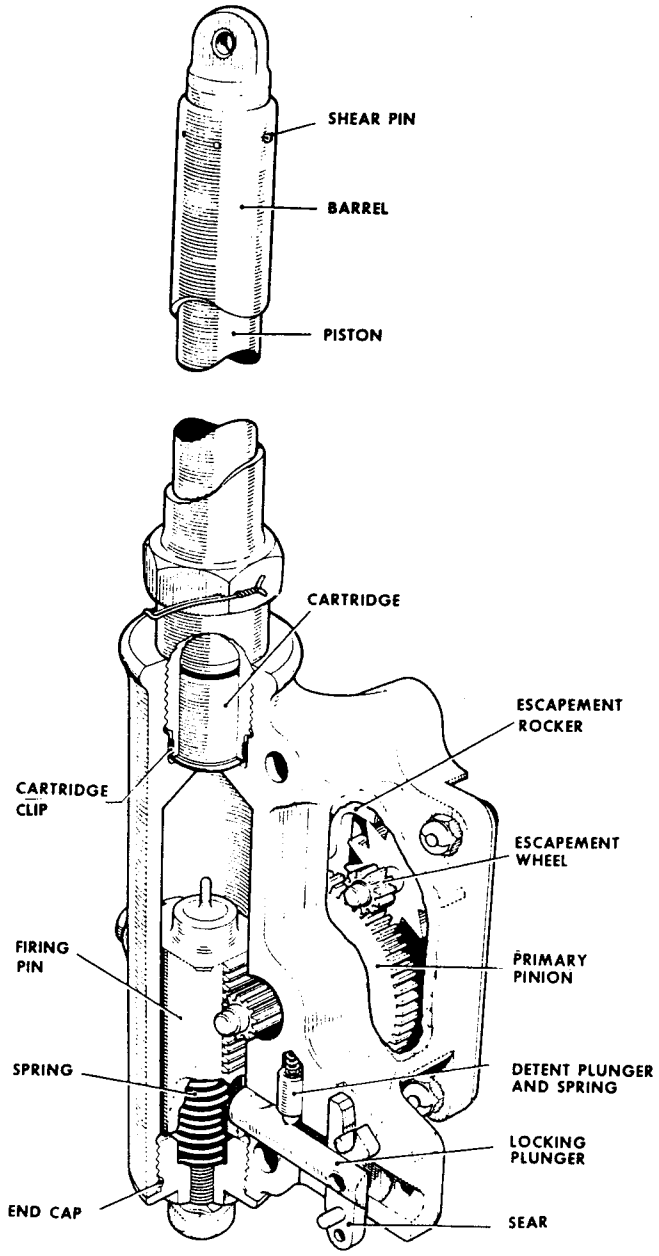


Fig 1 Drogue gun, Type 4

TIME-DELAY MECHANISM

4 The mechanism consists of a firing pin the rack of which is in engagement with a train of gears controlled by an escapement wheel and rocker. Beneath the firing pin is a main spring and, when in the cocked position, the mechanism is prevented from operating by the end of the locking plunger engaging in the recess in the firing pin. The locking plunger, which is held in position by a detent plunger and spring, embodies at its outer end a slot bridged by a riveted pin. Passing through the slot is a sear to which is attached a trip rod.

OPERATION

5 As the seat ascends the guide rails during ejection the trip rod withdraws the sear and in so doing the locking plunger is disengaged from the firing pin. The firing pin is now free to rise under spring pressure, the rate of ascent being governed initially by the escapement mechanism. After the delay has elapsed the firing pin rack disengages from the gear train and it is free to ascend under spring pressure to strike the cap of the cartridge. The gas produced from the cartridge ejects the piston from the barrel, shearing the shear pin and deploying the drogues.

SERVICING

TABLE 2 SPECIAL TOOLS AND EQUIPMENT

Nomenclature (1)	Part No (2)	Reference No (3)	Remarks (4)
Tool, cocking	MBEU 4341	27L/ 1046822	For cocking firing pin
Gauge, protrusion	MBEU 3669	27L/1045905	For checking protrusion of firing pin in fired position
Test fixture, rated spring	-	27L/4665814	For testing firing pin spring
Assembling jig and gear positioning tool	-	Local manufacture	Refer to AP109S-0100-1 App 2

TABLE 3 MATERIALS

Nomenclature (1)	UK Joint Service designation (2)	NATO Code No (3)	Specification (4)
Oils and greases			
Note... Details of lubricants to be used and their correct application will be found in AP 109-0100-6, Leaflet A4.			
Cleaning agents			
Trichloroethane			TS 367D Type 1 or 2

COCKING THE MECHANISM

6

6.1 Remove the 5/16 in. bolt and spring washer from the end cap.

6.2 Insert the seat and depress the locking plunger to its fully locked position.

6.3 Insert the cocking tool and engage the threads of the firing pin. Screw in the tool until the green cannelure (nearest to the handle) disappears into the drogue gun body.

6.4 Pull outwards on the cocking tool to withdraw the firing pin and operate the gears. Continue to pull on the cocking tool and observe the locking plunger until it rises over the firing pin and then falls into its locking recess.

6.5 To ensure that the unit is correctly cocked:

6.5.1 Operate the mechanism in the overrun position by continuing to pull on the cocking tool and observe that the red cannelure (furthest from the handle) is visible, then allow the firing pin to return to its correctly cocked position. Repeat the check twice more and remove the cocking tool.

6.5.2 Attempt to insert a suitable Martin-Baker drogue gun trip rod retention pin in the safety lock hole. If the pin will not insert, press in the end of the locking plunger and ensure that the trip rod retention pin will subsequently enter the safety lock hole unobstructed.

6.6 Replace the spring washer and 5/16 in. bolt in the end cap.

TIMING THE MECHANISM

7 The timing tests to be carried out prior to stripping the unit are detailed in AP 109T-0101-12, Chapter 5.

DISMANTLING THE DROGUE GUN (fig 2)

8

8.1 Remove the barrel and piston assembly.

▶ 8.1A Remove and discard the external water seal from the end fitting of the drogue gun barrel (Type 20, 24 and 25 drogue guns). ◀

8.2 Operate the mechanism by withdrawing the sear.

8.3 Remove the four 2 BA nuts and cover plate securing bolts.

8.4 Remove the cover plate.

8.5 Remove the rocker, escapement wheel, primary pinion and the cone end plunger and spring.

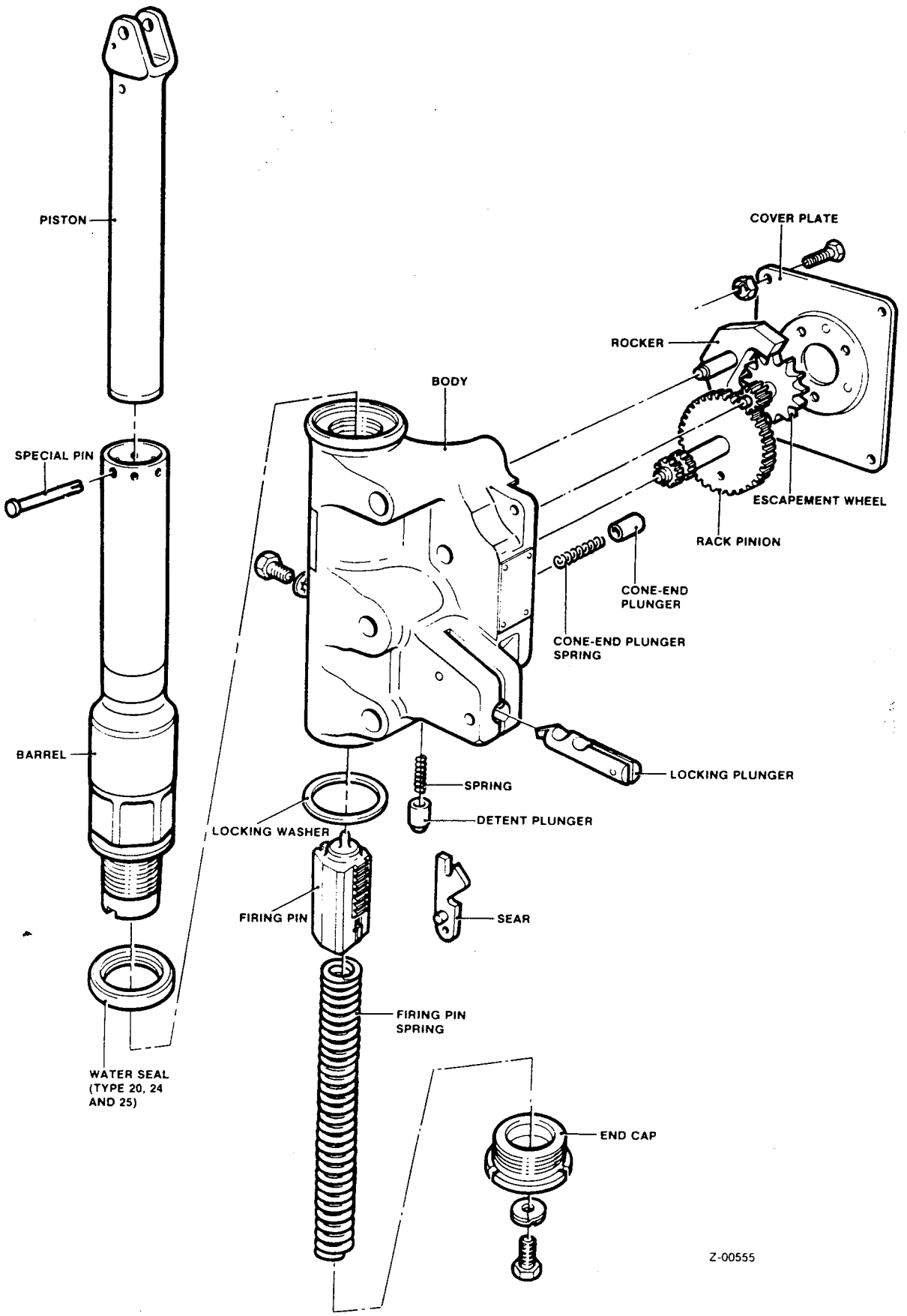


Fig 2 Drogue gun, exploded view
(Type 25 Mk 2, post mod DG 18)

8.6 Remove the 5/16 in BSF bolt and spring washer from the end cap.

8.7 Remove the end cap and locking washer.

8.8 Remove the firing pin spring and firing pin.

8.9 Remove the set screw and shakeproof washer.

8.10 Rotate the locking plunger through 180 deg and remove it from the housing.

Note...
Care is to be taken to prevent the detent plunger and spring from flying out of the housing.

8.11 Remove the detent plunger and spring.

8.12 Remove the cartridge retaining clip from the barrel (if fitted).

8.13 Remove the special shear pin, remove the piston from the barrel.

ASSEMBLING THE DROGUE GUN

▶ 9 During assembly lightly lubricate the barrel and piston with grease and the locking plunger assembly, detent plunger and spring with grease. All other components should be lightly lubricated with oil. Reassemble the drogue gun as follows: ◀

9.1 Insert the detent plunger and spring, compress the spring until only the top of the plunger is visible in the locking plunger housing.

9.2 Insert the locking plunger and press firmly inwards to engage the first position.

9.3 Using a new shakeproof washer, replace the set screw.

9.4 Insert the firing pin in its housing to its fully forward position; replace the firing pin spring.

9.5 Place a new locking washer on the end cap and screw the end cap into the body.

9.6 Check the firing pin protrusion as detailed in para 10.

9.7 Punch the locking washer into the recesses in the end cap and body.

9.8 Place the assembly jig in a vice and position the gun body on the jig.

9.9 Replace the cone-end plunger and spring.

9.10 Fit the primary pinion (fig 3) so that the cone-end plunger is in engagement with the countersunk hole, and check that the plunger and spring are functioning correctly.

9.11 Exert a light pressure on the primary pinion to engage its pivot in its bearing and to restrain the cone-end plunger spring. Fit the escapement wheel to engage its gear teeth with that of the primary pinion.

9.12 Fit the rocker and engage it with the teeth of the escapement wheel.

9.13 Place the assembly jig swivel arm on the left-hand mounting bolt so that the riveted plate is face downwards and secure, using a double spring washer and a 5/16 in BSF nut, finger-tight only. Ensure that the arm is free to swivel and that the hook end engages the right-hand mounting bolt. Position the arm at approximately 90 deg. to the body (fig 4, Action 1).

9.14 Ensuring that all three lower pivot pins are seated correctly in their bearing points, place the gear positioning tool over the upper pivot pins and maintain a light pressure to restrain the cone-end plunger and spring (fig 4, Action 1).

9.15 Replace the cover plate, ensuring that the pivot pins enter their bearing sockets, (fig 4, Action 2).

9.16 Move the assembly jig swivel arm to engage the right-hand mounting bolt and secure, using a double spring washer and a 5/16 in nut, finger-tight only, (fig 4, Action 2).

9.17 Position the 2BA securing bolts through the holes in the cover plate and body, (fig 4, Action 3).

9.18 Remove the gear positioning tool.

9.19 Secure the cover plate using the 2 BA bolts and stiff-nuts.

9.20 Remove the 5/16 in BSF nuts and spring washers from the mounting bolts and remove the swivel arm.

9.21 Remove the gun assembly from the jig.

9.22 Insert the sear and press the locking plunger fully home.

9.23 Screw the cocking tool into the firing pin. By attaching a spring scale to the cocking tool, check that the load required to disturb the firing pin is between 8 to 15 lbf, (fig 5).

▶ 9.24 Cock the mechanism and remove the cocking tool. ◀

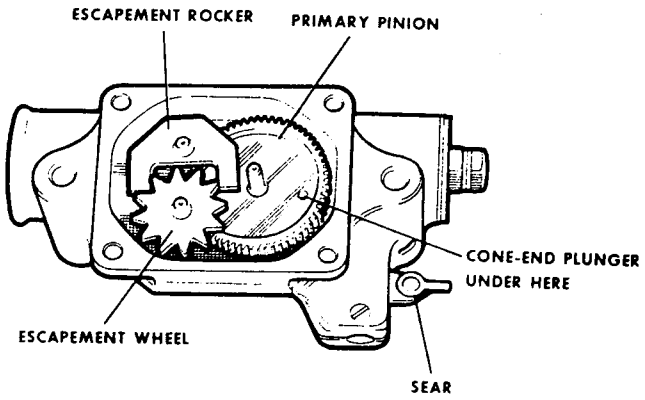
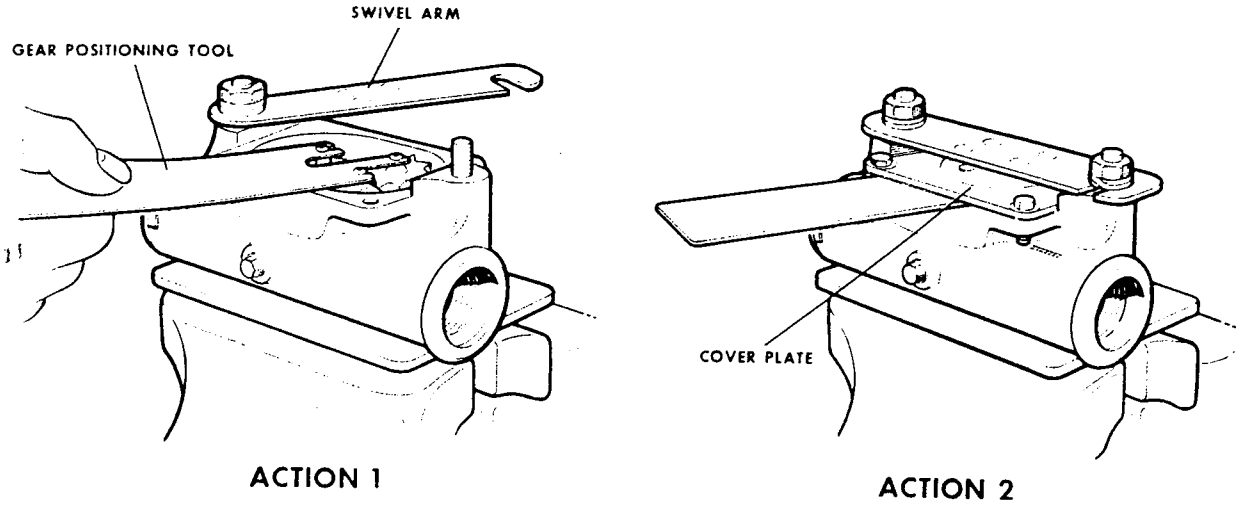


Fig 3 Assembling gear train



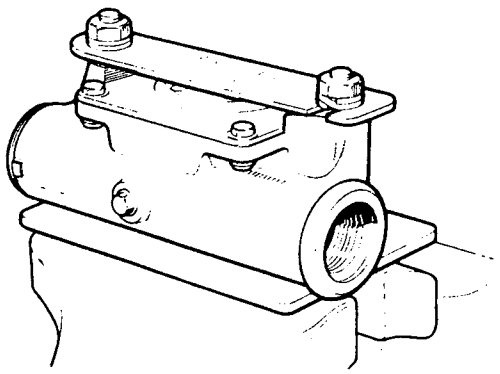


Fig 4 Using the special jig and gear positioning tool

9.25 With the mechanism cocked, attach a spring scale to the sear using a suitable length of cord. Check load required to extract sear by pulling spring scale in the normal direction of pull of trip rod. Load is to be between 25 to 45 lbf (fig 6). Check that the mechanism functions smoothly.

9.26 Cock the mechanism and remove the cocking tool.

9.27 Gauge the firing pin protrusion as described in para 10.

9.28 Replace the piston in the barrel and secure with a new shear pin.

9.29 Test the unit as detailed in AP 109T-0101-12, Chap 5.

▶ 9.29A Fit the replacement water seal to the end fitting of the drogue gun barrel (Type 20, 24 and 25 drogue guns). ◀

9.30 Screw the barrel assembly into the body finger tight only.

GAUGING THE FIRING PIN PROTRUSION

10

10.1 Remove the barrel assembly from the drogue gun body.

10.2 Operate the mechanism by withdrawing the sear.

10.3 Lower the protrusion gauge into the breech and position the centre indicating spigot over the point of the firing pin; lower the body of the gauge until it rests on the breech face. The indicating spigot shall be either flush with or slightly higher than the top of the gauge body (fig 7).

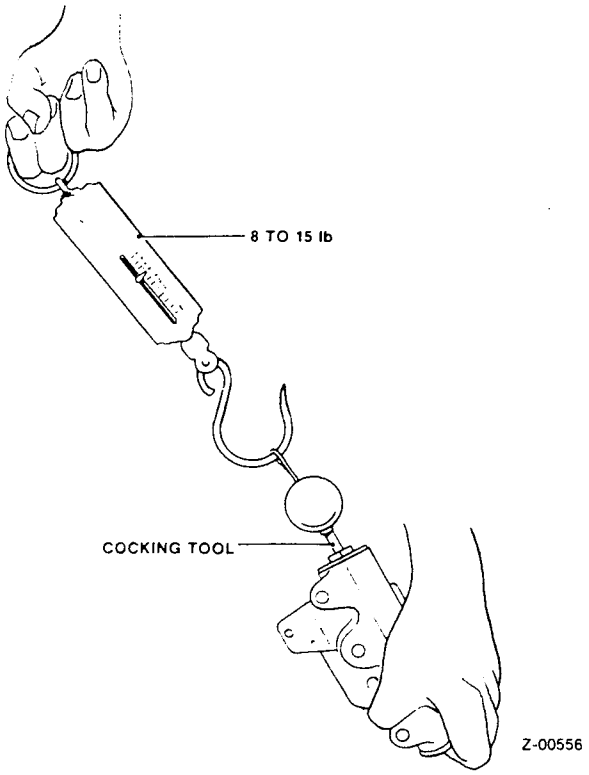


Fig 5 Testing firing pin spring

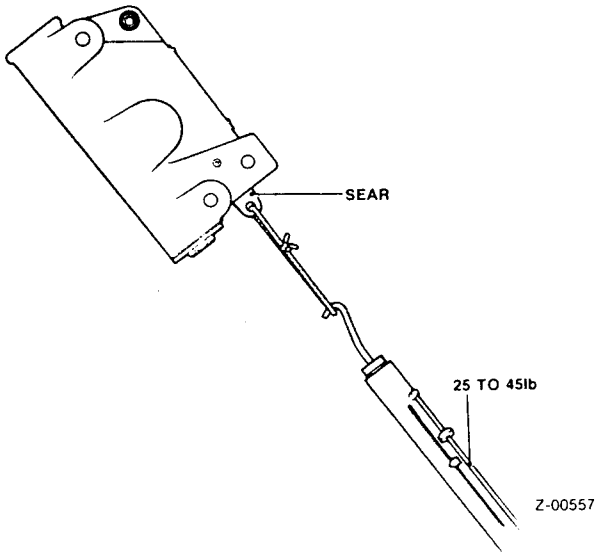


Fig 6 Checking sear pull-out load

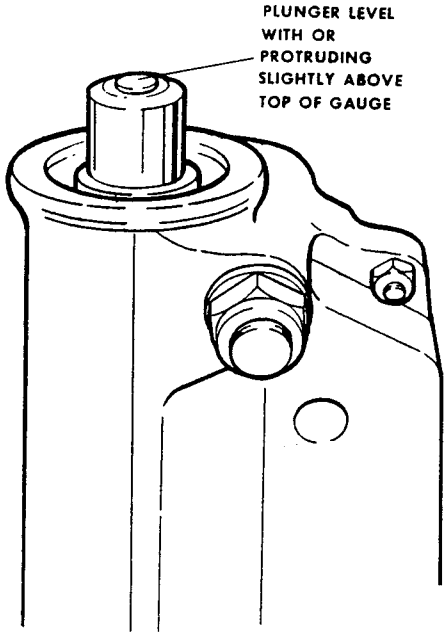


Fig 7 Gauging firing pin protrusion

TRIP ROD - VITAL AREA PAINT SCHEME

11 The trip rod lower telescopic half is to be painted as follows:

11.1 Identify and thoroughly clean the trip rod lower half.

11.2 Paint the lower half using paint, Yellow (33B/2204876) 3 pint size, (33B/2204859) 15 litre size.

11.3 Paint finish is to be renewed as required during subsequent bay servicing.