SOLARTRON
Schlumberger

WESTON (UK) DIVISION
SOLARTRON TRANSDUCERS
GREAT CAMBRIDGE ROAD, ENFIELD,
MIDDLESEX, EN1 3RX, ENGLAND

MODEL S.546 FORM 1

INDICATOR - TEMPERATURE/PRESSURE/LIQUID LEVEL

VARIANTS

S.546-1-39

S.546-1-66

S.546-1-188

S.546-1-373

S.546-1-531

COMPONENT MAINTENANCE MANUAL

WITH

ILLUSTRATED PARTS LIST

STATEMENT OF INITIAL CERTIFICATION

This manual complies with British Civil Airworthiness Requirements, Section A, Chapter A6-2.

Signed: Research & Engineering Manager

.....

Date: 30th October 1987

CAA Approval No: DAI/1198/39

NOTE: The above certification does not apply to revisions or amendments made after the date of initial certification by other Approved Organisations. Revisions or amendments made by other Approved Organisations must each be separately certified, and recorded on separate record sheets.

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The introduction of any amendment or revision not certified in accordance with British Civil Airworthiness Requirements Chapter A6-2 will invalidate the statement of certification on the Title Page.

Amendments or revisions embodied in this manual, which have been certified under an approval authorisation other than that applicable to the initial certification must be recorded on separate record sheets.

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9			31		
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16			38		
17			39		
18			40		
19			41		
20			42		
21			43		
22			44		

MODIFICATION STANDARDS

Modification standards listed on this page are applicable to all variants of the Model S.546 Form 1 Indicators.

A modification standard relevant only to a particular variant of the model, will be listed in the related variant information.

A designated modification letter (or letters) which is marked on the scale of the model indicates that the modification has been embodied. This embodiment also applies to a following letter (or letters) of the modification standards.

Modification letter(s)	Service Bulletin No.

LIST OF EFFECTIVE PAGES

WESTON (UK) DIVISION

COMPONENT MAINTENANCE MANUAL

MODEL S.546 FORM 1 - INDICATOR - TEMPERATURE/PRESSURE/LIQUID LEVEL

TABLE OF CONTENTS

INTRODUCTION

1. General

This manual contains shop verified instructions for the Weston (UK) Division Model S.546 Form 1 Indicator.

The servicing procedures given are consistent with those accomplished by the manufacturer.

Differences between indicators such as range, scale presentation and pointer finishes are defined by variant numbers (refer to Introduction - Illustrated Parts List) and details specific to variants are listed separately (refer to Table of Contents).

To accommodate additions of variants to the manual, which could also require additions to other sections of the manual, the block system as outlined in ATA 100 has been used. The variants are listed in the Description and Operation section of the manual.

Disassembly of parts of an indicator beyond that given in the manual is not recommended nor considered economical.

Although complete disassembly details are given to the extent considered necessary, the operator must use discretion on the actual level of breakdown, and be guided by the history sheet returned with the indicator, or by results obtained in the Testing and Trouble Shooting section. This section is the first reference level to establish the action to be taken if the history sheet is not available or the cause of the return/rejection of the indicator not apparent.

Once the required action to be taken is obvious, and if disassembly of the indicator is necessary, refer to Check and Cleaning sections before reassembly of the indicator.

Parts available as replacements are given in the Illustrated Parts List.

The only special tools quoted are balance wrenches; all other tools/ equipment quoted can be substituted by similar items if they conform to the requirements specified.

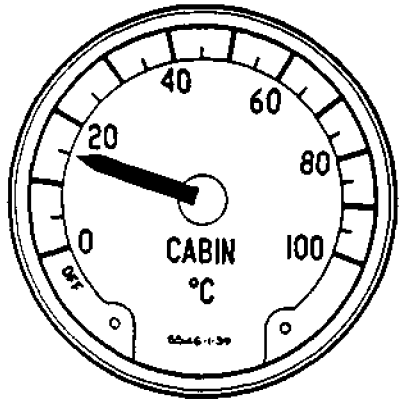
3. Operation

The moving element of the movement complete (160) is connected across a bridge network which is energized from a voltage or current stabilised circuit. Two arms of the bridge have resistors of identical value; the other two arms consist of a wire-wound spool, and external transducer. The resistance of the transducer element varies in accordance with variation of the quantity to be measured, and causes an out-of-balance current to flow through the moving element. The current variations through the moving element can thus be related to quantity variations and used to design a preprinted scale for the chosen quantity and range of the particular indicator variant.

TEMPERATURE INDICATOR, 0-100°C

MODEL S546-1-39

4. Variant Data (Ref. Figs. 1 and 2)



Front View of S546-1-39
Figure 1

A. General

Model S546-1-39 is a d.c. indicator connected in a voltage-stabilised bridge network. The circuit is designed for use with an external, platinum resistance temperature-element and the instrument scale is calibrated directly in degrees, range 0-100°C. If power fails, the indicator pointer is deflected to the scale 'OFF' position. Electrical connections to the indicator are made via a radial terminal block. A non-reflecting glass is fitted to the case.

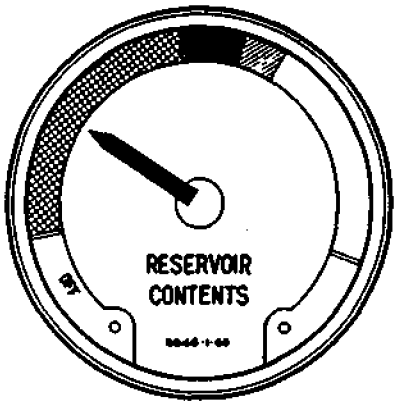
B. Scale Detail (Ref. Fig. 1)

The indicator pointer deflects over a 220° scale with divisions as shown in the figure. Scale markings, the captions °C and CABIN and the pointer are finished in white; the scale background in matt black. The case bezel is black.

LIQUID LEVEL INDICATOR

MODEL S.546-1-66

4. Variant Data (Ref. Figs. 1 and 2)



Front View of S.546-1-66
Figure 1

A. General

Model S.546-1-66 is a d.c. indicator connected in a voltage-stabilised bridge network. The circuit is designed for use with an external transducer whose resistance varies with the level of fluid in a reservoir. In the event of power failure, the indicator pointer is deflected to the scale 'OFF' position. Electrical connections to the instrument are made via a radial terminal block. A non-reflecting glass is fitted to the case.

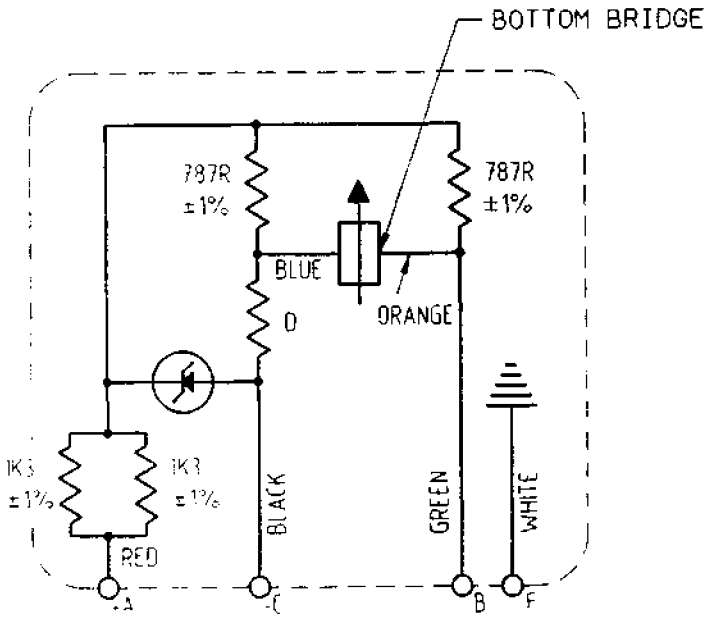
B. Scale Detail (Ref. Fig. 1)

The scale is divided into coloured bands: A red band starts 20° above the 'OFF' position and extends 95°, a green band occupies the next 23°, and a yellow band the next 9.5°. The remainder of the scale is painted black. A narrow white mark is painted at the start of the red band and at the right-hand end of the black band. The word 'OFF' and caption 'RESERVOIR CONTENTS', and the pointer are painted white. The scale background and case bezel are matt black.

LIQUID LEVEL INDICATOR

MODEL S.546-1-66

C. Electrical Data (Ref. Fig. 2)



Circuit Diagram of S.546-1-66
Figure 2

Resistance of moving element (including springs)		50 - 71 ohms
Zener diode		7.5V ±5%
Moving coil sensitivity (in case)		
L.H. scale mark	approx.	0.12mA
R.H. scale mark	approx.	1.43mA
Maximum circuit current at 26V		35mA
Resistance of 'D' spool (unadjusted)		102 +5%, -0% ohms
Accuracy		±2%

LIQUID LEVEL INDICATOR

MODEL S.546-1-66

D. Test and Calibration

Calibration Table

Scale Mark	External Resistance (Ohms)
L.H. & start of red band	103.1
End red/start green band	125.9
End green/start yellow band	132.0
End yellow	134.7
R.H. (White cardinal line)	161.0

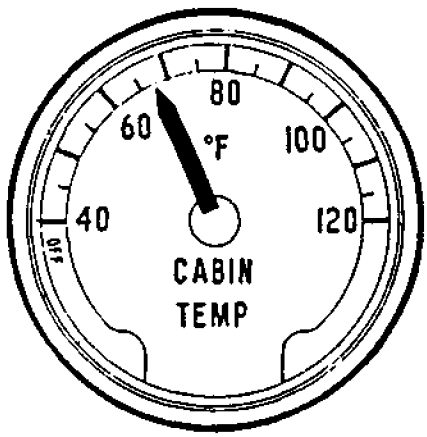
Details of the calibration procedure are given in Testing and Trouble Shooting. The accuracy of the indicator is 2% of full scale deflection, that is ±4.4° (angular).

The external resistance values include 1 ohm for leads - refer to Testing and Trouble Shooting, 7.A.NOTE.

TEMPERATURE INDICATOR, 40°-120°F

MODEL S.546-1-188

4. Variant Data (Ref. Figs. 1 and 2)



Front View of S.546-1-188
Figure 1

A. General

Model S.546-1-188 is a d.c. indicator connected in a voltage-stabilised bridge network. The circuit is designed for use with an external, platinum resistance temperature-element and the instrument scale is calibrated directly in degrees, range 40°-120°F. If power fails, the indicator pointer is deflected to the scale 'OFF' position. Electrical connections to the indicator are made via a 3 pin Cannon plug fitted to its end plate. A non-reflecting glass is fitted to the case.

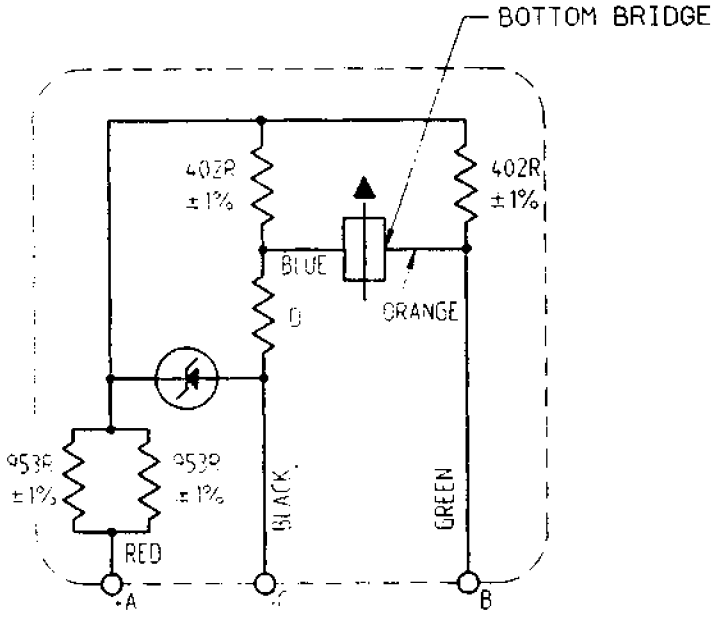
B. Scale Detail (Ref. Fig.1)

The indicator pointer deflects over a 180° scale with divisions as shown in the figure. Scale markings, the captions °F and CABIN TEMP. and the pointer are finished in white; the scale background in matt black. The case bezel is black.

TEMPERATURE INDICATOR, 40°-120°F

MODEL S.546-1-188

C. Electrical Data (Ref. Fig. 2)



Circuit Diagram of S.546-1-188
Figure 2

Resistance of moving element (including springs)	50 - 71 ohms
Resistance of 'D' spool (unadjusted)	132 + 5%, - 0% ohms
Zener diode	7.5V ±5%
Moving coil sensitivity (in case)	40°F - approx. 0.43mA 120°F - approx. 0.81mA
Maximum circuit current at 26V	50mA
Accuracy	±2.5°F

TEMPERATURE INDICATOR, 40°-120°F

MODEL S.546-1-188

D. Test and Calibration

Calibration Table

Scale Mark °F	External Resistance (Ohms)
40	132.7
50	135.5
60	138.4
70	141.2
80	144.1
90	146.9
100	149.9
110	152.6
120	155.4

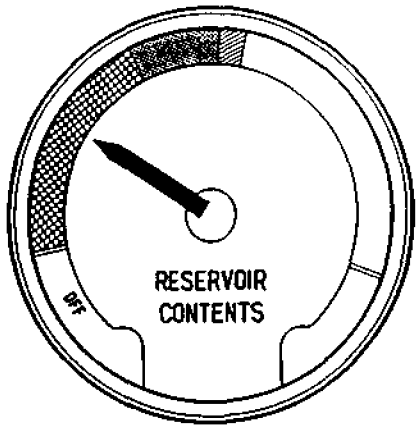
The external resistance values include self-heating and lead resistance - refer to NOTE of TESTING AND TROUBLE SHOOTING, 7.A.

Details of the calibration procedure are given in TESTING AND TROUBLE SHOOTING. The accuracy of the indicator is 2% of full scale deflection, that is ±2.5°F.

LIQUID LEVEL INDICATOR

MODEL S.546-1-373

4. Variant Data (Ref. Figs. 1 and 2)



Front View of S.546-1-373
Figure 1

A. General

Model S.546-1-373 is a d.c. indicator connected in a voltage-stabilised bridge network. The circuit is designed for use with an external transducer whose resistance varies with the level of fluid in a reservoir. In the event of power failure, the indicator pointer is deflected to the scale 'OFF' position. Electrical connections to the instrument are made via a radial terminal block. A non-reflecting glass is fitted to the case.

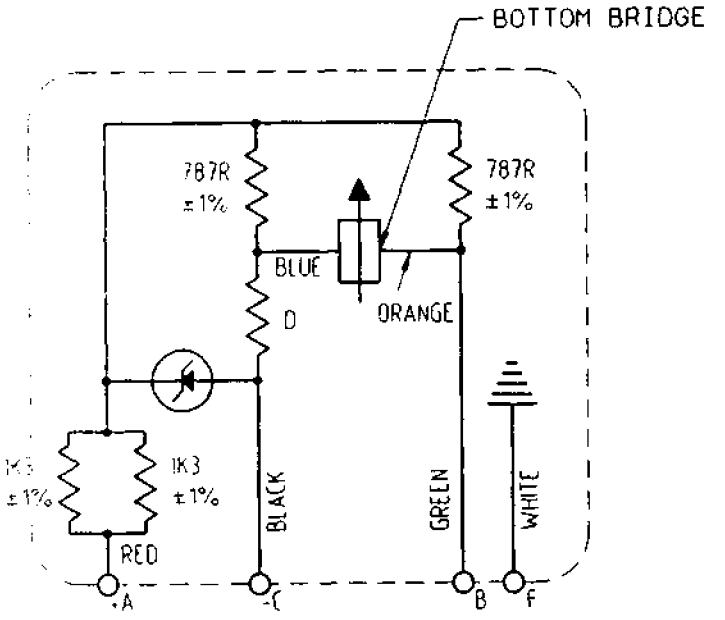
B. Scale Detail (Ref. Fig. 1)

The scale is divided into coloured bands: A red band starts 20° above the 'OFF' position and extends 74°, a green band occupies the next 30°, and a yellow band the next 8.5°. The remainder of the scale is painted black. A narrow white mark is painted at the start of the red band and at the right-hand end of the black band. The word 'OFF' and caption 'RESERVOIR CONTENTS', and the pointer are painted white. The scale background and case bezel are matt black.

LIQUID LEVEL INDICATOR

MODEL S.546-1-373

C. Electrical Data (Ref. Fig. 2)



Circuit Diagram of S.546-1-373
Figure 2

Resistance of moving element (including springs)		50 - 71 ohms
Zener diode		7.5V ±5%
Moving coil sensitivity (in case)		
L.H. scale mark	approx.	0.13mA
R.H. scale mark	approx.	1.5mA
Maximum circuit current at 26V		35mA
Resistance of 'D' spool (unadjusted)		102 +5%, -0% ohms
Accuracy		±2%

LIQUID LEVEL INDICATOR

MODEL S.546-1-373

D. Test and Calibration

Calibration Table

Scale Mark	External Resistance (Ohms)
L.H. & start of red band	102.3
End red/start green band	119.9
End green/start yellow band	127.7
End yellow	130.0
R.H. (White cardinal line)	157.4

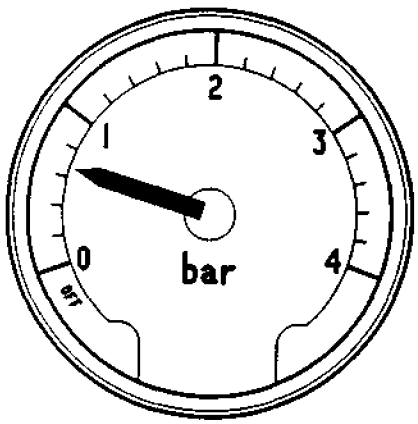
Details of the calibration procedure are given in Testing and Trouble Shooting. The accuracy of the indicator is 2% of full scale deflection, that is ±4.4° (angular).

The external resistance values include 1 ohm for leads - refer to Testing and Trouble Shooting, 7.A.NOTE.

PRESSURE INDICATOR, 0-4 bar

MODEL S546-1-531

4. Variant Data (Ref. Figs. 1 and 2)



Front View of S546-1-531
Figure 1

A. General

Model S546-1-531 is a d.c. indicator connected in a current stabilised bridge network. The indicator is designed for use with a Weston (UK) S.122 pressure transmitter. The instrument scale is calibrated 0-4 bar. If power fails, the indicator pointer is deflected to the scale 'OFF' position. Electrical connections to the indicator are made via a radial terminal block. A non-reflecting glass is fitted to the case.

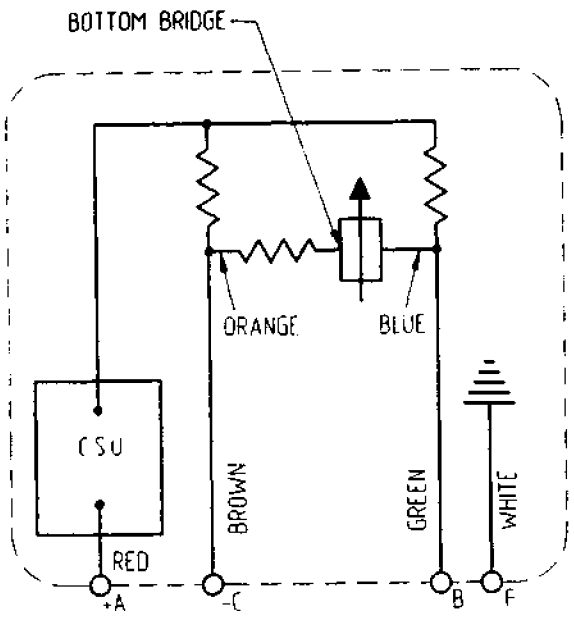
B. Scale Detail (Ref. Fig. 1)

The indicator pointer deflects over a 220° scale with divisions as shown in the figure. Scale markings, the captions bar, OFF and the pointer are finished in white; the scale background in matt black. The case bezel is black.

PRESSURE INDICATOR, 0-4 bar

MODEL S546-1-531

C. Electrical Data (Ref. Fig. 2)



Circuit Diagram of S546-1-531
Figure 2

Resistance of moving element (including springs)	120 - 162 ohms
Moving coil sensitivity (in case)	0 bar - nominal 0.071mA
	4 bar - nominal 1.36mA
Maximum circuit current at 26V	5mA
Accuracy	±2°C

PRESSURE INDICATOR, 0-4 bar

MODEL S546-1-531

D. Test and Calibration

Calibration Table

Scale Mark bar	External Resistance R1(ohms)	R2(ohms)
0	490	3010
1	1052	2448
2	1605	1895
3	2150	1350
4	2687	813

Details of the calibration procedure are given in TESTING AND TROUBLE SHOOTING. The accuracy of the indicator is 2% of full scale deflection, that is ±0.08 bar.

TESTING AND TROUBLE SHOOTING

1. General

The procedure given presupposes that the indicator has been removed from the aircraft because of a fault condition. However, the numerical testing sequence follows a step-by-step procedure which combines with a diagnosis of faults that can occur at the Assembly and Testing levels.

2. Preparation

NOTE: Equivalent substitutes may be used for listed equipment. Equipment applies to all variants unless stated otherwise.

TABLE 101

EQUIPMENT AND SPECIAL TOOLS

A. Equipment

Equipment	Code	Supplier
Portable d.c. milliammeter Range: 0-2mA Accuracy: ±0.5% f.s.d.		Salford Electrical Industries Ltd., Eccles, Manchester.
Insulation test meter 250/500V d.c.	1905L	Comark Electronics, Rustington, Sussex.
Portable Wheatstone Bridge (substitute must measure to ±0.5%)	5785/4	H. Tinsley & Co.Ltd., Stanger Road, London SE25
Decade resistance box (R1) (Max. resistance: 5000 ohms; Min step: 1 ohm)	5274/4	H. Tinsley & Co.Ltd., Stanger Road, London SE25
Raiser/Demagnetiser.	M.S.C.2	Hirst Electrical Industries, Gatwick Road, Crawley, Sussex
Jig (for holding movement complete)	J2A	
Limiting resistor - as reqd. Value Ref.) 'CAUTION' Rating) Para. 3		Mullard Ltd., Torrington Place, London WC2

TABLE 101

EQUIPMENT AND SPECIAL TOOLS (CONT.)

B. Special Tools

Description	Code	Supplier
Balance Wrenches	271157	Weston (UK) Division, Great Cambridge Road, Enfield, EN1 3RX

3. Testing and Trouble Shooting Procedure (Ref. Fig. 101)

Apply the procedure given in Fig. 101. Commence with 'START' box and follow direction of arrows.

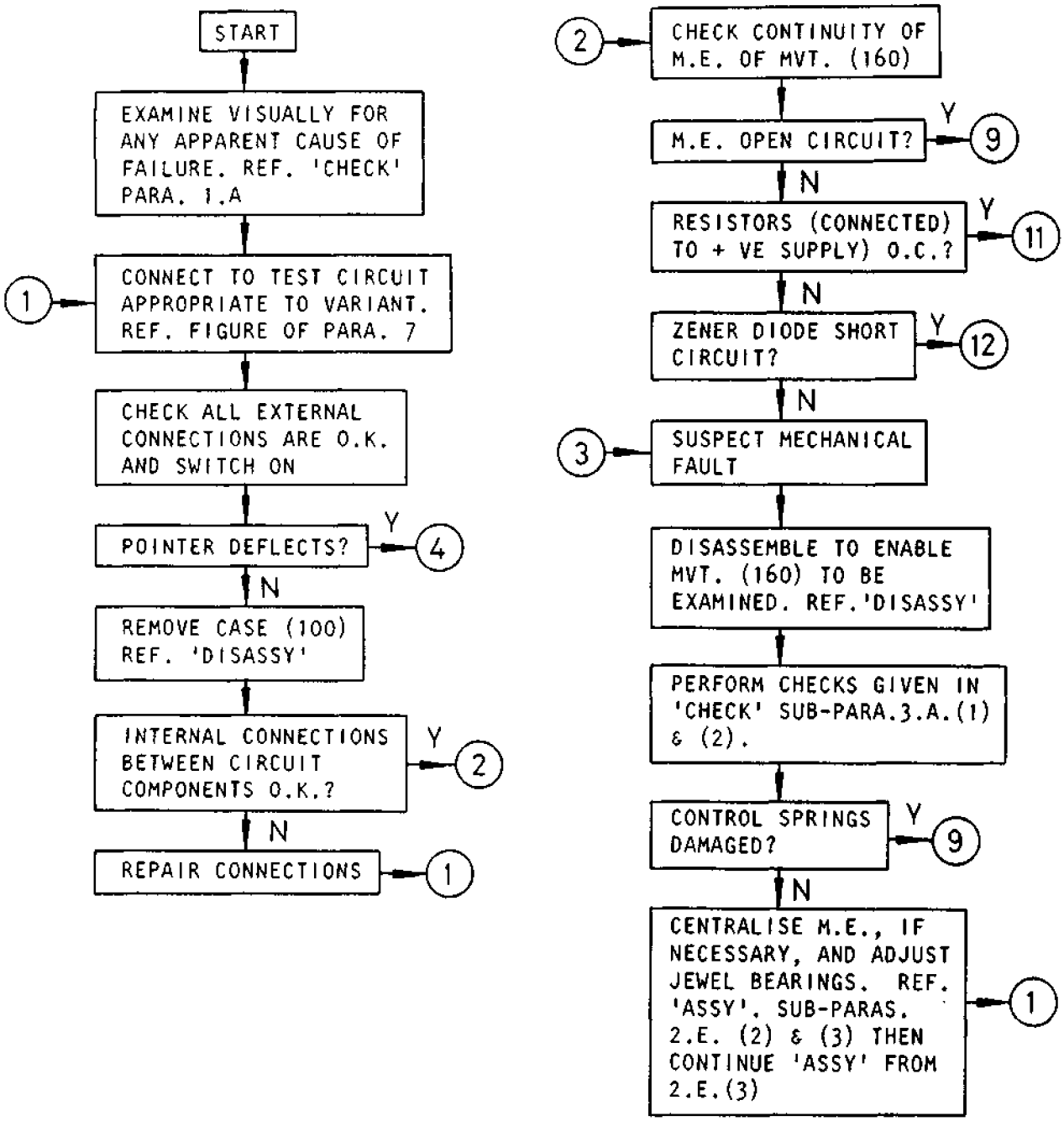
CAUTION: DO NOT EXCEED RATED CURRENTS OR VOLTAGES FOR CIRCUIT ELEMENTS. IN PARTICULAR ENSURE THAT NO MORE THAN TWICE THE STATED F.S.D. CURRENT IS PERMITTED TO PASS THROUGH THE MOVING ELEMENT OF THE MOVEMENT COMPLETE (160).

NOTE: Carry out the high voltage and insulation tests given in para. 4 immediately before and after sealing the indicator.

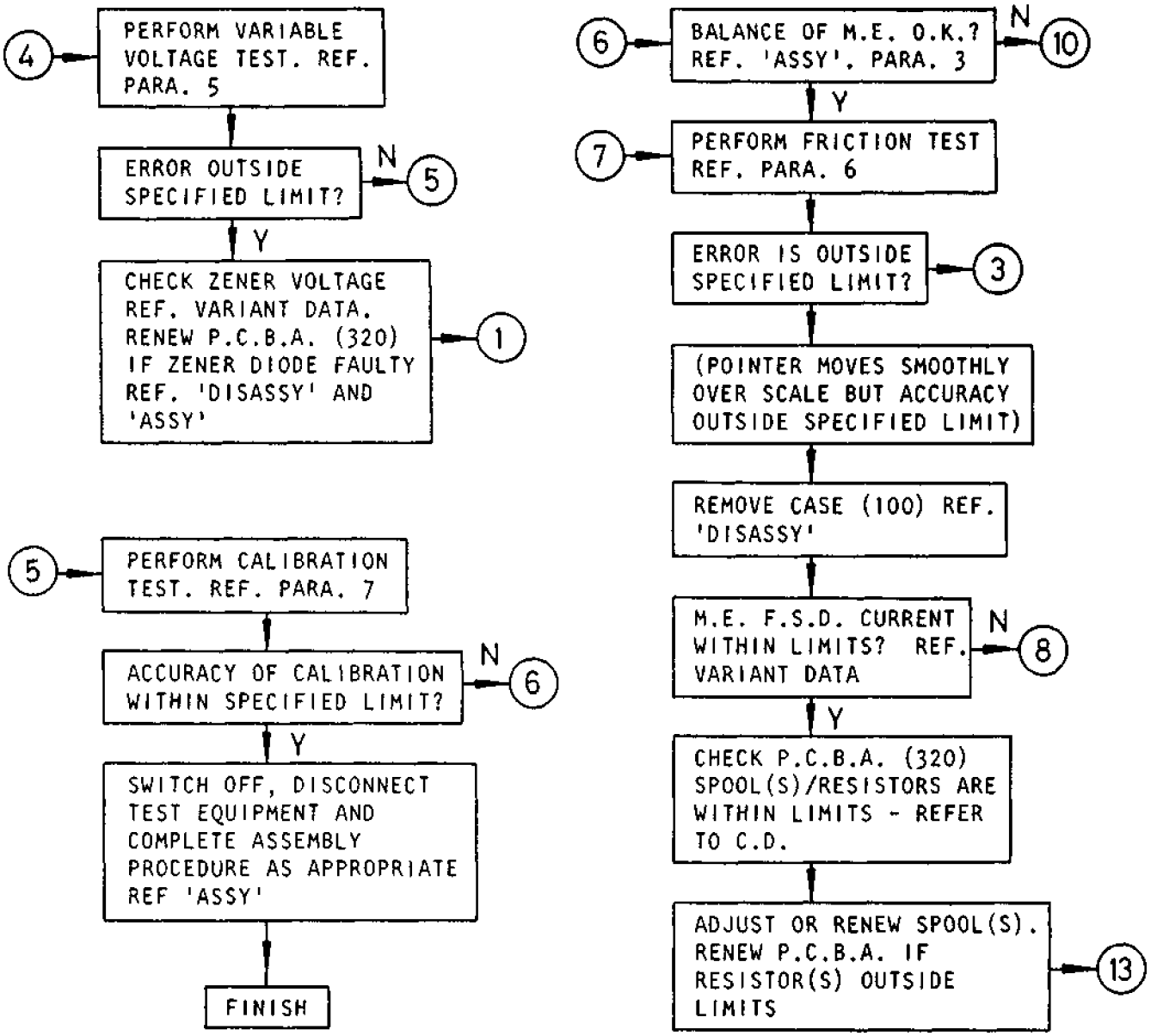
Abbreviations used in Fig. 101 are as follows:-

O.C.	OPEN CIRCUIT	Y	YES
M.E.	MOVING ELEMENT	N	NO
ASSY.	ASSEMBLY	DISASSY	DISASSEMBLY
F.S.D.	FULL SCALE DEFLECTION DEFLECTION	P.C.B.A.	PRINTED CIRCUIT BOARD ASSEMBLY
C.D.	CIRCUIT DIAGRAM	MVT.	MOVEMENT

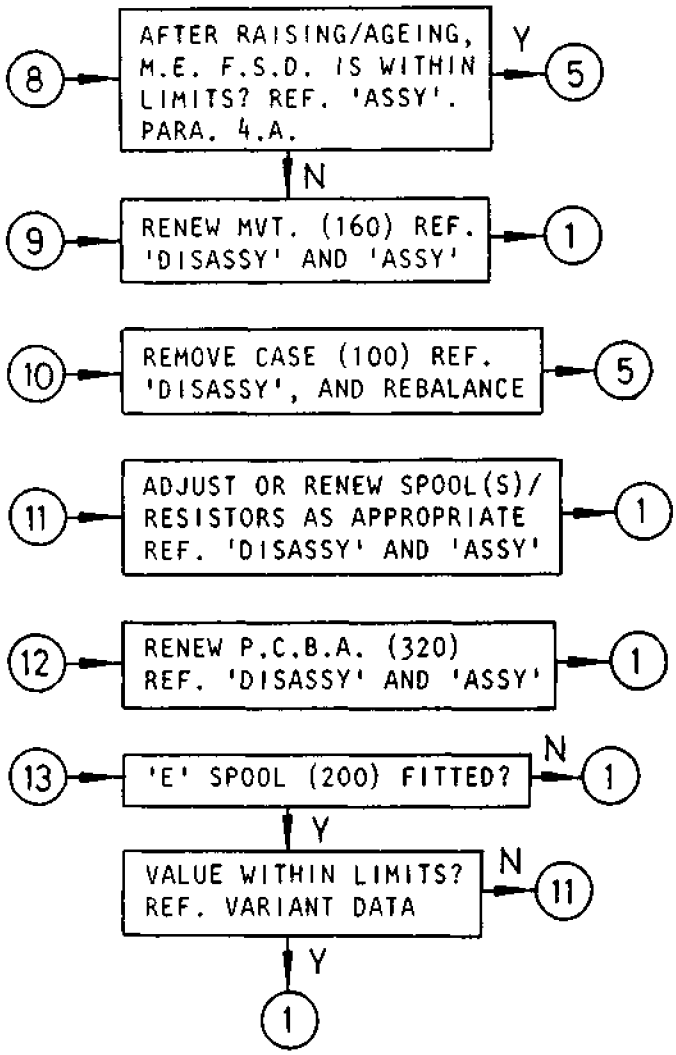
TEMPERATURE INDICATOR



Test/Fault Flow Diagram
Figure 101 (Sheet 1 of 5)

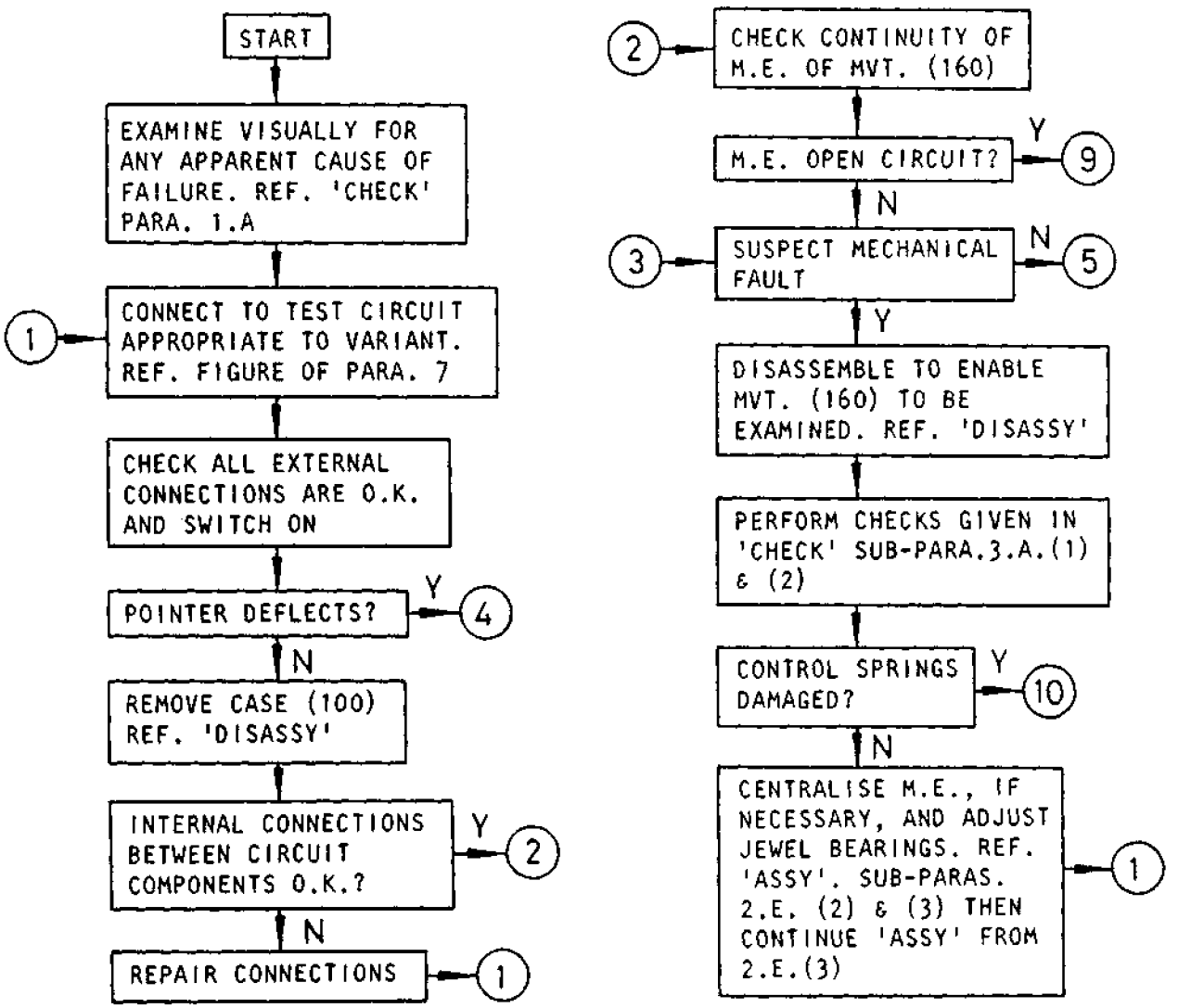


Test/Fault Flow Diagram
Figure 101 (Sheet 2 of 5)

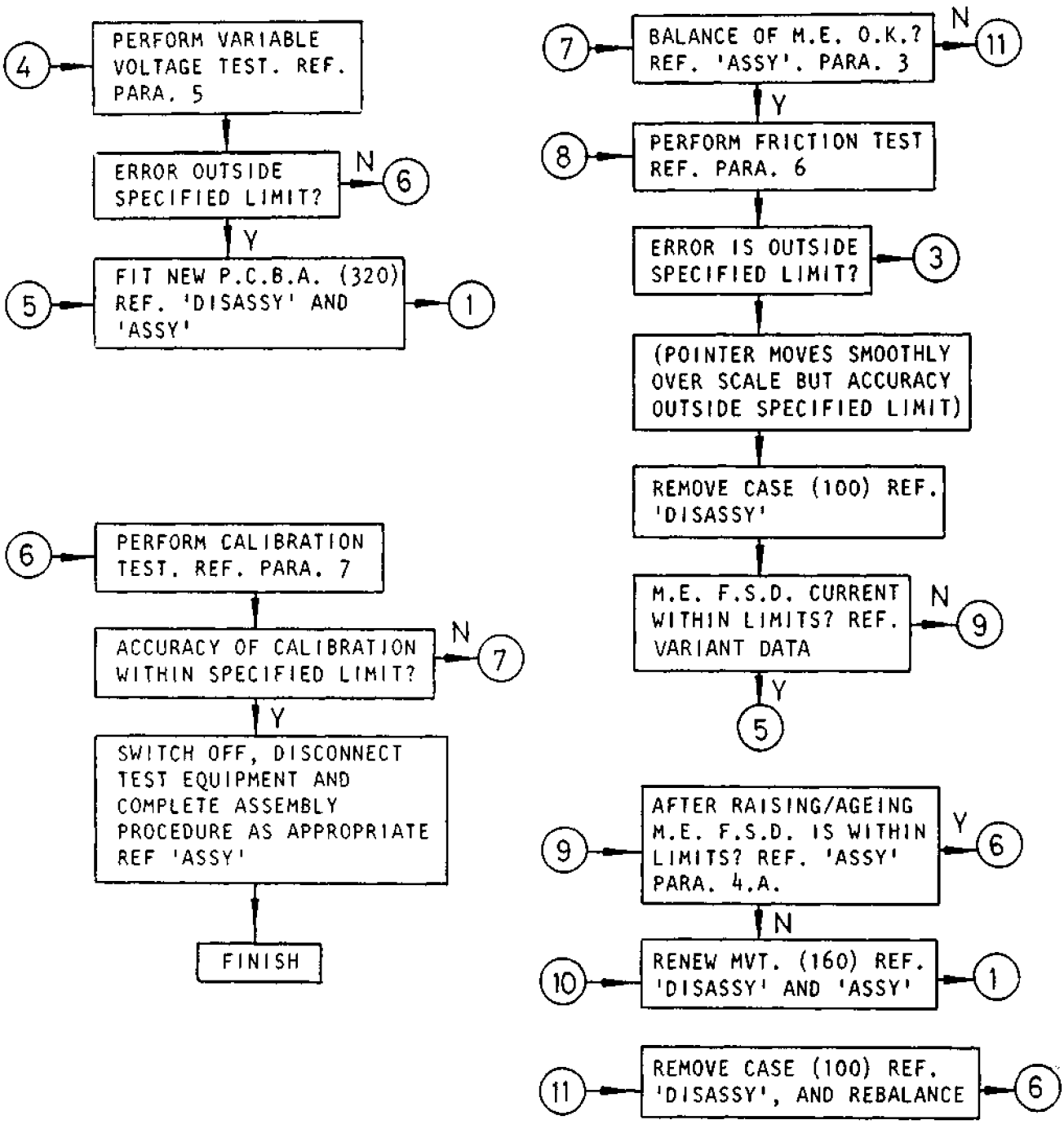


Test/Fault Flow Diagram
Figure 101 (Sheet 3 of 5)

PRESSURE INDICATOR



Test/Fault Flow Diagram
Figure 101 (Sheet 4 of 5)



TEst/Fault Flow Diagram
Figure 101 (Sheet 5 of 5)

4. High Voltage and Insulation Tests

A. High Voltage

Apply 500 Volts r.m.s. between the indicator circuits bonded together and its case for a period of 1 minute. There must be no insulation breakdown.

B. Immediately following the high voltage test, check the insulation of the indicator as below.

(1) Between all circuits bonded together and the case. The insulation resistance must not be less than twenty megohms after the application of 500 Volts D.C. for not less than 15 seconds.

5. Variable Voltage Test

A. Connect the indicator to the appropriate variant test circuit (ref. para. 7). Set resistance box R1, or boxes R1 and R2 if a pressure indicator circuit, to give mid-scale deflection (ref. Variant Data, Test and Calibration), and energise the circuit with 26V d.c. Observe the indication. Vary the supply voltage over the range 24-29V. Repeat the procedure at left-hand and right-hand scale cardinals.

B. The variation from the initially observed indicators must not exceed ± 1% of full-scale deflection, or if variant has an offset zero, the summation of scale end values.

6. Friction Test

A. Connect the indicator into the test circuit appropriate to variant. The resistance box or boxes must be of a continuous variable type, not in decade steps. Mount the indicator with its scale in the vertical plane.

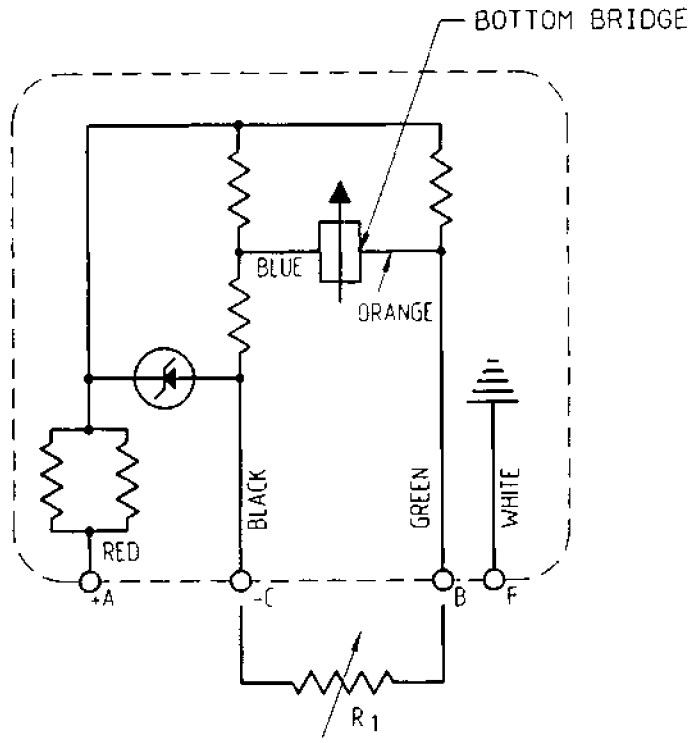
B. Energise the indicator, (26V) with box or boxes set to deflect the pointer to the left-hand scale cardinal. Lightly tap the indicator. Gradually vary R1 to bring the pointer to a vertical division and aligned with a scale cardinal or division line taking care not to overshoot. Record the value of box or boxes.

C. Gradually vary box or boxes to deflect the pointer to the right-hand scale cardinal. Lightly tap the indicator. Gradually vary box or boxes until the value is as recorded in sub-para. B. Observe the error (if any) in the pointer deflection chosen in sub-para. B.

D. The error is the difference between the two recorded pointer indications as a percentage of full scale deflection, or if the indicator has an offset zero, the summation of the scale end values. The error must not exceed ± 2%.

7. Calibration Test

A. Temperature Indicators (Ref. Fig. 102)



Calibration Test Circuit
Figure 102

1. Connect the indicator in the circuit of Fig. 102, set the d.c. supply to 26V and adjust resistance box R1 to give readings in the range appropriate to the indicator under test (refer to Variant Data, Test and Calibration). R1 simulates the external transducer to which the indicator is connected in normal operation.

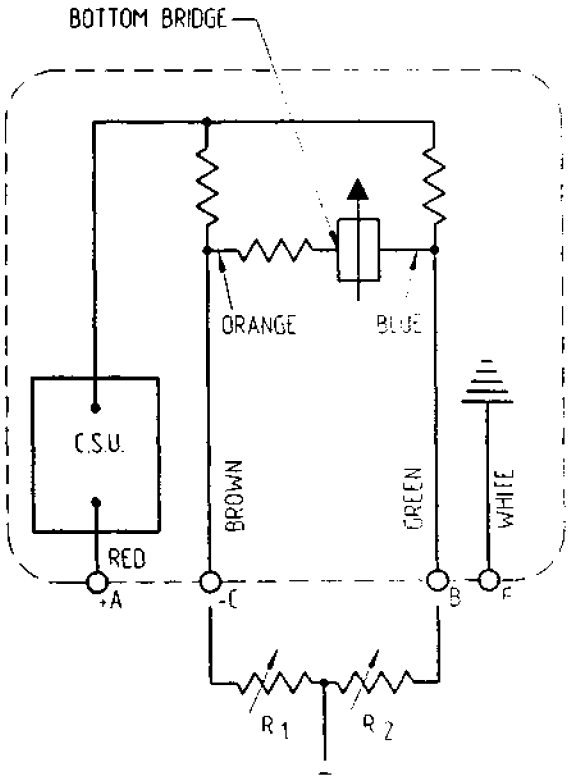
2. Vary R1 up and down to give indicator readings between zero and full scale deflections. Note any tendency of the pointer to stick or give inconsistent readings when the same values of R1 are repeatedly reselected with the indicator in different attitudes.

3. Refer to Variant Data, Test and Calibration and check the accuracy of the indicator at each of the given values of the external resistance (R1).

NOTE: The value of the external resistance, R1, given in the calibration table includes the lead resistance between external transducer and indicator appropriate to the installed state. Unless otherwise stated therefore, connecting leads of negligible resistance should be used in testing procedures.

4. For variants without numerically graduated scales, calculate accuracy by direct measurements of the angular deflection of the pointer, taking care to minimise parallax errors.

B. Pressure indicators (Ref. Fig. 103)



Calibration Test Circuit
Figure 103

1. Connect the indicator in the circuit of Fig. 103, set the d.c. supply to 26V. The resistance boxes R1 and R2 are adjusted to simulate changes in the resistance of the pressure transmitter.

2. Refer to Variant Data, Test and Calibration and check the accuracy of the indicator against the values stated in the calibration table. Note any tendency of the pointer to stick or give inconsistent readings when the same values of R1 and R2 are repeatedly reselected with the indicator in different attitudes.

DISASSEMBLY

1. General

Ascertain if the indicator has been returned with a history sheet, which may indicate any part needing particular attention. Complete disassembly details are not given as such action is not generally necessary.

NOTE: Connect the indicator into a circuit as shown in the Testing and Trouble Shooting section to establish the electrical condition of the indicator or most probable cause of its malfunction. This action will determine the extent of the required disassembly.

2. Procedure (Ref. IPL, Fig. 1)

A. If the indicator is of the radial-terminal block type, remove round nuts (20), 3 off; collect flange cover (10) and cover plates (30). Carefully withdraw terminals (40) with connection wires and screw and washer assemblies (50) attached; collect drilled flange (60) and pillar (70) from end-plate (390).

B. Remove sealing wire (80) from the end plate; pull it clear with a pair of pliers.

C. Carefully withdraw the indicator from its cover until it is possible to prise our seating ring (90); avoid breaking connections from the printed-circuit board assembly (320).

D. Withdraw the indicator fully from its case (100) and remove moulded collar (110).

E. Remove scale screws (140) and lockwashers (150), 2 off each item; remove the upper scale (120) and lower scale (130); exercise care and avoid damage to the pointer.

F. Unsolder from movement complete (160) its top bridge connection. Remove nyloc nuts (170), 4 off; carefully withdraw assembly (160) and unsolder the connection from its bottom bridge.

G. If fitted, and if the movement complete is being renewed, remove the following items from the movement complete (160): screws (210), lockwashers (220), spool (200), screw (240) and lockwasher (250) and collect spool mounting bracket (230).

H. Collect spacers (260), spacer washers (270), 4 off each item and then remove round nuts (290), and lockwashers (300), 3 off each item; collect ruggedized ring (280) and insulator (310).

I. Unscrew and remove shouldered nuts (330), 3 off. Partially withdraw printed-circuit board assembly (320) from projecting end-plate supports to enable connections to end-plate to be unsoldered.

J. Unsolder from the end-plate connector, wires from the printed-circuit board assembly (320) having recorded the pin number and position to which each coloured wire is connected. Collect end-plate sleeves (380).

K. Complete withdrawal of printed-circult board assembly (320) and collect spacers (370), 3 off.

L. If fitted and if appropriate, remove spool (340): record the positions of, and then unsolder its connections to printed-circuit board assembly (320); remove screw (350), washer (360) and collect spool (340).

CLEANING

1. Preparation

TABLE 401

MATERIALS

Material/Specification	Supplier
Acetone, B.P.	Commercially Available
Spirits, Methylated	" "
Brush, Bristle	" "
Leather, Chamois	" "

NOTE: Equivalent substitutes may be used for listed items.

2. Procedure (Ref. IPL, Fig. 1)

WARNING: USE ACETONE IN A WELL-VENTILATED AREA AND AVOID BREATHING FUMES. ACETONE AND METHYLATED SPIRITS ARE HIGHLY FLAMMABLE.

CAUTION: ENSURE THAT ACETONE DOES NOT COME INTO CONTACT WITH INSULATING OR COATED SURFACES OR PLASTIC PARTS.

A. Use acetone applied with a brush to remove Bostik (or alternative material used) adhering to threads of screws, nuts and components which have been removed from assemblies and are not to be renewed.

B. Remove residual solder from the rim of the case (100).

C. Remove surplus flux from all metal surfaces and edges with methylated spirits.

CAUTION: EXCESS CORALINE FLUX SHOULD BE WIPED AWAY WITH A DRY RAG ONLY - DO NOT USE SOLVENTS.

D. Use soft brush to remove dust from the case; clean the glass with a chamois leather.

E. Clean plastic items with methylated spirits; wipe off surplus spirit immediately.

F. Clean the magnet gap of the movement (160) with a jet of clean dry air. Keep the movement complete in a dust-free container until reassembly.

NOTE: Air from workshop compressed-air lines is unsuitable.

CHECK

1. Preparation

TABLE 501

MATERIALS AND EQUIPMENT

NOTE: Equivalent substitutes may be used for items listed.

Item	Code	Supplier
Magnifying glass	-	Commercially available
Non-metallic tool (Ref. Sub-para. 3.A)	-	Commercially available
Multi-minor tester	Mk.5	Avo Ltd., Archcliffe Road, Dover.
Limiting resistor (Ref. sub-para. 3.A.)	-	Mullard Ltd., Torrington Place, London. WC2

2. General Checks

Apply the following general checks to indicator components. Additional detailed checks are given in para. 3.

A. Examine components for:

(1) Corrosion.

(2) Serviceability of threads.

(3) Distortion.

(4) Cracks.

(5) Evidence of wear.

(6) Security of components not dismantled.

3. Detail Checks (Ref. IPL, Fig. 1)

A. Examine parts as follows:

CAUTION: DO NOT USE A METALLIC NEEDLE FOR REMOVAL OF OBSTRUCTIONS (SUB-PARA. (1)). AVOID DAMAGE TO MOVEMENT CONTROL SPRINGS (SUB-PARA. (2)).

(1) The gaps in which the moving coil rotates for obstruction; the magnetic core and adjacent surfaces. Remove particles adhering to these surfaces with a suitably shaped piece of wood, plastic or non-metallic tool.

(2) The control springs of movement complete (160); they must open as the pointer is deflected upscale.

(3) The glass of case (100) for security, cracks and cleanness.

(4) The scale surface for good finish. The scale markings must not be broken nor defaced. Examine the pointer, its finish and ensure correct alignment with scale datum mark.

B. Check resistances as follows:

CAUTION: WHEN USING THE TESTER (OR EQUIVALENT SUBSTITUTE) ENSURE THAT NO MORE THAN TWICE THE VARIANT FULL-SCALE DEFLECTION CURRENT (REF. VARIANT DATA) PASSES THROUGH THE MOVING ELEMENT BY INSERTING APPROPRIATE RESISTANCE IN SERIES WITH MOVING ELEMENT.

(1) Check that resistance values of the moving element of the movement complete (160), spools (200) and (330) are within limits specified in Variant Data, making allowance for the series limiting resistor when measuring the resistance of the moving element.

REPAIR

1. Case Assembly (100) (Ref. IPL, Fig. 1)

   If the case or glass is damaged the assembly must be replaced.

2. Movements Complete (160)

   CAUTION: THE BEADS OF THE POINTER STOPS MUST NOT BE HANDLED.

   This item is not repairable beyond minor remedial action. Pointer stops (180/190) can be replaced.

3. End Plate (390/390A)

   If the end plate or its connector is damaged the complete end-plate must be replaced. Damaged parts (400), (410), (420) and (430) can be replaced as required.

4. Printed-circuit Board Assembly (320)

   Spools can be adjusted to lower resistance values. If the fixed resistors or zener diode are defective, which is determined from the fault/flow diagram of Testing and Trouble Shooting, the complete assembly (320) must be replaced.

ASSEMBLY

1. Materials, Equipment and Special Tools

NOTE: Equivalent substitutes may be used for listed Materials and Equipment. The materials can be ordered directly from Weston (UK) quoted manufacturers.

TABLE 701

MATERIALS, EQUIPMENT AND SPECIAL TOOLS

A. Materials

Material	Specification	Supplier
Red Thermolene lacquer No. 185	MILS 22473 GRADE B	A. Cannings & Co. Ltd. Great Hampton Street, Birmingham
Bostik B.S.104	Bostik No. 772 thinned with Acetone B.P.C. to a brushable consistency	Weston (UK) Division, Great Cambridge Road, Enfield, EN1 3RX
Solder, resin cored 59/41	QQS571 - Types SN50	E.G.M. Solder Ltd., Wolsey Road, Mitcham, Surrey
Solder, resin cored 50/50	QQS571 - Type SN60	
Shell Teepol (514/610)		Shell Chemical U.K. Ltd. 41 Strand, London. WC2
Lubricant 'Mr. Sheen'	-	Reckitt & Colman Ltd., Burlington Lane, London. W4

TABLE 701

MATERIALS, EQUIPMENT AND SPECIAL TOOLS (CONT.)

B. Equipment

Equipment	Code	Supplier
Raiser/Demagnetiser	M.S.C.2.	Hirst Electrical Inds. Gatwick Road, Crawley, Sussex.
Jig (For holding movement)	J2A	
Sealing Equipment: comprising:		
Vacuum Pump E2M5	03-A361-01-912	Edwards High Vacuum Manor Royal Crawley, West Sussex, RH10 2LW
Vibration Isolators 4	04-A248-01-404	" "
Vacuum Gauge, Pirano 10	07-D-35-53-000	" "
Gauge Head PR10K	07-D024-22-000	" "
Leakage Valve LV5	20-C370-01-000	" "
Back Migration Trap	04-A133-05-000	" "
Isolation Valve PV10K	20-C311-05-000	" "
Water Tank, approx. 6"x6"	-	Commercially available
Pressure Test Adapter	TD32391	Weston (UK) Division, Great Cambridge Road, Enfield, EN1 3RX
Cylinder - Dry Nitrogen with		British Oxygen Co.Ltd., Deer Park Road, London. N.W.19
Two Stage regulator Delivery pressure 4.8 Bar.	SRX 70	British Oxygen Co.Ltd.,
Pressure Gauge	S42261	British Oxygen Co.Ltd.,

NOTE: Equivalent substitutes may be used for listed items.

C. Special Tools

Item	Code	Supplier
Balance Wrenches	271157	Weston (UK) Division Great Cambridge Road, Enfield, EN1 3RX

2. Procedure (Ref. IPL, Fig. 1 701 and 702)

CAUTION: USE GREAT CARE AND PREVENT THE FINISHING MATERIALS FROM COMING INTO CONTACT WITH THE MOVING PARTS.

NOTE: During assembly coat with solution EC776 all nuts, threaded holes and screw heads to lock against vibration. Apply Thermolene lacquer to the jewel screws and bridge abutments after these items have been finally adjusted. Solder all spool and circuit connections using 50/50 solder and then coat the solder joins with Thermolene lacquer. Refer to Table 701 for the listed materials.

A. Assemble spacers (370), 3 off to assembly (320). Locate assembly over projecting supports of the end-plate (390/390A) leaving sufficient space to resolder connections to the end-plate connector.

B. Fit insulating sleeves and solder coloured wires from assembly (320) to appropriate pins of end-plate connector as recorded at disassembly. Press assembly against shoulders of the projecting supports of the end-plate (390/390A).

C. Secure printed-circuit board assembly (320) with 6 B.A. shouldered nuts (330), 3 off. Tighten nuts evenly and ensure heat sinks of resistors (if fitted) make firm contact with end-plate (390/390A).

D. Place ruggedized ring (280) in position over studs of end-plate (390/390A) resting against shouldered nuts (330). Secure ring with 6 B.A. lockwashers (300) and 6 B.A. round nuts (290), 3 off each item. Place spacing washers (270) and spacers (260), 4 off each item, over the studs of ring (280).

E. Before securing the movement complete (160) to the studs of ring (280), complete the following procedures:

(1) Ensure that the gap in which the moving coil swings is free from obstructions; refer to the Check section of the manual for the necessary action.

(2) Adjust, if necessary, the jewelled bearings to centralize the position of the moving coil relative to the pole piece.

(3) Adjust the jewelled bearings to just obtain discernible flop of the pointer. Pointer flop is the movement of the pointer caused by the pivots moving laterally in their bearings. If the bearings need adjustment, check that the coil is evenly centred and then adjust the jewel screws in the top and bottom bridges, in increments of one tenth of a turn until pointer flop is just eliminated. Then back off the top jewel screw by between one tenth and one eighth of a turn until slight pointer flop is just perceptible. Maintain the requirements of sub-para (2) when making the adjustment. Complete the procedure and secure the movement complete (160) with 6 B.A. nyloc nuts (170), 4 off.

(4) If incorporated in variant, refit spool (200); secure bracket (230) to movement (160) with 10 B.A. screws (240) and lockwashers (250); secure spool (200) to bracket (230) by 10 B.A. screw (210) and lockwasher (220).

F. Solder the connecting leads to the movement complete (160); the blue lead to the tag of the top bridge; the orange lead to the bottom bridge.

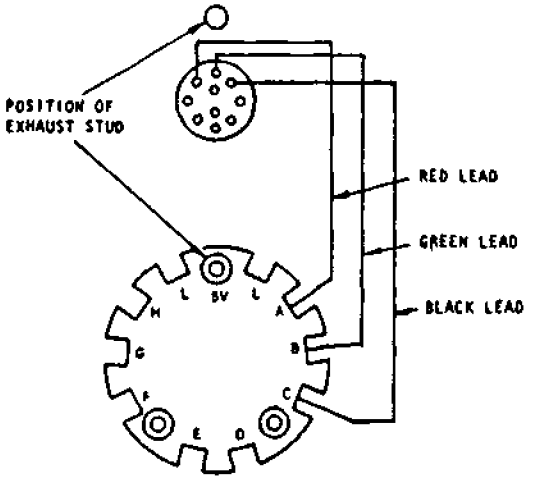
G. Clip upper scale (120) to lower scale (130) and then carefully ease the pointer through the hole in the lower scale. Ensure that the clip of the upper scale engages in the groove of its location stud on the movement complete. Secure the scale to the studs of the movement complete (160) with 10 B.A. lockwashers (150) and 10 B.A. screws (140), 2 off each item.

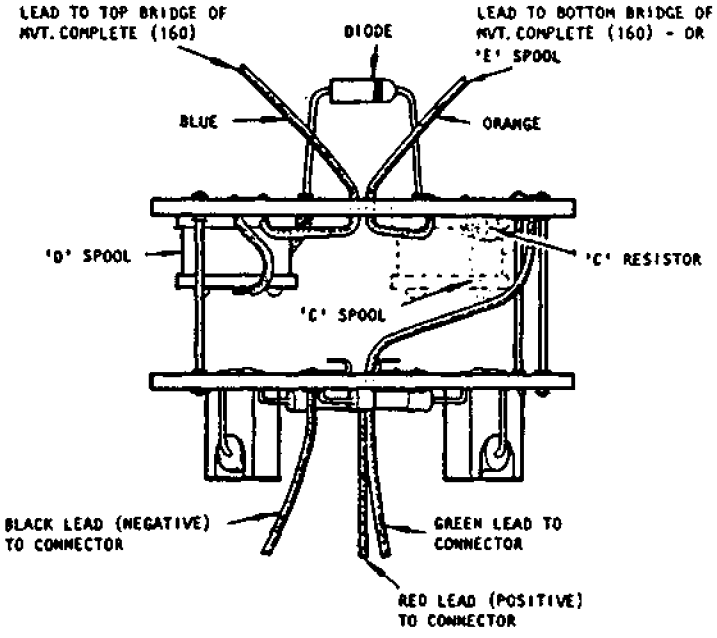
H. Check the balance of the moving element as instructed in para. 3.

I. Refer to the Testing and Trouble Shooting section if the movement complete (160) and/or printed-circuit board assembly (320) have been renewed.

J. If a new movement complete (160) has been fitted, age and stabilise the magnet as described in paras. 4 and 5 respectively. Recheck the balance of the moving element after the temperature stabilising procedure.

K. After the completion of all testing and adjustments, place insulator (310) in position over the printed-circuit board assembly (320); the front edge of insulator (310) must rest against the ruggedized ring (280), and the bottom edge against seating ring (90) when it is fitted.





Connections to End Plates and
Printed Circuit Board Assembly
Figure 701

L. Prior to fitting moulded collar (110) apply the recommended lubricant to lint-free cloth and wipe the outer periphery of the collar. Polish the treated surface with a clean cloth before the lubricant dries. Fit the collar over the movement complete ensuring the scales are correctly seated in the groove of the collar.

M. Fit the seating ring (90) with its ridged periphery towards the endplate and insert the indicator into its case (100). Check prior to sealing, that the sealing wire (80) fits into the recess between the end-plate (390/390A) and case (100), and that no gap is evident in the sealing wire.

N. Effect the pre-sealing and sealing procedures given in paras. 6 and 7.

O. Indicators fitted with radial terminal block:

(1) Screw pillar (70) to the exhaust stud on end-plate (390). Check that the sealing pin soldered into the exhaust stud is straight and does not foul the pillar (70) when screwed in place.

(2) If the end-plate (390) has been renewed, solder connecting wires from the tags of the end-plate to terminals (40). Locate the drilled flange (60) over the studs of the end-plate and then locate the terminals in their positions to align with the markings of flange cover (10). The wire colours and positions of terminals are to be as recorded at disassembly.

(3) Insert cover plates (30) into unused terminal positions. Place flange cover (10) in position and secure with round nuts (20), 3 off.

3. Balancing the Moving Element of Movement Complete (160)

Prior to balancing the moving element, check that it is correctly adjusted between the jewelled bearings as detailed in sub-paras 2.E(2) and 2.E.(3); then proceed as follows:

A. Adjust the balance weights of the moving element with the pointer in the positions given below. After adjustments the weights must not project beyond the ends of the cross arms of the pointer.

The accuracy of adjustment must not be worse than ±2% of full scale deflection in the stated positions.

(1) Set the pointer to a cardinal line at or near mechanical zero with the indicator in the horizontal plane.

(2) With the pointer horizontal and its pointer tip to the left.

(3) With the pointer horizontal and its pointer tip to the right.

(4) With the pointer vertically upwards.

NOTE: The scale must be kept in the horizontal plane and turned to give the correct positions (2) to (4) before gently raising the scale to the vertical plane.

4. Ageing the Magnet of Movement Complete (160)

A. Use the raiser/demagnetiser specified in Table 701.

(1) Age the magnet to give the required sensitivity as stated in the Variant Data section and with circuit conditions as given in the Testing and Trouble Shooting section of the Manual.

NOTE: If the required ageing is accidentally exceeded, the magnet must be resaturated using the raiser/demagnetiser. If, however, this equipment is not available the magnet can be demagnetised using a coil designed to be connected to a 50Hz supply. The ageing process may be accomplished by the gradual approach and recession of the coil or by slowly increasing and decreasing the current in the magnetising coil. The process must be continued until the correct pointer deflection is obtained.

5. Temperature Stabilisation of Indicator

A. The stabilisation procedure follows the ageing process of the magnet:

(1) Subject the indicator to a temperature of +93°C ±2°C for at least 8 hours.

(2) Check the balance, adjustment of moving element between the jewels and the accuracy of the indicator after the stabilisation procedure. Allow a minimum period of 12 hours after stabilisation before checking.

6. Pre-Sealing Procedure

A. Check that all the required finishes to nuts, soldered joins and screws have been applied.

B. Examine the case interior (which will be in contact with the sealing wire) to ascertain that it is free from excess solder.

C. Withdraw the end-plate assembly approximately half an inch from the case and place the indicator in an oven to dry out for a period of 8 hours at a temperature of +60°C.

7. Sealing Procedure (Ref. Fig. 702)

The indicator must be sealed within one hour of its removal from the drying oven. If this is not possible the indicator must be kept in a dry atmosphere. Failure to keep the indicator dry will necessitate re-drying as described in para. 6.

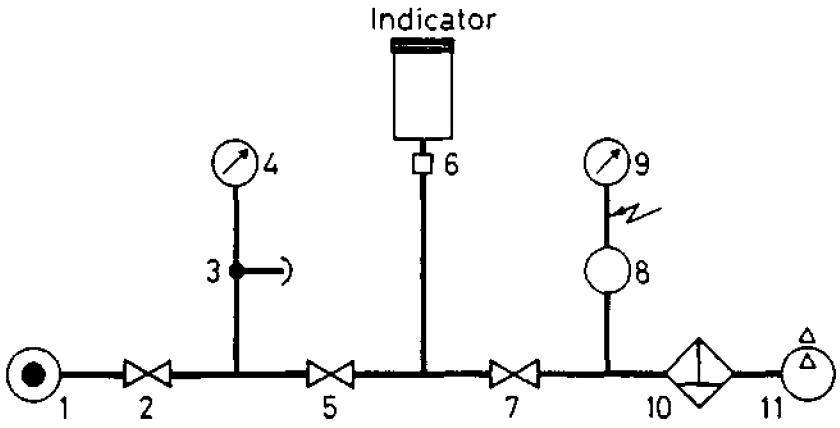
A. Push in the end-plate assembly so that the end-plate rests firmly on the seating ring (90).

B. Fit the sealing wire (80) in the gap between the end-plate (390/390A) and the case (100). The sealing wire must fit into the gap without leaving a space.

C. Solder the sealing wire into position, using solder 60/40, and ensure that the end-plate is completely sealed to the case. The wire must overlap at the split and must not be embedded in solder at this junction. Facilitate soldering with the use of Coraline Flux; clear surplus flux with a dry rag.

D. Connect the exhaust stud on the indicator end-plate to the gas filling rig in order to remove air from the case.

E. Ensure that a tight seal is made between the exhaust stud and the manifold.



1. Pressure Source (Dry Nitrogen)
2. Isolation Valve
3. Leakage Needle Valve
4. Pressure Gauge (Dry Nitrogen)
5. Isolation Valve
7. Isolation Valve
8. Gauge Head
9. Vacuum Gauge
10. Back-migration Trap
11. Vacuum Pump

Fig. 701 Gas Filling Rig

CAUTION: PLACE THE INDICATOR IN A SAFETY TANK TO AVOID POSSIBLE INJURY TO PERSONNEL IN THE EVENT OF THE CASE GLASS DISINTEGRATING.

F. Ensure that all valves are closed.

G. Start the vacuum pump (11) and obtain a vacuum between 0.01mm Hg and 0.1mm Hg (1.3 Pa and 13 Pa).

H. When the required vacuum is indicated on gauge (9), open valve (7) and allow the system to attain the required vacuum.

NOTE: If it is not possible to obtain or maintain the vacuum close valve (7); remove the indicator and check for leakage as detailed in paras L and M. Inspect and if necessary reseal the indicator. Reconnect the indicator to the system; open valve (7) and obtain the required vacuum.

J. Close valve (7). Adjust valve (2) to obtain a pressure of 15 p.s.i.g. gauge (100 kPa) on pressure gauge (4). Open valve (5) to admit dry nitrogen into the system.

K. After a lapse of 30 seconds, adjust control valve (2) and leakage needle valve (3) to reduce the system pressure to 10 p.s.i.g. (70 kPa) on pressure gauge (4).

L. The indicator, still under pressure, must now be immersed in 99.5% distilled water and 0.5% wetting agent.

NOTE: A suitable wetting agent is Shell Teepol 514.

M. Gently tap the indicator to remove any air bubbles that may be trapped on the case exterior. Examine over a period of five minutes, for any sign of leakage. Leakage will be shown by the presence of bubbles leaving the case. In the event of leakage, mark the case at the defective part for action on removal of the indicator from the system. Particular care must be taken to check for leakage at the seal between the case and the backplate, and the case glass.

N. At the completion of the test for leakage, reduce the dry nitrogen pressure to zero by operating control valve (2).

P. Remove the indicator from the tank and dry with a piece of lint free cloth. Disconnect the indicator from the pressure test adaptor and seal as instructed below.

(1) Indicator case fitted with a sealing tube:
Crimp the tube in a suitable fixture and seal the end of the tube with solder.

(2) Indicator case fitted with sealing stud:
Place a sealing pin in the stud aperture and complete the sealing process by carefully soldering the pin to the stud.

NOTE: The final sealing of the indicator must be made immediately after its removal from the tank.

8. Storage

A. If the original packing is not available, obtain the following:

(1) Packing for temperate areas:

(a) Oven dried silica gel.

(b) A polythene bag to contain the indicator together with the silica gel. Heat seal the opening of the bag.

(c) A rubberised hair mould to enclose the indicator in its polythene bag.

(d) A cardboard box to contain the hair mould.

(e) Gummed paper strip to seal the cardboard box.

(f) A label to be affixed to the box and giving the following information:

1. Identification e.g. S546.1.00

2. Modification standard.

3. Date of removal from aircraft.

4. Date of last service.

5. Details and date of any component change.

6. Reason for return of indicator.

(2) Packing for Tropical areas:

(a) Water resistant paper to completely enwrap the indicator; then proceed as described in sub-paras. (1) (d) and (e).

(b) A polythene bag large enough to hold the rubberised mould. Heat seal the bag and proceed as described in sub-paras. (1) (d) and (e).

(c) A wooden box of suitable dimensions to enclose the cardboard box; secure it and affix a label as in (1) (f).

B. If the original packing is available, repack the indicator and affix a label as in A. (1) (f).

C. Indicators must be stored under conditions where humidity does not exceed 50% and the temperature is within the range -20°C to +50°C.

D. Indicators which have been in store must be subjected to the calibration check and the insulation resistance test detailed in the Testing/Trouble Shooting section before being put into service.

SPECIAL TOOLS, FIXTURES AND EQUIPMENT

1. General

The special tools, and equipment required to effect the repair and testing of S.546 Form 1 indicators are listed below.

The indicator should be repaired and tested in a clean atmosphere, free from corrosive fumes.

NOTE: Equivalent substitutes may be used for listed items.

TABLE 901
SPECIAL TOOLS AND EQUIPMENT

A. Special Tools

Description	Code	Supplier
Balance Wrenches	271157	Weston (UK) Division Great Cambridge Road, Enfield EN1 3RX

B. Equipment

Description	Code	Supplier
Portable d.c. milliammeter Range: 0-2mA Accuracy: ± 0.5% f.s.d.	-	Salford Electrical Instruments Ltd., Eccles, Manchester
Insulation test meter 250/500V d.c.	1905L	Comark Electronics Rustington, Sussex
Portable Wheatstone Bridge (substitute must measure to ± 0.5%)	5785/4	H. Tinsley & Co. Ltd., Stanger Road, London SE25
Decade resistance box (R1) (Max. resistance: 5000 ohms; minimum step: 1 ohm)	5274/4	H. Tinsley & Co. Ltd., Stanger Road, London SE25
Raiser/Demagnetiser. Jig (for holding movement complete)	M.S.C.2 J2A	Hirst Electrical Industries Gatwick Road, Crawley, Sussex

SPECIAL TOOLS AND EQUIPMENT (CONT.)

Description	Code	Supplier
Magnifying glass	-	Commercially available
Multi-minor tester	Mk.5	Avo Ltd., Archcliffe Road, Dover
Limiting resistor) Value -) Rating -)	Ref. 'Check' Sub-para.3.B.	Mullard Ltd., Torrington Place, London. WC2
Non-metallic tool	Ref. 'Check' Sub-para.3.A.	-
Sealing Equipment: comprising:		
Vacuum Pump E2M5	03-A361-01-912	Edwards High Vacuum Manor Royal Crawley, West Sussex, RH10 2LW
Vibration Isolators 4	04-A248-01-404	" "
Vacuum Gauge, Pirano 10	07-D-35-53-000	" "
Gauge Head PR10K	07-D024-22-000	" "
Leakage Valve LV5	20-C370-01-000	" "
Back Migration Trap	04-A133-05-000	" "
Isolation Valve PV10K	20-C311-05-000	" "
Water Tank, approx. 6"x6"	-	Commercially available
Pressure Test Adapter	TD32391	Weston (UK) Division, Great Cambridge Road, Enfield, EN1 3RX
Cylinder - Dry Nitrogen with		British Oxygen Co.Ltd., Deer Park Road, London. N.W.19
Two Stage regulator Delivery pressure 4.8 Bar.	SRX 70	British Oxygen Co.Ltd.,
Pressure Gauge	S42261	British Oxygen Co.Ltd.

ILLUSTRATED PARTS LIST

1. Introduction

This section lists and illustrates replaceable parts of the Model S.546 Form 1 indicator.

The form and variant number is printed on the scale of the indicator. The variant number defines a particular application of the model and is not dependent on the form number; a given variant number will never appear on another form of the same model.

The first group of numbers in the part number column of the detailed parts list identifies the model, form and variant as displayed on the scale, that is, the basic part number.

The variants included in this Illustrated Parts List are:

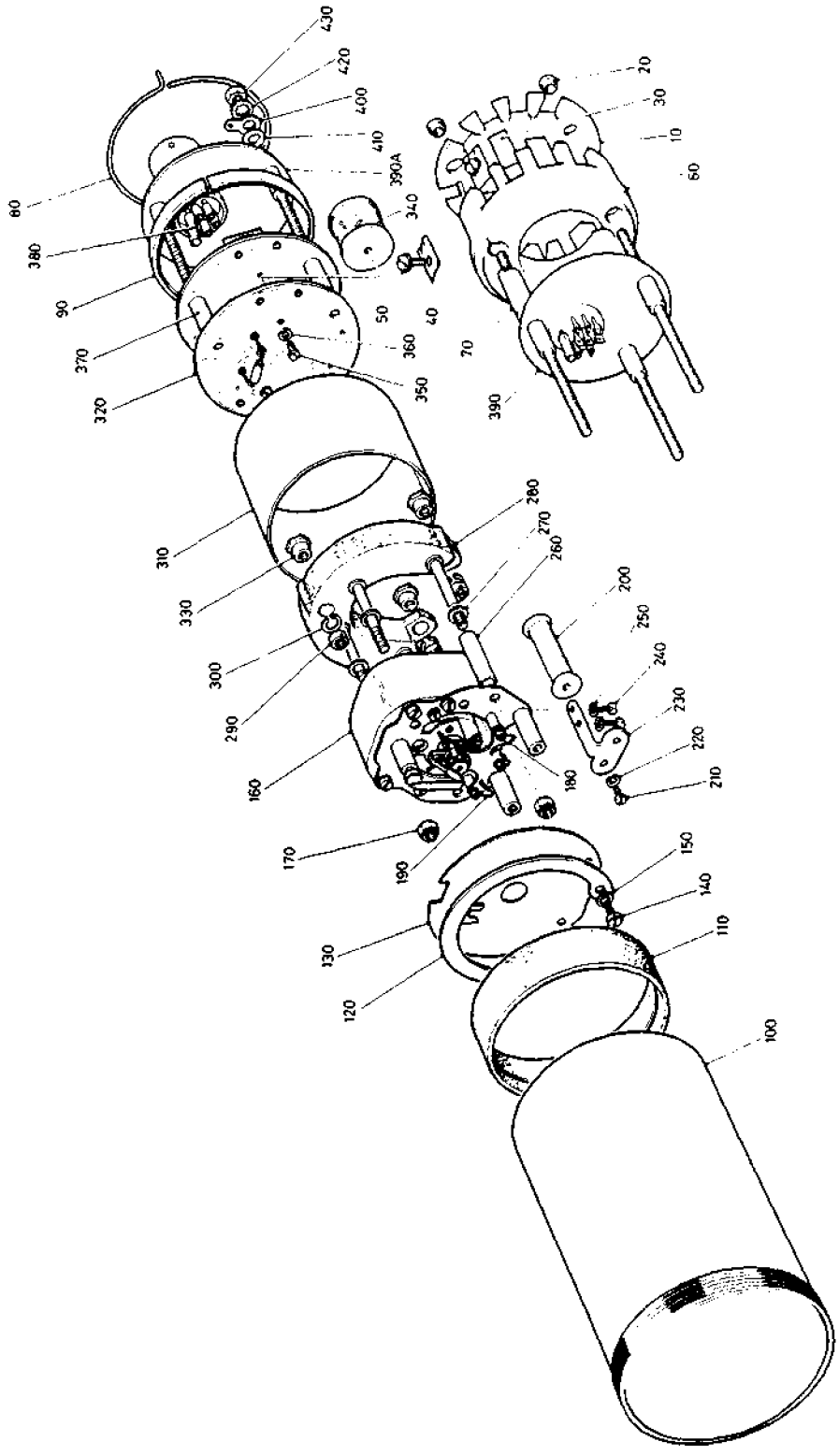
S.546.1.39

S.546.1.66

S.546.1.188

S.546.1.373

S.546.1.531



Illustrated Parts List - Model S.546 Form 1
Figure 1

2. Detailed Parts List

FIG. ITEM	PART NUMBER	AIRLINE PART NO.	1234567 NOMENCLATURE	EFF CODE	UNITS PER ASSY
1- 1A	S546-1-39		INDICATOR,TEMPERATURE,0-100°C	A	RF
- 1B	S546-1-66		INDICATOR,HYDRAULIC CONTENTS	B	RF
- 1C	S546-1-188		INDICATOR,TEMPERATURE,40°C-120°F	C	RF
- 1D	S546-1-373		INDICATOR,HYDRAULIC CONTENTS	D	RF
- 1E	S546-1-531		INDICATOR,PRESSURE,0-4 bar	E	RF
10	185645		.COVER, FLANGE		1
			--ATTACHING PARTS--		
20	173903		.NUT, ROUND 6 B.A.		3
			* * *		
30	179792		.PLATE, COVER		7
40	179790		.TERMINAL		3
			--ATTACHING PARTS--		
50	179793		.SCREW AND WASHER ASSY.		3
			* * *		
60	180329		.FLANGE		1
70	179818		.PILLAR		1
80	168416		.WIRE, SEALING		1
90	169908		.RING, SEATING		1
100	186055		.CASE, NON REFLECTING GLASS		1
110	185607		.COLLAR, MOULDED		1
120	185647-546-1-39		.SCALE FINISHED, UPPER	A	1
-120A	185647-546-1-66		.SCALE FINISHED, UPPER	B	1
-120B	185647-546-1-188		.SCALE FINISHED, UPPER	C	1
-120C	185647-546-1-373		.SCALE FINISHED, UPPER	D	1
-120D	185647-546-1-531		.SCALE FINISHED, UPPER	E	1
130	185691-546-1-39		.SCALE FINISHED, LOWER	A	1
-130A	185691-546-1-66		.SCALE FINISHED, LOWER	B	1
-130B	185691-546-1-188		.SCALE FINISHED, LOWER	C	1
-130C	185691-546-1-373		.SCALE FINISHED, LOWER	D	1
-130D	185691-546-1-531		.SCALE FINISHED, LOWER	E	1
			--ATTACHING PARTS--		
140	169910		.SCREW, SCALE, 10 B.A.		2
150	159306		.LOCKWASHER, 10 B.A.		2

- Items not illustrated

FIG. ITEM	PART NUMBER	AIRLINE PART NO.	1234567 NOMENCLATURE	EFF CODE	UNITS PER ASSY
1-					
160	160-546-1-39		.MOVEMENT COMPLETE	A	1
-160A	160-546-1-66		.MOVEMENT COMPLETE	B	1
-160B	160-546-1-188		.MOVEMENT COMPLETE	C	1
-160C	160-546-1-373		.MOVEMENT COMPLETE	D	1
-160D	160-546-1-531		.MOVEMENT COMPLETE	E	1
			--ATTACHING PARTS--		
170	178510		.NUT, NYLOC, 6 B.A.		4
			* * *		
180	162558		..POINTER STOP, RIGHT-HAND		1
190	162557		..POINTER STOP, LEFT-HAND		1
260	176247		.SPACER, MOVEMENT		4
270	165285		.WASHER, SPACER		4
280	185620		.RING RUGGEDIZED		1
			--ATTACHING PARTS--		
290	92356		.NUT, ROUND, 6 B.A.		3
300	156976		.LOCKWASHER, 6 B.A.		3
			* * *		
310	185633		.INSULATOR		1
320	185624-546-1-39		.PRINTED CIRCUIT BOARD ASSY.	A	1
-320A	185624-546-1-66		.PRINTED CIRCUIT BOARD ASSY.	B	1
-320B	185624-546-1-188		.PRINTED CIRCUIT BOARD ASSY.	C	1
-320C	185624-546-1-373		.PRINTED CIRCUIT BOARD ASSY.	D	1
-320D	185700-546-1-531		.PRINTED CIRCUIT BOARD ASSY.	E	1
			--ATTACHING PARTS--		
330	170056		.NUT, SHOULDERED, 6 B.A.		3
			* * *		
340	158363-546-1-39		..SPOOL, SERIES (D)	A	1
-340A	158363-546-1-66		..SPOOL, SERIES (D)	B	1
-340B	158363-546-1-188		..SPOOL, SERIES (D)	C	1
-340C	158363-546-1-373		..SPOOL, SERIES (D)	D	1

- Items not illustrated

FIG. ITEM	PART NUMBER	AIRLINE PART NO.	1234567 NOMENCLATURE	EFF CODE	UNITS PER ASSY
			--ATTACHING PARTS--		
350	167699		..SCREW, CH., HD., 10 B.A.		1
360	153367		..LOCKWASHER, 10 B.A.		1
			* * *		
370	See Index No.260		.SPACER		3
380	MPS-92-10-4		.SLEEVE, END PLATE		AR
390	185858		.PLATE, END		1

- Items not illustrated