Nav 113 D - 1914-1

Chapter 7

FUSES

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INTRODUCTION

Function

1. Fuses are included in aircraft wiring systems to protect equipment and cables against overload. Should a fault in a particular circuit cause the current to rise above a predetermined limit, the fuse will operate, thus cutting off the supply and isolating the circuit before the excessive current causes damage or fire.

2. A fuse operates when the current flowing through it is sufficient to melt the wire or strip element. The time taken for this to happen varies inversely with the current. A comparatively large current will vaporize the element almost immediately, whereas, a lower value of current may not open the circuit for several minutes. The time-current characteristic of a fuse-link is dependent upon the cooling surface and so varies with the design of the fuse.

FUSE-LINKS

Rating

3. Prolonged heating of a fuse causes deterioration of the element, with a resultant lowering of the melting point. The characteristic of the fuse-link will thus be changed, and it will eventually open-circuit at too low a current value.

4. Fuse-links are therefore given a rating to indicate the current that they will carry either continuously or for a stated period, without overheating and deteriorating.

5. A fuse-link for a particular circuit is therefore chosen such that its rating is not less than the normal current flowing in the circuit, but such that it will open-circuit at a current level below the safety limit of the equipment or cables. For this reason, it is important to ensure that only the specified fuse-links are installed in the system.

H.R.C. fuse-links

6. High rupturing capacity fuse-links give improved performance over non-H.R.C. fuse-links. The fusing element is mechanically supported throughout its length by a filling medium and in addition is hermetically sealed. Thus deterioration owing to oxidization, as described in para. 3 does not take place, and a more stable performance is obtained. H.R.C. fuse-links will also withstand starting and switching surges in excess of their rated current, and are able to interrupt large fault currents with safety.

Types of fuse-links

7. Cartridge fuse-links can be divided into two groups according to the type of contact the link makes with the fuse-unit or carrier. These are the ferrule-contact type (*fig.* 1) and the tag-contact type (*fig.* 2). Fuse-links used in service are listed in Appendices to this chapter.

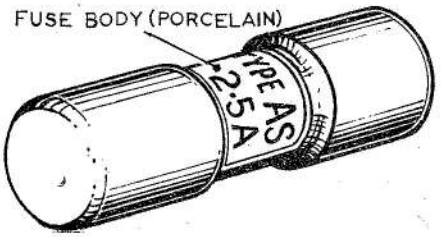


Fig. 1. Ferrule-contact fuse-link

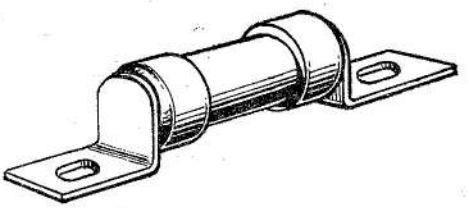


Fig. 2. Tag-contact fuse-link

FUSE UNITS

8. Fuse-links are secured between vibration-proof terminals of adequate current carrying capacity, which are designed to ensure good electrical connection and yet permit easy removal of the fuse-link. The unit housing the fixed contacts, to which the fuse-link makes contact, is called the fuse unit, and may take several forms, that of a fuse box, fuse base or fuse holder. The various types of unit are listed separately, in the appendices to this chapter.

Installation, operation and servicing

9. The blowing of a fuse-link should be taken as indication of a fault in the circuit or malfunctioning of equipment. Fuse-links should not be renewed, therefore, until the cause of the excess current has been ascertained and the fault rectified. When a spare fuse-link is carried in the box, this should be used as a replacement, and a new spare of the correct rating obtained from stores.

10. Where an obsolescent fuse-link is used these should be replaced by a preferred type when these are dimensionally replaceable. Obsolescent fuse-links are listed in an appendix to this chapter together with their preferred replacement when existing.

11. The fixed contact of the fuse should be kept clean so as to make good contact, since bad contact will cause overheating. Where ferrule-contact fuse-links are fitted, an overheated clip is apt to lose its resilience and so make even poorer contact. The clips are shaped and aligned during manufacture and they should not therefore be bent. A defective fuse unit should be renewed. Where tag-contact fuse-links are fitted, security of fixing screws should be checked.

Dummy fuse-links

12. In electrical circuits NOT IN USE in an aircraft dummy fuses must be fitted. This includes circuit rendered inoperative by S.T.I's or Modification action. Dummy fuse-links are also to be fitted to aircraft circuits during servicing, whenever components are removed for bay servicing, or when it is necessary to isolate a particular circuit in a live system. To distinguish the servicing dummy fuse-links red streamers should be permanently attached to the fuse-link.

13. Dummy fuse-links are manufactured to standard fuse dimensions from red plastic and to assist in identification in areas of poor illumination and to facilitate identification by feel, the centre portion is square in section with corrugated sides. Dummy fuse-links are listed in Appendix 6.

Appendix 1

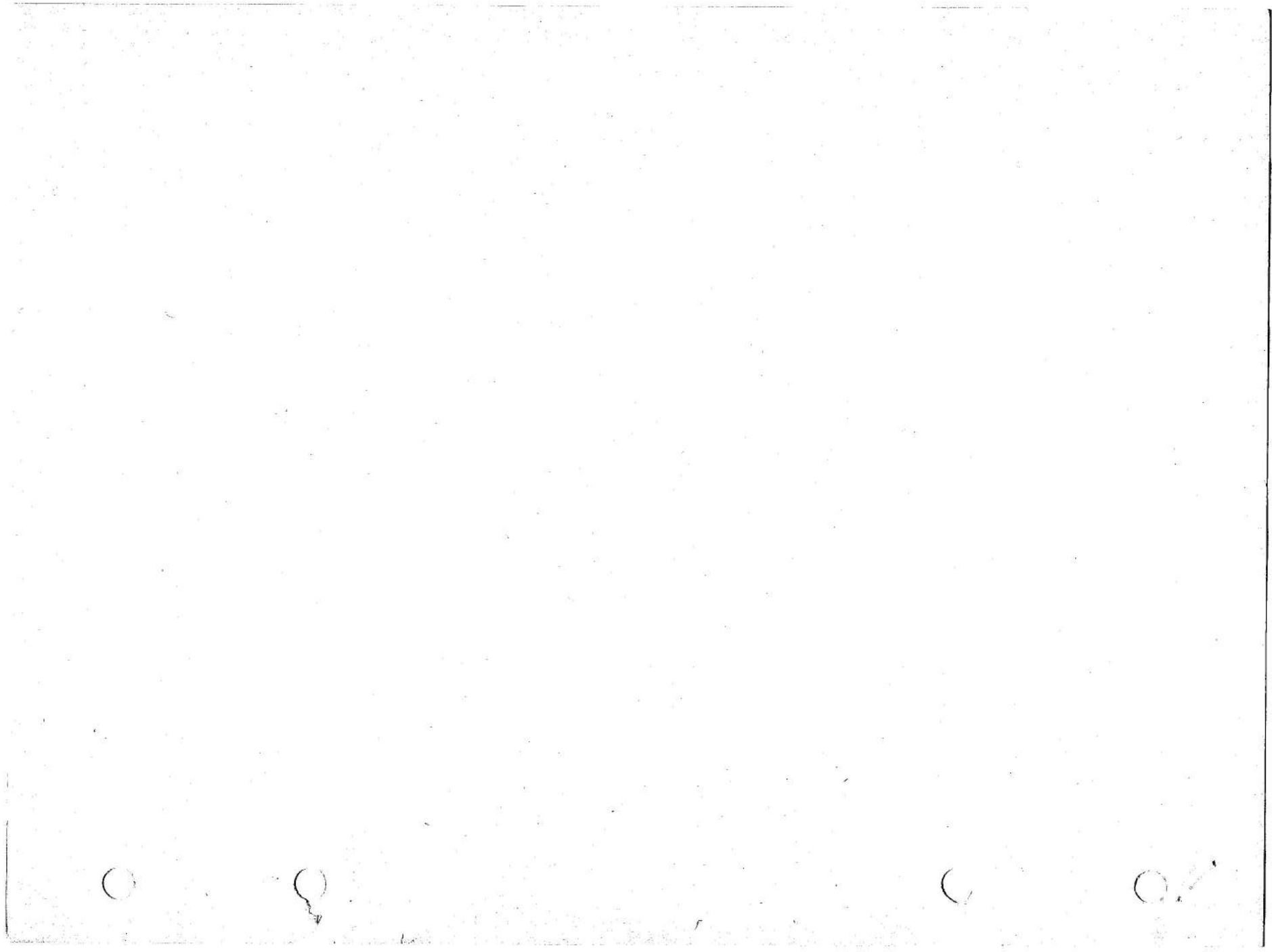
FERRULE-CONTACT CARTRIDGE FUSE-LINKS

Fuse-link type		Ref. No. 5CZ/	Rating Amp.	Rating Period	Ref. No. 10H/
A		204	20	Continuous	23802
G		907	25	5 min.	23805
R.1		3445	30	Continuous	23809
R.2		3207	40	Continuous	23811
R.3		3446	50	Continuous	23810
R'4		3208	60	Continuous	23812
R.5		3209	60	15 sec.	23813
R.6		3210	100	15 sec.	23814
L754/0·5	H.R.C.	5704	0·5	Continuous	
L1055/2·5		5757	2·5	Continuous	
L1055/5		5758	5	Continuous	
A.S.1	H.R.C.	5762	1	Continuous	23866
A.S.2·5	H.R.C.	5214	2·5	Continuous	23865
A.S.5	H.R.C.	5215	5	Continuous	23864
A.S.7·5	H.R.C.	5219	7·5	Continuous	23863
A.S.10	H.R.C.	5216	10	Continuous	23862
A.S.15	H.R.C.	5217	15	Continuous	23861
A.S.20	H.R.C.	5218	20	Continuous	23860
115 III F		5258	115	Continuous	23874
125 III F		5761	125	Continuous	23825
A.P.18521	H.R.C.	5706	10	Continuous	
XZ950115		5117	100	Continuous	24225
XQ55A		5131	5	Continuous	24219
G.A.5.81.3485	H.R.C.	5258	115	Continuous	
10231/18		1061	15	Continuous	23875
Bonella S.		5289	1·5	Continuous	23815
A.S.7.5		5219	7·5	Continuous	23863
Belling & Lee		5941	3	Continuous	24221
Belling & Lee		5942	5	Continuous	24222
Belling & Lee		5943	7	Continuous	24223
3 A.G.		5954	0·25	Continuous	23937

Appendix 2

TAG-CONTACT CARTRIDGE FUSE-LINKS

Fuse-link type		Ref. No. 5CZ/	Rating Amp.	Rating Period	Ref. No. 10H/
N		1963	120	Continuous	23808
T.B.60	H.R.C.	4866	60	Continuous	23857
S5888	H.R.C.	5266	80	Continuous	
T.C.P.80	H.R.C.	5401	80	Continuous	23856
T.C.P.100	H.R.C.	3180	100	Continuous	23855
T.F.P.125	H.R.C.	5114	125	Continuous	23854
T.F.P.160	H.R.C.	4627	160	Continuous	23853
T.F.200	H.R.C.	5061	200	Continuous	23852
T.F.P.200	H.R.C.	5132	200	Continuous	23851
T.K.M.300	H.R.C.	5115	300	Continuous	23850
T.K.F.300	H.R.C.	5209	300	Continuous	23849
85T.M.	H.R.C.	5029	350	Continuous	23848
85T.M.	H.R.C.	5461	400	Continuous	23847
1078	H.R.C.	5780	150	Continuous	24218
40 II T	H.R.C.	5457	40	Continuous	24212
50 II T	H.R.C.	5458	50	Continuous	24209
115 III T	H.R.C.	5441	115	Continuous	24208
125.M.14	H.R.C.	5638	125	Continuous	23824
150 IIIT	H.R.C.	5889	150	Continuous	24210
200M.14	H.R.C.	5497	200	Continuous	23826
20.O.T.	H.R.C.	5855	20	Continuous	24211
L1330/35		5746	35	Continuous	21775
L1330/50		5367	50	Continuous	21776
L1330/60		5756	60	Continuous	21777
L1330/80		5917	80	Continuous	21778
L1330/100		5400	100	Continuous	21779
L1330/150		5747	150	Continuous	21780
L1330/200		5755	200	Continuous	21781
L1330/225		5368	225	Continuous	21782
L1330/275		5369	275	Continuous	21783
L1330/300		5451	300	Continuous	21784
L1330/500		5371	500	Continuous	21785
S5888		5226	80	Continuous	23846
Z590124		5938	20	Continuous	24224
358TJ250		6023	250	Continuous	23859
TB50		6148	50	Continuous	23858



Appendix 3

FUSES, OBSOLESCENT AND OBSOLETE

Fuse-links

1. Fuse-links listed in this appendix are obsolescent or obsolete. When renewing such a fuse-link, a preferred type of the same rating should be used as a replacement. A table of obsolescent and obsolete types with some replacements is given below.

Fuse link type	Ref. No.	Rating		Replacement
		Amp.	Period	
D	5CZ/515	5	Continuous	—
B	5CZ/463	10	Continuous	—
L	5CZ/1666	60	15 sec.	5CZ/3209
Q	5CZ/3155	30	Continuous	5CZ/3445
E	5CZ/550	40	Continuous	5CZ/3207
P	5CZ/2953	50	Continuous	5CZ/3446
M	5CZ/1667	60	Continuous	5CZ/3208
F	5CZ/878	60	15 sec.	5CZ/3209
J	5CZ/1321	100	15 sec.	5CZ/3210
K	5CZ/1882	150	80 sec.	—
S	5CZ/879	2·5	Continuous	5CZ/5214
S	5CZ/880	5	Continuous	5CZ/5215
S	5CZ/881	10	Continuous	5CZ/5216
S	5CZ/1255	20	1 min.	—
S	5CZ/4057	20	Continuous	5CZ/5218

Fuse boxes

2. Obsolescent and obsolete fuse boxes are listed below;

Fuse box type	Ref. No.	No of ways.	Type of link housed
E	5CZ/882	1	S (10 Amp. max.)
F	5CZ/883	4	S (10 Amp. max.)
G	5CZ/886	8	S (10 Amp. max.)
A	5CZ/445	1	A, B, D, G, L
C	5CZ/758	4	A, B, D, G, L
D	5CZ/761	8	A, B, D, G, L
B No. 2	5CZ/2727	1	E, F, J, K, M, R
Y.6264H	5CZ/5399		

Appendix 4

JOINT SERVICE FUSES, FERRULE CONTACT-TYPE

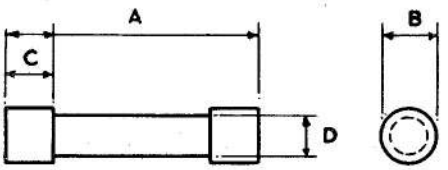


Fig. 1. Ferrule-contact fuse-link

TABLE 1

Dimensions

Body size	A Minimum (in.)	A Maximum (in.)	B Minimum (in.)	B Maximum (in.)	C Minimum (in.)	C Maximum (in.)
00	0·610	0·656	0·182	0·192	0·125	0·187
0	1·234	1·281	0·245	0·255	0·187	0·25
1	1·291	1·354	0·463	0·474	0·25	0·312
2	1·454	1·509	0·656	0·663	0·312	0·374
3	1·858	1·919	1·306	1·319	0·437	0·499

TABLE 2

Current Rating

Body size	(amp.)	Ref. No. 10H/	Body size	(amp.)	Ref. No. 10H/
00	0·025	0590133	0	0·25	0590107
00	0·050	0590134	0	0·50	0590108
00	0·10	0590135	0	1·0	0590109
00	0·25	0590136	0	2·0	0590110
00	0·50	0590137	0	3·0	0590111
00	1·0	0590138	0	5·0	0590112
00	2·0	0590139	0	7·0	0590113
0	0·06	0590130	0	10·0	0119925
0	0·10	0590131	0	15·0	0119926
0	0·15	0590132	1	0·50	0590140

Appendix 4—Continued

Body size	(amp.)	Ref. No. 10H/
1	1·0	0590141
1	2·0	0590142
1	3·0	0590143
1	5·0	0590144
1	7·0	0590145
1	10·0	0590146
1	15·0	0590147
1	20·0	0119483
2	10·0	0590148
2	15·0	0590149
2	20·0	0590150
2	30·0	0590151
3	40·0	0590152
3	60·0	0590153
3	80·0	0590154
3	100·0	0590155

Note . . .

Where fuses are used in ambient temperatures above 50°C they should not carry more than 80% of their nominal current rating continuously.

Appendix 5

JOINT SERVICE FUSES, TAG-CONTACT TYPE

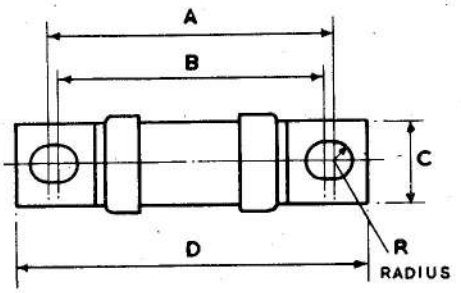


Fig. 1. Tag-contact fuse-link

TABLE 1

Dimensions

Body size	A (in.)	B (in.)	C (in.)	D (in.)	R Minimum (in.)	R Maximum (in.)
0	1·807	1·684	0·250	1·985	0·074	0·076
1	1·812	1·687	0·375	2·187	0·097	0·102
2	2·25	2·125	0·615	2·78	0·133	0·135
3	2·826	2·68	1·00	3·5	0·164	0·167

TABLE 2

Current Rating

Body size	amp.	Ref. No. 10H/	Body size	amp.	Ref. No. 10H/
0	0·25	0120071	2	10	0590122
0	0·5	0120072	2	15	0590123
0	1·0	0120073	2	20	0590124
0	2·0	0120074	2	30	0590125
0	3·0	0120075	2	40	0120067
0	5·0	0120076	2	50	0119127
0	7·0	0120077	2	60	0120141
0	10·0	0120078	3	40	0590126
0	15·0	0120079	3	60	0590127
0	20·0	0120080	3	80	0590128
1	0·50	0590114	3	100	0590129
1	1·0	0590115	3	125	0119128
1	2·0	0590116	3	150	0119129
1	3·0	0590117	3	200	0119927
1	5·0	0590118			
1	7·0	0590119			
1	10·0	0590120			
1	15·0	0590121			
1	20·0	0119679			
1	30·0	0120140			

Note . . .

Where fuses are used in ambient temperatures above 50°C they should not carry more than 80% of their nominal current rating continuously.

Appendix 6

DUMMY FUSE-LINKS

LEADING PARTICULARS

Size Amp.	Ref. No.	Ref. No.
	5CZ/	10H/
2	5865	21790
2·5	5866	21791
5	5866	21791
10	5867	21792
40	5868	21793
2·5/5	6404	23996

Fig. 1. Dummy fuse-link

Appendix 7

FUSE BOXES

LEADING PARTICULARS

Type of box	*Ref. No.*	*Type of link housed*	*No. of ways*
S	5*H*/73	*AS*	3
S	5*H*/74	*AS*	6
S	5*H*/75	*AS*	12
B No. 1	5*CZ*/549	*R.A.C.*	1
J	5*CZ*/1962	*N*	1
J2	5*CZ*/3935	*N*	1
*F.E.S.*2	5*CZ*/4095	*AS*	4
Plessey	5*X*/6395	*AS*	4

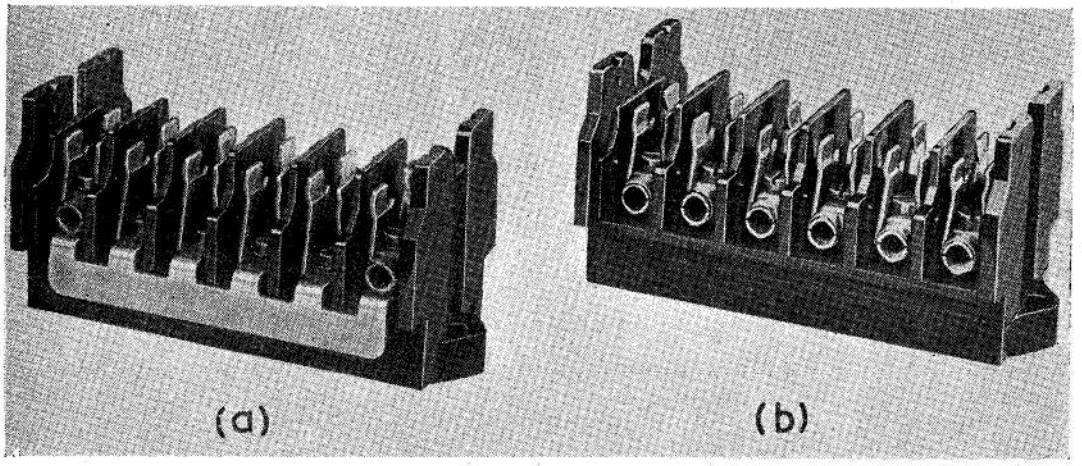


Fig. 1. Fuse box, Type S

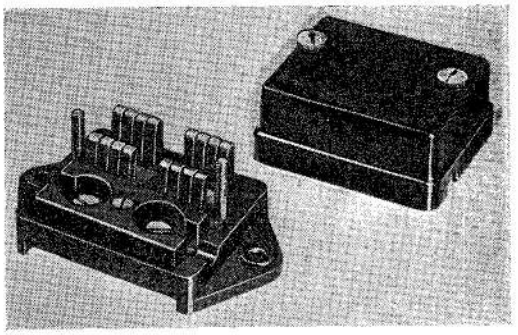


Fig. 2. Fuse box, Type B, No. 1

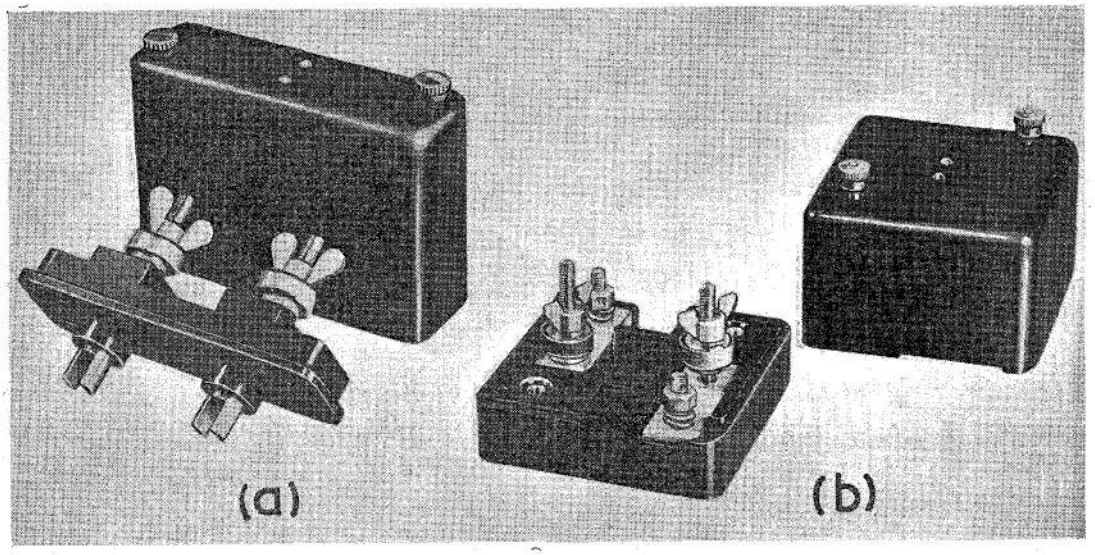


Fig. 3. Fuse boxes, Types J and J.2

APPENDIX 8

FUSE HOLDERS

LEADING PARTICULARS

Type of holder	Ref. No.	Type of link housed
Belling Lee Y6264H	10H/0120231	
Belling Lee Y6264H (modified)	10H/9473075	
Belling Lee L675	10H/0591061	
Belling Lee L1307/A No. 3	10H/21787	
Belling Lee L1340	10H/9140686	
Belling Lee 1341	10H/1037738	
Belling Lee 1348	10H/0591056	
Belling Lee 1382	10H/0120231	
Fuse holder Type A	10H/23998	AS
Fuse unit E.L.E. 2444A comprising:—		
Base electric fuse	10H/0120597	
Carrier fuse link	10H/0120598	

1. Fuse holder, Belling Lee Type L1382, which replaces the fuse holders Type L674 (Ref. No. 10H/9128842) and Type L1340 has a lid containing a spring and clip. When renewing the lid to fuse holders Types L1382, L674 or 1340, the lid Type L1382/L (Ref. No. 10H/0120232) is to be used. N.A.M.O. GENERAL L 134 refers. Other type lids are not interchangeable.

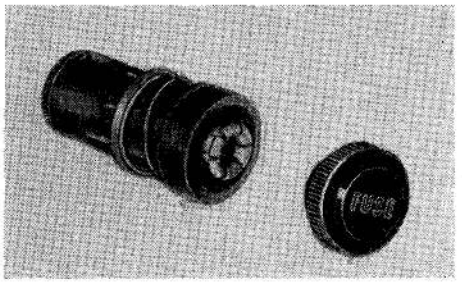


Fig. 1. Fuse holder, type A

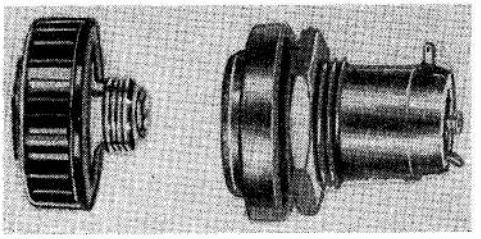


Fig. 2. Fuse holder — Belling Lee

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(6760) 631181 1700 11/68 483/1

Appendix 9

FUSE BASES AND CARRIERS

LEADING PARTICULARS

Type	*Ref. No.*	*Type of link housed*	*No. of ways*	*Description*	*Ref. No. 10H/*
E.E.Co. Size 1 Shrouded	5CZ/5049		1	*Carrier*	9401032
E.E.Co. Size 2 Shrouded	5CZ/5050		1	*Carrier*	9401033
E.E.Co. Size 1 non-shrouded	5CZ/5055		1	*Carrier*	2386
E.E.Co. Size 2 non-shrouded	5CZ/5056		1	*Carrier*	23868
E.L.E. Size 2	5CZ/5628		1	*Carrier*	21789

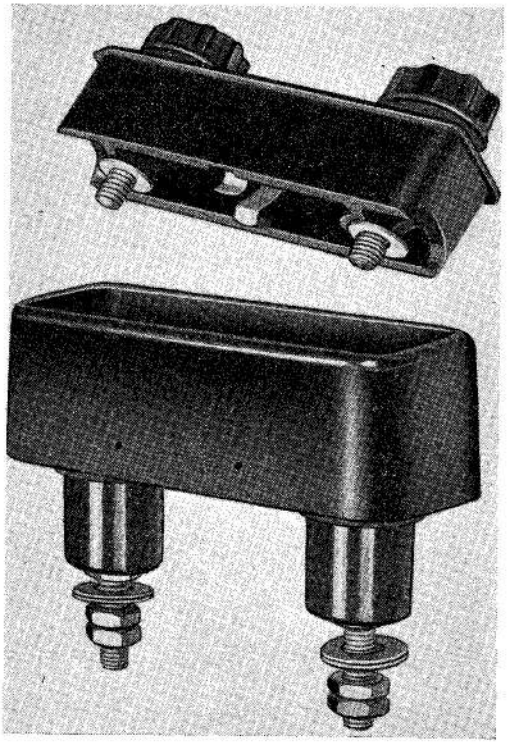

Fig. 1. Fuse carrier with base

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Appendix 10

FUSE INDICATORS

LEADING PARTICULARS

Page Type 1501/*A*/1:	
Ref. No.	10*H*/9522047
Voltage rating	28*V d.c.*
Current rating	15 *amps*
Page Type 1503:	
Ref. No.	10*H*/9522046
Voltage rating	250*V a.c.*
Current rating	15 *amps*

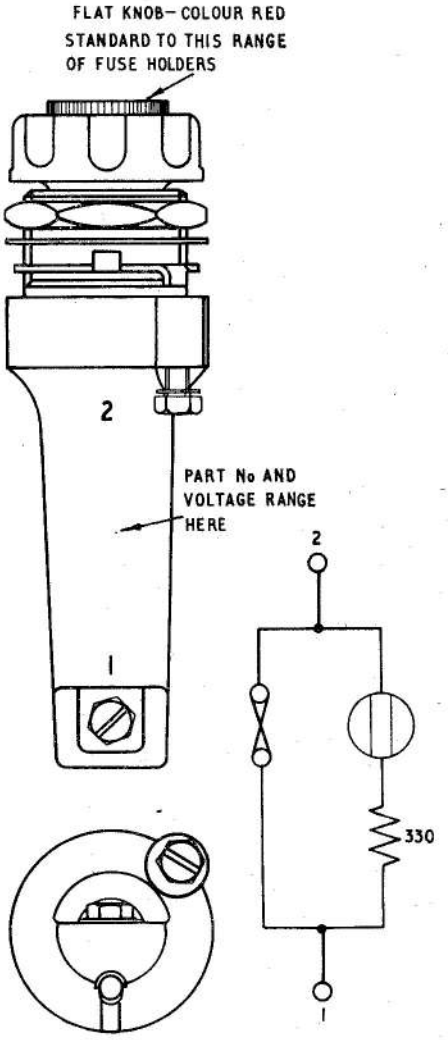

Fig 1. Fuse Indicator Type

DESCRIPTION

1. These fuse indicators are each fitted with a lamp which illuminates the translucent knob when the fuse blows. They consist of a black phenolic moulded body, into which is screwed the fuse holder and illuminating knob. Type 1503 differs from Type 1501/A/1 in that it has a domed illuminating knob, a neon indicator, replacing the lamp, and a 270 kilohm series resistor.

SERVICING

2. During the servicing of the units in which these items are fitted the following procedure should be adopted:

(1) The illuminating knob should be removed and the fuse extracted. The knob should then be replaced and the lamp should glow.

(2) Replace the fuse and the illuminating knob.

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