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MINIATURE PRESSURE GAUGES, TRANSMITTING— APPLEBY AND IRELAND

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L. T. Burnett

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Chapter 1

DESCRIPTION AND OPERATION

Introduction

1. The miniature pressure gauge, transmitting, consists of a transmitter, Type AI757 (Ref. No. 6A/7285) and an indicator, Type AI756 (Ref. No. 6A/7284). The pressure gauge is used to indicate hydraulic pressure in an aircraft system. Pressure is applied to a diaphragm chamber and movement of the diaphragm turns the rotor of a 26V synchro transmitter. The output of the synchro transmitter is fed to a synchro receiver in the indicator.

Leading particulars

2.

(1)	Indicator	weight	5 oz.
		diameter	1·237 in.
		length	3·375 in.
(2)	Transmitter	weight	9 oz.
		diameter	1·237 in.
		length	3·5 in.
(3)	Range:		0 to 5000 lb/in²
(4)	Power supply:		26V 400 Hz single phase a.c.

DESCRIPTION

Transmitter

3. The mechanism is contained in a metal case which is sealed at both ends of an O-ring. A steel diaphragm is fitted between the inlet union and the body of the instrument. The body contains a stop to prevent overload pressures distorting the diaphragm. A plunger passes through plain bearings in the centre of the stop and contacts a calibration screw set in the rocking shaft.

Fig. 1. Transmitter

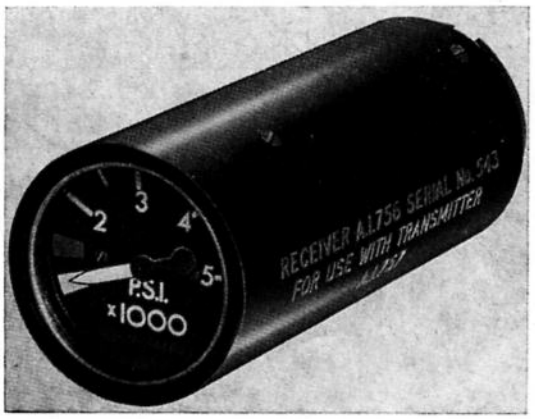

Fig. 2. Indicator

4. Attached to the rocking shaft is a calibration arm which bears against a lever attached to the quadrant shaft. The quadrant shaft also carries a quadrant and a spring attachment arm. A light helical spring is fitted between the spring attachment arm and a post on the quadrant platform; this spring serves to maintain contact between the calibration arm and the quadrant lever. The quadrant engages with a pinion attached to the shaft of the synchro.

5. The electrical transmitter is a 26V synchro transmitter with a maximum line voltage of 11·8V. Electrical connection to the synchro is made via a Mk. 4 miniature plug.

Indicator

6. The indicator consists of a synchro receiver, the rotor of which is connected via gearing to a pointer. The gearing is so arranged that the synchro rotor cannot adopt any other angular position, relative to electrical zero, than that of the synchro transmitter to which it is electrically connected. A hair spring causes the pointer of the indicator to return to the white sector of the dial when the electrical supply is cut off. When the hydraulic pressure in the system falls to 1500 lb/in² the pointer registers in the red sector of the dial. At the other end of the scale, a stop prevents the indicator registering more than 5000 lb/in². The dial is marked from 2 to 5, clear

indication being given that it represents pressures of 2000 to 5000 lb/in², the dial being additionally marked × 1000.

OPERATION

7. When pressure is applied to the transmitter inlet union, flexing of the diaphragm moves the plunger and rotates the rocking shaft about its axis. This movement is magnified by the calibration arm and transmitted, by action of the calibration arm against the quadrant lever, to the quadrant. The quadrant, being engaged with the pinion, turns the rotor of the synchro transmitter.

8. Since the stator of the synchro transmitter is connected to the stator of the synchro receiver in the indicator, and since both synchros are connected to the same 26V single phase a.c. supply, the rotor of the synchro receiver rotates to assume the same angular position, relative to electrical zero, as the rotor of the synchro transmitter. The resulting angle of the synchro receiver rotor is shown as an indicated pressure.

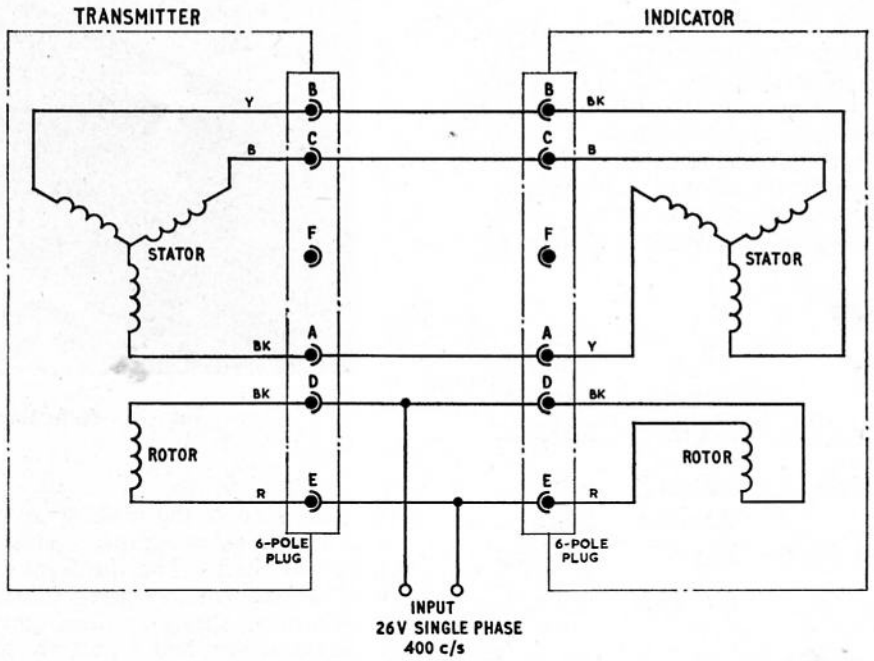

Fig. 3. Circuit diagram

Chapter 2

STANDARD SERVICEABILITY TEST

Introduction

1. This chapter describes the tests to be applied to indicators, Type AI756 (Ref.No. 6A/7284) and transmitters, Type AI757 (Ref.No. 6A/7285). The tests are to be performed prior to installation in an aircraft and at any time that serviceability is suspect.

Test equipment

2. The following test equipment is required:-

◀ (1) Pressure gauge calibrator, Mk.3 (Ref.No. 6C/1925549)

(2) Power control unit (Ref.No. 6C/4199422)

(3) Test set, Type 4B (Ref.No. 6C/4369620) ▶

(4) Test set multi-range No.1 (Ref.No. 5QP/6625-99-105-7049)

◀ (5) Insulation resistance tester, multi-range, Mk.2 (Ref.No. 5G/1112740) ▶

(6) Vibrator, Type KVC0101 (Ref.No. 6A/7041)

(7) A serviceable transmitter (Ref.No. 6A/7285) and indicator (Ref.No. 6A/7284), set aside for use as a bay servicing standard, and standardized as in para.4 to 6.

Power supplies

3. A 115 ± 2V, 400 ± 4Hz, 3-phase supply is required.

STANDARDIZING

Preparation of test equipment

4. (1) Connect the power control unit to the 115V supply and to the test set, Type 4B.

(2) Set the ON/OFF switch to ON.

(3) Adjust the voltage to 115V.

(4) Set the ON/OFF switch to OFF.

Standardizing the transmitter

5. (1) Connect the transmitter to the pressure gauge calibrator and attach the vibrator. Type KVC0101 to the transmitter.

Note...
The transmitter is to be positioned with the transmitter body horizontal and the TDC line at the top.

(2) Connect the transmitter to the test set as follows:-

Transmitter	ALTERNATIVE INPUT Connector
Pole A	Pole 5
Pole B	Pole 6
Pole C	Pole 4
Pole D	Pole 38
Pole E	Pole 37

(3) Set the SELECTOR SWITCH to 26V C.T. Set the ON/OFF switch to ON. Switch on the vibrator.

(4) Apply first increasing and then decreasing pressures to the transmitter and check that the test set synchro indicates as shown in Table 1.

TABLE 1

Transmitter		Test set synchro
bars	lbf/in^2	degrees
0	0	90 ± 3½
137·895	2000	130 ± 3½
206·843	3000	181 ± 3½
275·790	4000	233 ± 3½
344·738	5000	285 ± 3½

(5) Adjust the transmitter as necessary, as shown in Chap.3, to bring it as close as possible to the nominal values shown in Table 1, but in any case within the tolerances shown in the table.

(6) Set the ON/OFF switch to OFF, and disconnect the transmitter from the test set.

(7) Mark the transmitter, using lacquer, opaque yellow, Ref.No. 33B/9429181, with the words 'FOR BAY SERVICING USE ONLY'

CAUTION...
Adjustments must not be made to aircraft transmitters

Standardizing the indicator

6. (1) Connect the indicator to the transmitter. Mount a vibrator, Type KVC0101, on the indicator and switch it on.

(2) Apply pressures to the transmitter at 2000, 3000, 4000 and 5000 lbf/in^2 and check that the indicator pointer indicates the pressures applied, within the tolerance of half the width of the pointer either side of the graduation. Check that at 0lbf/in^2 the pointer indicates within the red sector.

(3) Adjust the indicator as necessary, as shown in Chap.3, to bring it within the required tolerance.

(4) Switch off the supplies to the vibrators, disconnect the transmitter and indicator from each other, and the transmitter from the pressure gauge calibrator. Mark the indicator, using lacquer, opaque yellow, with the words FOR BAY SERVICING USE ONLY.

(5) Adjust the transmitter as necessary, as shown in Chap.3, to bring it within the tolerances.

TEST PROCEDURE

Insulation resistance test, indicator and transmitter

◀ 7. Using the insulation resistance tester, set to the 250V range, measure the resistance between poles A, B or C and the housing and between poles D or E and the housing. In each case the resistance is to be not less than 20 megohms. ▶

Continuity tests, indicator

8. Using the multimeter set to the resistance scale, check that the resistance between the poles of the plug are as follows:-

A and B - 9 ohms to 12 ohms
A and C - 9 ohms to 12 ohms
B and C - 9 ohms to 12 ohms
D and E - 20 ohms to 32 ohms

Continuity tests, transmitter

9. Using the multimeter set to the resistance scale, check that the resistance between the poles of the plug are as follows:-

A and B - 9 ohms to 12 ohms
A and C - 9 ohms to 12 ohms
B and C - 9 ohms to 12 ohms
D and E - 27 ohms to 32 ohms

Transmitter, accuracy test

10. Connect the transmitter under test to the pressure gauge calibrator and to the standardized indicator. Mount vibrators on both instruments and switch them on. Switch on the supply to the system.

11. Apply pressures to the transmitter as shown in Table 1 and check that the indicator pointer indicates the required pressures within the tolerance of one pointer's width either side of the graduation mark at each test point except zero, and within the red sector at 0lbf/in^2.

Indicator, accuracy test

12. Connect the indicator under test to the standardized transmitter and the transmitter to the pressure gauge calibrator. Mount vibrators on both instruments and switch them on. Switch on the supply to the system.

13. Apply pressures to the transmitter as shown in Table 1. Check that the indicator pointer indicates the required pressure within the tolerance of one pointer's width either side of the graduation mark at each test point except zero, and within the red sector at 0lbf/in^2.

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Chapter 3

SERVICING

Introduction

1. This chapter describes the servicing of the indicator, Type AI756 (Ref. No. 6A/7284) and of the transmitter, Type AI757 (Ref. No. 6A/7285).

2. Before commencing work these instructions are to be read carefully and the operations performed thereafter in sequence.

Test equipment

3. The test equipment required is as specified in Chapter 2.

Transmitter

4. Mark the casing and locking ring so that when the transmitter is reassembled the casing may be fitted in exactly the same position it was in before removal. Remove the six screws which secure the casing to the body of the transmitter and withdraw the casing over the hydraulic connection, taking care not to twist the casing.

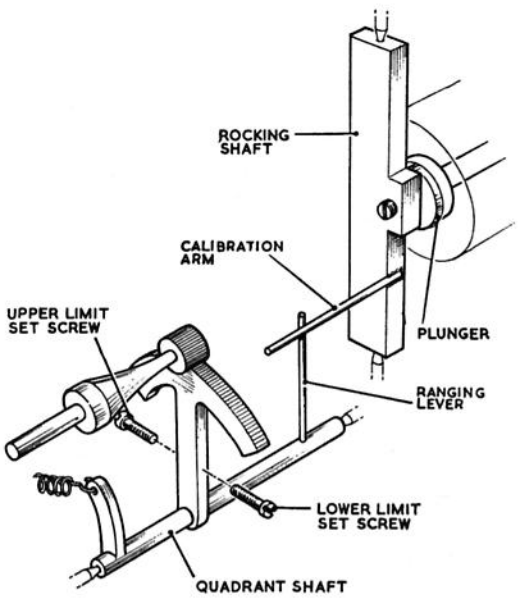

Fig. 1. Transmitter — showing adjustment areas

5. Examine the teeth of the pinion and sector for wear. If any wear is evident, refit the casing and return the indicator to stores.

Correction of errors

6. Prepare a graph of the transmitter errors, using the figures shown in Chap. 2, Table 1 to show the envelope within which the errors will be tolerable. Compare the graph with those shown in A.P.3280B, Sect. 1, Chap, 1, fig. 12. Adjust the mechanism to correct the errors as follows :—

Note . . .

It is advisable to make first a correction of the calibration error, if present, to straighten the error curve, then a ranging correction, if necessary, to produce an error curve parallel to the centre line of the envelope, and finally a pointer correction to bring the error curve as close as possible to the centre line of the envelope.

(a) Calibration error. This is the most common error and may be reduced by bending the calibration arm (fig. 1) toward the centre of the transmitter to increase the indication at the top of the range, or away from the centre of the transmitter to decrease the indication at the top of the range.

(b) Ranging error. Adjust by bending the ranging lever toward the sector to increase the indication at the top of the range, and away from the sector to decrease the indication at the top of the range. Because of the short length of the ranging lever, care is necessary to avoid damaging the bearing surface of the lever.

(c) Pointer error. Loosen the clamps which secure the synchro to the mounting plate,

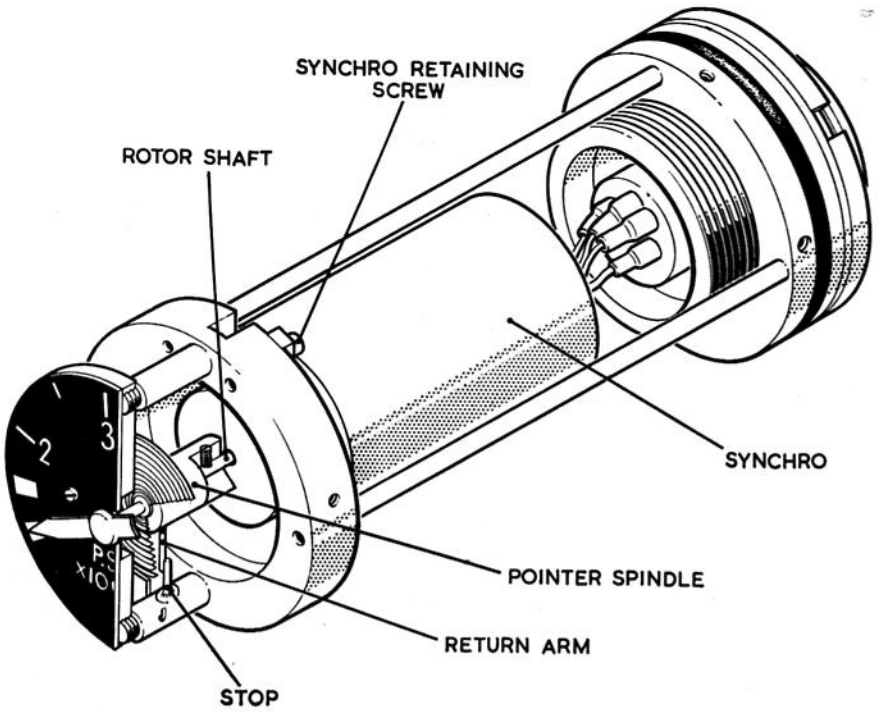

Fig. 2. Indicator — showing mechanism

rotate the synchro to correct the error, then tighten the clamps.

7. Refit the case, taking care that it is correctly orientated. Perform the standard serviceability tests described in Chap. 2.

Indicator

8. The only error which can be adjusted in the service is a pointer error. To correct this, proceed as follows :—

(1) Remove the six screws which secure the casing to the indicator.

(2) Draw off the casing, taking care not to twist it.

(3) Connect the indicator to the test equipment as detailed in Chapter 2, para. 10.

(4) Set the test set to indicate 166 deg.

(5) Remove the pointer and refit it to indicate 3000 lb/in^2.

(6) Refit the casing, again taking care not to twist it.

(7) Perform the standard serviceability test as detailed in Chap. 2.

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