

ELECTRONIC VALVE SPECIFICATIONS  
SPECIFICATION CV7480-3  
ISSUE 1. DATED 17th JANUARY 1964  
AMENDMENT No. 1

Page 5 Sub Group 4. In hFE Limits Col.  
Against CV7480, CV7481 Insert: 10 min.  
" CV7482, CV7483 Insert: 18 min.

Page 6 Sub Group 7 K1001/NATO Ref.  
Delete: 6.6.1.2.2.  
Insert: 6.6.1.2.1.

Page 7. Sub Group 8 K1001/NATO Ref.  
Delete: 6.6.1.2.2.  
Insert: 6.6.1.2.1.

Ministry of Aviation/R.R.E.

March, 1965

N.269183

MILITARY SPECIFICATION  
**CV 7480-3**  
 SEMICONDUCTOR DEVICE. TRANSISTORS  
 2N1511, 2N1512, 2N1513, 2N1514

Description:- This specification covers the detail requirements for Silicon NPN medium power transistors and is in accordance with K1007, Issue 3 except as otherwise stated.

Mechanical Dimensions and Outlines:- See Drawing Fig. 5 Page 12.

Connections:- Collector connected to Case.  
 Lead 1. Emitter, Lead 2. Base, Lead 3. Collector.

Absolute Maximum Ratings:-

Device	Rating	V <sub>CBO</sub>	V <sub>EBO</sub>	V <sub>CEO</sub>	V <sub>CEX</sub>	I <sub>C</sub>	I <sub>B</sub>	T <sub>stg</sub>	T <sub>j</sub>	P <sub>c</sub>
	Unit	V	V	V	V	A	A	°C	°C	W
CV7480 & 7482	Min	-	-	-	-	-	-	-65	-	-
	Max	60	10	40	60	6.0	1.0	+200	+200	75
CV7481 & 7483	Min	-	-	-	-	-	-	-65	-	-
	Max	100	10	55	100	6.0	3.0	+200	+200	75
Notes										C

Device	Rating	Shock	Vibration
	Unit	g	g
All	Max	1500	20
	Notes	A	

Note A: B: and C: See Page 2

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Note A: Duration 0.5 msec.

B: Commercial equivalents ZT1511 - ZT1514  
CV numbers run consecutively.

C: This power dissipation is for 1000 hrs. expected  
life at a case temperature of  $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ .

## Primary Electrical Characteristics:-

Characteristic		$I_{CBO}$	$I_{EBO}$	$V_{CE}$ (sat)		$V_{BE}$	$h_{FE}$	$I_{CBO}$	$f_{hfb}$	
Unit		$\mu\text{A}$	$\mu\text{A}$	V	V	V		mA	kc/s	
CV7480 & 7481	Min	-	-				15	-	500	
	Max	25	25	3.0		3.0	45	1.0	-	
CV7482 & 7483	Min	-	-				25	-	500	
	Max	25	25		1.0	2.0	75	1.0	-	
CONDITIONS	$T_{\text{case}}$	$^{\circ}\text{C}$	25	25	25	25	25	25	175	25
	$V_{CB}$	V	30					30	28	
	$V_{CE}$	V					4.0	4.0		
	$V_{EB}$	V		12						
	$I_C$	A			1.5	1.5	1.5	1.5		5.0
	$I_E$	mA	0	0					0	
	$I_B$	mA			300	100				

Reliability Assurance Requirements:- Under discussion

Requirements:-

Marking: The device shall be marked as K1007. Section B  
1.3.4 excluding 1.3.4.1(b)

Quality Assurance Provisions:

Destructive Tests: The tests listed in Table 2, Group B  
Inspection, Sub Groups 2 and Table 3,  
Group C Inspection Sub Group 2 are considered  
destructive.

Group C Inspection This inspection shall be conducted on the  
initial lot, and thereafter every ninety  
days or every fifth lot, whichever occurs  
first.

Preparation for Delivery:-

Packaging: The device shall be packed according to K1007,  
Section A, 1.2 (c). Washers and nut shall be  
packed with each device.

Joint Service Catalogue Number:

CV7480 -----	=	5960-99-037-3690
CV7481 -----	=	5960-99-037-3691
CV7482 -----	=	5960-99-037-3692
CV7483 -----	=	5960-99-037-3693

This specification has been prepared by, and the Qualification Approval  
Authority is:-

Ministry of Aviation, Royal Radar Establishment, Malvern, Worcs., England.

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TABLE 1 GROUP A INSPECTION

Examination or Test	K1007/NATO Ref.	Test Conditions		AQL %	Insp. Level	Sym-bol	Limits		Units	
		Specific Conditions	Min.				Max.			
<u>SUB GROUP 1</u> Visual and Mechanical Inspection	5.1	Excluding Physical Dimensions		0.65	II					
<u>SUB GROUP 2</u> Collector-Base Cut-off	7.2.5.1	$V_{CB} = 30V$ $I_E = 0$		0.65	II	$I_{CBO}$	-	25	$\mu A$	
Collector-Emitter Sustaining Voltage	7.2.2.2.1	$I_C = 100mA$	CV7480 & CV7482			$V_{CEO}$ (sust)	40	-	V	
		$I_B = 0$	CV7481 & CV7483			$V_{CEX}$	55	-	V	
		$I_C = 0.5mA$						60	-	V
		$V_{EB} = 1.5V$	CV7480 CV7482 CV7481 CV7483					100	-	V
Emitter-Base Cut-off Current	7.2.6	$V_{EB} = 12V$ $I_C = 0$				$I_{EBO}$	-	25	$\mu A$	
<u>SUB GROUP 3</u> Static Forward Current Transfer Ratio	7.3.4	$I_C = 1.5A$ $V_{CE} = 4.0V$	CV7480 CV7481 CV7482 CV7483	2.5	I	$h_{FE}$	15	45		
							25	75		

TABLE 1 GROUP A INSPECTION (Cont'd)

Examination or Test	TEST CONDITIONS		Insp. Level	Sym- bol	LIMITS		Units
	K1007/NATO Ref.	Specific Conditions			Min.	Max.	
Collector-Emitter Saturation Voltage	7.3.3	$I_C = 200\text{mA}$ CV7 A, CV7 B $I_B = 300\text{mA}$ CV7 C, CV7 D $I_B = 100\text{mA}$		$V_{CE}$ (sat)	-	3.0	V
Base-Emitter Voltage	7.3.2	$I_C = 1.5\text{A}$ $V_{CE} = 4.0\text{V}$ CV7480, CV7481 CV7482, CV7483		$V_{BE}$	-	1.0	V
<u>SUB GROUP 4</u>							
Collector-Base Cut-off	7.2.5.1	$T = 175^\circ\text{C}$ $V_{CB} = 30\text{V}$ $I_E = 0$		$I_{CBO}$	-	1.0	mA
Static Forward Current Transfer Ratio	7.3.4	$T = -55^\circ\text{C}$ $I_C = 1.5\text{A}$ $V_{CE} = 4.0\text{V}$ CV7480, CV7481 CV7482, CV7483		$h_{FE}$			
Small-signal forward current transfer ratio	7.5.2	$I_C = 100\text{mA}$ $V_{CB} = 12\text{V}$ $f = 500\text{kc/s}$		$f_T$	500	-	kc/s

TABLE 2 GROUP B INSPECTION  
See Page 3, Quality Assurance Provisions, Destructive Tests

Examination or Test	TEST CONDITIONS		AQL %	Insp. Level	Sym- bol	LIMITS		Units
	K1007/NATO Ref.	Specific Conditions				Min.	Max.	
<u>SUB GROUP 1</u> Physical dimensions	5.1	According to drawing Fig. 5 Page 12	6.5	IC				
<u>SUB GROUP 2</u> Solderability Temperature Cycling	5.13 5.5	-55°C to +200°C 100°C to 0°C	6.5	IC				
Thermal Shock Moisture Resistance	5.6.2 5.3.							
<u>SUB GROUP 3</u> Vibration fatigue	5.15	Non operating	6.5	IC				
<u>SUB GROUP 4</u> Omitted								
<u>SUB GROUP 5</u> Omitted								
<u>SUB GROUP 6</u> Omitted								
<u>SUB GROUP 7</u> High Temperature Life (non-operating)	6.6.1.2.2.	T <sub>stg</sub> = +200°C Duration 1000 hours	6.5	IC				

TABLE 2 GROUP B INSPECTION (Cont'd)

Examination or Test	K1007/NATO Ref.	TEST CONDITIONS		AQL %	Insp. Level	Symbol	LIMITS		Units
		Specific Conditions					Min.	Max.	
<u>SUB GROUP 8</u>					NOTE 1				
Operating Life	6.3 6.6.1.2.2.	$T_{amb}$ at any temperature between +100°C and +160°C $V_{CB}$ = max for device $P_C$ = to wattage shown on derating curve for chosen temperature Fig.1. Page 9.							
Post Test End Points for Sub Groups 2, 3, 7 and 8									
Collector-Base Cut-off Current	7.2.5.1	$V_{CB}$ = 30V $I_E$ = 0				$I_{CBO}$	-	75	$\mu A$
Static Forward Current Transfer Ratio	7.3.4	$V_{CB}$ = 4.0V $I_C$ = 1.5A CV7480, CV7481 CV7482, CV7483				$h_{FE}$	7 18		



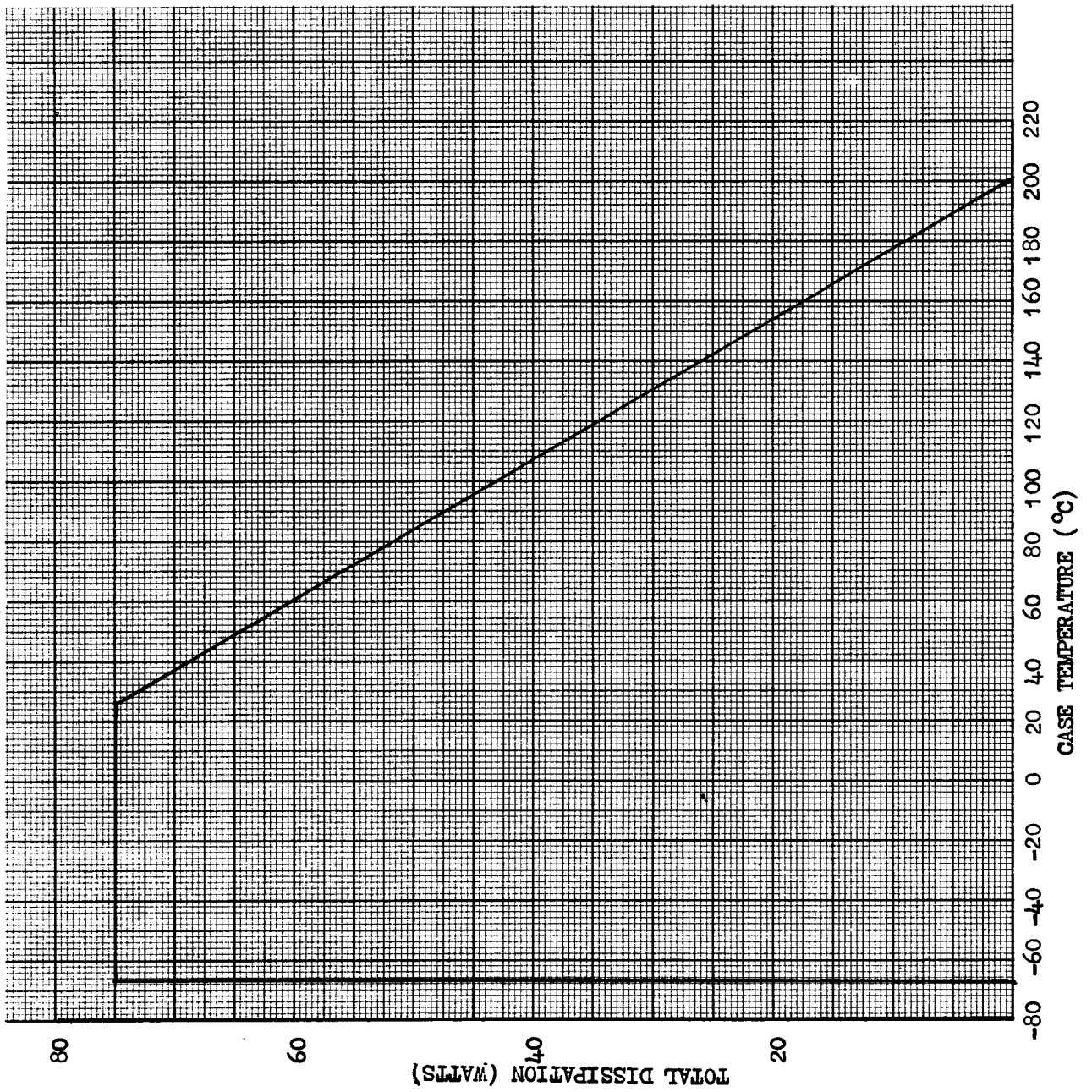
TABLE 3 GROUP C INSPECTION  
See Page 3, Quality Assurance Provisions, Group C Inspection

Examination or Test	TEST CONDITIONS		AQL %	Insp. Level	Sym- bol	LIMITS		Units
	K1007/NATO Ref.	Specific Conditions				Min.	Max.	
<u>SUB GROUP 1</u> Omitted								
<u>SUB GROUP 2</u> Shock		5 blows in each of three mutually perpendicular directions	6.5	IC				
<u>Post Test End Points for SUB GROUP 2</u> Collector-Base Cut-off Current	7.2.5.1	$V_{CB} = 30V$ $I_B = 0$			$I_{CBO}$	-	75	$\mu A$
Static Forward Current Transfer Ratio	7.3.4	$I_C = 1.5A$ CV7480, CV7481 $V_{CE} = 4.0V$ CV7482, CV7483			$h_{FE}$	7	-	

NOTES

1. For Life Test procedure see Appendix A pages 13 and 14.

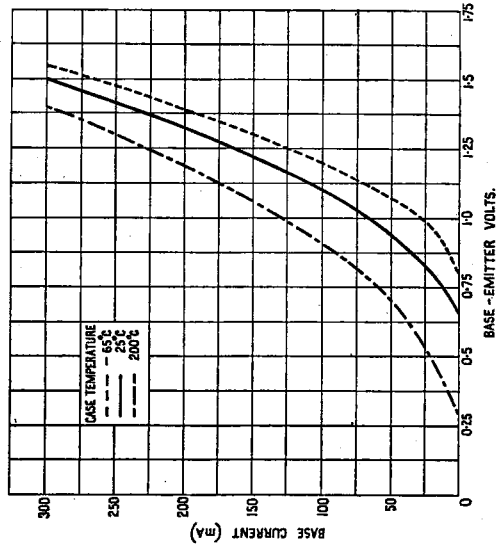
FIG 1



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**FIG 3**

TYPICAL BASE INPUT CHARACTERISTIC



**FIG 2**

TYPICAL VARIATION OF DC CURRENT GAIN (hFE) with Collector current and Ambient Temperature.

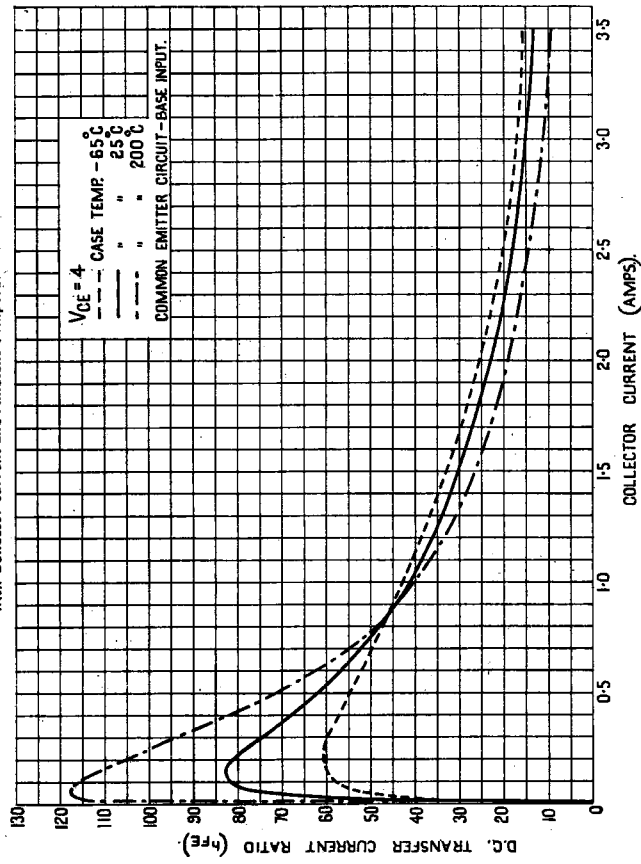
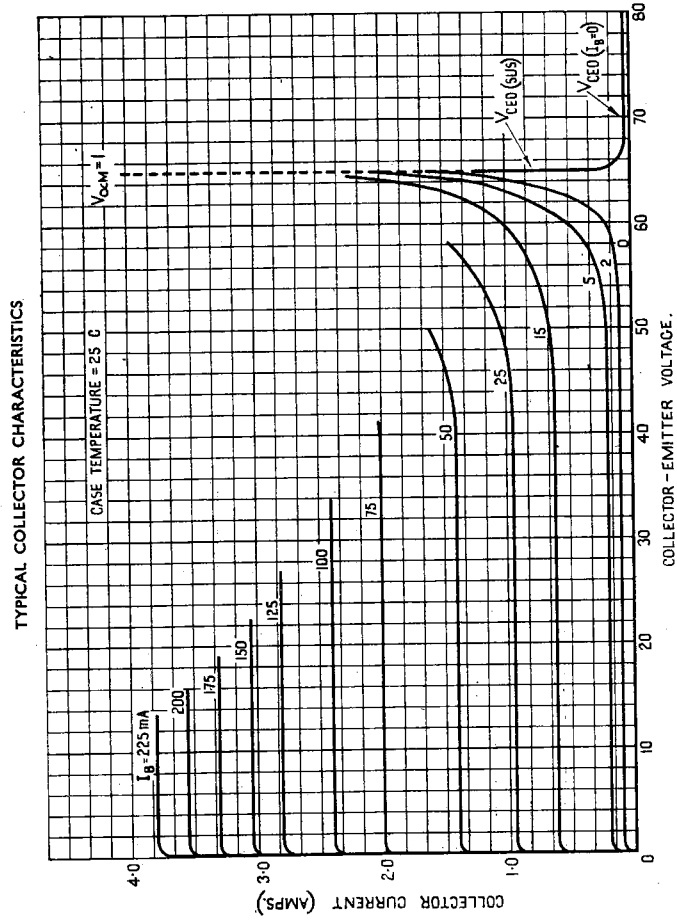


FIG 4

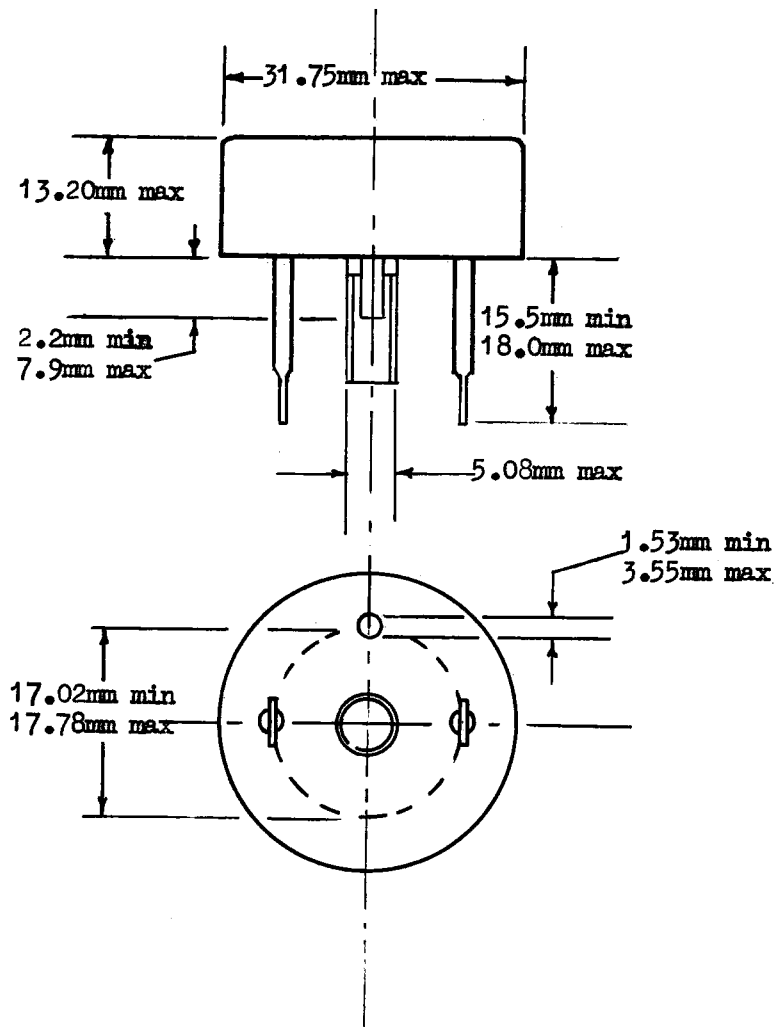


\*  $V_{CEM}$  is the Voltage at which the product of  $\alpha$  at low voltage and the multiplication factor ( $M$ ) is equal to unity.

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FIG 5

OUTLINE DRAWING



APPENDIX 'A'Inspection Level

For lot sizes up to 200, at least one rectifier shall be taken from each lot and life tested for 1000 hours. For lot sizes 201 and over, at least two rectifiers shall be taken from each lot and life tested for 1000 hours.

Merit Life

Merit Life is defined as the ratio of the actual life hours for one or more rectifiers to the total life hours that would have occurred had there been no failures, expressed as a percentage:-

$$\text{Merit Life} = \frac{\text{Actual hours run}}{\text{Total possible hours}} \quad \times 100\%$$

Classification of failures

The end point limits of the specification shall be the criterion of failure and the merit life shall be computed from the number of hours in which the devices have not deteriorated outside these limits.

Procedure of continuous production

When 1000 hours have elapsed since the sample drawn from the first lot was placed on life test, there should be at least four additional samples undergoing life test, with various numbers of hours on test. The Merit Life shall be computed for the first five lots. If the Merit Life exceeds 90% the first lot is acceptable. When 1000 hours have elapsed since the sample from the second lot was placed on life test, the merit life shall be computed using the test results from the first five lots. If this exceeds 90% the second lot is acceptable. The acceptability of the third, fourth and fifth lots is determined from the first five lots.

If, when the sample from one of the first five lots have been life tested for 1000 hours, the computed Merit Life is 90% or less, the lot from which the sample was drawn shall be held in store. If when the sample from the subsequent lot has been life tested for 1000 hours, the computed Merit Life exceeds 90%, both lots shall be accepted. If the Merit Life is 90% or less, both lots shall be held. When the sample from the fifth lot has been life tested for 1000 hours, if the computed Merit Life for all five samples exceed 90% all lots being held shall be accepted. If the Merit Life is 90% or less, all lots being held shall be rejected.

When the sample from the sixth lot has been life tested for 1000 hours, the Merit Life shall be computed for the samples from lots 2 to 6. If this exceeds 90%, lot 6 shall be accepted; if it is 90% or less, lot 6 shall be rejected. A similar procedure shall apply for subsequent lots, the Merit Life being computed on the combined results of the completed life test of the lot under consideration and the previous consecutive lots.

When any sample has passed the prescribed life test period or has failed it shall be removed from test.

#### Reduced Duration

When five consecutive lots have been accepted without any of them having been held due to failure to meet the 90% merit life requirement, reduced duration life testing is applicable, and the Merit Life shall then be computed after the sample from a lot has been life tested for 240 hours. If when a sample from a given lot has been life tested for 240 hours the computed Merit Life is 90% or less, the lot shall be held in store and the life test of that sample and subsequent samples shall continue to 1000 hours, the Merit Life being computed after 1000 hours for each sample. Reduced duration testing shall be again applicable after five consecutive lots have been accepted.

#### Single Lot or non-continuous production

If production is not continuous (see section 6.6) the above procedure cannot be used. In this case the manufacturer shall place at least five rectifiers on life test from a given lot. After 1000 hours the Merit Life for the sample shall be computed and if this exceeds 90% the lot shall be accepted. If it is 90% or less the lot shall be rejected.

If production is continuous (section 6.6), but an interval of more than one week occurs between any two lots at the start of a production run, either the manufacturer shall place additional rectifiers on life test from one or more lots, or lots shall be held in store for a period after the sample has completed 1000 hours of life test, so that the Merit Life is computed from the results of life test on not less than five rectifiers before a determination of acceptability is made.

#### Additional samples

The manufacturer may place on life test any number of additional samples from each lot, provided the minimum requirement of 1, 2 or 5 (as the case may be) is met. In addition, after the life test has started for any lot, the manufacturer may add an additional quantity to the initial life test sample, but this may be done once only for any life test lot.