ROYAL CANADIAN AIR FORCE



# HANDBOOK WITH PART LIST

# MAGNETIC COMPASSES

# TYPES B-16, B-17, D-12



(This EO replaces EO 20-25BC-2 dated 5 Jan 54)

ISSUED ON AUTHORITY OF THE CHIEF OF THE AIR STAFF

29 AUG 55

# LIST OF RCAF REVISIONS

| DATE | PAGE NO | DATE | PAGE NO |
|---|---|---|---|

# TABLE OF CONTENTS



# LIST OF ILLUSTRATIONS

# LIST OF ILLUSTRATIONS (Cont'd)

# LIST OF ILLUSTRATIONS (Cont'd)

# LIST OF TABLES

# PART 1

## INTRODUCTION

1 This EO is issued as the general basic instructions for the equipment involved.

2 This EO with Part List contains instructions for the installation, operation, maintenance and overhaul with Part List, for the following magnetic compasses manufactured by the Eclipse-Pioneer Division of Bendix Aviation Corporation, Teterboro, N. J., see Table 1.

3 Reference has been made in this EO to the following instruction which contains applicable data and information:-

| NUMBER | |
|---|---|
| EO 20-25-1 | Compass Installation, Compensation and Swinging |

TABLE 1

| COMPARATIVE TABLE OF TYPE IDENTIFICATIONS FOR MAGNETIC COMPASSES | |
|---|---|
| PILOT'S TYPE | |
| TYPE | PIONEER TYPE |
| B-17 | 1813-1-A |
| B-17 | 1813-1-B |
| B-16 | 1818-1-A |
| B-16 | 1818-4-A |
| B-16 | 1821-2-A |
| NAVIGATOR'S TYPE | |
| D-12 | 1801-1-A |
| | 1826-1-A |
| D-12 | 1832-1-A |
| | 1832-3-A |
| D-12 | 1833-1-A |

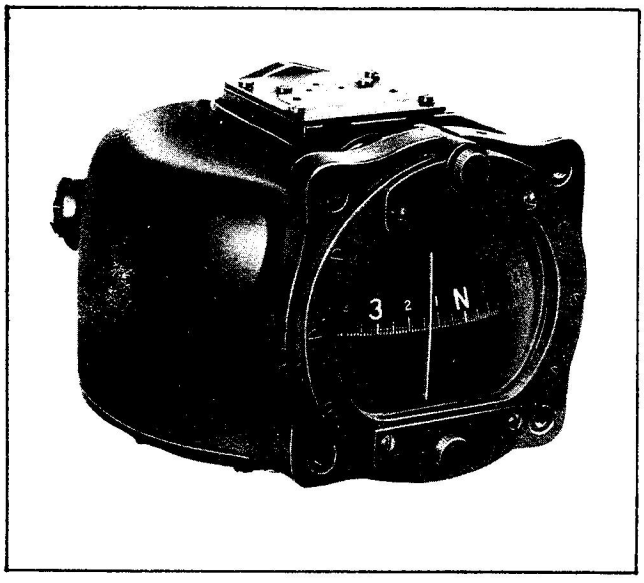



Figure 1-1 Magnetic Compass - Type B-17 (Pioneer Type 1813-1-A and 1813-1-B

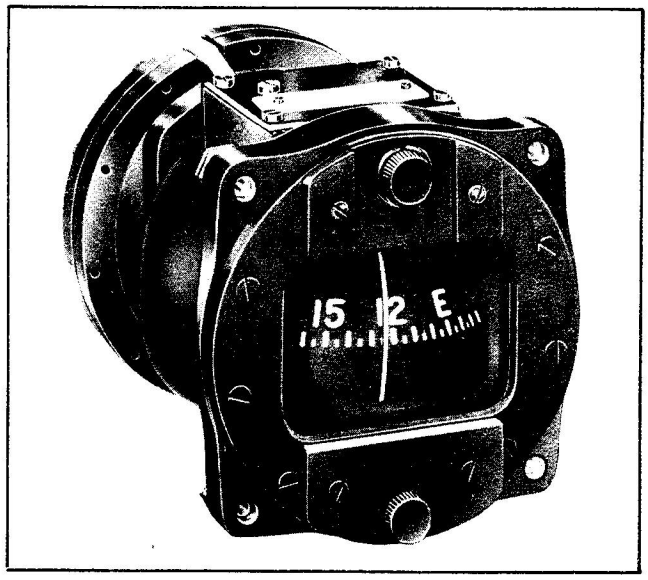



Figure 1-2 Magnetic Compass - Type B-16 (Pioneer Type 1818-1-A, 1818-4-A, and 1821-2-A)

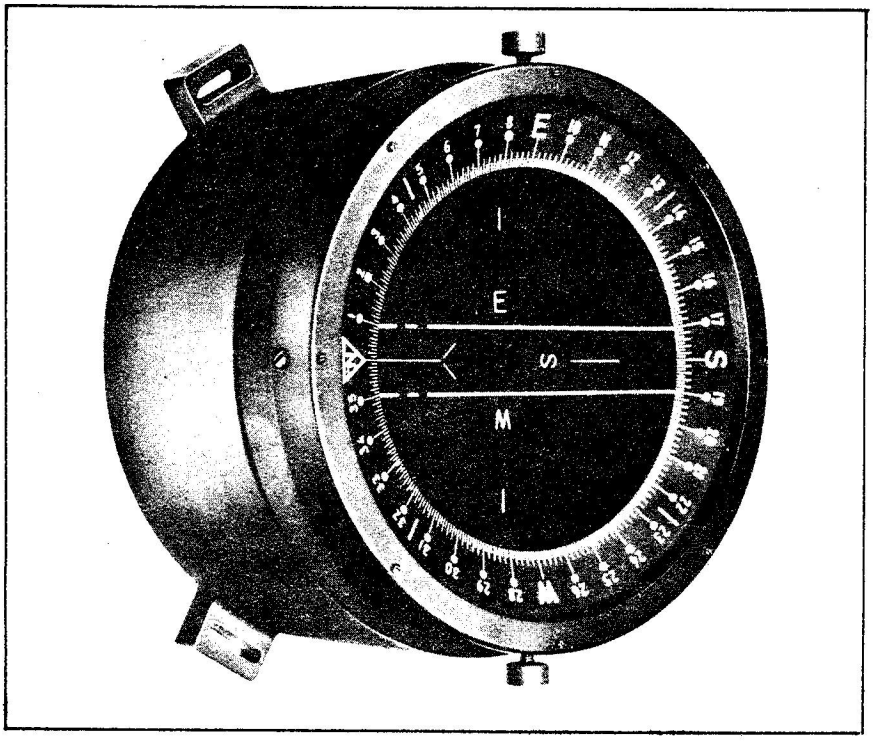



Figure 1-3 Magnetic Compass - Type D-12 (Pionner Types 1801-1-A, 1826-1-A)

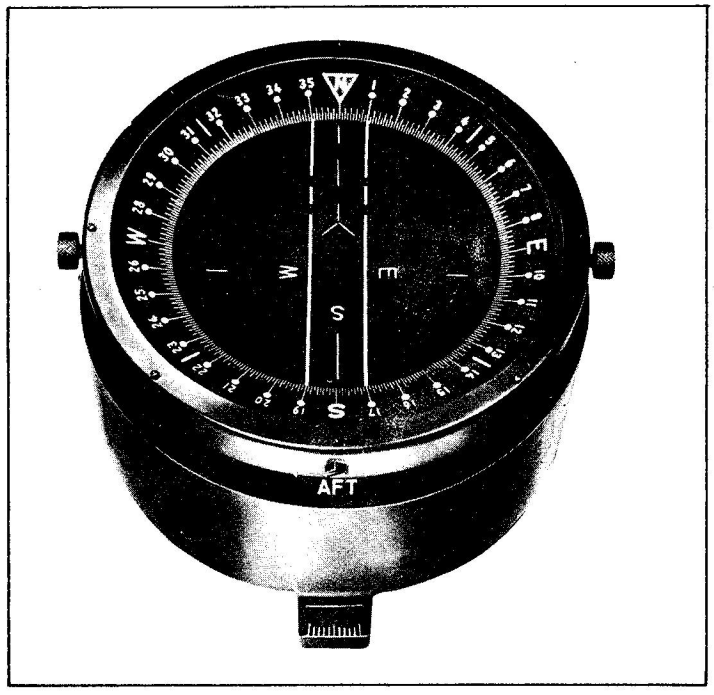



Figure 1-4 Magnetic Compass - Type D-12 (Pioneer Types 1832-1-A, 1832-3-A)

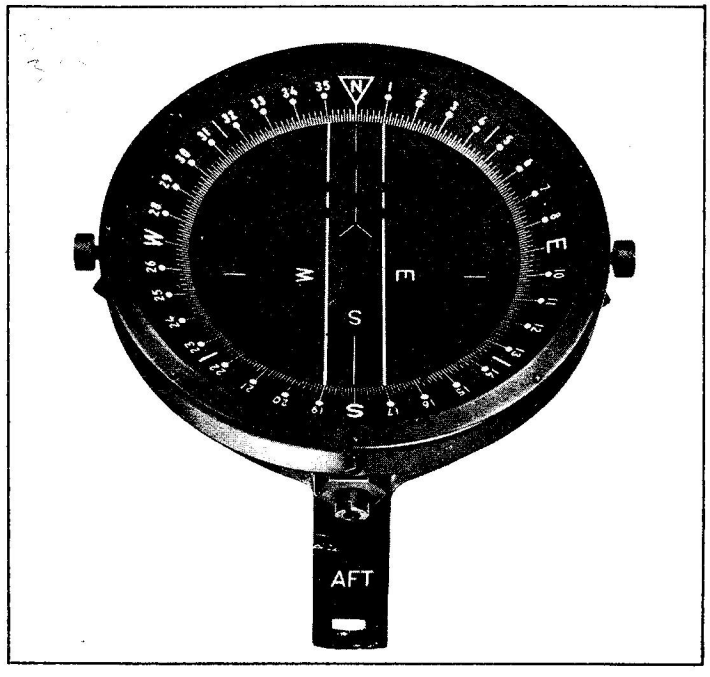



Figure 1-5 Magnetic Compass Type D-12 (Pioneer Type 1833-1-A)

PART 2

TABLE OF CONTENTS



## DESCRIPTION

### GENERAL

Magnetic Compasses

1 Pioneer direct-reading magnetic compasses continuously indicate the heading of an aircraft with reference to the earth's magnetic field. These instruments are divided into two main classifications: the pilot's type compass for panel mounting, and the navigator's (aperiodic) type compass for floor or table mounting.

2 The card element of the compass bears a system of magnetized needles so suspended on a pivot that it is free to align itself with the meridian of the earth's magnetic field, and also to move laterally through an angle of approximately 20 degrees. The indications of the card are visible, in reference to a lubber line, through a glass window in the bowl. An expansion chamber is built into the compass to provide for expansion and contraction of the liquid resulting from the pressure and temperature changes. To correct for deviations of the card from magnetic disturbances, a compensating system, utilizing small permanent magnets for correction, is attached to the compass. The bowl is filled with liquid for damping oscillations of the card element, and for reducing friction on the pivot. An individual lighting system is generally provided in the compass for illumination of the card, when required.

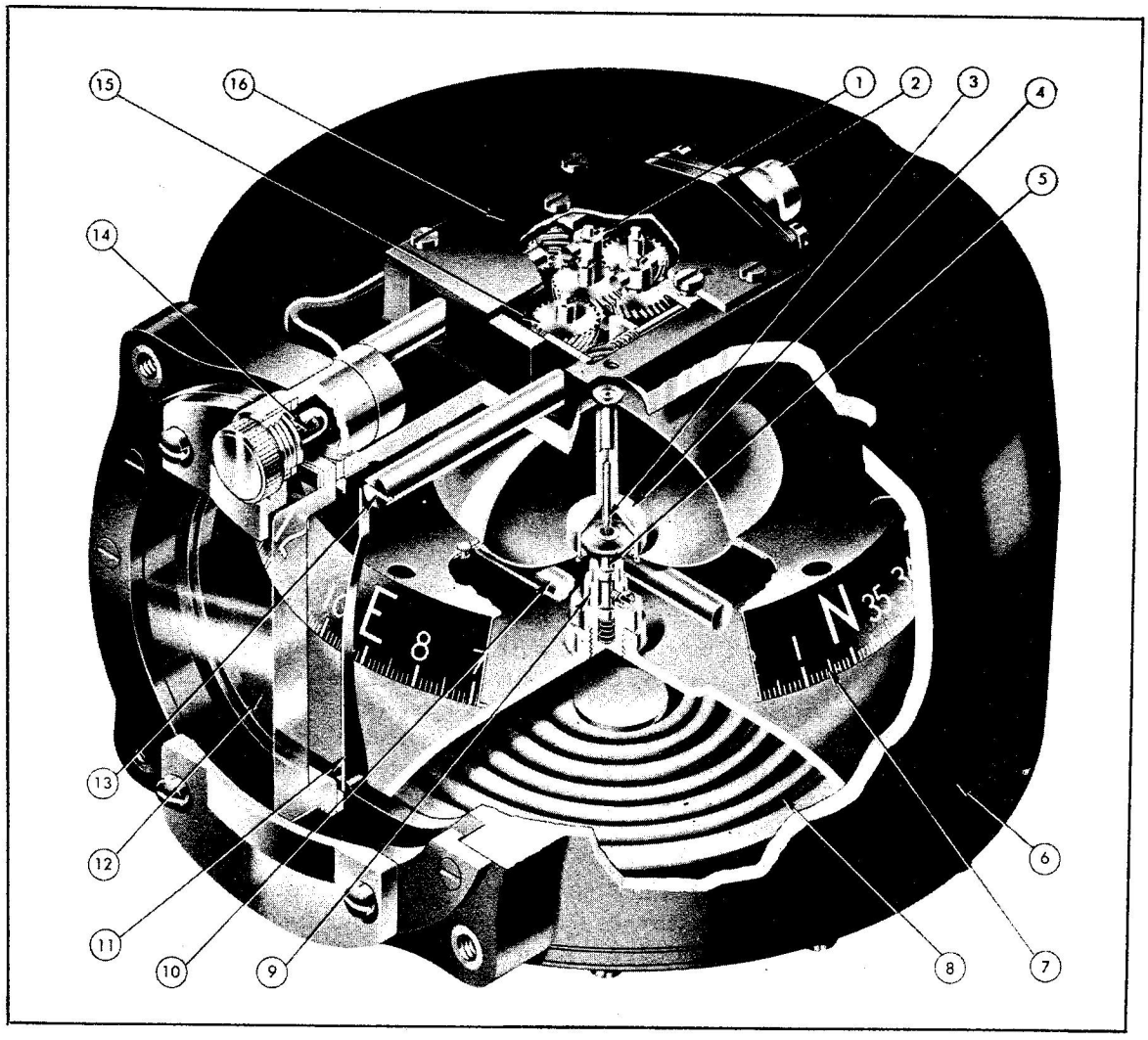
Pilot's Type Compass, See Figures 1-1 and 1-2

3 These compasses are comprised of a bowl filled with compass liquid in a case suitable for panel mounting. The compass consists of a card, a means for illuminating the card, and an expansion chamber which provides for expansion and contraction of the liquid caused by temperature change.

4 The compass card has graduations around its outer edge and is attached to a float and magnet assembly in such a way as to pivot on a jewel. The cardinal headings are designated by "N", "E", "S" and "W", and each 30-degree point is indicated by a number corresponding to the angle. The magnets are so arranged that their axes are parallel to each other and to the north-south axis of the card.

5 The pivot rests in a cup jewel which is spring mounted to absorb external vibration.

6 Mounted in the case behind the lens is a lubber line for reference when reading the compass. The line is close to the card to reduce parallax error. A plane passing through the line and the center of the pivot is parallel to the longitudinal axis of the aircraft at installation.




1 Compensator Magnet
2 Tube and Plug Assembly
3 Pivot
4 Float Assembly
5 Jewel Post Assembly
6 Compass Bowl
7 Card
8 Expansion Chamber Assembly
9 Jewel Post Support
10 Card Magnet
11 Lubber Line
12 Compass Lens
13 Compensator Knob
14 Lamp Assembly
15 Compensator Idler Gear
16 Compensator Assembly

Figure 2-1 Three-Quarter Cutaway View - Type B-17 (Pioneer Types 1813-1-A and 1813-1-B)

7 The compensator has two sets of permanent bar magnets arranged in two planes at right angles to each other, and assembled above the center of the compass magnets. Each set is adjusted by means of slotted heads marked "NS" and "EW" which are found under a cover at the top of the lens ring.

Navigator's Type Compass, See Figures 1-3, 1-4 and 1-5

8 These compasses consist of a cylindrical bowl divided into two chambers by a support plate. The bowl is filled with compass liquid, upper chamber contains a semi-float type card assembly equipped with north-seeking magnets. The card assembly is balanced on a pivot so that it is free to align itself with the meridian of the earth's magnetic field. The pivot of the card assembly turns on a jewelled bearing and is spring-mounted to protect it from vertical shock and to reduce vibration effects.

9 A rotatable ring graduated in 1-degree increments is provided on the top of the compass for setting and indicating courses to be flown. The bezel ring may be locked in position by means of two locking screws. Observation of the indications on the bezel ring in reference to the lubber line is made through the glass top of the bowl. Parallax error is reduced by means of the two wires or grid lines mounted parallel to each other and to the north-south diameter of the bezel ring.

10 The lower or expansion chamber is equipped with a bellows which provides for the expansion and contraction of the compass liquid owing to pressure and temperature changes. The liquid eliminates oscillations of the card as well as the need for oiling any part of the instrument. A shield protects the compass bowl from external damage.

11 A compensating system mounted on the bottom of the compass bowl corrects deviations of the card assembly caused by local magnetic disturbances. The compensator consists of two sets of magnets; an upper set for north-south compensation and a lower set for east-west compensation. The positions of the magnets are changed by gears, which in turn are controlled by two compensator knobs on the compensator bracket. The knobs are identified by the letters "NS" and "EW". This unit sets up a counter magnetic field which neutralizes the horizontal components of the magnetic influences inherent in the aircraft.

12 The navigator's type compass is not provided with an individual lighting system. However, luminous material painted on the arms of the card assembly and on the grid lines provides sufficient illumination for night flight.

## PILOT'S TYPE COMPASSES

Type B-17 (Pioneer Types 1813-1-A and 1813-1-B), see Figure 2-1

13 These compasses consist of the following principal subassemblies and parts: compensator assembly, card and float assembly, tube and plug assembly, lamp assembly and expansion chamber assembly.

Compensator Assembly

14 The compass contains a built-in permanent magnet compensator consisting of two sets of permanent magnets arranged in two planes at right angles to each other, and assembled above the center of the compass magnets.

15 The positions of the magnets are changed by gears which are controlled by two compensator knobs on the compensator bracket. The knobs are marked "NS" and "NW".

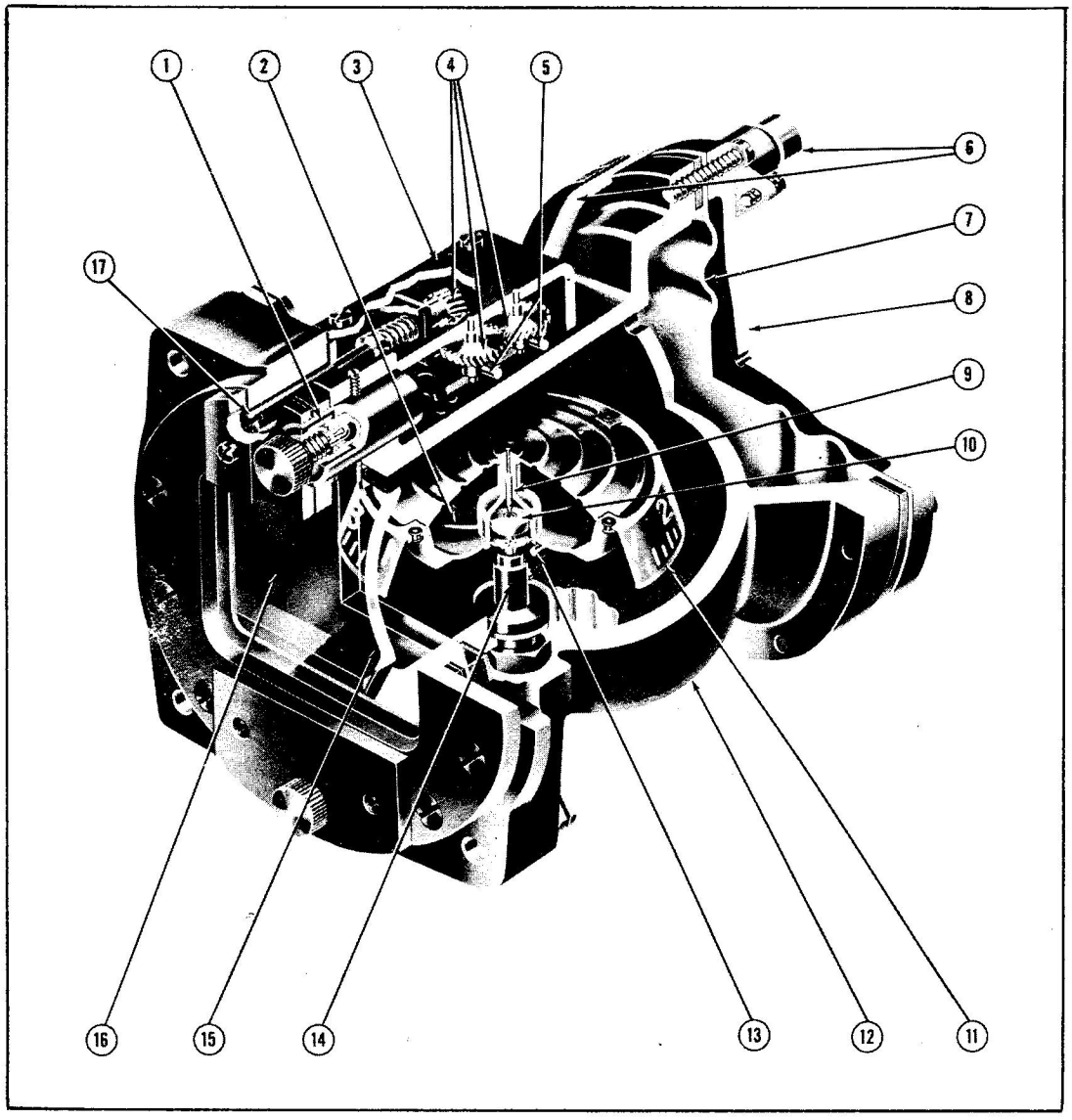
Card and Float Assembly

16 This assembly is contained in a bowl filled with compass liquid and consists of a float assembly with attached magnets, a pivot and a card with 1-degree graduations.

17 The card assembly pivots on the jewel post assembly.

Lamp Assembly

18 A lamp assembly provides illumination for the card.




1 Lamp Assembly
2 Float Assembly
3 Compensator Assembly
4 Compensator Gears
5 Compensator Magnets
6 Tube and Plug Assembly or Lighting System Bracket Assembly
7 Diaphragm
8 Back Cover
9 Pivot
10 Jewel Post Assembly
11 Card
12 Bowl and Stop Nut Assembly
13 Card Magnet
14 Jewel Post Support
15 Lubber Line
16 Painted Compass Lens
17 Compensator Knob

Figure 2-2 Three-Quarter Cutaway View - Type B-16 (Pioneer Types 1818-1-A, 1818-4-A, and 1821-2-A)

Tube and Plug Assembly

19 A 3-volt lamp at the top of the compass is connected to the aircraft's electrical system by means of a socket at the rear of the compass.

Expansion Chamber Assembly

20 A diaphragm and base form an expansion chamber at the bottom of the compass.

Type B-16 (Pioneer Types 1818-1-A, 1818-4-A and 1821-2-A), See Figure 2-2

21 These compasses are comprised of the following principal subassemblies and parts: compensator assembly, card assembly, and tube and plug assembly (or lighting system and bracket assembly).

Compensator Assembly

22 The compass contains a built-in permanent magnet compensator.

23 It consists of two sets of permanent magnets arranged in two planes at right angles to each other, and assembled above the center of the compass magnets.

24 The positions of the magnets are changed by gears which are controlled by two compensator knobs on the compensator bracket. The knobs are marked "NS" and "EW".

Card Assembly

25 The compass bowl is filled with compass liquid and contains the card assembly.

26 The card assembly is made up of a card and magnets which are attached to a float and pivot assembly. The pivot rests in a cup jewel.

27 The card has 5-degree graduations read in reference to a lubber line mounted behind the flat glass compass lens.

Tube and Plug Assembly (Pioneer Types 1818) or Lighting System and Bracket Assembly (Pioneer Type 1821)

28 A 3-volt lamp at the top of the compass is connected to the aircraft's electrical system by means of a socket at the rear of the compass. Pioneer type 1818-1-A has a one-wire circuit; while Pioneer types 1818-4-A and 1821-2-A have a two-wire circuit.

## NAVIGATOR'S TYPE COMPASS

Type D-12 (Pioneer Type 1832-1-A and 1832-3-A), See Figure 2-3

29 These compasses consist of the following principal subassemblies and parts: compensator assembly, bezel ring assembly, card, float and pivot assembly, sylphon assembly, and support plate assembly.

Compensator Assembly

30 The universal compensator is mounted at the bottom of the bowl. It consists of two sets of permanent magnets arranged in two planes at right angles to each other.

31 The position of the magnets are changed by gears which are controlled by two compensator knobs on the compensator bracket. The knobs are clearly marked "NS" and "EW".

Bezel Ring Assembly

32 This assembly consists mainly of a dial assembly, retainer ring, and top glass. Two clamp screws make setting of the bezel ring possible. The rotatable bezel ring assembly with two parallel grid lines, is graduated in 1-degree increments.

Card, Float and Pivot Assembly

33 This assembly consists of the float and sleeve assembly, the pivot, and the card assembly.

34 To the float and sleeve assembly are attached two magnets. The card assembly has four radial arms which indicate the cardinal points of the compass.

35 The assembly is mounted on the jewel post assembly in the compass bowl.

Sylphon Assembly

36 A bellows provides for the expansion and contraction of compass liquid in the bowl.

Support Plate Assembly

37 The jewel post assembly rests on the support plate assembly in order to hold the card.

Type D-12 (Pioneer Types 1801-1-A, and 1833-1-A), See Figure 2-4

38 Pioneer types 1801-1-A and 1833-1-A are identical except that Pioneer type 1801-1-A has a shield over the compass bowl. These compasses consist of the following subassemblies and parts: compensator assembly, bezel ring assembly, card, float and pivot assembly, sylphon assembly, and support plate assembly.

Compensator Assembly

39 A loose magnet, drawer-type compensator is mounted at the bottom of the compass bowl. Bar magnets are inserted into slots in the compensator so that the east-west line runs fore and aft.

Bezel Ring Assembly

40 This assembly consists mainly of a dial assembly, retainer ring, and top glass.

41 Two clamp screws make setting of the bezel ring possible.

42 The rotatable bezel ring assembly with two parallel grid lines is graduated in 1-degree increments.

Card, Float and Pivot Assembly

43 This assembly consists of the float and sleeve assembly, the pivot, and the card assembly.

44 To the float and sleeve assembly are attached two magnets. The card assembly has four radial arms which indicate the cardinal points of the compass.

45 The assembly is mounted on the jewel post assembly in the compass bowl.

Sylphon Assembly

46 A bellows provides for the expansion and contraction of compass fluid in the bowl.

Support Plate Assembly

47 The jewel post assembly rests on the support plate assembly and holds the card assembly.

Pioneer Type 1826-1-A, See Figure 2-5

48 These compasses consist of the following subassemblies and parts: compensator assembly, bezel ring assembly, sylphon assembly, bowl and shield, and support plate assembly.

Compensator Assembly

49 The universal compensator is mounted at the bottom of the bowl. It consists of two sets of permanent magnets arranged in two planes at right angles to each other.

50 The position of the magnets are changed by gears which are controlled by two compensator knobs. The knobs are clearly marked "NS" and "EW".

Bezel Ring Assembly

51 This assembly consists of a dial assembly, retainer ring, and top glass. Two clamp screws make setting of the bezel ring possible.

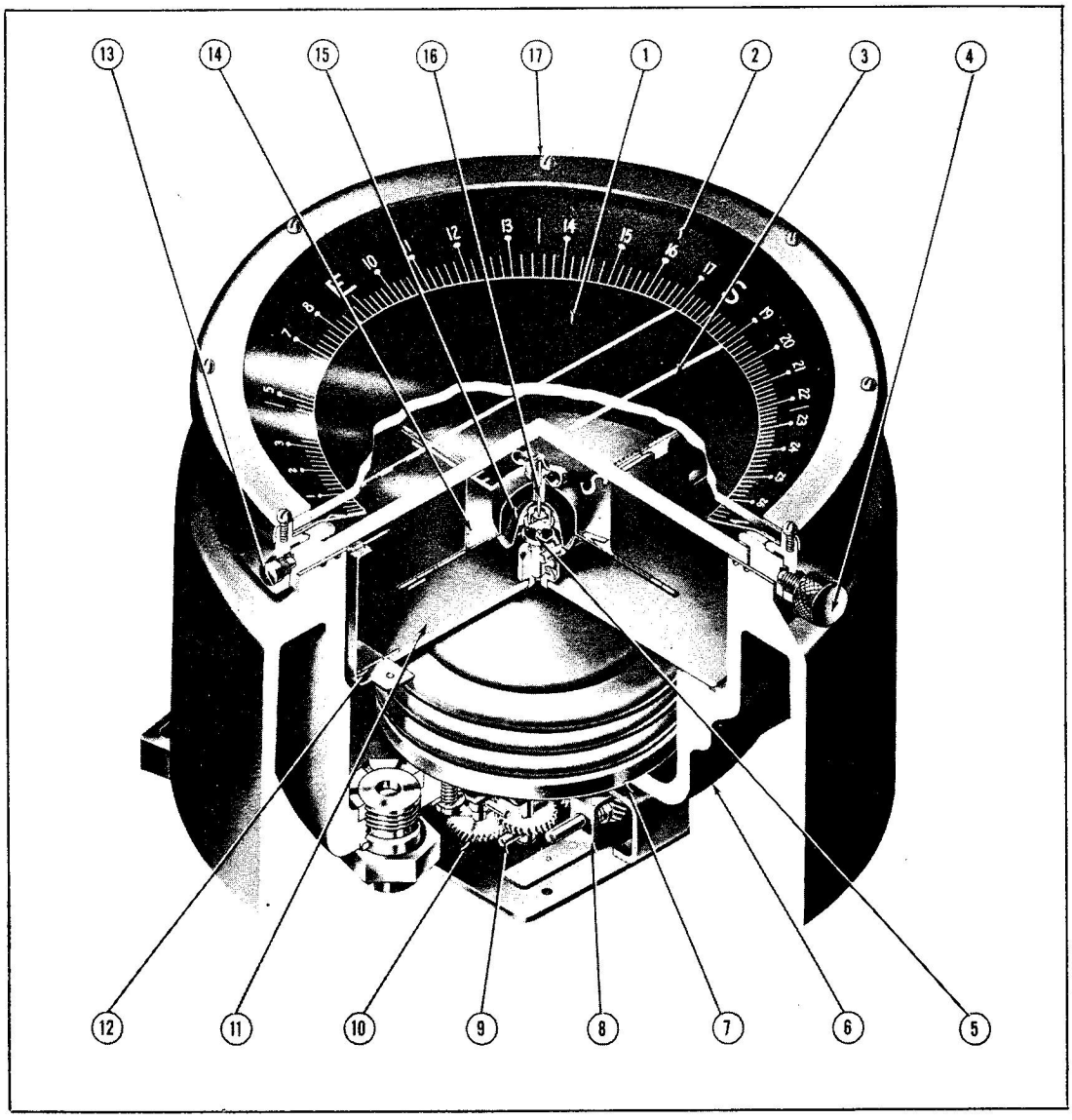
52 The rotatable bezel ring assembly, with two parallel grid lines is graduated in 1-degree increments.

Card, Float and Pivot Assembly

52 This assembly consists of the float and sleeve assembly, the pivot, and the card assembly.

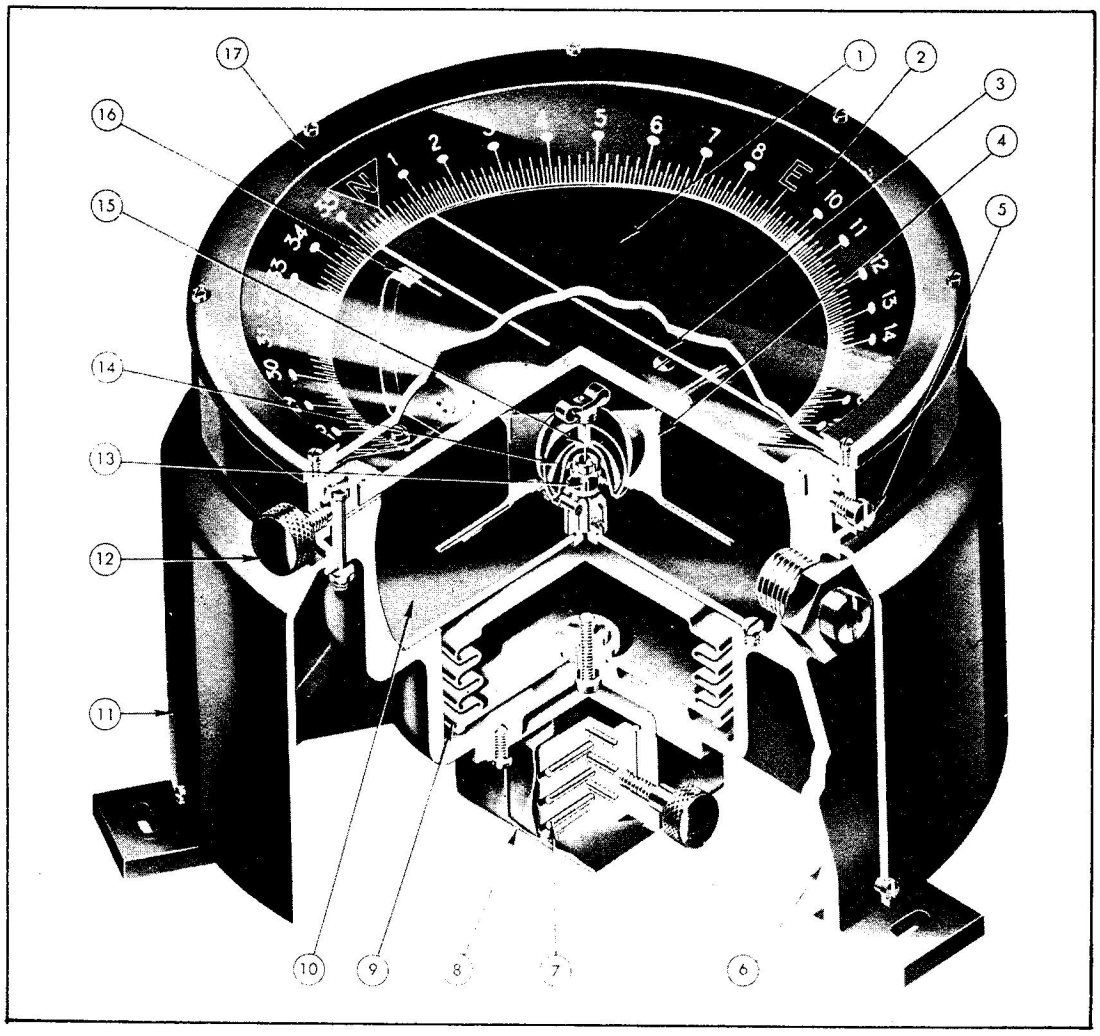
54 To the float and sleeve assembly are attached two magnets. The card assembly has four radial arms which indicate the cardinal points of the compass.

55 The assembly is mounted on the jewel post assembly in the compass bowl.




1 Top Glass
2 Dial Assembly
3 Grid Line
4 Clamp Screw
5 Jewel Post Assembly
6 Compass Bowl
7 Sylphon Assembly
8 Compensator Assembly
9 Compensator Magnet
10 Compensator Gear
11 Support Plate Assembly
12 Lubber Line Assembly
13 Locking Screw
14 Card
15 Float Assembly
16 Pivot
17 Bezel Ring Assembly

Figure 2-3 Three-Quarter Cutaway View - Type D-12 (Pioneer Types 1832-1-A, 1832-3-A)




1 Top Glass
2 Dial Assembly
3 Grid Line
4 Card
5 Locking Screw
6 Compass Bowl
7 Compensator Magnet
8 Compensator Assembly
9 Sylphon Assembly
10 Support Plate Assembly
11 Shield (Pioneer Type 1801-1-A only)
12 Clamp Screw
13 Jewel Post Assembly
14 Float Assembly
15 Pivot
16 Lubber Line Assembly
17 Bezel Ring Assembly

Figure 2-4 Three-Quarter Cutaway View - Type D-12 (Pioneer Types 1801-1-A and 1833-1-A)

Sylphon Assembly

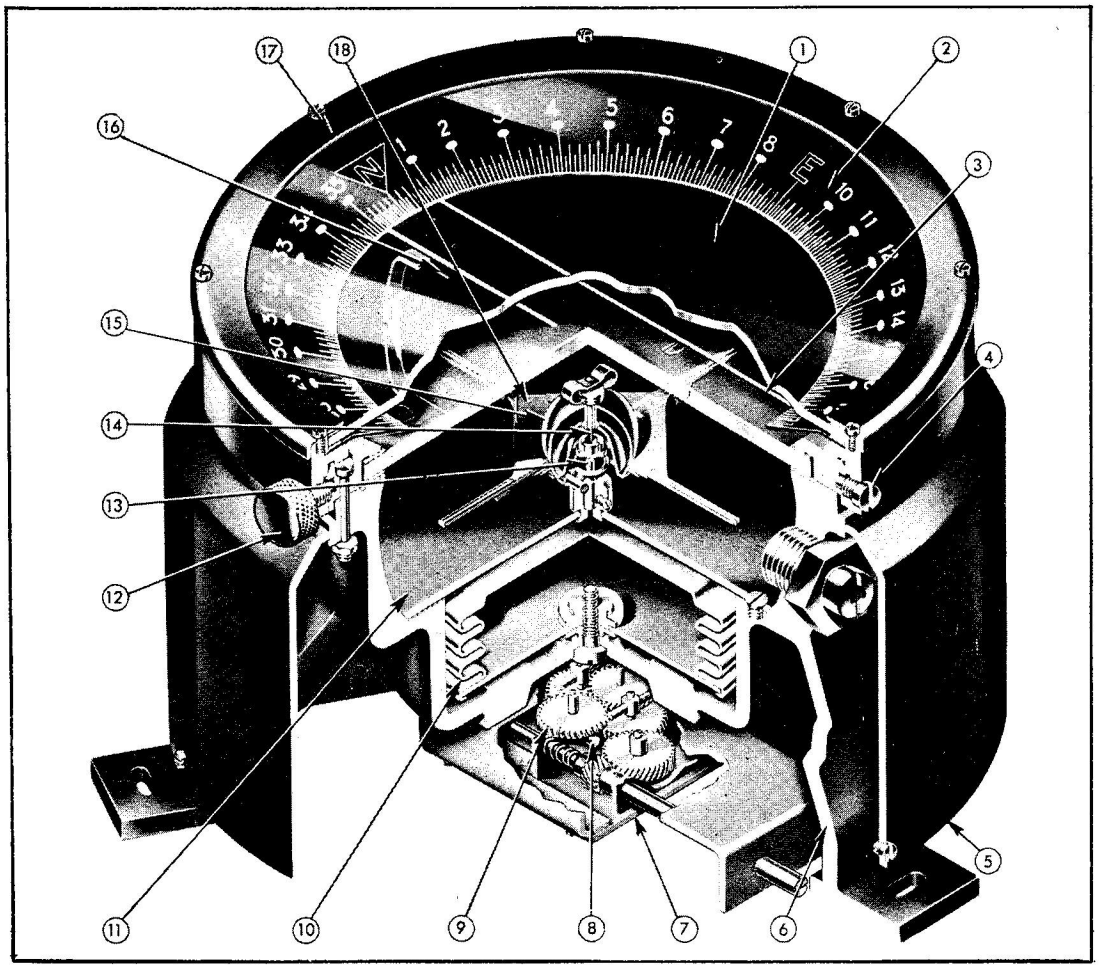
56 A bellows provides for the expansion and contraction of compass fluid in the bowl.

Bowl and Shield

57 The compass bowl is protected by a separate shield.

Support Plate Assembly

58 The jewel post assembly rests on the support plate assembly in order to hold the card.




1 Top Glass
2 Dial Assembly
3 Grid Line
4 Locking Screw
5 Shield
6 Compass Bowl
7 Compensator Assembly
8 Compensator Magnet
9 Compensator Gear
10 Sylphon Assembly
11 Support Plate Assembly
12 Clamp Screw
13 Jewel Post Assembly
14 Pivot
15 Float Assembly
16 Lubber Line Assembly
17 Bezel Ring Assembly
18 Card

Figure 2-5 Three-Quarter Cutaway View (Pioneer Type 1826-1-A)

PART 3

TABLE OF CONTENTS



# INSTALLATION AND COMPENSATION

## INSTALLATION

### General

1 Installation of compasses by Units must be made in the location provided in the aircraft unless relocation is necessary and is authorized by an appropriate RCAF Engineering Order. All initial installations of compasses is to be made with special attention given to the requirements of EO 20-25-1.

2 Special attention must be given to the prevention of disturbing magnetic fields in the vicinity of the compass. These may be either of a permanent nature resulting from the proximity of electrical equipment such as radio, armament, or structural members, or of a varying nature resulting from variations in current flow in electrical wiring. Retractable landing gears and kindred equipment are also responsible for certain magnetic disturbances. Before compensation, the maximum deviation of the compass, resulting from the effects of permanent magnetic fields, must not exceed 20 degrees spread. If the maximum deviation is exceeded, secure a more favourable location. A reasonable amount of permanent magnetism in the vicinity of the compass may be compensated for, but variable magnetic fields having an effect upon the instrument are not permissible, since they cannot be corrected. A satisfactory installation depends upon the elimination of these magnetic disturbances. The less compensation required, the better will be the performance of the compass.

3 Mounting screws of nonmagnetic material are provided. Mounting brackets must be made of brass, duralumin, or other nonmagnetic material.

TABLE 2

| Pioneer Type | Figure Reference |
|---|---|
| 1813-1-A | 3-1 |
| 1813-1-B | 3-1 |
| 1818-1-A | 3-2 |
| 1818-4-A | 3-2 |
| 1821-2-A | 3-3 |

TABLE 3

| Type | Pioneer Type | Electrical Receptacle | Lamp Voltage | Input Voltage |
|---|---|---|---|---|
| B-17 | 1813-1-A | 1 Wire | 3 | 3 |
| B-17 | 1813-1-B | 1 Wire | 3 | 3 |
| B-16 | 1818-1-A | 1 Wire | 3 | 3 |
| B-16 | 1818-4-A | 2 Wire | 3 | 3 |
| B-16 | 1821-2-A | 2 Wire | 3 | 24 |

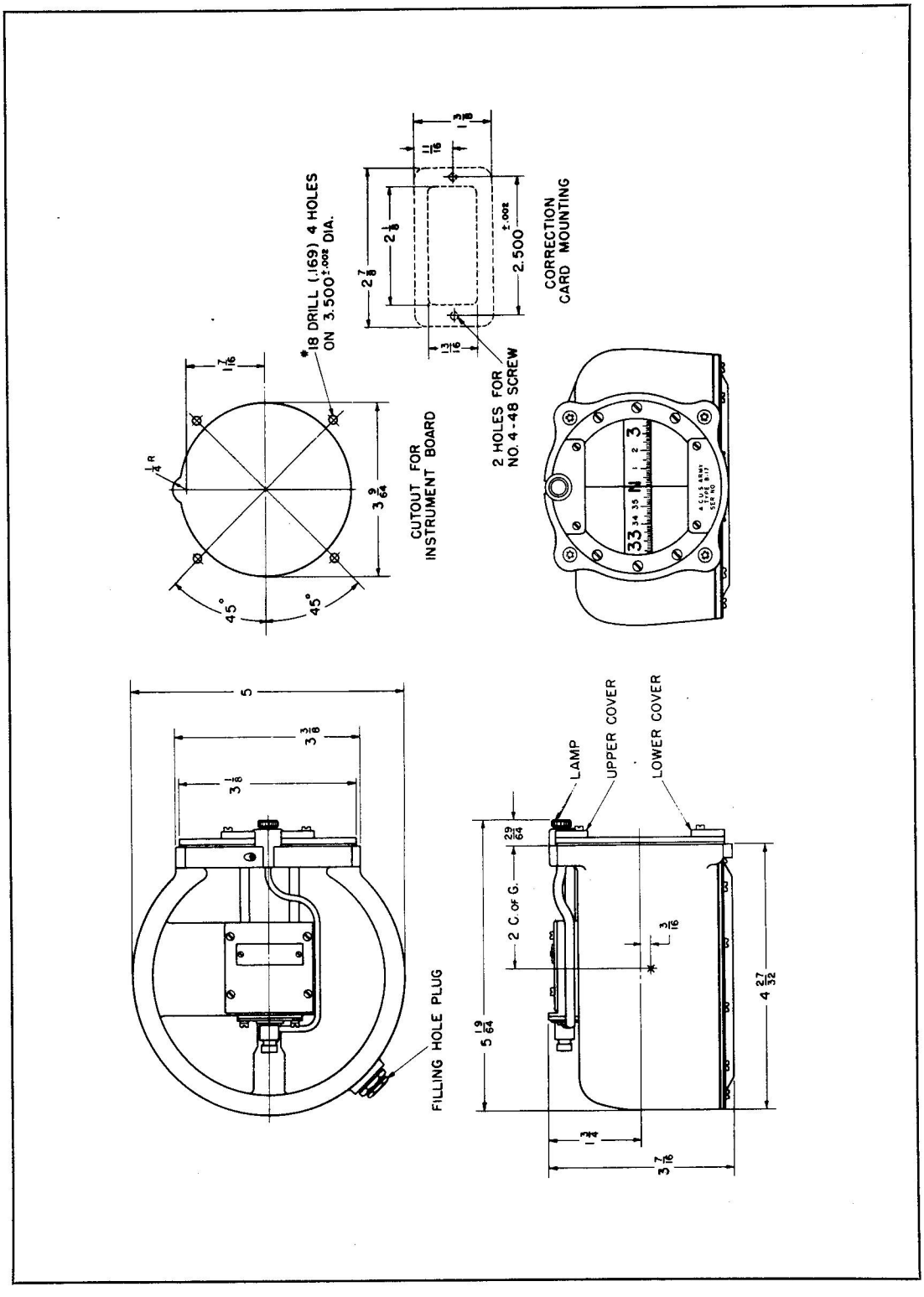



Figure 3-1 Dimensional Drawing - Type B-17 (Pioneer Types 1813-1-A and 1813-1-B)

## PILOT'S TYPE COMPASSES

### Dimensions

4 For outline dimensions for pilot's type compasses refer to Table 2 for the dimensional drawing applicable to each type.

### Mounting

5 Since the compass is a navigation instrument, locate it within the unobstructed view of the pilot. It is essential that the compass be mounted as far as possible from any magnetic disturbances. The compass must be installed so that a plane passing through the lubber line and the card pivot is parallel to the for-and-aft axis of the aircraft. In addition, the mounting surface of the compass must be vertical when the aircraft is in its normal, level flight attitude.

6 Cut a hole in the instrument panel as shown in Figure 3-2. Mount the instrument from the rear of the panel and secure it with the mounting screws provided. The panel on which the compass is installed must not have a movement of vibration, from one extreme to the other, in excess of 0.010 inch over a range of frequencies of 500 to 2,500 cycles per minute.

### Electrical

7 Connect the compass in accordance with Table 3. Note carefully the type of electrical receptacle and lamp and the input voltage of each. Check the lamp before applying power.

## NAVIGATOR'S TYPE COMPASSES

### Dimensions

8 For outline dimensions for navigator's type compasses refer to Table 4 for the dimensional drawing applicable to each type.

TABLE 4

| Type | Pioneer Type | Figure Reference |
|---|---|---|
| D-12 | 1801-1-A | 3-4 |
| | 1826-1-A | 3-5 |
| D-12 | 1832-1-A | 3-6 |
| | 1832-3-A | 3-6 |
| D-12 | 1833-1-A | 3-7 |

### Mounting

9 The compass must be so mounted that the plane of the base is horizontal when the aircraft is in normal level flight position. The word "AFT" stamped on the compass must face aft.

10 A nonmagnetic platform or shelf must be provided and located in a place where the maximum amplitude of vibration to which it will be subjected will never exceed 0.010 inch over a range of frequencies of 500 to 2,500 cycles per minute. The use of a suitable vibration absorption mount is recommended (symetrical, 3-point suspension by single, 2-pound Lord shock mounts). The brackets, screws and shock mounts required for mounting the compass must be of nonmagnetic material.

## COMPENSATION

11 Compensation and swinging is to be accomplished in accordance with the instructions contained in EO 20-25-1.

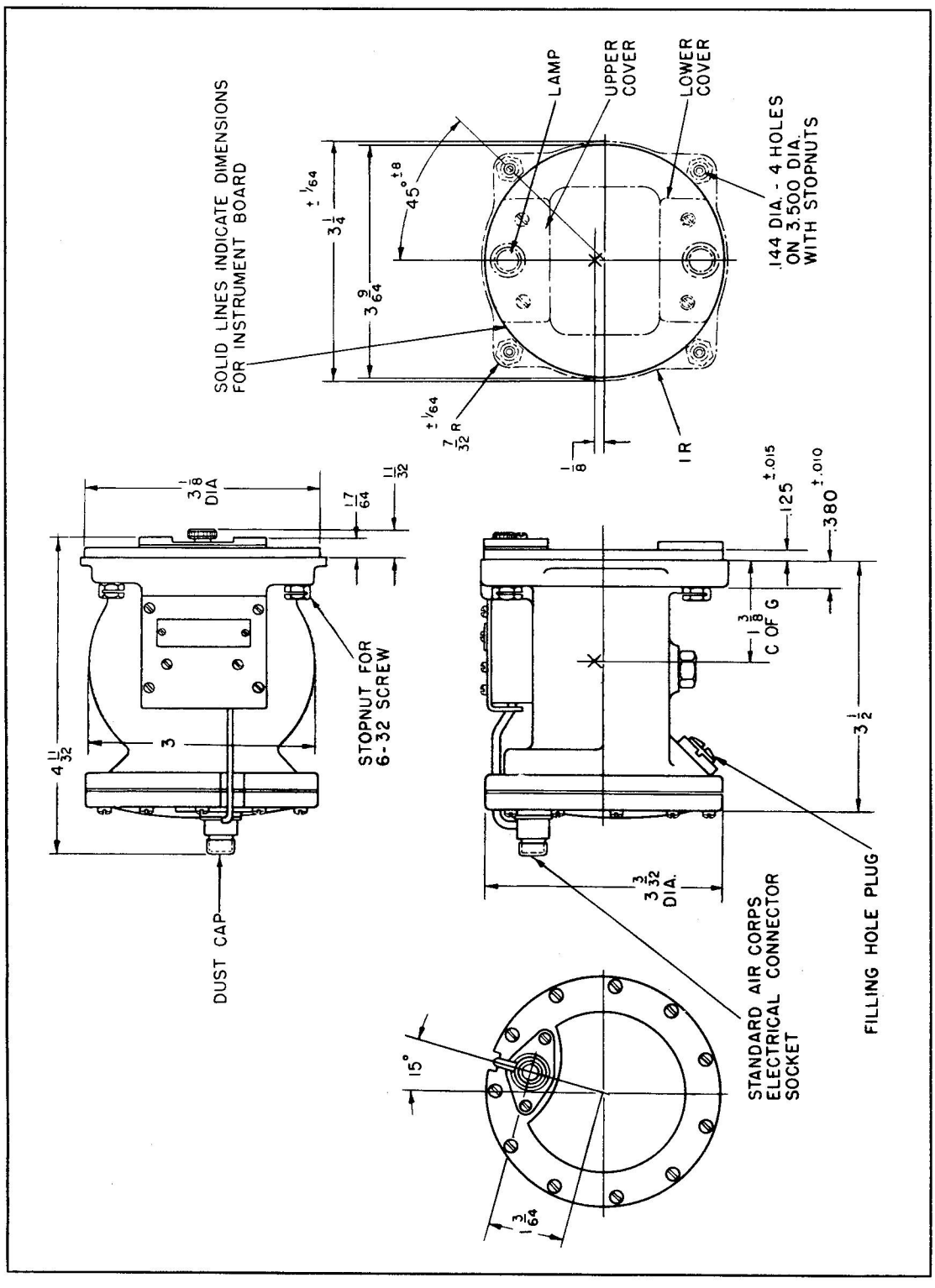



Figure 3-2 Dimensional Drawing - Type B-16 (Pioneer Types 1818-1-A and 1818-4-A)

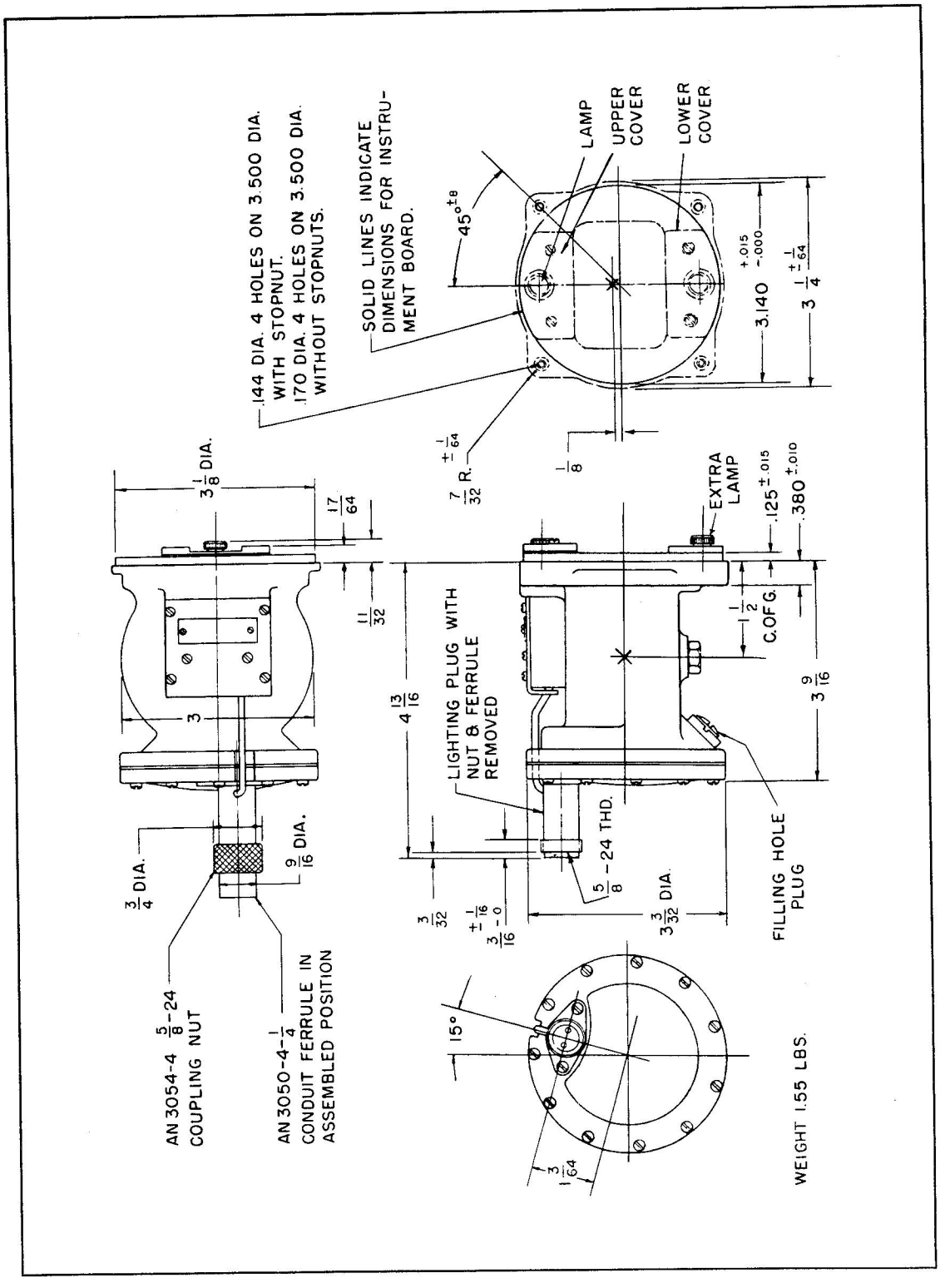



Figure 3-3 Dimensional Drawing Type B-16 (Pioneer Type 1821-2-A)

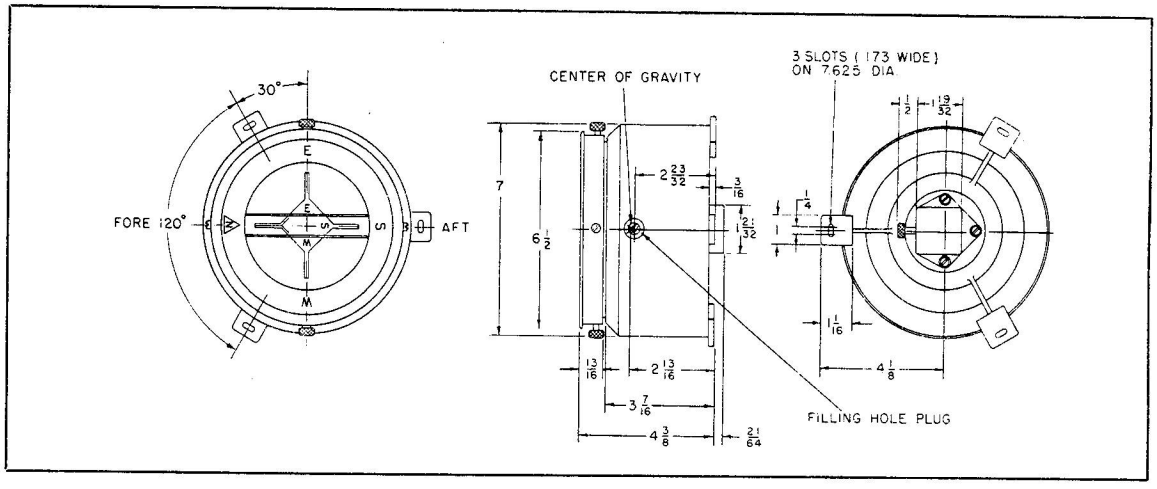



Figure 3-4 Dimensional Drawing Type D-12 (Pioneer Type 1801-1-A)

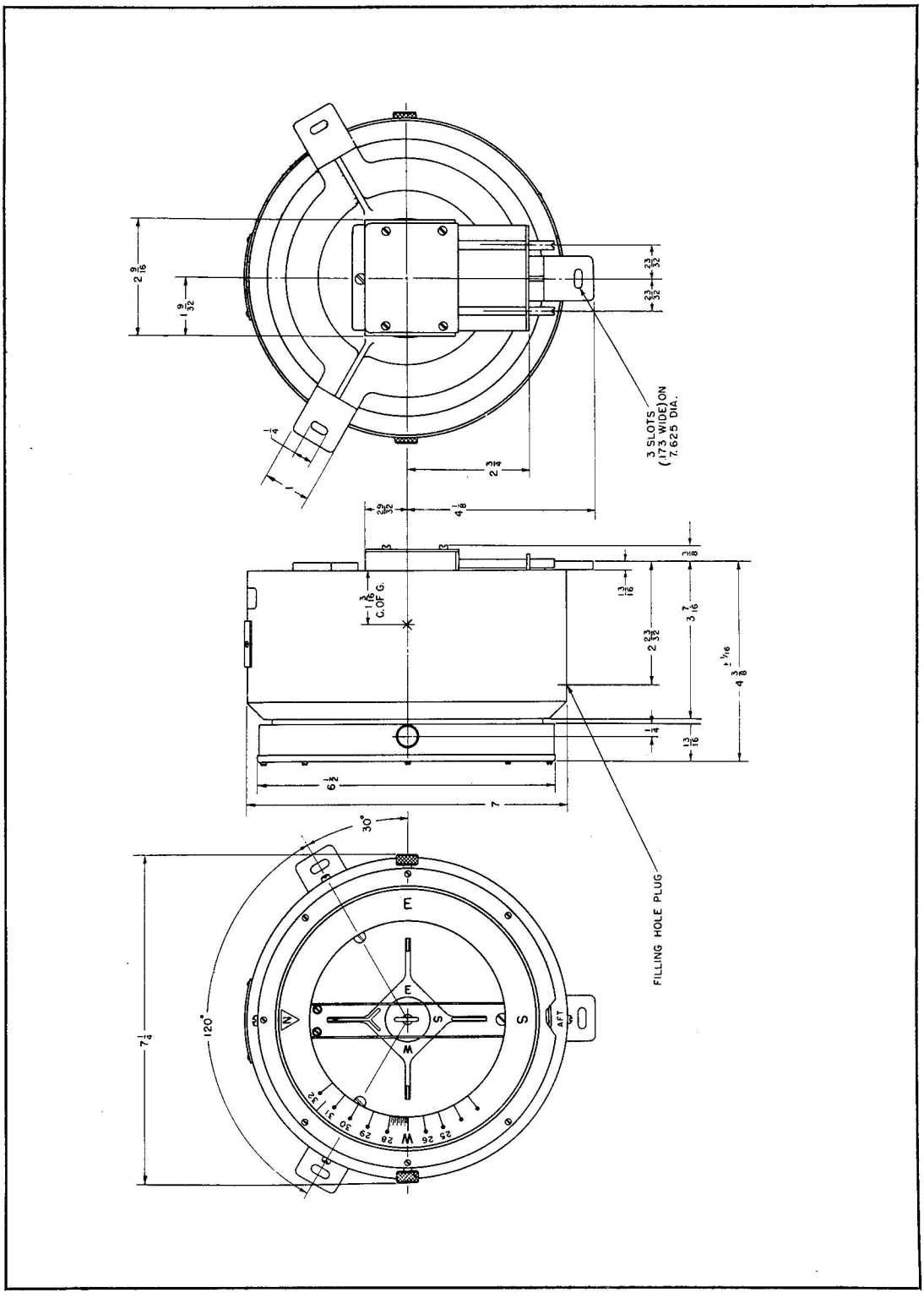



Figure 3-5 Dimensional Drawing - (Pioneer Type 1826-1-A)

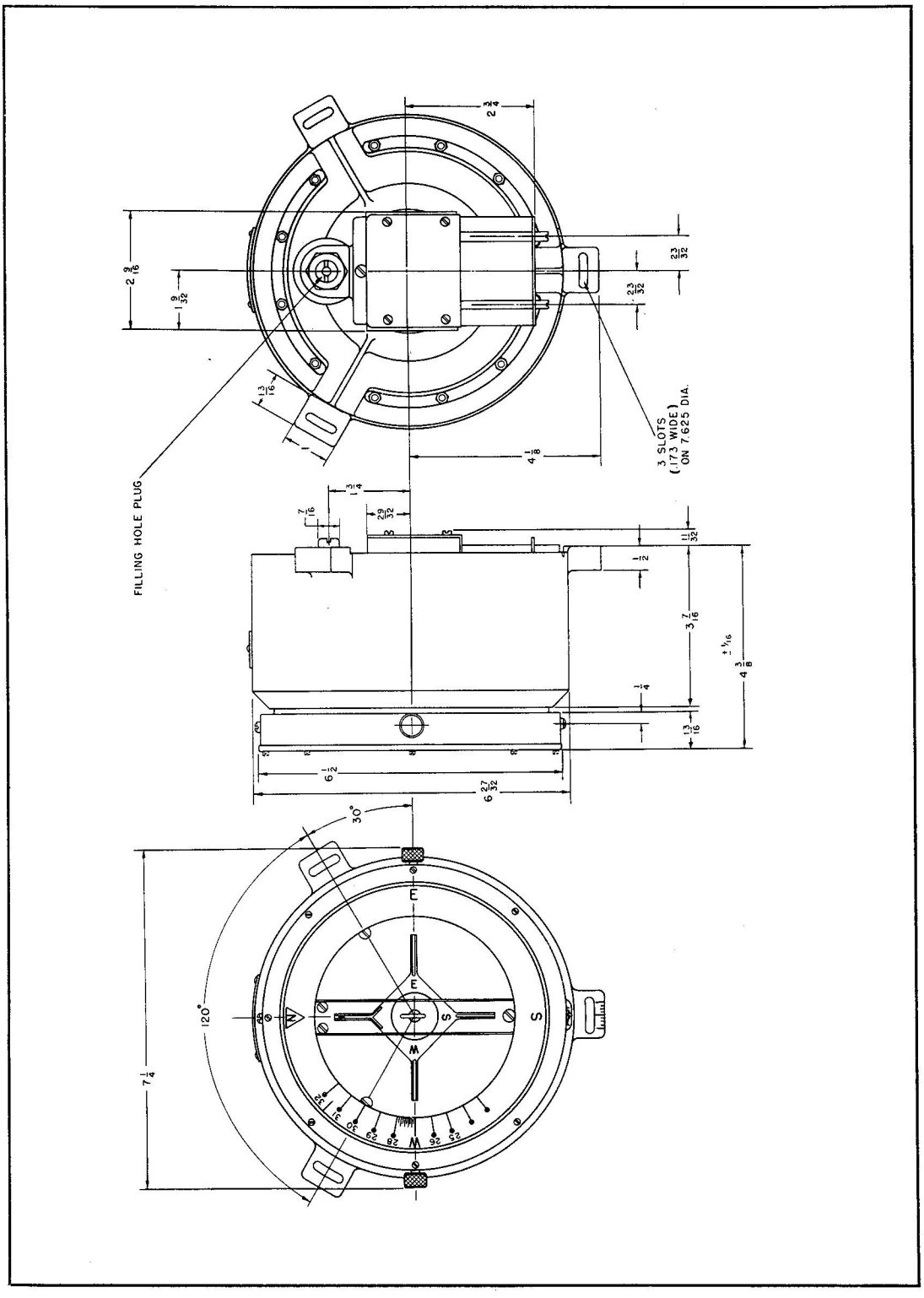



Figure 3-6 Dimensional Drawing - Type D-12 (Pioneer Types 1832-1-A, 1832-3-A)

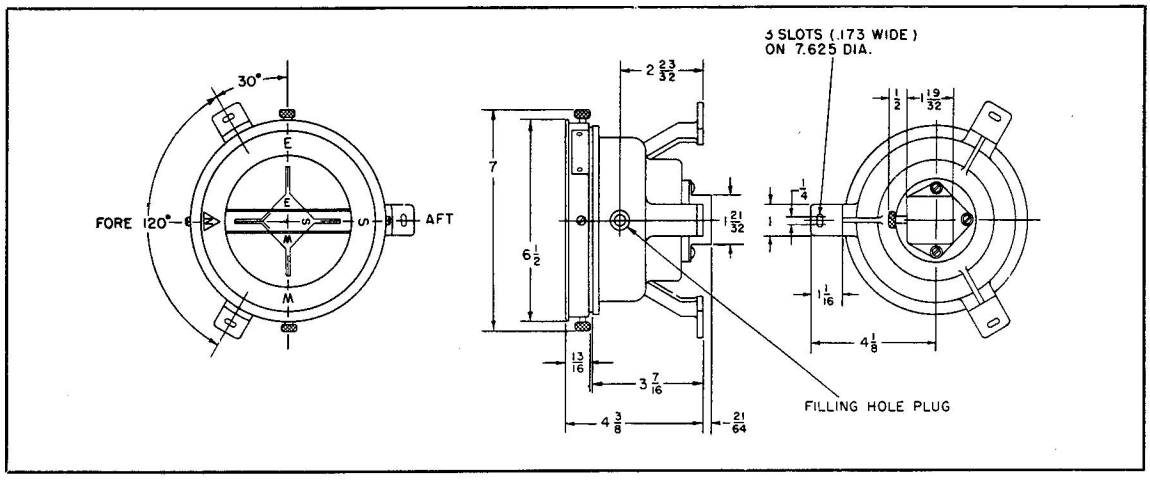



Figure 3-7 Dimensional Drawing Type D-12 (Pioneer Type 1833-1-A)

PART 4

TABLE OF CONTENTS



# OPERATION

## PRINCIPLES OF OPERATION

General

1 The operation of the magnetic compass depends on the fact that the north-seeking magnets align themselves with the meridian of the earth's magnetic field, and continuously point to magnetic north.

Pilot's Type See Figures 2-1 and 2-2

2 Since the magnets are rigidly attached to the card and float assembly, and tend to remain parallel to the earth's magnetic field when the aircraft turns, the heading may be read from the compass card with the lubber line as a reference. The lubber line represents the longitudinal axis of the aircraft when the compass was installed.

Navigator's Type See Figures 2-3, 2-4 and 2-5

3 The north-south line in the card assembly to which the magnets are attached tends to remain parallel to the earth's magnetic field when the aircraft turns. The bezel ring may be rotated to bring the grid lines into alignment with the card pointer.. After this alignment has been made, the heading of the aircraft may be then read directly on the graduated scale of the bezel ring with reference to the lubber line.

## OPERATION INSTRUCTIONS

General

4 Before taking off, the compass must be compensated for compass error, and the correction card filled out as specified in EO 20-25-1.

5 Compass readings should be taken only during steady flight since errors may be introduced by turning and acceleration. Readings must not be taken when the tilt is greater than 20 degrees because the card assembly is not free to rotate on its pivot.

Pilot's Type Compass

6 No operational adjustments need be made on this compass.

Navigator's Type Compass

7 Loosen the clamp screws and rotate the bezel ring so that the grid lines are parallel to the north-south line of the card assembly with the N line toward the N mark on the ring. The scale mark for the required compass course should coincide with the lubber line.

8 Clamp the ring in place with the clamp screws. After this alignment is made, the heading may be read directly on the graduated scale of the bezel ring with reference to the lubber line.

PART 5

TABLE OF CONTENTS



# SERVICE INSPECTION, MAINTENANCE AND LUBRICATION

## SERVICE TOOLS REQUIRED

1 There are no special tools required to perform the operations described in this part.

## SERVICE INSPECTION

### Preflight Inspection

2 Check the compass for broken or loose cover glasses, or other visible defects.

3 Clean the compass cover glass with a clean, dry cloth. Special care must be exercised where individually lighted instruments are used, as scratches or fingerprints on the cover glass disturb the visibility. Replace defective lamps. (Refer to Part 3).

4 Inspect the compass visually for discolouration of liquid or for evidence of bubbles. Deflect the card by means of a small magnet or piece of steel to check compass card rotation. The card should rotate freely.

### Aircraft Minor Inspection

5 At each minor inspection of the aircraft, examine the compass for security of mounting, bubbles, leakage or discolouration of the liquid, defective lighting, broken glass, unbalanced card, or any defect which impairs the visibility or renders the compass inoperative. Ensure that compass correction cards are installed and are legible and secure. It must also be ensured that a compass swing has been carried out within the intervals specified in EO 20-25-1.

## MAINTENANCE

### General

6 Normal service squadron or line maintenance shall be confined only to the following:

(a) Replace defective lamps.

(b) Tighten loose screws and nuts.

(c) Compensate the compass.

(d) Replace the compass, if defective.

(e) Do not open the compass bowl other than to add compass fluid.

### Addition of Compass Fluid

7 Incomplete filling of the compass bowl results in bubbles and undue motion of the fluid, causing erratic action of the card. Refer to EO 20-25-2A for refilling procedures when a compass is found to have developed bubbles in the liquid.

NOTE

Pioneer type compasses 1822-1-A, 1822-1-B and 1822-1-C are allowed a bubble formation. If a bubble appears in the card chamber when the compass is tilted 19 degrees forward or 22 degrees backward from the horizontal, it must be removed so that the bubble is just removed at the angles specified.

LUBRICATION

8 Magnetic compasses do not require any lubrication.

TABLE 5

| SERVICE TROUBLES AND REMEDIES | | |
|---|---|---|
| Trouble | Probable Cause | Remedy |
| EXCESSIVE CARD ERROR | Compass not properly compensated | Compensate instrument. |
| | External magnetic interference | Locate magnetic interference and eliminate if possible. |
| EXCESSIVE CARD OSCILLATION | Insufficient liquid | Add fluid as specified in paragraph 7. |
| | Excessive vibration of instrument mounting panel | Correct vibration. |
| | Friction between jewel post and jewel post support bearing | Replace compass. |
| CARD ELEMENT NOT LEVEL | Leaking float chamber | Replace compass. |
| | Card magnets detached from card | Replace compass. |
| CARD SLUGGISH | Weak card magnets | Replace compass. |
| | Excessive pivot friction or broken jewel | Replace compass. |
| | Instrument heavily compensated | Recompensate and relocate if there is too much magnetic interference. |
| LEAKAGE OF LIQUID | Loose screws | Tighten screws. |
| | Broken glass or case | Replace compass. |
| | Defective gaskets | Replace compass. |
| DISCOLOURED LIQUID OR CARD MARKINGS | Age | Replace compass. |
| DEFECTIVE LIGHTING SYSTEM ON PILOT'S TYPE COMPASS | Burnt out lamp | Replace lamp. |
| | Open or short circuit | Check wiring. |

## PACKING, STORAGE, AND SHIPMENT

9 Pack magnetic compasses for storage and shipment in accordance with existing packing instructions.

**CAUTION**

Keep compasses and compensating magnets at least 3 feet away from wires not enclosed in conduit. Do not store compasses in locations where excessive temperatures may exist. Excessive heating will cause expansion of the liquid with resultant leakage.

PART 6

TABLE OF CONTENTS



## DISASSEMBLY, INSPECTION, REPAIR AND RE-ASSEMBLY

### COMPASS, TYPE B-17 (PIONEER TYPES 1813-1-A AND 1813-1-B)

Overhaul Tools Required

1 No special tools or test equipment are required to overhaul the type B-17 compass.

Disassembly (See Figure 6-1)

2 Disassemble as follows:

(a) With fingers, unscrew the lamp assembly (5) from the instrument.

(b) Loosen the two screws which hold the top cover assembly (10) in place, and lift off the top cover assembly.

(c) Remove the four compensator screws (4) and lift out the compensator assembly (1) by twisting it slightly, and simultaneously lifting it up and back.

NOTE

The compensator system consists of a delicately adjusted series of gears and further disassembly should not be attempted. Should damage result to any of the parts, the whole assembly should be replaced.

(d) Loosen the two screws and remove the bottom cover assembly (11).

(e) Loosen the setscrew (26). It is not necessary to remove the setscrew to release the tube and plug assembly (6).

(f) Remove the two plug mounting screws (21) and two plug mounting lock washers (22) at the rear of the compass and take off the tube and plug assembly.

(g) Place the instrument face down on the bench. Use a hex head wrench to remove the filling hole cap (19), and drain out the compass fluid into a clean container.

CAUTION

Extreme care must be taken not to damage the float which topples over after the liquid is drained off.

(h) Remove the gasket (23) filling hole insert (8), and lead seal (9), if necessary.

(j) Turn the instrument face up and take out the 10 bezel screws (15) which hold the bezel (14) to the compass bowl (7). BACK OUT EACH SCREW ABOUT AN EIGHTH OF A TURN AT A TIME TO ELIMINATE THE POSSIBILITY OF THE LENS CRACKING THROUGH UNEVEN PRESSURE.

(k) Lift off the bezel (14), the shim (20), and the lens gasket (16).

(l) On Pioneer type 1813-1-A, gently remove the compass lens (24) by prying it off with a screwdriver which should be inserted between the bowl gasket (17) and the bowl to avoid damaging the lens.

(m) On pioneer type 1813-1-B, remove the spacer (18) and the glass (25).

(n) Take off the bowl gasket (17).

(p) Carefully pry the lubber line (13) loose with a screwdriver, and remove it.

(q) Turn the instrument bottom up, and take out the 12 base screws (14) Figure 6-2, and remove the base cover (13), the expansion chamber assembly (12), and the base gasket (11).

CAUTION

Care must be taken in removing the expansion chamber assembly from the compass bowl as the attaching jewel post support and card and float assembly may become damaged.

(r) Remove the jewel post screw (10) Figure 6-2 from the side of the jewel post support (9) and pry loose the retainer ring (6).

(s) The card and float assembly (1) Figure 6-2 may now be lifted free from the jewel post assembly (7) and the jewel post spring (8) taken out of the jewel post support (9).

(t) If necessary to disassemble the card and float assembly (1) Figure 6-2 first a light pencil marking should be made on the float denoting the position of the "N" marking on the card so that the compass card may be replaced in the same position with respect to the magnets as the old was. The compass card (2) then may be removed by carefully taking out the tubular rivets (3) which secure it to the float assembly (4). The pivot (5) is press-fitted into the float and may be removed by inserting a 0.030-inch diameter punch through the hole in the top of the float and gently tapping it until the pivot is free.

NOTE

The assembly may sometimes be supported sufficiently for this operation by holding it in one hand. If the pivot cannot be removed readily in this manner it will be necessary to support the float by means of the float center on a suitable hollow punch and tap the pivot until it falls free.

(u) With a wrench remove the jewel post support (9) Figure 6-2 from the expansion chamber assembly (12).

(v) If it is necessary to replace any of the four stop nuts (12), Figure 6-1 which are press fitted into the compass bowl, they may be removed.

(w) The specification plate screws (3) may be replaced in case of loss or damage. The same applies to the bracket screws (2) included in the compensator assembly (1). The compensator assembly should not be disassembled and care should be taken that the specification plate does not become loose, lost or transferred.

## CLEANING, INSPECTION, TESTING AND REPAIR

### Cleaning

3 After the compass has been disassembled, clean all the parts thoroughly by washing them in benzene. After drying, a light blast of air may be used to blow loose dust off the parts. Particular attention must be paid to the compass bowl. Exercise care to remove all traces of dust particles and metallic chips. After washing the lens with soap and water, dry it with a soft cloth and avoid handling.

4 Clean the jewel post assembly with benzene. Dry the jewel post with a blast of air. Then wipe with a dry cotton swab.

### Inspection and Repair

5 Jewel - Detect any cracks or flaws in the smooth surface of the jewel by using the sharp point of a needle. Move the needle point around in the cup jewel. Always replace a cracked or damaged jewel with a new jewel post assembly.

6 Pivot - Examine the pivot for excessive wear or damage. Do not mistake a slight uniform roundness of the point for dullness. This condition is necessary to prevent the breaking of the sharp needle point. (0.0035 inch radius) on the pivot. Also this slight roundness of the pivot point tends to prevent heeling or tipping of the card which may result from an extremely sharp pointed pivot.

7 Card - Inspect the card very carefully to see that it is not warped or bent out of shape. To check the card, lay it on a level piece of wood or metal and look for light coming through the "high spots". If any spot on the lower edge of the card is high, squeeze it gently toward the center. Damaged float assemblies should be replaced with new ones. The card magnets are in their proper position if each axis is parallel to each other and also parallel to a line through the north-south points on the card within an accuracy of 1 degree. Test the card float for leaks and liquid present. If the float is defective, replace the float assembly.

### Card Magnets

8 Both age and vibration slightly decrease the magnetic strength of the card. This decrease in strength increases the period of the card. When it becomes necessary to remagnetize the card magnets, place the card and float assembly in a compass magnetizing stand. It is most important that the south poles of the card magnets are aligned with the south poles of the magnetizing stand; and likewise, the north poles of the card magnets are on the north pole of the magnetizing stand.

9 Balance the card after remagnetizing the card magnets. Mount the card assembly on a jewel post in a glass container filled with compass liquid. Thus the same condition of balance occurs as in the completed compass including any possible angle of dip. Apply a small amount of solder to the bottom float section to counteract any dipping of the card. If the proper amount of solder has been added, the card will become exactly horizontal.

**CAUTION**

Avoid excessive heating in adding the solder to the float.

10 After balancing the card and float assembly, clean it thoroughly to remove all traces of the soldering flux. Paint the magnet with dull black paint. The strength of the card magnets may be determined after magnetizing by measuring the time of the card swing from 30 degrees to 5 degrees.

**NOTE**

The time in seconds must be within the tolerance specified in Part 7, para. 10.

### Gaskets

11 Replace all sealing gaskets to prevent leakage from the case. They must be thoroughly impregnated before assembly. This eliminates the natural porosity of the cork and makes them impervious to compass fluid. Impregnation instructions follow:

(a) Place gaskets in a shallow dish and cover them with cellulose nitrate lacquer, Specification AN-L-29, diluted with approximately 25 percent cellulose nitrate thinner, Specification AN-TT-T-256.

(b) Agitate the mixture GENTLY to eliminate bubbles, being careful not to injure the gaskets. Place a metal frame over gaskets to keep them from floating.

(c) Place the dish in a vacuum chamber. Evacuate the chamber to an absolute pressure of NOT OVER 10 inches of mercury. If an altimeter is used as an absolute pressure gauge, it must indicate 30,000 feet or over. Maintain the vacuum until bubbles no longer emerge from the gaskets.

(d) Shut off the vacuum and vent the chamber to the atmosphere.

(e) Leave gaskets in the liquid at least 10 minutes longer.

(f) Remove the gaskets from the liquid, hang them separately on a rack, and allow them to dry at room temperature for at least 1 hour. GASKETS MUST BE USED WITHIN 24 HOURS AFTER IMPREGNATION.

Re-Assembly

12 Re-assemble as follows:

(a) If it has been necessary to replace a stop nut (12) Figure 6-1, with a new one, replace the new stop nut by pressing it into the compass bowl (7).

(b) With a wrench, screw the jewel post support (9) Figure 6-2, into the expansion chamber assembly (12).

(c) Place the jewel post spring (8) Figure 6-2, in the jewel post assembly (7) into the jewel post support (9). Lock in position with the jewel post screw (10).

(d) To assemble the card and float assembly (1) Figure 6-2, insert the pivot (5) into the float assembly (4). The distance from the point of the pivot to the bottom of the float should be 0.095 inch to 0.0105 inch. Place the card (2) on the float assembly so that the "N" of the card has the same relative position to the light pencil marking made on the float assembly as at the disassembly and insert and secure the tubular rivets (3).

(e) Slip the retainer ring (6) Figure 6-2, on the jewel post assembly (7) and position in place on the card and float assembly (1) by inserting long nosed pincers into the two holes of the retainer ring (6) and squeezing until the ring slides in position.

(f) Place the base gasket (11) Figure 6-2, in position.

(g) Carefully place the card and float assembly (1) Figure 6-2, with the expansion chamber assembly (12) and attaching jewel post support (9) into the bottom of the compass bowl. Fit the base cover (13) on, and secure with the 12 base screws (14).

**CAUTION**

Extreme care must be taken in placing the card and float assembly in the bowl to prevent bending the card or damaging the float.

(h) Carefully fit the lubber line (13) Figure 6-1, in place.

(j) Replace the bowl gasket (17) Figure 6-1.

(k) For Pioneer type 1813-1-B, replace the spacer (18) Figure 6-1, and the glass (25).

(l) Replace the lens gasket (16) Figure 6-1, and the shim (20), and fasten the bezel (14) in place with the 10 bezel screws (15). Insert lamp assembly (5) in hole before tightening bezel, to ensure alignment. Tighten the screws uniformly to avoid cracking the lens.

(m) For Pioneer type 1813-1-A, fit on the compass lens (24) Figure 6-1.

(n) If the filling hole insert (8) Figure 6-1, was removed during disassembly, replace the

lead seal (9) and screw the filling hole insert into the compass bowl (7). Tighten the filling hole insert with a torque-meter wrench, applying 50 inch-pounds torque.

(p) The compass must be filled under a vacuum. Fill the bowl with aircraft compass liquid, Specification 3-GP-31. Submerge the bowl on its side, with the filling hole on top, in a tank of compass fluid.

(q) Place the tank in a vacuum chamber and evacuate the chamber to 10 inches of mercury, at a pressure approximately equivalent to that at 30,000 feet. Keep the tank in the chamber until all bubbling has ceased.

(r) Remove the tank from the chamber, place a finger over the filling hole, and remove the bowl from the fluid. Turn the bowl upside down, and, if it is not filled to capacity, add more liquid with a medicine dropper.

(s) Replace the gasket (23) Figure 6-1, and filling hole cap (19). Thoroughly dry all surfaces before proceeding with the re-assembly.

(t) Attach the tube and plug assembly (6) Figure 6-1, at the back of the compass with the two plug mounting screws (21) and two plug mounting lockwashers (22) and secure it at the front of the compass with the setscrew (26).

(u) Fit the compensator assembly (1) Figure 6-1 in place, securing it with the four compensator screws (4).

(v) Replace the top cover assembly (10) Figure 6-1 and tighten the two screws.

(w) Fit on the bottom cover assembly (11) Figure 6-1 and tighten the two screws.

(x) The compass is now ready for final inspection and test.

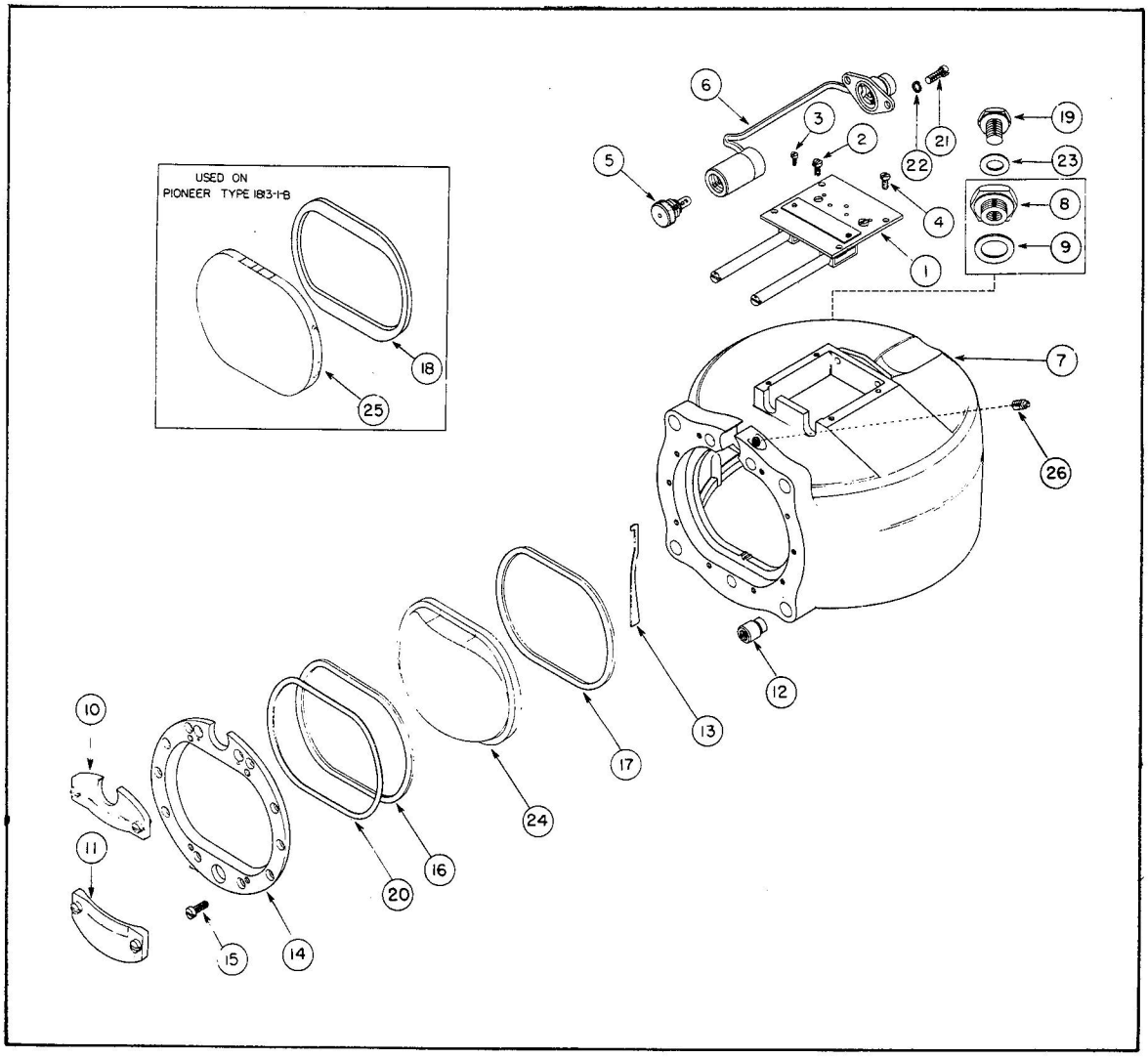
## COMPASS, TYPE B-16 (PIONEER TYPES 1818-1-A, 1818-4-A, AND 1821-2-A)

### Overhaul Tools Required

13 The following is a list of special tools and test equipment required in these instructions.

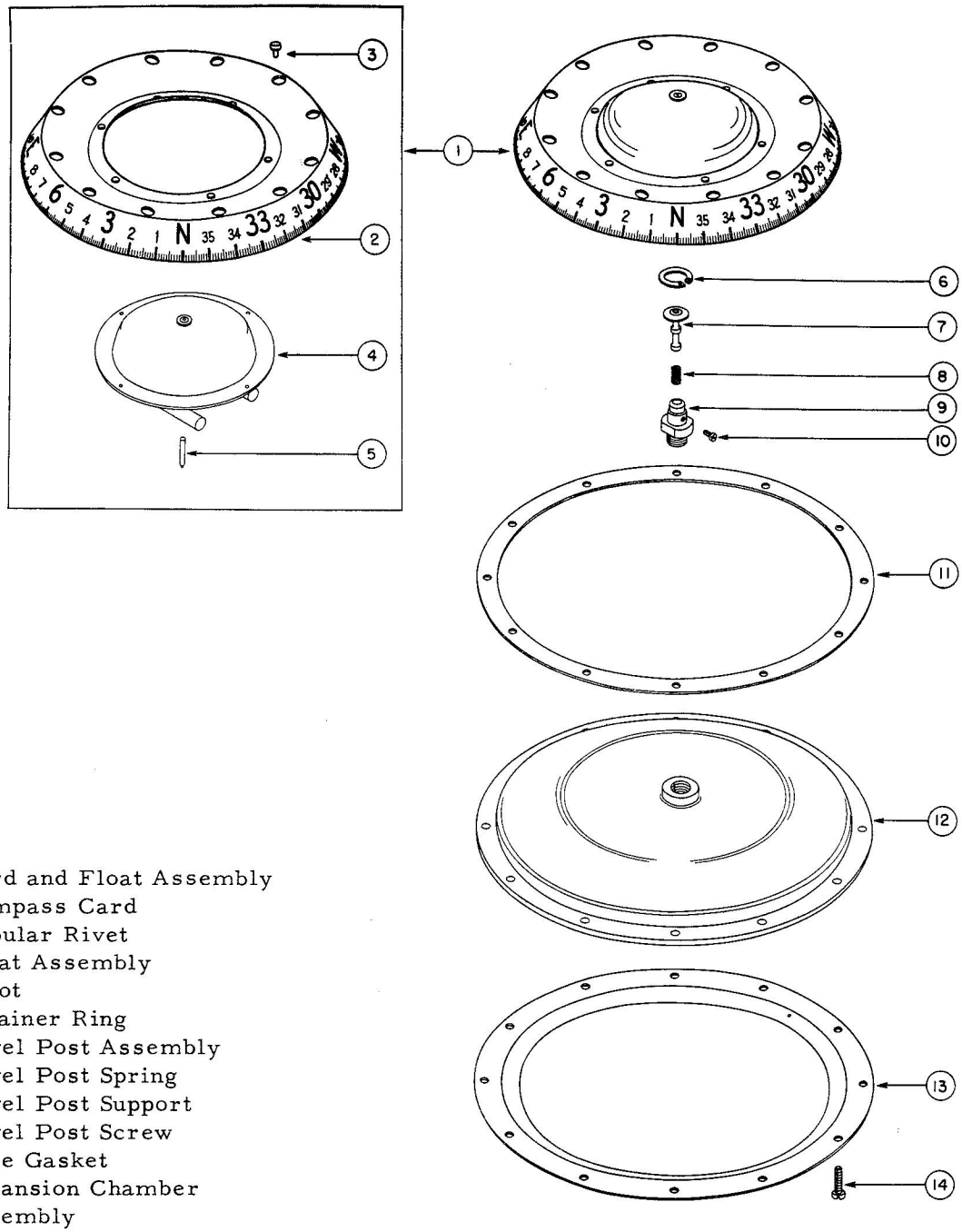
TABLE 6

| PART | NOMENCLATURE | APPLICATION |
|---|---|---|
| QB2663-1 | Non-Magnetic Screwdriver | To adjust compensator |
| QB70061-1 | Stop Nut Swaging Tool | To swage stop nuts into bezel |
| QB71327-2 | Compass Adaptor | To support compass in Helmholtz coil (used with QB71468-1) |
| QB71463-2 | Magnetizing Jig | To magnetize card assembly |
| QB71468-1 | Adaptor Plate | To support compass in Helmholtz coil (used with QB71327-2) |
| 13001-1-A | Compass Balancing Stand | To check card balance and alignment |
| 13634-1-A | Helmholtz Coil | Calibration and test |
| 13700-1-A or equal | Insulation Tester | To test insulation for breakdown |
| THE FOLLOWING STANDARD EQUIPMENT OR EQUAL IS REQUIRED AND MAY BE PURCHASED FROM VENDORS OTHER THAN ECLIPSE-PIONEER | | |
| Standard | Mercurial Manometer (minimum range 20 in. Hg) | Leak test |
| Standard | Bell Jar | Filling and Leak test |
| Model 107 | Magnet Charger Radio Frequency Labs. Boonton, N. J. | To magnetize compass card (see QB71463-2) |




| | | | |
|---|---|---|---|
| 1 | Compensator Assembly | 14 | Bezel |
| 2 | Bracket Screw | 15 | Bezel Screw |
| 3 | Specification Plate Screw | 16 | Lens Gasket |
| 4 | Compensator Screw | 17 | Bowl Gasket |
| 5 | Lamp Assembly | 18 | Spacer |
| 6 | Tube and Plug Assembly | 19 | Filling Hole Cap |
| 7 | Compass Bowl | 20 | Shim |
| 8 | Filling Hole Insert | 21 | Plug Mounting Screw |
| 9 | Lead Seal | 22 | Plug Mounting Lockwasher |
| 10 | Top Cover Assembly | 23 | Gasket |
| 11 | Bottom Cover Assembly | 24 | Compass Lens |
| 12 | Stop Nut | 25 | Glass |
| 13 | Lubber Line | 26 | Setscrew |

Figure 6-1 Exploded View - Compass Type B-17 (Pioneer Types 1813-1-A and 1813-1-B)




1 Card and Float Assembly
2 Compass Card
3 Tubular Rivet
4 Float Assembly
5 Pivot
6 Retainer Ring
7 Jewel Post Assembly
8 Jewel Post Spring
9 Jewel Post Support
10 Jewel Post Screw
11 Base Gasket
12 Expansion Chamber Assembly
13 Base Cover
14 Base Screw

Figure 6-2 Exploded View - Compass - Card and Float Assembly and Attaching Parts - Type B-17 (Pioneer Types 1813-1-A and 1813-1-B)

Disassembly

14 Disassemble as follows:

(a) With the fingers, unscrew the lamp assembly (23) Figure 6-3 (as well as the spare, if present) from the instrument.

(b) Loosen the two screws (9B) Figure 6-5 which hold the top cover assembly (9) in place, and lift off the top cover assembly and light seal (11).

(c) Remove the four compensator screws (4) Figure 6-3 and lift out the compensator assembly (1), by twisting it slightly, and simultaneously lifting it up and back.

NOTE

The compensator system consists of a delicately adjusted series of gears and further disassembly should not be attempted. Should damage result to any of the parts, the whole assembly should be replaced.

(d) Take out the two screws (12) Figure 6-5 and remove the lower cover (10).

(e) Loosen the setscrew (21) Figure 6-3. It is not necessary to remove the setscrew to release the tube and plug assembly (22) or the lighting system and bracket assembly (22A).

(f) Remove the two plug mounting screws (24) Figure 6-3 and two plug mounting lockwashers (25) at the rear of the compass and take off the tube and plug assembly (22) or the lighting system and bracket assembly (22A).

(g) Place the instrument face up on the bench. Use a screwdriver to remove the filling hole cap (20) Figure 6-3, and drain out the compass fluid into a clean container.

CAUTION

Extreme care must be taken not to damage the float which topples over after the liquid is drained off.

(h) Remove the washer (15) Figure 6-3, filling hole insert (9), and lead seal (10) if necessary.

(j) Keeping the instrument face up, take out the two bezel screws (4) Figure 6-5 and eight bezel screws (3) which hold the bezel (5) to the bowl and stop nut assembly (7) Figure 6-3. BACK OUT EACH SCREW ABOUT AN EIGHTH OF A TURN AT A TIME TO ELIMINATE THE POSSIBILITY OF THE LENS CRACKING THROUGH UNEVEN PRESSURE.

(k) Lift off the bezel (5) Figure 6-5, the shim (8), and the lens gasket (2).

(l) Gently remove the painted compass lens (1) Figure 6-5 by prying it off with a screwdriver which should be inserted between the bowl gasket (6) and the bowl to avoid damaging the lens.

(m) Take off the bowl gasket.

(n) Carefully pry the lubber line (7) Figure 6-5 loose with a screwdriver, and remove it.

(p) Keep the instrument facing up, and with a socket wrench loosen the nut (19) Figure 6-3 which holds the jewel post support (18) in place. Then, while holding the jewel post support with a pair of long nosed pliers, remove the nut.

(q) Insert a screwdriver into the slotted end of the jewel post support on the outside of the case, and turn to loosen the assembly. Remove the card assembly (5) Figure 6-3, the jewel post support (18) and jewel post assembly (6), AS AN ASSEMBLY through the front of the compass while holding lightly with the pliers.

(r) Take out the washer (15) Figure 6-3 from the inside of the bowl.

(s) Remove the jewel post screw (17) Figure 6-3 from the jewel post support (18) and pry loose the retainer ring (14).

(t) The card assembly (5) Figure 6-3 may now be lifted free from the jewel post assembly (6) and the jewel post spring (16) taken out of the jewel post support (18).

(u) If necessary to disassemble the card assembly (5) Figure 6-3, first a light pencil marking should be made on the float assembly (2) Figure 6-4 denoting the position of the "N" marking on the card so that the card may be replaced in the same position with respect to the magnets as the old card. The card (4) then may be removed by carefully taking out the tubular rivets (5) which secure it to the float assembly (2).

(v) The pivot (3) Figure 6-4 is press-fitted into the float and pivot assembly (1), and may be removed by inserting an 0.030 inch diameter punch through the hole in the top of the float and gently tapping it until the pivot is free.

NOTE

The assembly may sometimes be supported sufficiently for this operation by holding it in one hand. If the pivot cannot be removed readily in this manner it will be necessary to support the float by means of the float center on a suitable hollow punch and tap the pivot until it falls free.

(w) With the instrument face down, remove the 11 screws (26) Figure 6-3 which secure the back cover (12).

(x) Then lift off the back cover tapping it lightly with a screwdriver in the event that it sticks.

(y) Take off the diaphragm (11) Figure 6-3 and its gasket (13).

(z) If it is necessary to replace any of the four stop nuts (8) Figure 6-3 in the bowl and stop nut assembly (7), carefully punch out the damaged stop nut.

(aa) The specification plate screws (3) may be replaced in case of loss or damage. The same applies to the bracket screws (2) included in the compensator assembly (1). The compensator assembly should not be disassembled and care should be taken that the specification plate does not become loose, lost or transferred.

(ab) If it is necessary to disassemble the lighting system and bracket assembly (22A) Figure 6-3 for type 1821-2-A, proceed as follows: Unscrew conduit nut (1) Figure 6-6 from tube and housing assembly (9), and remove ferrule (2), pull out wire (3), and female plug assembly (6), The female plug assembly is a press fit in the housing and may be removed by pulling it straight out. In cases where this is an excessively tight fit, a tool similar to an open end wrench (1/2 inch diameter, 1/32 inch thick) may be employed by inserting it between the plug housing and the plug shoulder, and then pulling it outward until the plug is free.

NOTE

Before the male plug assembly (8) can be removed, the leads between the plug and the lamp socket must be unsoldered from the posts on the bottom of the male plug. Removal of the screw (4) and washer (5) on the side of the tube and housing assembly (9) will then permit the male plug to be pushed out through the back of the housing.

## CLEANING, INSPECTION, TESTING AND REPAIR

### Cleaning

15 After the compass has been disassembled, clean all the parts thoroughly by washing them in benzene. After drying, a light blast of air may be used to blow loose dust off the parts. Particular attention must be paid to the compass bowl. Exercise care to remove all traces of dust particles and metallic chips. After washing the lens with soap and water, dry it with a soft cloth and avoid handling.

16 Clean the jewel post assembly with benzene and dry with a blast of air.

### Inspection and Repair

17 Jewel - Detect any cracks or flaws in the smooth surface of the jewel by using the sharp point of a needle. Move the needle point around in the cup jewel. Always replace a cracked or damaged jewel with a new jewel post assembly.

18 Pivot - Examine the pivot for excessive wear or damage. Do not mistake a slight uniform roundness of the point for dullness. This condition is necessary to prevent the breaking of the sharp needle point (0.0035 inch radius) on the pivot. Also this slight roundness of the pivot point tends to prevent heeling or tipping of the card which may result from an extremely sharp pointed pivot.

19 Card - Inspect the card very carefully to see that it is not warped or bent out of shape. To check the card, lay it on a level piece of wood or metal and look for light coming through the "high spots". If any spot on the lower edge of the card is high, squeeze it gently toward the center. Damaged floats should be replaced with new ones. The card magnets are in their proper position if each axis is parallel to each other and also parallel to a line through the north-south points on the card within an accuracy of 1 degree. Test the card float for leaks and liquid present. If the float is defective, replace the card assembly.

Card Magnets

20 Both age and vibration slightly decrease the magnetic strength of the card. This decrease in strength increases the period of the card. When it becomes necessary to remagnetize the card magnets, use magnetizing jig, QB71463-2 and magnet charger, Radio Frequency Labs Model 107. It is most important that the south poles of the card magnets are aligned with the south pole of the magnetizing stand, and likewise, the north poles of the card magnets are on the north pole of the magnetizing stand.

21 Balance the card after remagnetizing the card magnets. Use compass balancing stand 13001-1-A or mount the card assembly on a jewel post in a glass container filled with compass liquid. Thus the same condition of balance occurs as in the completed compass including any possible angle of dip. Apply a small amount of solder to the bottom float section to counteract any dipping of the card. If the proper amount of solder has been added, the card will become exactly horizontal.

CAUTION

Avoid excessive heating in adding the solder to the float.

22 After balancing the card assembly, clean it thoroughly to remove all traces of the soldering flux. Paint the magnet with dull black paint. The strength of the card magnets may be determined after magnetizing by measuring the time of the card swing from 30 degrees to 5 degrees.

NOTE

The time in seconds must be within the tolerance specified in Part 7, para. 24.

23 Gaskets - Replace all sealing gaskets to prevent leakage from the case. They must be thoroughly impregnated before assembly. This eliminates the natural porosity of the cork and makes them impervious to compass fluid. Impregnation instructions follow:

(a) Place gaskets in a shallow dish and cover them with cellulose nitrate lacquer, Specification AN-L-29, diluted with approximately 25 percent cellulose nitrate thinner, Specification AN-TT-T-256.

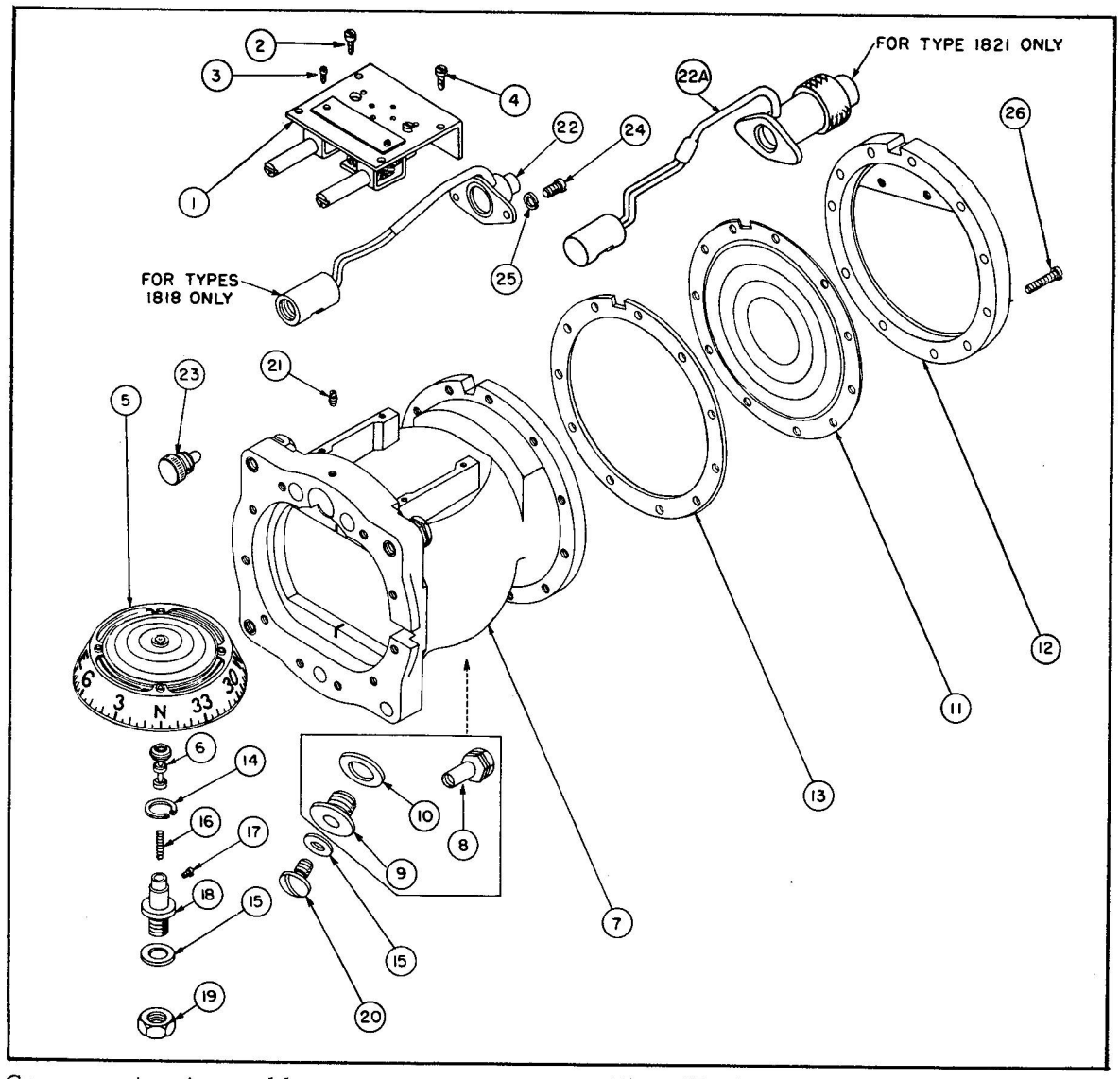
(b) Agitate the mixture GENTLY to eliminate bubbles, being careful not to injure the gaskets. Place a metal frame over gaskets to keep them from floating.

(c) Place a dish in a vacuum chamber. Evacuate the chamber to an absolute pressure of NOT OVER 10 inches of mercury. If an altimeter is used as an absolute pressure gauge, it must inidcate 30,000 feet or over. Maintain the vacuum until bubbles no longer emerge from the gaskets.

(d) Shut off the vacuum and vent the chamber to the atmosphere.

(e) Leave the gaskets in the liquid at least 10 minutes longer.

(f) Remove the gaskets from the liquid,




| | | | |
|---|---|---|---|
| 1 | Compensator Assembly | 15 | Washer |
| 2 | Bracket Screw | 16 | Jewel Post Spring |
| 3 | Specification Plate Screw | 17 | Jewel Post Screw |
| 4 | Compensator Screw | 18 | Jewel Post Support |
| 5 | Card Assembly | 19 | Nut |
| 6 | Jewel Post Assembly | 20 | Filling Hole Cap |
| 7 | Bowl and Stop Nut Assembly | 21 | Setscrew |
| 8 | Stop Nut | 22 | Tube and Plug Assembly |
| 9 | Filling Hole Insert | 22A | Lighting System and Bracket Assembly |
| 10 | Lead Seal | 23 | Lamp Assembly |
| 11 | Diaphragm | 24 | Plug Mounting Screw |
| 12 | Back Cover | 25 | Plug Mounting Lockwasher |
| 13 | Gasket | | |
| 14 | Retainer Ring | 26 | Screw |

Figure 6-3 Exploded View - Compass - Type B-16, (Pioneer Types 1818-1-A, 1818-4-A, 1821-2-A)

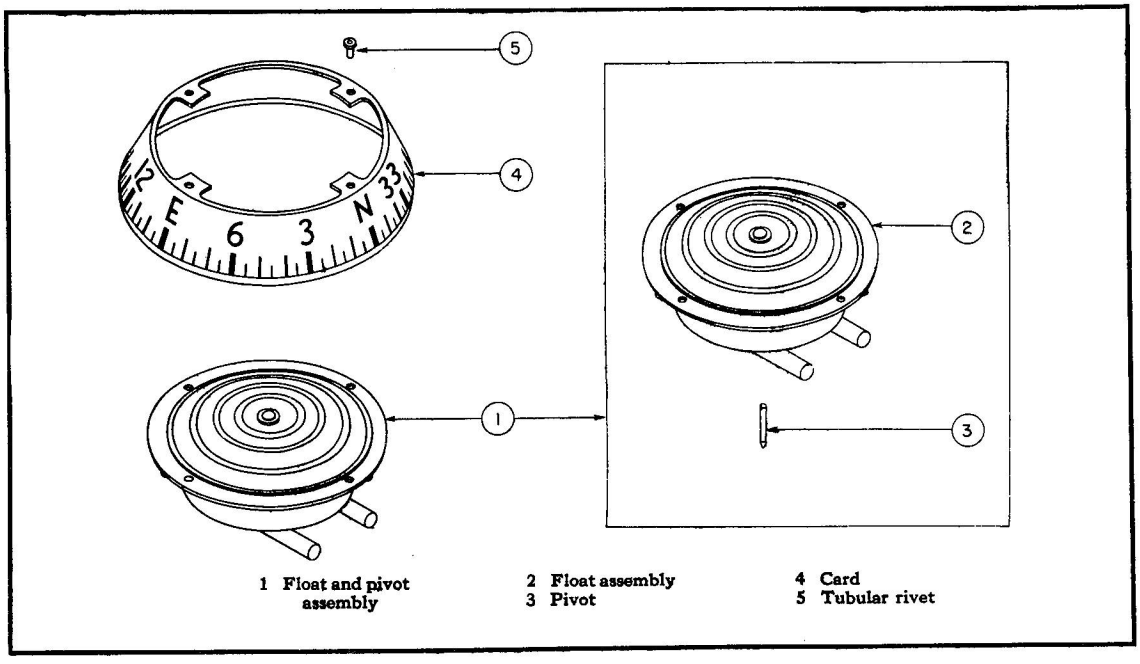



Figure 6-4 Exploded View - Compass - Card Assembly Type B-16, (Pioneer Types 1818-1-A, 1818-4-A, and 1821-2-A)

hang them separately on a rack and allow them to dry at room temperature for at least 1 hour. GASKETS MUST BE USED WITHIN 24 HOURS OF IMPREGNATION.

Re-Assembly

24 If it has been necessary to disassemble the lighting system and bracket assembly (22A) Figure 6-3 for type 1821-2-A, re-assemble it as follows:

(a) Replace the male plug assembly (8) Figure 6-6, in the tube and housing assembly (9) and secure it with screw (4) and washer (5).

(b) Clean the bared, loose ends of the wires leading through the tube from the lamp socket, wind each one around a stud on the bottom of the plug, and solder them in place. Use a non-corrosive flux.

(c) After soldering, clean the connection and feed up the wire insulation until it butts against the connection. Paint this joint with two coats of Glyptal or equal.

(d) Replace female plug assembly (6), ferrule (2), and pullout wire (3), and secure to tube and housing assembly (9) with conduit nut (1).

(e) If it has been necessary to replace a stop nut (8) Figure 6-3 with a new one, replace the new stop nut using the stop nut swaging tool, QB70061-1.

(f) With the instrument face down, place the 11 screws (26) Figure 6-3 in the back cover (12), and put the diaphragm (11) and its gasket (13) over the screws, and being careful that the cutouts for the tube and plug assembly (22) line up, mount them to the bowl and stop nut assembly (7). Tighten the screws uniformly, an eighth of a turn at a time.

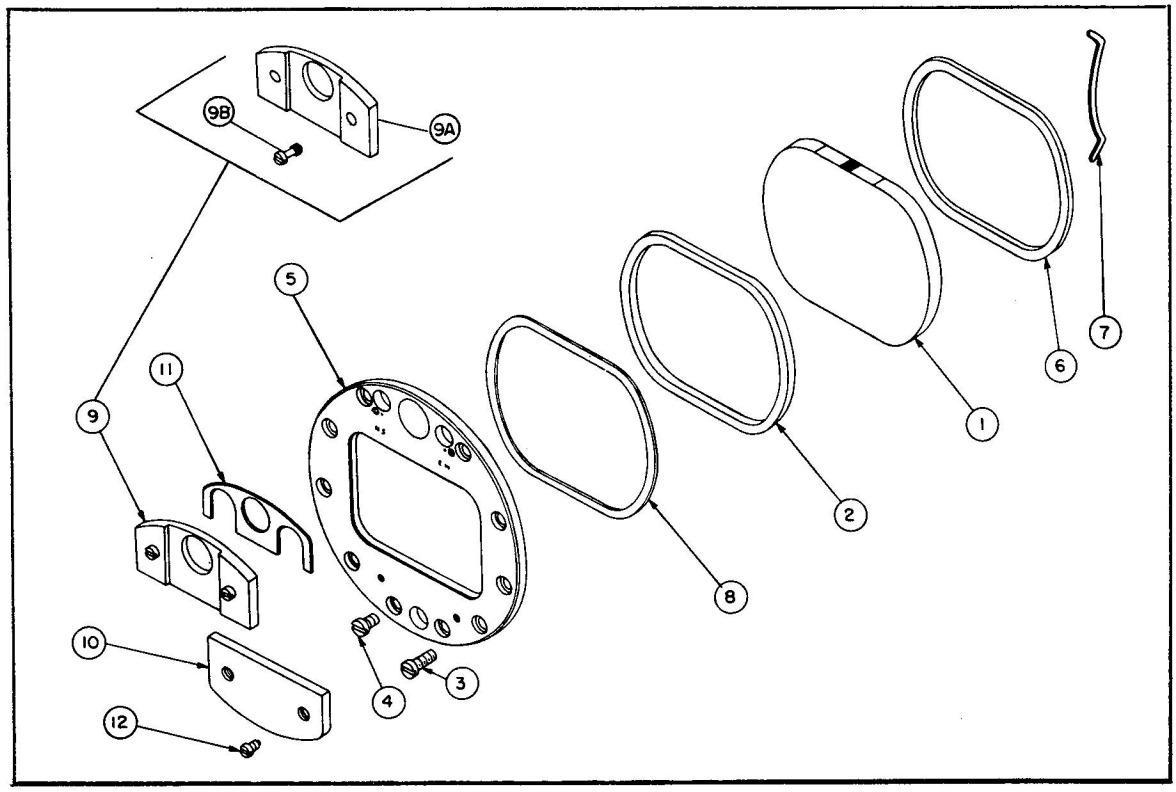
(g) Place the jewel post spring (16) Figure 6-3 on the jewel post assembly (6) into the jewel post support (18). Lock in position with the jewel post screw (17).

(h) To assemble the card assembly (5) Figure 6-3 insert the pivot (3) Figure 6-4 into the float assembly (2). The distance from the point of the pivot to the bottom of the float should be 0.095 inch to 0.105 inch. Place the card (4) on the float and pivot assembly (1) so that the "N" of the card has the same relative position to the light pencil marking made on the float assembly as at the disassembly and insert and secure the tubular rivets (5).

(j) Place the card assembly (5) Figure 6-3 top down on the bench and place the jewel post assembly (6) and the attaching jewel post support (18) in position on the pivot.

(k) Slip the retainer ring (14) Figure 6-3 on the jewel post assembly (6) and position in place on the card assembly (5) by inserting long nosed pincers into the two holes of the retainer ring (14) and squeezing until the ring slides in position.

(l) Place the instrument face up on the bench. Slide the washer (15) Figure 6-3 onto the jewel post support (18).




1 Painted Compass Lens
2 Lens Gasket
3 Bezel Screw
4 Bezel Screw
5 Bezel
6 Bowl Gasket
7 Lubber Line
8 Shim
9 Top Cover Assembly
9A Top Cover
9B Screw
10 Lower Cover
11 Light Seal
12 Screw

Figure 6-5 Exploded View - Compass - Bezel and Attaching Parts - Type B-16, (Pioneer Types 1818-1-A, 1818-4-A, and 1821-2-A)

(m) Carefully place the card assembly (5) Figure 6-3 with the attaching jewel post assembly (6) and jewel post support (18) into the compass bowl. Slide the end of the jewel post support into the aperture in the bottom of the bowl, and tighten in position with a screwdriver. Secure in place with the nut (19) on the outside of the bowl.

**CAUTION**

Extreme care must be taken in placing the card assembly in the bowl to prevent bending the card or damaging the float.

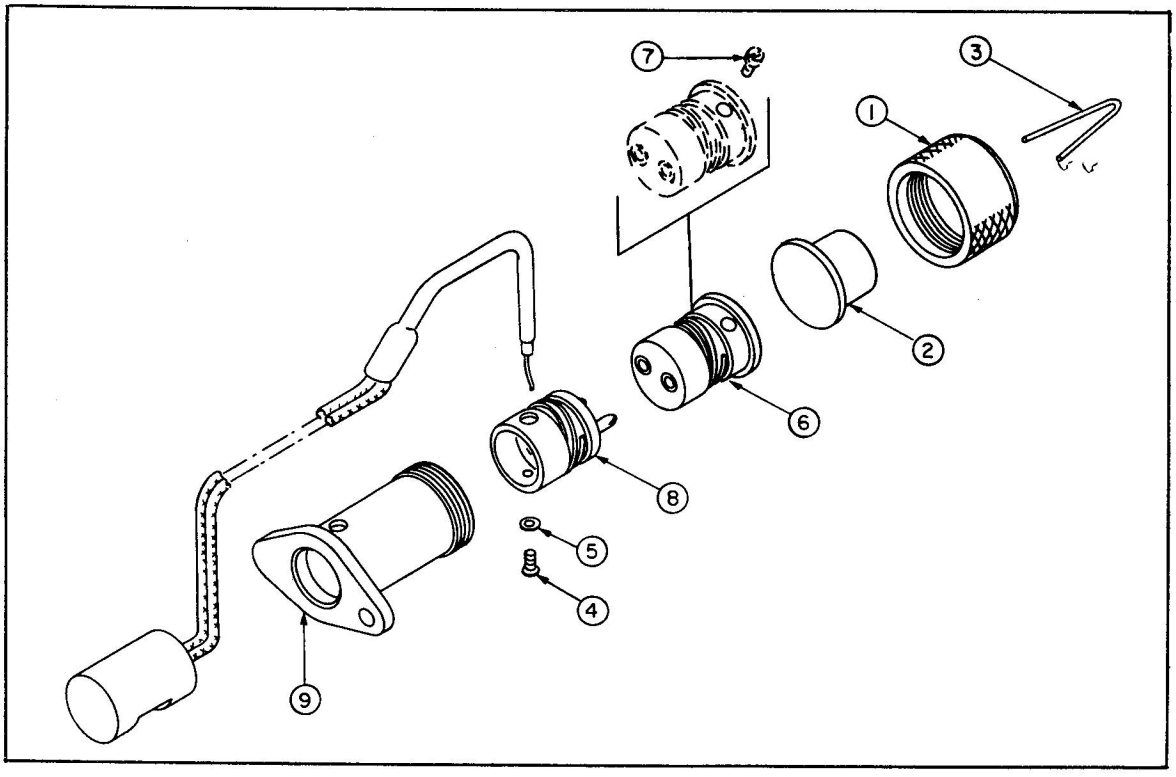
(n) Carefully fit the lubber line (7) Figure 6-5 in place.

(p) Replace the bowl gasket (6) Figure 6-5.

(q) Fit on the lens gasket (2) Figure 6-5, the shim (8) and the painted compass lens (1), and fasten the bezel (5) in place with the eight bezel screws (3) and the two bezel screws (4). Tighten the screws uniformly to avoid cracking the lens.

(r) If the filling hole insert (9) Figure 6-3 was removed during disassembly, replace lead seal (10) and screw the filling hole insert into lower compass bowl. Tighten the filling hole insert with a torque-meter wrench, applying 50 inch-pounds torque.

(s) The compass must be filled under a vacuum. Fill the bowl with aircraft compass liquid, Specification 3-GP-31. Submerge the bowl on its side, with the filling hole on top, in a tank of compass fluid.




1 Conduit Nut
2 Ferrule
3 Pull Out Wire
4 Screw
5 Washer
6 Female Plug Assembly
7 Screw
8 Male Plug Assembly
9 Tube and Housing Assembly

Figure 6-6 Exploded View - Compass - Lighting System and Bracket Assembly - Type B-16 (Pioneer Type 1821-2-A)

(t) Place the tank in a vacuum chamber and evacuate the chamber to 10 inches of mercury, a pressure approximately equivalent to that at 30,000 feet. Keep the tank in the chamber until all bubbling has ceased.

(u) Remove the tank from the chamber, place a finger over the filling hole, and remove the bowl from the fluid. Turn the bowl upside down, and, if it is not filled to capacity, add more liquid with a medicine dropper.

(v) Replace the washer (15) Figure 6-3 and filling hole cap (20). Thoroughly dry all surfaces before proceeding with re-assembly.

(w) Attach the tube and plug assembly (22) Figure 6-3 or lighting system and bracket assembly (22A) at the back of the compass with the two plug mounting screws (24) and two plug mounting lockwashers (25), and secure it at the front of the compass with setscrew (21).

(x) Fit the compensator assembly (1) Figure 6-3 in place, securing it with the four compensator screws (4).

(y) Replace the light seal (11) Figure 6-5 and the top cover assembly (9).

(z) Screw the lamp assembly (23) Figure 6-3 in place, as well as the spare lamp if present.

(aa) Fit on the lower cover (10) Figure 6-5 and secure with the two screws (12).

(ab) The compass is now ready for final inspection and test.

## COMPASS, TYPE D-12 (PIONEER TYPES 1832-1-A AND 1832-3-A)

### Overhaul Tools Required

25 No special tools or test equipment are required to overhaul the type D-12 compass.

### Disassembly

26 Disassemble as follows:

(a) Remove the four cover screws (6) Figure 6-14 and slide the compensator assembly (1) from the compensator mounting bracket (3).

(b) Remove the three compensator mounting screws (4) Figure 6-14 shakeproof lockwashers (5) and lift the compensator mounting bracket (3) from the bottom of the compass bowl (1) Figure 6-12.

NOTE

Do not attempt further disassembly of the compensator assembly. If any part is damaged, the assembly must be replaced.

(c) Loosen the two locking screws (7) Figure 6-9 and loosen the two knurled clamp screws (6) in the sides of the bezel ring assembly (1) Figure 6-7. Rotate the bezel ring assembly until the clamp screws mate with the notches of the clamp ring (2). The bezel ring assembly is then free to be lifted off.

(d) Remove the eight retainer ring screws (4) Figure 6-8 from the retainer ring (1) and lift the retainer ring from the bezel ring (3) Figure 6-9.

(e) Separate the gasket (2) Figure 6-8, the top glass (3), gasket (2), and the dial assembly (1) Figure 6-9 from the bezel ring (3).

NOTE

Do not attempt further disassembly of the dial assembly. If damaged in any way, replace the entire assembly.

(f) Remove the clamp screw pin (5) Figure 6-9 and the shim (4) from each clamp screw. (6) and unscrew the clamp screws from the bezel ring (3).

(g) Unscrew the filling plug gland (7) Figure 6-12 from the bottom of the compass bowl (1). Remove the filling plug (5), filling plug seal (6), the filling plug housing (2), and the housing seal (3). Drain the aircraft compass liquid from the compass by inserting a small piece of tubing into the drain hole and allowing air to enter the bowl as the fluid is drained.

NOTE

Do not shake the bowl while removing fluid, since the card float, and pivot assembly is loosely mounted on the pivot and may become damaged.

(h) Remove the 12 nuts (10) Figure 6-12 and the 12 screws (6) Figure 6-7 and lift the clamp ring (2) from the compass bowl (1) Figure 6-12.

(j) Remove the gasket (4) Figure 6-7, the bottom glass (3), and the other gasket (5) from the top of the compass bowl.

NOTE

Take care not to crack the glass in removing the gasket which is cemented to the compass bowl.

(k) Remove the three support plate screws (14) Figure 6-10 from the support plate assembly (6). Lift out the support plate assembly, the jewel post assembly (2), the lubber line assembly (8), and the card, float and pivot assembly (1) AS ONE UNIT.

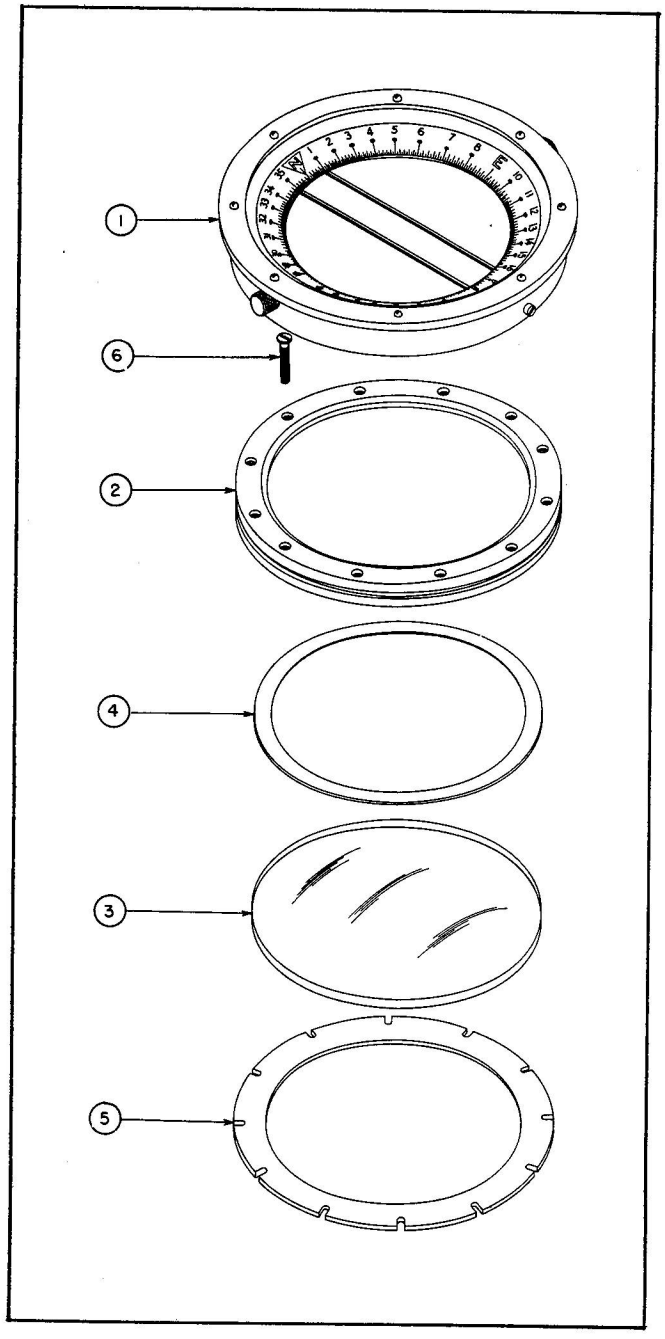
NOTE

Take the utmost care in performing this operation so as not to damage the card, float and pivot assembly.

(l) Remove the two reference line support screws (15) Figure 6-10 and two washers (16) and lift the lubber line assembly (8) and the other two washers (16) from the support plate assembly (6).

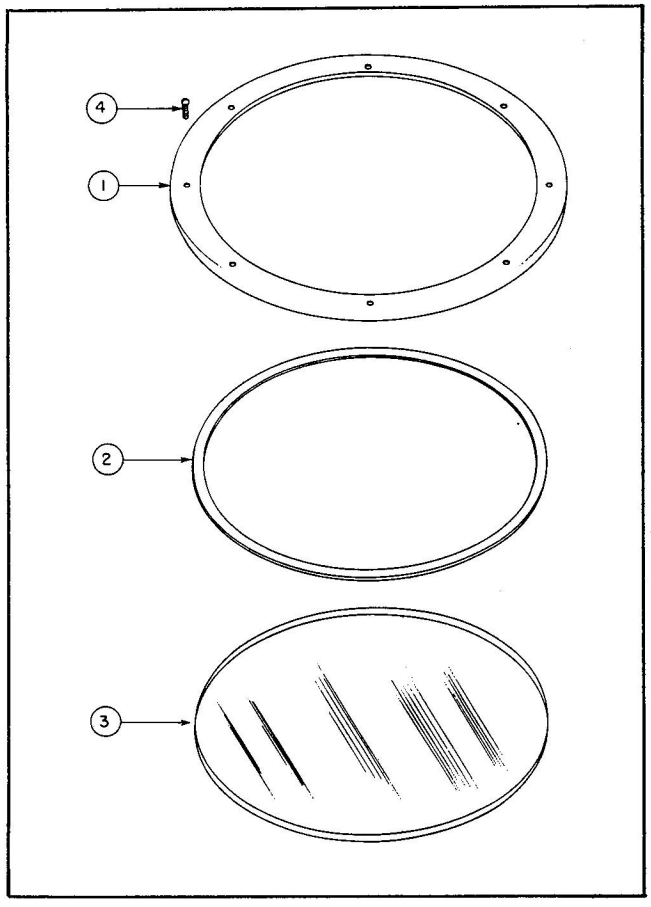
NOTE

No further disassembly of the lubber line assembly should be attempted unless the parts are damaged. In that event, remove the two lubber lines (9) Figure 6-10 from the lubber line support (10) by unfastening the wires and breaking the cement which holds the lubber line on the support. Be careful not to break the lubber lines while removing them.




| | | | |
|---|---|---|---|
| 1 | Bezel Ring Assembly | 4 | Gasket |
| 2 | Clamp Ring | 5 | Gasket |
| 3 | Bottom Glass | 6 | Screw |

Figure 6-7 Exploded View - Compass - Type D-12 (Pioneer Types 1801-1-A, 1832-1-A 1833-1-A, 1826-1-A and 1832-3-A)




1 Retainer Ring
2 Gasket
3 Top Glass
4 Retainer Ring Screw

Figure 6-8 Exploded View - Compass - Bezel Ring Assembly, - Type D-12 (Pioneer Types 1801-1-A, 1832-1-A, 1826-1-A and 1832-3-A)

(m) Remove the jewel post screw (13) Figure 6-10 from the support plate assembly (6) and lift out the jewel post assembly (2) and the card, float, and pivot assembly (1) and separate them from each other by removing the pivot retainer spring (12).

(n) Bend back the tabs which hold together the card (6) Figure 6-11 and the float and sleeve assembly (1). The card then can be lifted from the float and sleeve assembly. If it is necessary to remove the card lines (7, 8 and 9), they may be removed by cutting the card line wire (10).

NOTE

Make a light pencil marking of float assembly to denote position of "N" on card so that the card may be replaced in the same relative position with reference to the magnets as the old.

(p) With a pair of clean-jawed nippers draw the pivot sleeve assembly (3) from the float assembly (2). The pivot sleeve assembly is press fitted into the float assembly and it should be gripped beneath the shoulder of the pivot sleeve in a manner not to damage the spring. With a pair of tweezers, separate the pivot (4) from the spring and remove the pivot from the pivot sleeve assembly.

(q) Remove the jewel retainer cap (5) Figure 6-10 from the jewel post (4) and lift out the jewel (3).

NOTE

Be very careful not to damage the jewel while removing the jewel retainer cap.

(r) Remove the bellows mounting screw (9) Figure 6-12, the bellows screw seal (11), and the washer (8) from the bottom of the compass bowl (1) and lift out the sylphon assembly (7) Figure 6-10.

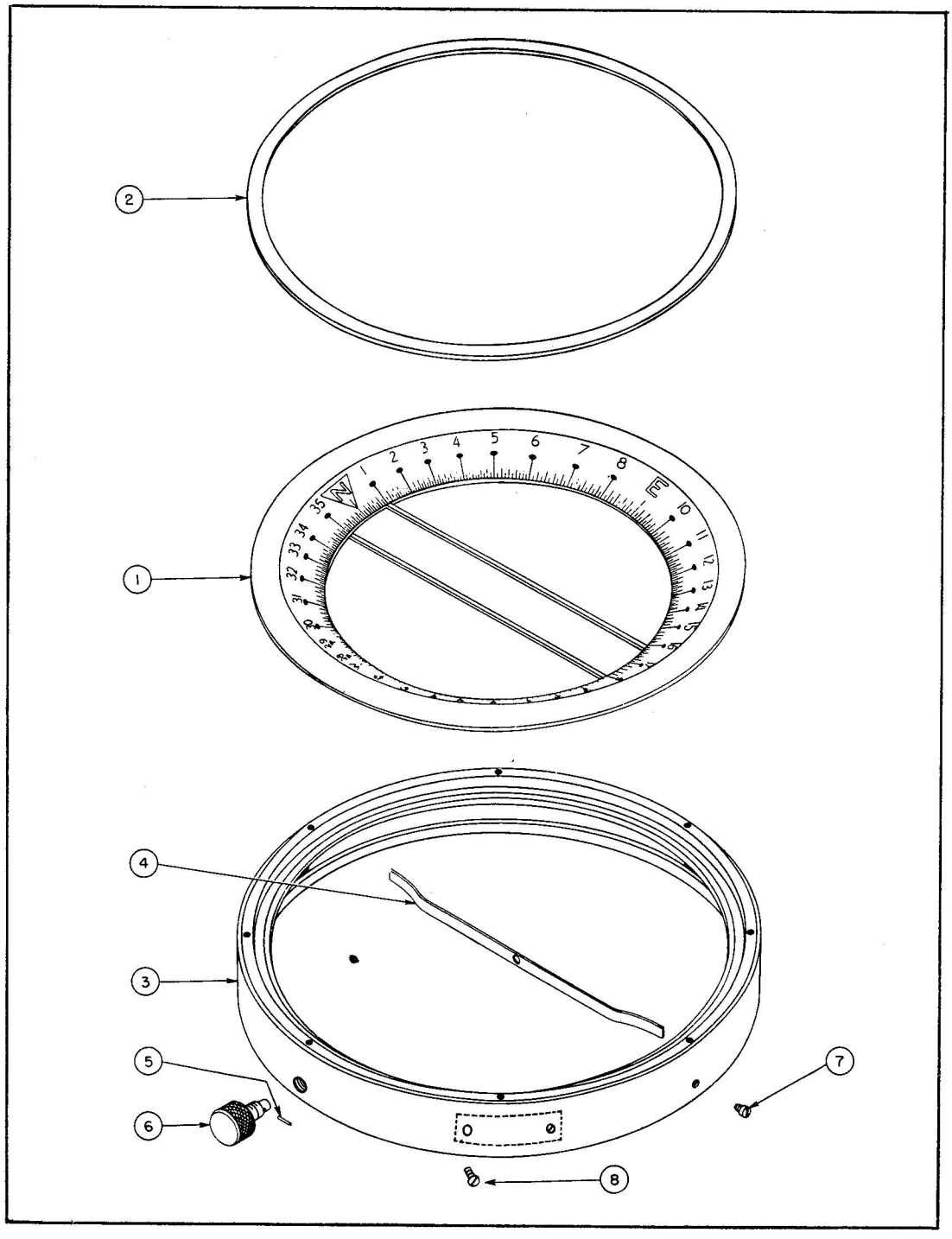
(s) Lift the filling nut (4) Figure 6-12 from the inside of the compass bowl.

## CLEANING, INSPECTION, TESTING AND REPAIR

### Cleaning

27 After disassembly, all parts must be kept absolutely clean and free from dust. This will ensure proper functioning of the unit when reassembled, Inspect all parts for wear or damage. Replace any parts if necessary.

28 Clean the jewel post with benzene and dry with a blast of air.




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Dial Assembly | 3 | Bezel Ring | 5 | Clamp Screw Pin | 7 | Locking Screw |
| 2 | Gasket | 4 | Shim | 6 | Clamp Screw | 8 | Name Plate Screw |

Figure 6-9 Exploded View - Compass - Bezel Ring Assembly - Type D-12
(Pioneer Types 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A and 1832-3-A)

Inspection and Repair

29 Jewel - Special attention must be given to the condition of the jewel. Clean the jewel with a tapered piece of pegwood. A sharp pointed needle is a useful tool in detecting any defects in the smooth surface of the jewel. Replace the jewel if it is cracked.

30 Pivot - Examine the pivot for wear or damage. Do not mistake the slight uniform roundness of the point for dullness. It is rounded to prevent the breaking of an otherwise needle-sharp end. This slight roundness also tends to eliminate any tipping of the card. The pivot must be perfectly straight and true, and it must have a smooth sliding fit in the pivot sleeve. BENT, SCORED OR WORN PIVOTS MUST BE REPLACED.

31 Card - Inspect the card very carefully to see that it is not warped or bent out of shape. Test the card float for leaks and liquid present. If the card or the float is damaged it must be replaced with a complete card, float, and pivot assembly.

32 Card Magnets - Both age and vibration slightly decrease the magnetic strength of the card. This decrease in strength increases the period of the card. When it becomes necessary to remagnetize the card magnets, place the card assembly in the compass magnetizing stand. It is most important that the south poles of the card magnets are on the south pole of the magnet-charger; and likewise, the north poles of the card magnets are on the north pole of the magnet-charger. Balance the card after remagnetizing the card magnets. Mount the card assembly on a jewel post in a glass container filled with compass liquid. Thus the same condition of balance occurs as in the completed compass including any possible angle of dip. Apply a small amount of solder to the bottom float section to counteract any dipping of the card. If the proper amount of solder has been added, the card will become exactly horizontal.

**CAUTION**

Avoid excessive heating in adding the solder to the float. After balancing the card assembly, clean it thoroughly to remove all traces of the soldering flux. Paint the magnet with dull black paint. The stregth of the card magnets may be determined after magnetizing by measuring the time of the card swing from 30 degrees to 5 degrees.

NOTE

The time in seconds must be within the tolerance specified in Part 7, para. 37.

33 Gaskets - Replace all sealing gaskets to prevent leakage from the case. They must be thoroughly impregnated before assembly. This eliminates the natural porosity of the cork and makes them impervious to compass fluid. Impregnation instructions follow:

(a) Place gaskets in a shallow dish and cover them with cellulose nitrate lacquer, Specification AN-L-29, diluted with approximately 25 percent cellulose nitrate thinner, Specification AN-TT-T-256.

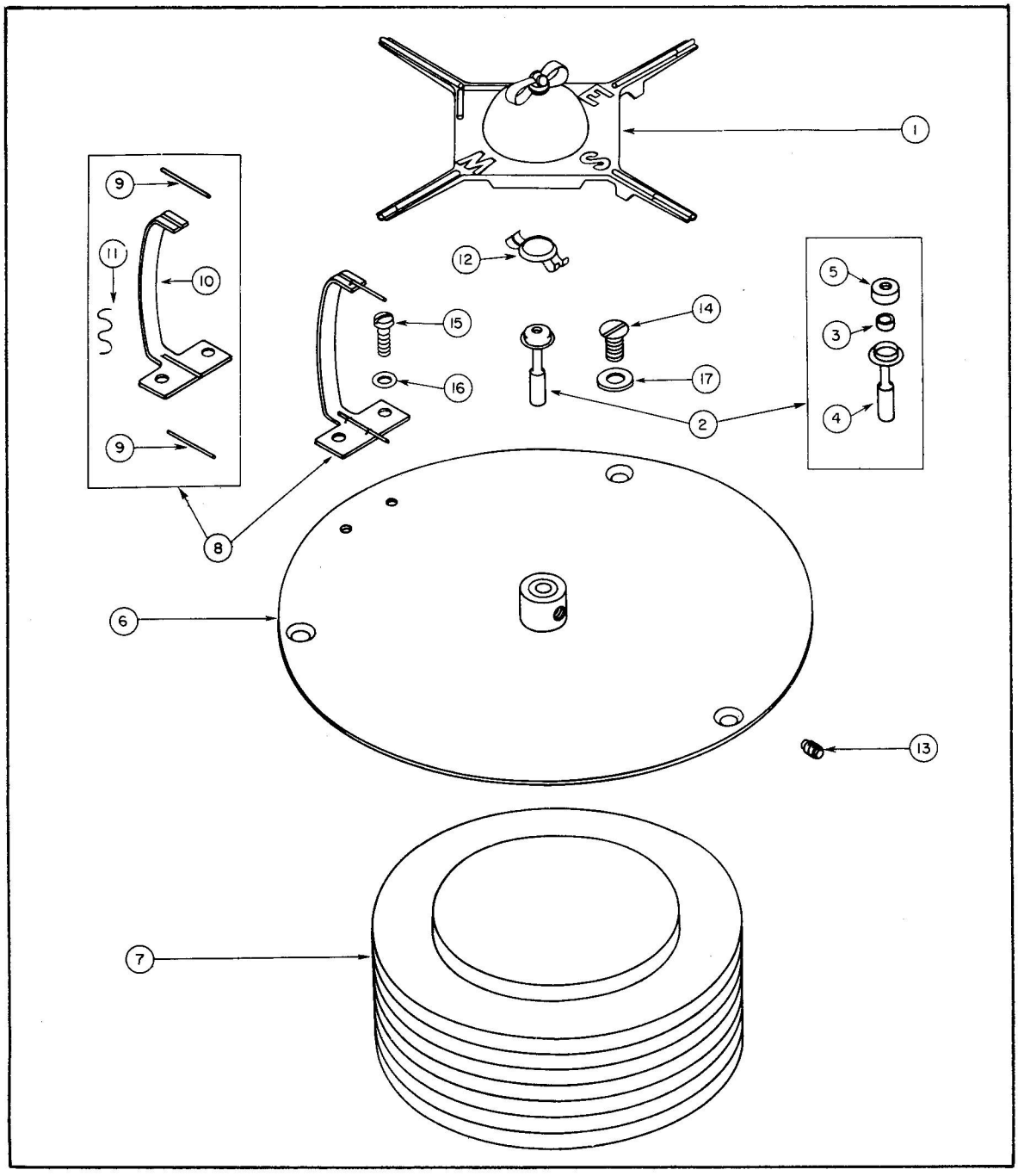
(b) Agitate the mixture GENTLY to eliminate bubbles, being careful not to injure the gaskets. Place a metal frame over gaskets to keep them from floating.

(c) Place the dish in a vacuum chamber. Evacuate the chamber to an absolute pressure of NOT OVER 10 inches of mercury. If an altimeter is used as an absolute pressure gauge, it must indicate 30,000 feet or over. Maintain the vacuum until bubbles no longer emerge from the gaskets.

(d) Shut off the vacuum and vent the chamber to the atmosphere.

(e) Leave gaskets in the liquid at least 10 minutes longer.

(f) Remove the gaskets from the liquid, hang them separately on a rack and allow them to dry at room temperature for at least 1 hour. GASKETS MUST BE USED WITHIN 24 HOURS OF IMPREGNATION.




| | | | | | |
|---|---|---|---|---|---|
| 1 | Card, Float, and Pivot Assembly | 7 | Sylphon Assembly | 13 | Jewel Post Screw |
| 2 | Jewel Post Assembly | 8 | Lubber Line Assembly | 14 | Support Plate Screw |
| 3 | Jewel | 9 | Lubber Line | 15 | Reference Line Support Screw |
| 4 | Jewel Post | 10 | Lubber Line Support | | |
| 5 | Jewel Retainer Cap | 11 | Lubber Line Wire | 16 | Washer |
| 6 | Support Plate Assembly | 12 | Pivot Retainer Spring | 17 | Washer |

Figure 6-10 Exploded View - Compass - Card, Float, and Pivot Assembly, and Attaching Parts Type D-12 (Pioneer Types 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A and 1832-3-A)

Re-Assembly

34 Re-assemble as follows:

(a) Put the filling nut (4) Figure 6-12 in place in the bottom of the compass bowl (1).

(b) Mount the washer (8) Figure 6-12 and the sylphon assembly (7) Figure 6-10 at the bottom of the compass bowl (1) Figure 6-12 and secure them with the bellows mounting screw (9) and the bellows screw seal (11).

(c) Place the jewel (3) Figure 6-10 in the jewel post (4), and fit the jewel retainer cap (5) on tightly.

(d) Slide the pivot retainer spring (12) Figure 6-10 onto the jewel post (4).

(e) Insert the pivot (4) Figure 6-11 into the pivot sleeve assembly (3) and into the small groove of the spring soldered to pivot sleeve. With a pair of pincers, it may be crimped tight. Insert the pivot sleeve assembly into the float assembly (2). Place the card (6) on the float assembly with "N" in same position with respect to magnets as formerly, bend back the tabs of the card and crimp them tight to the float. If it has been necessary to remove the line cards (7, 8, and 9), they may be placed into position and secured to the card by the card line wire (10).

(f) Re-assemble the jewel post assembly (2) Figure 6-10 to the card, float and pivot assembly (1) by pressing the hooked ends of the pivot retainer spring (12) around the magnets. Check to see that the pivot is centered on the jewel, and that the jewel post assembly is securely fastened.

(g) If the lubber line assembly (8) Figure 6-10 was disassembled, fasten the two lubber lines (9) to the lubber line support (10) with a short length of wire (11) inserted in the four holes provided, and seal by adding Roxalin cement (Roxalin Flexible Lacquer Co., Elizabeth, New Jersey) in the holes.

(h) Fasten the lubber line assembly (8) Figure 6-10 to the support plate assembly (6) with the two washers (16), two reference line support screws (15), and the other two washers (16).

(j) Place the card, float and pivot assembly (1) Figure 6-10 and the attaching jewel post assembly (2) in position on the support plate assembly (6) and secure with the jewel post screw (13).

(k) Place the card, float and pivot assembly (1) Figure 6-10, jewel post assembly (2), lubber line assembly (8), and support plate assembly (6) AS ONE UNIT into the compass bowl (1) Figure 6-12, and secure them with the three support plate screws (14) Figure 6-10.

(l) Check the lubber line assembly (8). The lower line must be directly opposite the words "AFT" on the side of the bowl. Slight adjustment of the lubber line assembly may be made by loosening the two reference line support screws (15) and shifting the lubber line assembly in the direction required to make the proper alignment. Then tighten the screws.

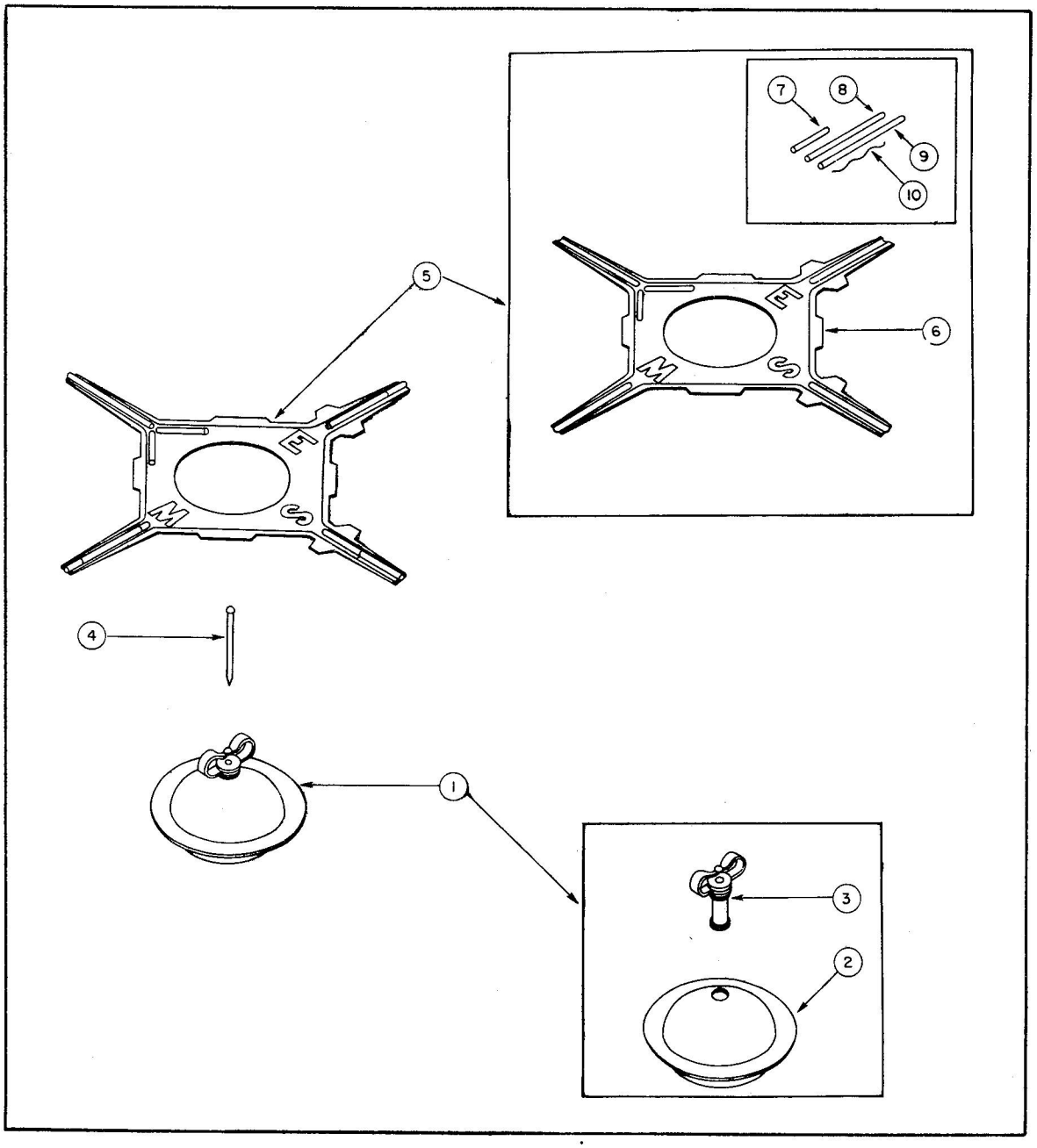
(m) Spread cellulose nitrate lacquer, Specification AN-L-29 on the top rim of the compass bowl (1) Figure 6-12 and the two sides of the newly impregnated gasket (5) Figure 6-7. Re-assemble this gasket, the bottom glass (3), and the gasket (4) in that order.

(n) Use an appropriate number of gaskets to provide clearance between the clamp ring (2) Figure 6-7 and the bottom glass (3).

(p) Replace the clamp ring on the compass bowl (1) Figure 6-12 and secure it with the 12 nuts (10) and 12 screws (6) Figure 6-7 taking care that the two notches on the clamp ring are aligned with the upper lubber line. Tighten the screws and the nuts gradually to avoid cracking the glass.

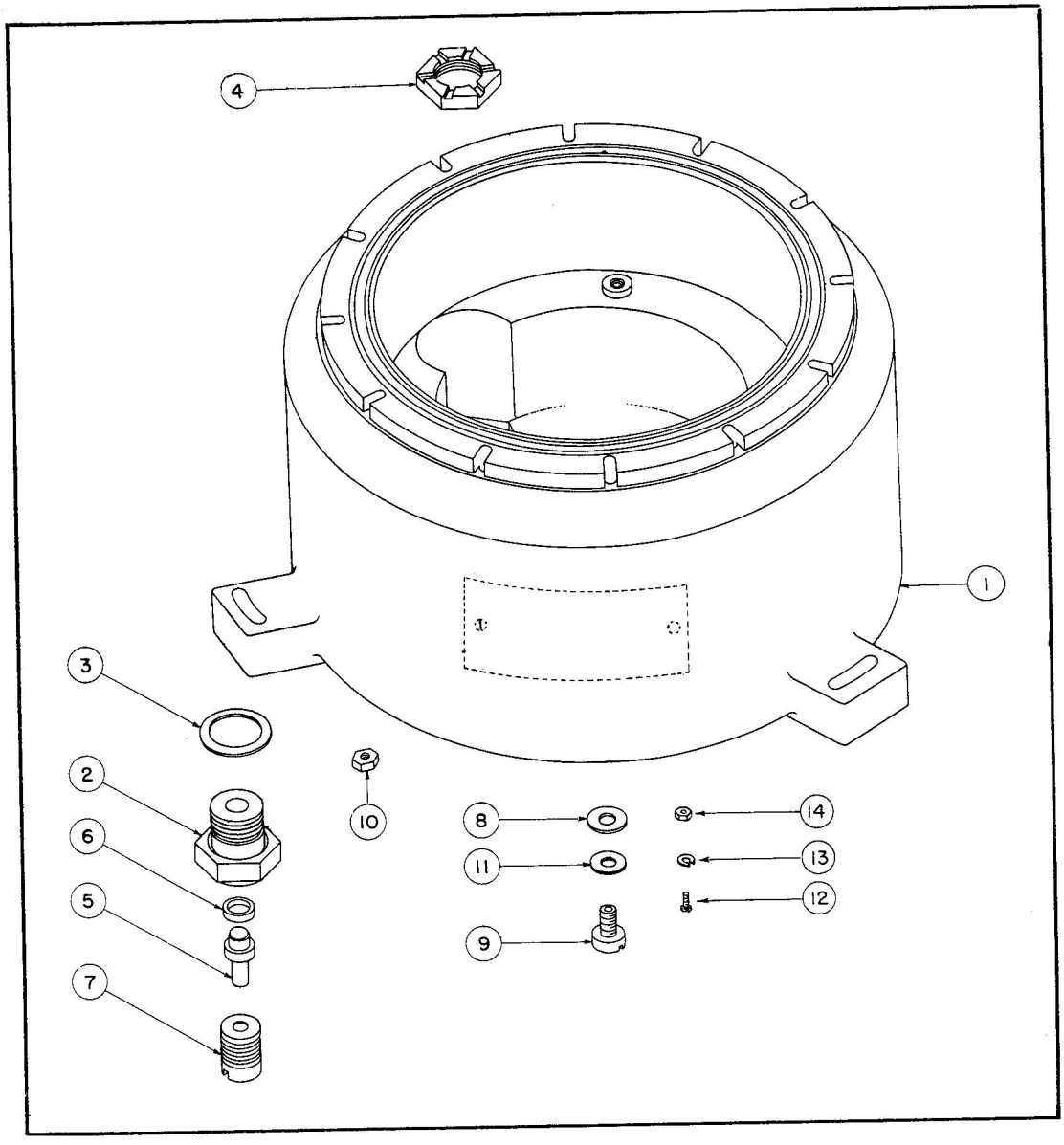
(q) Now completely refill the compass bowl (1) Figure 6-12 under vacuum pressure with all the aircraft compass liquid, Specification 3-GP-31, it will hold.

(l) With the filling hole in an upright position, submerge the bowl on its side in a tank of compass fluid. Place the tank in a vacuum chamber.



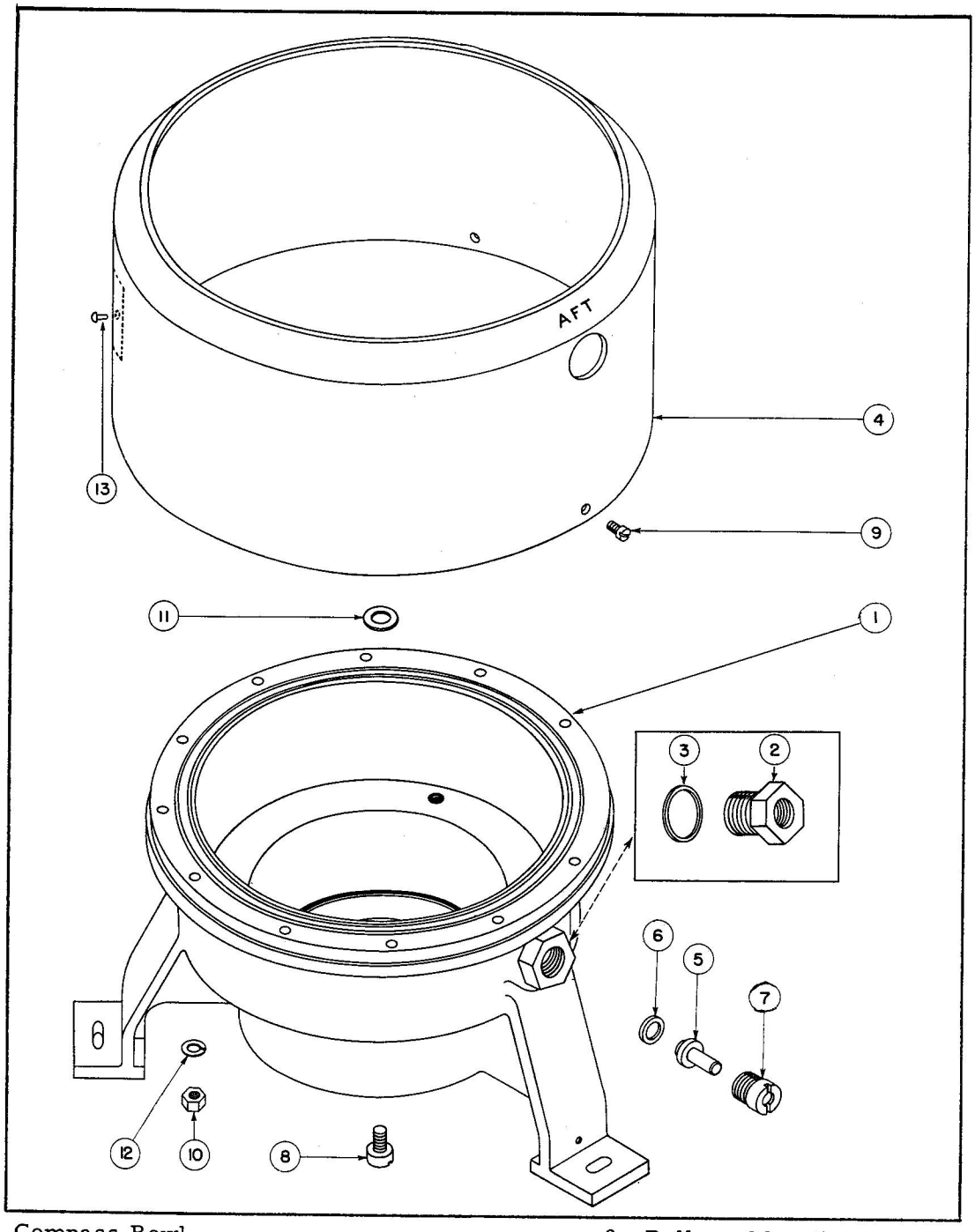

1 Float and Sleeve Assembly
2 Float Assembly
3 Pivot Sleeve Assembly
4 Pivot
5 Card Assembly
6 Card
7 Small Card Line
8 South Card Line
9 North Card Line
10 Card Line Wire

Figure 6-11 Exploded View - Compass - Card, Float, and Pivot Assembly - Type D-12 (Pioneer Types 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A and 1832-3-A)




1 Compass Bowl
2 Filling Plug Housing
3 Housing Seal
4 Filling Nut
5 Filling Plug
6 Filling Plug Seal
7 Filling Plug Gland
8 Washer
9 Bellows Mounting Screw
10 Nut
11 Bellows Screw Seal
12 Screw
13 Lockwasher
14 Nut

Figure 6-12 Exploded View - Compass - Compass Bowl and Attaching Parts - Type D-12 (Pioneer Types 1832-1-A and 1832-3-A)




1 Compass Bowl
2 Filling Plug
3 Housing Seal
4 Shield
5 Filling Plug
6 Filling Plug Seal
7 Filling Plug Gland
8 Bellows Mounting Screw
9 Shield Screw
10 Nut
11 Washer
12 Lockwasher
13 Rivet

Figure 6-13 Exploded View - Compass - Compass Bowl and Attaching Parts - Type D-12 (Pioneer Types 1801-1-A, 1833-1-A and 1826-1-A)

(2) Evacuate the chamber to a pressure equivalent to that at 30,000 feet and maintain this pressure for about an hour, until all bubbling ceases.

(3) Remove the tank from the chamber with the bowl still submerged, and replace the housing seal (3) Figure 6-12, the filling plug housing (2), the filling plug seal (6), the filling plug (5), and the filling plug gland (7).

(4) Tighten the filling plug gland as much as possible, taking care not to strip the threads.

(r) Insert the two clamp screws (6) Figure 6-9 into the two holes in the bezel ring (3).

(s) Slip a shim (4) Figure 6-9 on the end of each clamp screw (6).

(t) Insert a clamp screw pin (5) Figure 6-9 into the hole on the end of each clamp screw.

(u) Place the two locking screws (7) Figure 6-9 into the other two holes of the bezel ring (3).

NOTE

Back out the locking screws and clamp screws a small distance from the bezel ring prior to assembling the bezel ring assembly (1) Figure 6-7 on the clamp ring (2).

(v) Set the dial assembly (1) Figure 6-9 in the bezel ring (3) so that the north-south diameter is in line with the locking screws (7).

(w) Place a gasket (2) Figure 6-9, the top glass (3) Figure 6-8, another gasket (2) Figure 6-8 and the retainer ring (1) over the dial assembly (1) Figure 6-9. Hold in place with eight retainer ring screws (4) Figure 6-8. Tighten the screws a half turn each until the retainer ring (1) is secured firmly to the bezel ring (3) Figure 6-9.

(x) Replace the bezel ring assembly (1) Figure 6-7 on the top of the compass bowl (1) Figure 6-12.

(y) Mount the compensator mounting bracket (3) Figure 6-14 on the bottom of the compass bowl (1) Figure 6-12 and secure it in place with the three shakeproof lockwashers (5) Figure 6-14 and the three compensator mounting screws (4).

(z) Fit the compensator assembly (1) Figure 6-14 into the compensator mounting bracket (3), and secure with the four cover screws (6).

(aa) The screw (12) Figure 6-12, the lockwasher (13), and nut (14) which secure the name plate may be replaced in case of loss or damage. The name plate should not be removed or transferred to another instrument.

(ab) The compass is now ready for final inspection and test.

## COMPASS, TYPE D-12 (PIONEER TYPES 1801-1-A, 1833-1-A AND 1826-1-A)

### Overhaul Tools Required

35 No special tools or test equipment are required to overhaul the type D-12 compass.

### Disassembly

36 To remove the compensator Pioneer type 1826-1-A proceed as follows:

(a) Remove the four cover screws (6) Figure 6-14 and slide the compensator assembly (1) from the compensator mounting bracket (3).

(b) Remove the three compensator mounting screws (4) Figure 6-14 and shakeproof lockwashers (5) and lift the compensator mounting bracket (3) from the bottom of the compass bowl (1) Figure 6-13.

37 On Pioneer Types 1801-1-A and 1833-1-A proceed as follows:

(a) Take off the three compensator mounting screws (4) Figure 6-15 and three shakeproof lockwashers (5) and remove the compensator assembly (1) from the compass bowl (1) Figure 6-13. The compensator drawer assembly (2) Figure 6-15 may be drawn free of the compensator case assembly (3).

(b) Loosen the two locking screws (7) Figure 6-9 and loosen the two knurled clamp screws (6), in the sides of the bezel ring assembly (1) Figure 6-7. Rotate the bezel ring assembly until the clamp screws mate with the notches of the clamp ring (2) Figure 6-7. The bezel ring assembly is then free to be lifted off.

(c) Take out the three shield screws (9) Figure 6-13 and remove the shield (4).

NOTE

This step may be omitted in disassembling Pioneer type 1833-1-A which has no shield.

(d) Remove the eight retainer ring screws (4) Figure 6-8 from the retainer ring (1), and lift the retainer ring from the bezel ring (3) Figure 6-9.

(e) Separate the gasket (2) Figure 6-8, the top glass (3), the gasket (2) Figure 6-9 and the dial assembly (1) from the bezel ring (3).

NOTE

Do not attempt further disassembly of the dial assembly. If damaged in any way, replace the entire assembly.

(f) Remove the clamp screw pin (5) Figure 6-9 and shim (4) from each clamp screw (6) and unscrew the clamp screws from bezel ring (3).

(g) Unscrew the filling plug gland (7) Figure 6-13 from the side of the compass bowl (1). Remove the filling plug (5), the filling plug seal (6), the other filling plug (2), and the housing seal (3). Drain the aircraft compass liquid from the compass by inserting a small piece of tubing into the drain hole and allowing air to enter the bowl as the fluid is drained.

NOTE

Do not shake the bowl while removing the liquid, since the card assembly is loosely mounted on the pivot, and may become damaged.

(h) Remove the 12 nuts (10) Figure 6-13, the 12 screws (6) Figure 6-7, and the 12 lockwashers (12) Figure 6-13, and lift the clamp ring (2) Figure 6-7 from the compass bowl (1) Figure 6-13.

(j) Remove the gasket (4) Figure 6-7, the bottom glass (3), and the other gasket (5) from the top of the compass bowl.

NOTE

Take care not to crack the glass in removing the gasket which is cemented to the compass bowl.

(k) Remove the three support plate screws (14) Figure 6-8 and the three washers (17) from the support plate assembly (6). Lift out the support plate assembly, the jewel post assembly (2), the lubber line assembly (8), and the card, float and pivot assembly (1) AS ONE UNIT.

NOTE

Take the utmost care in performing this operation so as not to damage the card, float and pivot assembly.

(l) Remove the two reference line support screws (15) Figure 6-10 and two washers (16) and lift the lubber line assembly (8) and the other two washers (16) from the support plate assembly (6).

NOTE

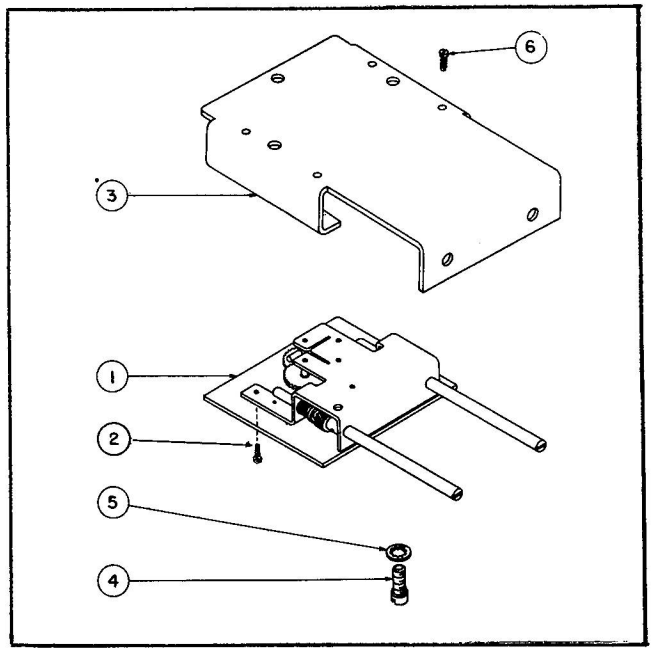
No further disassembly of the lubber line assembly should be attempted unless the parts are damaged. In that event, remove the two lubber lines (9) from the lubber line support (10) by unfastening the wires, and breaking the cement which holds the lubber line on the support. Be careful not to break the lubber lines while removing them.

(m) Remove the jewel post screw (13) Figure 6-10 from the support plate assembly (6) and lift out the jewel post assembly (2) and the card, float, and pivot assembly (1) and separate them from each other by removing the pivot retainer spring (12).

(n) Bend back the tabs which hold together the card (6) Figure 6-11 and the float and sleeve assembly (1). The card then can be lifted from the float and sleeve assembly. If it is necessary to remove the card lines (7, 8 and 9), they may be removed by cutting the card line wire (10).

NOTE

Make a light pencil marking on the float assembly to denote the position of "N" on card so that the card may be replaced in the same relative position with reference to the magnets as the old.




1 Compensator Assembly
2 Bracket Screw
3 Compensator Mounting Bracket
4 Compensating Mounting Screw
5 Shakeproof Lockwasher
6 Cover Screw

Figure 6-14 Exploded View - Compass - Compensator Assembly and Attaching Parts Type D-12 (Pioneer Types 1832-1-A, 1826-1-A a and 1832-3-A)

(p) With a pair of clean-jawed nippers, draw the pivot sleeve assembly (3) from the float assembly (2). The pivot sleeve assembly is press fitted into the float assembly and it should be gripped beneath the shoulder of the pivot sleeve in a manner not to damage the spring. With a pair of tweezers separate the pivot (4) from the spring and draw the pivot from the pivot sleeve assembly.

(q) Remove the jewel retainer cap (5) Figure 6-10 from the jewel post (4) and lift out the jewel (3).

NOTE

Be very careful not to damage the jewel while removing the jewel retainer cap.

(r) Remove the bellows mounting screw (8) Figure 6-13 and the washer (11) from the bottom of the compass bowl (1), and lift out the sylphon assembly (7) Figure 6-10.

(s) The rivets (13) Figure 6-13 which secure the name plate to the shield in Pioneer types 1801-1-A and 1826-1-A may be replaced in case of loss or damage. The name plate screws (not illustrated) for Pioneer type 1833-1-A also may be replaced. The name plate should not be removed or transferred to another instrument.

## CLEANING, INSPECTION, TESTING AND REPAIR

### Cleaning

38 After disassembly, all parts must be kept absolutely clean and free from dust. This will ensure proper functioning of the unit when re-assembled. Inspect all parts for wear or damage. Replace any parts if necessary.

39 Clean the jewel post with benzene and dry with a blast of air.

### Inspection and Repair

40 Jewel - Special attention must be given to the condition of the jewel. Clean the jewel with a tapered piece of pegwood. A sharp,

pointed needle is a useful tool in detecting any defects in the smooth surface of the jewel. Replace the jewel if it is cracked.

41 Pivot - Examine the pivot for wear or damage. Do not mistake the slight uniform roundness of the point for dullness. It is rounded to prevent the breaking of an otherwise needle-sharp end. This slight roundness also tends to eliminate any tipping of the card. The pivot must be perfectly straight and true, and it must have a smooth sliding fit in the pivot sleeve. BENT, SCORED OR WORN PIVOTS MUST BE REPLACED.

42 Card - Inspect the card very carefully to see that it is not warped or bent out of shape. Test the card float for leaks and liquid present. If the card or the float is damaged it must be replaced with a complete card, float and pivot assembly.

43 Card magnets - Both age and vibration slightly decrease the magnetic strength of the card. This decrease in strength increases the period of the card. When it becomes necessary to remagnetize the card magnets, place the card assembly in the compass magnetizing stand. It is most important that the south poles of the card magnets are on the south pole of the magnet-charger; and likewise the north poles of the card magnets are on the north pole of the magnet-charger. Balance the card after remagnetizing the card magnets. Mount the card assembly on a jewel post in a glass container filled with compass liquid. Thus the same condition of balance occurs as in the completed compass including any possible angle of dip. Apply a small amount of solder to the bottom float section to counteract any dipping of the card. If the proper amount of solder has been added, the card will become exactly horizontal.

**CAUTION**

Avoid excessive heating in adding the solder to the float. After balancing the card assembly, clean it thoroughly to remove all traces of the soldering flux. Paint the magnet with dull black paint. The strength of the card magnets may be determined after magnetizing by measuring the time of the card swing from 30 degrees to 5 degrees.

NOTE

The time in seconds must be within the tolerance specified in Part 7.

44 Gaskets - Replace all sealing gaskets to prevent leakage from the case. They must be thoroughly impregnated before assembly. This eliminates the natural porosity of the cork and makes them impervious to compass fluid. Impregnation instructions follow:

(a) Place gaskets in a shallow dish and cover them with cellulose nitrate lacquer, Specification AN-L-29, diluted with approximately 25 percent cellulose nitrate thinner, Specification AN-TT-T-256.

(b) Agitate the mixture GENTLY to eliminate bubbles, being careful not to injure the gaskets. Place a metal frame over gaskets to keep them from floating.

(c) Place the dish in a vacuum chamber. Evacuate the chamber to an absolute pressure of NOT OVER 10 inches of mercury. If an altimeter is used as an absolute pressure gauge, it must indicate 30,000 feet or over. Maintain the vacuum until bubbles no longer emerge from the gaskets.

(d) Shut off the vacuum and vent the chamber to the atmosphere.

(e) Leave the gaskets in the liquid at least 10 minutes longer.

(f) Remove the gaskets from the liquid, hang them separately on a rack and allow them to dry at room temperature for at least 1 hour. GASKETS MUST BE USED WITHIN 24 HOURS OF IMPREGNATION.

Re-Assembly

45 Re-assemble as follows:

(a) Mount the washer (11) Figure 6-13 and the sylphon assembly (7) Figure 6-10 in the compass bowl (1) Figure 6-13 and secure them with the bellows mounting screw (8).

(b) Place the jewel (3) Figure 6-10 in the jewel post (4) and fit the jewel retainer cap (5) on tightly.

(c) Slide the pivot retainer spring (12) Figure 6-10 onto the jewel post (4).

(d) Insert the pivot (4) Figure 6-11 into the pivot sleeve assembly (3) and into the small groove of the spring soldered to the pivot sleeve. With a pair of pincers, it may be crimped tight. Insert the pivot sleeve assembly into the float assembly (2). Place the card (6) on the float assembly with "N" in same position with respect to magnets as formerly, bend back the tabs of the card and crimp them tight to the float. If it has been necessary to remove the card lines (7, 8 and 9), they may be placed into position and secured to the card by the card line wire (10).

(e) Re-assemble the jewel post assembly (2) Figure 6-10 to the card, float and pivot assembly (1) by pressing the hooked ends of the pivot retainer spring (12) around the magnets. Check to see that the pivot is centered on the jewel, and that the jewel post assembly is securely fastened.

(f) If the lubber line assembly (8) Figure 6-10 was disassembled, fasten the two lubber lines (9) to the lubber line support (10) with a short length of lubber line wire (11) in the four holes provided, and seal by adding Roxalin cement (Roxalin Flexible Lacquer Co., Elizabeth, New Jersey) in the holes.

(g) Fasten the lubber line assembly (8) Figure 6-10 to the support plate assembly (6) with the two washers (16), two reference line support screws (15), and the other two washers (16).

(h) Place the card, float and pivot assembly (1) Figure 6-10 and the attaching jewel post assembly (2) in position on the support plate assembly (6) and secure with the jewel post screw (13).

(j) Place the card, float and pivot assembly (1) Figure 6-10, jewel post assembly (2), lubber line assembly (8), and support plate assembly (6) AS ONE UNIT, into the compass bowl (1) Figure 6-13 and secure them with the three support plate screws (14) Figure 6-10.

(k) Before tightening the three screws slip a washer (17) underneath the support plate on each screw.

(l) Check the lubber line assembly (8) Figure 6-10. The lower line must be directly opposite the filling plug hole. Slight adjustment of the lubber line assembly may be made by loosening the two reference line support screws (15) and shifting the lubber line assembly in the direction required to make the proper alignment. Then tighten the screws.

(m) Spread cellulose nitrate lacquer, Specification AN-L-29, on the top rim of the compass bowl (1) Figure 6-13 and the two sides of the newly impregnated gasket (5) Figure 6-7. Re-assemble this gasket, the bottom glass (3), and the gasket (4) in that order.

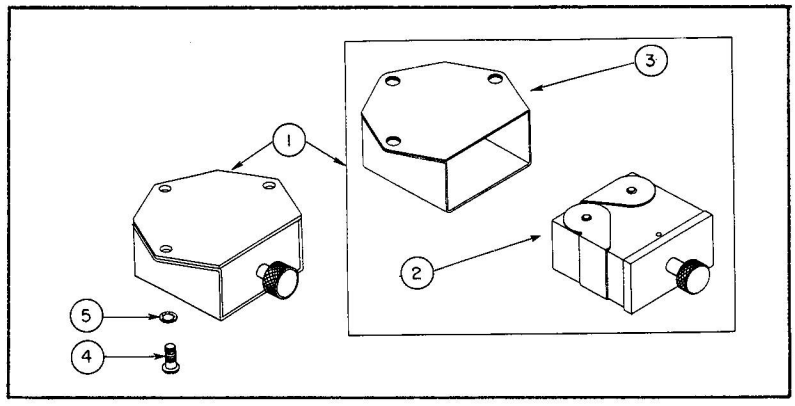
(n) Use an appropriate number of gaskets to provide clearance between the clamp ring (2) Figure 6-7 and the bottom glass (3).

(p) Replace the clamp ring on the compass bowl (1) Figure 6-13, and secure it with the 12 nuts (10) Figure 6-13, 12 lockwashers (12), and 12 screws (6) Figure 6-7, taking care that the two notches on the clamp ring are aligned with the upper lubber line. Tighten the screws and the nuts gradually to avoid cracking the glass.

(q) Now completely refill the compass bowl (1) Figure 6-13 under vacuum pressure with all aircraft compass liquid Specification 3-GP-31.

(1) With the filling hole in an upright position, submerge the bowl on its side in a tank of compass liquid. Place the tank in a vacuum chamber.

(2) Evacuate the chamber to a pressure equivalent to that at 30,000 feet, and maintain this pressure for about an hour, until all bubbling ceases.




1 Compensator Assembly
2 Compensator Drawer Assembly
3 Compensator Case Assembly
4 Compensator Mounting Screw
5 Shakeproof Lockwasher

Figure 6-15 Exploded View - Compass - Compensator Assembly Type D-12 (Pioneer Types 1801-1-A and 1833-1-A)

(3) Remove the tank from the chamber with the bowl still submerged, and replace the housing seal (3) Figure 6-13, the filling plug (5) the filling plug seal (6), the other filling (2), and the filling plug gland (7).

(4) Tighten the filling plug gland as much as possible, taking care not to strip the threads.

(r) For Pioneer types 1801-1-A and 1826-1-A place the shield (4) Figure 6-13 over the compass bowl (1) and secure it in place with the three shield screws (9). The word "AFT" on the shield must be directly over the filling plug gland.

(s) Insert the two clamp screws (6) Figure 6-9 into the two holes in the bezel ring (3), and slip a shim (4) on the end of each clamp screw (6).

(t) Insert a clamp screw pin (5) Figure 6-9 into the hole on the end of each clamp screw.

(u) Place the two locking screws (7) Figure 6-9 into the other two holes of the bezel ring (3).

NOTE

Back out the locking screws and clamp screws a small distance from the bezel ring prior to assembling the bezel ring assembly (1) Figure 6-7 on the clamp ring (2).

(v) Set the dial assembly (1) Figure 6-9 in the bezel ring (3) so that the north-south diameter is in line with the locking screws (7).

(w) Place a gasket (2) Figure 6-9, the top glass (3) Figure 6-8, another gasket (2), and the retainer ring (1) over the dial assembly (1) Figure 6-9. Hold in place with the eight retainer ring screws (4) Figure 6-8. Tighten the screws a half turn each until the retainer ring (1) is secured firmly to the bezel ring (3) Figure 6-9.

(x) Replace the bezel ring assembly (1) Figure 6-7 on the top of the compass bowl (1) Figure 6-14.

(y) To replace the compensator, Pioneer type 1826-1-A:-

(1) Mount compensator mounting bracket (3) Figure 6-14 on the bottom of the compass bowl (1) Figure 6-13 and secure it in place with the three shakeproof lockwashers (5) Figure 6-14 and the three compensating mounting screws (4).

(2) Fit the compensator assembly (1) into the compensator mounting bracket (3), and secure with the four cover screws (6).

(z) On Pioneer types 1801-1-A and 1833-1-A proceed as follows:

(2) Slide the compensator drawer assembly (2) Figure 6-15 into the compensator case assembly (3).

(2) Attach the compensator assembly (1) Figure 6-15 to the bottom of the compass bowl (1) Figure 6-13 with the three compensating mounting screws (4) Figure 6-15 and shakeproof lockwashers (5).

(aa) The compass is now ready for final inspection and test.

PART 7

TABLE OF CONTENTS



PART 7

TEST PROCEDURE

## CONDITIONS

1 Unless otherwise specified, the tests must be made at atmospheric pressure (29.92 inches of mercury), room temperature 20°C (68°F) in a horizontal field strength of approximately 0.18 gauss, and in a vertical field strength of approximately 0.54 gauss in the direction normal in the northern hemisphere. Proper allowance must be made for the deviation from specified conditions when tests are made under conditions varying greatly from the previously stated values.

## COMPASS, TYPE B-17 (Pioneer 1813-1-A AND 1813-1-B

### Card Error Test

2 With the compensator removed from the compass, and with the plane through the lubber line and the center of the pivot post parallel to the magnetic meridian, the compass shall indicate north and south within 1 degree.

3 If the tolerance of 1 degree is exceeded, check to see that the card assembly is aligned with the north-south line of the card magnets. If out of alignment, replace the card and float assembly. (Refer to Part 6, para. 12.)

### Friction Error Test

4 After the card has been magnetically deflected from its position of rest either way by 5 degrees it must return to within 1 degree of its original position without vibration. The compass shall not be tapped during this test.

5 If the tolerance of 1 degree is exceeded and vibration excessive, check the pivot for concentricity and alignment. (Refer to Part 6, para. 6.)

### Balance Test

6 The card shall balance on its pivot so that the plane of the card is within 1 degree of the horizontal.

7 If the tolerance of 1 degree is exceeded rebalance the card assembly (Refer to Part 6, para. 6.)

### Leveling Test

8 When the bowl is in its normal, upright position, the lubber line must be within 1 degree of the vertical.

9 If tolerance of 1 degree is exceeded, re-

align the lubber line by removing and straightening it. (Refer to Part 6, para. 2 (p).)

Card Test (Time 30 Degrees to 5 Degrees)

10 Make this test in a uniform magnetic field, such as that of the earth's, of which the horizontal force does not exceed 0.20 gauss (centimeter-gram-second units). Use a small magnet and deflect magnetically the card 30 degrees from its position of equilibrium. Maintain this position a sufficient length of time for the liquid to come to rest. Release the card and observe accurately the time required for the card to pass through an angle of 25 degrees toward its equilibrium position. Repeat this same test by deflecting the card 30 degrees in the opposite direction. Do not change the position of the compass between observations. The deflection in both directions is to average out any error due to incorrect setting of the lubber line with reference to the equilibrium position of the card. The average time of these observations (both right and left deflections) is termed the "Time 30 degrees to 5 Degrees". The average time of the two observations (right and left deflection) for the card to rotate through an angle of 25 degrees shall not exceed 3.6 seconds nor be less than 3.0 seconds.

11 If these tolerances are exceeded, remagnetize the card magnets. (Refer to Part 6, para. 8.)

Overswing Test

12 Use a small magnet and deflect the card magnetically 30 degrees from its equilibrium position. Hold it long enough in this position for the liquid to come to rest. Then release it and note the overswing of the card in degrees past the equilibrium position. Repeat the test deflecting the card in the opposite direction. The average of the two observations in degrees is termed the "overswing". This test may be combined with the "Time 30 Degrees to 5 Degrees" test. The card should not overswing more than 12 degrees.

13 If the tolerance of 12 degrees is exceeded, remagnetize the card magnets. (Refer to Part 6, para. 8.)

Vibration Test

14 Place the compass on a vibration stand designed to vibrate the instrument at any desired frequency between 500-2,500 cycles per minute. Subject the instrument to vibration, such that a point on the case will describe, in a plane inclined 45 degrees to the horizontal, a circle whose diameter is 0.018 to 0.020 inches. During vibration, the card reading must not vary more than 3 degrees either side of the lubber line from its previbration reading.

15 If the tolerance of 3 degrees is exceeded, check for excessive play between the jewel post and the jewel post support (Refer to Part 6, para. 2 (r) and (s).) Also check the condition of the pivot (Refer to Part 6, para. 6.)

## COMPASS, TYPE B-16 (PIONEER TYPES 1818-1-A, 1818-4-A AND1821-2-A)

NOTE

Refer to Table 6 for test equipment.

Card Error Test

16 With the compensator removed from the compass, and with the plane through the lubber line and the center of the pivot post parallel to the magnetic meridian, the compass shall indicate north and south within 1 degree.

17 If the tolerance of 1 degree is exceeded, check to see that the card assembly is aligned with the north-south line of the card magnets. If out of alignment, replace the card assembly. (Refer to Part 6, para. 24.)

Friction Error Test

18 After the card has been magnetically deflected from its position of rest either way by 5 degrees, it must return to within 1 degree of its original position without vibration. The compass shall not be tapped during this test.

19 If the tolerance of 1 degree is exceeded and vibration excessive, check the pivot for

concentricity and alignment. (Refer to Part 6, para. 18.)

Balance Test

20 The card shall balance on its pivot so that the plane of the card is within 1 degree of the horizontal.

21 If the tolerance of 1 degree is exceeded, rebalance the card assembly. (Refer to Part 6, para. 21.

Leveling Test

22 When the bowl is in its normal, upright position, the lubber line must be within 1 degree of the vertical.

23 If tolerance of 1 degree is exceeded, realign the lubber line by removing and straightening it. (Refer to Part 6, para. 14 (n).)

Card Test (Time 30 Degrees to 5 Degrees)

24 Make this test in a uniform magnetic field, such as that of the earth's of which the horizontal force does not exceed 0.20 gauss (centimeter-gram-second units). Use a small magnet and deflect magnetically the card 30 degrees from its position of equilibrium. Maintain this position a sufficient length of time for the liquid to come to rest. Release the card and observe accurately the time required for the card to pass through an angle of 25 degrees toward its equilibrium position. Repeat this same test by deflecting the card 30 degrees in the opposite direction. Do not change the position of the compass between observations. The deflection in both directions is to average out any error due to incorrect setting of the lubber line with reference to the equilibrium position of the card. The average time of these observations (both right and left deflections) is termed the "Time 30 Degrees to 5 Degrees". The average time of the two observations (right and left deflection) for the card to rotate through an angle of 25 degrees shall not exceed 1.8 seconds nor be less than 1.4 seconds.

(a) If these tolerances are exceeded, remagnetize the card magnets (Refer to Part 6, para. 20.)

Overswing Test

25 Use a small magnet and deflect the card magnetically 30 degrees from its equilibrium position. Hold it long enough in this position for the liquid to come to rest. Then release it and note the overswing of the card in degrees past the equilibrium position. Repeat the test, deflecting the card in the opposite direction. The average of the two observations in degrees is termed the "overswing". This test may be combined with the "Time 30 Degrees to 5 Degrees" test. The card should not overswing more than 15 degrees.

26 If the tolerance of 15 degrees is exceeded remagnetize the card magnets. (Refer to Part 6, para. 20.)

Vibration Test

27 Place the compass on a vibration stand designed to vibrate the instrument at any desired frequency between 500-2,500 cycles per minute. Subject the instrument to vibration such that a point on the case will describe, in a plane inclined 45 degrees to the horizontal, a circle whose diameter is 0.018 to 0.020 inches. During vibration, the card reading must not vary more than 3 degrees either side of the lubber line from its previbration reading.

28 If the tolerance of 3 degrees is exceeded, check for excessive play between the jewel post and the jewel post support. (Refer to Part 6, para. 24 (g).) Also check the condition of the pivot (Refer to Part 6, para. 18.)

## COMPASS, TYPE D-12 (PIONEER TYPES 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A AND 1832-3-A)

Card Error Test

29 With the compensator removed from the compass, and with the plane through the lubber line and the center of the pivot post parallel to the magnetic meridian, the compass shall indicate north and south to within 1 degree.

30 If the tolerance of 1 degree is exceeded, check to see that the card assembly is aligned with the north-south line of the card magnets. If out of alignment, replace the card assembly.

(For Pioneer types 1832-1-A and 1832-3-A, refer to Part 6, para. 34, (e), (f), (g), (h), and (j).) (For Pioneer types 1801-1-A, 1826-1-A and 1833-1-A, refer to Part 6, para. 45, (d), (e), (f), (g), and (h).)

Friction Error Test

31 After the card has been magnetically deflected from its position of rest either way by 5 degrees, it must return to within 1 degree of its original position without vibration. The compass shall not be tapped during this test.

32 If the tolerance of 1 degree is exceeded and vibration excessive, check the pivot for concentricity and alignment. (For Pioneer types 1832-1-A and 1832-3-A, refer to Part 6, para. 30.) (For Pioneer types 1801-1-A, 1826-1-A, and 1833-1-A, refer to Part 6, para. 41.)

Balance Test

33 The card shall balance on its pivot so that the plane of the card is within 1 degree of the horizontal.

34 If the tolerance of 1 degree is exceeded, rebalance the card assembly. (For Pioneer types 1832-1-A and 1832-3-A, refer to Part 6, para. 32.) (For Pioneer types 1801-1-A, 1826-1-A, and 1833-1-A, refer to Part 6, para. 43.)

Leveling Test

35 When the bowl is in its normal position, the plane through the upper and lower lubber lines must be within 1 degree of the vertical.

36 If the tolerance of 1 degree is exceeded, re-align the lubber line. (For Pioneer types 1832-1-A and 1832-3-A, refer to Part 6, para. 34 (1).) (For Pioneer types 1801-1-A, 1826-1-A and 1833-1-A, refer to Part 6, para. 45.)

Card Test

(Time 30 Degrees to 5 Degrees)

37 Make this test in a uniform magnetic field, such as that of the earth's of which the horizontal force does not exceed 0.20 gauss (centimeter-gram-second units). Use a small magnet and deflect magnetically the card 30 degrees from its position of equilibrium. Maintain this position a sufficient length of time for the liquid to come to rest. Release the card and observe accurately the time required for the card to pass through an angle of 25 degrees toward its equilibrium position. Repeat this same test by deflecting the card 30 degrees in the opposite direction. Do not change the position of the compass between observations. The deflection in both directions is to average out any error due to incorrect setting of the lubber line with reference to the equilibrium position of the card. The average time of these observations (both right and left deflections) is termed the "Time 30 Degrees to 5 Degrees". The average time of the two observations (right and left deflection) for the card to rotate through an angle of 25 degrees, shall not exceed 8 seconds nor be less than 5 seconds.

38 If these tolerances are exceeded, remagnetize the card magnets. (For Pioneer types 1832-1-A and 1832-3-A, refer to Part 6, para. 32.) (For Pioneer types 1801-1-A, 1826-1-A, and 1833-1-A, refer to Part 6, para. 43.)

Vibration Test

39 Place the compass on a vibration stand designed to vibrate the instrument at any desired frequency between 500-2,500 cycles per minute. Subject the instrument to vibration such that a point on the case will describe, in a plane inclined 45 degrees to the horizontal, a circle whose diameter is 0.018 to 0.020 inches. During vibration, the card reading must not vary more than 3 degrees either side of the lubber line from its previbration reading.

40 If the tolerance of 3 degrees is exceeded, check the play between the jewel post and the jewel post support. For Pioneer types 1832-1-A and 1832-3-A, refer to Part 6, para 34 (c), (d), and (f). (For Pioneer types 1801-1-A, 1826-1-A, and 1833-1-A, refer to Part 6, para. 45 (b), (d), and (e).) Check the condition of the pivot. (For Pioneer types 1832-1-A and 1832-3-A, refer to Part 6, para. 30.) (For Pioneer types 1801-1-A, 1826-1-A, and 1833-1-A, refer to Part 6, para. 41.)

# PART 8

## PART LIST

PART 8

TABLE OF CONTENTS

# SECTION 1

## INTRODUCTION

1 This Part List contains illustrations and lists of procurable parts used in conjunction with the overhaul of the following magnetic compasses manufactured by the Eclipse-Pioneer Division of Bendix Aviation Corporation, Teterboro, N.J.

TABLE 7

| COMPARATIVE TABLE OF TYPE IDENTIFICATIONS FOR MAGNETIC COMPASSES | |
|---|---|
| Type | Pioneer Type |
| PILOT'S TYPE | |
| B-17 | 1813-1-A |
| B-17 | 1813-1-B |
| B-16 | 1818-1-A |
| B-16 | 1818-4-A |
| B-16 | 1821-2-A |
| NAVIGATOR'S TYPE | |
| D-12 | 1801-1-A |
| | 1826-1-A |
| D-12 | 1832-1-A |
| | 1832-3-A |
| D-12 | 1833-1-A |

2 Section 2, "Group Assembly Part List" consists of a breakdown of the complete units into sub-assemblies and detailed parts.

Figure and Index Number Column

3 In this column the digit preceding the hyphen refers to the Figure in the Part List on which a part or assembly is illustrated. The digits following the hyphen are the index numbers of procurable parts or assemblies. No figure or index number is listed for the article itself.

Part Number Column

4 In this column are listed part numbers, which are the same as drawing numbers, for procurable parts and assemblies.

Nomenclature Column

5 In this column is listed each assembly followed by its components properly indented to show their relationship to the assembly.

Units Per Assembly Column

6 In this column is listed the quantity of parts or assemblies required in the immediately preceding assembly of which the unit is a component part.

Total Quantity and Instrument Type Number Columns

7 Under each Pioneer type number, in the instrument type number columns between "Total Quantity" and "Units per Assembly", is indicated the interchangeability of the parts and assemblies making up that instrument. In the "Total Quantity" column is listed the total quantity of units required in each instrument which is designated by an "X" in the instrument type number column. An "X" in the instrument type number column also indicates that the units per assembly apply to that instrument.

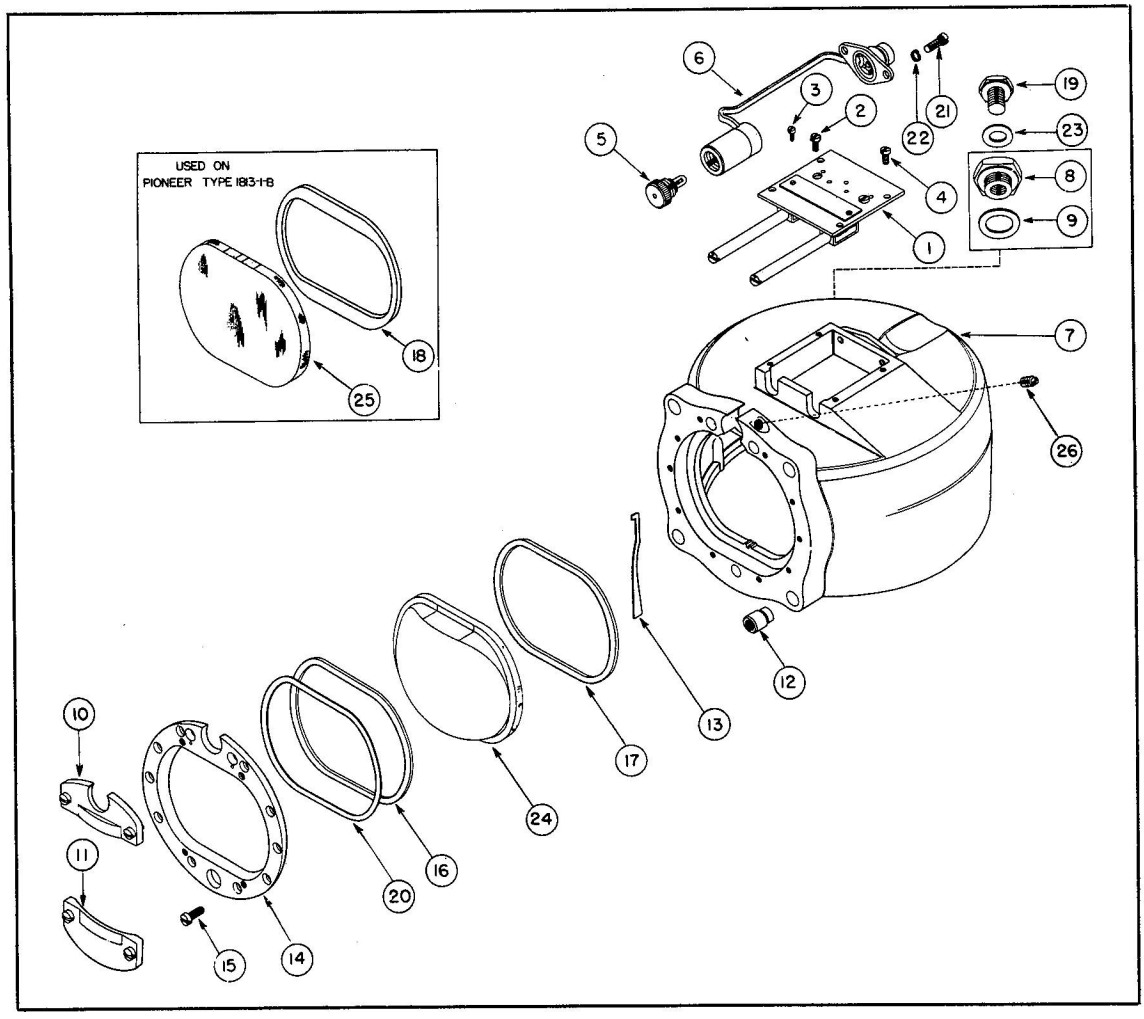



Figure 8-1 Exploded View - Compass - Type B-17 (Pioneer Types 1813-1-A and 1813-1-B)

TYPE B-17 (PIONEER TYPES 1813-1-A AND 1813-1-B)

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE | TOTAL QTY | 1813-1-A | 1813-1-B | UNITS PER ASSY |
|---|---|---|---|---|---|---|
| | | 1 2 3 4 5 6 7 | | | | |
| 8-1 | 1813-1-A | Compass Assembly | 1 | X | | 1 |
| | 1813-1-B | Compass Assembly | 1 | | X | 1 |
| | PC17635 | Compensator Assembly | 1 | X | X | 1 |
| | *PB7716 | Spring - Compensator | 2 | X | X | 2 |
| | *PB5992 | Driver - Compensator | 2 | X | X | 2 |
| | *PB19032 | Bracket Assembly - Compensator | 1 | X | X | 1 |

TYPE B-17 (PIONEER TYPES 1813-1-A AND 1813-1-B) (Cont'd)

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE 1 2 3 4 5 6 7 | TOTAL QTY | 1813-1-A | 1813-1-B | UNITS PER ASSY |
|---|---|---|---|---|---|---|
| 8-1 (Cont'd) | | | | | | |
| | *PC8082 | Bracket - Compensator | 1 | X | X | 1 |
| | *PB8096 | Dowel - Compensator bracket | 2 | X | X | 2 |
| | *PB11902 | Cover - Compensator | 1 | X | X | 1 |
| | *PB6253-5 | Knob - Compensator | 2 | X | X | 2 |
| | *PB6259 | Pin - Knob | 1 | X | X | 1 |
| | *PB12280-1 | Staff Assembly - Upper magnetic | 1 | X | X | 1 |
| | *PB8083 | Staff - Upper magnetic | 2 | X | X | 2 |
| | *PB5998-1 | Magnet - Upper | 2 | X | X | 2 |
| | *PB5993 | Gear - Driven spiral RH | 1 | X | X | 1 |
| | *PB5994 | Gear - Driven spiral LH | 1 | X | X | 1 |
| | *PB12281-1 | Staff Assembly - Lower magnetic | 1 | X | X | 1 |
| | *PB8093 | Staff - Lower magnetic | 2 | X | X | 2 |
| | *PB8094-1 | Magnet - Lower | 2 | X | X | 2 |
| | *PB5993 | Gear - Driven spiral RH | 1 | X | X | 1 |
| | *PB5994 | Gear - Driven spiral LH | 1 | X | X | |
| | *EPO-2103 | Pin - Escutcheon | 2 | X | X | 2 |
| | *PB6733 | Cover - Knob pin | 1 | X | X | 1 |
| | *PB6735 | Gear Assembly - Idler | 1 | X | X | 1 |
| | *PB5995 | Gear - Compensator idler | 1 | X | X | 1 |
| | *PB8086 | Staff - Compensator idler | 1 | X | X | 1 |
| | *PB8214 | Washer - Magnet staff spacing | 2 | X | X | 2 |
| -2 | FFILO-302TE | Screw - Bracket | 2 | X | X | 2 |
| -3 | FILO-001 1/2TE | Screw - Specification plate | 2 | X | X | 2 |
| -4 | FFILO-303TE | Screw - Compensator | 4 | X | X | 4 |
| -5 | PB25833-1 | Lamp Assembly | 1 | X | X | 1 |
| -6 | PC14184-37 | Tube and Plug Assembly | 1 | X | X | 1 |
| -7 | PE17431 | Bowl - Compass | 1 | X | X | 1 |
| -8 | PB17432 | Insert - Filling hole | 1 | X | X | 1 |
| -9 | PB14005 | Seal - Lead | 1 | X | X | 1 |
| -10 | PB17629-1 | Cover Assembly - Top | 1 | X | | 1 |
| -10 | PB19125-1 | Cover Assembly - Top | 1 | | X | 1 |
| -11 | PB17629-2 | Cover Assembly - Bottom | 1 | X | | 1 |
| -11 | PB19125-2 | Cover Assembly - Bottom | 1 | | X | 1 |
| -12 | PB11865 | Nut - Stop | 4 | X | X | 4 |
| -13 | PB17433 | Line - Lubber | 1 | X | X | 1 |
| -14 | PC17404-1 | Bezel | 1 | X | | 1 |
| -14 | PC19123-1 | Bezel | 1 | | X | 1 |
| -15 | PB14756-2 | Screw - Bezel | 10 | X | X | 10 |
| -16 | PB17409 | Gasket - Lens | 1 | X | | 1 |
| -16 | PB23540-1 | Gasket - Lens | 1 | | X | 1 |
| -17 | PB17410 | Gasket - Bowl | 1 | X | | 1 |
| -17 | PB23541-1 | Gasket Bowl | 1 | | X | 1 |

TYPE B-17 (PIONEER TYPES 1813-1-A AND 1813-1-B) (Cont'd)

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE 1 2 3 4 5 6 7 | TOTAL QTY | 1813-1-A | 1813-1-B | UNITS PER ASSY |
|---|---|---|---|---|---|---|
| 8-1 (Cont'd) | | | | | | |
| -18 | PB23444-1 | Spacer | 1 | | X | 1 |
| -19 | PB17434 | Cap - Filling hole | 1 | X | X | 1 |
| -20 | PB17678 | Shim | AR | X | | AR |
| -20 | PB19135 | Shim | AR | | X | AR |
| -21 | PB14756-1 | Screw - Plug mounting | 2 | X | X | 2 |
| -22 | LWO-4C | Washer - Plug mounting lock | 2 | X | X | 2 |
| -23 | 56-74 | Gasket | 1 | X | X | 1 |
| -24 | PC18122 | Lens - Compass | 1 | X | | 1 |
| -25 | PB19139 | Glass | 1 | | X | 1 |
| -26 | PB14153 | Setscrew | 1 | X | X | 1 |

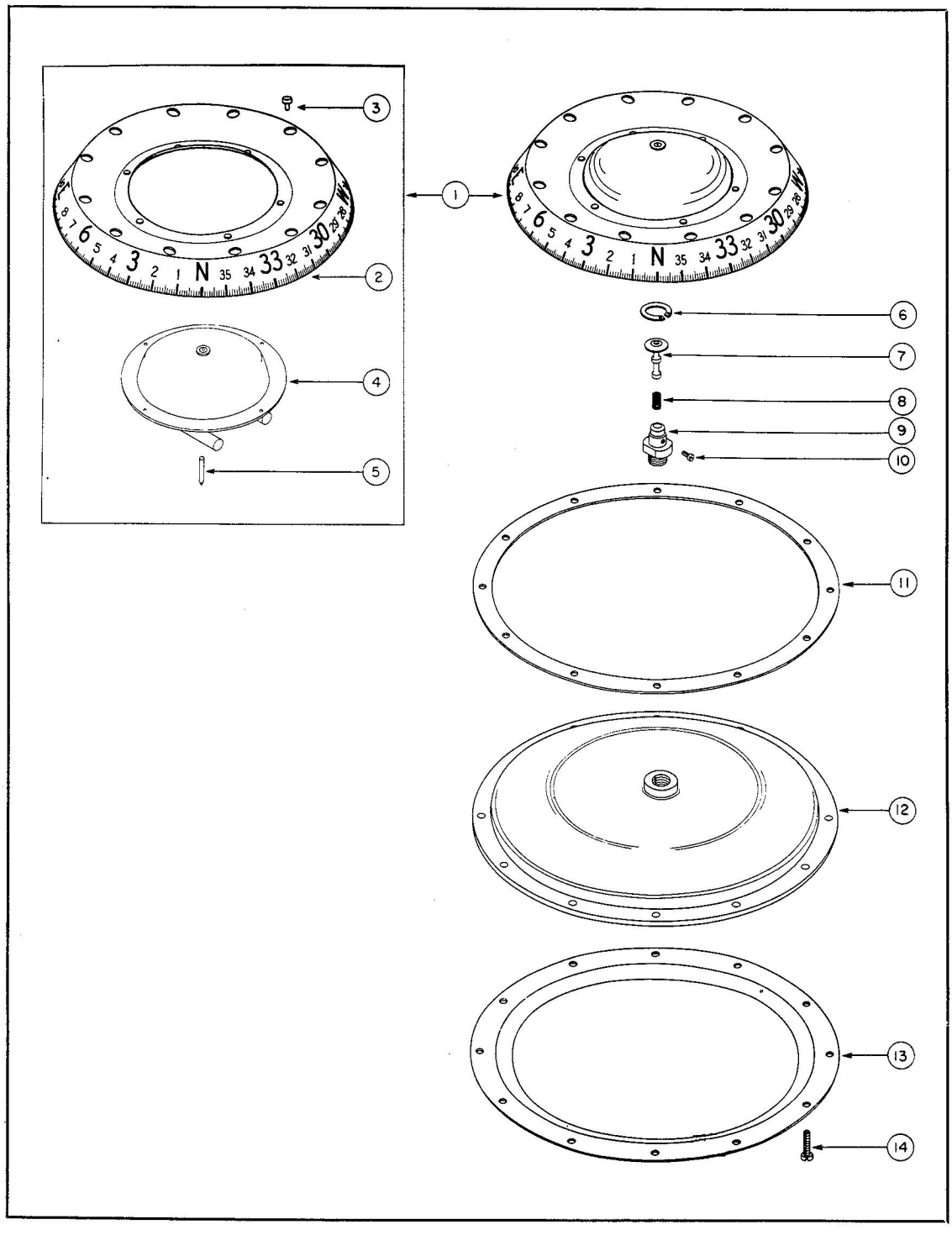



Figure 8-2 Exploded View - Compass - Card and Float Assembly and Attaching Parts - Type B-17 (Pioneer Types 1813-1-A and 1813-1-B)

TYPE B-17 (PIONEER TYPES 1813-1-A AND 1813-1-B) (Cont'd)

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE | TOTAL QTY | 1813-1-A | 1813-1-B | UNITS PER ASSY |
|---|---|---|---|---|---|---|
| | | 1 2 3 4 5 6 7 | | | | |
| 8-2 | | | | | | |
| -1 | PB17148 | Card and Float Assembly | 1 | X | X | 1 |
| -2 | PB23366-1 | Card - Compass | 1 | X | X | 1 |
| -3 | ACC-38 | Rivet - Tubular | 6 | X | X | 6 |
| -4 | PB23026 | Float Assembly | 1 | X | X | 1 |
| -5 | PB14007 | Pivot | 1 | X | X | 1 |
| -6 | PB17118 | Ring - Retainer | 1 | X | X | 1 |
| -7 | PB41494-1 | Post Assembly - Jewel | 1 | X | X | 1 |
| -8 | PB17120 | Spring - Jewel post | 1 | X | X | 1 |
| -9 | PB26295-1 | Support - Jewel post | 1 | X | X | 1 |
| -10 | FILO-001 1/4T | Screw - Jewel post | 1 | X | | 1 |
| -10 | PB50326-1 | Screw - Jewel post | 1 | | X | 1 |
| -11 | PB17429 | Gasket - Base | 1 | X | X | 1 |
| -12 | PB25980-1 | Chamber Assembly - Expansion | 1 | X | X | 1 |
| -13 | PB17414 | Cover - Base | 1 | X | X | 1 |
| -14 | FFILO-404 1/2TE | Screw - Base | 12 | X | X | 12 |

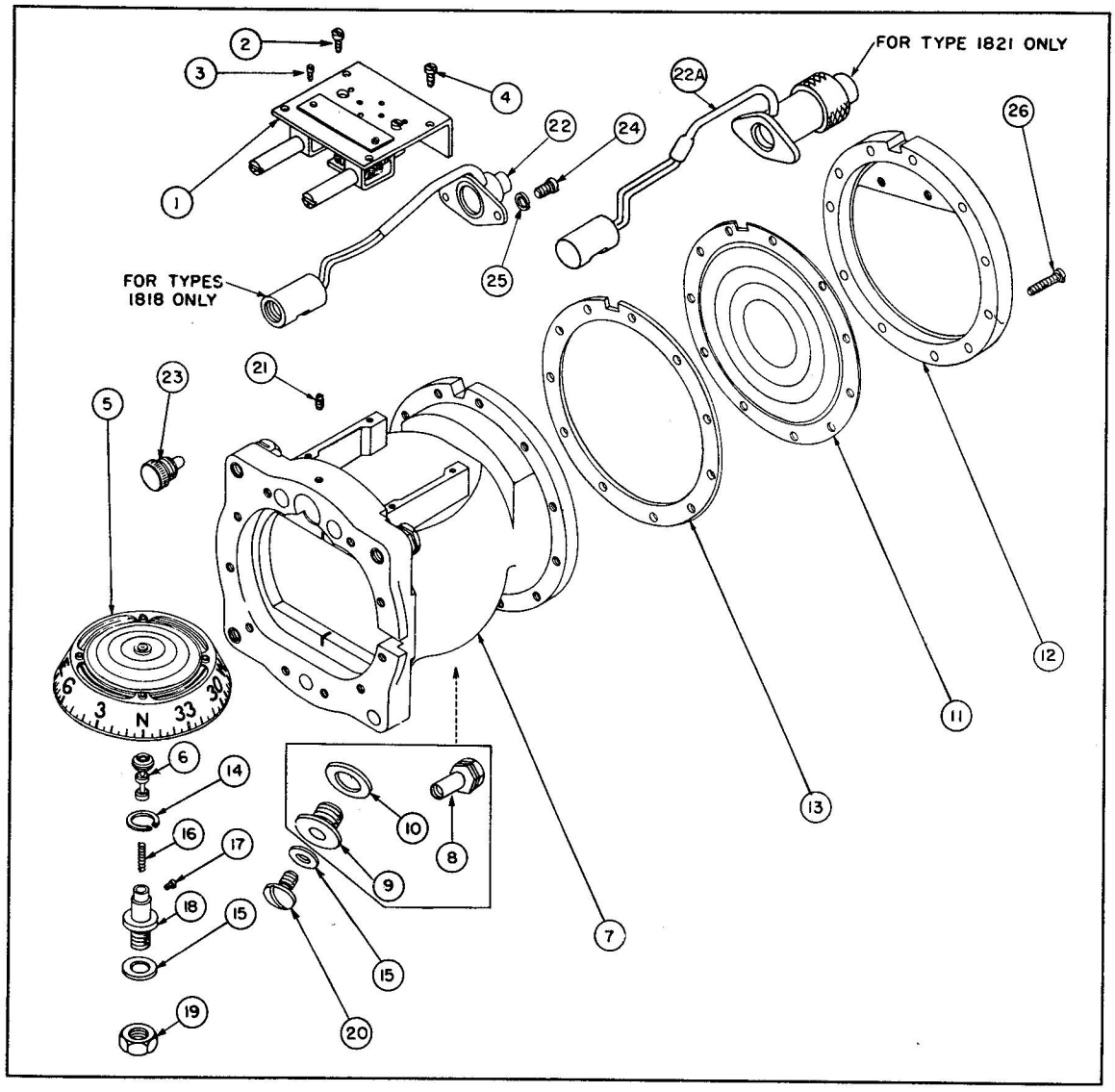



Figure 8-3 Exploded View - Compass - Type B-16 (Pioneer Types 1818-1-A, 1818-4-A, and 1821-2-A

TYPE B-16 (PIONEER TYPES 1818-1-A, 1818-4-A, AND 1821-2-A)

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE 1 2 3 4 5 6 7 | TOTAL QTY | 1818-1-A | 1818-4-A | 1821-2-A | UNITS PER ASSY |
|---|---|---|---|---|---|---|---|
| 8-3 | 1818-1-A | Compass Assembly | 1 | X | | | 1 |
| | 1818-4-A | Compass Assembly | 1 | | X | | 1 |
| | 1821-2-A | Compass Assembly | 1 | | | X | 1 |
| -1 | PC6280-1 | Compensator Assembly | 1 | X | X | X | 1 |
| | *PB19032 | Bracket Assembly - Compensator | 1 | X | X | X | 1 |
| | *PB8096 | Dowel - Compensator bracket | 2 | X | X | X | 2 |
| | *PC8082 | Bracket - Compensator | 1 | X | X | X | 1 |
| | *PB12280-1 | Staff - Assembly - Upper magnet | 1 | X | X | X | 1 |
| | *PB8083 | Staff - Upper magnet | 2 | X | X | X | 2 |
| | *PB5998-1 | Magnet - upper | 2 | X | X | X | 2 |
| | *PB5993 | Gear - Driven spiral RH | 1 | X | X | X | 1 |
| | *PB5994 | Gear - Driven spiral LH | 1 | X | X | X | 1 |
| | *PB12281-1 | Staff Assembly - Lower magnet | 1 | X | X | X | 1 |
| | *PB8093 | Staff - Lower magnet | 2 | X | X | X | 2 |
| | *PB8094-1 | Magnet - Lower | 2 | X | X | X | 2 |
| | *PB5993 | Gear - Driven spiral RH | 1 | X | X | X | 1 |
| | *PB5994 | Gear - Driven spiral LH | 1 | X | X | X | 1 |
| | *PB7716 | Spring - Compensator | 2 | X | X | X | 2 |
| | *PB5992 | Driver - Compensator | 2 | X | X | X | 2 |
| | *PC6197-3 | Cover - Compensator | 1 | X | X | X | 1 |
| | *PB6253-6 | Knob - Compensator | 1 | X | X | X | 1 |
| | *PB6259 | Pin - Knob | 1 | X | X | X | 1 |
| | *EPO-2103 | Pin - Escutcheon | 2 | X | X | X | 2 |
| | *PB6733 | Cover - Knob pin | 1 | X | X | X | 1 |
| | *PB6735 | Gear Assembly - Idler | 1 | X | X | X | 1 |
| | *PB5995 | Gear - Compensator idler | 1 | X | X | X | 1 |
| | *PB8086 | Staff - Compensator idler gear | 1 | X | X | X | 1 |
| | *PB8214 | Washer - Magnet staff spacing | AR | X | X | X | AR |
| -2 | FFILO-302TE | Screw - Bracket | 2 | X | X | X | 2 |
| -3 | FFILO-001 1/2TE | Screw - Specification plate | 2 | X | X | X | 2 |
| -4 | FFILO-303TE | Screw - Compensator | 4 | X | X | X | 4 |
| -5 | PB17151-2 | Card Assembly | 1 | X | X | | 1 |
| -5 | PB17151-1 | Card Assembly | 1 | | | X | 1 |
| -6 | PB41494-1 | Post Assembly - Jewel | 1 | X | X | X | 1 |
| -7 | PB14155-2 | Bowl and Stop Nut Assembly | 1 | X | X | X | 1 |
| -8 | O-607-10 | Stop Nut | 4 | X | X | X | 4 |
| -9 | PB14031 | Insert - Filling hole | 1 | X | X | X | 1 |
| -10 | PB14005 | Seal - Lead | 1 | X | X | X | 1 |
| -11 | PB26438-1 | Diaphragm | 1 | X | X | X | 1 |
| -12 | PC14144 | Cover - Back | 1 | X | X | X | 1 |
| -13 | PB14152 | Gasket | 1 | X | X | X | 1 |

TYPE B-16 (PIONEER TYPES 1818-1-A, 1818-4-A, AND 1821-2-A) (Cont'd)

| FIGURE AND INDEX NUMBER | PART | NOMENCALATURE | TOTAL QTY | 1818-1-A | 1818-4-A | 1821-2-A | UNITS PER ASSY |
|---|---|---|---|---|---|---|---|
| | | 1 2 3 4 5 6 7 | | | | | |
| 8-3 (Cont'd) | | | | | | | |
| -14 | PB17118 | Ring - Retainer | 1 | X | X | X | 1 |
| -15 | 56-74 | Washer | 2 | X | X | X | 2 |
| -16 | PB24106-1 | Spring - Jewel post | 1 | X | X | X | 1 |
| -17 | PB50326-1 | Screw - Jewel post | 1 | X | X | X | 1 |
| -18 | PB26292-1 | Support - Jewel post | 1 | X | X | X | 1 |
| -19 | NO-16B | Nut | 1 | X | X | X | 1 |
| -20 | 356B-57 | Cap - Filling hole | 1 | X | X | X | 1 |
| -21 | PB14153 | Setscrew | 1 | X | X | X | 1 |
| -22 | PC17122-1 | Tube and Plug Assembly | 1 | X | | | 1 |
| -22 | PC25223-1 | Tube and Plug Assembly | 1 | | X | | 1 |
| -22A | PC19706 | Lighting System and Bracket Assembly | 1 | | | X | 1 |
| -23 | PB25833-1 | Lamp Assembly | 1 | X | X | | 1 |
| -23 | PB25833-1 | Lamp Assembly | 2 | | | X | 2 |
| -24 | FFILO-403TE | Screw - Plug mounting | 2 | X | X | X | 2 |
| -25 | LWO-4C | Washer - Plug mounting lock | 2 | X | X | X | 2 |
| -26 | FFILO-408TE | Screw | 11 | X | X | X | 11 |

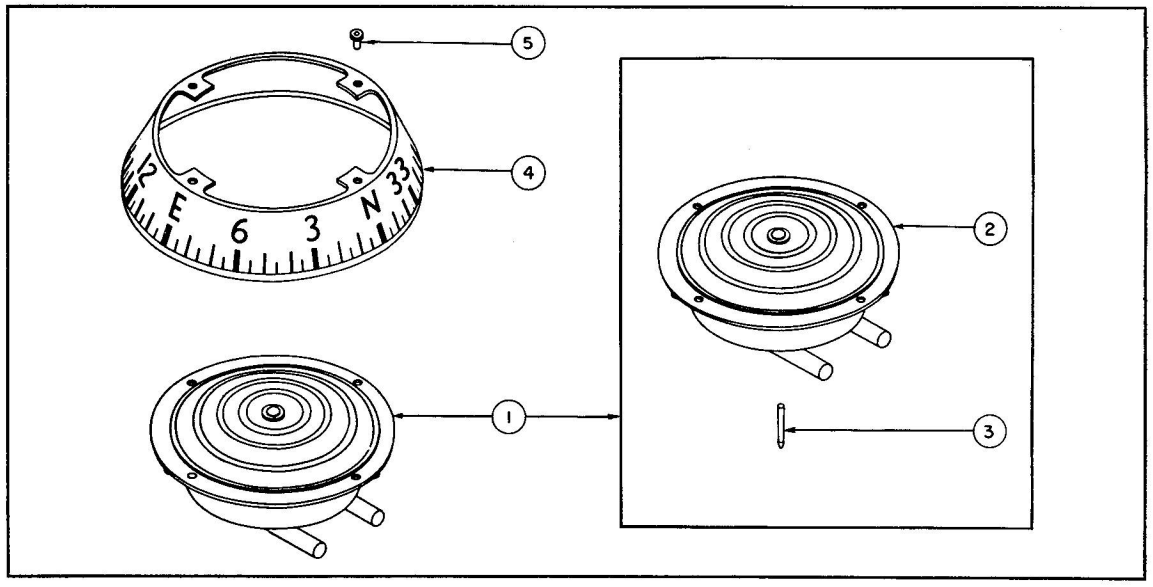



Figure 8-4 Exploded View - Compass - Card Assembly - Type B-16
(Pioneer Types 1818-1-A, 1818-4-A, and 1821-2-A)

TYPE B-16 (PIONEER TYPES 1818-1-A, 1818-4-A, AND 1821-2-A) (Cont'd)

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE | TOTAL QTY | 1818-1-A | 1818-4-A | 1821-2-A | UNITS PER ASSY |
|---|---|---|---|---|---|---|---|
| | | 1 2 3 4 5 6 7 | | | | | |
| 8-4 | | | | | | | |
| -1 | PB17116 | Float and Pivot Assembly | 1 | X | X | X | 1 |
| -2 | PB17484 | Float Assembly | 1 | X | X | X | 1 |
| -3 | PB14007 | Pivot | 1 | X | X | X | 1 |
| -4 | PB23352-1 | Card | 1 | X | X | | 1 |
| -4 | PB23352-3 | Card | 1 | | | X | 1 |
| -5 | ACC-38 | Rivet - Tubular | 4 | X | X | X | 4 |

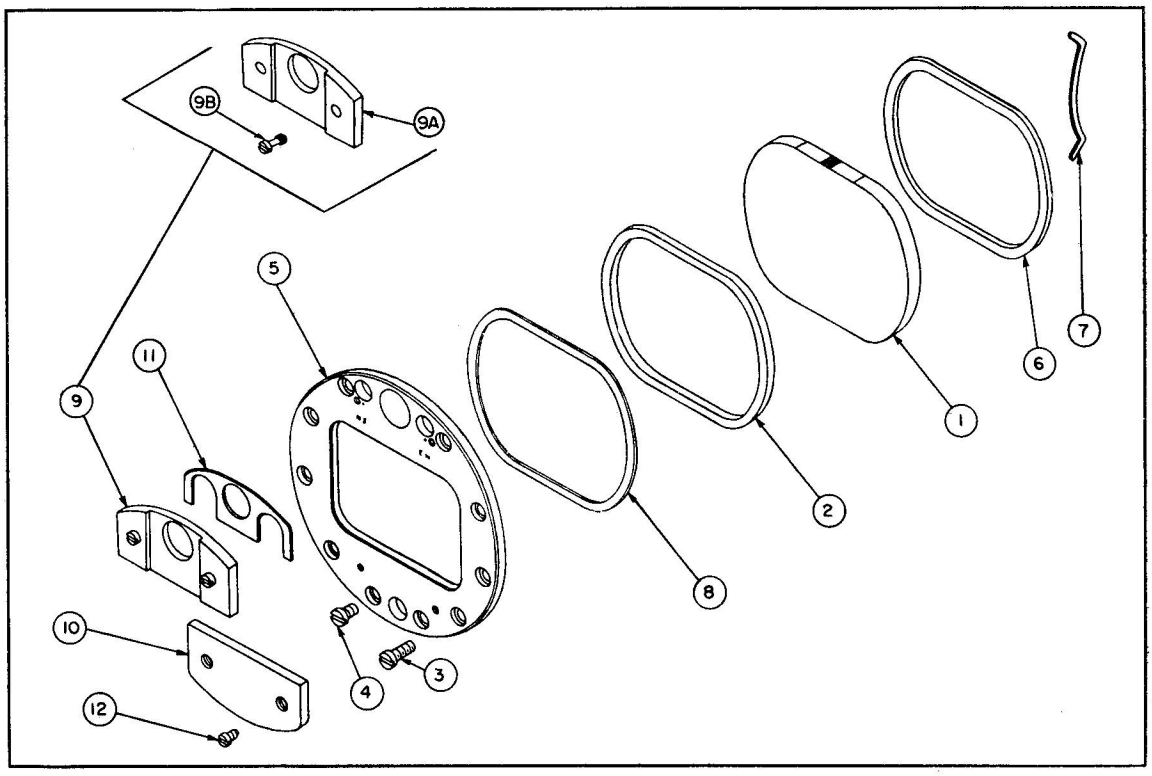



Figure 8-5 Exploded View - Compass - Bezel and Attaching Parts - Type B-16, (Pioneer Types 1818-1-A, 1818-4-A and 1821-1-A)

TYPE B-16 (PIONEER TYPES 1818-1-A, 1818-4-A, AND 1821-2-A) (Cont'd)

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE 1 2 3 4 5 6 7 | TOTAL QTY | 1818-1-A | 1818-4-A | 1821-2-A | UNITS PER ASSY |
|---|---|---|---|---|---|---|---|
| 8-5 | | | | | | | |
| -1 | PB19442-1 | Lens - Painted compass | 1 | X | X | | 1 |
| -1 | PB19422-2 | Lens - Painted compass | 1 | | | X | 1 |
| -2 | PC6199-5 | Gasket - Lens | 1 | X | X | | 1 |
| -2 | PC6199-5 | Gasket - Lens | 3 | | | X | 3 |
| -3 | PB6724-1 | Screw - Bezel | 8 | X | X | X | 8 |
| -4 | PB6724-2 | Screw - Bezel | 2 | X | X | X | 2 |
| -5 | PC19085-1 | Bezel | 1 | X | X | X | 1 |
| -6 | PB14177 | Gasket - Bowl | 1 | X | X | | 1 |
| -7 | PB19078-1 | Line - Lubber | 1 | X | X | X | 1 |
| -8 | PB11311 | Shim | AR | X | X | X | AR |
| -9 | PB19131 | Cover Assembly - Top | 1 | X | X | X | 1 |
| -9A | PB19132 | Cover - Top | 1 | | | X | 1 |
| -9B | PB17438 | Screw | 2 | | | X | 2 |
| -10 | PB19133-1 | Cover - Lower | 1 | X | X | | 1 |
| -10 | PB19133-2 | Cover - Lower | 1 | | | X | 1 |
| -11 | PB14643 | Seal - Light | 1 | X | X | X | 1 |
| -12 | FFILO-302TE | Screw | 2 | X | X | X | 2 |

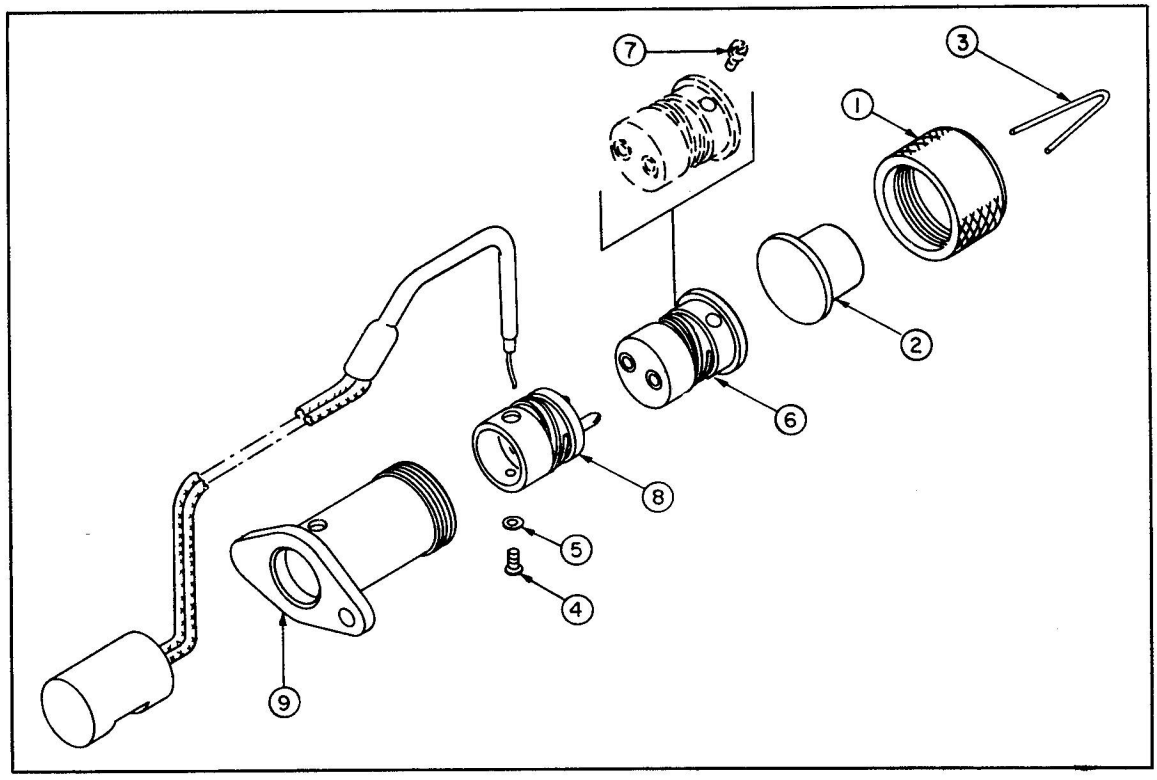



Figure 8-6 Exploded View - Compass - Lighting System and Bracket Assembly Type B-16 (Pioneer Type 1821-2-A)

TYPE B-16 (PIONEER TYPES 1818-1-A, 1818-4-A, AND 1821-2-A) (Cont'd)

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE | TOTAL QTY | 1821-2-A | UNITS PER ASSY |
|---|---|---|---|---|---|
| | | 1 2 3 4 5 6 7 | | | |
| 8-6 | | | | | |
| -1 | AN3054-4 | Nut - Conduit | 1 | X | 1 |
| -2 | AN3050-4 | Ferrule | 1 | X | 1 |
| -3 | PB50250 | Wire - Pull out | 1 | X | 1 |
| -4 | RO-001 1/2TE | Screw | 1 | X | 1 |
| -5 | WO-0N | Washer | 1 | X | 1 |
| -6 | PB19292-1 | Plug Assembly - Female | 1 | X | 1 |
| -7 | FFILO-202 1/2 | Screw | 2 | X | 2 |
| -8 | PB13288 | Plug Assembly - Male | 1 | X | 1 |
| -9 | PB16769 | Tube and Housing Assembly | 1 | X | 1 |

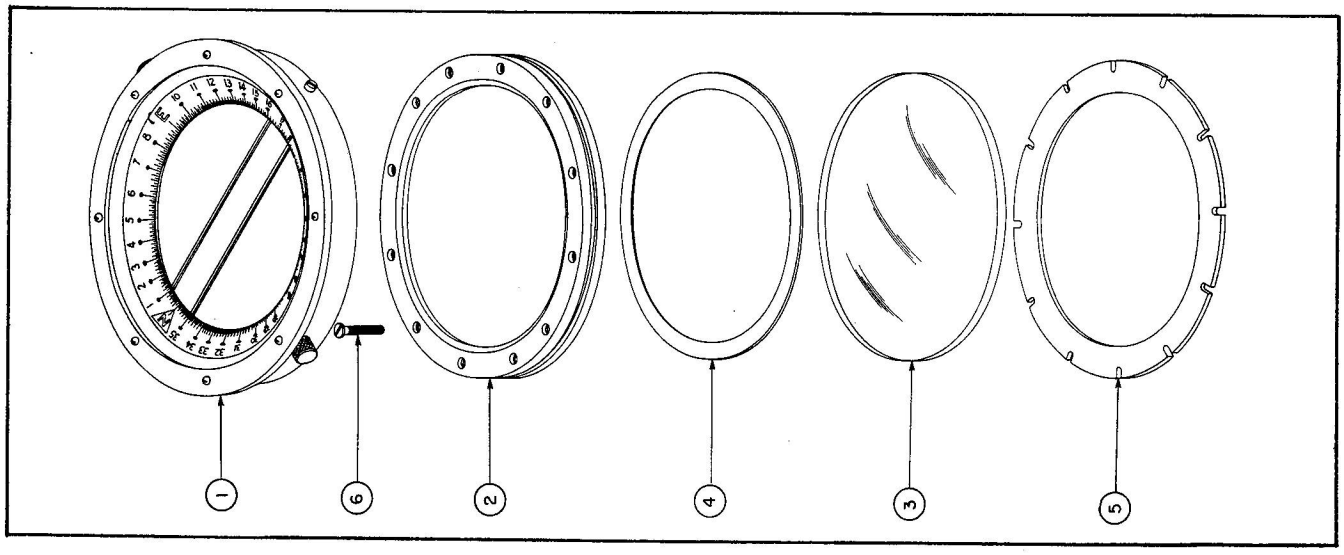



Figure 8-7. Exploded View - Compass - Type D-12 (Pioneer Types 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A and 1832-3-A

TYPE D-12 (PIONEER TYPES 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A AND 1832-3-A)

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE | TOTAL QTY | 1801-1-A | 1826-1-A | 1832-1-A | 1832-3-A | 1833-1-A | UNITS PER ASSY |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 2 3 4 5 6 7 | | | | | | | |
| 8-7 | 1801-1-A | | | | | | | | |
| | | Compass Assembly | 1 | X | | | | | 1 |
| | 1826-1-A | Compass Assembly | 1 | | X | | | | 1 |
| | 1832-1-A | Compass Assembly | 1 | | | X | | | 1 |
| | 1832-3-A | Compass Assembly | 1 | | | | X | | 1 |
| | 1833-1-A | Compass Assembly | 1 | | | | | X | 1 |
| -1 | PC1899-1 | Ring Assembly - Bezel | 1 | X | | | | | 1 |
| -1 | PC1899-2 | Ring Assembly - Bezel | 1 | | X | | | | 1 |
| -1 | PC25678-1 | Ring Assembly - Bezel | 1 | | | X | | | 1 |
| -1 | PC25678-2 | Ring Assembly - Bezel | 1 | | | | X | | 1 |
| -1 | PC26009-1 | Ring Assembly - Bezel | 1 | | | | | X | 1 |
| -2 | PC1903-1 | Ring - Clamp | 1 | X | X | X | X | X | 1 |
| -3 | PB1905 | Glass - Bottom | 1 | X | X | X | X | X | 1 |
| -4 | PB1907 | Gasket | AR | X | X | X | X | X | AR |
| -5 | PB1920 | Gasket | 1 | X | X | X | X | X | 1 |
| -6 | FFILO-614TE | Screw | 12 | X | X | | | | 12 |
| -6 | FFILO-614B | Screw | 12 | | | X | X | | 12 |
| -6 | FFILO-613TE | Screw | 12 | | | | | X | 12 |

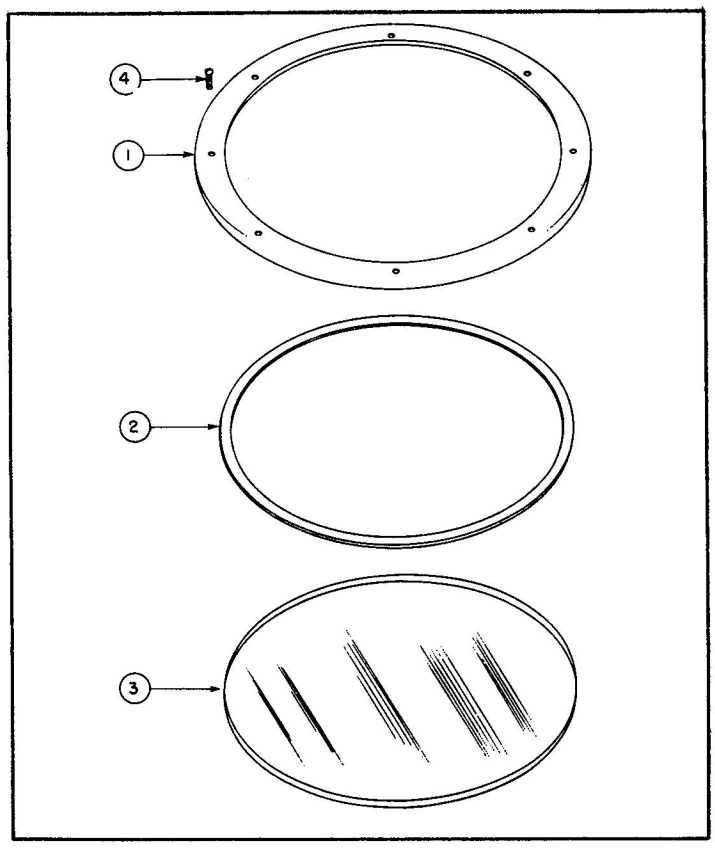



Figure 8-8 Exploded View - Compass - Bezel Ring Assembly Type D-12
(Pioneer Types 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A and 1832-3-A)

TYPE D-12 (PIONEER TYPES 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A AND 1832-3-A) (Cont'd

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE | TOTAL QTY | 1801-1-A | 1826-1-A | 1832-1-A | 1832-3-A | 1833-1-A | UNITS PER ASSY |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 2 3 4 5 6 7 | | | | | | | |
| 8-8 | | | | | | | | | |
| -1 | PC595 | Ring - Retainer | 1 | X | X | | | X | 1 |
| -1 | PC25680-1 | Ring - Retainer | 1 | | | X | X | | 1 |
| -2 | PB596 | Gasket | 2 | X | X | X | X | X | 2 |
| -3 | PB1904 | Glass - Top | 1 | X | X | X | X | X | 1 |
| -4 | FILO-003TE | Screw - Retainer ring | 8 | X | X | | | X | 8 |
| -4 | RO-203E | Screw - Retainer ring | 8 | | | X | X | | 8 |

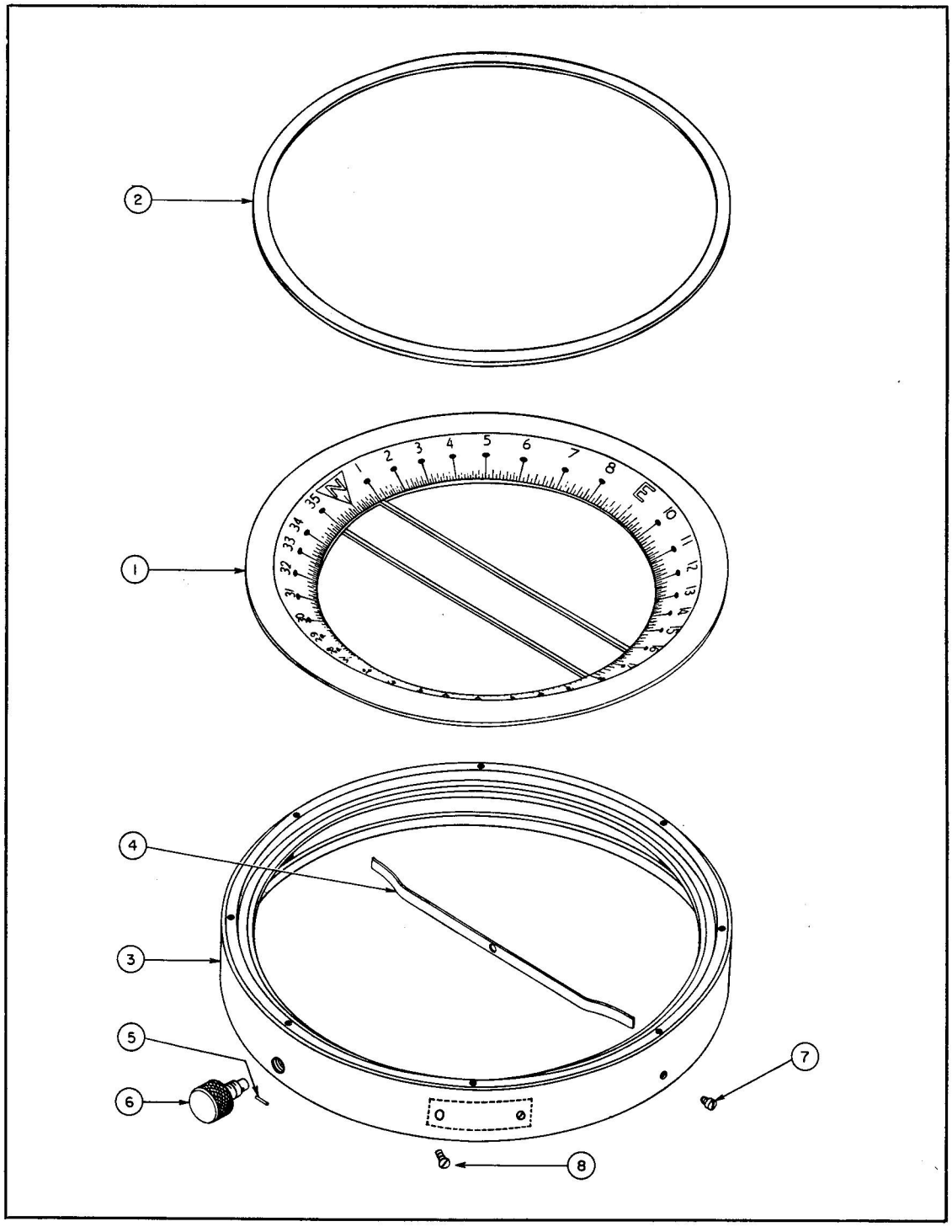



Figure 8-9 Exploded View - Compass - Bezel Ring Assembly - Type D-12
(Pioneer Types 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A and 1832-3-A)

TYPE D-12 (PIONEER TYPES 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A AND 1832-3-A) (Cont'd

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE 1 2 3 4 5 6 7 | TOTAL QTY | 1801-1-A | 1826-1-A | 1832-1-A | 1832-3-A | 1833-1-A | UNITS PER ASSY |
|---|---|---|---|---|---|---|---|---|---|
| 8-9 | | | | | | | | | |
| -1 | PC8036-1 | Dial Assembly | 1 | X | X | | X | X | 1 |
| -1 | PC8036-2 | Dial Assembly | 1 | | | | X | | 1 |
| -2 | PB596 | Gasket | 2 | X | X | X | X | X | 2 |
| -3 | PC1902 | Ring - Bezel | 1 | X | X | | | | 1 |
| -3 | PC25679-1 | Ring Bezel | 1 | | | X | X | | 1 |
| -3 | PC26010-1 | Ring - Bezel | 1 | | | | | X | 1 |
| -4 | PB9423 | Shim | 2 | X | X | X | X | X | 2 |
| -5 | PB578 | Pin - Clamp screw | 2 | X | X | X | X | X | 2 |
| -6 | PB602 | Screw - Clamp | 2 | X | X | X | X | X | 2 |
| -7 | PB603 | Screw - Locking | 2 | X | X | X | X | X | 2 |
| -8 | RO-202TE | Screw - Name plate | 2 | | | | | X | 2 |

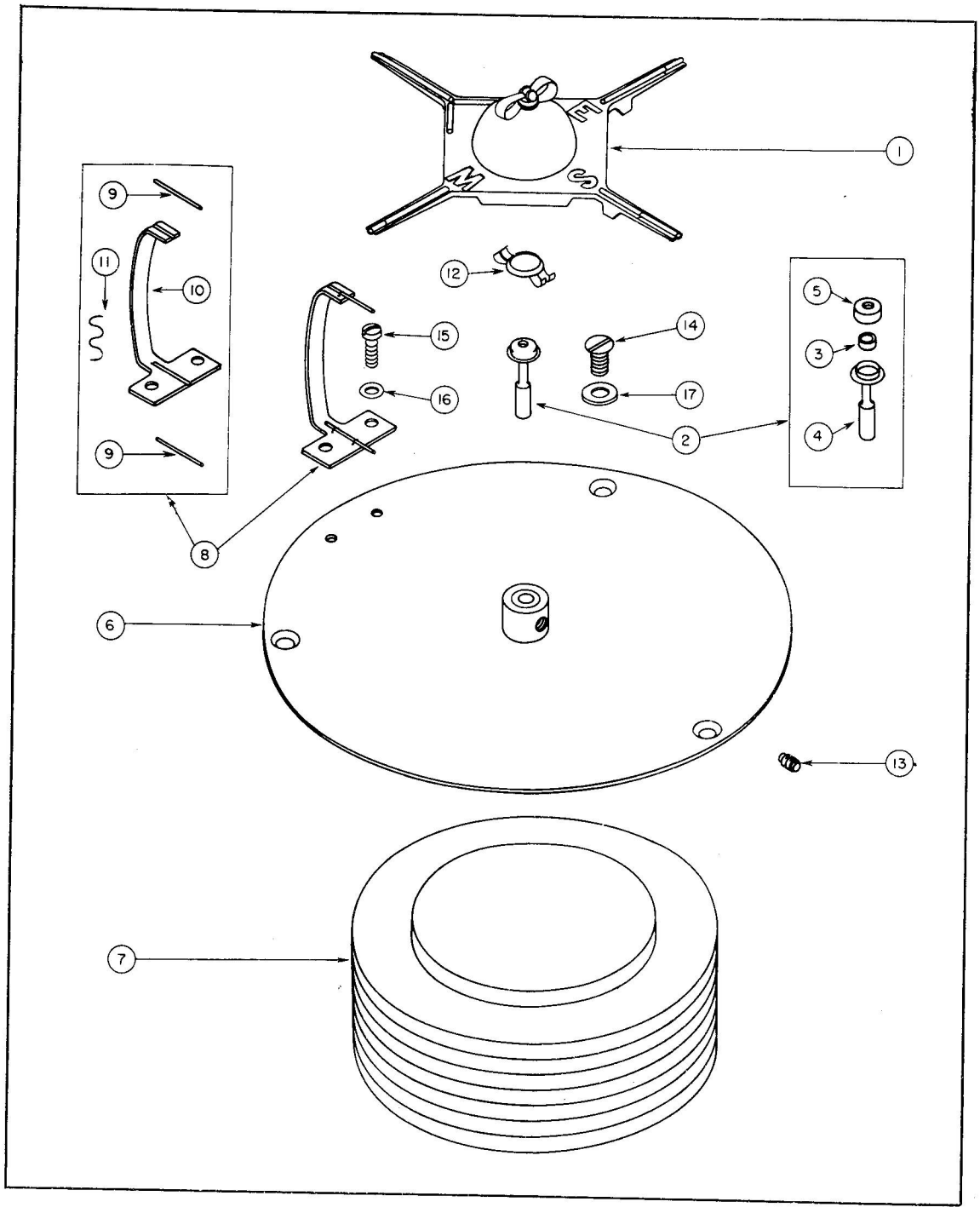



Figure 8-10 Exploded View - Compass - Card, Float, and Pivot Assembly, and Attaching Parts - Type D-12 (Pioneer Types 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A and 1832-3-A)

TYPE D-12 (PIONEER TYPES 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A AND 1832-3-A) (Cont'd)

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE | TOTAL QTY | 1801-1-A | 1826-1-A | 1832-1-A | 1832-3-A | 1833-1-A | UNITS PER ASSY |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 2 3 4 5 6 7 | | | | | | | |
| 8-10 | | | | | | | | | |
| -1 | PC7635-1 | Card, Float, and Pivot Assembly | 1 | X | X | X | X | X | 1 |
| -2 | PB8119 | Post Assembly - Jewel | 1 | X | X | | | X | 1 |
| -2 | PB39449-1 | Post Assembly - Jewel | 1 | | | X | X | | 1 |
| -3 | ACC-41 | Jewel | 1 | X | X | X | X | X | 1 |
| -4 | PB8120 | Post - Jewel | 1 | X | X | X | X | X | 1 |
| -5 | PB8179 | Cap - Jewel retainer | 1 | X | X | | | X | 1 |
| -5 | PB36483-1 | Cap - Jewel retainer | 1 | | | X | X | | 1 |
| -6 | PB7637 | Plate Assembly - Support | 1 | X | X | X | X | X | 1 |
| -7 | PB7631 | Sylphon Assembly | 1 | X | X | X | X | X | 1 |
| -8 | PB8163-1 | Line Assembly - Lubber | 1 | X | X | | | X | 1 |
| -8 | PB34598-1 | Line Assembly - Lubber | 1 | | | X | X | | 1 |
| -9 | PB839-1 | Line - Lubber | 2 | X | X | X | | X | 1 |
| -9 | PB839-2 | Line - Lubber | 2 | | | | X | | 1 |
| -10 | PB7633 | Support - Lubber line | 1 | X | X | | | X | 1 |
| -10 | PB34597-1 | Support - Lubber line | 1 | | | X | X | | 1 |
| -11 | PB5199 | Wire -Lubber line | AR | X | X | X | X | X | AR |
| -12 | PB7636 | Spring - Pivot retainer | 1 | X | X | X | X | X | 1 |
| -13 | PB667-2 | Screw - Jewel post | 1 | X | X | X | X | X | 1 |
| -14 | FO-604TE | Screw - Support plate | 3 | X | X | | | X | 3 |
| -14 | FO-605TE | Screw - Support plate | 3 | | | X | X | | 3 |
| -15 | FFILO-202 1/2TE | Screw - Reference line support | 2 | X | X | X | X | X | 2 |
| -16 | WO-2T | Washer | 4 | X | X | | | X | 4 |
| -16 | WO-2TE | Washer | 4 | | | X | X | | 4 |
| -17 | WO-6T | Washer | 3 | X | X | | | X | 3 |

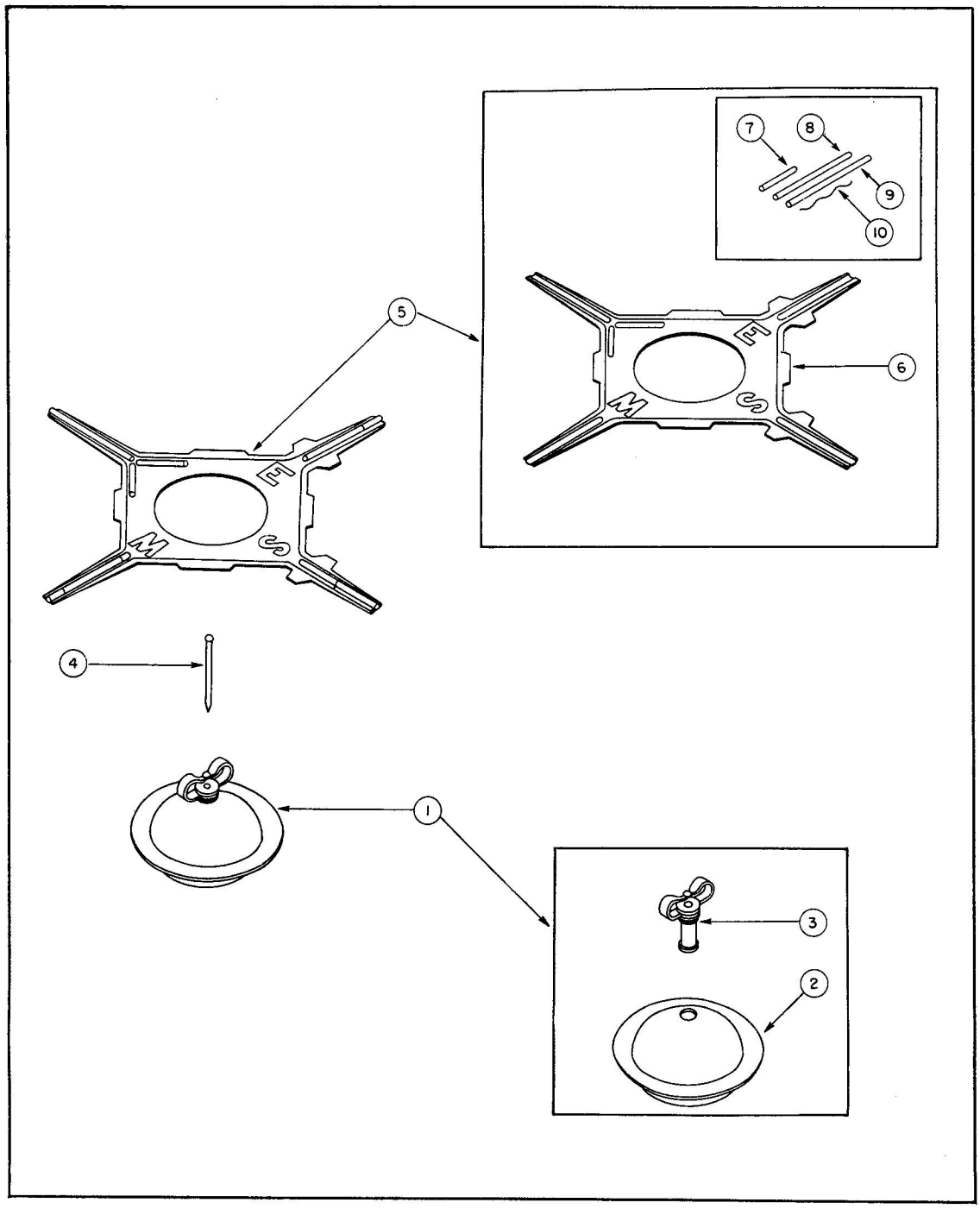



Figure 8-11 Exploded View - Compass - Card, Float, And Pivot Assembly - Type D-12
(Pioneer Types 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A and 1832-3-A)

TYPE D-12 (PIONEER TYPES 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A AND 1832-3-A) (Cont'd)

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE | TOTAL QTY | 1801-1-A | 1826-1-A | 1832-1-A | 1832-3-A | 1833-1-A | UNITS PER ASSY |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 2 3 4 5 6 7 | | | | | | | |
| 8-11 | | | | | | | | | |
| -1 | PB13994 | Float and Sleeve Assembly | 1 | X | X | X | X | X | 1 |
| -2 | PB8116 | Float Assembly | 1 | X | X | X | X | X | 1 |
| -3 | PB8117 | Sleeve Assembly - Pivot | 1 | X | X | X | X | X | 1 |
| -4 | PB26693-1 | Pivot | 1 | X | X | X | X | X | 1 |
| -5 | PC33721-1 | Card Assembly | 1 | X | X | X | X | X | 1 |
| -5 | PC33721-2 | Card Assembly | 1 | | | | X | | 1 |
| -6 | PC8113 | Card | 1 | X | X | X | X | X | 1 |
| -7 | PB841 | Line - Card (small) | 4 | X | X | X | | X | 4 |
| -7 | PB841-2 | Line - Card (small) | 4 | | | | X | | 4 |
| -8 | PB8123-1 | Line - Card (south) | 1 | X | X | X | | X | 1 |
| -8 | PB8123-2 | Line - Card (south) | 1 | | | | X | | 1 |
| -9 | PB8124-1 | Line - Card (north) | 1 | X | X | X | | X | 1 |
| -9 | PB8124-2 | Line - Card (north) | 1 | | | | X | | 1 |
| -10 | PB5199 | Wire - Card line | AR | X | X | X | X | X | AR |

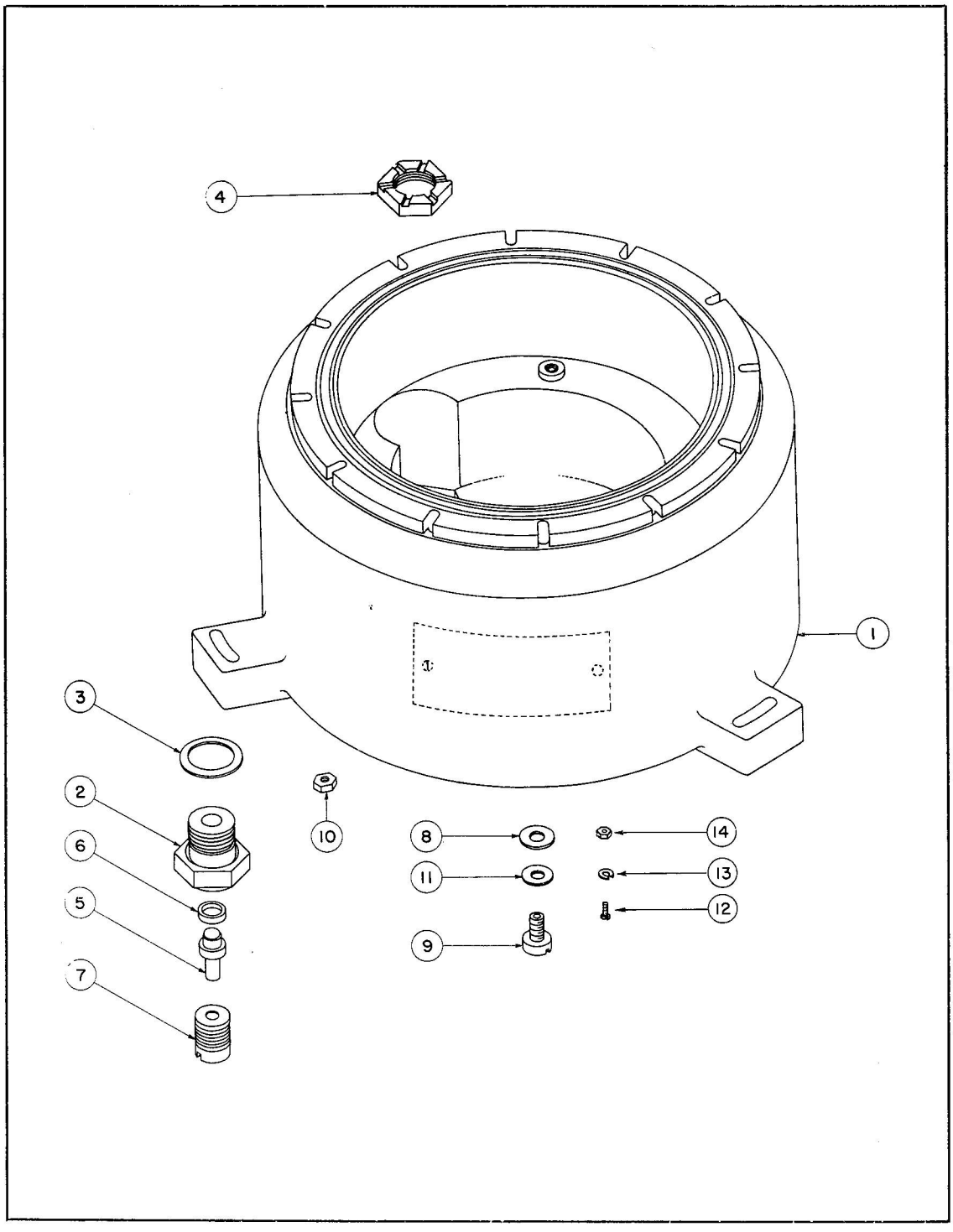



Figure 8-12 Exploded View - Compass - Compass Bowl and Attaching Parts - Type D-12 (Pioneer Types 1832-1-A and 1832-3-A)

TYPE D-12 (PIONEER TYPES 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A AND 1832-3-A) (Cont'd

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE | TOTAL QTY | 1832-1-A | 1832-3-A | UNITS PER ASSY |
|---|---|---|---|---|---|---|
| | | 1 2 3 4 5 6 7 | | | | |
| 8-12 | | | | | | |
| -1 | PD25377-1 | Bowl - Compass | 1 | X | X | 1 |
| -2 | PB36610-1 | Housing - Filling plug | 1 | X | X | 1 |
| -3 | PB5657 | Seal - Housing | 1 | X | X | 1 |
| -4 | PB25379-1 | Nut-Filling | 1 | X | X | 1 |
| -5 | PB5658-2 | Plug-Filling | 1 | X | X | 1 |
| -6 | PB5659 | Seal - Filling plug | 1 | X | X | 1 |
| -7 | PB7469 | Gland - Filling plug | 1 | X | X | 1 |
| -8 | 56-74 | Washer | 1 | X | X | 1 |
| -9 | PB8169 | Screw - Bellows mounting | 1 | X | X | 1 |
| -10 | NO-6B | Nut | 12 | X | X | 12 |
| -11 | PB36464-1 | Seal - Bellows screw | 1 | X | X | 1 |
| -12 | RO-205E | Screw | 2 | X | X | 2 |
| -13 | LWO-2C | Washer - Lock | 2 | X | X | 2 |
| -14 | NO-2B | Nut | 2 | X | X | 2 |

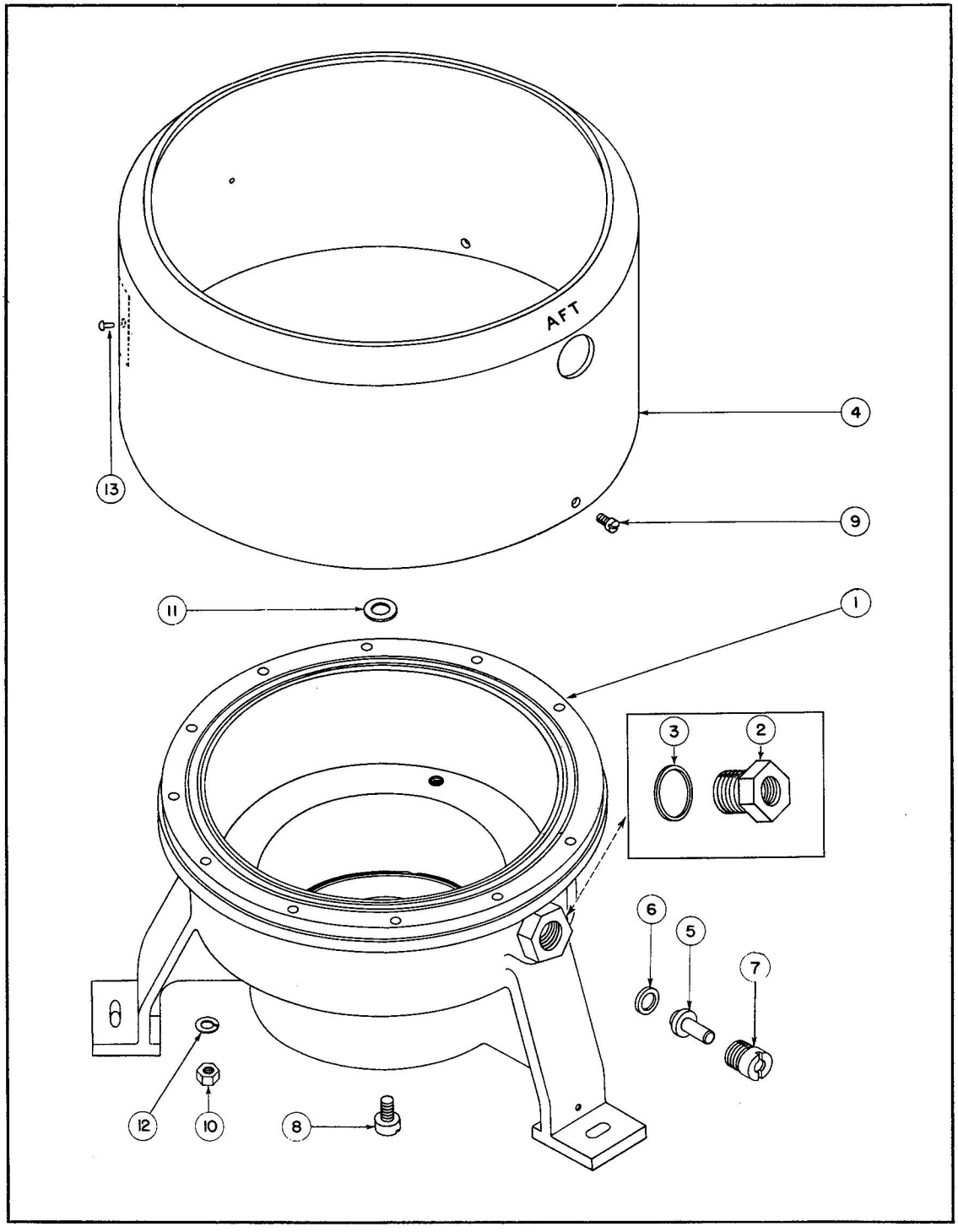



Figure 8-13 Exploded View - Compass - Compass Bowl and Attaching Parts Type D-12 (Pioneer Types 1801-1-A, 1833-1-A, 1826-1-A)

TYPE D-12 (PIONEER TYPES 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A AND 1832-3-A) (Cont'd)

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE | TOTAL QTY | 1801-1-A | 1826-1-A | 1833-1-A | UNITS PER ASSY |
|---|---|---|---|---|---|---|---|
| | | 1 2 3 4 5 6 7 | | | | | |
| 8-13 | | | | | | | |
| -1 | PD23958-1 | Bowl - Compass | 1 | X | X | | 1 |
| -1 | PD26014-1 | Bowl - Compass | 1 | | | X | 1 |
| -2 | PB5656 | Plug - Filling | 1 | X | X | X | 1 |
| -3 | PB5657 | Seal - Housing | 1 | X | X | X | 1 |
| -4 | PC7634-3 | Shield | 1 | X | X | | 1 |
| -5 | PB5658-2 | Plug - Filling | 1 | X | X | X | 1 |
| -6 | PB5659 | Seal - Filling plug | 1 | X | X | X | 1 |
| -7 | PB7469 | Gland - Filling plug | 1 | X | X | X | 1 |
| -8 | PB8169 | Screw - Bellows mounting | 1 | X | X | X | 1 |
| -9 | FILO-304TE | Screw - Shield | 3 | X | X | | 3 |
| -10 | NO-6B | Nut | 12 | X | X | X | 12 |
| -11 | 56-74 | Washer | 1 | X | X | X | 1 |
| -12 | LWO-6C | Washer - Lock | 12 | X | X | X | 12 |
| -13 | RRO-202B | Rivet | 2 | X | X | | 2 |

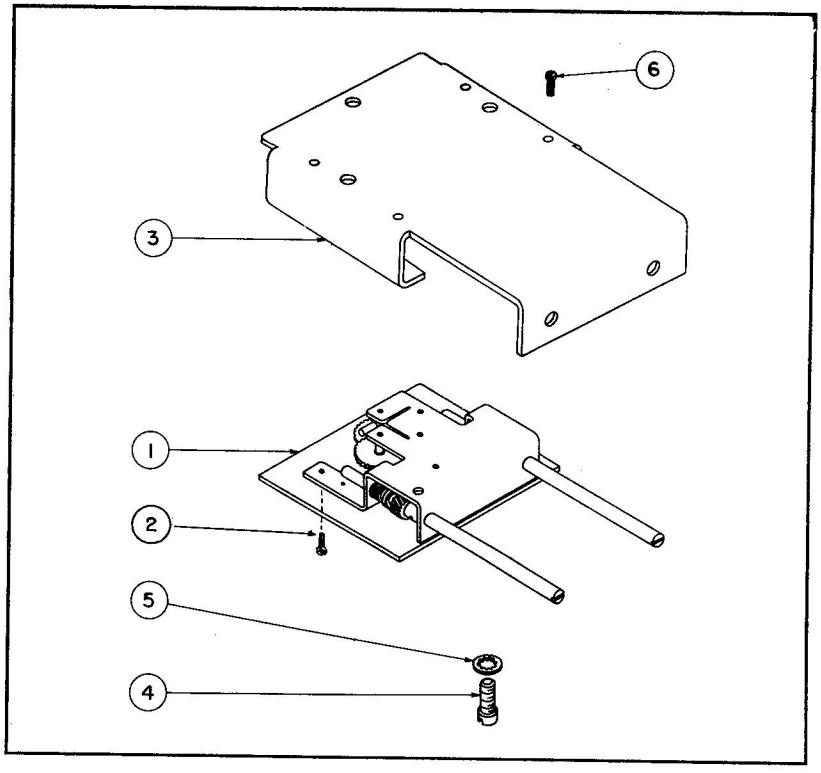



Figure 8-14 Exploded View - Compass - Compensator Assembly and Attaching Parts - Type D-12 (Pioneer Types 1832-1-A, 1826-1-A and 1832-3-A)

TYPE D-12 (PIONEER TYPES 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A AND 1832-3-A) (Cont'd)

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE | TOTAL QTY | 1826-1-A | 1832-1-A | 1832-3-A | UNITS PER ASSY |
|---|---|---|---|---|---|---|---|
| | | 1 2 3 4 5 6 7 | | | | | |
| 8-14 | | | | | | | |
| -1 | PD24274-1 | Compensator Assembly | 1 | X | X | X | 1 |
| | *PB24709-1 | Bracket and Dowel Assembly | 1 | X | X | X | 1 |
| | *PD24708-1 | Bracket - Compensator | 1 | X | X | X | 1 |
| | *PB8096 | Dowel | 2 | X | X | X | 2 |
| | *PB23554-2 | Magnet Assembly - Upper | 1 | X | X | X | 1 |
| | *PB23549-1 | Staff - Upper magnet | 2 | X | X | X | 2 |
| | *PB5998-4 | Magnet - Upper | 2 | X | X | X | 2 |
| | *PB23551-1 | Gear - Driven spiral RH | 1 | X | X | X | 1 |
| | *PB23552-1 | Gear - Driven spiral LH | 1 | X | X | X | 1 |
| | *PB23553-2 | Magnet Assembly - Lower | 1 | X | X | X | 1 |
| | *PB23550-1 | Staff - Lower magnet | 2 | X | X | X | 2 |
| | *PB5998-5 | Magnet - Lower | 2 | X | X | X | 2 |
| | *PB23551-1 | Gear - Driven spiral RH | 1 | X | X | X | 1 |
| | *PB23552-1 | Gear - Driven spiral LH | 1 | X | X | X | 1 |

TYPE D-12 (PIONEER TYPES 1801-1-A, 1832-1-A, 1833-1-A, 1826-1-A AND 1832-3-A) (Cont'd)

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE | TOTAL QTY | 1826-1-A | 1832-1-A | 1832-3-A | UNITS PER ASSY |
|---|---|---|---|---|---|---|---|
| | | 1 2 3 4 5 6 7 | | | | | |
| 8-14 (Cont'd) | | | | | | | |
| | *PB23555-1 | Gear Assembly - Idler | 1 | X | X | X | 1 |
| | *PB23556-1 | Gear - Idler | 1 | X | X | X | 1 |
| | *PB23557-1 | Staff - Idler | 1 | X | X | X | 1 |
| | *PC23564-2 | Cover - Compensator | 1 | X | X | X | 1 |
| | *PB20389 | Spring - Compensator | 2 | X | X | X | 2 |
| | *PB23560-1 | Driver - Compensator | 2 | X | X | X | 2 |
| | *PB23563-1 | Pin - Knob | 2 | X | X | X | 2 |
| | *PB23559-1 | Cover - Knob pin | 2 | X | X | X | 2 |
| | *PB23565-2 | Knob - Compensator | 2 | X | X | X | 2 |
| | *PB8214 | Washer - Staff spacing | AR | X | X | X | AR |
| | *EPO-2104 1/2 | Pin - Escutcheon | 2 | X | X | X | 2 |
| -2 | FFILO-302E | Screw - Bracket | 4 | X | X | X | 4 |
| -3 | PD24280-1 | Bracket - Compensator mounting | 1 | X | X | X | 1 |
| -4 | MFFILO-803 1/2TE | Screw - Compensator mounting | 3 | X | | | 3 |
| -4 | MFFILO-804 1/2E | Screw - Compensator mounting | 3 | | X | X | 3 |
| -5 | SLWO-1908 | Washer - Shakeproof lock | 3 | X | | | 3 |
| -5 | SLWO-1908C | Washer - Shakeproof lock | 3 | | X | X | 3 |
| -6 | FFILO-402TE | Screw - Cover | 4 | X | | | 4 |
| -6 | FFILO-402E | Screw - Cover | 4 | | X | X | 4 |

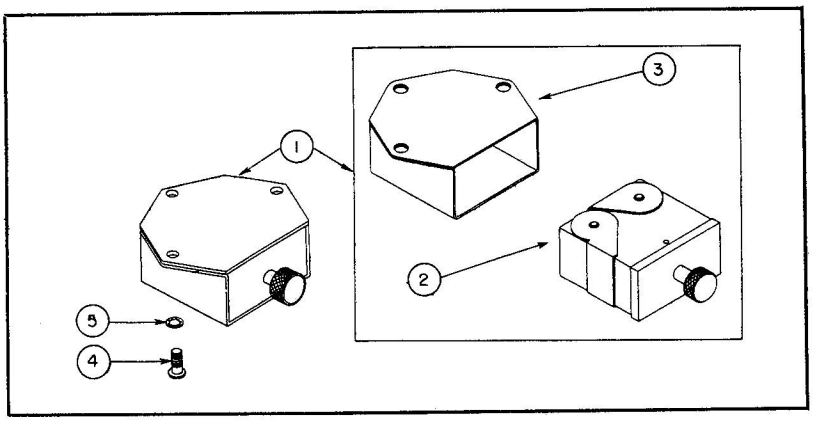



Figure 8-15 Exploded View - Compass - Compensator Assembly - Type D-12
(Pioneer Types 1801-1-A and 1833-1-A)

| FIGURE AND INDEX NUMBER | PART | NOMENCLATURE | TOTAL QTY | 1801-1-A | 1833-1-A | UNITS PER ASSY |
|---|---|---|---|---|---|---|
| | | 1 2 3 4 5 6 7 | | | | |
| 8-15 | | | | | | |
| -1 | PB2655 | Compensator Assembly | 1 | X | X | 1 |
| -2 | PB2786 | Drawer Assembly - Compensator | 1 | X | X | 1 |
| -3 | PB2787 | Case - Assembly - Compensator | 1 | X | X | 1 |
| -4 | MRO-803 1/2TE | Screw - Compensator mounting | 3 | X | X | 3 |
| -5 | SLWO-1908 | Washer - Shakeproof lock | 3 | X | X | 3 |