SOLARTRON
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WESTON (UK) DIVISION
SOLARTRON TRANSDUCERS
GREAT CAMBRIDGE ROAD, ENFIELD,
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MODEL S.110G

RESISTANCE THERMOMETER ELEMENT

VARIANTS:

S.110G FORM 4
S.110G FORM 5
S.110G FORM 12
S.110G FORM 19
S.110G FORM 61
S.110G FORM 65

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

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Date: 30th June, 1980

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WESTON INSTRUMENTS

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REVISION RECORD SHEET

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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MODIFICATION STANDARDS

Modification standards listed on this page are applicable to all variants of the Model S.110G Resistance Thermometer Element.

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.

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LIST OF EFFECTIVE PAGES

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INTRODUCTION

1. General

This manual contains shop verified instructions for the Weston Instruments Model S.110 Resistance Thermometer Element.

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

Differences between elements such as temperature range, dimensions, application etc. are defined by variant numbers 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.

The resistance thermometer element is not a repairable item.

No special equipment is required for testing and so equipment quoted can be substituted by similar items if they conform to the requirements specified.

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MODEL S.110G - RESISTANCE THERMOMETER ELEMENT

DESCRIPTION AND OPERATION

1. General

The information contained in this manual is applicable, in general, to all forms of S.110G resistance thermometer element. Details of particular variants are given on following pages.

2. Detail

The S.110G resistance thermometer element consists of a helically wound platinum wire carried on a cylindrical, anodised, aluminium former, which, in turn, is supported in a 1/4 in. o.d. stainless steel tube. One end of the tube is closed by a stainless steel disc which is argon-arc welded into position. The connection end is fitted with a metal/glass seal which forms a connecting plug. Before the stainless steel tube is sealed, all air is evacuated from it and it is then filled with dry hydrogen.

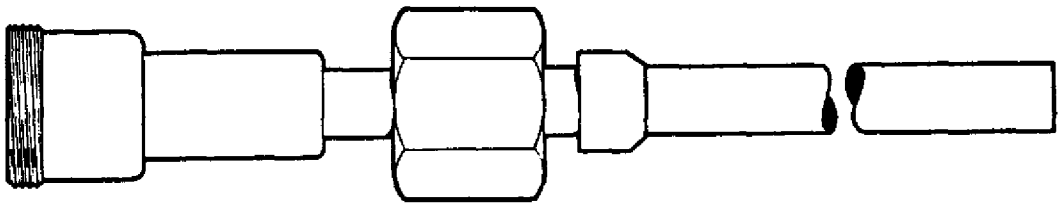
This model has a working temperature range of $-200^{\circ}C$ to $+200^{\circ}C$.

3. Operation

The resistance value of the platinum wire varies with differences in temperature and this resistance change is utilised to operate a ratiometer type indicator normally calibrated in terms of temperature.

MODEL S.110G FORM 4 - RESISTANCE BULB

4. Variant Data



Model S.110G Form 4 - Resistance Bulb

Figure 1

A. Description

On Model S.110G Form 4 the temperature sensitive element is accommodated in a straight length of stainless steel tube. The disc at the element end of the resistance bulb is either soldered or argon arc welded in position, bulbs assembled by the latter method being identified by the letter 'P' after the model number. The approximate length of the inserted section of each variant is as follows:

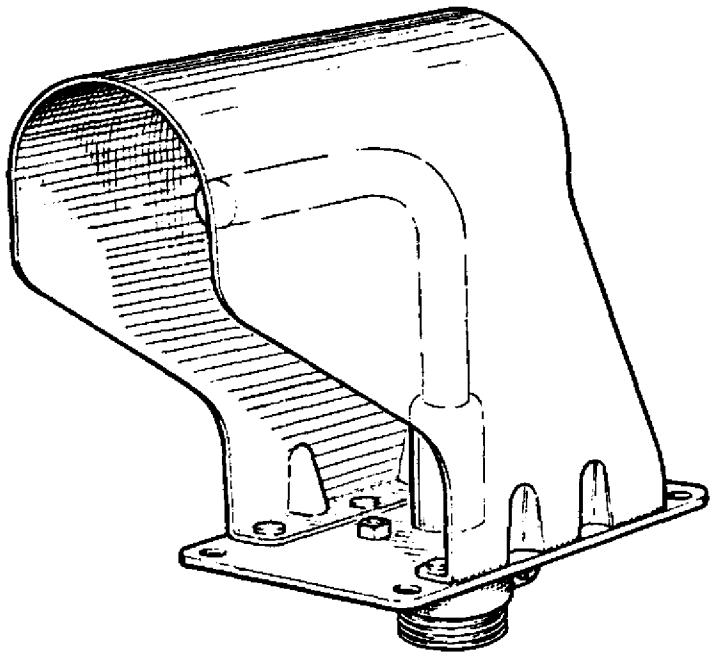
Model No.	Length of inserted section
S.110G-4-200 - S.110G-4-267	2.25 to 19.0 in. in steps of 0.25 in.
S.110G-4-268	83.0 in.
S.110G-4-269	42.0 in.
S.110G-4-270	19.75 in.
S.110G-4-271	20.0 in.
S.110G-4-272	21.5 in.
S.110G-4-273	28.5 in.
S.110G-4-274	34.0 in.
S.110G-4-275	51.0 in.
S.110G-4-276	37.0 in.
S.110G-4-277	31.5 in.
S.110G-4-278	114.0 in.
S.110G-4-279	78.0 in.
S.110G-4-280	45.25 in.

MODEL S.110G FORM 4 - RESISTANCE BULB

Model No.	Length of inserted section
S.110G-4-281	120.0 in.
S.110G-4-282	72.0 in.
S.110G-4-283	1.5 in.
S.110G-4-284	39.0 in.
S.110G-4-285	84.0 in.
S.110G-4-286	44.75 in.
S.110G-4-287	23.0 in.
S.110G-4-288	54.0 in.
S.110G-4-289	30.0 in.
S.110G-4-290	21.0 in.
S.110G-4-291	2.0 in.
S.110G-4-292	69.0 in.
S.110G-4-293	82.0 in.
S.110G-4-294	27.0 in.
S.110G-4-295	40.0 in.
S.110G-4-296	60.0 in.
S.110G-4-297	48.0 in.
S.110G-4-298	36.0 in.
S.110G-4-299	24.0 in.
S.110G-4-302	81.0 in.
S.110G-4-303	45.0 in.
S.110G-4-304	46.0 in.
S.110G-4-305	29.0 in.

MODEL S.110G FORM 5 - RESISTANCE THERMOMETER ELEMENT

4. Variant Data



Model S.110G Form 5 - Resistance Thermometer Element

Figure 1

A. Description

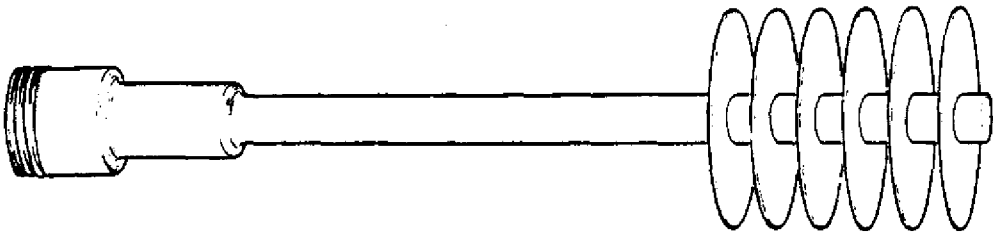
Model S.110G Form 5 resistance thermometer element is designed to measure the air temperature outside an aircraft. It is mounted on the mainplane of the aircraft and is fitted with a solar shield in order to reduce errors due to the effect of direct sunlight on the thermometer element. The temperature sensitive element is accommodated in a stainless steel tube which is in the form of a right angle. The vertical section of the tube is approximately 1.3 in. long, the length of horizontal section being as follows:-

Model No.	Length of horizontal section
S.110G-5-87	1.9 in. approximately

NOTE: Earlier versions of the S.110G Form 5 resistance thermometer element were bullet ended and the horizontal section of the stainless steel tube 0.5 in. longer than the length given above.

MODEL S.110G FORM 12 - RESISTANCE BULB

4. Variant Data



Model S.110G Form 12 - Resistance Bulb

Figure 1

A. Description

Model S.110G form 12 resistance bulb is designed for use in still air. The temperature sensitive element is accommodated in a straight copper tube which is fitted with six copper cooling fins in order to counteract any errors due to the self-heating of the bulb. The length of the copper tube differs between variants, the approximate length in each case being as follows:

Model No.	Length of copper tube
S.110G-12-92	4.0 in.
S.110G-12-943	11.5 in.

MODEL S.110G FORM 19 - RESISTANCE BULB

4. Variant Data

Model S.110G Form 19 - Resistance Bulb

Figure 1

A. Description

On Model S.110G Form 19 the temperature sensitive element is accommodated in a straight length of stainless steel tube and connection to the resistance bulb is by means of two flexible leads soldered to pin connectors in the end cover. The disc at the element end is either soldered or argon arc welded in position, bulbs assembled by the latter method being identified by the letter 'P' after the model number. The approximate lengths of the stainless steel tube and extension leads of the different variants are given below.

(1) Resistance bulbs with standard extension leads (2.0 in. long).

Model No.	Approximate tube length	Model No.	Approximate tube length
S.110G-19-86	1.3/8 in.	S.110G-19-279	27 in.
S.110G-19-200 to 267	2.1/4 in. to 19 in. (increasing by 1/4 in. for each variant)	S.110G-19-280	35 in.
		S.110G-19-281	64.1/2 in.
		S.110G-19-282	19.1/2 in.
		S.110G-19-283	21.1/2 in.
		S.110G-19-284	43 in.
		S.110G-19-285	64 in.
S.110G-19-268	62.1/2 in.	S.110G-19-286	30 in.
S.110G-19-269	39 in.	S.110G-19-287	20 in.
S.110G-19-270	78.3/4 in.	S.110G-19-288	63.1/2 in.
S.110G-19-271	26 in.	S.110G-19-289	29 in.
S.110G-19-272	63 in.	S.110G-19-290	25 in.
S.110G-19-273	48 in.	S.110G-19-291	24 in.
S.110G-19-274	78 in.	S.110G-19-292	23 in.
S.110G-19-275	24.1/2 in.	S.110G-19-293	37 in.
S.110G-19-276	1.1/2 in.	S.110G-19-294	72 in.
S.110G-19-277	22.1/2 in.	S.110G-19-295	97 in.
S.110G-19-278	28 in.	S.110G-19-296	22 in.

MODEL S.110G FORM 19 - RESISTANCE BULB

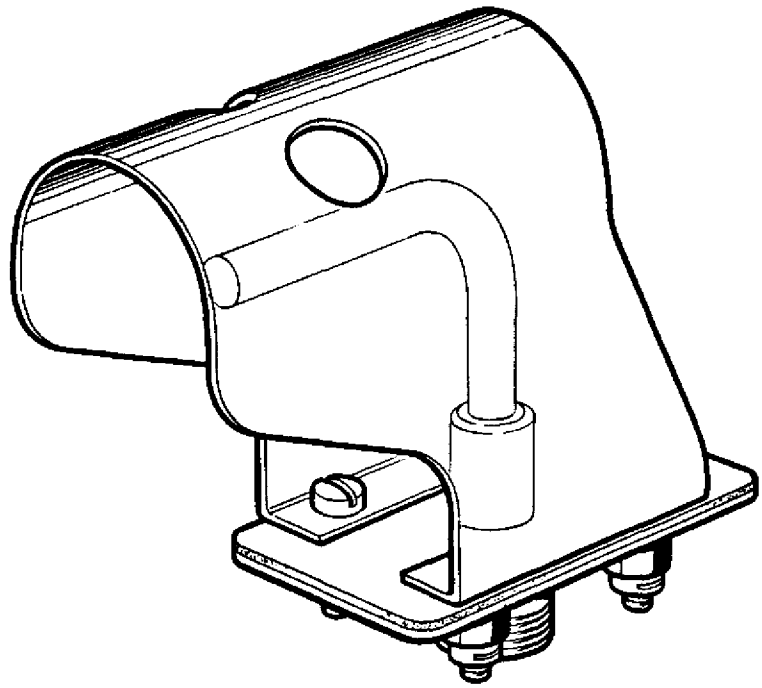
Model No.	Approximate tube length	Model No.	Approximate tube length
S.110G-19-297	21 in.	S.110G-19-813	42 in.
S.110G-19-298	33 in.	S.110G-19-814	25.1/2 in.
S.110G-19-299	32.1/2 in.	S.110G-19-815	42.1/2 in.
S.110G-19-582	1.3/8 in.	S.110G-19-816	45 in.
S.110G-19-800	36 in.	S.110G-19-817	44 in.
S.110G-19-801	51 in.	S.110G-19-818	40 in.
S.110G-19-802	32 in.	S.110G-19-819	34 in.
S.110G-19-803	45.1/4 in.	S.110G-19-820	73 in.
S.110G-19-804	20.1/2 in.	S.110G-19-821	47 in.
S.110G-19-805	57 in.	S.110G-19-822	114 in.
S.110G-19-806	60 in.	S.110G-19-823	36.1/4 in.
S.110G-19-807	58.1/2 in.	S.110G-19-824	37.1/2 in.
S.110G-19-808	53 in.	S.110G-19-825	31.1/2 in.
S.110G-19-809	59.1/2 in	S.110G-19-826	23.1/2 in.
S.110G-19-810	65 in.	S.110G-19-827	29.1/4 in.
S.110G-19-811	90 in.	S.110G-19-828	25.3/4 in.
S.110G-19-812	76 in.		

(2) Resistance bulbs with special extension leads

Model No.	Approximate tube length	Length of extension leads
S.110G-19-65	15 in.	8 in.
S.110G-19-70	2.1/4 in.	18 in.
S.110G-19-91	2.1/4 in.	6 ft.
S.110G-19-585	2.1/4 in.	24 in.
S.110G-19-586	4 in.	24 in.
S.110G-19-902	1.3/8 in.	24 in.
S.110G-19-903	50 in.	12 in.
S.110G-19-904	9 in.	12 in.
S.110G-19-905	24 in.	12 in.
S.110G-19-906	23 in.	12 in.
S.110G-19-922	17 in.	12 in.
S.110G-19-923	8 in.	12 in.
S.110G-19-924	64 in.	12 in.
S.110G-19-925	11 in.	12 in.
S.110G-19-926	4 in.	12 in.
S.110G-19-927	7 in.	12 in.
S.110G-19-928	16 in.	12 in.
S.110G-19-929	7.1/2 in.	12 in.
S.110G-19-930	9 in.	12 in.
S.110G-19-931	17.1/2 in.	12 in.
S.110G-19-932	49 in.	12 in.

MODEL S.110G FORM 65 - RESISTANCE BULB

4. Variant Data



Model S.110G Form 65 - Resistance Bulb

Figure 1

A. Description

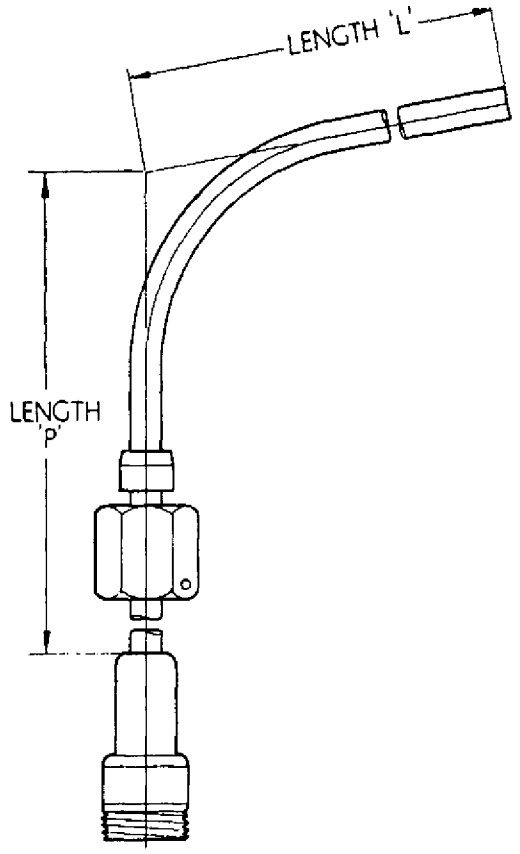
Model S.110G Form 65 resistance bulb is used to record outside air temperature and is designed to form a seal to the skin of the aircraft, thus being suitable for mounting into pressurized sections.

A solar shield, positioned over the temperature sensitive element, is provided in order to reduce errors due to the effect of direct sunlight on the bulb. The tube accommodating the temperature sensitive element is in the form of a right angle, the length of the vertical section being approximately 1.3 in. The appropriate length of the horizontal section is as follows:

Model No.	Approximate length of horizontal section
S.110G-65-983	2.0 in.

MODEL S.110G FORM 61 - RESISTANCE THERMOMETER ELEMENT

4. Variant Data



Model S.110G Form 61 - Resistance Thermometer Element
Figure 1

A. Description

The S.110G Form 61 resistance thermometer element is secured in position by means of a locking bush and union locking nut having a 9/16 in. 18 UNF, 2A thread. The locking bush and union nut can be positioned to suit a particular requirement.

The thermometer element is suitable for use up to 250°C at the element end and up to 130°C at the connection end. Connection to the thermometer element is by means of a 2-pin plug.

MODEL S.110G FORM 61 - RESISTANCE THERMOMETER ELEMENT

The stainless steel tube accommodating the temperature sensitive element is bent to give an internal angle of 100°. The length of the two arms so formed are as follows:-

Model No.	Length L	Length P
S.110G.61.978	$2\frac{1}{2}$ in ± $\frac{1}{8}$ in	$2\frac{3}{4}$ in ± $\frac{1}{8}$ in

NOTE: Earlier versions of the S.110G Form 61 resistance thermometer element were bullet ended and the horizontal section of the stainless steel tube 0.5 in. longer than the length given above.

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TESTING AND TROUBLE SHOOTING

1. Equipment

TABLE 101

EQUIPMENT

Equipment	Requirements	Supplier
Standardised temperature indicator		Local Supply
24V Battery		Local Supply
Certified mercury thermometer	0 - 100°C	Local Supply
Oil bath	6 in. x 6 in. x 6 in. approx.	Local Supply
Insulation test meter e.g. Comark 1905L	250V d.c.	Comark Electronics Rustington, Sussex
Multi-minor tester e.g. AVO Mk. 5	Current o/p less than 20mA	AVO Ltd., Archcliffe Road, Dover, Kent

NOTE: Equivalent substitutes may be used for listed items.

2. Test Procedure

A. Connect the resistance thermometer element to an indicator of known accuracy and a 24 volt battery as shown in Fig. 101.

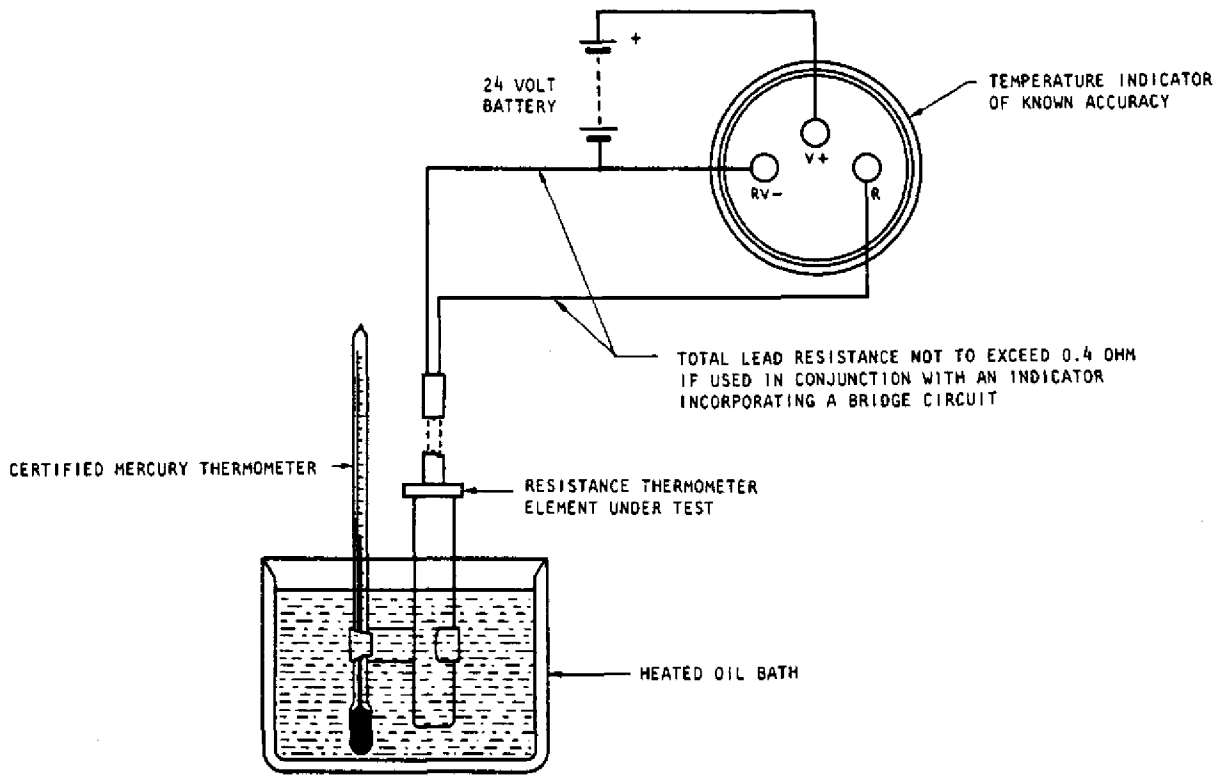
B. Clip the thermometer element to a certified mercury thermometer and immerse in oil.

C. Heat and agitate the coil and check that the indicator deflection agrees with the mercury thermometer reading within the limits $\pm 1^{\circ}C$ in the range 0 to 100°C.

NOTE: The associated indicator is calibrated for use with a lead resistance of 0.2 ohm and will read approximately 1°C in error for every 0.5 ohm variation from this value.

D. Switch off the supply, disconnect the leads from the resistance thermometer element, remove the thermometer element from the oil and unfasten the mercury thermometer.

E. Connect a 250V insulation tester between one connection pin and the thermometer element sheath. The resistance must not be less than 20 megohms.



Test Circuit Diagram

Figure 101

3. Trouble Shooting

A. Causes

(1) The main causes of trouble are:

(a) Open circuit resistance element.

(b) Low insulation resistance.

B. Procedure

CAUTION: THE CURRENT FROM THE TEST METER MUST NOT EXCEED 20mA.

(1) Check continuity resistance across the terminal pins of the element. At 20°C the resistance is approximately 140 ohms.

(2) Check insulation resistance as detailed in para. 2.E.

CLEANING

1. Preparation

TABLE 401

MATERIALS

Material/Specification	Supplier
Silicon Carbide paper, fine grade A400	Commercially available
Genklene or	I.C.I.
Arklone P or	I.C.I.
Inhibisol	Penetone Paripan

NOTE: Equivalent substitutes may be used for listed items.

2. Procedure

A. Remove scaling or discolouration of the tube using silicon carbide paper.

B. Remove grease using Genklene or equivalent.

CHECK

1. Equipment

An ohmmeter whose output does not exceed 20mA is required for the test in para. 3. (E.g. AVO Mk. 5, AVO Ltd., Dover).

2. Visual Checks

Examine the thermometer element for:

(1) Cleanliness.

(2) Distortion or damage.

(3) Evidence of wear.

(4) Serviceability of thread.

3. Electrical Check

CAUTION: THE CURRENT FROM THE OHMMETER MUST NOT EXCEED 20mA.

Check continuity resistance across the terminal pins of the element using an ohmmeter. At 20°C the resistance of the element is approximately 140 ohms.

STORAGE

1. Storage Instructions

A. Conditions

(1) The resistance thermometer element should be retained in its original packing throughout the storage period.

(2) It is recommended that the thermometer element is stored under conditions where the humidity does not exceed 50% and the temperature is within the range -20°C to +50°C.

(3) After periods of two years the resistance thermometer element must be checked as follows:

(a) Check the continuity as detailed in para. 3 of the Check section of the manual.

(b) Measure the insulation resistance as detailed in para. 2.(E) of the Test section of the manual.

B. Limiting Period

Provided that the storage conditions have been fulfilled, the limiting period of the resistance thermometer element is 6 years. At the expiry of this period the thermometer element must be checked and tested as detailed in this manual. If proved satisfactory in the thermometer element may then be returned to storage.

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SPECIAL TOOLS, FIXTURES AND EQUIPMENT

1. General

The equipment required to carry out producedures in other sections of the manual is listed in Table 901.

TABLE 901

EQUIPMENT

Description	Code	Supplier
Standardised temperature indicator	-	Local supply
24V battery	-	Local supply
Certified mercury thermometer 0-100°C	-	Local supply
Oil bath (6 in. x 6 in. x 6 in.)	-	Local supply
Insulation test meter 250V d.c.	1905L	Comark Electronics, Rustington, Sussex
Multi-minor tester	Mk.5	AVO Ltd., Archcliffe Rd., Dover, Kent.

NOTE: Equivalent substitutes may be used for listed items.