OVERHAUL INSTRUCTIONS WITH PARTS BREAKDOWN

'HIS MANUAL WILL COVER THE BASIC COMPASS. 'ITH THE EXCEPTIONS OF THE VARIOUS LIGHT SSY.,BRACKETS,STREAMLINE SHELLS & FACES 'OR WHICH THE REMOVAL & REPLACEMENT ARE BVIOUS. THIS IS THE ONLY MANUAL THAT IS VAILABLE.

MAGNETIC COMPASS

PART NO. C2300-DL4

(AIRPATH)

Published under authority of the Chief of The Bureau of Aeronautics

1 December 1957

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TABLE OF LEADING PARTICULARS

Damping	Liquid
Damping liquid specification	MIL-L-5020 or nearest equivalent
Expansion compensation	Diaphragm
Visibility range	60 degrees
Weight:	
With damping fluid	12 oz.
Without damping fluid	10 oz.
Magnets	Permanent bar type
Lens	Flat glass
Compensating adjustment location	Front of unit
Lamp voltage (direct current)	24

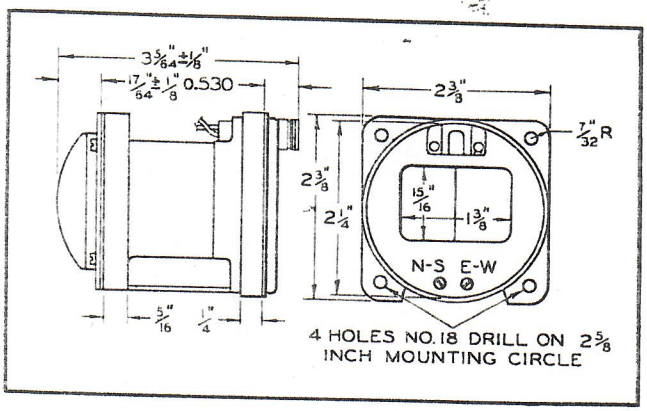

Figure 2. Principal Dimensions

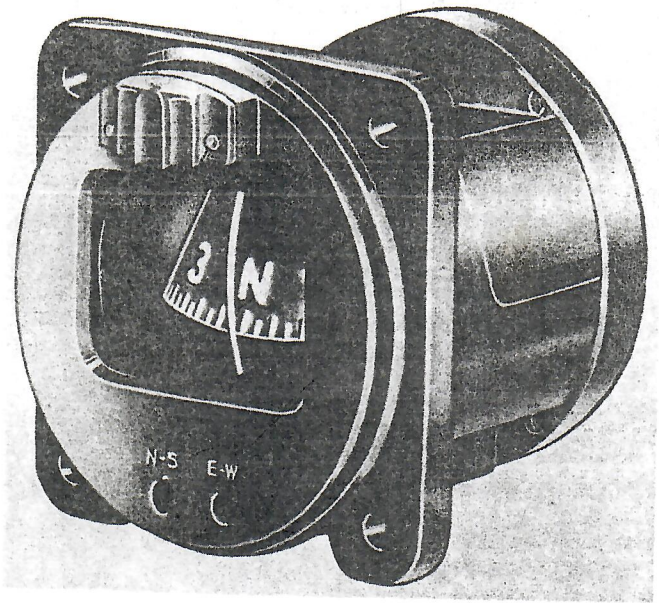

Figure 1. Identifying View of Magnetic Compass — Part No. C2300-DL4

1. SPECIAL TOOLS. None required.

2. DISASSEMBLY. (See figure 3.)

a. Disassemble the compass in the order of key index numbers assigned to the exploded view illustration, figure 3, except that attaching parts are listed following the parts they attach. For example: Item 14 must be removed to free item 13 and permit its removal.

b. Before disassembling, place the compass where there will be no metal objects within approximately 24 inches of the unit and test for weak card magnets as outlined in the following instructions. Rotate the card assembly 30 degrees from the normal position by holding a small bar magnet sufficiently near the compass to produce the 30 degree deflection. Hold the magnet in this position until the card becomes steady at the 30 degree position. Release the magnetic pull on the card by moving the magnet away quickly, and at the same time starting a stop watch to measure the time interval required for the card to move 25 degrees. Repeat this procedure precisely to rotate the card in the opposite direction. Place a compass known to be in good condition (test compass) in the same location and at the same angle as the compass being overhauled (with the compass being tested moved out of reach) and compare the reading of the test

compass with that of the compass being tested. If the card in both compasses require the same time interval to move 25 degrees the card magnets in the test compass are properly magnetized. However, if movement of the card in the compass being tested is slower than that of the test compass, the entire card assembly must be replaced.

c. If gaskets (8 and 10) are stuck to the lens (9), scrape them off carefully to avoid scratching the surface of the lens.

d. Do not remove the lubber line (12) unless replacement is required. If the lubber line is distorted or damaged to the extent that replacement is required, pry each end loose carefully with a small blade screwdriver and remove the lubber line (12) from the case (25).

e. To remove the lamp (1), simply rotate the lamp retainer cover upward. This cover is a part of the light subassembly (4). The spring (3) will force the lamp (1) out of the light subassembly (4) when the cover is raised, therefore, be sure to catch the lamp (1) as it pops out. The light subassembly (4) is freed by removal of the bolt (2).

f. It will be necessary to unscrew and remove the jewel post (21) from the case (25) to permit removal of the card assembly (17), jewel (19) and associated parts. Exercise extreme care when loosening the jewel post to prevent damage to any of the parts. Use a 1/2-inch thin-walled, open-end wrench to loosen the jewel post whenever removal is necessary.

g. Do not remove the compensator housing (23) or drive screws (24) unless replacement is required.

3. CLEANING.

a. Wash all parts, except the lens and lamp, in benzene, Federal Specification 4-16b. Dry the parts with a stream of compressed air from a pressure source limited to a maximum pressure of 20 psi. Make certain that all foreign material has been removed from the parts.

b. Carefully polish the mounted jewel with a small piece of pithwood.

c. Wash the lens with soap and warm water; rinse thoroughly to remove all traces of soap, and dry the lens with a lint-free cloth or compressed air. Avoid handling the lens and card assembly after cleaning.

d. Cover all parts with tracing paper or lint-free cloth to prevent an accumulation of dust on the parts prior to reassembly.

4. INSPECTION. (See Table I.) The key index numbers in Table I refer to figure 3.

TABLE I. INSPECTION

Index No.	Nomenclature	Inspection
1	Lamp	Using an ohmmeter, check from the contact terminal at the base of the lamp to the lamp housing. If no reading is obtained, the lamp is burned out and must be replaced.
3	Spring	Check the lamp ejector spring for cracks and collapse. Replace for either condition.
4	Light subassembly	Check for distortion, cracks and loose cover plate. Also check for continuity of wire connections within the light subassembly housing and replace the entire housing assembly for any of these conditions.
5	Cover plate	Check for distortion and damaged lacquered surfaces. Replace if cracked or dented, and relacquer if surface finish is damaged. (Refer to paragraph 6.)
6	Bezel	Replace if cracked or damaged. Also check for chipped lacquer and relacquer if necessary. (Refer to paragraph 6.) The bezel is cupped slightly to insure a seal on the lens when tightened down and therefore should be almost flat after all four screws have been tightened. To check for flatening out of the bezel, place a straight edge across the top surface to determine the extent of the concave surface. If the bezel is flat it will not apply sufficient pressure on the lense and must be replaced.
9	Lens	Check the lens for cracks, scratches on the surface and chipped edges. Replace for any of these conditions.
11	Compensator assembly	Inspect for damaged gears, bent shafts and/or loose magnets. Replace the entire assembly if any of these conditions exist.
12	Lubber line	Replace if bent or damaged. For correct method of removing the lubber line refer to paragraph 2.

TABLE I. INSPECTION (Cont.)

Index No.	Nomenclature	Inspection
13	Back plate	Check for dents, cracks and damaged lacquered surface. Replace if dented or cracked, and relacquer if necessary. (Refer to paragraph 6.)
15	Diaphragm	Replace during reassembly.
16	Diaphragm stop	Check for cracks and distortion. Replace for either condition.
17	Card assembly	Check for damaged graduation markings. Also check for bent or distorted pivot point and replace the card assembly if any of these conditions exist. Check for weak card magnets as outlined in paragraph 2.
18	Jewel post cap	Check carefully for bends and other visible damage. Replace if damaged.
19	Mounted jewel	Check the jewel with a magnifying glass for cracks. Feel the entire bearing surface of the jewel by rubbing the point of a new sewing needle across it. If invisible cracks, scratches or any slight imperfection is discovered the jewel must be replaced.
20	Spring	Check for correct length (7/16 ± 1/32 inch) and diameter (0.115 ± 0.003 inch). Replace if distorted.
21	Jewel post	Replace if damaged.
22	Jewel post washer	Replace each time the jewel post is removed.
23	Compensator housing	Check for cracks, dents and damaged lacquered surfaces. Replace if dented or cracked and relacquer if necessary. (Refer to paragraph 6.)
25	Case	Check for cracks and damaged screw holes. Replace if cracked, or if damaged screw threads cannot be properly restored. Also check for chipped lacquer and relacquer if necessary. (Refer to paragraph 6.)
All	Screws and bolts	Check for visible damage, particularly to screwdriver slots in the screw and bolt heads. Replace if damaged.
All	Gaskets	Replace at overhaul.

5. REPAIR OR REPLACEMENT.

6. RELACQUERING PARTS. On all parts having chipped or worn lacquered surfaces, feather the edges of the chipped surfaces with No. 320 wet or dry abrasive paper, and remove all abrasive dust with compressed air. Using a spray gun adjusted to produce a fine spray, apply a coating of black lacquer, Federal Specification TT-L-54, or the nearest equivalent.

NOTE

No attempt should be made to repaint the card assembly. If the indications on the card are damaged, or if the background finish has been chipped, the card assembly should be replaced.

7. ADJUSTING THE LUBBER LINE. The lubber line is adjusted by comparing the compass being repaired with a compass known to be in good condition, which should be a new unit. Remove the compensator assembly from each compass and place both units approximately 24 inches apart. With the mounting surface of each compass against a common straight edge so that both mounting surfaces are perfectly parallel, the reading of each compass should be exactly the same after allowing sufficient time for both cards to settle properly. If a slight variation exists, press the lubber line carefully with the tip of the finger to bend it to the proper location. The lubber line can be bent slightly in this manner provided care is exercised. After the lubber line has been properly positioned to register with the mark on the card as compared with the test compass, check for proper vertical positioning and straighten if necessary. The lubber line must clear the dial with the compass tilted as much as 18 degrees. If interference is encountered, move the

lubber line straight away from the card assembly, using extreme care not to change the adjustment just completed.

8. LUBRICATION. None required.

9. REASSEMBLY. (See figure 3.)

a. Reassembly is essentially the reverse of disassembly. Attention should be given to the following operations:

b. Exercise extreme care when installing and tightening the jewel post (21) to prevent damage to either the jewel post or the card assembly (17). Tighten the jewel post with a 1/2-inch, thin-walled open-end wrench.

c. If the lubber line (12) was removed during disassembly, install a new lubber line by pressing each end into the grooves in the case (25). Stake the grooves slightly to make certain the lubber line will be held tightly in the case. (Refer to paragraph 7 for proper adjustment instructions.)

d. After assembling the compass, with the exception of items (1 through 10) immerse the unit in a container prepared for filling the compass by the evacuation method. Position the compass so that the mounting surface is facing upward and make sure the compass will be covered completely by the compass fluid. The container should be fitted with an air-tight lid so that a vacuum line and gage can be attached to the lid in order to remove all air from the compass when filling with fluid. The size of the container should not be any larger than necessary to accomodate the compass in the position stated above and to permit sufficient hand room to lift the compass out of the container. Before evacuating the container, rotate the compass end to end and side to side several times to assist in removing air bubbles. With the compass in an upright position, and the fluid approximately 1/2 inch above the top of the compass, place a rubber gasket under the lid of the evacuating container and connect a vacuum pump, capable of producing a vacuum of 28 to 29 inches of mercury (Hg) in the container. Continue the evacuating process for a minimum of three hours in order to remove all traces of air from the compass. After the evacuation process has been completed, place the gasket (10), lens (9), gasket (8) and bezel (6) on the case (25) and install the four bolts (7). Tighten the bolts (7) before changing the position of the compass. Avoid tipping the compass from side to side while tightening the bolts in order to maintain maximum surface tension and prevent air from entering the compass.

NOTE

When tightening the bezel bolts, they should be drawn down progressively in order to compress the gaskets (8 and 10) evenly against the lens (9). If these screws are tightened carelessly the lens will probably be strained and may crack, even after the compass has been placed in service.

e. Remove all fluid from the outside of the compass with compressed air after it is removed from the evacuating container.

f. Press the cover plate (5) on the case (25) with the fingers making certain that the opening for the light subassembly (4) is properly aligned with the slot in the bezel (6). The cover (5) should fit tight enough to prevent any possibility of its falling off or becoming loosened before the compass is installed in the aircraft. If the cover is loose, use a small automatic center punch on the edge to dimple the cover slightly between the bezel edge and the case.

g. Insert the two wire leads of the light subassembly (4) through the hole at the top of the cover plate (5), then move the light subassembly carefully into position and install the bolt (2). Place the spring (3) in the light subassembly with the small end of the spring facing outward. Press the bulb (1) against the spring and rotate the cover on the light subassembly (4) to hold the bulb in place.

h. After the compass has been completely assembled, adjust the North-South (N-S) and East-West (E-W) screws by placing the compass in an artificial magnetic field, specially prepared for compass adjustments on regulation compass test equipment. If such an arrangement is not available, adjust the compass by comparing it with a unit known to be in proper adjustment. It should be remembered that the compass to be adjusted must be located in precisely the same position as the compass from which the readings are taken.

10. TEST PROCEDURE. After the compass has been properly overhauled and assembled with all parts known to be in good condition no further test will be required.

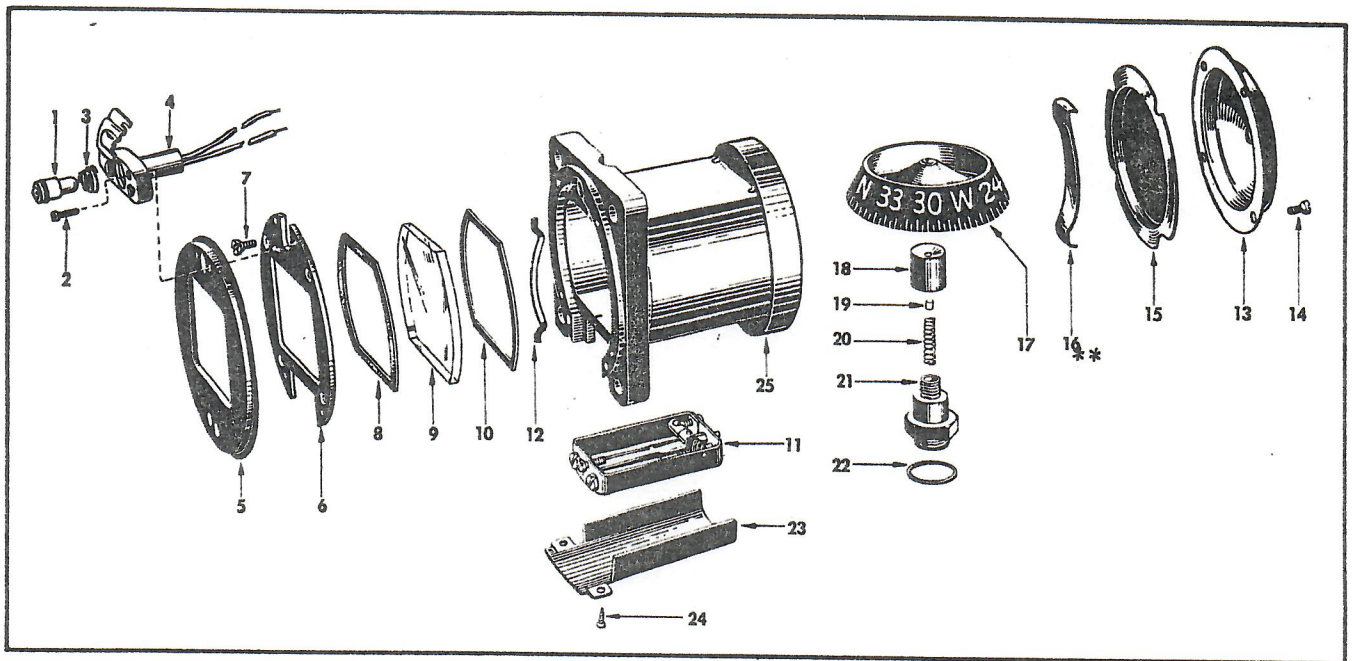

Figure 3. Compass Assembly

Figure And Index No.	Part Number	Description 1 2 3 4 5 6 7	Units Per Assy	Usable On Code
3-	C2300-DL4	COMPASS ASSY	1	
-1	AN3140-327	. LAMP	1	
	C24-550	. LIGHT ASSY	1	
		(ATTACHING PARTS)		
-2	2-56-3-VBX	. BOLT	1	
		- - - * - - -		
-3	CB21-512	. . SPRING	1	
-4	* No Number	. . LIGHT SUBASSY	NP	
-5	C21-703B	. PLATE, Cover	1	
-6	C23-601-DL	. BEZEL	1	
		(ATTACHING PARTS)		
-7	CB21-602	. BOLT	4	
		- - - * - - -		
-8	CB21-915G	. GASKET, Bezel spacer	1	
-9	CB21-913X	. LENS	1	
-10	CB21-914H	. GASKET, Bezel sealing	1	
-11	CB21-400	. COMPENSATOR ASSY	1	
-12	C23-924	. LINE, Lubber	1	
-13	C24-102	. PLATE, Back	1	

* - Not procurable as a separate part.

Figure And Index No.	Part Number	Description 1 2 3 4 5 6 7	Units Per Assy	Usable On Code
3-		(ATTACHING PARTS)		
-14	CB21-602M	. BOLT	4	
		- - - * - - -		
-15	C21-100	. DIAPHRAGM	1	
-16	C24-101	. STOP, Diaphragm	1	
-17	C23-313	. CARD ASSY	1	
	CB21-250	. POST ASSY, Jewel	1	
-18	CB21-232	. . CAP, Jewel post	1	
-19	CB-231	. . JEWEL	1	
-20	CB21-233	. . SPRING	1	
-21	CB21-201M	. . POST, Jewel	1	
-22	CB21-202	. WASHER, Jewel post	1	
-23	C23-904G	. HOUSING, Compensator	1	
		(ATTACHING PARTS)		
-24	COMM	. SCREW, Drive No. 0 x 3/16 in. lg type "U" (Parker-Kalon Corp., New York, N. Y.).	3	
		- - - * - - -		
-25	C21-701	. CASE	1	
**	C23-702	CASE	1	
-26	C23-709	PLUG, FILLER	1	
-27	CB21-736	GASKET, FILLER PLUG	1	

Case not procureable as spare p

** CASE C23-702 SUPERCEDES CASE C21-701, COMPENSATOR HOUSING C23-904G, AND #0 x 3/16 DRIVE SCREWS.

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Subject: Overhaul Manual NAVAER 05-15-606

Gentlemen:

In regard to the subject manual we wish to advise it is the only manual available to cover the basis compass overhaul on the following Airpath Compasses:

C2200 series
C2300 series
C2350 series
C2400 series

With the subject manual and a set of individual compass model parts lists you should have adequate information to overhaul the above series compasses.

AIRPATH INSTRUMENT COMPANY

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COMPENSATING INSTRUCTIONS FOR AIRPATH COMPASSES

Before attempting to compensate compass, every effort should be made to place the aircraft in simulated flight conditions. Check to see that doors are closed, flaps are in retracted position, throttles set at cruise position, engine(s) operating, and aircraft in a level attitude. All electrical switches, generators, radios, etc...., should be in the position they will normally be for navigational flight.

COMPENSATION

1. Set adjustment screws of compensator on zero. Zero position of adjustment screw is obtained by lining up the dot on the screw with the dot on the compensator frame.

2. Head aircraft on magnetic **North** heading. Adjust N-S adjustment screw until compass reads exactly North.

3. Head aircraft on magnetic **East** heading. Adjust E-W adjustment screw until compass reads exactly East.

4. Head aircraft on magnetic **South** heading. Note the resulting South error. Adjust the N-S adjustment screw until one-half of this error is removed.

5. Head aircraft on magnetic **West** heading. Note the resulting West error. Adjust the E-W adjustment screw until one-half of this error is removed.

6. Head aircraft in successive magnetic 30-degree headings and record all errors on the deviation card furnished with the compass.

For satisfactory results, all extraneous magnetism causing over 30-35 degree compass errors should be removed from the aircraft, or the compass should be relocated to a position where uncompensated error does not exceed 30-35 degrees. **Use a brass or other non-ferrous material screwdriver when making compensator adjustments.**

Best results can be obtained in actual flight compensation by following the procedure outlined below:

A. Set directional gyro from a sectional line or runway. (Allow for magnetic variation to ensure gyro corresponds to magnetic headings).

B. Follow procedures 1 thru 6 above.

C. Re-check directional gyro occasionally for possible precession, and allow for such precession error in recording results on magnetic compass deviation card.

NOTE: If aircraft is equipped, GPS can be used (allowing for variation) to establish referenced headings for compass compensation. This technique will eliminate possible errors caused by gyro precession.

COMMON COMPENSATION PROBLEMS

Any time there is maintenance or repair to your aircraft, it is recommended that the compass be compensated. This is particularly true if there is work associated with the removal of old and/or installation of new equipment in the instrument panel. New radios and relocation of speakers or intercoms could affect the amount of compensation required. New hardware (i.e. screws, nuts ect...) installed during maintenance can sometimes be the cause of excessive errors if the hardware is steel or magnetic.

Loose electrical grounds, lightning, or extended periods of parking in a North-South alignment on the ramp can lead to the magnetization of the airframe itself. This is often evidenced by excessive uncompensated compass error (more than 30-35 degrees). Engine mounts on single engine aircraft and center windshield posts becoming magnetized can lead to compensation problems. Demagnetizing (Degaussing) the airframe component or relocating the compass will solve this problem.

Remember that every aircraft is different. Following the set-up procedures outlined above prior to compensation is important. As stated, in-flight compensation will achieve the best results. Landing gear position can sometimes affect deviation. Other factors to consider are: yoke position, cruise configuration, pitot heat, and de-icing equipment (particularly windshield anti-ice).

Operators should consider removing any jewelry while compensating compasses. Such things as watches, rings, and eyeglasses can affect the amount of compensation required. If above method does not give satisfactory results, determine the amount of uncompensated error by aligning the reference dots on the compensator adjustment screws and frame or by removing the compensator assembly from the compass. If the uncompensated error is in excess of 30-35 degrees, troubleshoot for magnetization of aircraft components or excessive electrical interference.

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SUBJECT: Compass Fluid Shelf Life

The shelf life for Airpath Compass Fluid is indefinite if the container cap is secured tightly to the container to prevent fluid evaporation.

Storage should be in accordance with the Material Safety Data Sheet.
Keep away from heat, sparks, and flame.
Store in a well ventilated area.
Store in a tightly closed container.

AIRPATH INSTRUMENT COMPANY

Gilmore C. Stone - Vice President, Opns.

MIL-L-5020 is no longer an active Mil Spec.. Airpath p/n: AP1000(Qt) and AP4000(Gal) supersede Mil number for compass fluid, and are offered as proprietary "off-the-shelf" products from TSO qualified O.E.M.

The U.S. Government has assigned Stock No. 6810-00-290-0051 to Airpath Compass Fluid.